iTrust Medical Care Requirements Specification

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Introduction

This project involves the development of an application through which doctors can obtain and share essential patient information and can view aggregate patient data. Currently, access to a patient's history regarding previous medical problems, previous surgery, medications, allergies and other factors is often difficult or obtainable only from a patient's recollection. Now, as more hospitals and doctor's offices are automated, this information is available electronically. However, it is not accessible by other doctors, and is often only viewed through some proprietary software so it can not be shared.

The final product is a site where health care workers can access important patient information, the non-emergency access can be controlled, and all access would be tracked. Security and privacy of such a system is of paramount importance. HIPAA rules protect patients' information and also allow a patient to dictate who can access this information.

Glossary

Approved diagnostic information: The set of diagnostic information a patient allows a designated or other licensed health care professional to view. A patient is only given the choice to restrict viewing on selected diagnostic information, such as those related to mental illness, substance abuse, and cosmetic surgery. The licensed health care professional making a diagnosis determines if a patient is granted the ability to restrict viewing of the diagnosis. For the diagnostic information which a patient can restrict viewing, he or she can choose to enable designated licensed health care professionals, and/or other licensed health care professionals, and/or no one.

- **Health Care Personnel (HCP)**: All of designated licensed health care professionals, licensed health care professionals, and unlicensed authorized personnel, as defined below.

There are eight roles in the iTrust Medical Records system. The role of a user determines their viewing and editing capabilities (role-based access control).

- **Patient**: When an American infant is born or a foreigner requests medical care, each is assigned a medical identification number and password. Then, this person's electronic records are accessible via the iTrust Medical Records system.
- **Administrator**: The administrator assigns medical identification numbers and passwords to LHCPs. [Note: for simplicity of the project, an administrator is added by directly entering the administrator into the database by an administrator that has access to the database.]
- **Licensed Health Care Professional (LHCP)**: A licensed health care professional that is allowed by a particular patient to view all approved medical records. In general, a patient does not know this non-designated health care professional, such as an emergency room doctor, and the set of approved records may be smaller than that granted to a designated licensed health care professional.
- **Designated Licensed Health Care Professional (DLHCP)**: A licensed health care professional that is allowed by a particular patient to view all approved medical records. Any LHCP can be a DLHCP to some patients (with whom he/she has an established relationship) and an LHCP to others (whom he/she has never/rarely seen before).

- **Emergency Responder (ER)**: Police, Fire, Emergency Medical Technicians (EMTs), and other medically trained emergency responders who provide care while at, or in transport from, the site of an emergency. [referred to as "on site care providers" by Department of Health and Human Services Emergency Responder Electronic Health Record Use Case http://www.dhhs.gov/healthit/usecases/documents/EmergencyRespEHRUseCase.pdf [http://www.dhhs.gov/healthit/usecases/documents/EmergencyRespEHRUseCase.pdf]]
- **Unlicensed Authorized Personnel (UAP)**: A health care worker such as a medical secretary, laboratory technician, case manager, care coordinator, or other authorized clerical-type personnel. An unlicensed personnel can enter and edit demographic information, diagnosis, office visit notes and other medical information, and can view records.
- **Software Tester**: An information technology worker who tests the iTrust Medical Records system. Of particular interest to the software tester is the operational profile information which informs him/her of the frequency of use of the features of the system.
- **Personal Representative**: A person legally authorized to make health care decisions on an individual's behalf or to act for a deceased individual. When a person logs into iTrust, if he or she is a personal representative, they view their own records or those of the person/people they are representing. (For example, a mother could choose herself and any one of her children.)

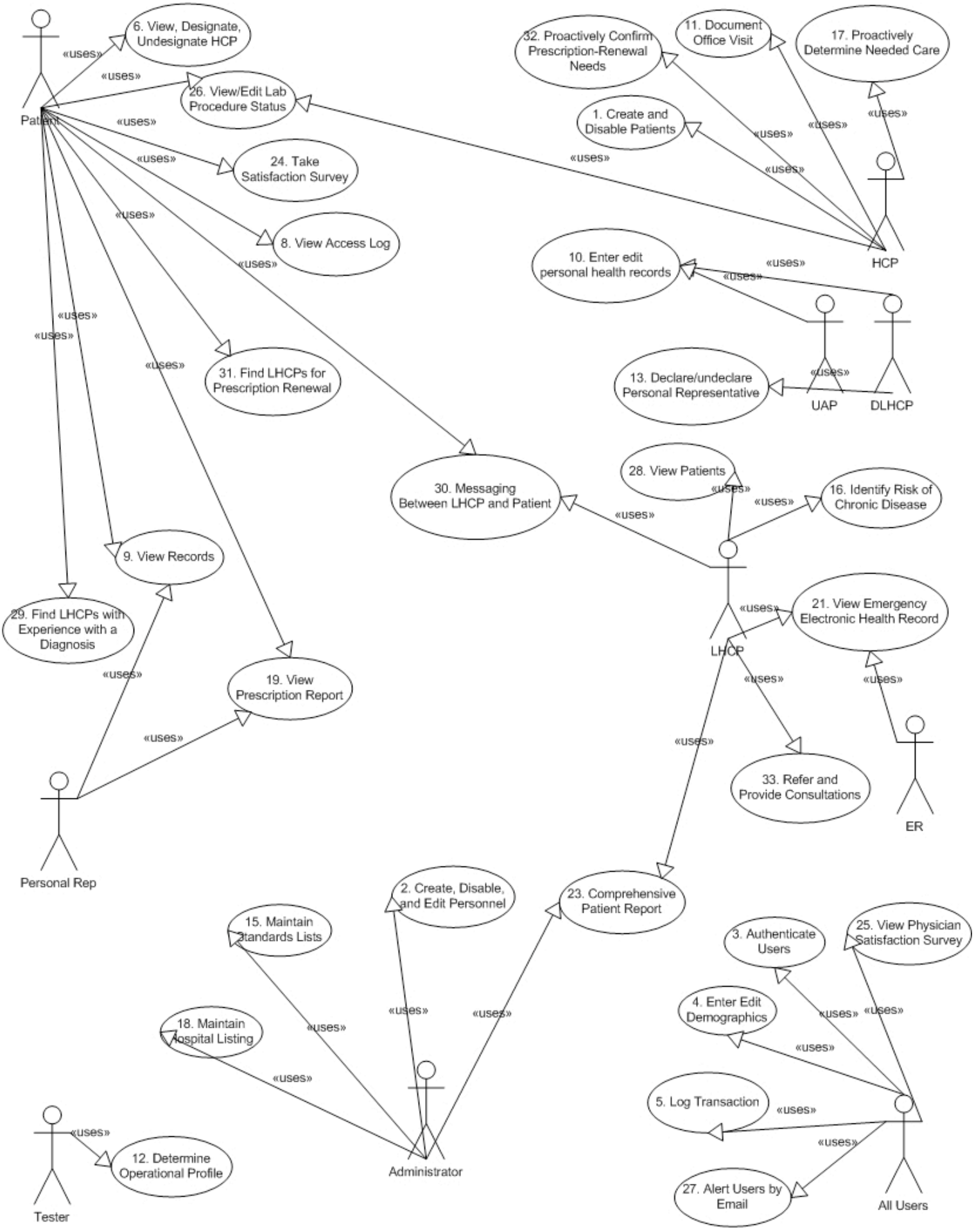
* **Public Health Agent**: A person legally authorized view and respond to reports of adverse events.

These are the standards codes used within iTrust:

- **ICD-9CM**: The International Statistical Classification of Diseases and Related Health Problems (most commonly known by the abbreviation ICD) provides codes to classify diseases and a wide variety of signs, symptoms, abnormal findings, complaints, social circumstances and external causes of injury or disease. NHCS Classification of Diseases, Functioning and Disability [http://www.cdc.gov/nchs/icd9.htm]
- **ND**: The National Drug Code (NDC) is a universal product identifier used in the United States for drugs intended for human use. National Drug Code Directory [http://www.fda.gov/Drugs/InformationOnDrugs/ucm142438.htm]
- **LOINC**: Logical Observation Identifiers Names and Codes (LOINC) is a database and universal standard for identifying medical laboratory observations. LOINC c/o Medical Informatics [http://loinc.org/]
- **CPT**: The CPT code set accurately describes medical, surgical, and diagnostic services and is designed to communicate uniform information about medical services and procedures among physicians, coders, patients, accreditation organizations, and payers for administrative, financial, and analytical purposes. About CPT [http://www.ama-assn.org/ama/pub/physician-resources/solutions-managing-your-practice/coding-billing-insurance/cpt/about-cpt.shtml]

Use Case Diagram and Flow of Events

There are 33 Use Cases for the system, as indicated by the attached diagram:


Patient
6. View, Designate, Undesignate HCP
26. View/Edit Lab Procedure Status
24. Take Satisfaction Survey
8. View Access Log
31. Find LHCPs for Prescription Renewal
9. View Records
29. Find LHCPs with Experience with a Diagnosis
19. View Prescription Report
Personal Rep
32. Proactively Confirm Prescription-Renewal Needs
11. Document Office Visit
17. Proactively Determine Needed Care
1. Create and Disable Patients
HCP
10. Enter edit personal health records
13. Declare/undeclare Personal Representative
UAP
DLHCP
30. Messaging Between LHCP and Patient
28. View Patients
16. Identify Risk of Chronic Disease
LHCP
21. View Emergency Electronic Health Record
33. Refer and Provide Consultations
ER
23. Comprehensive Patient Report
2. Create, Disable, and Edit Personnel
15. Maintain Standards Lists
18. Maintain Hospital Listing
Administrator
3. Authenticate Users
25. View Physician Satisfaction Survey
4. Enter Edit Demographics
5. Log Transaction
27. Alert Users by Email
All Users
12. Determine Operational Profile
Tester
«uses»

This diagram is also available as a Microsoft Visio File [http://agile.csc.ncsu.edu/iTrust/doc/usecases_uml.vsd]

Throughout this document MID = medical identification number. The MID is a unique number assigned to all roles.

The following use cases document flows of events.

UC1 Create and Disable Patients Use Case

1.1 Preconditions:

The iTrust HCP has authenticated himself or herself in the iTrust Medical Records system [UC3].

1.2 Main Flow:

An HCP creates patients [S1] and disables patients [S2]. The create/disable patients and HCP transaction is logged [UC5].

1.3 Sub-flows:

- [S1] The HCP enters a patient as a new user of iTrust Medical Records system. Only the name and email are is provided. ~~An email with~~ The patient's assigned MID and a secret key (the initial password) is **personally provided** to the user, with which the user can reset his/her password. The HCP can edit the patient according to data format 6.4 [E1] with all initial values (except patient MID) defaulting to null and/or 0 as appropriate. Patient MID should be the number assigned when the patient is added to the system and cannot be edited. The HCP does not have the ability to enter/edit/view the patient's security question/password.
- [S2] The HCP provides the MID of a patient for whom he/she wants to disable [E2]. The HCP provides a deceased date (data format 6.4). An optional diagnosis code is entered as the cause of death.

1.4 Alternative Flows:

- [E1] The system prompts the enterer/editor to correct the format of a required data field because the input of that data field does not match that specified in data format 6.4 for patients.
- [E2] The enterer/editor is presented with the name of the user and determines if it is invalid or not the right person. The enterer/editor is prompted to try again.

1.5 Sub-flow Traces

- [S1] http://localhost:8080/iTrust/auth/admin/addPatient.jsp [http://localhost:8080/iTrust/auth/admin/addPatient.jsp]
- [S2] None

UC2 Create, Disable, and Edit Personnel Use Case

2.1 Preconditions:

The iTrust Admin has authenticated himself or herself in the iTrust Medical Records system [UC3].

2.2 Main Flow:

An admin creates a LHCP, an ER, or a public health agent [S1]. A LHCP creates [S2] UAPs. Once entered, the enterer/editor is presented a screen of the input to approve [E2].

2.3 Sub-flows:

- [S1] An administrator enters a LHCP, ER, or **public health agent** as a user of iTrust Medical Records system, initially only the name and email are provided. A secret key is personally provided to the user, with which the user can reset his/her password. The data for personnel can be edited according to Data Format 6.2 (all fields mandatory except for associated MID and Street Address 2) [S6, E1]. The administrator shall be allowed to assign a LHCP to multiple hospitals, and the administrator can choose among only the hospitals provided in the hospital list pull down menu. The hospital ID numbers for a LHCP are stored in the Medical Care Personnel Affiliation database (data format 5.11).

- [S2] A LHCP enters an UAP as a user of iTrust Medical Records system according to data format 6.2 (all fields mandatory) [E1].
- [S3] The transaction is logged [UC5].

2.4 Alternative Flows:

- [E1] The system prompts the enterer/editor to correct the format of a required data field because the input of that data field does not match that specified in data format 6.2, for HCPs.
- [E2] The enterer/editor is presented with the name of the user and determines if it is invalid or not the right person. The enterer/editor is prompted to try again.

2.5 Reference document

The inclusion of the ER role was inspired by Department of Health and Human Services USA Emergency Responder Electronic Health Record Use Case http://www.dhhs.gov/healthit/usecases/documents/EmergencyRespEHRUseCase.pdf [http://www.dhhs.gov/healthit/usecases/documents/EmergencyRespEHRUseCase.pdf]

UC3 Authenticate Users Use Case

3.1 Preconditions:

UC1/UC2 has completed and a user has been created.

3.2 Main Flow:

A user enters their MID and their password to gain role-based entry into the iTrust Medical Records system [E1] or requests that their password be changed [S1]. A session that has been inactive for too long is terminated [S3]. An authenticated session ends when the user logs out or closes the iTrust application.

3.3 Sub-flows:

- [S1] If the security question/answer has been set (it is not null) [E2], present security question and obtain answer [S2, E1].
- [S2] If answer to security question is correct, allow user to change their password. An email notification is sent [UC27, S1].
- [S3] Electronic sessions must terminate after a "pre-determined" period of inactivity. Allow the administrator to set the length of this period of time and ensure that all authorization is disabled after a period of inactivity that exceeds this length.
- [S4] A LHCP is presented with a screen of links to the following:
  - Recent Laboratory Results: recent (within the last month) laboratory results [UC26] for laboratory procedures he/she ordered in office visits.
  - Any upcoming appointments within the next week
  - Rejection/Acceptance of comprehensive report
- [S5] A patient is presented with a screen of links to the following:
  - Recent Laboratory Results: recent (within the last month) laboratory results [UC26] for laboratory procedures that the patient (or a patient he/she represents), that the patient has access.
  - Any upcoming appointments within the next week
  - Comprehensive report requested/generated of the patient, including patients that he/she represents

3.4 Alternative Flows:

- [E1] The user may try three times. After three failed attempts with a userid in a given session, disallow attempts to log in via IP address for 15 minutes (see comments in the source code).
- [E2] If the patient has never stored a security question/answer, the user is not provided the ability to change the password.

UC4 Enter/edit Demographics Use Case

4.1 Precondition:

UC1 has completed and a patient has been created. The iTrust user has authenticated himself or herself in the iTrust Medical Records system [UC3].

4.2 Main Flow:

Demographic information is entered and/or edited [S1, S2]. Once entered, the enterer/editor is presented a screen of the input to approve [E2].

4.3 Sub-flows:

- [S1] A patient or personal health representative may enter or edit their own demographic information including their security question/answer according to data format 5.1. When answer to the security question is typed in, the answer should not appear on the screen (similar to how a password normally appears) and the answer should be confirmed (by the patient or personal health representative) before it is saved. [S4, E1].
- [S2] HCP must enter the MID of a patient and then enter or edit demographic information with the exception of the patient's security question/password according to data format 5.1 [S4, E1].
- [S3] An HCP may enter or edit their own demographic information according to data format 5.2 [S4, E1].
- [S4] The enter/edit demographics transaction is logged [UC5].

4.4 Alternative Flows:

- [E1] The system prompts the patient or HCP to correct the format of a required data field because the input of that data field does not match that specified in data format 5.1 or data format 5.2, as appropriate.
- [E2] The enter/editor reviews the input and finds an error, he or she does not confirm the selection. He/She provides the correct input and submits again.

UC5 Log Transaction Use Case

5.1 Precondition:

One of UC1-UC4 or UC6-UC17 has been initiated.

5.1 Precondition:

One of UC1-UC4 or UC6-UC17 has been initiated.

5.2 Main Flow:

An HCP or patient enter/edits demographics [UC4, S1], designate/un-designate DLHCP [UC6, S2], allows/disallows access to diagnosis [UC7, S3], views access log [UC8, S4], views medical records [UC9, S5], view prescription report [UC19, S19], find LHCPs for prescription renewal [UC31, S32], or chronic disease risk factors [UC16, S15], authenticates users [UC3, S6], enter/edits personal health information [UC10, S7], documents an office visit [UC11, S8], proactively determines if healthcare is an office visit or procedure is due for a patient [UC17, S17], or proactively confirm prescription-renewal needs of a patient [UC32, S33]. An administrator or HCP creates or disables a HCP [UC2, S9] or patient [UC1, S9] respectively. An administrator maintains the standards list [UC 15, S10, S12-14] or maintains the hospital list [UC 18, S18]. An HCP requests biosurveillance information [UC14, S11], declares/undeclares a personal health representative for a patient [UC13, S16], or refers a patient for consultations [UC33, S34]. An LHCP, UAP and patient engage in telemedicine through which blood pressure and glucose levels can be monitored [UC34, S35]. All transaction logs are formatted via data format 6.3.

5.3 Sub-flows:

- [S1] Enter/edit demographics. The MID of the editor (may be the patient) and of the patient, transaction type = 1, and the date are recorded.
- [S2] View HCP; declare/undeclare LHCP as DLHCP. The MID of the editor (may be the patient) and of the patient, transaction type = 2, and the MID of the LHCP, and the date are recorded.

~~* [S3] Allow/disallow access to diagnosis. The MID of the editor (may be the patient) and of the patient, transaction type = 3, the diagnosis number and "-allow" or "-disallow" (concatenated with diagnosis number), and the date are recorded.~~

- [S4] View access log. The MID of the viewer (must be patient), transaction type = 4, and the date are

recorded.

- [S5] View medical records. The MID of the viewer (may be patient) and of the patient, transaction type = 5,and the date are recorded.
- [S6] Authenticate users. The MID of the patient and/or the health care professional, transaction type= 6, an optional string of “authenticated” and the date are recorded. “Authenticated” should be logged when the user's home page is accessed.
- [S7] Enter/edit personal health information. The MID of the editor and of the patient, transaction type = 7, and the date are recorded.
- [S8] Document office visit. The MID of the editor and of the patient, the office visit id, transaction type = 8, and the date are recorded.
- [S9] Create/disable patient or HCP. The MID of the editor and of the new patient or health care personnel, and role of the new user, transaction type = 9, and the date are recorded.
- [S10] Diagnosis code. The MID of the administrator, [patient = blank], transaction type =10, the diagnosis code, and the date are recorded.
- [S11] Request biosurveillance. The MID of the administrator, [patient = blank], transaction type =11, the diagnosis code, and the date are recorded.
- [S12] Medical procedure code. The MID of the administrator, [patient = blank], transaction type =12, the medical procedure code, and the date are recorded.
- [S13] Drug code. The MID of the administrator, [patient = blank], transaction type =13, the drug code, and the date are recorded.
- [S14] Identify risk factors. The MID of the LHCP and of the patient, transaction type =14, and the date are recorded.
- [S15] Cause of Death Trends. The MID of the logged in user, transaction type = 15, and the date are recorded.
- [S16] Declare/undeclare personal health representative. The MID of the editing HCP and of the patient, transaction type = 16, and the MID of the personal representative, and the date are recorded.
- [S17] Proactively determine necessary patient care. The MID of the HCP making the request, secondary MID = patient MID, transaction type = 17, and the date are recorded. Note that each patient in the presented patient list will have one log entry
- [S18] Maintain a hospital listing. The MID of the administrator, [secondary MID = blank], transaction type = 18; optional entry = hospital ID number, and the date are recorded.
- [S19] View prescription report. The MID of the editor and of the patient, transaction type = 19, and the date are recorded.
- [S20] View Hospital Statistics. The MID of the HCP, transaction type = 20; and the date are recorded.
- [S21] View patient comprehensive record. The MID of the HCP and of the patient, transaction type = 21, and the date are recorded.
- [S22] View emergency report. The MID of the LHCP and of the patient, transaction type = 22, and the date are recorded.
- [S23] Schedule Appointments. The MID of the person logged in, secondary MID = the person who the appointment is scheduled with, transaction type=23, and the date are recorded.
- [S24] View Upcoming Appointments. The MID of the person logged in, [no secondary MID], transaction type=24, and the date are recorded.
- [S25] Comprehensive Report. The MID of the person logged in, the MID of the patient's record being requested (as the secondary MID), ~~the status of the request at the time of the transaction (including the requesting LHCP where applicable)~~, transaction type = 28, and the date are recorded.
- [S26] Take Satisfaction Survey. The MID of the patient, the office visit id, transaction type = 32, and the date are recorded.

- [S27] View physician satisfaction results. The MID of the patient, transaction type = 33, and the date are recorded.
- [S28] View laboratory procedure results. The MID of the viewer and of the patient, laboratory procedure ID, transaction type = 29, and the date are recorded.
- [S29] View patient list. The MID of the HCP, transaction type = 34, and the date are recorded.
- [S30] Find LHCPs with experience with a diagnosis. The MID of the patient, transaction type = 35, and the date are recorded.
- [S31] Send messages. The MID of the message sender, the MID of the message recipient, transaction type = 40, and the date are recorded.
- [S32] Find LHCPs for prescription renewal. The MID of the patient, transaction type = 41, and the date are recorded.
- [S33] Proactively confirm prescription-renewal needs. The MID of the HCP making the request, secondary MID = patient MID, transaction type = 41, and the current date are recorded. Note that each patient in the presented patient list will have one log entry.
- [S34] Refer a patient for consultations. The MID of the HCP sending the referal, secondary MID = patient MID, transaction type = 42, and the current date are recorded.
- [S35] Telemedicine monitoring. When an LHCP chooses to add/delete patients from his or her monitoring list, the MID of the LHCP, the MID of the patient, transaction type = 45, the word “add” or “delete”, and the current date are recorded. When a patient reports their blood pressure and/or glucose levels, their MID, transaction type 45, and a timestamp are recorded. When an LHCP chooses to monitor their patients, their MID, transaction type 45, and a timestamp are recorded.
- [S36] Adverse event reporting. A patient MID, type 49, and the date are recorded.
- [S37] Prescribe medication. A patient MID, an LHCP MID, the CPT code, type 38, and the date are recorded.
- [S38] Adverse event monitoring. A public health agent MID, type 49, and the date are recorded.
- [S39] Create/disable ER. An admin MID, the newly created ER MID, type 43, and the timestamp are recorded.
- [S40] Create/disable Public Health Agent. An admin MID, the newly created PHA MID, type 47, and the timestamp are recorded.
- [S41] Drug Interactions. The Admin MID, no secondary MID, type 48, and the two prescriptions involved in the interaction are recorded, along with a timestamp.
- [S42] Login Failures. The IP Address of the machine, type 50, and timestamp are recorded.
- [S43] Maintain appointment type listing. The MID of the administrator, [secondary MID = blank], transaction type = 51, and the date are recorded.
- **[S44] Send Reminders. The MID of the administrator, [secondary MID = blank], transaction type = 52, and the date are recorded.**

5.4 Alternative Flows:

None.

UC6 View HCP; Designate/Undesignate Designated Licensed Health Care Professional Use Case

6.1 Precondition:

UC1 and UC2 have completed and a licensed health care professional and a patient have been created. The patient has authenticated himself or herself in the iTrust Medical Records system [UC3].

6.2 Main Flow:

The patient chooses to view all LHCPs the patient has ever had an office visit with and those whom he/she

had designated [S1, S2]. The patient can also add a LHCP to their provider list by searching for the name of a LHCP [S3] and then selecting to add the HCP to their list of providers. The event is logged [UC5].

6.3 Sub-flows:

[S1] The LHCP's name, specialty, address, date of office visit, and whether or not the LHCP is a DLHCP for this patient is indicated. The list is sorted by the date of the last office visit (most recent first).

[S2] The patient can choose to toggle between designating/undesignating any LHCP as being a DLHCP for them.

[S3] The patient types a last name or partial last name and optionally reduces the list of choices by providing the specialty and/or zip code (match on first three numbers of zip code). The LHCP's name, specialty, and address are provided.

6.4 Alternative Flows:

none

6.5 Reference document

Office of the National Coordinator for Health Information Technology (ONC) Consumer Empowerment: Consumer Access to Clinical Information Prototype Use Case http://www.hhs.gov/healthit/usecases/consumeraccess.html [http://www.hhs.gov/healthit/usecases/consumeraccess.html], Scenario 2

UC7 Allow/disallow access to diagnosis Use Case [deleted]

7.1 Precondition:

~~The patient has authenticated himself or herself in the iTrust Medical Records system [UC2].~~

7.2 Main Flow:

~~The patient chooses to allow/disallow access to diagnosis to DLHCP, to LHCP, or to no one. He or she is presented with a listing of diagnoses for which allowing access is discretionary. The default access option is "allow" and all prior allow/disallow choices are displayed. The patient can change the default or current choices. The patient is then asked to confirm their selection [E1]. Upon confirmation, the patient sees a listing of their diagnoses with discretionary access and the current allow/disallow status.~~

7.3 Sub-flows:

~~None.~~

7.4 Alternative Flows:

- ~~[E1] The patient does not agree with the update and is prompted to try again. * [E2] If an office visit applies to more than one diagnosis and any of those diagnoses has discretionary access, the office visit can only be seen by the DLHCP.~~

UC8 View Access Log Use Case

8.1 Precondition:

A patient is a registered user of the iTrust Medical Records system [UC1]. The patient has authenticated himself or herself in the iTrust Medical Records system [UC3].

8.2 Main Flow:

The patient chooses to view his or her access log. The patient then chooses the beginning and end date for the period of time they would like to view their access log for [S1, S2]. The resulting list should include the following for each access:

- Name of accessor (with a link to contact information if the viewer is an LHCP)
- Role of accessor relative to the patient
- Date and time of access

- Transaction Type (See Section 6.3)

The event is logged [UC5].

8.3 Sub-flows:

[S1] The patient also chooses to view the list sorted by dates, most recent access first.
[S2] The patient also chooses to view the list sorted by the role of the accessor relative to the patient (personal health representative, DLHCP, LHCP, UAP, Emergency Responder; any order is fine as long as the list is sorted by role) as well as by date for each role type.

8.4 Alternative Flows:

None.

UC9 View records Use Case

9.1 Precondition:

A patient is a registered user of the iTrust Medical Records system [UC1]. The iTrust user has authenticated himself or herself in the iTrust Medical Records system [UC3].

9.2 Main Flow:

A patient or personal health representative chooses to view medical records [S1] including family history [S2]. The event is logged [UC5].

9.3 Sub-flows:

- [S1] The patient or personal health representative can see patient personal health information (including historical values), immunizations, and office visit information (date, diagnoses, medication, name of attending physician but not notes, laboratory procedures) for (a) their own records and (b) the records for whom the user is a personal representative. If a patient or personal health representative has not taken an office visit satisfaction survey for an office visit yet, the patient may choose to take the survey for an office visit (if the survey has already been taken, the patient or personal health representative will not have the ability to take the survey or view their previously submitted survey) [UC24].
- [S2] The patient or personal health representative can see an abbreviated health history of their siblings, parents, and both sets of grandparents for which MIDs are available in iTrust. They can see diagnoses related to the following [presented as a table with an x if the family member suffered from that diagnosis]:

1. high blood pressure (Systolic blood pressure over 240 mmHg and/or a diastolic blood pressure over 120 mmHg);
2. high cholesterol (HDL ("good") cholesterol levels under 35 mg/dL (milligrams per deciliter) and/or a triglyceride level over 250 mg/dL);
3. diabetes [is diagnosed with ICD-9CM code beginning with 250: http://icd9cm.chrisendres.com/index.php?action=child&recordid=1765 [http://icd9cm.chrisendres.com/index.php?action=child&recordid=1765],;
4. cancer [is diagnosed with ICD-9CM code beginning with 199: http://icd9cm.chrisendres.com/index.php?action=child&recordid=1765 [http://icd9cm.chrisendres.com/index.php?action=child&recordid=1765],;
5. heart disease [is diagnosed with ICD=9CM code beginning with 402: http://icd9cm.chrisendres.com/index.php?action=child&recordid=1765 [http://icd9cm.chrisendres.com/index.php?action=child&recordid=1765],;
6. smoking; and
7. the cause of death if the family member has deceased.

9.4 Alternative Flows:

None.

9.5 Reference document:

The inclusion of the ER role was inspired by Department of Health and Human Services USA Personalized Health Care Use Case http://www.hhs.gov/healthit/usecases/documents/PHCDetailed.pdf [http://www.hhs.gov/healthit/usecases/documents/PHCDetailed.pdf]

9.6 Sub-flow Traces

- [S1] http://localhost:8080/iTrust/auth/patient/viewMyRecords.jsp [http://localhost:8080/iTrust/auth/patient/viewMyRecords.jsp]
- [S2] No links. Implemented by ViewMyRecordsAction.getFamilyHistory()

UC10 Enter/edit personal health records Use Case

10.1 Precondition:

An HCP is a registered user of the iTrust Medical Records system [UC2]. The HCP has authenticated himself or herself in the iTrust Medical Records system [UC3].

10.2 Main Flow:

An HCP chooses to enter/edit personal health information. The information is view/editied [S1]. If the HCP is not one of the patient's DLHCP or the UAP associated with one of their DLHCP, a message is sent to the patient and their personal representative [S2]. The event is logged [UC5, S7].

10.3 Sub-flows:

- [S1]The health care personnel enters a MID [E1] of a patient and confirms their selection [E2]. The event is immediately logged as a "view" by the LHCP [UC5, S5]. The health care personnel may enter/edit personal health information including editing historical values from Data Format 6.4.1 and 6.4.2, immunizations, and office visit information (date, diagnoses, medication, name of attending physician but not notes, laboratory procedures), and family history (the MIDs of the patient's mother and father). The HCP can indicate the patient has passed away, providing an appropriate diagnosis code.
- [S2] The patient whose personal health record was viewed by a LHCP or UAP is notified of the viewing/editing on his or her notification area upon logging into iTrust [patient is provided name of LHCP and/or HCP and the date of access]. This notification remains on the patient's notification screen for a period of 90 days. A fake email is also sent to the patient telling the patient to log onto iTrust to see who has viewed their Emergency Heath Record. *Note to students: the iTrust system does NOT currently support actual email sending, only a "fake" email sending facility. All email notifications should be executed through the fake email utility.*

10.4 Alternative Flows:

- [E1] The health care professional types an invalid medical identification number and is prompted to try again.
- [E2] The patient chosen is not the desired patient. The health care professional does not confirm the selection and is prompted to try again.

UC11 Document office visit Use Case

11.1 Precondition:

An HCP is a registered user of the iTrust Medical Records system [UC2]. The iTrust user has authenticated himself or herself in the iTrust Medical Records system [UC3].

11.2 Main Flow:

An HCP chooses to document [S1] or edit [S2] an office visit .

11.3 Sub-flows:

- [S1] The LHCP enters a MID [E1] of a patient and confirms their input [E2]. The LHCP document the notes (numbers, characters, ?, -, ', ., :, blankspace and carriage return) of an office visit, providing the date of the office visit, and their own medical identification number. Additionally, the HCP can document one or

more diagnoses (ICD-9CM code), one or more medical procedures (CPT code) performed, one or more lab procedures that are ordered (LOINC code, see Data Format 6.11) one or more medications (NDC, see Data Format 5.6) prescribed, and one or more immunizations given (CPT Code, see UC15, S1) chosen from appropriate pull-down lists. ~~The LHCP can indicate if the patient is allowed to restrict access to the diagnosis information.~~ The event is logged [UC5, S8].

* [S2] LHCPs can return to an office visit and alter the fields of the office visit [text, diagnoses, medical procedures, medications]. The event is logged [UC5, S8].

11.4 Alternative Flows:

- [E1] The LHCP types an invalid medical identification number and is prompted to try again.
- [E2] The patient chosen is not the desired patient. The health care personnel does not confirm the selection and is prompted to try again.

11.5 Reference document:

The inclusion of recording of immunizations was inspired by Department of Health and Human Services USA Immunization and Response Management Detailed Use Case http://www.dhhs.gov/healthit/usecases/documents/EmergencyRespEHRUseCase.pdf [http://www.dhhs.gov/healthit/usecases/documents/EmergencyRespEHRUseCase.pdf]

UC12 Determine operational profile Use Case

12.1 Precondition:

A software tester has a login and password. Similar to an administrator, a software tester is added by directly entering the software tester into the database by an administrator that has access to the database.

12.2 Main Flow:

The software tester authenticates himself or herself in the iTrust Medical Records system [UC2]. He or she is then presented with the actual operational profile of the operations of the iTrust Medical Records where the use percentage is the % of total transactions of a particular type by each of the user types [patient, LHCP, UHCP, admin, tester]

Operation	Reference
Enter/Edit patient/personnel demographics	UC4
View HCP / Change designation	UC6
~~Allow/Disallow access to patient diagnosis~~	UC7
View patient's record access log	UC8
View patient's medical records	UC9
Authenticate user	UC3
Enter/Edit Personal Health Information	UC10
Document an office visit	UC11
Create or disable a patient or hcp	UC1 & UC2
Declare Personal Health Representative	UC13
Request biosurveillance	UC14
Manage ICD9CM diagnosis codes	UC15
Manage CPT Procedure Codes	UC15
Manage ND Drug Codes	UC15
Identify risk factors for chronic diseases	UC16
Proactively determine necessary patient care	UC17
Maintain hospital listing	UC18
View prescription report	UC19
Examine cause-of-death trends	UC20
View emergency patient report	UC21
Schedule appointments	UC22
Request appointments	UC22
View comprehensive patient report	UC23

Take satisfaction survey	UC24
View satisfaction survey	UC25
View/edit laboratory procedures	UC26
Alert users by email	UC27
View My Patients	UC28
Find LHCPs with experience with a diagnosis	UC29
Send Message	UC30
Telemedicine monitoring	UC34
Report adverse event	UC35
Monitor adverse events	UC36

12.3 Sub-flows:

None.

12.4 Alternative Flows:

None

UC13 Declare/undeclare Personal Representative Use Case

13.1 Precondition:

An HCP is a registered user of the iTrust Medical Records system [UC2]. The iTrust user has authenticated himself or herself in the iTrust Medical Records system [UC3].

13.2 Main Flow:

A patient's DLHCP chooses to add or delete a patient's [E1, E2] personal representative by typing that person's MID [E1, E2]. The event is logged [UC5].

13.3 Sub-flows:

None.

13.4 Alternative Flows:

- [E1] The health care personnel types an invalid medical identification number and is prompted to try again.
- [E2] The patient chosen is not the desired patient. The health care personnel does not confirm the selection and is prompted to try again.

UC14 Request Biosurveillance Use Case

14.1 Precondition:

An HCP is a registered user of the iTrust Medical Records system [UC2]. The iTrust user has authenticated himself or herself in the iTrust Medical Records system [UC3].

14.2 Main Flow:

A LHCP chooses to determine if instances of a certain ailment is reaching epidemic proportions in a given area. Allowable epidemic queries are malaria [S1] and influenza [S2]. Alternatively, the LHCP chooses to examine recent trends in diagnoses [S3]. The event is logged [UC5].

14.3 Sub-flows:

- [S1] The LHCP can choose a malaria diagnosis [E1] and type in the desired zip code [E2] and a date (such as today's date) [E3]. The data in the database is analyzed according to the heuristics in section 5.7.1 to determine if an epidemic is occurring in the region defined by the zip code that match the first three numbers in the provided zip code (e.g. if zip code 27695 is provided, all data with zip code 276xx is analyzed, where each x is any digit from 0-9). If the health care professional chooses to analyze the epidemic potential for a diagnosis for which there is not a defined epidemic detection algorithm, the

doctor is notified that no analysis can occur. The LHCP is provided a yes/no answer on whether an epidemic is occurring during any consecutive two weeks during the time period.

- [S2] The LHCP can choose an influenza diagnosis [E1] and type in the desired zip code [E2] and a date (such as today's date) [E3]. The data in the database is analyzed according to the heuristics in section 5.7.2 to determine if an epidemic is occurring in the region defined by the zip code that match the first three numbers in the provided zip code (e.g. if zip code 27695 is provided, all data with zip code 276xx is analyzed, where each x is any digit from 0-9). If the health care professional chooses to analyze the epidemic potential for a diagnosis for which there is not a defined epidemic detection algorithm, the doctor is notified that no analysis can occur. The LHCP is provided a yes/no answer on whether an epidemic is occurring.
- [S3] The LHCP can choose to examine recent trends in diagnoses. The LHCP can choose any diagnosis code [E1] and type in the desired zip code [E2] and a date (such as today's date) [E3] . The LHCP is then provided a bar chart (such as can be found here: http://www.imedi.org/docs/references/testbed.htm [http://www.imedi.org/docs/references/testbed.htm]) for the last 8 weeks. For each week, three bars are provided: (1) the region (region defined by the zip code that match the first three numbers in the provided zip code (e.g. if zip code 27695 is provided, all data with zip code 276xx is analyzed, where each x is any digit from 0-9); (2) the state (region defined by the zip code that match the first two numbers in the provided zip code (e.g. if zip code 27695 is provided, all data with zip code 27xxx is analyzed, where each x is any digit from 0-9); and (3) all cases in the database.

14.4 Alternative Flows:

- [E1] The HCP types an invalid diagnosis code and is prompted to try again.
- [E2] The HCP types a invalid zip code and is prompted to try again.
- [E3] The HCP types an invalid date and is prompted to try again.

UC15 Maintain standards lists Use Case

15.1 Precondition:

The administrator has authenticated himself or herself in the iTrust Medical Records system [UC2].

15.2 Main Flow:

An administrator chooses to maintain the standards list for immunizations [S1], diagnoses [S2], allowable drugs [S3], or allowable physical services [S4]. The event is logged [UC5].

15.3 Sub-flows:

- [S1] The administrator will maintain [add/update] a listing of allowable immunizations that an HCP can use. The administrator will store (1) the CPT code (The CPT code set accurately describes medical, surgical, and diagnostic services and is designed to communicate uniform information about medical services and procedures among physicians, coders, patients, accreditation organizations, and payers for administrative, financial, and analytical purposes. About CPT [http://www.ama-assn.org/ama/pub/physician-resources/solutions-managing-your-practice/coding-billing-insurance/cpt/about-cpt.shtml]) [E1] and (2) up to 30 alpha characters giving the name [E1] of the immunization.
- [S2] The administrator will maintain a listing of allowable diagnoses that an LHCP can use. The administrator will store (1) the ICD-9CM code (The International Statistical Classification of Diseases and Related Health Problems (most commonly known by the abbreviation ICD) provides codes to classify diseases and a wide variety of signs, symptoms, abnormal findings, complaints, social circumstances and external causes of injury or disease. NHCS Classification of Diseases, Functioning and Disability [http://www.cdc.gov/nchs/icd9.htm]) for the diagnosis [E1]; (2) a classification that the diagnosis is either chronic/long-term OR short term; and (3) up to 30 alphanumeric characters giving the name [E1] of the diagnosis.
- [S3] The administrator will maintain [add/update] a listing of allowable drugs that an HCP can use. The administrator will store (1) the National Drug Code (The National Drug Code (NDC) is a universal product

identifier used in the United States for drugs intended for human use. National Drug Code Directory [http://www.fda.gov/Drugs/InformationOnDrugs/ucm142438.htm])

- [S4] The administrator will maintain [add/update] a listing of allowable physical services (including laboratory procedures) that an HCP can use. The administrator will store information of a LOINC code (Logical Observation Identifiers Names and Codes (LOINC) is a database and universal standard for identifying medical laboratory observations. LOINC c/o Medical Informatics [http://loinc.org/]) [E1] according to Data Format 6.11.

15.4 Alternative Flows:

- [E1] The administrator types an invalid code information and is prompted to try again.

UC16 Identify risk of chronic disease Use Case

16.1 Precondition:

The LHCP has authenticated himself or herself in the iTrust Medical Records system [UC3].

16.2 Main Flow:

Through the Personal Health Records page, an LHCP chooses a chronic disease and a patient. The data in the database is analyzed according to the risk factors for the disease to determine if the patient exhibits a certain risk factor. Currently available risk factors for chronic diseases are defined for Diabetes and Type 1 and Type2 and Heart Disease. When the chosen patient satisfies the preconditions of the chosen chronic disease [E1], the LHCP is provided with a warning message if that patient exhibits three or more risk factors. The message will display the risk factors that the patients exhibit. The event is logged [UC5].

16.3 Sub-flows:

None.

16.4 Alternative Flows:

- [E1] The LHCP chooses to examine a patient for which the preconditions do not apply (e.g., an adult shouldn't be tested for child diabetes) and the LHCP is prompted that no analysis can occur.

UC17 Proactively Determine Needed Patient Care Use Case

17.1 Precondition:

The HCP has authenticated himself or herself in the iTrust Medical Records system [UC2].

17.2 Main Flow:

An HCP chooses to identify chronic patients who need an office visit [S1], older patients who need a flu shot [S2], or any patient who is overdue for an immunization [S3]. The HCP is presented with a listing of patients **for whom they are a DLHCP** who need care because of satisfying the one of preceding conditions. The presented patient information shall include each patient's name and home phone number so that reminder calls can be made. The list is sorted based on the alphabetical order of the patients' last names, and then first names. The event is logged [UC5].

17.3 Sub-flows:

- [S1] An alive patient who has not had an office visit for more than one year and who has been diagnosed with
  - diabetes mellitus [is diagnosed with ICD code beginning with 250: http://icd9cm.chrisendres.com/index.php?action=child&recordid=1765 [http://icd9cm.chrisendres.com/index.php?action=child&recordid=1765]],
  - asthma [is diagnosed with ICD code beginning with 493: http://icd9cm.chrisendres.com/index.php?action=child&recordid=4700 [http://icd9cm.chrisendres.com/index.php?action=child&recordid=4700]], or
  - circulatory-system disease [is diagnosed with an ICD code between 390 and 459 inclusive: http://icd9cm.chrisendres.com/index.php?action=child&recordid=4025 [http://icd9cm.chrisendres.com/index.php?action=child&recordid=4025]].

- [S2] An alive patient over 50 years old who has not had a flu shot [CPT codes 90656, 90658, 90660 per http://www.influenza.com/index.cfm?fa=ADDITIONAL_RES_HC_2 [http://www.influenza.com/index.cfm?fa=ADDITIONAL_RES_HC_2]] during the months Sept – Dec of the last calendar year (or during the months Sept – Dec of the current calendar year if the retrieval time is between Sept – Dec).
- [S3] An alive patient **under the age of 19** who has not had proper immunizations per the immunization schedule. The "catch up schedule" is relevant when the patient did not begin the immunizations according to the recommended schedule.
  - *Hepatitis B (90371)* **three** doses: at birth, at age 1 month, at age 6 months; catch up schedule: at least 4 weeks between dose 1 and dose 2 and at least 8 weeks between dose 2 and dose 3
  - *Rotavirus (90681)* **three** doses: at age 6 weeks, at age 4 months, at age 6 months; catch up schedule: at least 4 weeks between dose 1 and dose 2 and at least 4 weeks between dose 2 and dose 3
  - *Diphtheria, Tetanus, Pertussis (90696)* **six doses**: at age 6 weeks, at age 4 months, at age 6 months, at age 15 months, at age 4 years, at age 11 years; catch up schedule: at least 4 weeks between dose 1 and dose 2, at least 4 weeks between dose 2 and dose 3, at least 6 months between doses 3 and 4, at least 6 months between dose 4 and dose 5, at least 5 years between dose 5 and dose 6
  - *Haemophilus influenzae (90645)* **three doses**: at 6 weeks, at age 4 months, at age 12 months; catch up schedule: at least 4 weeks between dose 1 and dose 2 and at least 4 weeks between dose 2 and dose 3 if first dose is administered at younger than 12 months; if first dose is administered between 12 and 14 months, at least 8 weeks between dose 1 and dose 2 and dose three is canceled; if first dose is administered at or after 15 months, only one dose is required
  - *Pneumococcal (90669)* **four doses**: at age 6 weeks, at age 4 months, at age 6 months, at age 12 months; catch up schedule: at least 4 weeks between dose 1 and dose 2 and at least 4 weeks between dose 2 and dose 3 and at least 8 weeks between dose 3 and dose 4 if first dose is administered at younger than 12 months; if first dose is administered between 12 and 14 months, at least 8 weeks between dose 1 and dose 2 and dose three is canceled; if first dose is administered at or after 15 months, only one dose is required
  - *Poliovirus (90712)* **four doses**: at age 6 weeks, at age 4 months, at age 6 months, 4 years; catch up schedule: at least 4 weeks between dose 1 and dose 2, at least 4 weeks between dose 2 and dose 3, at least 4 weeks between doses 3 and 4, dose 4 is not required if dose 3 was administered at the age of 4 or older
  - *Measles, Mumps, Rubella (90707)* **two doses**: at age 12 months, at age 4 years; catch up schedule: at least 4 weeks between dose 1 and dose 2
  - *Varicella (90396)* **two doses**: at age 12 months, at age 4 years; catch up schedule: at least 3 months between dose 1 and dose 2
  - *Hepatitis A (90633)* **two doses**: at age 12 months; at age 18 months: catch up schedule: at least 6 months between dose 1 and dose 2
  - *Human Papillomavirus (90649)* **Female only, three doses**; at age 9 years; at age 9 years + 2 months; at age 9 years + 6 months; catch up schedule: at least two months between dose 1 and dose 2; at least four months between dose 2 and dose 3

17.4 Alternative Flows:

None.

17.5 Reference Documents:

American Academy of Pediatrics http://www.cispimmunize.org/ [http://www.cispimmunize.org/]

- Childhood schedule (birth to 6 years): http://www.cispimmunize.org/IZSchedule_Childhood.pdf [http://www.cispimmunize.org/IZSchedule_Childhood.pdf]
- Adolescent schedule (7 to 18 years): http://www.cispimmunize.org/IZSchedule_Adolescent.pdf [http://www.cispimmunize.org/IZSchedule_Adolescent.pdf]
- CPT Codes: http://www.cdc.gov/vaccines/programs/iis/stds/cpt.htm [http://www.cdc.gov/vaccines/programs/iis/stds/cpt.htm]

UC18 Maintain a hospital listing Use Case

18.1 Precondition:

The administrator has authenticated himself or herself in the iTrust Medical Records system [UC2].

18.2 Main Flow:

An administrator chooses to maintain hospitals that a health care professional belongs to (a health care professional can belong to multiple hospitals [UC2, S3]]) [S1] and the event is logged [UC5].

18.3 Sub-flows:

- [S1] The administrator will store (1) hospital Id number for the hospital [E1]; and (2) up to 30 alphanumeric characters giving the name of the hospital
- [S2]. The system shall enable the administrator to add a new entry for a hospital, or modify the hospital name in an existing entry. Note that the administrator is not allowed through the system interface to delete an existing entry or modify the hospital ID number in an existing entry.

18.4 Alternative Flows:

- [E1] The administrator types an invalid ID and is prompted to try again.
- [E2] The administrator types an invalid name and is prompted to try again.

UC19 View prescription report Use Case

19.1 Precondition:

A patient and LHCP is a registered user of the iTrust Medical Records system [UC1 and UC2]. The iTrust user has authenticated himself or herself in the iTrust Medical Records system [UC3].

19.2 Main Flow:

A patient or personal health representative [S1] or LHCP [S2] chooses to view prescription reports. If the LHCP is not one of the patient's DLHCP or the UAP associated with one of their DLHCP, a message is sent to the patient and their personal representative [S4]. The event is logged [UC5].

19.3 Sub-flows:

- [S1] The user (patient or personal health representative) can choose to view a list of (1) their own prescriptions or (2) the prescriptions for whom the user is a person health representative by choosing one patient from a a list of these patients. A prescription list is then displayed [S3], sorted by start date (the later date is ranked earlier).
- [S2] The user (LHCP) enters a MID of a patient [E1] and confirms their input [E2]. At this point, the LHCP can view a prescription list for that patient [S3], sorted by start date (the later date is ranked earlier).
- [S3] The prescription report is titled with the patient name. The prescription list includes medication, date prescribed, start date, end date for each prescription, and the name of the doctor who prescribed the medication.
- [S4] The patient whose prescription was viewed by a LHCP or UAP is notified of the viewing/editing on his or her notification area upon logging into iTrust [patient is provided name of LHCP and/or HCP and the date of access]. This notification remains on the patient's notification screen for a period of 90 days. A fake email is also sent to the patient telling the patient to log onto iTrust to see who has viewed their Emergency Heath Record. *Note to students: the iTrust system does NOT currently support actual email sending, only a "fake" email sending facility. All email notifications should be executed through the fake email utility.*

19.4 Alternative Flows:

- [E1] The LHCP types an invalid medical identification number and is prompted to try again.
- [E2] The patient chosen is not the desired patient. The LHCP does not confirm the selection and is prompted to try again.

UC20 View cause-of-death trends report Use Case

20.1 Precondition:

A LHCP is a registered user of the iTrust Medical Records system [UC1 and UC2]. The iTrust user has authenticated himself or herself in the iTrust Medical Records system [UC3].

20.2 Main Flow:

A LHCP chooses to view a cause-of-death trends report that provides a sorted list of the "top 2" most common causes of death for all patients [S1], for all males [S2], and for all females in the databased [S3] for a stated time period. The set of a LHCP's patients are all those patients whom have ever had an office visit with the LHCP. The event is logged [UC5].

20.3 Sub-flows:

- [S1] The LHCP chooses the time period for which he or she would like to see the report at the granularity level of a starting year and an ending year (which can be the same) [E1]. The LHCP can then view the top 2 most common causes of death of his or her own patients and the top 2 most common causes of death for all patients during the specified time period. For each of the top 2, the diagnosis ICD-9CM code and name is displayed, the quantity of deaths by this diagnosis is provided.
- [S2] The LHCP chooses the time period for which he or she would like to see the report at the granularity level of a starting year and an ending year (which can be the same) [E1]. The LHCP can then view the top 2 most common causes of death of his or her own male patients and the top 2 most common causes of death for all male patients during the specified time period. For each of the top 2, the diagnosis ICD-9CM code and name is displayed, the quantity of deaths by this diagnosis is provided.
- [S3] The LHCP chooses the time period for which he or she would like to see the report at the granularity level of a starting year and an ending year (which can be the same) [E1]. The LHCP can then view the top 2 most common causes of death of his or her own female patients and the top 2 most common causes of death for all female patients during the specified time period. For each of the top 2, the diagnosis ICD-9CM code and name is displayed, the quantity of deaths by this diagnosis is provided.

20.4 Alternative Flows:

- [E1] The LHCP chooses and invalid year and is prompted to try again.

UC21 View emergency electronic health record Use Case

21.1 Precondition:

A LHCP or ER is a registered user of the iTrust Medical Records system [UC1 and UC2]. The iTrust user has authenticated himself or herself in the iTrust Medical Records system [UC3].

21.2 Main Flow:

A LHCP or ER chooses to view an emergency report and provides an MID [S1]. At this point, the LHCP obtains a printable report [meaning you should minimize the space taken up to provide the information] containing vital information for the patient:

- Name
- Age
- Gender
- Emergency contact (name and phone number)
- Allergies
- Blood type
- A list of all diagnosis codes chronic/long-term diagnoses for the patient and well as all short term diagnoses made within the last 30 days. Display the ICD-9CM code and the name of the diagnoses. Sort by most recent first.
- A list of all prescriptions the patient is likely to be currently taking as determined by the end date of the prescription has passed by 91 days or less. Display the National Drug Code and the name of the

prescription. Sort by most recent first.
- A list of all immunizations the patient has had. Display the CPT Code and the name of the immunization. Sort by most recent first.

A notification and email notify the patient of the viewing [S2]. *A notification is also sent to all of the patient's DLHCP's [S3]*. The event is logged [UC5].

21.3 Sub-flows:

- [S1] The LHCP or ER enters a MID [E1] and confirms the input [E2].
- [S2] The patient whose emergency electronic health record was viewed by a LHCP or ER is notified of the viewing on his or her notification area upon logging into iTrust [patient is provided name of LHCP and/or HCP and the date of access]. This notification remains on the patient's notification screen for a period of 90 days. A fake email is also sent to the patient and the patient's personal representative*; the email should ask* ~~telling~~ the patient to log onto iTrust to see who has viewed their Emergency Heath Record. *Note to students: the iTrust system does NOT currently support actual email sending, only a "fake" email sending facility. All email notifications should be executed through the fake email utility.*
- *[S3] All of the DLHCP's of the patient whose emergency electronic health record was viewed are notified of the viewing on their notification area upon logging into iTrust [the name of the LHCP or ER and the date of access is also included]. This notification remains on the DLHCP's notification screen for a period of 30 days. A fake email is also sent to all of the DLHCP's telling them that one of their patient's records has been viewed in an emergency situation.*

21.4 Alternative Flows:

- [E1] The LHCP types an invalid medical identification number and is prompted to try again.
- [E2] The patient chosen is not the desired patient. The LHCP or ER does not confirm the selection and is prompted to try again.

21.5 Reference document:

The inclusion of the ER role was inspired by Department of Health and Human Services USA Emergency Responder Electronic Health Record Use Case http://www.dhhs.gov/healthit/usecases/documents/EmergencyRespEHRUseCase.pdf [http://www.dhhs.gov/healthit/usecases/documents/EmergencyRespEHRUseCase.pdf]

UC22: Flow of Events for the Schedule Appointments Use Case

22.1 Precondition:

A patient and LHCP are registered users of the iTrust Medical Records system [UC1 and UC2]. The iTrust user or administrator has authenticated himself or herself in the iTrust Medical Records system [UC3 and UC2].

22.2 Main Flow:

An administrator can manage a standardized list of appointment types [S1]. An LHCP can schedule an appointment with a patient [S2]. Both patients and LHCPs can view a list of their upcoming appointments [S3].

22.3 Sub-flows:

- [S1] The system shall enable the administrator to (1) add a new entry for an appointment type, including its type name with up to 30 alpha characters and duration in the unit of minutes [E1], and (2) modify the duration in an existing entry [E1]. A new entry shall not have the same type name as that of any existing entry [E1]. Note that the administrator is not allowed through the system interface to delete an existing entry or modify the appointment type name in an existing entry. The event is logged [UC5, S39].
- [S2] The LHCP chooses to schedule an appointment with a patient (it is assumed that the LHCP and patient have already worked out the details of the appointment in person or via telephone outside of the system). The LHCP enters the patient MID, selects the type of appointment from a pull-down menu of the existing appointment types, enter the appointment date and start time (only a date/time equal or after the current date/time is allowed) **(the user interface shall provide both the option of typing in a specific date in the date format and the option of selecting a date from a calendar for the current month)**, enter

comment (optional) up to 1000 characters such as reason for the appointment [E1]. The event is logged [UC5, S23].

- [S3] A user (an LHCP or patient) wishes to view a list of his or her upcoming appointments (i.e., a list including appointments whose appointment date and start time is equal or later than the current date/time). The user chooses to open his or her upcoming appointment list. Each row in the list includes the appointment type, appointment date and start time, duration, and the name of either the patient (only for the user being an LHCP) or the LHCP (only for the user being a patient). The appointments in the list shall be ordered by appointment date and start time, the soonest upcoming first. The row for each conflicting appointment is highlighted in bold (a conflicting appointment is one that has overlap in its appointment duration period with that of at least another appointment of the same user). The user selects an appointment from the list to read comment by clicking the "Read Comment" link beside the row for the appointment, and then the comment for the appointment shall be displayed in a new page [E2].

22.4 Alternative Flows:

- [E1] The user inputs invalid information and is prompted to try again.
- [E2] The comment is empty and the text "No Comment" (without link) is displayed instead of the "Read Comment" link.

UC23 View Comprehensive Patient Report Use Case

23.1 Precondition:

An LHCP ~~and Admin~~ has authenticated him or herself in the iTrust Medical Records system [UC2].

23.2 Main Flow:

The LHCP requests a comprehensive patient report for a particular patient [S1].~~ The Admin can either approve [S2] or reject [E3] the report from a list of requests. Upon approval,~~ The LHCP is able to view the ~~approved~~ comprehensive patient report [S3] from a list of his/her requests. The event ~~of requesting, approving/rejecting, and report generation~~ is logged [UC5].

23.3 Sub-flows:

- [S1] The LHCP enters a patient medical identification number (MID) [E1] and confirms his/her input [E2].
- [S2] ~~The Admin views the Names and MIDs of the requesting LHCP and the requested patient, and approves the report~~ [E3].
- [S3] The LHCP can view of the comprehensive patient report for the specified patient, including the information below. ~~An email notification is sent [UC27, S4]~~
  - All patient demographic information (address, phone, etc.), see [UC4] and Data Format 6.1
  - The entire history of personal health records, see [UC10] and Data Format 6.4
  - All diagnoses, including those not normally viewable by the requesting LHCP, see [UC11] and Data Format 6.5
  - All designated HCPs (MIDs and Names), see [UC6]
  - All allergies, procedures, medications, office visits, and known relatives, see [UC11] and Data Format 6.5, 6.6
  - All MIDs and names of people that this person is representing, see [UC13]
  - All MIDs and names of people that this person is represented by, see [UC13]
  - ~~The date/time in which the report was generated by the LHCP * The date/time in which the report was approved by an Admin * The MID and name of the LHCP who requested the report * The MID and name of the Admin who approved the report~~
- [S4] The LHCP views a list of requests he/she has made for reports, with the status and pertinent information about the requests. ~~For approved requests, a one-time only link to generate and display the report [S3] is shown.~~

23.4 Alternative Flows:

- [E1] The LHCP types an invalid MID and is prompted to try again.
- [E2] The chosen patient is not the desired patient. The LHCP does not confirm the selection and can try

again.

- [E3] ~~The Admin rejects the request for a comprehensive patient report, providing justification for the rejection. The LHCP can view rejection justification in his/her list of report requests.~~

UC24 Take Satisfaction Survey Use Case

24.1 Precondition

A patient is a registered user of the iTrust Medical Records system [UC1]. The iTrust user has authenticated himself or herself in the iTrust Medical Records system [UC3].

24.2 Main Flow

A patient or personal health representative can answer any of the following questions relative to a previous (in UC9, S1) office visit according to Data Format 6.13.

- How many minutes did you wait in the waiting room?
- How many minutes did you wait in the examination room before seeing your physician?
- How satisfied were you with your office visit?
- How satisfied were you with the treatment or information you received?

The answers to the survey are stored. The event is logged [UC5, S26].

24.3 Sub-flows

None

24.4 Alternative Flows

None

UC25 View Physician Satisfaction Survey Results Use Case

25.1 Precondition

A user is a registered user of the iTrust Medical Records system [UC1]. The iTrust user has authenticated himself or herself in the iTrust Medical Records system [UC3].

25.2 Main Flow

A user chooses to view physician satisfaction survey results. The user provides a zip code [E1] and an (optional) physician type (from a pull-down list: see data format 6.2 - general, surgeon, heart specialist, pediatrician, OB/GYN). The patient is provided with the following for each physician of that type that practices in a zip code (based upon the address/zipcode provided in UC2) that match the first three digits of the provided zip code:

- Name
- Address
- Average number of minutes patients wait in waiting room
- Average number of minutes patients wait in examination room prior to seeing physician
- Average office visit satisfaction
- Average satisfaction with treatment/information
- Percentage of office visits for which satisfaction information is available

The event is logged [UC5, S27].

25.3 Sub-flows

None

25.4 Alternative Flows:

[E1] The input is not a valid zip code and/or a valid physician type (see Data Format 6.2). The user is asked to

try again.

UC26 View/Edit Laboratory Procedure Status Use Case

26.1 Precondition

A patient and HCP are registered users of the iTrust Medical Records system [UC1 and UC2]. The iTrust user has been authenticated in the iTrust Medical Records system [UC3].

26.2 Main Flow

A patient or personal health representative [S1] or HCP [S2] chooses to view laboratory procedure status; or a HCP chooses to edit a laboratory procedure [S3]. If the HCP is not one of the patient's DLHCP or the UAP associated with one of their DLHCP, a message is sent to the patient and their personal representative [S4].

26.3 Sub-flows

- [S1] The patient can view a list of laboratory procedures and status for (a) their own records and (b) the records for which the user is a personal representative. Only laboratory procedures for which the HCP has allowed viewing access are shown. The list is sorted by date of the last status update, most recent first. The event is logged [UC5, S28].
- [S2] The HCP enters a MID [E1] of a patient and confirms their input [E2]. The HCP can view a list of laboratory procedures and results, sorted by the date of the last status update, most recent first. The HCP can choose to sort by date of the last status update or by LOINC code ([UC15 S4], ascending order). If the HCP is the HCP that ordered the laboratory procedure, the HCP can allow or disallow viewing access to the laboratory results and is given the option to edit the office visit in which the laboratory procedure was ordered. The event is logged [UC5, S28].
- [S3] The HCP enters a MID [E1] of a patient and confirms their input [E2]. The HCP can view a list of laboratory procedures and can choose to update the status and comments (including results, if applicable) (see Data Format 6.11). The list is sorted by the dates of the last status update. The event is logged [UC5, S28] and an email notification is sent [UC27, S2].
- [S4] The patient whose laboratory report was viewed by a LHCP or UAP is notified of the viewing/editing on his or her notification area upon logging into iTrust [patient is provided name of LHCP and/or HCP and the date of access]. This notification remains on the patient's notification screen for a period of 90 days. A fake email is also sent to the patient telling the patient to log onto iTrust to see who has viewed their Emergency Heath Record. Note to students: the iTrust system does NOT currently support actual email sending, only a “fake” email sending facility. All email notifications should be executed through the fake email utility.

26.4 Alternative Flows

- [E1] The HCP types an invalid medical identification number and is prompted to try again.
- [E2] The patient chosen is not the desired patient. The HCP does not confirm the selection and is prompted to try again.

UC27 Alert Users by Email Use Case

27.1 Precondition

One of UC3, UC22, UC23, or UC26 has been initiated.

27.2 Main Flow

An email alert is sent out to the iTrust user in the event of a changed password [S1], status change in laboratory procedure [S2], accepted scheduled appointment [S3], comprehensive report requested and generated [S4]. *Note to students: the iTrust system does NOT currently support actual email sending, only a “fake” email sending facility. All email notifications should be executed through the fake email utility.*

27.3 Sub-flows

- [S1] The user has successfully changed his/her password [UC3, S2]. An email informing the user of the password change is sent to the user including the MID but *not* the password.
- [S2] The status of a laboratory procedure has been updated [UC26, S3]. The patient is notified with the following information: the LOINC number and the updated status.
- [S3] The patient or LHCP has accepted an appointment as scheduled [UC22, S6] and both users are notified of the date, time, length, and comment via email.
- [S4] The admin has approved the comprehensive report generation [UC23, S2] or the LHCP generates the report. The patient is notified via email that a comprehensive report was generated, and the MID of the LHCP and the approving Admin are included.

UC28 View Patients

28.1 Precondition

A LHCP is a registered user of the iTrust Medical Records system [UC2]. The iTrust user has been authenticated in the iTrust Medical Records system [UC3].

28.2 Main Flow

The LHCP chooses to view all patients with which he or she has ever had an office visit with. The patient's name (clickable to view PHR), address, and date of last office visit. The list is sorted by the date of the last office visit (most recent first). The event is logged [UC5, S29]

28.3 Sub-flows

None.

28.4 Reference document

Office of the National Coordinator for Health Information Technology (ONC) Consumer Empowerment: Consumer Access to Clinical Information Prototype Use Case http://www.hhs.gov/healthit/usecases/consumeraccess.html [http://www.hhs.gov/healthit/usecases/consumeraccess.html], Scenario 2

UC29 Find LHCPs with experience with a diagnosis

29.1 Precondition

A patient is a registered user of the iTrust Medical Records system [UC2]. The iTrust user has been authenticated in the iTrust Medical Records system [UC3].

29.2 Main Flow

A patient has just been diagnosed with a condition and wants to find the LHCPs in the area who have handled that condition. The patient chooses 'My Diagnoses" and is presented with a listing of all their own diagnoses, sorted by diagnosis date (more recent first). The patient can select a diagnosis and will be presented with the LHCPs in the patient's living area (based upon the first three numbers of their zip code) who have handled this diagnosis in the last three years. The list is ranked by the quantity of patients the LHCP has treated for that diagnosis (each patient is only counted once regardless of the number of office visits). For each LHCP, the following information is displayed:

- Name of LHCP linked to contact information for that LHCP
- The quantity of unique patients treated by that LHCP for that diagnosis (each patient is only counted once regardless of the number of office visits)
- List of all prescriptions given by that LHCP for that diagnosis
- List of all laboratory procedures ordered by that LHCP for that diagnosis
- The LCHP's average visit satisfaction
- The LHCP's average treatment satisfaction

The event is logged [UC5, S30]

29.3 Sub-flows

None.

29.4 Reference document

Inspired by Office of the National Coordinator for Health Information Technology (ONC) Quality Detailed Use Case http://healthit.hhs.gov/portal/server.pt?open=512&objID=1202&&PageID=15677&mode=2&in_hi_userid=10732&cached=true [http://healthit.hhs.gov/portal/server.pt?open=512&objID=1202&&PageID=15677&mode=2&in_hi_userid=10732&cached=true]

UC30 Messaging between LHCP and patient

30.1 Precondition

A LHCP or patient is a registered user of the iTrust Medical Records system [UC2]. The iTrust user has been authenticated in the iTrust Medical Records system [UC3].

30.2 Main Flow

An LHCP wants to send a message to a patient and/or that patient's personal representative [S2] or a patient or personal representative wants to send a message to one of their DLHCP or that of a person they are representing [S1]. LHCPs and patients/representatives may reply to messages [S3, S4]. An LHCP or patient/representative may view a message [S5]. An LHCP or patient/representative can sort his or her message inbox and message outbox [S6]. **An LHCP or patient/representative can modify and save his/her message displaying filter [S7] or view his/her message inbox [S5] including only the messages satisfying the specified filtering criteria in the saved filter.** The event is logged [UC5, S31].

30.3 Sub-flows

- [S1] A patient or personal representative for a patient chooses to send a message to an LHCP (no multiple recipients allowed in a single message). The patient/representative is presented with a pull down menu of his/her DLHCP. The patient/representative chooses one of these DLHCP and types the subject (up to 100 characters) and text of a message (up to 1000 characters), and clicks the send button. A row for showing the message subject, the name of the recipient, and the timestamp (which includes both date and time) is then visible in the patient/representative's message outbox. A bolded row for showing the message subject, the name of sender, and the timestamp is then visible in the LHCP's message inbox. A fake email is sent to the LHCP alerting the user that a new message has arrived. After a message is sent, the patient or personal representative is directed to his/her message outbox.
- [S2] An LHCP chooses to send a message to a patient/representative (no multiple recipients allowed in a single message). The LHCP enters and confirms the patient/representative's MID [E1, E2]. The LHCP types the subject (up to 100 characters) and the text of a message (up to 1000 characters), and clicks the send button. A row for showing the message subject, the name of the recipient, and the timestamp is then visible in the LHCP's message outbox. A bolded row for showing the message subject, the name of the sender, and the timestamp is then visible in the patient/representative's message inbox, and a fake email is sent to the patient/representative that indicates that he/she has a new message from an LHCP. After a message is sent, the LHCP is directed to to his/her message outbox.
- [S3] A patient or patient representative wishes to reply to a message. The patient/representative views his or her message inbox. The patient/representative opens the message to which he or she wishes to reply [S5], and then clicks the reply link above the message text. The patient/representative enters the text of the response message (up to 1000 characters) he or she wishes to send, then clicks the send button. A row for showing the message subject (now preceded by "RE:"), the name of the recipient, and the timestamp is then visible in the patient/representative's message outbox. A bolded row for showing the message subject (now preceded by "RE:"), the name of the sender, and timestamp is then visible in the LHCP's message inbox. A fake email is sent to the LHCP alerting the LHCP that a new message reply has arrived.
- [S4] An LHCP wishes to reply to a message. The LHCP views his or her message inbox. The LHCP opens the message to which he or she wishes to reply [S5], and then clicks the reply link above the message text. The LHCP enters the text of the response message (up to 1000 characters) he or she wishes to send, then clicks the send button. A row for showing the message subject (now preceded by "RE:"), the name of the

recipient, and the timestamp are then visible in the LHCP's message outbox. A bolded row for showing the message subject (now preceded by "RE:"), the name of sender, and timestamp are then visible in the patient/representative's message inbox. A fake email is sent to the patient/representative alerting the patient/representative that a new message reply has arrived.

- [S5] A user (a patient, patient representative, or LHCP) wishes to read a message from the message inbox or outbox. The user chooses to open his or her message inbox/outbox. Each row in the message inbox/outbox includes the message subject, the name of either the sender (only for the case of inbox) or recipient (only for the case of outbox), and timestamp. By default, the messages in the message inbox/outbox should be ordered by timestamp, the most recent first. Each row for an unread message in the message inbox is bolded. The user selects a message from the message inbox/outbox to read by clicking the "Read" link beside the row for the message, and then the message subject, the name of the sender, the name of the the recipient, timestamp, and the message text shall be displayed in a new page. After a message in the message inbox is read (i.e., displayed in a new page), the row for the message in the message inbox is not bolded anymore.
- [S6] A user (a patient, patient representative, or LHCP) can sort messages in his or her message inbox by either the sender's last name or timestamp (but not both) in either ascending or descending order (where timestamps in descending order would have the most recent first). A user can sort messages in his or her message outbox by the recipient's last name or timestamp (but not both) in either ascending or descending order. To do so, a user selects one option out of the "Sort by" labeled drop-down box (with options of "Sender/Recipient" or "Timestamp") and selects one option out of the "by order of" labeled drop-down box (with options of "ascending" or "descending"), and then click the "Sort" button. Note that the sorted order is not saved for later viewing after the message inbox or outbox is reopened again (where the default sorting is always used).
- **[S7] A user (an LHCP or patient/representative) can modify his/her message displaying filter by modifying the following filtering criteria: (1) the sender (i.e., the sender's name is exactly the same as the specified string), (2) the subject (i.e., the subject is exactly the same as the specified string), (3) has the words (i.e., the subject or the message body has the specified substring), (4) doesn't have (i.e., neither the subject nor the message body has the specified substring), (5) time stamp falling into the period defined by the starting date and ending date (inclusive) (the user interface shall provide both the option of typing in a specific date in the date format and the option of selecting a date from a calendar for the current month). Note that a single filter includes values for these five filtering criteria (rather than five filters for these five filtering criteria) and a value could be an empty string, indicating that this criterion has no impact on filtering (i.e., imposing no constraints related to this criterion). The user interface shall be initially populated with the values of the filtering criteria from the previously saved filter. After the user modifies the criteria, the user chooses to click the "Cancel" button to cancel the modifications of the filter (i.e., repopulate the user interface with the values of the filtering criteria from the previously saved filter), to click the "Test Search" button to search (i.e., displaying the message inbox [S5] including only the messages satisfying the specified filtering criteria), or to click the "Save" button to save the modified filter. Each user is associated with only one filter (being saved across login sessions) and applies only this saved filter. The user's associated filter initially has all empty inputs for the filtering criteria before the user modifies it.**

30.4 Alternative flows

- [E1] The HCP types an invalid medical identification number and is prompted to try again.
- [E2] The patient chosen is not the desired patient. The HCP does not confirm the selection and is prompted to try again.

30.5 Reference document

Inspired by Office of the National Coordinator for Health Information Technology (ONC) Patient – Provider Secure Messaging Use Case http://healthit.hhs.gov/portal/server.pt/gateway/PTARGS_0_10731_848113_0_0_18/PPSMDetai led.pdf [http://healthit.hhs.gov/portal/server.pt/gateway/PTARGS_0_10731_848113_0_0_18/PPSMDetai led.pdf]

UC31 Find LHCPs for prescription renewal Use Case

31.1 Precondition:

A patient is a registered user of the iTrust Medical Records system [UC2]. The iTrust user has been authenticated in the iTrust Medical Records system [UC3].

31.2 Main Flow:

A patient wants to renew the patient's expired prescriptions (i.e., prescriptions' end dates are ~~later~~ earlier than the current date) and therefore wants to find the LHCPs who earlier wrote the patient's expired prescriptions *(it is assumed that the doctors who wrote prescriptions are all LHCPs so no LHCP checks on the prescription-writing doctors are needed)*. The patient chooses "My Expired Prescription Reports" and is presented with a list of the patient's expired prescriptions [S1], sorted by start date (the later date is ranked ~~earlier~~ closer to the top). The patient can select to view contact information of a selected LHCP shown in the expired prescription list [S2].

31.3 Sub-flows:

- [S1] The expired prescription ~~report~~ list is titled with the patient name. The expired prescription list includes medication, date prescribed *(i.e., the day of the office visit)*, start date, end date for each prescription, and the name of the LHCP who prescribed the medication (where the name of the LHCP is linked to contact information for that LHCP). *If there are no expired prescriptions, an empty expired prescription list is presented. The event is logged [UC5, S32]*
- [S2] The patient clicks on the name of the LHCP for an expired prescription, and is presented with the contact information for that LHCP *(including First Name Last Name, LHCP Type, Street Address 1, Street Address 2, City, State, Zip Code, Phone, and Contact Email); if any type of contact information is missing or the whole contact information for the LHCP is not available in the database, the corresponding missing types of information are simply shown as blank.*

~~*The event is logged [UC5, S32]*~~

UC32 Proactively Confirm Prescription-Renewal Needs Use Case

32.1 Precondition:

The HCP has authenticated himself or herself in the iTrust Medical Records system [UC~~2~~ 3].

32.2 Main Flow:

The HCP chooses "My Patients with Potential Prescription-Renewal Needs" and is presented with a list of patients [S2] that satisfy ALL of the three conditions: (1) patients for whom the HCP is a DLHCP, (2) ~~chronic~~ *special-diagnosis-history* patients [S1], (3) patients whose prescriptions will expire within 7 days (including the 7th day) from the current date *(i.e., (**currentDate** < = expiredDate < = (currentDate + 7 days))*. The event is logged [UC5*, S33*] *(after the patient list is displayed)*.

32.3 Sub-flows:

- [S1] A ~~chronic~~ *special-diagnosis-history* patient is an alive patient who has been diagnosed with *at least one of the following:*
  - diabetes mellitus [is diagnosed with ICD code beginning with 250: http://icd9cm.chrisendres.com/icd9cm/index.php?action=child&recordid=1894 [http://icd9cm.chrisendres.com/icd9cm/index.php?action=child&recordid=1894]],
  - asthma [is diagnosed with ICD code beginning with 493: http://icd9cm.chrisendres.com/icd9cm/index.php?action=child&recordid=5000 [http://icd9cm.chrisendres.com/icd9cm/index.php?action=child&recordid=5000]], or
  - circulatory-system disease [is diagnosed with an ICD code between 390 and 459 inclusive: http://icd9cm.chrisendres.com/icd9cm/index.php?action=child&recordid=4314 [http://icd9cm.chrisendres.com/icd9cm/index.php?action=child&recordid=4314]].
- [S2] The patient list is titled with the HCP's name. The patient list includes the patient's name (i.e., first name and last name), phone number, and contact email address [E1, E2] *(*so that confirmation calls or emails can be made or sent *outside of the iTrust system)*. The list is sorted based on the *ascending*

alphabetical order of the patients' last names, and then first names. *When a ~~chronic~~* special-diagnosis-history *patient satisfies all three conditions and has multiple prescriptions satisfying the third condition, the patient is listed in the list only once. The list is a static list with no link on the patient's name, phone number, or contact email address)*

32.4 Alternative Flows:

- [E1] If there are no patients satisfying the three conditions, an empty list is presented.
- ~~[E2] If any type of contact information is missing in the database, the corresponding missing types of information are simply shown as blank. (this flow is deleted since Data Field Formats 3.1 stated that the mentioned contact info here is mandatory)~~

32.5 Reference Documents:

http://www.patentstorm.us/patents/7286996/fulltext.html
[http://www.patentstorm.us/patents/7286996/fulltext.html]

UC33 Refer and Provide Consultations Use Case

33.1 Precondition:

A LHCP is a registered user of the iTrust Medical Records system [UC2]. The iTrust user has been authenticated in the iTrust Medical Records system [UC3].

33.2 Main Flow:

A sending HCP refers a patient to another receiving HCP [S1]. A receiving HCP reviews pending consultations [S2]. A sending HCP reviews the consultation sent back by the receiving HCP [S3].

33.3 Sub-flows:

- [S1] An HCP chooses to refer a patient to another receiving HCP. The sending HCP is presented with a drop down menu of his patients and another drop down menu of other HCPs. When the patient and receiving HCP are chosen, the HCP is presented with the *MID of* the patient that will be sent to the receiving HCP. The sending HCP is also presented with a text box to include the details of the referral to be sent to the receiving HCP. The sending HCP then chooses to send the request or to cancel [E1, E2]. The status of the consultation being sent is set as “pending”. After the consultation is sent, the event is logged [UC5, S34]
- [S2] An HCP chooses to review pending consultations. The receiving HCP is presented with a list of pending referrals. The receiving HCP then selects a referral to view details and is presented with the *MID* of the sending HCP, the patient MID, and the referral details~~reason for the consultation~~. The HCP is also presented with an option (“finish”, “decline”, “pending” with “pending” as default value) to mark the status of the consultation and a text box to enter the details of the consultation. The receiving HCP can then choose to confirm the status setting/consultation entering or cancel.
- [S3] An HCP chooses to review patient consultations referred by the HCP and already entered by the receiving HCPs. The HCP is presented with a list of referrals that were sent by him and whose statuses are “finish” or “decline”. Each referral includes the patient MID, receiving HCP MID, referral details, and consultation details.

33.4 Alternative Flows:

- [E1] The patient chosen is not the desired patient. The HCP does not confirm the selection and is prompted to try again.
- [E2] The receiving HCP chosen is not the desired HCP. The sending HCP does not confirm the selection and is prompted to try again.

UC34 Remotely monitor patient physiologic measurements

34.1 Precondition:

A LHCP, UAP, or patient is a registered user of the iTrust Medical Records system [UC2]. The iTrust user has been authenticated in the iTrust Medical Records system [UC3].

34.2 Main Flow:

An LHCP or UAP creates a list of patients (by MID) for which he or she will monitor remotely [E1, S1]. A patient inputs his or her blood pressure and glucose levels throughout each day [S2]. An LHCP can see the blood pressure and glucose levels for the patients he or she is monitoring [S3]. A UAP [S5] or patient representative [S6] can input the blood pressure and glucose levels for a patient. A patient may have up to 10 data points in any one day, reported by him/herself, a UAP, or a personal representative [E4]. All events are logged [UC5,S35].

34.3 Sub-flows:

- [S1] An LHCP or UAP can add and delete patients from his or her monitoring list. A patient is added to the list by the LHCP or UAP typing in the patient's MID [E1] or name. An LHCP can delete a patient from his or her monitoring list by the LHCP typing the the patient's MID [E1]. In both cases, the LHCP is presented the name of the patient and must confirm the add/delete.
- [S2] A patient choose to report their status. He or she can report their blood pressure (systolic and diastolic) [E2] and/or glucose levels [E3]. The input data and a timestamp and that fact that the status is "self-reported" are saved.
- [S3] An LHCP chooses to view their monitoring. The LHCP is presented with a listing of all his or her patients with their blood pressure and glucose levels, time recorded timestamp, and whom reported the data (patient, UAP name, personal representative name). Patients with no information for the current day are highlighted. Patients with blood pressure or glucose level out of range are highlighted (normal blood pressure: systolic 90-140; diastolic 60-90; normal glucose 70-150). The LHCP can select a patient to obtain additional information about a patient [S4].
- [S4] An LHCP selects to view additional information for a patient. The LHCP is presented with a screen upon which he/she can choose a date range. Once the date range is selected, the LHCP can see the patient name; patient phone number; personal representative (name and phone number), if applicable; and the blood pressure and glucose levels as well as whom reported the data (patient, UAP name, personal representative name) for that date range.
- [S5] A UAP can select to report physiologic measurements. He/she is presented with a list of the patients for which he/she is allowed to report measurements. He she can select a patient and then enter data. He or she can report the blood pressure (systolic and diastolic) [E2] and/or glucose levels [E3] for the patient. The input data and a timestamp and that fact the the status was reported by "case manager" and their MID are saved.
- [S6] A patient can select to report physiologic measurements for those for whom they are patient representatives. He/she is presented with a list of the patients for which he/she is allowed to report measurements. He she can select a patient and then enter data. He or she can report the blood pressure (systolic and diastolic) [E2] and/or glucose levels [E3] for the patient. The input data and a timestamp and the fact that the status was reported by "patient representative" and their MID are saved.

34.4 Alternative Flows:

- [E1] The patient chosen is not the desired patient. The HCP does not confirm the selection and is prompted to try again.
- [E2] The patient, UAP, or personal representative enters a systolic blood pressure outside the range 40-240 or a diastolic blood pressure outside the range 40-150. He/she is notified of an error and is prompted to try again.
- [E3] The patient, UAP, or personal representative enters a glucose level outside the range 0-250. He/she is notified of an error and is prompted to try again.
- [E4] The patient, UAP, or personal representative tries to enter more than ten data points for one day and is told additional data cannot be entered.

34.5 Reference Documents:

US Department of Health and Human Services Remote Monitoring Use Case: http://healthit.hhs.gov/portal/server.pt/gateway/PTARGS_0_10731_848114_0_0_18/RMonDetailed.pdf [http://healthit.hhs.gov/portal/server.pt/gateway/PTARGS_0_10731_848114_0_0_18/RMonDetailed.pdf]

UC35 Report Adverse Event Use Case

35.1 Precondition:

A patient is a registered user of the iTrust Medical Records system [UC2]. The iTrust user has been authenticated in the iTrust Medical Records system [UC3].

35.2 Main Flow:

A patient selects to reports an event related to a prescription drug [S1] or immunization [S2] reaction. The event is logged [UC5; S36].

35.3 Sub-flows:

- [S1] A patient is presented with a listing of all prescription drugs for which he/she has been prescribed **and/or has taken** in the last 12 months. The patient chooses one or more drug(s) for which to report the adverse event. The patient is then able to write a textual description which describes the symptoms of the adverse event and to save the information. A fake email is sent to the LHCP who prescribed the medication indicating the patient name and MID, drug, and symptoms.
- [S2] A patient is presented with a listing of all immunizations for which he/she has been administered in the last 12 months. The patient chooses the immunization for which to report the adverse event. The patient is then able to write a textual description which describes the symptoms of the adverse event and to save the information. A fake email is sent to the LHCP who administered the immunization indicating the patient name and MID, drug, and symptoms.

35.4 Alternative Flows:

35.5 Reference Documents:

US Department of Health and Human Services Consumer Adverse Event Reporting Use Case: http://healthit.hhs.gov/portal/server.pt/gateway/PTARGS_0_10731_848115_0_0_18/CAERFinalExtGap.pdf [http://healthit.hhs.gov/portal/server.pt/gateway/PTARGS_0_10731_848115_0_0_18/CAERFinalExtGap.pdf]

UC36 Monitor Adverse Event Use Case

36.1 Precondition:

A patient or public health agent are a registered user of the iTrust Medical Records system [UC2]. The iTrust user has been authenticated in the iTrust Medical Records system [UC3]. The event is logged [UC5, S38].

36.2 Main Flow:

A public health agent selects a specific time period for which he/she would like to see a detailed listing of all adverse events related to prescription drugs [S1] or immunizations [S2] or to see trends in adverse events relate to prescription drugs [S4] or immunizations [S5].

36.3 Sub-flows:

- [S1] A public health agent is presented with a listing of prescription drug-related adverse events for the time period that do not have a status of “removed”, sorted by NDC. The public health agent can select to see the detail of a specific report. Upon reading the report, the public health agent can choose to send a “fake email” message to the adverse event reporter to gain more information about the report. The public health agent may also choose to remove an adverse event report (such as based upon communication with the reporter or because the report appears to be bogus) [S3].
- [S2] A public health agent is presented with a listing of immunization-related adverse events for the time period that do not have a status of “removed”, sorted by CPT code . The public health agent can select to see the detail of a specific report. Upon reading the report, the public health agent can choose to send a “fake email” message to the adverse event reporter to gain more information about the report. The public health agent may also choose to remove an adverse event report (such as based upon communication with the reporter or because the report appears to be bogus) [S3].
- [S3] The adverse event report changes to a status of “removed.” A message of the removal is sent to the adverse event reporter and to the LHCP involved in the report (because the LHCP prescribed the drug or

administered the immunization).

- [S4] The public health agent chooses a time period and a drug (NDC). The public health agent is presented with a bar chart giving the quantity of non-removed drug-related adverse events for this drug by month.
- [S5] The public health agent chooses a time period and an immunization (CPT). The public health agent is presented with a bar chart giving the quantity of non-removed drug-related adverse events for this drug by month.

36.4 Alternative Flows:

36.5 Reference Documents:

US Department of Health and Human Services Consumer Adverse Event Reporting Use Case: http://healthit.hhs.gov/portal/server.pt/gateway/PTARGS_0_10731_848115_0_0_18/CAERFinalExtGap.pdf [http://healthit.hhs.gov/portal/server.pt/gateway/PTARGS_0_10731_848115_0_0_18/CAERFinalExtGap.pdf]

UC37 Safe Drug Prescription Use Case

37.1 Precondition:

An LHCP is registered user of the iTrust Medical Records system [UC2]. The iTrust user has been authenticated in the iTrust Medical Records system [UC3].

37.2 Main Flow:

The LHCP selects to prescribe a patient a drug by selecting its NDC and name [S1, S2]. Upon notice of allergies and interactions the LHCP proceeds with the prescription [S3] or the the use case begins again to allow the LHCP to choose another drug or the LHCP abandons the use case. If a prescription is completed, the event is logged [UC5, S37].

37.3 Sub-flows:

- [S1] The drug desired to be prescribed is checked against the patient's drug allergies. The LHCP is notified of drug allergy.
- [S2] The drug desired to be prescribed is checked for interactions between other drugs currently taken by the patient. The LHCP is notified of possible interactions.
- [S3] The patient is sent a “fake email” that the LHCP has prescribed a medication that he/she is allergic to or that has a known interaction with a drug he/she is taking.

37.4 Alternative Flows:

37.5 Reference Documents:

US Department of Health and Human Services Medication Gaps Use Case: http://healthit.hhs.gov/portal/server.pt/gateway/PTARGS_0_10731_848121_0_0_18/MedGapFinalExtGap.pdf [http://healthit.hhs.gov/portal/server.pt/gateway/PTARGS_0_10731_848121_0_0_18/MedGapFinalExtGap.pdf]

UC38 Maintain Drug Interaction Use Case

38.1 Precondition:

An admin is a registered user of the iTrust Medical Records system [UC2]. The iTrust user has been authenticated in the iTrust Medical Records system [UC3].

38.2 Main Flow:

The administrator records [S1] or deletes [S2] a drug interaction between two prescription drugs.

38.3 Sub-flows:

- [S1] The administer is presented with two lists of NDC codes/names. The administrator chooses a drug from each list to record an interaction between the two drugs [E1] The two drugs and a textual description of the possible effects of the interaction are stored.
- [S2] The administrator selects one drug and is presented with a listing of all drug interactions with that drug. The administrator can select a particular pair of drugs and delete the interaction between the two

drugs.

38.4 Alternative Flows:

- [E1] The administrator has chosen the same drug from both lists. The system directs the user to make a different choice.

38.5 Reference Documents:

US Department of Health and Human Services Medication Gaps Use Case: http://healthit.hhs.gov/portal/server.pt/gateway/PTARGS_0_10731_848121_0_0_18/MedGapFinalExtGap.pdf [http://healthit.hhs.gov/portal/server.pt/gateway/PTARGS_0_10731_848121_0_0_18/MedGapFinalExtGap.pdf]

UC39 View Transaction Logs Use Case

39.1 Precondition:

An administrator has authenticated himself or herself in the iTrust Medical Records system [UC3]. A software tester has a login and password. Similar to an administrator, a software tester is added by directly entering the software tester into the database by an administrator that has access to the database. The software tester authenticates himself or herself in the iTrust Medical Records system [UC2].

39.2 Main Flow:

A user (an administrator or a software tester) specifies filtering criteria to view or summarize transaction logs satisfying the filtering criteria [S1].

39.3 Sub-flows:

* [S1] The user selects filtering criteria by specifying (1) a specific user role or all roles for the logged-in user field from a role pull down menu, (2) a specific user role or all roles for the secondary user field from a role pull down menu, (3) all dates or the period defined by the starting date and ending date (the user interface shall provide both the option of typing in a specific date in the date format and the option of selecting a date from a calendar for the current month), and (4) all transaction type names or a specific transaction type name from a transaction type pull down menu. The user chooses to click the “View” button to retrieve the list of transaction logs that satisfy the specified criteria [S2] or click the “Summarize” button to draw bar charts among the transaction logs that satisfy the specified criteria [S3]. * [S2] The system shall display a list of anonymized transaction logs that satisfy the specified filtering criteria. Each row in the list includes the corresponding role of the logged-in user field, the corresponding role of the secondary user field, the transaction type name, the additional information, and the time stamp (i.e., date/time). The logs in the list shall be be ordered by timestamp, the most recent first. * [S3] The system displays four bar charts for trends among target transaction logs (i.e., transaction logs that satisfy the specified filtering criteria). In the first bar chart, the x axis shows the roles for the logged-in user field and the y axis shows the total number of target transaction logs for each role for the logged-in user field. In the second bar chart, the x axis shows the roles for the secondary user field and the y axis shows the total number of target transaction logs for each role for the secondary user field. In the third bar chart, the x axis shows a specific month of a specific year and the y axis shows the total number of target transaction logs for each specific month of specific year (the left most bar corresponds the least recent month/year in the target transaction logs and the right most bar corresponds the most recent month/year in the target transaction logs). In the fourth bar chart, the x axis shows the transaction types and the y axis shows the total number of target transaction logs for each transaction type.

39.4 Alternative Flows:

none

UC40 View Schedule Calendar Use Case

40.1 Precondition:

An LHCP or patient is a registered user of the iTrust Medical Records system [UC2]. The iTrust user has been authenticated in the iTrust Medical Records system [UC3].

40.2 Main Flow:

An LHCP or patient can click the “View Appointment Calendar” link to view his/her appointments in the

current month displayed on a calendar for the current month [S1]. A patient can click “View Full Calendar” link to view his/her appointments in the current month together with his/her office visit dates, prescription dates, and lab procedure dates in the current month displayed on a calendar for the current month [S2].

40.3 Sub-flows:

- [S1] A user (an LHCP or patient) chooses to display his/her appointments in the current month on a calendar for the current month. His/her appointments in the current month shall be displayed on the calendar [S3]. The user can select an appointment from the calendar to read the appointment's details [S4].
- [S2] A user (a patient) chooses to display his/her appointments in the current month together with his/her office visit dates, prescription dates, and lab procedure dates of the current month on a calendar for the current month. His/her appointments shall be displayed on the calendar [S3]. The user can select an appointment from the calendar to read the appointment's details [S4]. In the calendar, the date entry with an office visit shall display a label as the diagnoses (i.e., ICD-9CM codes) for the office visit. The user can select an office visit from the calendar to read the visit's details [S5]. In the calendar, the date entry with a prescription date (i.e., the date of the office visit where themedications in the prescription was prescribed) shall display a label as the medications prescribed (i.e., NDC, see Data Format 5.6) in the prescription. The user can select a prescription from the calendar to read the prescription's details [S6]. In the calendar, the date entry with a laboratory procedure (i.e., the entry of the its last status update date) shall display a label as the LOINC code for the laboratory procedure. The user can select a laboratory procedure from the calendar to read the laboratory procedure's details [S7].
- [S3] In the calendar, the date entry with an appointment shall display a label as the appointment type name for the appointment. The date entry including conflicting appointments is highlighted in bold (a conflicting appointment is one that has overlap in its appointment duration period with that of at least another appointment of the same user).
- [S4] The user selects an appointment from the calendar to read its details by clicking the “Read Details” link beside *or below* the appointment type name displayed for the appointment, and then the details for the appointment shall be displayed in a new page, including the appointment type, the appointment date and start time, comment, and the name of either the patient (only for the user being an LHCP) or the LHCP (only for the user being a patient). The event is logged [UC5, S24].
- [S5] The user selects an office visit from the calendar to read its details by clicking the “Read Details” link beside *or below* the ICD-9CM code (i.e., diagnose) displayed for the visit, and then the details for the visit shall be displayed in a new page, including date of office visit, note text, diagnoses (i.e., ICD-9CM codes), medical procedures performed (i.e., CPT code) , lab procedures ordered (LOINC code, see Data Format 6.11), medications prescribed (i.e., NDC, see Data Format 5.6), immunizations given (i.e., CPT Code, see UC15, S1), and the name of the doctor who prescribed the medication. The event is logged [UC5, S19][UC5, S28].
- [S6] The user selects a prescription from the calendar to read its details by clicking the “Read Details” link beside *or below* the medication displayed for the prescription, and then the details for the prescription shall be displayed in a new page, including the medications prescribed (i.e., NDC, see Data Format 5.6), date prescribed, start date, end date for each prescription, and the name of the doctor who prescribed the medication. The event is logged [UC5, S19].
- [S7] The user selects a laboratory procedure from the calendar to read its details by clicking the “Read Details” link beside *or below* the LOINC code displayed for the laboratory procedure, and then the details for the laboratory procedure shall be displayed in a new page, including laboratory procedure code, status, commentary, results, andoffice visit date when the laboratory procedure was ordered. The event is logged [UC5, S28].

40.4 Alternative Flows:

none

UC41 Send Reminders Use Case

41.1 Precondition:

An administrator has authenticated himself or herself in the iTrust Medical Records system [UC3].

41.2 Main Flow:

The administrator chooses to select the number (denoted as n) of reminder-in-advance days and click the button “Send Appointment Reminders” to send a reminder message to each patient with any upcoming appointment within the next n days [S1]. The administrator chooses to view a message in the reminder message outbox [S2].

41.3 Sub-flows:

- [S1] A row for showing the reminder message's subject, the name of the recipient, and the timestamp is then visible in the system's reminder message outbox. A bolded row for showing the message subject, the name of the sender, and the timestamp is then visible in the patient’s message inbox, and a fake email is sent to the patient that indicates that he/she has a new message from the “System Reminder”. For a reminder message for an upcoming appointment, the message sender shall be “System Reminder”. The message subject shall be “Reminder: upcoming appointment in N day(s)” where N is the number of days between the upcoming appointment date and the current date. The text of the message shall be “You have an appointment on <TIME>, <DATE> with Dr. <DOCTOR>” where <TIME> is the appointment start time, <DATE> is the appointment date, and <DOCTOR> is the name of the LHCP in the appointment. The event is logged [UC5, S44].
- [S2] The user (an administrator) wishes to read a message from the reminder message outbox. The user chooses to open the reminder message outbox. Each row in the reminder message outbox includes the message subject, the name of the recipient, and timestamp. The messages in the message outbox shall be ordered by timestamp, the most recent first. The user selects a message from the reminder message outbox to read by clicking the “Read” link beside the row for the message, and then the message subject, the name of the the recipient, timestamp, and the message text shall be displayed in a new page.

41.4 Alternative Flows:

none

4. Non-Functional Requirements

4.1 HIPAA

Implementation must not violate HIPAA guidelines.

4.2 Exlusive Authentication

The system shall enable multiple simultaneous users, each with his/her own exclusive authentication.

4.3 Form Validation

The form validation of the system shall show the errors of all the fields in a form at the same time.

4.4 Reports

A **report** is a page which opens in a separate window and contains minimal decoration. The format is printer-friendly in that the background is white and the information does not exceed the width of 750 pixels so that upon printing, no information is lost due to the information being too wide.

4.5 Privacy Policy

The system shall have a privacy policy linked off of the home page. The privacy policy should follow the template provided here: http://ecommerce.ncsu.edu/studio/templates/privacy_tem.doc [http://ecommerce.ncsu.edu/studio/templates/privacy_tem.doc]

4.6 Security of MID

Remove MID from being displayed on all pages and URLs. MIDs should be considered private, sensitive information.

5. Constraints

5.1 Language

The system shall be implemented as a Java Server Page web application.

5.2 Coding Standards

The implementation shall adhere to the Java Coding Standards.

5.3 Documentation

All new code shall be documented using the Javadoc documentation system.

5.4 Environment

The implementation shall run on the Windows platform in the Eclipse 3.3 environment.

5.5 Testing

All non-GUI classes must have at least 80% unit testing/JUnit coverage of tests that pass.

5.6 Database

To control open connections to the database, all database access should be done through an object that uses the Singleton pattern.

5.7 Patterns

The implementation must use the Strategy pattern for epidemic detection and cause-of-death trends and the Singleton pattern for database connections.

5.8 Static Analysis

The application should have no true positive Severe or Medium FindBugs errors.

6. Data Field Formats

6.0 User

Field	Format
Security question	Up to 50 alphanumeric characters and symbols: <space> ? - '
Security answer	Up to 30 alphanumeric characters and symbols: <space> ? - '
Password	8-20 alphanumeric characters. In production, password should be encrypted in the database. During development, password can be in plain text.

6.1 Patient

Field	Format
Medical identification number (MID)	Unique 10-digit number that does not start with 9 (reserved for personnel, ie LHCP, UHCP (UAP), Admin)
Last Name	Up to 20 alpha characters and symbol - and ', <space>
First Name	Up to 20 alpha characters and symbol - and ' ,<space>
Contact email	Up to 30 alphanumeric characters and symbols . and _ @, <space>
Street Address 1	Up to 20 alphanumeric characters and symbols: . <space>
Street Address 2	Up to 20 alphanumeric characters and symbols: . <space> (optional field)
City	Up to 15 alpha characters
State	Approved 2-letter state abbreviation
Zip Code	5 digits - 4 digits (the latter part – 4 digits- is optional)
Phone	3 digits - 3 digits - 4 digits

Emergency contact name	Up to 40 alpha characters and symbol - and ', <space>
Emergency contact phone	3 digits - 3 digits - 4 integers
Insurance company name	Up to 20 alphanumeric characters
Insurance company Address 1	Up to 20 alphanumeric characters and symbols: . - and blankspace
Insurance company Address 2	Up to 20 alphanumeric characters and symbols: . - and blankspace (optional field)
Insurance company City	Up to 15 alpha characters
Insurance company State	Approved 2-letter state abbreviation
Insurance company Zip	5 integers - 4 integers (the latter part – 4 integers – is optional)
Insurance company Phone	3 integers - 3 integers - 4 integers
Insurance identification	Up to 20 alphanumeric characters

6.2 Medical Care Personnel

Field	Format
Medical identification number (MID)	Unique 10-digit number that begins with 9 for Admin, LHCP, and ER and with an 8 for UAP
Role	"Administrator", "Licensed health care professional", "Unlicensed authorized personnel", "Emergency responder" "Public health agent" (admin, LHCP, UAP, ER, PHA)
LHCP Type	(for LHCP only) "General", "Surgeon", "Heart specialist", "Pediatrician", "OB/GYN"
Last Name	Up to 20 alpha characters and symbol - and '
First Name	Up to 20 alpha characters and symbol - and '
Street Address 1	Up to 30 alphanumeric characters and symbol: .
Street Address 2	Up to 30 alphanumeric characters and symbol: . (optional field)
City	Up to 15 alphanumeric characters
State	Approved 2-letter state abbreviation
Zip Code	5 integers - 4 integers (the latter part – 4 integers – is optional)
Phone	3 integers - 3 integers - 4 integers
Contact Email	Up to 30 alphanumeric characters and symbols . and _ @, <space>

6.3 Transaction log

Field	Format
Editor/Viewer MID (ie the user performing the action)	10-digit number
Secondary medical identification number	10-digit number
Transaction type	See below
Additional Information	Up to 30 alphanumeric characters for optional description or clarification
Date/ Time	Timestamp

Transaction Types

Code	Use Case
1	enter/edit demographics
2	declare/undeclare designated licensed health care professional
3	~~allow/disallow access to diagnosis~~
4	view access log
5	view medical records
6	authenticate users
7	enter/edit personal health information
8	document office visit
9	create/disable patient or health care personnel
10	maintain diagnosis code
11	request biosurveillance
12	manage procedure code
13	manage drug code
14	identify risk factors of chronic diseases
15	cause of death trends
16	declare/undeclare representative

17	patient reminders (proactively determine patient-needed care)
18	maintain hospital listing
19	view prescription report
20	view hospital statistics
21	view comprehensive report
22	view emergency report
23	schedule appointments
24	view upcoming appointments
28	comprehensive report
29	view lab procedure
30	enter/edit laboratory procedures
31	enter/edit LOINC Code
32	added patient survey
33	view HCP survey results
34	view patient list
35	Find LHCPs with diagnosis experience
36	View patient health records
37	View office visit
38	Add prescription
39	Update office visit
40	Send a message
41	View renewal-needs patients
42	Refer a patient to LHCP for consultation
43	Create/disable emergency responder
45	Telemedicine monitoring
47	Create/disable PHA
48	Drug Interactions
49	Report adverse events
50	Login Failure
51	Maintain appointment type listing
51	Send Reminders

6.4 Patient Personal Health Record

Order of these entries does not matter.

The following information must be maintained

Table 6.4.1

Field	Format
Patient MID	Unique 10-digit number that does not start with 9 [uneditable]
Topical notes	Up to 200 alphanumeric characters and symbols: ? - ' . blankspace and carriage return of personal information about the patient (optional field)
Blood type	O+, A+, B+, AB+, O-, A-, B-, AB-
Ethnicity	Choose from Caucasian, African American, Hispanic, American Indian, Asian, other
Gender	Male or Female
Mother MID	Unique 10-digit number that does not start with 9
Father MID	Unique 10-digit number that does not start with 9 (optional)
Food Allergies	As many entries as necessary of up to 30 alpha characters each; stored per office visit.
Drug Allergies	National Drug code
Birth date	including day, month, and year
Deceased date	including day, month, and year (optional field)
Deceased diagnosis	The cause-of-death diagnosis, in ICD9CM format (optional field) [for UC16]

Additionally, a history of the following information must be maintained

Table 6.4.2

Field	Format
Height	Up to 3-digit number+ up to 1 decimal place (inches).
Weight	Up to 4-digit number + up to 1 decimal place (pounds).
Blood pressure	Up to 3-digit number / Up to 3-digit number
Cholesterol	HDL [integer less than 90], triglyceride [integer between 100 and 600], LDL [integer between 0 and 600] and the total cholesterol [integer between 100 and 600].
Smoker	(Yes/No)

6.5 Diagnosis Information

Field	Format
Patient MID	Unique 10-digit number that does not start with 9
Diagnosis number	Unique (to that patient) up to 10-digit number
Diagnosis	ICD9cm code
~~Discretionary Access~~	~~Yes/no, specifies whether or not the patient has the ability to hide this diagnosis~~
~~Privacy Level~~	~~Privacy level of the diagnosis set by the patient: all, none, designated HCP only~~
Office Visit ID	Integer identifier that specifies the office visit.

6.6 Prescription History

Field	Format
Patient Medical identification number	Unique 10-digit number that does not start with 9
Medication	National Drug Code
Start Date	Date
End Date	Date
Office Visit ID	Identifier that specifies the office visit.

6.7 Hospital Information

Field	Format
Hospital ID number	A unique 10-digit integer
Name	Up to 30 alphanumeric characters

6.8 Medical Care Personnel Affiliation

Field	Format
Medical identification number (MID)	10-digit number that begins with 9
Hospital ID number	A 10-digit integer

6.9 Chronic disease risk factors

6.9.1 Diabetes risk factors

6.9.1.1 Type 1 diabetes (11 years old or younger)

From: http://www.webmd.com/hw/diabetes_1_2/uq1456.asp [http://www.webmd.com/hw/diabetes_1_2/uq1456.asp]

- Family history of type 1 diabetes (mother, father, sister, brother)
- Ethnicity: Increase risk for Caucasian people.
- Viral infections during childhood (less than 18 years old): echovirus (ICD9cm 079.1) and Coxsackie B (ICD9cm 079.2)

6.9.1.2 Type 2 diabetes

From: http://www.webmd.com/content/article/59/66831 [http://www.webmd.com/content/article/59/66831]

- Age over 45.

- Ethnicity. The risk of diabetes is greater in Hispanics, African American, American Indians, and Asians.
- Being overweight. If you are overweight, defined as a body mass index (BMI) greater than 25.
  - Assume any height and weight are in inches and pounds, respectively.
  - With the English system, calculate BMI by dividing weight in pounds (lbs) by height in inches (in) squared and multiplying by a conversion factor of 703.
- Hypertension. High blood pressure increases the risk of developing diabetes.
  - Systolic blood pressure over 240 mmHg and/or a diastolic blood pressure over 120 mmHg.
- Abnormal cholesterol levels. HDL ("good") cholesterol levels under 35 mg/dL (milligrams per deciliter) and/or a triglyceride level over 250 mg/dL increases your risk.
- Prior diagnoses. History of gestational diabetes, polycystic ovary disease (PCOS) or vascular disease
- Family history of type 2 diabetes (mother, father, sister, brother)

6.9.2 Heart disease risk factors

From: http://www.webmd.com/content/pages/9/1675_57840 [http://www.webmd.com/content/pages/9/1675_57840]

- Gender. Men have greater risk than women.
- Age. Over 45
- Ethnicity. The risk of heart disease is greater in African American, American Indians and Hispanic Americans.
- Obesity. If you are overweight, defined as a body mass index (BMI) greater than 30.
  - Assume any height and weight are in inches and pounds, respectively.
  - With the English system, calculate BMI by dividing weight in pounds (lbs) by height in inches (in) squared and multiplying by a conversion factor of 703.
- Hypertension. High blood pressure increases the risk of developing diabetes.
  - Systolic blood pressure over 240 mmHg and/or a diastolic blood pressure over 120 mmHg.
- Abnormal cholesterol levels. HDL ("good") cholesterol levels under 35 mg/dL (milligrams per deciliter) and/or a triglyceride level over 250 mg/dL increases your risk.
- Smoking. Current or prior smoker
- Prior diagnoses. Diabetes.
- Family history of heart disease (mother, father, sister, brother)

6.10 Patient Appointment Request

Field	Format
Medical identification number	Unique 10-digit number
Reason for the visit	up to 500 characters (optional)
HCP Medical identification number	Unique 10-digit number *
Hospital ID number	Unique 10-digit number *
Date 1	Date that is today or after (optional)
Time 1	Time (optional)
Date 2	Date that is today or after (optional)
Time 2	Time (optional)
Length of Visit	up to a 4 digit number
Status of the appointment request	"Scheduled", "Need Patient Confirm", "Need LHCP Confirm", "Rejected"
Rejection Message	up to 500 characters (optional)
Comments	up to 500 characters (optional)
Number of Weeks to Visit	2 digit number (optional)

Either the HCP Medical Identification Number or the hospital is required.
Note: Date/Time can be timestamps.

6.11 Logical Observation Identifiers Names and Codes (LOINC)

Field	Format
Laboratory Procedure Code	(Unique) LOINC Number(http://www.regenstrief.org/medinformatics/loinc/ [http://www.regenstrief.org/medinformatics/loinc/]) Digits of the format nnnnn-n
Component	Up to 100 characters
Kind of Property	Up to 100 characters
Time Aspect	Up to 100 characters (optional)
System	Up to 100 characters (optional)
Scale Type	Up to 100 characters (optional)
Method Type	Up to 100 characters (optional)

see Test Data for examples

6.12 Laboratory Procedure

Field	Format
Patient MID	Unique 10-digit number that does not start with 9
Laboratory Procedure ID	Unique identifier for a laboratory procedure of a patient
Laboratory Procedure Code	LOINC Number
Status	One of (NOT YET RECEIVED, PENDING, COMPLETED)
Commentary	Up to 500 alphanumeric characters
Results	Up to 500 alphanumeric characters
Office Visit ID	Identifier that specifies the office visit in which the laboratory procedure was ordered
Date/Time of last status update	Timestamp

6.13 Satisfaction Survey

All fields are optional.

Field	Format
Minutes	Up to 3 digit number
Satisfaction Rating	Number ranging from 1 (very unhappy) to 5 (very satisfied)

8. Document Revision History

Version 12

Andy Meneely

Date: December 22, 2007

Change Desc.

- Moved the requirements over to a wiki, see version control on wiki to see history

To see previous revision history, see Version 11 [http://agile.csc.ncsu.edu/iTrust/doc/formalreqs11.html] of the requirements

Version 13

Laurie Williams

Date: September 8, 2008

Change Desc.

- Added subflow 29 to UC5
- Added three flows to UC6
- Added addition transactions to UC12 (UC23-28)
- Added UC28

Version 14

Laurie Williams

Date: October 16, 2008

Change Desc.

- added emergency responder role (UC 2, 15, 21)
- removed ability to restrict access to certain diagnoses (UC 7, 10, 11, 26)
- added ability to create dynamic health history of chronic illness and cause of death (UC 9, 10)
- added ability to track immunizations (UC 9, 11, 17)
- made prescription report more streamlined and user friendly (UC 19)
- added ability to message between patient and HCP
- removed MID from pages and URLs

Version 14.1

Laurie Williams

Date: October 22, 2008

Changed UC21 from listing all prescriptions given in the last 90 days to the following: A list of all prescriptions the patient is likely to be currently taking as determined by the end date of the prescription has passed by 91 days or less. Display the National Drug Code and the name of the prescription. Sort by most recent first.

Version 15

Tao Xie

Date: January 28, 2009

Added UC31 for Find LHCPs for prescription renewal Use Case.

Version 15.1

Tao Xie

Date: February 18, 2009

Added UC32 Proactively Confirm Prescription-Renewal Needs Use Case.

Version 15.2

Ben Smith

Date: July 26, 2009

- Added updated, legible use case diagram (pending corrections)
- Updated references to standards codes.

Version 15.3

Tao Xie

Date: Feb 3, 2010

- Updated UC 30 to provide an expanded messaging system