INF 1342 – SYSTEM REQUIREMENTS AND ARCHITECTURAL DESIGN

ASSIGNMENT 1B

by

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Team Member 2 using Scenario Techniques (S2)
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9. Functional and Data Requirements

9a. Functional Requirements

Requirement Shell		
Requirement#: S2-1	Requirement Type: Functional	Event/Use Case#: 1
Description: Application saves GPS mapping coordinates for remote access.		
Rationale: Patients will need to access the coordinates in an out-of-service area such as when they are traveling via subway.		
Originator: Patient		
Fit Criterion: The patient will be able to access previously saved mapping coordinates while in an out-of-service area, e.g. subway.		
Customer Satisfaction: 5	Customer Dissatisfaction: 5	
Priority: Must	Conflicts: n/a	
Supporting Materials: Use Case #1, Bp-5.		
History: Created 31 January, 2010		

Requirement Shell		
Requirement#: S2-2	Requirement Type: Functional	Event/Use Case#: 1
Description: Application contains a memory store.		
Rationale: Patient will be able to save coordinates within application in case of a missing or full memory card with material that the patient does not want to delete.		
Originator: Patient		
Fit Criterion: The patient will be able to access previously saved mapping coordinates while in an out-of-service area, e.g. subway after saving without memory card.		
Customer Satisfaction: 5	Customer Dissatisfaction: 5	
Priority: Must	Conflicts: not as much random-access memory available for other tasks.	
Supporting Materials: Use Case #1, Ep-1.		
History: Created 31 January, 2010		

Requirement Shell		
Requirement#: S2-3	Requirement Type: Functional	Event/Use Case#: 2

Description: Application is interoperable with the three most popular car GPS navigation systems on the North American market.	
Rationale: When patient is moving from cell phone to car, they may sync the GPS coordinates with their car GPS navigation via wireless protocol.	
Originator: Patient	
Fit Criterion: The car system will register that is has found the mobile and then displays the GPS data from the mobile.	
Customer Satisfaction: 5	Customer Dissatisfaction: 4
Priority: Should	Conflicts: may be excluding certain less popular car navigation system brands
Supporting Materials: Use Case #2, Bp-5.	
History: Created 31 January, 2010	

Requirement Shell		
Requirement#: S2-4	Requirement Type: Functional	Event/Use Case#: 2
Description: Application provides automatic updating to retain compatibility with three most popular car GPS navigation systems in North America.		
Rationale: When patient is moving from cell phone to car, they will not suddenly find out that their car GPS is no longer compatible with their mobile and needs to be updated.		
Originator: Patient		
Fit Criterion: When a car GPS carrier must have customers install a new patch into their device, EDWTA is automatically updated with it.		
Customer Satisfaction: 1	Customer Dissatisfaction: 5	
Priority: Should	Conflicts: n/a	
Supporting Materials: Use Case #2, Bp-5.		
History: Created 31 January, 2010		

Requirement Shell		
Requirement#: S2-5	Requirement Type: Functional	Event/Use Case#: 2
Description: Application data is transferable to another user's EDWTA once patient has registered with hospital's EDRS.		
Rationale: When patient has registered at the hospital, a concerned friend or family member may want to view patient's progress in real time using their EDWTA.		
Originator: Patient's friend or family member		
Fit Criterion: The patient's friend is able to view the patient's progress in line after data has been transferred between EDWTAs.		
Customer Satisfaction: 4	Customer Dissatisfaction: 4	
Priority: Could	Conflicts: privacy implications – perhaps not secure enough to transfer data this	

	way.
Supporting Materials: Use Case #2, Bp-5.	
History: Created 31 January, 2010	

Requirement Shell		
Requirement#: S2-6	Requirement Type: Functional	Event/Use Case#: 2
Description: EDWTA offers audio output functionality.		
Rationale: When the patient's car GPS system has died or they simply prefer to listen to coordinates, they may use audio output with headphones.		
Originator: Patient		
Fit Criterion: The patient hears the requested directions after inserting headphones into their device.		
Customer Satisfaction: 5	Customer Dissatisfaction: 4	
Priority: Should	Conflicts: n/a	
Supporting Materials: Use Case #2, Ep-1.		
History: Created 31 January, 2010		

Requirement Shell		
Requirement#: S2-7	Requirement Type: Functional	Event/Use Case#: 3
Description: Application is fully connected with all area EDRSs from initial registration through to patient leaving hospital.		
Rationale: The application will be able to provide ongoing monitoring of EDRS so that EDWTA user(s) may remain informed about all data.		
Originator: EDWTA user(s)		
Fit Criterion: The EDWTA will update in real time with EDRS data as it is entered by hospital employees from registration to final exit.		
Customer Satisfaction: 5	Customer Dissatisfaction: 5	
Priority: Must	Conflicts: n/a	
Supporting Materials: Use Case #3, Bp-3 through to Br-2.		
History: Created 31 January, 2010		

Requirement Shell		
Requirement#: S2-8	Requirement Type: Functional	Event/Use Case#: 3
Description: EDWTA provides multiple means of alerting the patient when their call time is near.		
Rationale: Patient may be in an environment where or state in which hearing or seeing the application is challenging. Providing multiple alert forms makes up for this.		
Originator: Patient		

Fit Criterion: Patients become aware of their call time through different means – not just visual or auditory.	
Customer Satisfaction: 4	Customer Dissatisfaction: 4
Priority: Must	Conflicts: n/a
Supporting Materials: Use Case #3, Bp-7.	
History: Created 31 January, 2010	

Requirement Shell		
Requirement#: S2-9	Requirement Type: Functional	Event/Use Case#: 3
Description: EDWTA provides the patient with an option to submit the results of their stay to the MOH and EDWTA website.		
Rationale: To refine the MOH database with the most current data and ensuring that correct time estimates were made, thereby improving the EDWTA. Also providing room for qualitative feedback from patient.		
Originator: Ministry of Health		
Fit Criterion: Once the EDRS has indicated that the patient has left the hospital, the EDWTA prompts the user to allow their data to be submitted to the MOH.		
Customer Satisfaction: 1	Customer Dissatisfaction: 1	
Priority: Should	Conflicts: n/a	
Supporting Materials: Use Case #3, Bp-10.		
History: Created 31 January, 2010		

11. Usability and Humanity Requirements

11a. Ease of Use Requirements

MEMBERS OF THE PUBLIC

Efficiency of use: although members of the public will naturally have varying skill sets when it comes to technology, keep in mind that users of this application will generally be in physical pain at the time of using this application. This alone should justify ensuring that the application is as simple and easy to use as possible. Users will need to access data very quickly, as certain situations could quite literally be a matter of life and death.

Ease of remembering: when assigned a registration number by the nurse, user must remember to enter it into EDWTA. Also at the end of the user's experience, user is expected to indicate how everything went and whether there were any problems with the application.

Error rates: only user input that occurs is when entering in registration number and at end of experience on feedback form. Incorrect registration number would simply prompt for a correct number.

Overall satisfaction: will be very important to the MOH that users are pleased with this product and feel it was helpful, as ultimately this product is being developed more for public interests than commercial interests.

Feedback: user will want ongoing indication that the EDWTA is working and continually monitoring their progress in the cue.

EMERGENCY MEDICAL TECHNICIANS

Efficiency of use: paramedics using the application will have higher skill level with it, as they have presumably used it already. They will nonetheless need response times to be just as quick as members of the public, although their interaction with the application ends once patient is dropped off.

Ease of remembering: paramedics are assumed to know exactly where all area EDs are located and therefore will not need all functionality on the app.

Error rates: paramedics will generally use the application only to view EDLOS aggregation for all area EDs. Error possibilities here are very low.

Overall satisfaction: important for paramedics to feel the application was useful, though not quite as important as members of public (key users).

Feedback: receive indication of current EDLOS aggregation.

11b. Personalization and Internationalization Requirements

Language configurability for new users coming into Canada from other countries, e.g. immigrants would be valuable. Also perhaps for Quebecers who only speak French. Application should offer multiple language options, perhaps corresponding to the top five highest immigrant populations for Canada.

Visual configurability to some extent for users who dislike the default colour options on the interface.

11c. Learning Requirements

Content

The key users – members of the general public – will not have time to go through much of a learning curve, as their first time using the

application will generally be in an emergency with little time to spare. The application must therefore be highly intuitive and capable of learning on the spot.

Fit Criterion

After loading the application for the first time a user shall be able to perform a search for EDLOS of area hospitals without having to consult anybody or anything.

Note: nevertheless, a quick guide on how to use the EDWTA should be made available to those forward-thinking individuals who are willing to take a look at it in a non-emergency situation. This guide should be available within the application at all times.

11d. Understandability and Politeness Requirements

The product shall not use medical jargon. All language used within the application will be in “layman’s terms.”

Visual symbols shall be given priority over text when possible.

11e. Accessibility Requirements

Content

Disabled individuals will certainly constitute a major portion of the user base, as they generally need ER assistance more frequently than non-disabled members of the public. The application should therefore account for any and all possible accessibility needs, e.g. a scalable interface for visually impaired individuals, built-in screen reader for blind individuals.

12. Performance Requirements

12a. Speed and Latency Requirements

Speed is no doubt an important factor for the application, as users will be in an emergency situation and need fast response times. Some latency will nevertheless have to be allowed for calculation of EDLOS stats and GPS coordinates generation.

The system response shall be fast enough to avoid having the user abandon the application.

12b. Safety-Critical Requirements

Content

The application may be seen by some as encouraging cell phone use while driving. The MOH should clearly build into their Terms of Use policy that they are not expecting that users should be viewing their EDWTA whilst driving to the hospital. Instead, the expectation should be that the user interfaces their mobile with their car GPS navigation system or uses the audio capabilities on their cell to listen to directions while driving.

12c. Precision or Accuracy Requirements

Content

Accuracy of GPS mapping coordinates shall be within visual range of user.

Accuracy of initial EDLOS estimate shall be within a few minutes.

Accuracy of EDRS estimates once patient has arrived and registered shall be within a few minutes.

12d. Reliability and Availability Requirements

Content

As the application is generally only being used in critical and possibly life threatening situations and these situations could potentially arise at any time of the day, reliability must be as close to 100% as possible and the application must be available at all times.

For moments at which the GPS database and service provider are down – this is beyond control, as these are external systems. In a case such as this, the best the application can do is clearly indicate to the user what/where the problem is, when roughly it is expected to be repaired, and let them know that the app is currently unusable.

The product shall be available for use 24 hours per day, 365 days per year.

The product shall achieve at least 99% uptime.

12e. Robustness or Fault-Tolerance Requirements

Whenever connection to the database(s) is lost, the application shall provide an indication to the user as to what the problem is.

Whenever the GPS system is down, the EDLOS aggregation shall work in the event that the user does not need directions, e.g. paramedic.

When the EDLOS database is down, the GPS functionality shall work in the event that the user only needs directions.

12f. Capacity Requirements

The application shall be able to quantify all EDRSs available in a major metropolitan region.

The application shall be able to save within its RAM locations and coordinates for at least two GPS requests.

In terms of simultaneous user capacity, the application shall be able to handle at least the maximum amount of registrations made to a major metropolitan ED in a single day.

12g. Scalability or Extensibility Requirements

The product's scalability requirements may be compared with the general population's expected rate of growth in coming years, as hospitals will have to account for patient increases and the entire system will need to grow in response to this.

In terms of extensibility, if proven successful in Ontario we would certainly be interested in extending the product's range nationally and perhaps even internationally.

12h. Longevity Requirements

The initial version of the product shall be expected to operate within the maximum maintenance budget for a minimum of one year and extended beyond that if proven successful.

13. Operational and Environmental Requirements

13a. Expected Physical Environment

As an emergency situation may conceivably arise in literally any physical environment, there are no boundaries on the patient's side. On the hospital's side, please consult section 3e – Anticipated Workplace

Environment from assignment 1S.

13b. Requirements for Interfacing with Adjacent Systems

Content

The application shall interface with the area's GPS system.

The application shall interface with the latest version of the three most popular car GPS navigation systems in North America.

The application shall interface with all area EDRSs.

The application shall interface with itself on all other platforms where the application is supported, e.g. Blackberry, iPhone, PC

13c. Productization Requirements

The product shall be available as a single downloadable file through both the MOH website and the particular vendor's website, e.g. iPhone website.

If proven successful under these circumstances, the product may be mandated through government to be automatically installed on all compatible devices in the name of improving health care efficiency.

The product shall be able to be installed by an untrained user.

The product shall be free.

13d. Release Requirements

Content

New releases of the product shall be produced in conjunction with user feedback. Feedback that is deemed particularly noteworthy will be given priority in development. New releases will be automatically installed to the users' devices through updating procedures.

14. Maintainability and Support Requirements

14a. Maintenance Requirements

The application will have a built-in bug report tool to communicate to maintenance operators any critical errors. These will be corrected and updated automatically through patches.

External maintenance that must be done on the GPS system and/or EDRSs will be communicated to the users through the application in real time along with an estimate on how long the delay will be.

14b. Supportability Requirements

Considering the rush that most users will be in whilst using the application, the application will have to be as self-supporting as possible and therefore a manual of any length – whether printed or digital – is superfluous.

A brief tutorial on the main functionality behind the application shall be presented when first loading the application and made available at all times thereafter.

For specific support-related questions, the technical department at the MOH shall be trained on the application and made available during business hours.

For after-hours problems, a means of leaving a message and user contact information shall be provided.

14c. Adaptability Requirements

The application is expected to run on iPhone, Blackberry, and Palm mobiles.

The application is expected to run on Windows XP, Windows Vista, Linux, and the two most popular Mac operating systems.

15. Security Requirements

15a. Access Requirements

All users will be asked to register when first installing or loading the application on their device. This should provide a unique identifier to the MOH to be able to keep track of who is using their product and investigate a particular user if need be.

Certain users will not want MOH management having access to their private data and will therefore request that the results of their hospital experience are not entered into any sort of database afterwards. This data should nevertheless be held by the MOH for their records but kept separate from integration with data that is publicly available.

15b. Integrity Requirements

See "Use/Misuse Case Diagram of EDWTA/EDRS Security Requirements" in the appendix, pg. 20.

The MOH shall ensure that personal registration numbers are sufficiently protected with advanced encryption.

15c. Privacy Requirements

See Misuse Case "Intercept and/or tamper with transmission of private data" in the appendix, pg. 18.

The application shall prompt its users for permission before integrating their data into the MOH database.

The application shall ensure that a patient's private data is transmitted securely across the network.

The application shall notify customers of changes to its information policy.

15d. Audit Requirements

The required registration process for all users will allow the MOH to retain records on who has used the application.

15e. Immunity Requirements

The application shall have built-in antivirus software provided by the MOH.

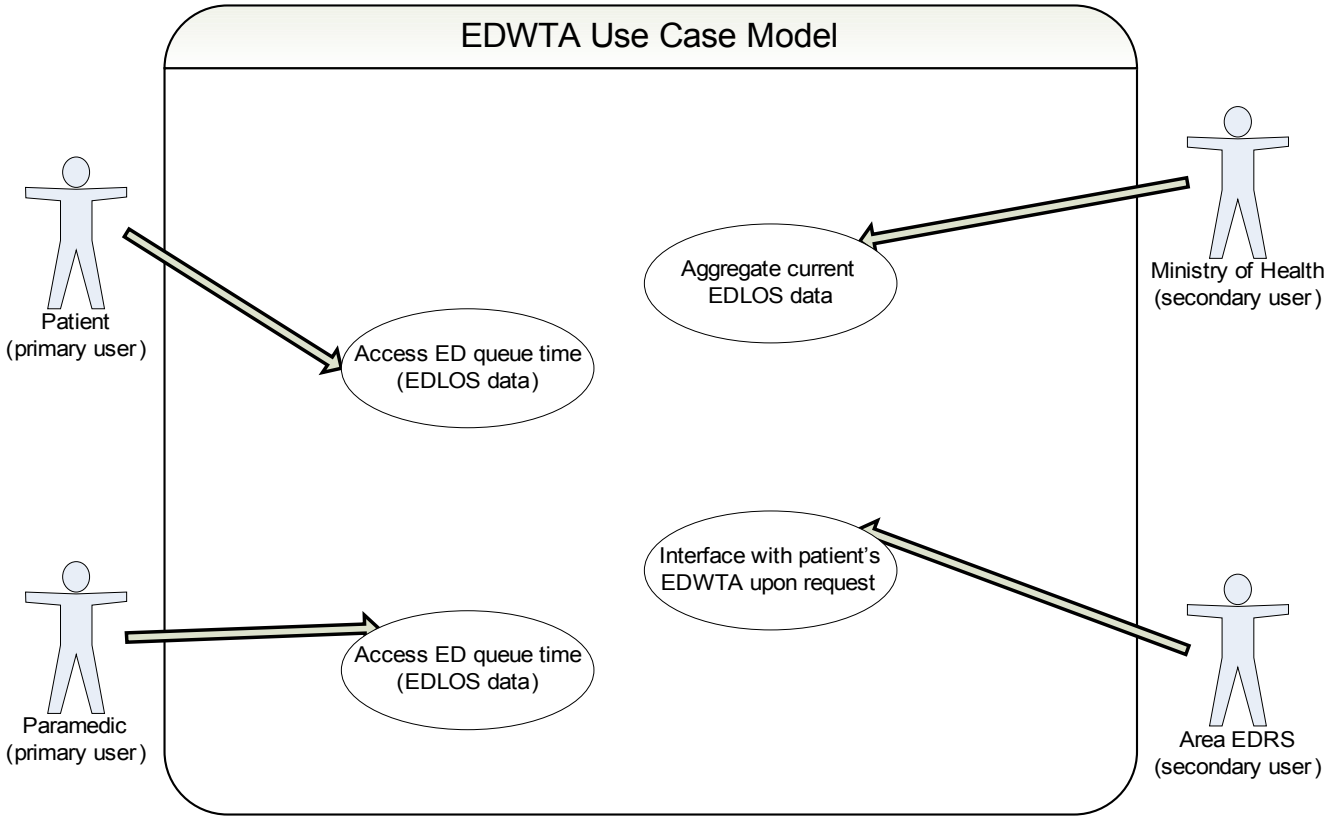
Appendix

1. Use Case Briefs

Actor	Goal	Brief
Patient	Access ED queue time (EDLOS data)	*Level of abstraction: type scenario*. The patient selects the app on their device. The system provides the app interface. The patient selects to see EDLOS aggregation of area hospitals.
Joanna	Access hospital GPS mapping coordinates	*Level of abstraction: instance scenario*. The patient, Joanna, selects the app on her cell phone. The system provides the app interface. Joanna selects to see EDLOS aggregation of area hospitals. Joanna selects to see GPS mapping for a particular hospital. *1* Joanna selects to save these GPS mapping coordinates remotely in the app for quick reference. Twenty minutes later, Joanna again selects the app on her device from the subway. The system provides the saved GPS mapping coordinates. Joanna navigates her way to the hospital using this.
Robert	Access hospital GPS mapping coordinates	*Level of abstraction: instance scenario*. The patient, Robert, selects the app on his cell phone. The system provides the app interface. Robert selects to see EDLOS aggregation of area hospitals. Robert selects to see GPS mapping for a particular hospital. *2* Robert gets in his car and must sync his cell GPS with his car GPS navigation system. Robert navigates his way to the hospital using this.
Ron	Access ED queue time (EDLOS data)	*Level of abstraction: instance scenario*. Ron, a paramedic, selects the app on his cell

		phone. The system provides the app interface. Ron selects to see EDLOS aggregation of area hospitals.

2. Use Case Model



3. Use Cases

Name	#1 Access hospital GPS mapping coordinates (Joanna)
Iteration	Filled
Summary	The patient uses the app to find locations of available hospitals using a GPS mapping system.
Basic path	Bp-1. Joanna selects the app on her cell phone. Bp-2. The system provides the app interface. Bp-3. Joanna selects to see EDLOS aggregation of area hospitals. Bp-4. Joanna selects to see GPS mapping for a particular hospital. Bp-5. Joanna selects to save these GPS mapping coordinates remotely in the app for quick reference. Bp-6. Twenty minutes later, Joanna again selects the app on her device from the subway. Bp-7. The system provides the saved GPS mapping coordinates. Joanna navigates her way to the hospital using this.
Alternative paths	Ap-1. The system notifies the user that the GPS mapping coordinates cannot be saved because memory card is missing.
Exception paths	Ep-1. The system notifies the user that the GPS mapping coordinates cannot be saved because memory card is full. Joanna deletes some of her memory and returns to Bp-5.
Trigger	Joanna selects the EDLOS aggregation feature on the app.
Assumptions	A-1. Aggregated EDLOS data is accurate. A-2. GPS mapping data is accurate.
Preconditions	Pre-1. User's device has sufficient free memory to save data.

	Pre-2. User's device has a battery that is not dying.
Postconditions	Post-1. GPS mapping coordinates have been successfully saved into the system.
Related business rules	Br-1. Users must be registered to gain access to the application.
Author	Grant Patten
Date	2010.01.30

Name	#2 Access hospital GPS mapping coordinates (Robert)
Iteration	Filled
Summary	The patient uses the app to find locations of available hospitals using a GPS mapping system.
Basic path	Bp-1. The patient, Robert, selects the app on his cell phone. Bp-2. The system provides the app interface. Bp-3. Robert selects to see EDLOS aggregation of area hospitals. Bp-4. Robert selects to see GPS mapping for a particular hospital. Bp-5. Robert gets in his car and must sync his cell GPS with his car GPS navigation system. Robert navigates his way to the hospital using this.
Alternative paths	Ap-1. Robert's car GPS navigation system stops working. Ap-2. Robert's mobile does not offer wireless protocol exchange, e.g. Bluetooth. Ap-3. Robert's car GPS navigation system does not offer wireless protocol exchange.
Exception paths	Ep-1. Robert's car GPS navigation system stops working but he instead uses the audio functionality on the mobile with headphones to navigate his way to the hospital.
Trigger	Robert selects the EDLOS aggregation feature on the app.
Assumptions	A-1. Aggregated EDLOS data is accurate. A-2. GPS mapping data is accurate.
Preconditions	Pre-1. User's devices have batteries that are not dying. Pre-2. User's devices are wireless protocol-enabled.
Postconditions	Post-1. Mobile GPS mapping coordinates have been successfully transferred to the car navigation system.
Related business	Br-1. Users must be registered to gain access to the

rules	application. Br-2. Application must be compatible with existing wireless protocol-enabled car navigation systems.
Author	Grant Patten
Date	2010.01.30

Name	#3 Sync application with hospital's EDRS
Iteration	Filled
Summary	The patient uses the app to interface with the particular hospital's EDRS for the most current information and, thereby, gaining more accurate time estimations.
Basic path	Bp-1. After registering with the nurse, the patient selects the app on their device. Bp-2. The system provides the app interface. Bp-3. The patient selects which hospital they are at. Bp-4. The patient enters in their registration number. Bp-5. The system pulls the individual's private information from the hospital's official EDRS and syncs it into the app. Bp-6. The system provides a means of keeping track of the patient's spot in the cue. Bp-7. The system provides multiple means of alerting the patient when their call time is near. Bp-8. The system uses the hospital's EDRS to indicate whether or not the patient was successfully admitted in to see the physician. Bp-9. The system uses the hospital's EDRS to keep track of how long it took for the patient to leave the physician's office. Bp-10. The system provides the patient with an option to submit the results of their stay to the MOH and EDWTA website for system refinement. Plus comments field for qualitative data.
Alternative paths	Ap-1. The patient leaves the ED after Bp-4 and misses their spot after failing to notice the system's indications.
Exception paths	Ep-1. The patient enters incorrect registration number. System should recognize this and provide error notification.

Trigger	The patient enters in a correct registration number.
Assumptions	A-1. Nurse(s) are continually updating the EDRS with up-to-date information.
Preconditions	Pre-1. User's device has a battery that is not dying. Pre-2. The hospital's EDRS is functioning smoothly.
Postconditions	Post-1. The system has logged activity of the patient's cycle through the EDRS.
Related business rules	Br-1. Users must be registered to gain access to the application. Br-2. All areas hospitals are mandated to interface their EDRS with EDWTA.
Author	Grant Patten
Date	2010.01.30

4. Misuse Case

Name	#4 Intercept and/or tamper with transmission of private data
Summary	Hacker intercepts a patient's private information as they are submitting it to the MOH and the EDWTA website at the end of their stay.
Basic path	Bp-1. Hacker compromises network remotely. Bp-2. Hacker identifies data that is MOH-related. Bp-3. Hacker updates, deletes, or saves private data for records. Hacker may publish private data online to prove that the system is flawed.
Alternative paths	Ap-1. Hacker attacks MOH database or EDWTA website directly after private data has been uploaded.
Mitigation points	Mp-1. Introduce stronger encryption technology when transmitting data across the network. Mp-2. Parse an individual's private data rather than sending it all at once. The disassociation of elements may confuse the hacker. Reassemble on other end. Mp-3. Introduce stronger security measures on MOH database and EDWTA websites, e.g. SSL security. Mp-4. Enclose all stakeholders within a VPN.
Extension points	[...]
Trigger	A patient agrees to transmit their data to the MOH database and EDWTA website at the end of their

	stay.
Preconditions	Pre-1. The network is not 100% secure against remote attacks.
Assumptions	A-1. Data is transmitted directly from EDRS database to MOH database and not through a third party.
Mitigation guarantee	Do not transmit personal data across the network in the first place. Paper-based transmission is a possibility, although database refinement will take longer.
Related business rules	Br-1. Data from patients' stays should be used to dynamically refine and improve the aggregated MOH database.
Potential misuser profile	Skilled. Knowledge of databases and network transmission processes.
Stakeholders and threats	St-1. MOH: compromised integrity of their system. St-2. Individual hospitals: compromised integrity of their EDRS database(s). St-3. Patient: loss of private information.
Terminology	SSL: Secure Socket Layer VPN: Virtual Private Network
Scope	May compromise integrity of entire system.
Abstraction level	Misuser goal.
Author	Grant Patten
Date	2010.01.30

5. Use/Misuse Case diagram