

**WEST AFRICAN INFECTIOUS DISEASE
DIAGNOSTIC AID
(WAIDDA)**

Human Factors Engineering: IE 545

Oregon State University

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Executive Summary

Sierra Leone has approximately two hundred fifty physicians to treat over six million people [1]. Sierra Leone lacks the medical infrastructure and resources to treat a large number of people suffering from infectious disease. According to the Center of Disease Control, Sierra Leone's main cause of death is Malaria, a widespread infectious disease spread by mosquitos [2]. To effectively treat Malaria and other infectious diseases such as Cholera, Typhoid, Dengue, and Yellow Fever, clinicians must diagnose patients using presenting symptoms and available rapid diagnostic tests [Jerry Mac.].

Willamette International, a nonprofit Christian organization, wants to bolster Sierra Leone's medical infrastructure and resourcefulness by developing a diagnostic aid. This diagnostic aid is also known as the West African Infectious Disease Diagnostic Aid or WAIDDA. WAIDDA is a software-based tool that should train and guide clinicians through patient interviews and medical examinations, record patient information, and suggest a diagnosis using patient information. In addition, WAIDDA should cue clinicians on important medical procedures such as wearing personal protective equipment like gloves and masks during examinations as well as how to properly deal with a patient suspected of carrying the Ebola virus.

Willamette International requested WAIDDA Team One of Oregon State University's Human Factors Engineering (HFE) course taught by Dr. Kenneth Funk, Mr. McIntosh, Dr. Patel, and the IE 545 teaching assistant. Ms. Katarina Morowsky, to develop the WAIDDA prototype. With the assistance of Dr. Kenneth Funk and Ms. Katarina Morowsky, WAIDDA Team One applied Human Factors Engineering knowledge and practices to develop a high-quality and implementable prototype.

Specifically, WAIDDA Team One created an IDEF0 model of the patient examination process. The IDEF0 model identified obscure user needs and was instrumental to the project requirements list. A list of project requirements were also created to consider customer and user needs early and often during WAIDDA's development. Other HFE methods applied to WAIDDA's development include: a detailed task analysis, trade study, and a graphical mockup of the WAIDDA prototype which includes detailed views of WAIDDA's appearance and functionality, as well as, an example of the algorithmic engine that may potentially drive WAIDDA's suggested diagnosis feature. The applied HFE methods can be found in this report.

Background

Description of the Domain [3]

Sierra Leone is a tropical West African country located between Guinea, Liberia, and the Atlantic Ocean. It has a population of 6 million people. Currently there are approximately 200 physicians within

the country and many do not work directly with patients. The lack of physicians has caused a health care disparity with many people lacking proper health care services.

Many infectious diseases negatively impact the lives of people in Sierra Leone, including Ebola, Malaria, Typhoid, Yellow Fever, Dengue Fever, and Cholera. The spread of these diseases can be attributed to the unsanitary water sources, poor living conditions in rural areas, as well as being infected by mosquitoes. Rivers and other water deposits where drinking water is collected are often unclean and used for activities such as showering, washing clothes and utensils, or watering livestock. In addition, stagnant water deposits, for example in wells or indentations on dirt roads, are the preferred egg hatching sites for mosquitoes.

Willamette International works with local District Medical Officers (DMOs) to provide diagnosis and treatment to people in need of medical attention within Sierra Leone. Expatriates from Willamette International and trained DMOs act as clinicians for local patients. English is used in Sierra Leone as a trade language, however at least one translator is often needed to understand different tribal dialects or languages during the clinical examination process.

Examinations are performed in private between the interviewer (the clinician), the patient, and translators as needed. This private environment encourages honesty from the patients while answering the clinician's questions. Within the examination area, power to lighting, diagnostic tools, and any electronics is supplied via a generator. Information regarding weight, height, heart rate, and blood pressure may be collected prior to entering the examination area. Clinicians may use a tablet, laptop, or something similar which could in the future incorporate a software to facilitate diagnosis or record keeping. Such a software would need a reliable and easy to understand user interface.

Examinations may include physical contact and are performed with Personal Protective Equipment (PPE) such as gloves. Examinations will proceed only if Ebola has been ruled out as a possible diagnosis before the patient enters the examination area since it may be spread by skin to skin contact. Patients are with the clinician for approximately 15 minutes on average, and much of the time is required to establish an accurate representation of these first-visit patients. Clinicians work 8-hour days.

Willamette International works to provide training for locals to become DMOs and clinicians. Trainees who are selected have roughly a U.S. 7th grade level proficiency in English. The program should ideally be adopted within a relatively short period of time. With the proposed diagnosis aid, clinicians with minimal training will be able to provide reliable diagnosis and keep informative records.

Description of Users

The primary users of the proposed diagnosis aid will be local DMOs and clinicians interacting with patients within Sierra Leone. The country is roughly 79% illiterate. Prior to field practice, the DMOs

will have received one to two years of training. This training is typically outcome oriented and therefore has little background information in biology or physiology of disease. DMOs and clinicians will know English but will oftentimes require a translator for tribal dialects to explain questions and symptoms to patients during examinations.

User Challenges

There are a number of potential challenges to the proposed project. The local trainees selected to become DMOs and clinicians have roughly a U.S. 7th grade level knowledge as well as limited background in physiology and the mechanisms of diseases and their treatment. This limitation will affect how much guidance the engine for the diagnosis aid will be required to give, however the guidance must remain unbiased. In addition, clinician bias in diagnosing diseases or overruling the aid's results may affect outcomes.

Another challenge involves inaccurate or dishonest patient information. This may occur when patients are unsure of their symptoms or are exaggerating to receive treatment. Inexperienced clinicians may be unable to identify when this occurs, and this may affect their diagnosis. Furthermore, if a patient is unable to respond due to an illness, mental or other circumstance, the clinician must rely on information from a family member if one is present. In these cases where a verbal interview cannot be properly conducted, information may be limited.

It is very typical that a patient will receive a diagnosis and treatment and not return for a follow-up. Some patients must travel a long way to the clinic site; patients must also wait to see the clinician, and the waiting area may be very crowded with other sick individuals. The lack of a follow-up visitations limit the information that can be collected in the field regarding, for example, diagnosis accuracy.

Technical Challenges

The most difficult technical challenge will be distinguishing between the different types of infectious diseases without analyzing blood samples. Many of the diseases share similar early stage symptoms and may become fatal in later stages. The engine must be able to process information inputted by the user and prompt users for further information if more is needed. From the user interface design standpoint, the user interface must be easy to understand and provide useful information to help with the examination process and diagnosis on a limited screen. Other device limitations, such as speed or memory (for larger programs or databases) may affect how the user interface must be designed.

Other technical challenges include the possibility of experiencing loss of power or software functionality during use. Users will be assumed to have minimal troubleshooting experience. Inexperienced users who may be reliant on the software may be unable to provide a diagnosis without it. In cases such as low device battery, the user interface should be able to inform the user.

Since clinicians are assumed to have minimal language knowledge, the diagnostic aid must be able to account for potential clerical errors and misspellings. The user interface may incorporate the use of drop-down menus, however these cannot be limited in description and options. In addition, these must not guide the users in a way that is biased or prompt for redundant pieces of information.

The social history of the patient, that is if other members of their village or workplace have been diagnosed with an infectious disease, is important. The sharing of records will help with this, and ideally this will be in real time. This also poses a technical challenge for designers.

Other Information Relevant to Project

Background information regarding the following diseases was gathered: Dengue Fever, Cholera, Ebola, Malaria, Typhoid, and Yellow Fever. This is included as a spreadsheet in **Appendix D**.

Statement of Need

WI needs a diagnosis aid that would enable a minimally trained native clinician to interview and examine a patient suspected of having an infectious disease, then choose the diagnostic test most appropriate to the patient's symptoms and conditions. The aid, now referred to as the West African Infectious Disease Diagnosis Aid (WAIDDA) should do the following:

1. Guide the clinician through a preliminary medical interview and a no-contact physical examination to determine if there is a significant chance that the patient has the Ebola Virus.
2. If there is sufficient evidence to suspect Ebola, suggest that the clinician stop and send the patient to Ebola specialists for diagnosis and treatment.
3. Otherwise (or if Ebola was subsequently ruled out and the patient returned), continue to guide the clinician through a more complete interview and physical examination process to collect data and other evidence to help decide whether the patient should be tested for one or more of the other infectious diseases.
4. Provide cues to help the clinician choose which of the infectious diseases to test for, if any.

WAIDDA may not make any definitive diagnosis itself or suggest that any test or other decision or action must or must not be made or taken, that is, WAIDDA may assist the clinician, but he or she is to make the final decision.

The prototype for this project is to be a part-functional one, implemented in, for example, MS Excel, MS Access, Visual Basic, Python, or other programming environment. The prototype must, at minimum, accept user input of symptoms and other information, then produce guidance for the choice of diagnostic tests.

Objectives

The objective of this project is to follow the human-machine system engineering (HSME) process for the WAIDDA to generate ideas and requirements, create a prototype for the user interface and algorithm, and to evaluate these deliverables.

This overarching objective can be broken down into steps. These reflect the phases of the HSME process the team followed throughout the course of this term. These are as follows:

1. Perform background research.
2. Identify and interview subject matter experts (SMEs).
3. Perform high-level task analysis.
4. Perform low-level task analysis.
5. Generate requirements for each step.
6. Create preliminary designs.
7. Conduct trade study and receive feedback from available resources.
8. Iterate through the design steps.

In order to create user interface designs and controls that fulfil requirements, concepts and guidelines as reviewed in lecture must be applied. To complete the objective at hand, a number of concepts and requirements had to be met. Details elaborating on key steps of the process are in the sections that follow.

Task Analysis

Integrated Definition Language 0, or IDEF0, is a task modeling analysis method used to aid designers in elaborating upon a task, process, or system to better understand the steps users and relevant operators need to take in using the design in question. The different levels of IDEF0 expose gradual exposition of detail of these steps with increasing precision with each level. The results from this high-level task analysis increased understanding of the task and will aid designers in engineering appropriate and thorough requirements.

For the WAIDDA, the team created an IDEF0 model to two levels of depth and detail to model the patient examination process. The main task in the A-0 diagram of the WAIDDA system may be described as “Suggest Patient Diagnosis”. This main task was divided into six children according to the examination procedure as described by Mr. MacIntosh. These are as follows:

1. Receive Patient
2. Initialize Patient Log
3. Gather Personnel
4. Interview and Examine Patient
5. Input Patient Data

6. Suggest Diagnosis

The process of creating the IDEF0 task model started with breaking down the main WAIDDA task of suggesting a patient diagnosis into steps. The program AI0 Win was used to create the proper diagrams and accompanying lists and charts. Conventions were followed in the creation of the IDEF0 as outlined in course lectures; controls, mechanisms, inputs, and outputs were organized and have not changed since the original submission, however the diagrams themselves have since been modified. Key changes made since the previous submission include (1) formatting the diagrams to exclude tunneling and (2) populating children diagrams with three to six children task boxes that properly capture the steps and level of detail desired.

The A-0 Diagram of the complete IDEF0 created is shown in Figure 1 below.

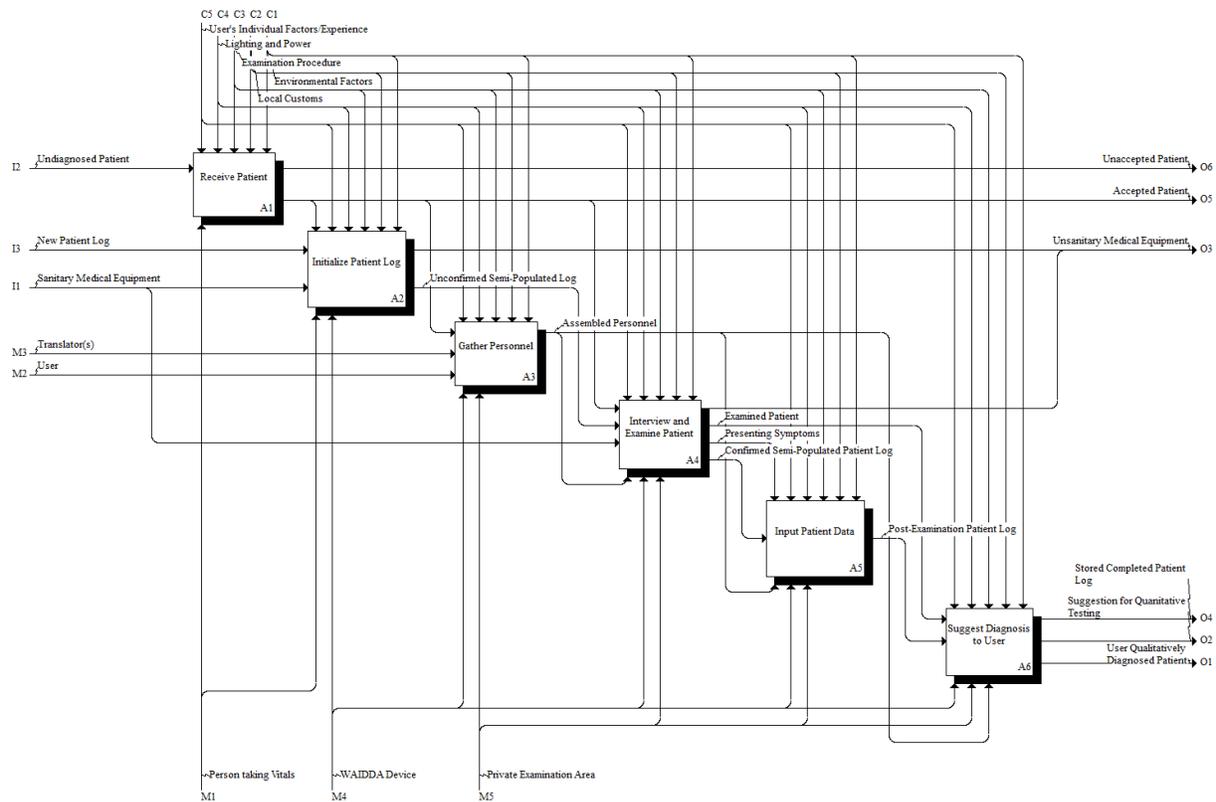


Figure 1: A-0 Diagram of the completed IDEF0 model for WAIDDA.

The levels shown 'tell the story' of the WAIDDA patient examination process starting from patient acceptance to giving the patient a user-determined diagnosis based on WAIDDA suggestions. The task flow and details presented are based on information received from Mr. McIntosh and Dr. Patel at subject matter expert interviews, along with team research into remote area clinical encounters. In summary, the IDEF0 model create walks through the process of accepting a patient, starting and completing their patient record throughout the examination process, and suggesting a final diagnosis to the user for consideration.

Figure 2 below shows the corresponding subtasks associated with the “Initialize Patient Log” step.

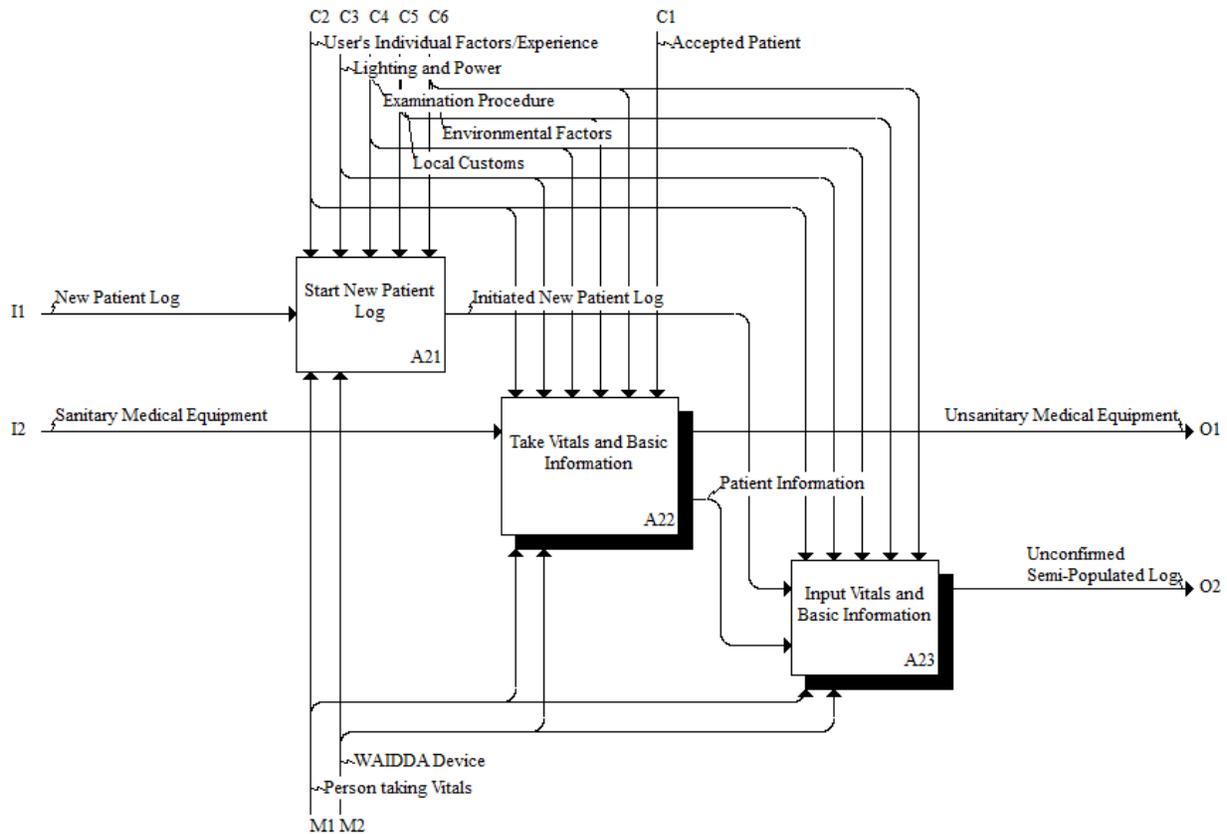


Figure 2: A2 subtasks model.

This initial task has three subtasks: Start New Patient Log, Take Vitals and Basic Information, and Input Vitals and Basic Information. From this diagram it is depicted that each subtask has the same controls, arrows pointing vertically down into a box, and mechanisms, arrows pointing vertically up into a box, influencing each task. The inputs, arrows point right into a box, and outputs, arrows pointing right out of a box, are different. For the “Start New Patient Log” the New Patient Log is transformed into an Initiated New Patient Log. This is inputted into the next subtask and transformed into Patient Information which then becomes Unconfirmed Semi-Populated Log in A23.

The decisions for classifying controls, mechanisms, inputs, and outputs follow all assumptions made and requirements stated throughout this document. For explicit elaboration on items where clarification was requested in the previous report, please refer to **Appendix C**, Section 2, however most, if not all, of these points follow design decisions that may be derived from the full list of requirements (as found in **Appendix H**). For example, in this IDEF0 model, the patient record itself is treated as an input/output entity since it is changing as it is populated and stored as an item that may be retrieved and referenced in the future.

IDEF0 analysis aided the team in engineering a number of requirements. These requirements are highlighted with a corresponding note in the requirements list. Many of these requirements focused on what would be needed to facilitate the task of interviewing and examining the patient. For example, if a minimally trained clinician is required to examine a patient, there would be a need to minimize the information required from their memory; a requirement generated could thus deal with presenting users with information and direct instructions rather than relying on their memory.

Detailed Task Analysis

Following the generation of a complete node list in the IDEF0, important leaf nodes, that is nodes with no further elaboration (children), were selected to perform a detailed task analysis (DTA). Like the IDEF0 analysis, the purpose of the DTA is to better designer understanding of the process, shed light on potential failures, and help generate requirements for the design. The selected nodes were:

- Node A13 - Visually Inspect for Ebola
- Node A41 - Determine Patient Identity and Information Regarding Vitals
- Node A62 - Inform and Input Patient of Final Clinician Diagnosis

For each task, the start cue, information required to perform the task, decisions made, actions performed, frequency and duration, environmental conditions, and any potential risks and errors were elaborated upon. A sample row, shown in Figure 3, from the generated DTA is included below; the full DTA table may be found in **Appendix I**.

AF	Task	Task Performer(s)	Start Cue	Information	Decision(s)	Action(s)	Frequency & Duration*	Location & Environmental Conditions	Potential Hazards & Errors	Comments
A41	Determine Patient Identity and Information Regarding Vitals	User (Trained Clinician)	User (Trained Clinician) and Patient** interaction begin. For most patients (conscious, nonurgent cases) this is when the patient enters the examination area.	Patient Information that will be confirmed, which was originally recorded in the Patient Log by the Team Member in the waiting area, are: Name, Chief Complaint, Height, Weight, Heart Rate, and Blood Pressure. Patient's answers to User's questions. User's questions may be found in Appendix B, for example: What is your name? What is your initial complaint?	Does the information from the patient match what is on this list? Does this Patient Log belong to this patient? Are there any immediate signs from the patient that indicate the visit may be incorrect? (For example the patient looks much sicker than recorded or the patient is breathing very quickly, therefore the heart rate recorded may be incorrect)	Determine if the Patient Log must be changed before proceeding	Once formally at the beginning of the examination and subconsciously ongoing as more information is received from the patient	Private Examination Area (lighting provided by natural light and generator power; language is translated by as many translators as is required, usually one)	User may incorrectly confirm Patient Log for the wrong patient. User may proceed with incorrect information regarding the correct patient, for example if an error in weight is not detected.	Basic information and vitals are recorded by a Team Member in the waiting area (as described in the interview with Jerry McRobb) in order to save time during the examination with the User. The user must confirm that the patient's photo is currently seeing is the patient referred to in the Patient Log currently open. Requirement generated to formally prompt the user to check patient identity.

Figure 3: Example of a Detailed Task Analysis for one task.

The process of performing the DTA included identifying leaf nodes that would generate requirements. Since at this stage, the team already had a number of requirements pertaining to the examination and patient interview process, nodes were selected to tasks outside of these steps. In these steps, requirements were generated to mitigate any potential risks, errors, or mental overload to the user. For example, if during the visual inspection for Ebola, the user is unable to recall the steps (working memory limits) then a failure could occur. Thus a requirement generated from this step would focus on lowering the amount of memory required. Requirements generated from the DTA are highlighted with notes in the requirements list.

Requirements

Throughout the design of the WAIDDA prototype, the team developed a list of project requirements. These requirements embody the customer and user needs, and align them with the prototype's development. The project requirements also clearly state the prototype's functional capabilities. Shall statements are hard capabilities and the prototype must adopt these. Should statements are soft capabilities and will ideally be adopted.

Developing the project requirements was an iterative process. Requirements were continually added and refined using feedback and expertise from the course instructor and teaching assistant. Thus, customer and user needs were understood, evaluated, and applied throughout the design process. Ten requirements were especially pertinent to WAIDDA's patient information gathering and clinician training. These ten requirements were verified through inspection, demonstration, and a trade study. The list of verified key requirements are below. A full list of requirements is found in **Appendix H**.

1. The diagnostic tool shall be able to be used on at least a *8" x 5.5"* screen in either the horizontal or vertical orientation.
2. The diagnostic tool shall provide the user with the option to start a new patient record.
3. The diagnostic tool shall provide the user with the option to return to a previously accessed patient record.
4. The diagnostic tool shall be able to inform users if a patient's record is currently being edited.
5. The diagnostic tool shall provide the user with information regarding how many rapid diagnostic tests are available if the user decides to quantitatively test a patient.
6. The diagnostic tool shall provide the user with information regarding how much prescription medicine is in stock/available to prescribe to a patient. - Demonstrated in the UI slides.
7. The diagnostic tool shall allow users to input their final diagnosis. (Corresponds to DTA for Node A62)
8. The diagnostic tool shall be able to accept symptoms categorized according to five bodily systems: cardiac, respiratory, gastrointestinal, integumentary, and cognitive. (Corresponds to IDEF0)
9. The diagnostic tool shall provide a means to identify symptoms as present or not present.
10. The diagnostic tool shall recommend/suggest the likely diagnoses based on symptoms and interview results.

Trade Study

In order to evaluate the preliminary UI design, a trade study was conducted in the form of an online survey. The team had ideated two potential ways of presented WAIDDA algorithm results in two different "Suggest Diagnosis" screens. This UI design is important to the WAIDDA in that it should provide users with any and all appropriate information that may be useful in making a final decision while not overwhelming users. It is at the time same time important from a design perspective to

follow control and design guidelines. It is also important to keep in mind that WAIDDA’s main task is suggesting a diagnosis based on user inputs, not directly diagnosing the patient.

***NOTE:** The user interfaces presented in this section were preliminary designs. Feedback regarding spacing, sizing, button views, and hyperlinks, were not given or addressed at this point in the design process. These screens are exactly as presented in the trade study.*

The first design created for “Suggested Diagnosis” is presented in Figure 4 below. This design presented users with the diagnosis with the highest weighted evidence (in the preliminary stage, this was called “Most Likely Diagnosis”). The user is presented with the option of viewing a list ranking of other potential diagnoses, as denoted by the hyperlink below the box but not explicitly shown here. This view also presents information regarding available treatments for the disease named.

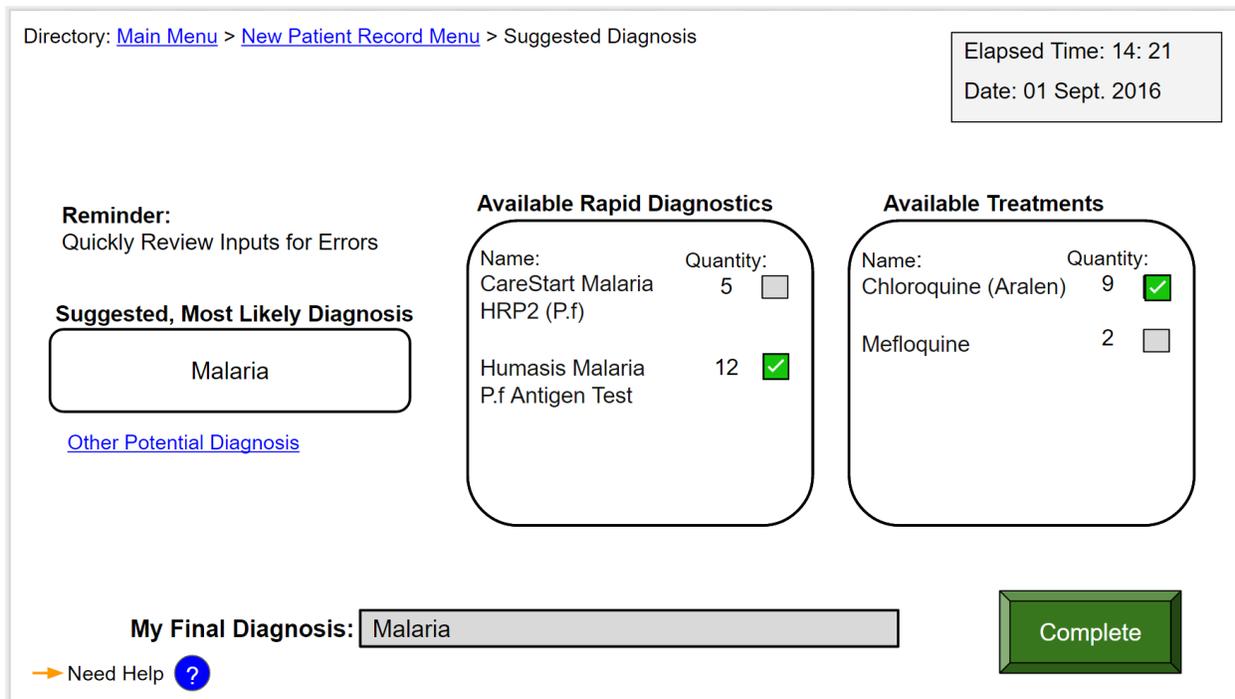


Figure 4: First design option for “Suggested Diagnosis”.

The second design created for “Suggested Diagnosis” is presented in Figure 5 below. This design presented users with a graph showing a differential diagnosis. The option to view further information regarding each disease is optional.

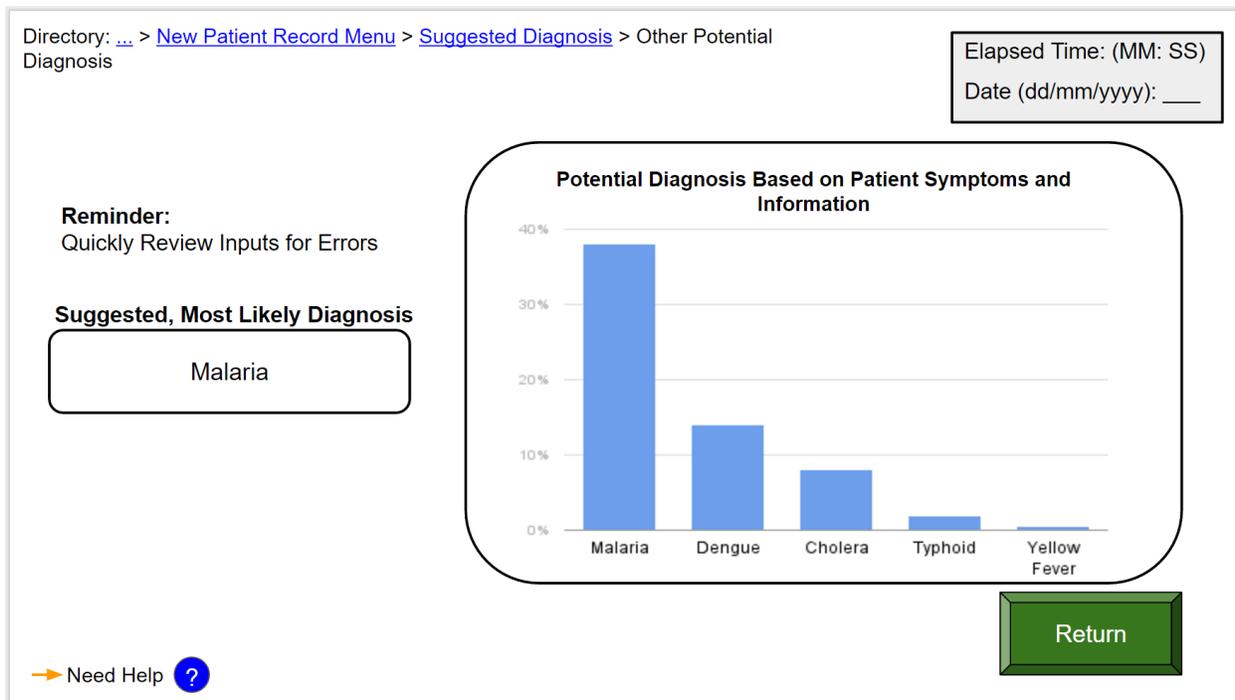


Figure 5: First design option for “Suggested Diagnosis”.

Users were asked nine questions total: five rating questions, four short answer questions, and one question regarding their occupation. The full trade study may be found in **Appendix J**. A total of three participants took the online survey; these were a professional registered nurse, a medical student, and a professional medical scribe. All three participants communicated that they preferred the differential diagnosis display. They also all provided input and ratings regarding other aspects of the designs, for example that they did not like any stated “Most likely diagnosis” and that treatment information was important but it cluttered the view on the first page. Ratings indicated that there was not enough information presented for participants to make a final decision, however the screen with more information appeared cluttered. Results also suggested UI features such as a change in color, sizing, and font. The next iteration of designs took as many of these comments into account as possible, considering tradeoffs. In addition, while Dr. Patel did not officially take the online survey, during the interview with him, he conveyed that he too would prefer a differential diagnosis over a stated suggestion.

The modified screens showed a differential diagnosis and linked to a separate screen containing more information regarding the user-selected disease. This incorporated participants’ feedback to include more information without cluttering the screen. Requirements regarding what information ought to be presented, sizing, and legibility were also met with these modified design.

Final Design

The final design for this project encompasses the design processes which has been discussed in the previous portions of this paper. These were developed following the HMSE model identified in Figure 6 below [4].

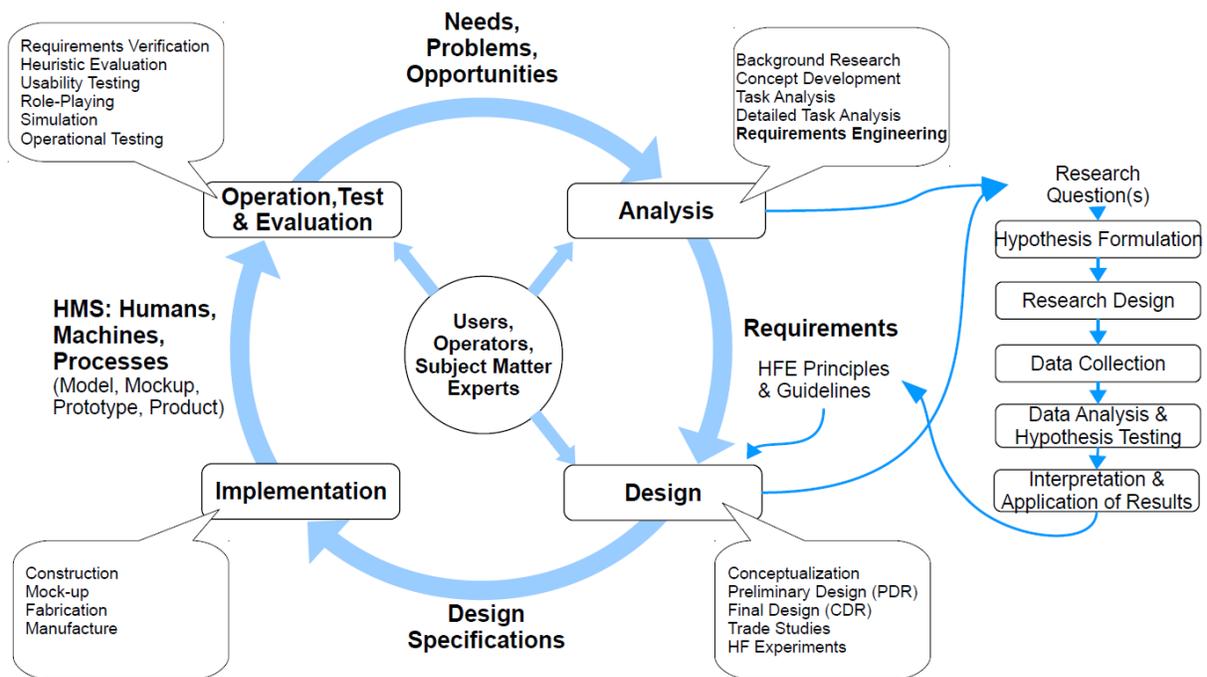


Figure 6: Diagram of HMSE process.

The design features and operations are exemplified in **Appendix L** and the verification of requirements is discussed in the Evaluation section below.

Mockup/Prototype

User Interface

The mockup prototype created consisted of a large number of user interface screens that exemplify various screens the user may be likely to encounter. These screens included the login screens, menu screens, clinical questions that required different sort of input methods (eg. check boxes, checklists, drop downs, text answers), loading screens, and ideas for suggest diagnosis screens.

The first mockup prototype created received a lot of constructive criticism regarding sizing, visual representation, and other modifications needed. A sample of the original user interface and its modified version are included in Figure 7 and 8 below.

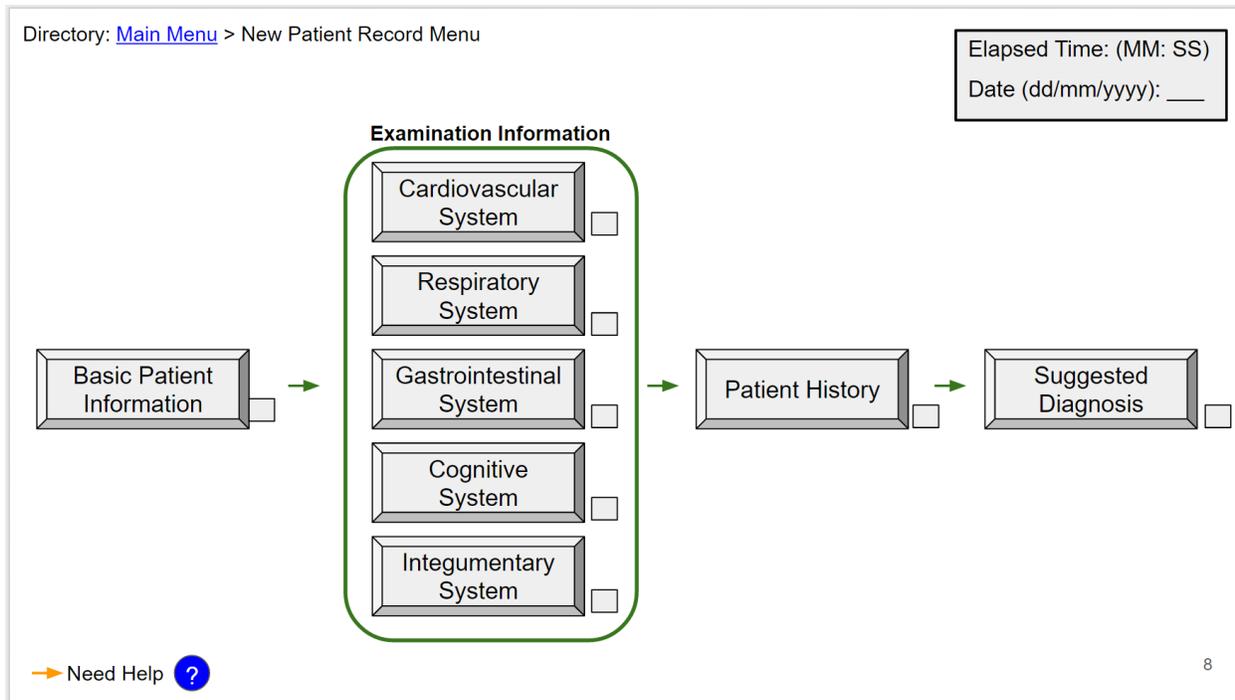


Figure 7: Original New Patient Record Menu.

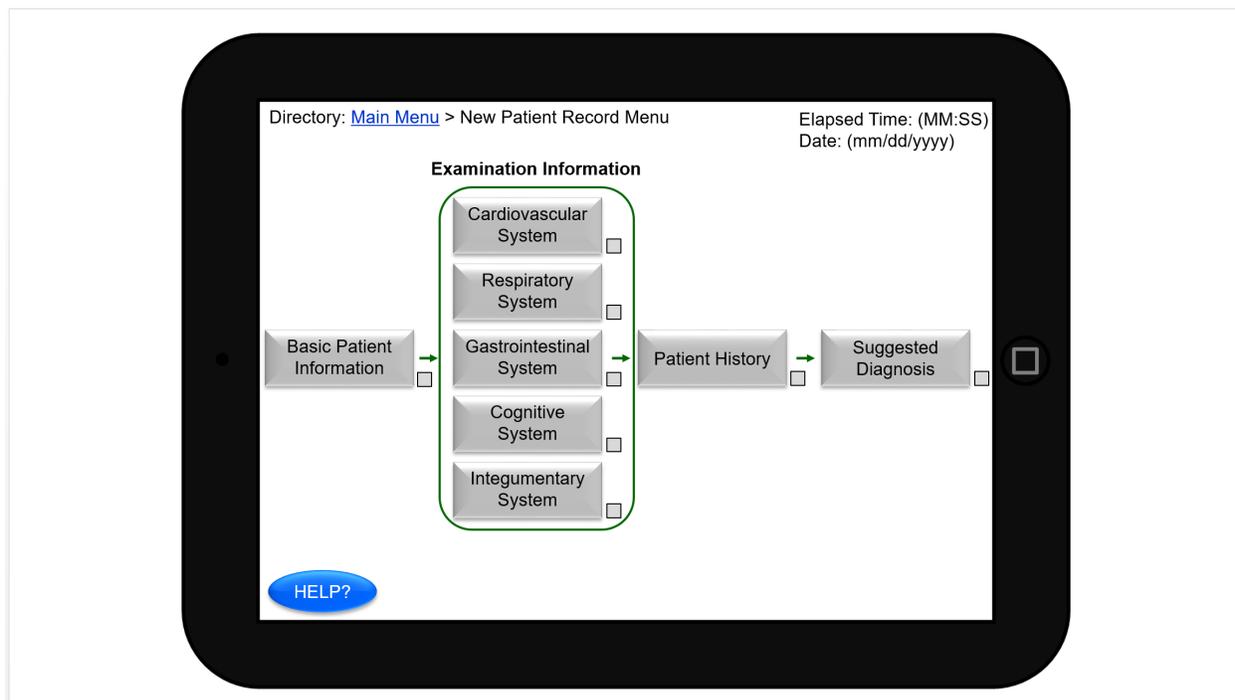


Figure 8: Modified New Patient Record Menu.

The changes that were implemented were the buttons in order to follow Apple Product Standards. Users could push each one without inadvertently activating another button. The Time/Date stamp were also modified in order to indicate that these were not editable but fixed within the program. The modified version is scaled exactly to fit a 8” x 5.5” screen which is why the display looks more compact compared to the original design.

A more thorough description of the final UI design may be found in the Final Design section. The remainder of this section will elaborate briefly on the UI design process and requirements. The complete prototype may be found in **Appendix L**.

In ideating a user interface, the team had to ensure that all requirements were met. Some trade-offs were required in order to meet design and control guidelines as presented in lecture. In addition, the UI designs had to exemplify all key scenarios that a user may encounter. One key thing to note is that the UI created and presented in this report follows a dengue case study as found on the World Health Organization website. That is, the questions and answers shown correspond to an actual case that was diagnosed as dengue fever. The WAIDDA program would be able to expand to address any chief complaint inputted.

The team developed a prototype engine for WAIDDA to illustrate this. Key words would be selected from the chief complaint then WAIDDA would only present the user with questions relevant to those keywords or the combination of keywords. Questions that may be presented may be found in **Appendix B**, however this appendix is incomplete; this appendix shows the design intention to include a completed list of predetermined questions within the WAIDDA system. Answers to these questions would be used to calculate a value to represent the amount of weighted evidence, and this would be presented to the user for consideration in making their final diagnostic decision.

Mock Suggested Diagnosis Engine

WAIDDA Team One developed a mock suggested diagnosis engine in Google Sheets. The mock engine works by using patient responses to interview and medical examination questions to suggest a diagnosis for one of the following infectious diseases:

1. Malaria
2. Typhoid
3. Cholera
4. Dengue
5. Yellow Fever

The example shown in Figure 9 below presents the series of seven questions used in the clinical Dengue example scenario. In this scenario, patient response and each question has weights

corresponding the relevant diseases. The weights quantify the relationship strength between each disease. Weights are assigned as follows:

1. Strong relationship between the a positive question response and the disease = 2
2. Moderate relationship between a positive question response and the disease =1
3. No relationship between a positive question response and the disease = Absent weight
4. Negative question response = 0

If the patient presents the symptom outlined in each question, then a positive “YES” response is interpreted by the mock engine. If a patient does not present the outlined symptom then a negative “NO” response is interpreted. The mock engine uses these responses to calculate question scores. For example, a question with a Malaria weight of two receives a positive response. Therefore, Malaria's question score is two. If that response is negative, then Malaria's question score is zero.

Weights Legend: () Next to Disease Name None: No Relationship (1): Moderate Relationship (2): Strong Relationship	Question 1:	Question 2:	Question 3:	Question 4:	Question 5:	Question 6:	Question 7:
	High Fever?	Severe Headache?	Pain Behind the Eyes?	Muscle and/or Joint Pain?	Nausea and/or Vomitting?	Swollen Lymph Glands?	Recently Bitten by Mosquito?
	Dengue (2) Typhoid (2)	Dengue (2) Typhoid (2) Malaria (1) Yellow Fever (1)	Dengue (2) Typhoid (2)	Dengue (1) Typhoid (1) Yellow Fever (1) Cholera (1)	Dengue (1) Malaria (1) Yellow Fever (1) Cholera(1)	Dengue Weight (2) Typhoid Weight (2)	Dengue (2) Malaria (2) Yellow Fever (2)
RESPONSE	YES	YES	YES	YES	YES	YES	YES
Malaria	0	1	0	0	1	0	2
Typhoid	2	2	2	1	0	2	0
Cholera	0	0	0	1	1	0	0
Dengue	0	2	2	1	1	2	2
Yellow Fever	0	1	0	1	1	0	2

Figure 9: Example of Engine response output for Dengue.

Question scores are located below the YES/NO responses for each question. These scores are the weighted values awarded to diseases for each question. Question scores are then summed across all questions for each disease to calculate raw scores. Raw scores are then converted to weighted percentages based on the summated raw scores. These percentages are then plotted and the suggested diagnosis and percent weight of evidence are presented alongside. An example of this is shown in Figure 10.

Suggested Diagnosis:

Dengue 33.3%

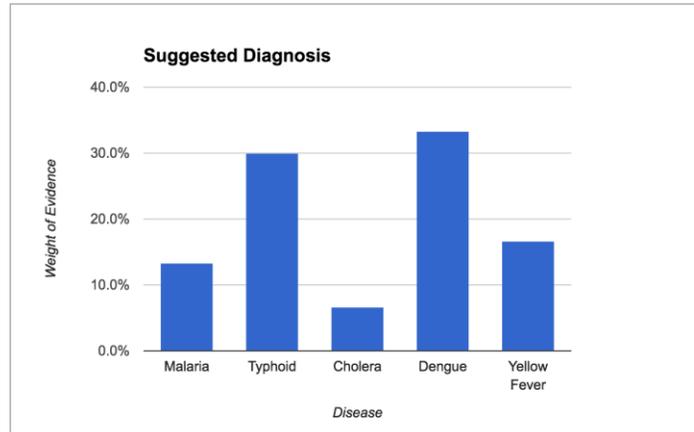


Figure 10: Example of Engine Response Graph and Suggested Diagnosis for Dengue.

Qualitative patient responses to interview and examination questions are inputted into WAIDDA by the clinician. The WAIDDA mock engine interprets this qualitative data and uses boolean YES/NO logic with weighted values to generate quantitative percent weight of evidence values and suggest a diagnosis. Note the diagnosis made by the WAIDDA mock engine is only a suggested diagnosis. The clinician ultimately decides the final diagnosis of the patient.

This mock engine illustrates the qualitative to quantitative transformation of patient information. This transformation is vital for WAIDDA to suggest an accurate patient diagnosis and recommend additional available resources such as rapid diagnostic tests and/or medication(s).

The WAIDDA mock engine boasts other capabilities as well. In Figure 11 below, multiple diseases share the maximum percent weight of evidence. The WAIDDA mock engine recognizes this and presents a different suggested diagnosis screen with the addition of a reminder, warning the user to review patient information for missing or incorrect inputs.

Matching Diagnoses:

Cholera 25.0%
Dengue 25.0%
Yellow Fever 25.0%

****WARNING: Review Patient Information****

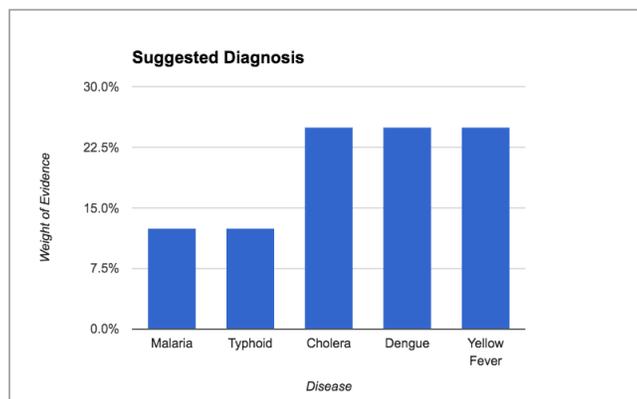


Figure 11: Example of Engine Response Graph and Suggested Diagnosis with multiple Matching Diagnoses.

Figure 12 presents the mock engine’s potential for additional statistical analysis of the weighted percent scores for each disease and suggested diagnostic information. Such analyses may be developed further in a final product to identify significant symptomatic and diagnostic trends. These trends may be invaluable for further efforts of Willamette International, the Center of Disease Control, and other pertinent organizations. A visual of the full mock engine is found in **Appendix K**.

Diagnosis Score	Diagnosis Score	Average	Standard Deviation	Standardized Score
RAW	PERCENT			
4	13.3%	6	3.391164992	-0.6
9	30.0%			0.9
2	6.7%			-1.2
10	33.3%			1.2
5	16.7%			-0.3

Figure 12: Statistical Analysis potential of Engine.

Evaluation

Important requirements were selected from the full list of requirements (see **Appendix H**) and verified through various methods. Slides corresponding to design implementation and verification methods are presented.

1. **The diagnostic tool shall be able to be used on at least a *8” x 5.5”* screen in either the horizontal or vertical orientation.**
 Verified through inspection using the to-scale UI screens created. All items were confirmed to fit and correspond to design of controls principles. Slide 4 shows the horizontal configuration of the Main Menu and Slide 5 shows the vertical configuration of the Main Menu.
2. **The diagnostic tool shall provide the user with the option to start a new patient record.**
 Verified through demonstration where the to-scale UI screens were presented to participants and participants were asked to navigate to the appropriate screens, given no direction. When a UI screen button was ‘pressed’ (selected by the participant), one of the team members navigated to the appropriate next screen. Slide 4 shows the option to start a New Patient Record.

3. **The diagnostic tool shall provide the user with information regarding how many rapid diagnostic tests are available if the user decides to quantitatively test a patient.**
 Verified through inspection and a trade study using the to-scale UI screens by seeing that this information is clearly presented where appropriate. A trade study was conducted regarding these UI screens to ensure the information presented was valuable and presented clearly. Slide 82 demonstrates that there are 4 available IDL TUBEX TF rapid diagnostics.
4. **The diagnostic tool shall provide the user with information regarding how much prescription medicine is in stock/available to prescribe to a patient.** - Demonstrated in the UI slides.
 Verified through inspection and a trade study using the to-scale UI screens by seeing that this information is clearly presented where appropriate. A trade study was conducted regarding these UI screens to ensure the information presented was valuable and presented clearly. Slide 82 demonstrates the available quantity of Tylenol and Oral Ciprofloxacin.
5. The diagnostic tool shall allow users to input their final diagnosis. (Corresponds to DTA for Node A62)
 Verified through inspection and a trade study using the to-scale UI screens to demonstrate how information is clearly presented and appropriate. A trade study was conducted regarding these UI screens to ensure the textbox where this input is required was clear and obvious to the user. Slide 82 has a My Final Diagnosis input available for the clinician to submit their diagnosis.
6. **The diagnostic tool shall be able to accept symptoms categorized according to five bodily systems: cardiac, respiratory, gastrointestinal, integumentary, and cognitive.** (Corresponds to IDEF0)
 Verified through inspection using the to-scale UI screens by seeing that this information is clearly presented where appropriate. Predetermined questions to be stored in WAIDDA, as presented in ***Appendix B***, are also separated accordingly and verified through inspection. (**Appendix B** completion, TBD) Slide 14 shows a New Patient Record Menu indicating that there is information and questions corresponding to each bodily system since they are not complete with a check mark.
7. **The diagnostic tool shall provide a means to identify symptoms as present or not present.**
 Verified through demonstration using the to-scale UI. Participants were shown different UIs were able to correctly identify which symptoms they were being prompted to look for and where to input their findings. Slide 17 demonstrates that the patient did not experience chest pain.
8. **The diagnostic tool shall recommend/suggest the likely diagnoses based on symptoms and interview results.**
 Verified through a trade study using the UI screens. The trade study concluded that on the UI design presented for Suggested Diagnosis, users will be able to identify likely diagnoses for the patient based on their inputs. Slide 38 identifies all the relative percentage for each infectious

disease. Once the clinician selects which infectious disease they want to investigate further, Slide 39 will provide information about likely diagnosis.

9. **The diagnostic tool shall make available a list of clinical examination checks, as listed in *Appendix B*, the clinician should perform during the examination.** (Note: **Appendix B** TBD) (Corresponds to IDEF0)

Verified through both inspection and demonstration. Inspection was used to confirm that checks, or at least a draft of skeleton checks and a placeholder for future addition of checks, is available within WAIDDA. To clarify, checks/questions refer to the prompted task a clinician must do to visually check a patient. Demonstration was used to check that the UI would be able to properly present these check prompts in an understandable and clear fashion. Different types of check prompts were included in the UI examples presented; this was the guarantee that the WAIDDA input system could accept a large variety of answers and answer formats to accommodate the variety of possible checks.

10. **The diagnostic tool shall prompt the user with questions from a predetermined list, as found in *Appendix A and Appendix B*, to interview the patient for their history and background.** (Note: **Appendix A, B** TBD) (Corresponds to IDEF0)

Verified through both inspection and demonstration. Inspection was used to confirm that questions, or at least a draft of skeleton questions and a placeholder for future addition of questions, is available within WAIDDA. To clarify, questions refer to the prompted question the user must answer to thoroughly complete the examination process. Demonstration was used to check that the UI would be able to properly present these questions in an understandable and clear fashion. Different types of questions were included in the UI examples presented; this was the guarantee that the WAIDDA input system could accept a large variety of answers and answer formats to accommodate the variety of possible questions.

These verifications addressed key requirements for functionality, usability, and human factors related concepts. While the official trade study, as discussed in the previous section, was done online, other verifications were done in person using the scaled UI screens on a computer or laptop. The scaled screens ensured that the sizing and spacing participants saw were representative of how they would be implemented on a 8"x5.5" tablet. For non-trade study verifications, participants were associates and acquaintances of designers who did not have any professional medical background. Team members thought this was acceptable for usability testing since the WAIDDA system is aimed towards minimally trained clinicians who would have to learn the concepts and system. In addition, some of the requirements these participants helped verify were focused on visual inspection and confirmation of legibility; medical knowledge is not required for this.

Conclusions & Recommendations

This report presents the WAIDDA prototype developed by WAIDDA Team One of Oregon State University's IE 545 Human Factors Engineering course. With the expertise and guidance of Dr. Kenneth Funk, Mr. McIntosh, Dr. Patel, and Ms. Katarina Morowsky, WAIDDA Team One applied

HFE methods including an IDEF0 model, project requirements list, detailed task analysis, and trade study to WAIDDA's design process. The main deliverables for this report are a detailed IDEF0 model, a detailed task analysis, a scaled WAIDDA prototype mockup, a requirements list, a verified subselection of this requirements list, and a prototype algorithm for suggested diagnosis as well as an example for a dengue case. Ideally, the presented WAIDDA prototype could be developed into a final product and implemented by Willamette International in Sierra Leone.

The team recommends that if this project were to indeed continue much more research on infectious diseases, especially within the context of Sierra Leone be performed. As a part of this recommendation, the team suggests that this be done by an expert in the medical field. The amount of medical knowledge required to generate an appropriate list of questions that both concisely and accurately shed meaningful information during a diagnosis is far greater than any member of the team possessed. Further, it is recommended that for future iterations of design and design evaluation, more in depth trade studies be conducted for the UI. This should also be done with a greater number of participants. The trade study presented sought the participation of members of the medical field, however the limitations on time and contact reach affected the participant pool.

In conclusion, at its current stage, this WAIDDA project needs more refined iterations to meet user requirements, however the delivered items reflects detailed work and analysis on a very complex system and task. The UI and algorithm prototypes delivered could be further developed to see the ultimate goal of the WAIDDA project as defined in the statement of need realized. From the experiences, the team concludes that users and subject matter experts should be consciously included within the human-machine system engineering and design processes.

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Appendices

Appendix A: Predetermined Questions within WAIDDA

****List of predetermined questions that the user will be prompted to ask during the examination**** These lists are available within the WAIDDA for the clinician to access in the event he/she is prompted or wishes to see it. Full list of questions for all subsections is being developed, TBD.

Section 1:

The following lists detail patient information that will be collected prior to the start of the examination. These questions may be asked by the clinician during the examination as well, however collecting the information in advance will save time during that process.

Background and Basic Information

1. What is the patient's name?
2. How old is the patient in years? If the patient is under two years of age, inquire the age in months.
3. What is the patient's initial complaint?

Patient History

- A. What area or village is the patient from?
- B. What are the patient's living conditions?
 - a. Is the patient under these conditions all day? All night?
 - b. If not, what are the other conditions the patient is often exposed to?
- C. Has the patient traveled to another village/area recently?
- D. Has the patient been in contact with anyone with a disease recently? If so, do they know which disease? If they do not, can they describe it?
- E. Where does the patient obtain water?
 - a. Is this water source used for other activities/uses as well? If so, what?
- F. Have other people in the village/area the patient is from experienced similar symptoms?
- G. How many hours has the patient been working manually/laboriously per day?
- H. How much water has the patient had to drink in the past day? Since the symptoms began?
- I. Does the patient sleep under a mosquito net?
- J. What type of mosquitoes are available in the patients are, if known.

Section 2:

The following lists detail patient information that will be collected during the examination with the clinician.

Patient Condition and Symptoms

- A. How long has the patient been experiencing fever?
 - a. Does the fever occur periodically? If so, when or what times during the day?
- B. ****How long has the patient been experiencing [insert relevant symptom here].**** (Full question TBD)

Appendix B: Predetermined Clinical Checks and Prompts within WAIDDA

****List of checks the clinician should perform for a thorough examination. These lists are available within the WAIDDA for the clinician to access in the event he/she is prompted or wishes to see it.** Full list of questions for all subsections is being developed, TBD.**

What is the patient's initial complaint? (Utilize standard paramedic/emergency rescue acronym AMPLE; A: Allergies, M: Medications, P: Pertinent/Past Medical info, L: Last in/out (urine and bm), E: Events leading up to the chief complaint)

1. Is the patient allergic to anything?
2. Is the patient currently taking any medications? If so, what?
3. Has the patient been seriously injured or ill recently or in the past?
4. When was the last time the patient defecated and urinated? Was it normal, painful, or a weird color?
5. When did the patient's symptoms start? What has the patient been doing recently?

For all systems, the clinician should note any particular instances of intense pain or discomfort.

Cognitive system.

- A. Does the patient know their name, location, and time of day?
- B. Do the patient's pupils react to light and dilated equally?
- C. ****Additional checks for this system TBD****

Cardiovascular system.

Check if the patient's heart rate is within the appropriate range for their gender and age group. ****A table for this information is available below**** Table TBD.

- A. Check if the patient's blood pressure is within the appropriate range for their gender and age group. ****A table for this information is available below**** Table TBD.
- B. Check the patient for heart palpitations.
- C. ****Additional checks for this system TBD****

Respiratory system

- A. ****Checks for this system TBD****

Gastrointestinal system

- A. ****Checks for this system TBD****

Skin

- A. Check the patient for external abnormalities, that is skin conditions, rashes, and signs of visible skin irritation. If the examination room has insufficient lighting, i.e. the user cannot distinguish features on the skin in detail, use a flashlight to provide additional lighting against the skin.
 - a. **Compare any symptoms found to the visual aid tables provided below. Different tables are presented to correspond to a variety of skin tones. Ensure that the table being used is appropriate for the patient's skin tone.** Tables TBD.
- B. Check the patient for any open wounds.
 - a. If found, inquire as to how long the patient has had this wound and how this wound was obtained.
- C. Check the patient for any infested wounds.
 - a. If found, inquire as to how long the patient has had this wound and how this wound was obtained.
- D. **Additional checks for this system TBD**

Appendix C: IDEF0 Task Model Analysis

IDEF0 Task Model Analysis

This section contains information and supplementary material regarding IDEF0 task modeling. IDEF0 models and notes do not show any level deeper than the second layer (for example, the A1 children, etc.) given course requirements.

Section 1:

IDEF0 model for all boxes and diagrams the team created based on team ideations and all feedback given in meetings and past assignments. Refer to the IDEF0 section in the report or the following section (Appendix C - Section 2) for notes if items or points presented if more detail is desired. A node list is included prior to the diagram images.

Node List:

WAIDDA

A0: Suggest Patient Diagnosis

Decomposition A0: Suggest Patient Diagnosis

A1: Receive Patient

Decomposition A1: Receive Patient

A11: Welcome Patient

A12: Explain Patient Intake Process

A13: Visually Inspect Patient for Ebola

A2: Initialize Patient Log

Decomposition A2: Initialize Patient Log

A21: Start New Patient Log

A22: Take Vitals and Basic Information

Decomposition A22: Take Vitals and Basic Information

A221: Ask Patient Name and Chief Complaint

A222: Measure Patient Heart Rate

A223: Measure Patient Blood Pressure

A224: Measure Patient Weight

A225: Measure Patient Height

A226: Measure Patient Temperature

A23: Input Vitals and Basic Information

Decomposition A23: Input Vitals and Basic Information

A231: Input Patient Name and Chief Complaint

A232: Input Patient Heart Rate

A233: Input Patient Blood Pulse

A234: Input Patient Weight

A235: Input Patient Height

A236: Input Patient Temperature

A3: Gather Personnel

Decomposition A3: Gather Personnel

A31: Check Clinician Availability in Examination Room

Decomposition A31: Check Clinician Availability in Examination Room

A311: Send Message to Clinician

Decomposition A311: Send Message to Clinician

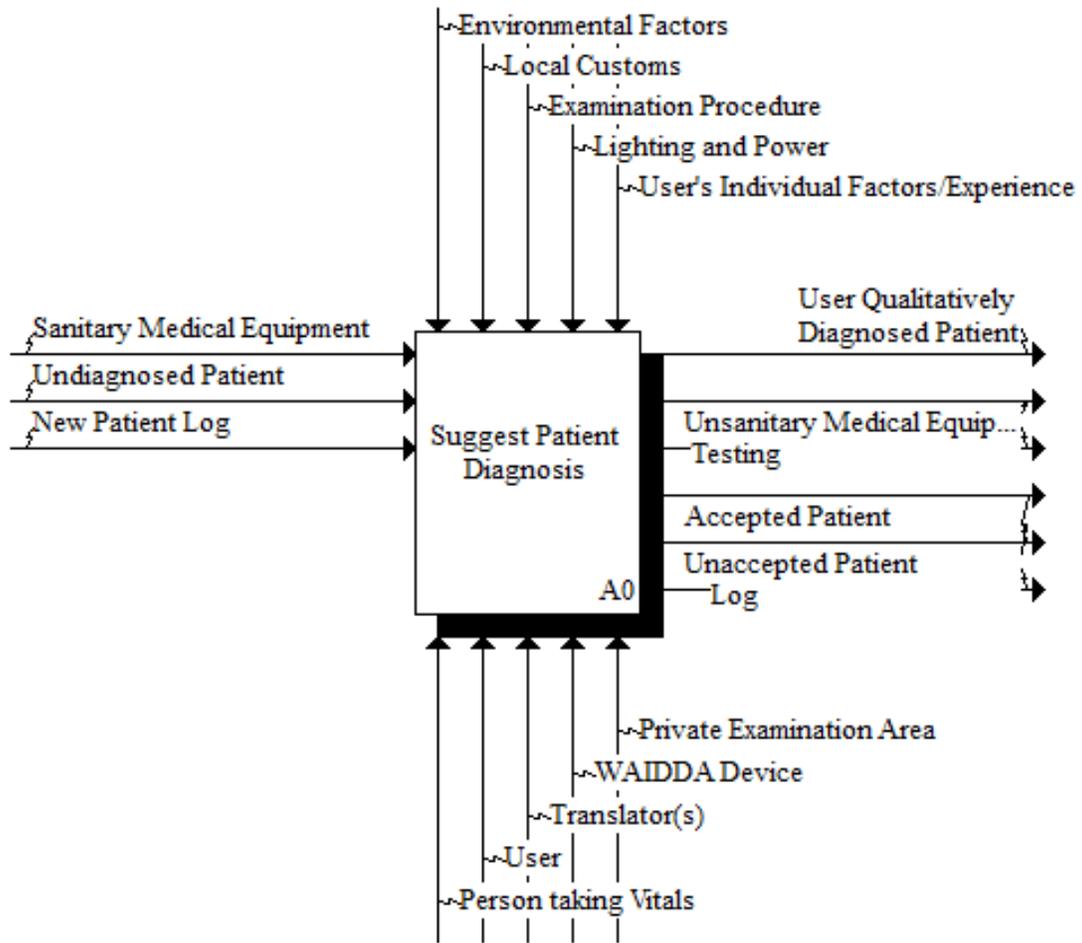
A3111: Identify Qualified and Available Clinicians

A3112: Select Clinician to Check

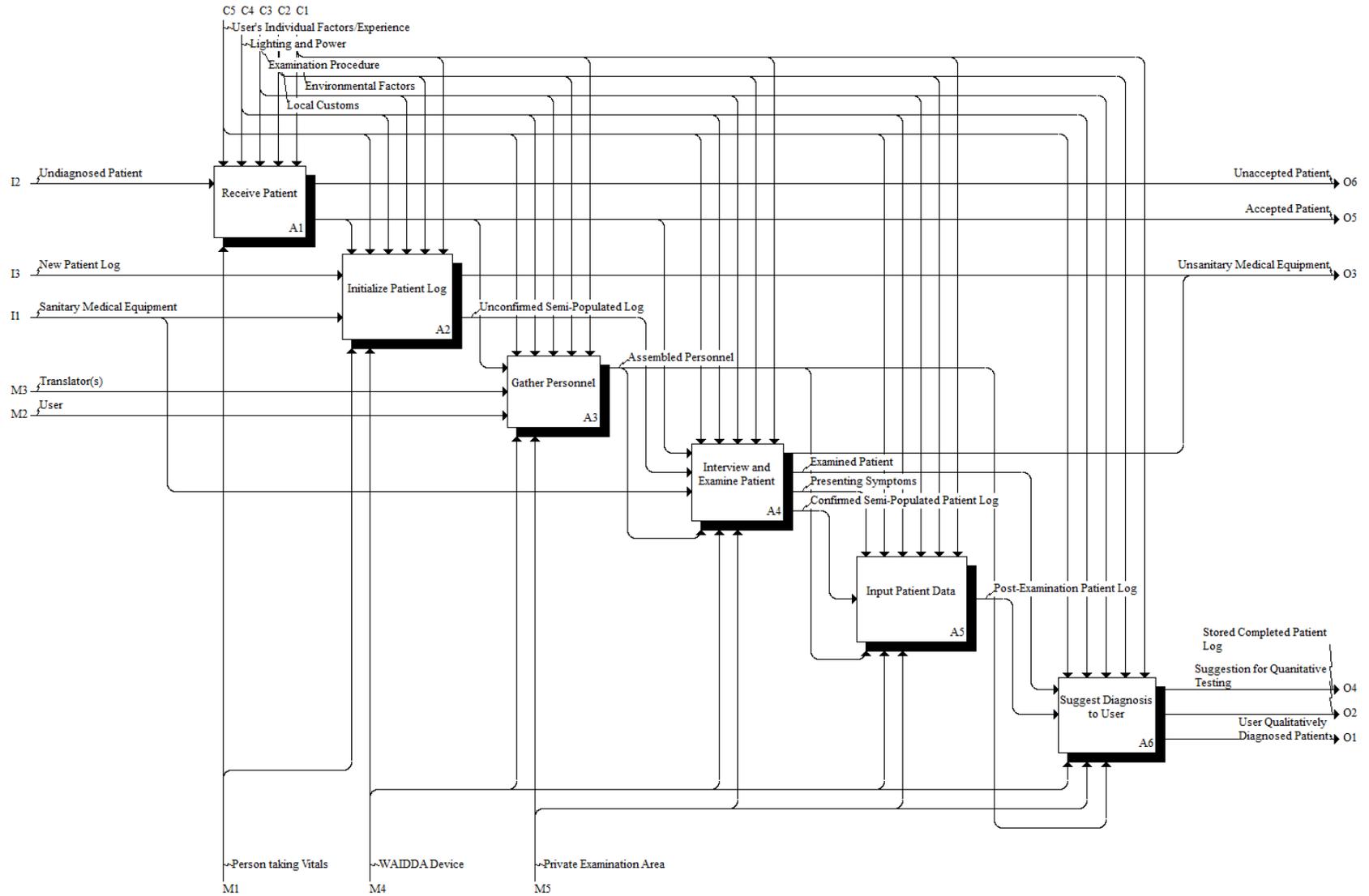
- A3113: Issue Message
- A312: Confirm Clinician Readiness
 - Decomposition A312: Confirm Clinician Readiness
 - A3121: Check Reply from Selected Clinician
 - A3122: Update Clinician Status
 - A3123: Inform Clinician of Designated Examination Area
 - A313: Send Clinician to Designated Examination Area
- A32: Find and Bring in Appropriate Translator
 - Decomposition A32: Find and Bring in Appropriate Translator
 - A321: Send Message to Translator
 - Decomposition A321: Send Message to Translator
 - A3211: Identify Qualified and Available Translators
 - A3212: Selected Translator to Check
 - A3213: Issue Message to Translator
 - A322: Confirm Translator Readiness
 - Decomposition A322: Confirm Translator Readiness
 - A3221: Check Reply from Selected Translator
 - A3222: Update Translator Status
 - A3223: Inform Translator of Designated Examination Area
 - A323: Send Translator to Designated Examination Area
 - A33: Guide Patient to Examination Area
 - Decomposition A33: Guide Patient to Examination Area
 - A331: Identify Next Patient in Queue
 - A332: Issue Message to Team Member to Find Patient in Waiting Area
 - A333: Lead Patient to Correct Examination Area
- A4: Interview and Examine Patient
 - Decomposition A4: Interview and Examine Patient
 - A41: Determine Patient Identity and Information Regarding Vitals
 - A42: Check Five Major Body Systems
 - Decomposition A42: Check Five Major Body Systems
 - A421: Cardiovascular
 - Decomposition A421: Cardiovascular
 - A4211: Check for Unperformed Cardiovascular Items on Examination Task Checklist
 - A4212: Ask Cardiovascular Questions Provided in WAIDDA
 - A4213: Perform Cardiovascular Tasks
 - A422: Respiratory
 - Decomposition A422: Respiratory
 - A4221: Check for Unperformed Respiratory Items on Examination Task Checklist
 - A4222: Ask Respiratory Questions Provided in WAIDDA
 - A4223: Perform Respiratory Tasks
 - A423: Gastrointestinal
 - Decomposition A423: Gastrointestinal
 - A4231: Check Unperformed Gastrointestinal Items on Examination Task Checklist
 - A4232: Ask Gastrointestinal Questions Provided in WAIDDA
 - A4233: Perform Gastrointestinal Tasks
 - A424: Integumentary
 - Decomposition A424: Integumentary
 - A4241: Check Unperformed Integumentary Items on Examination Task Checklist
 - A4242: Ask Integumentary Questions Provided in WAIDDA
 - A4243: Perform Integumentary Tasks
 - A425: Cognition
 - Decomposition A425: Cognition

- A4251: Check Unperformed Cognition Items on Examination Task Checklist
- A4252: Ask Cognition Questions Provided in WAIDDA
- A4253: Perform Cognition Tasks
- A43: Ask for Patient History
 - Decomposition A43: Ask for Patient History
 - A431: Check Unanswered Items under Questions Checklist Provided in WAIDDA
 - A432: Ask Patient History Questions Provided in WAIDDA
 - A433: Perform Patient History Task
- A5: Input Patient Data
 - Decomposition A5: Input Patient Data
 - A51: Open Patient Log for Current Patient
 - A52: Confirm Correct Patient Log
 - A53: Input Information from Patient Interview/Examination
- A6: Suggest Diagnosis to User
 - Decomposition A6: Suggest Diagnosis to User
 - A61: Verify WAIDDA Diagnosis Suggestion
 - Decomposition A61: Verify WAIDDA Diagnosis Suggestion
 - A611: Confirm Input Accuracy
 - A612: Look over Information Recorded for Glaring Errors
 - A613: Read and Assess Suggestion Based On Clinicians Opinion
 - A62: Inform and Input Patient of Final Clinician Diagnosis
 - A63: Confirm and Store Completed Log

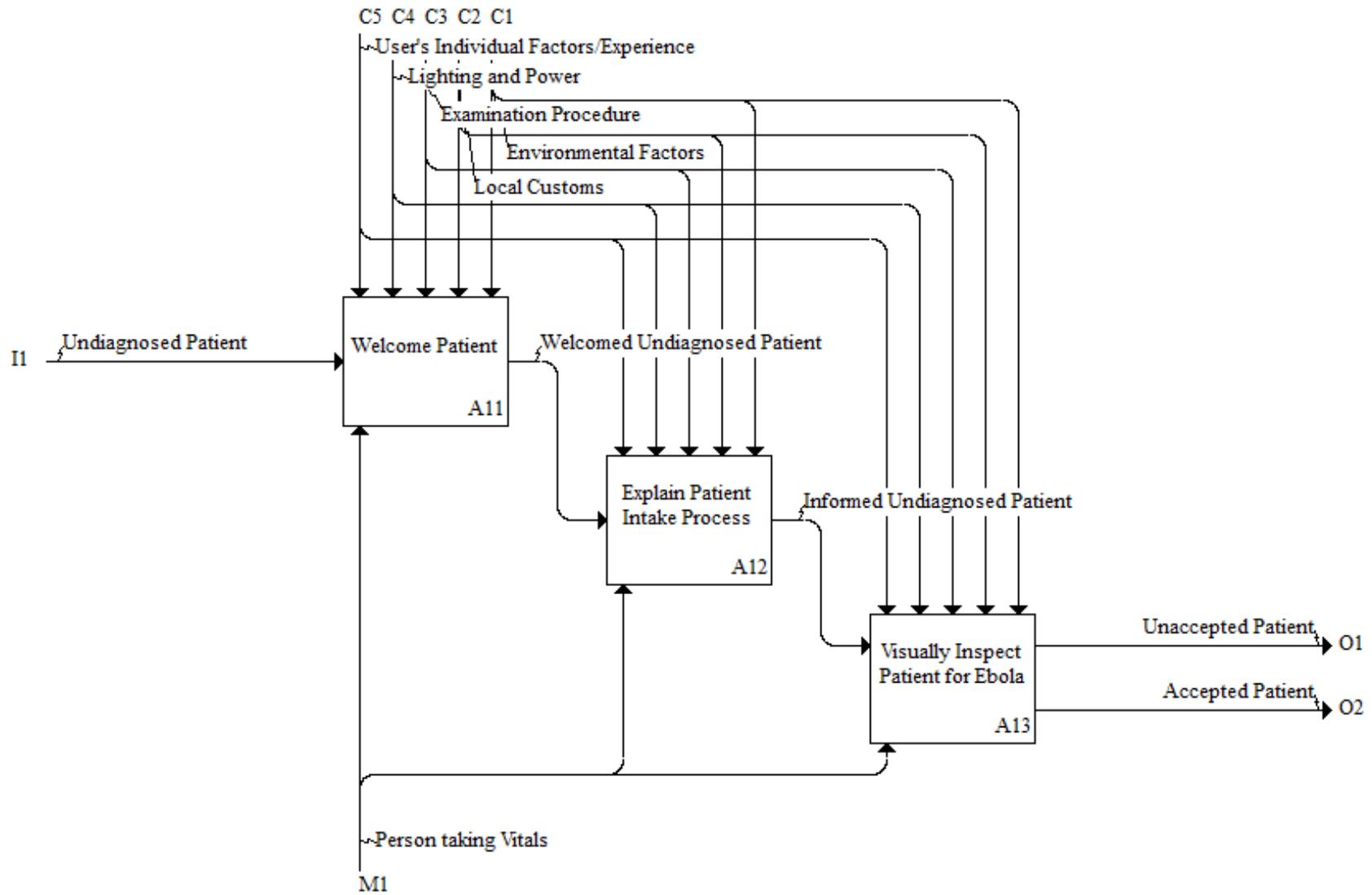
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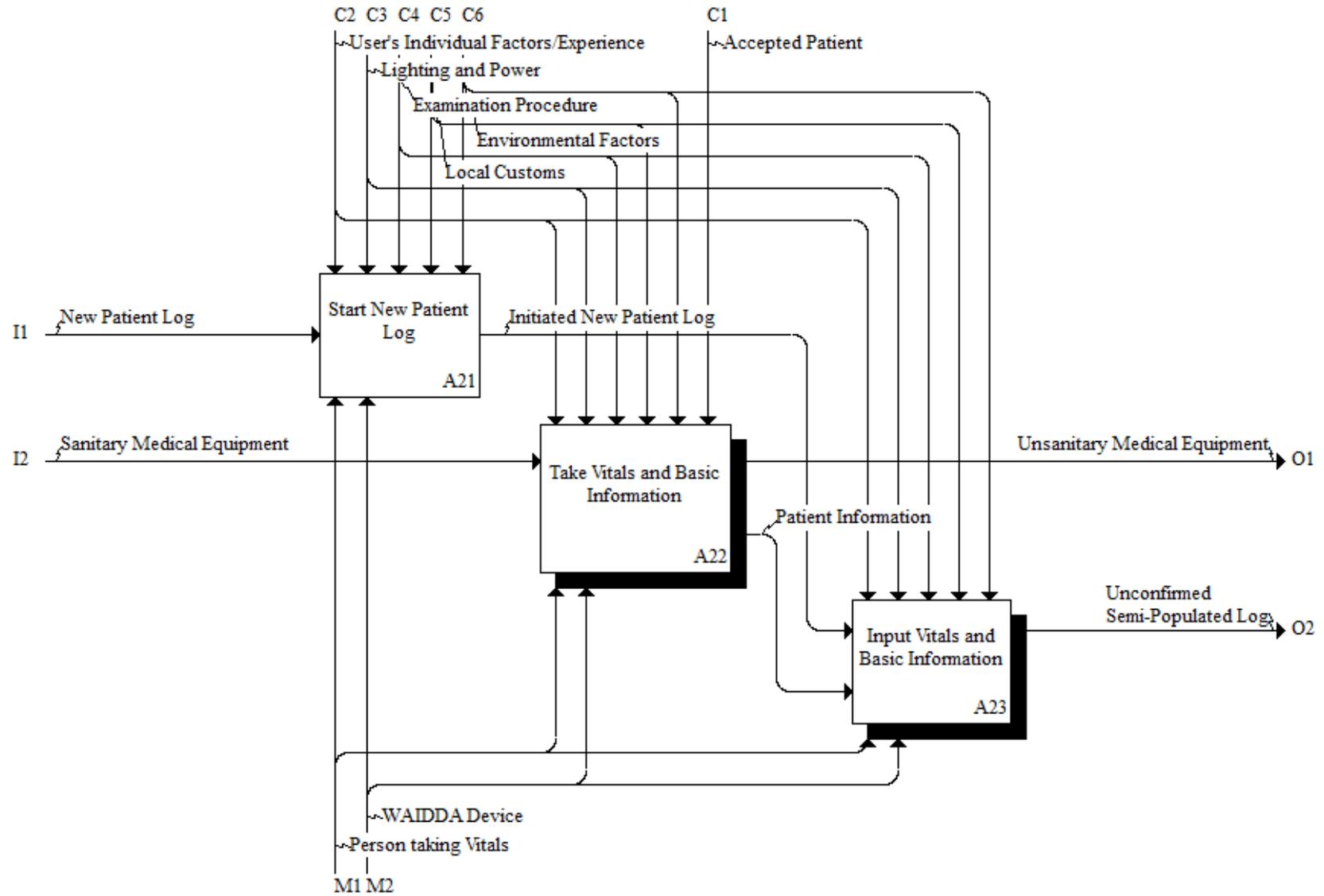
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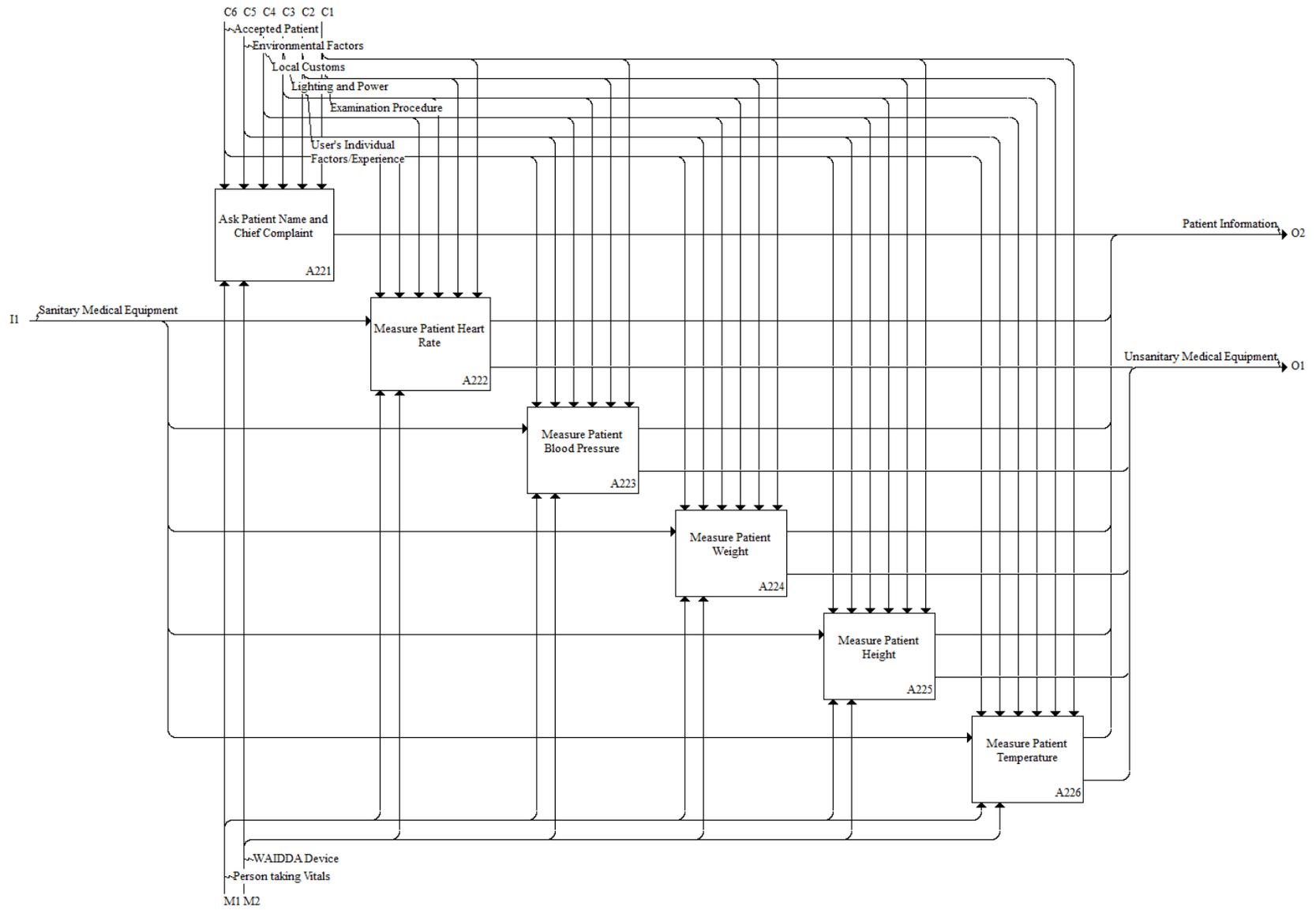
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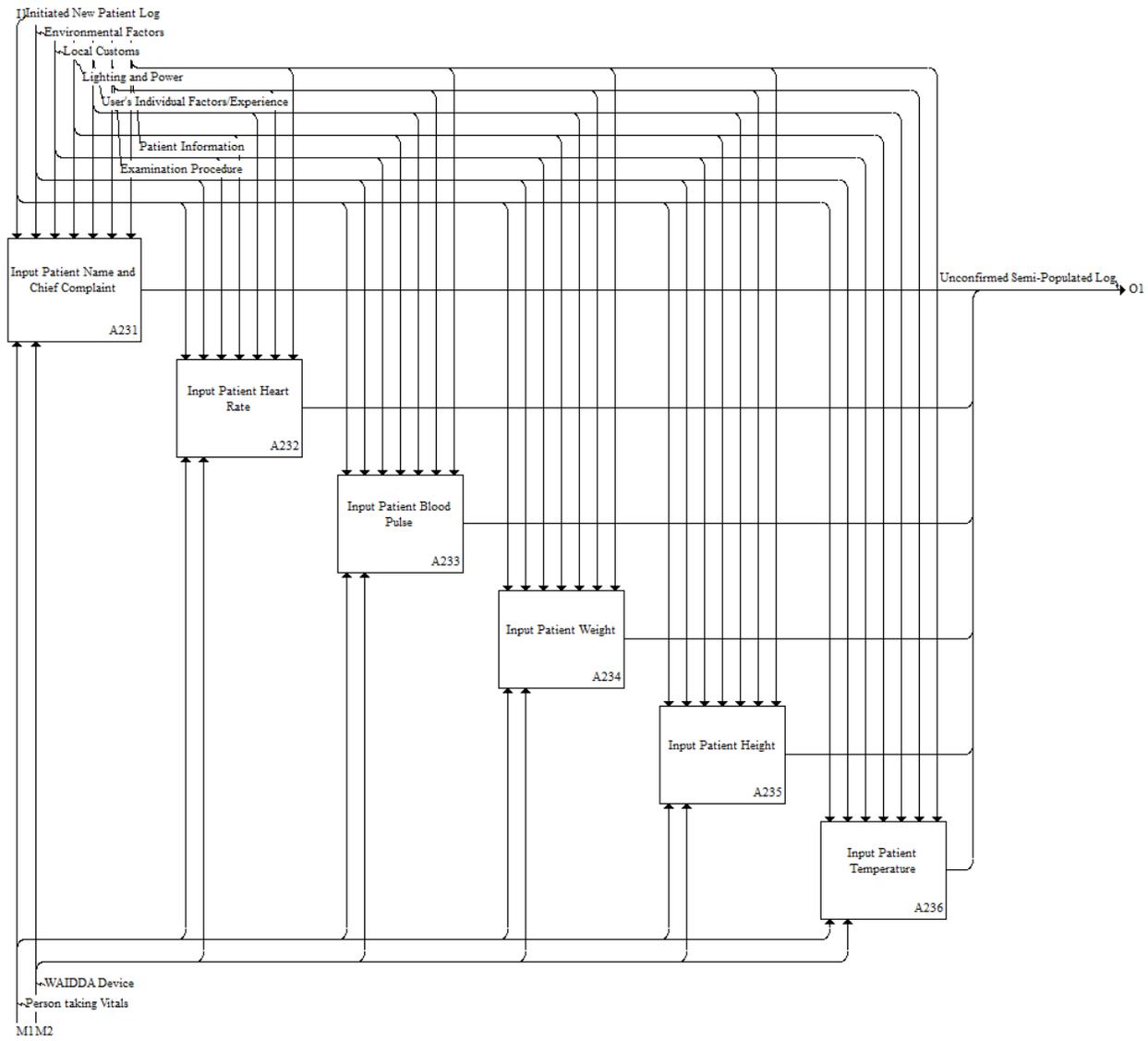
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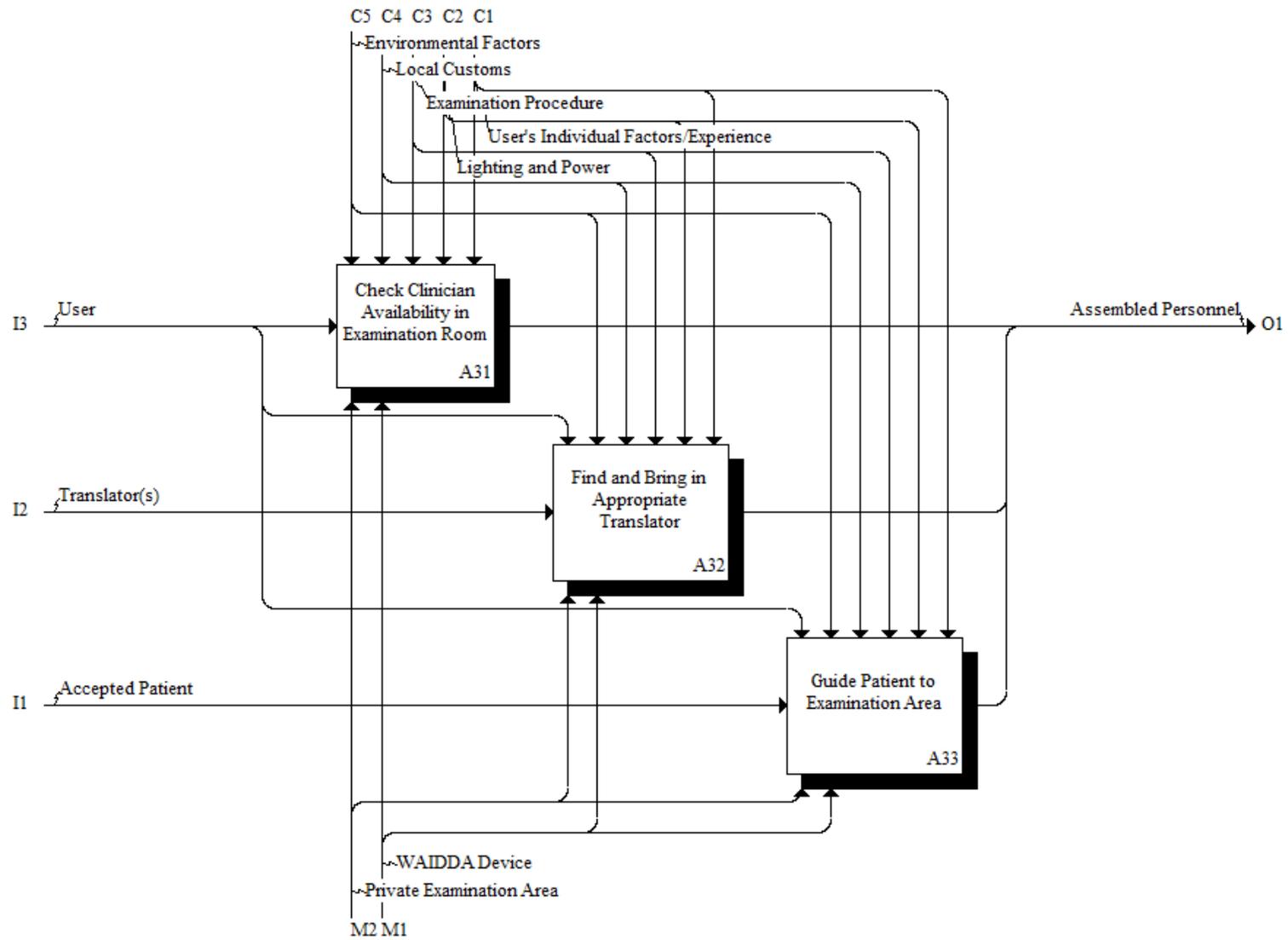
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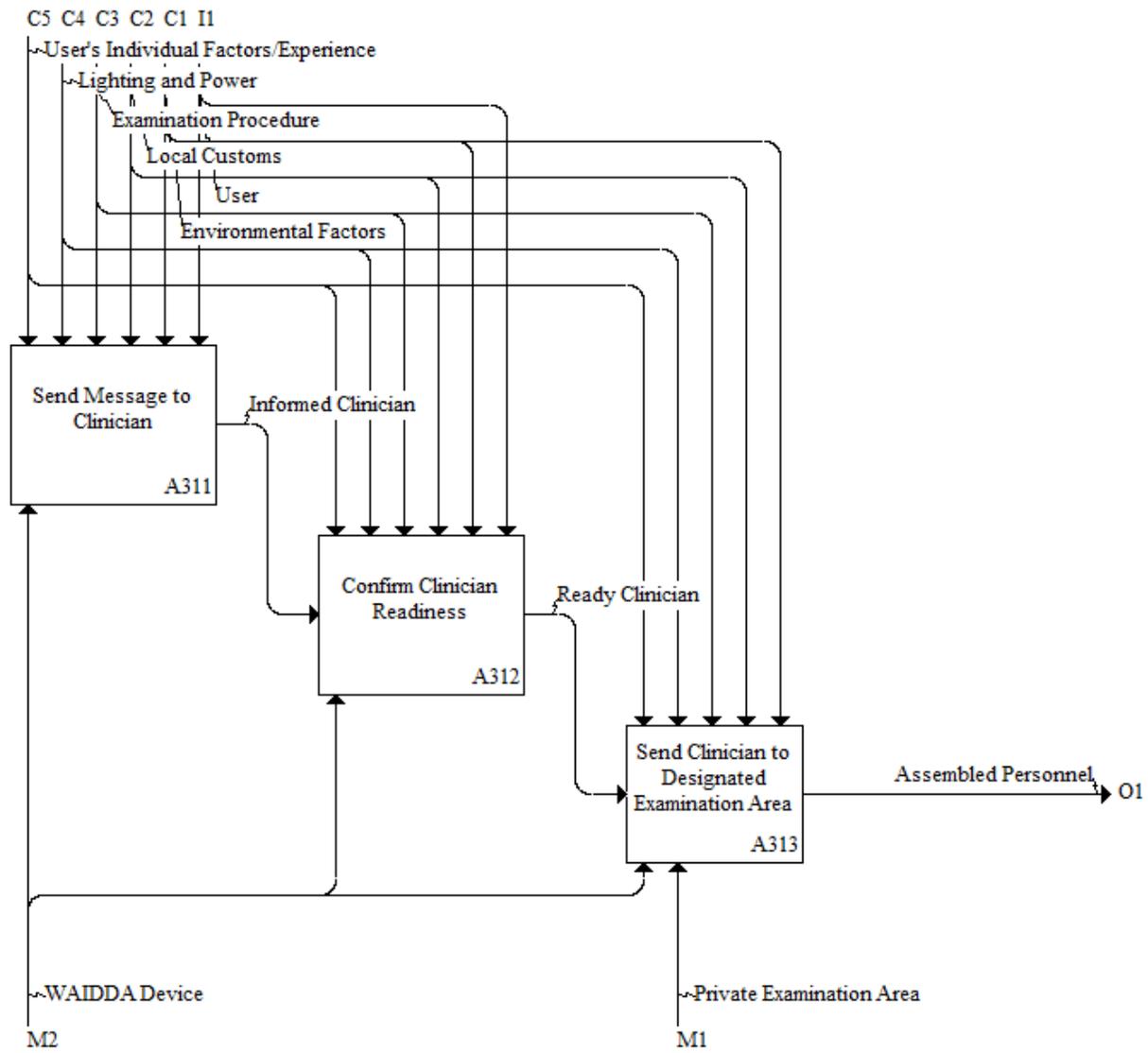
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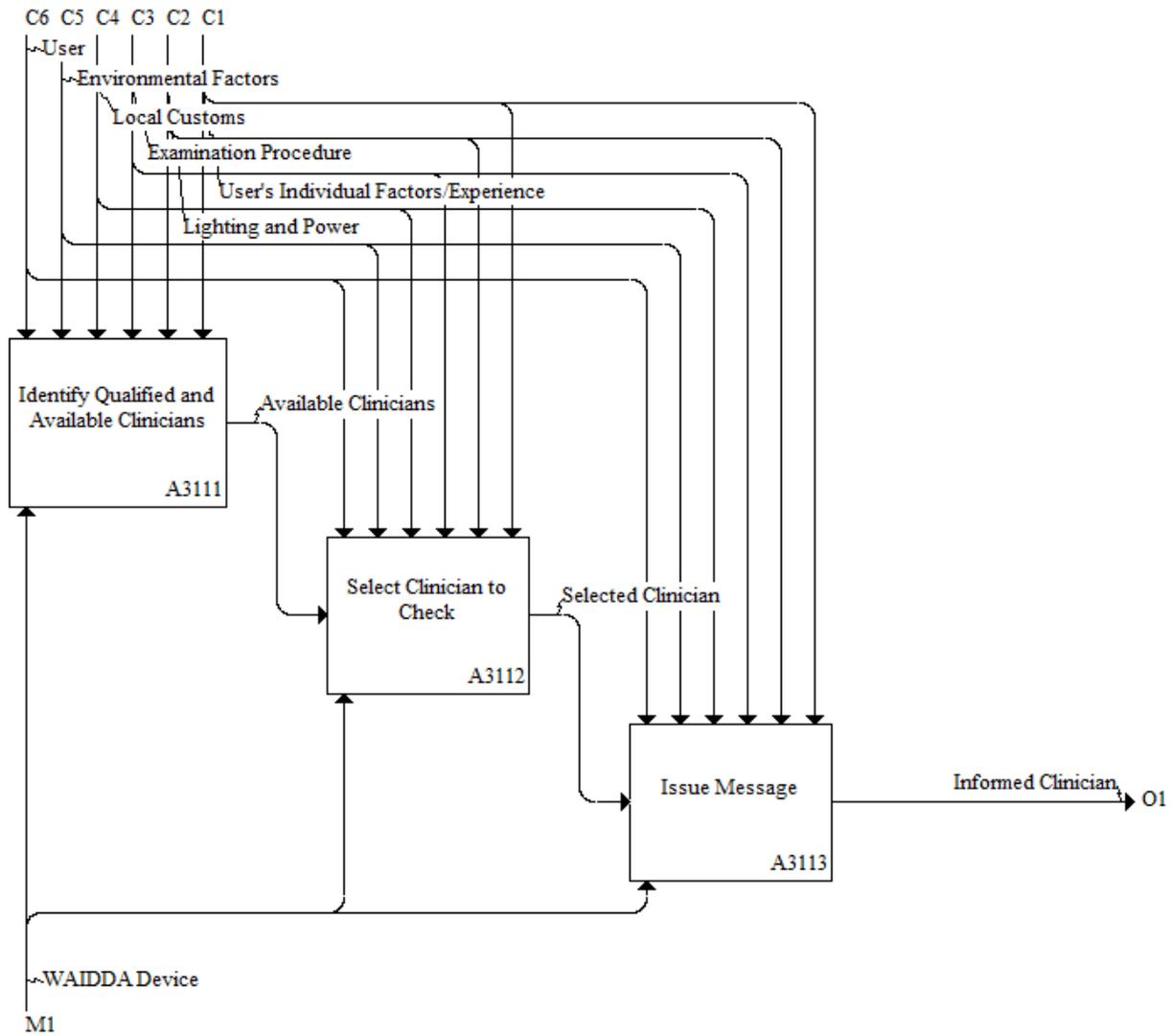
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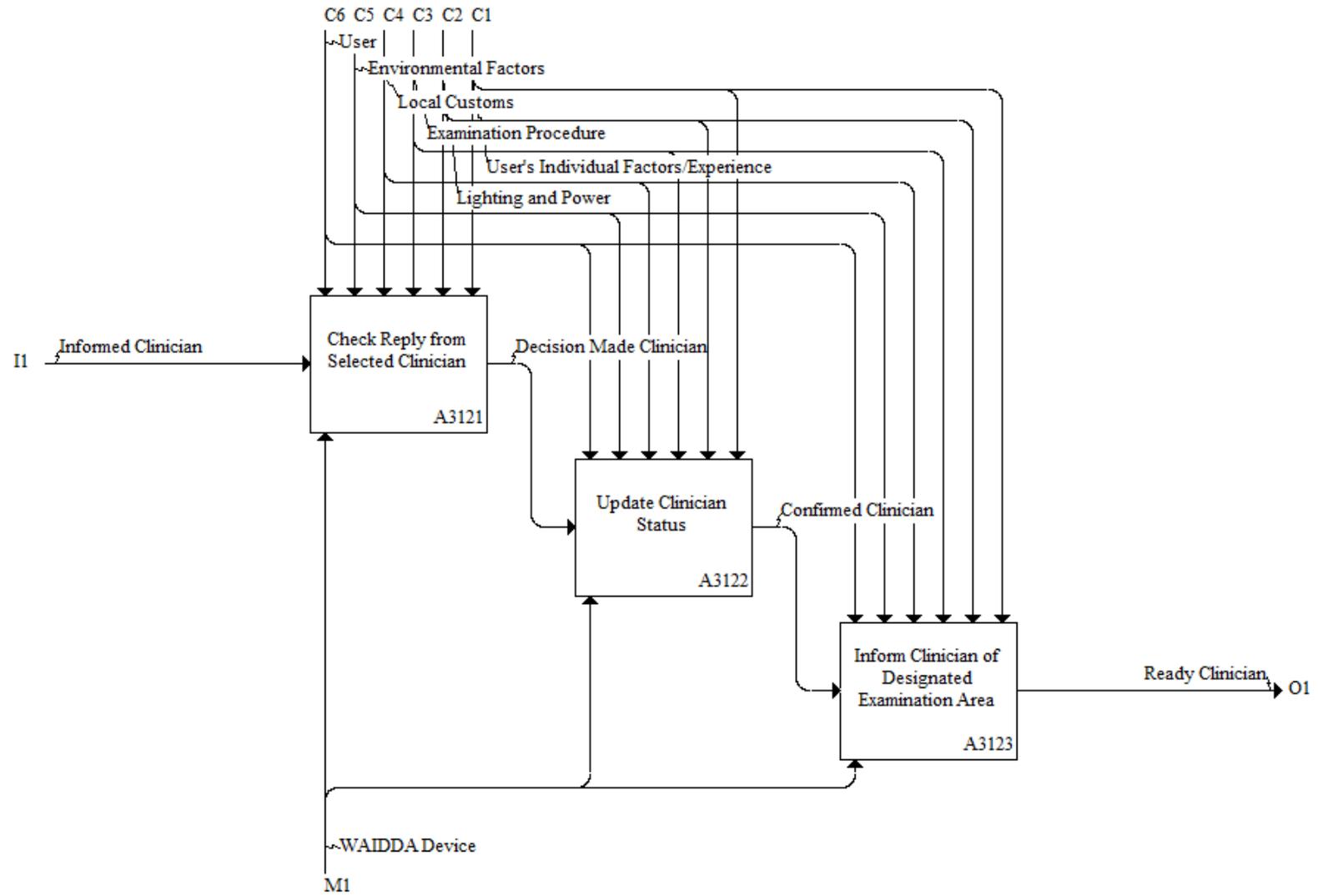
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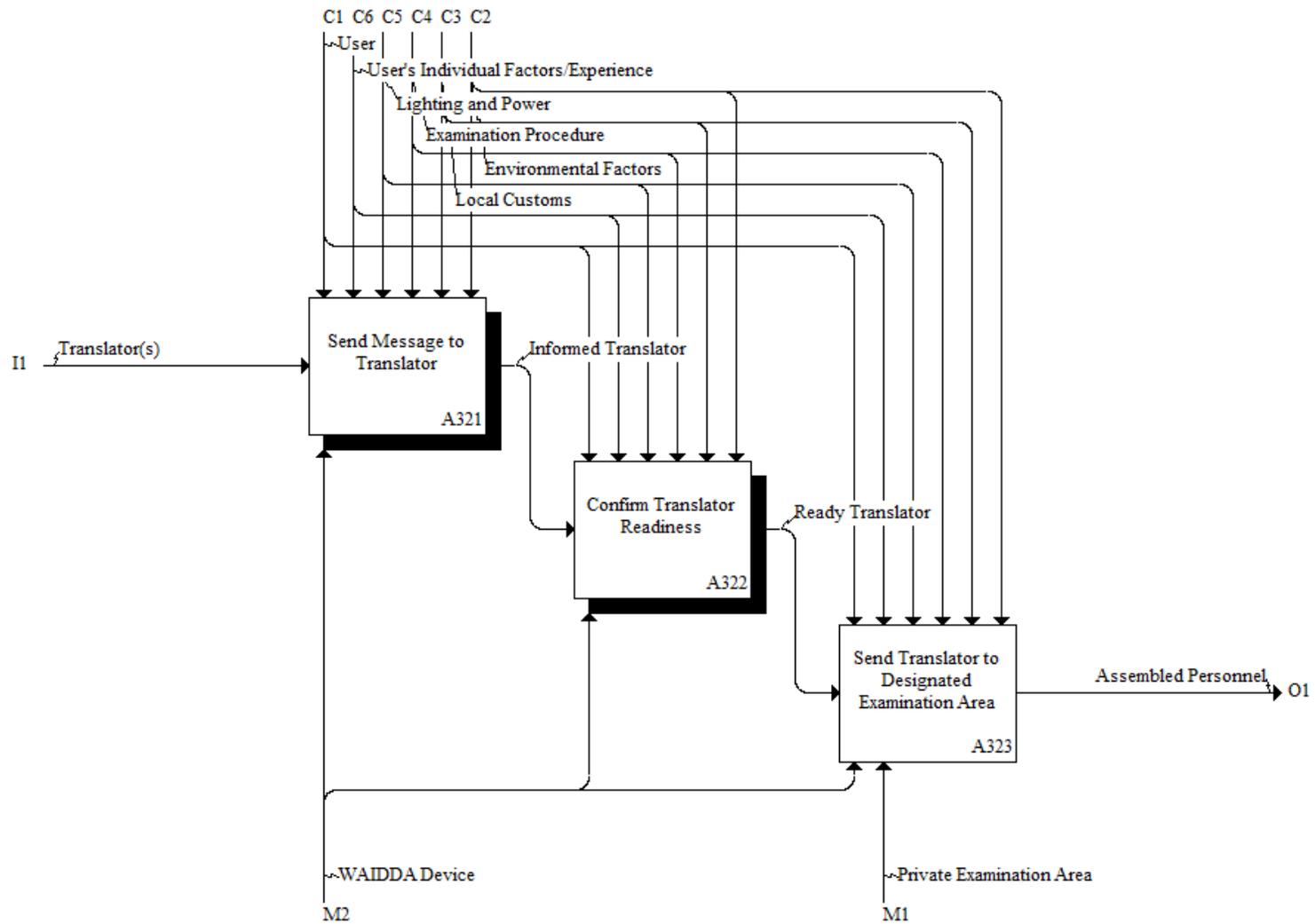
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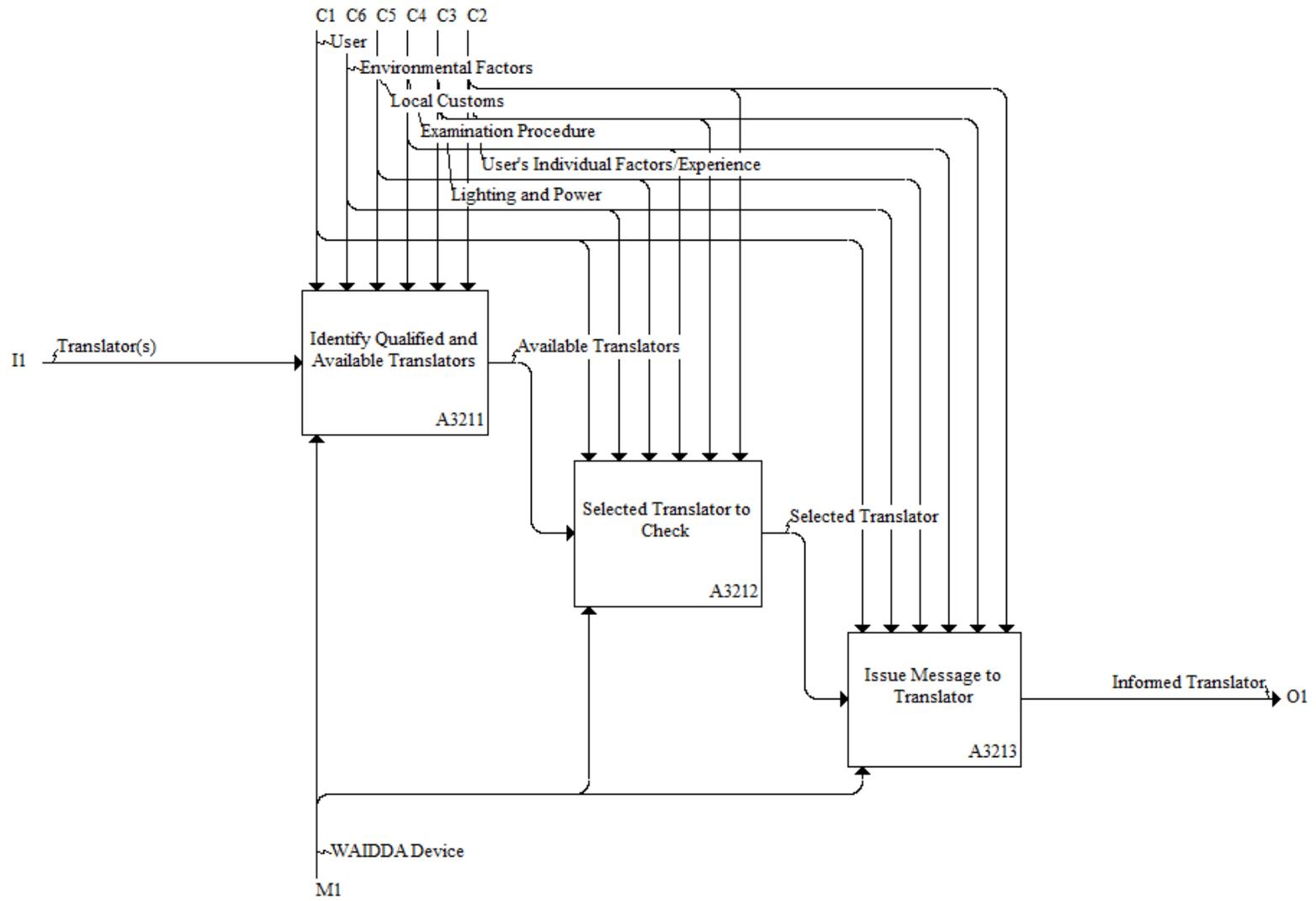
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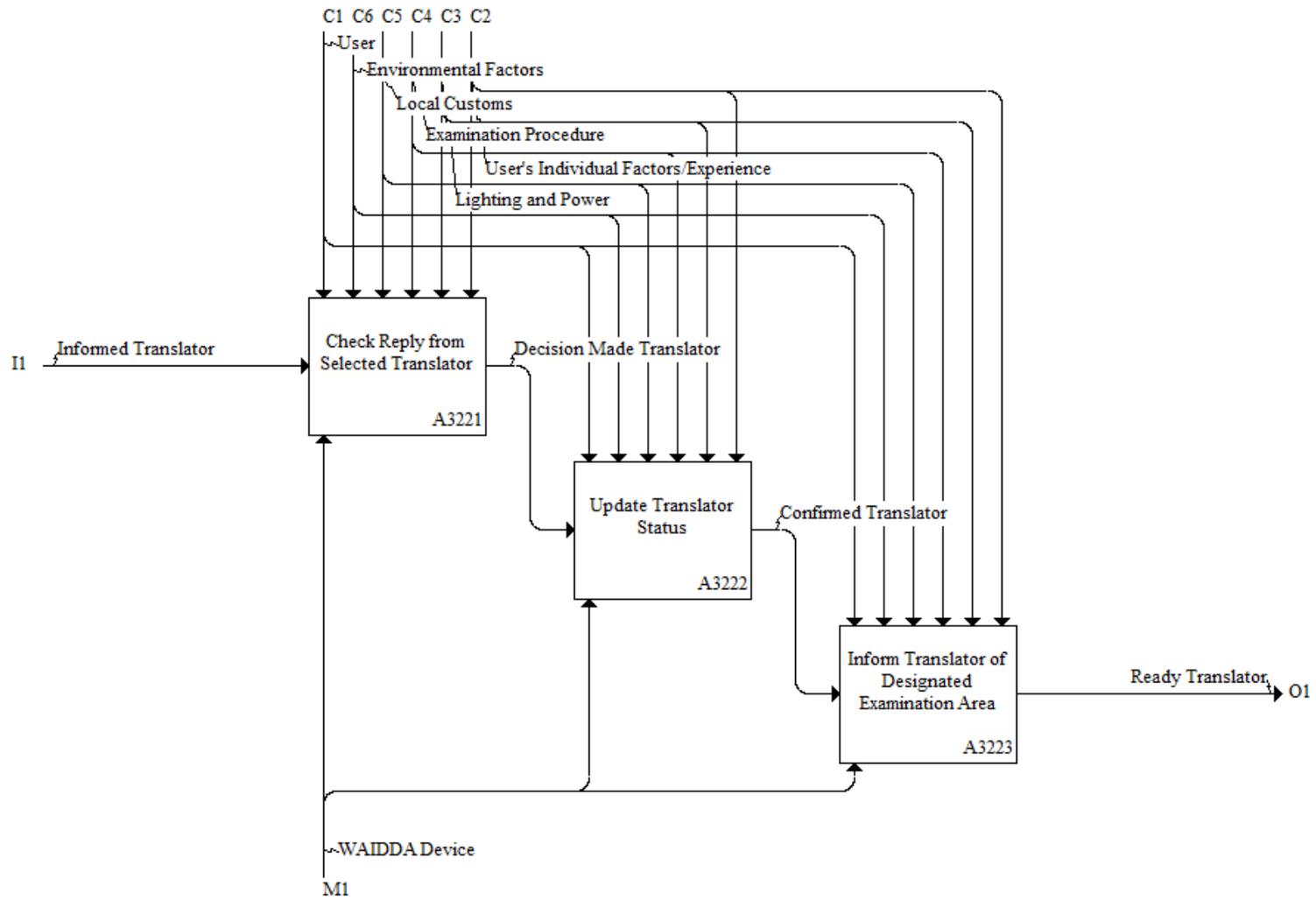
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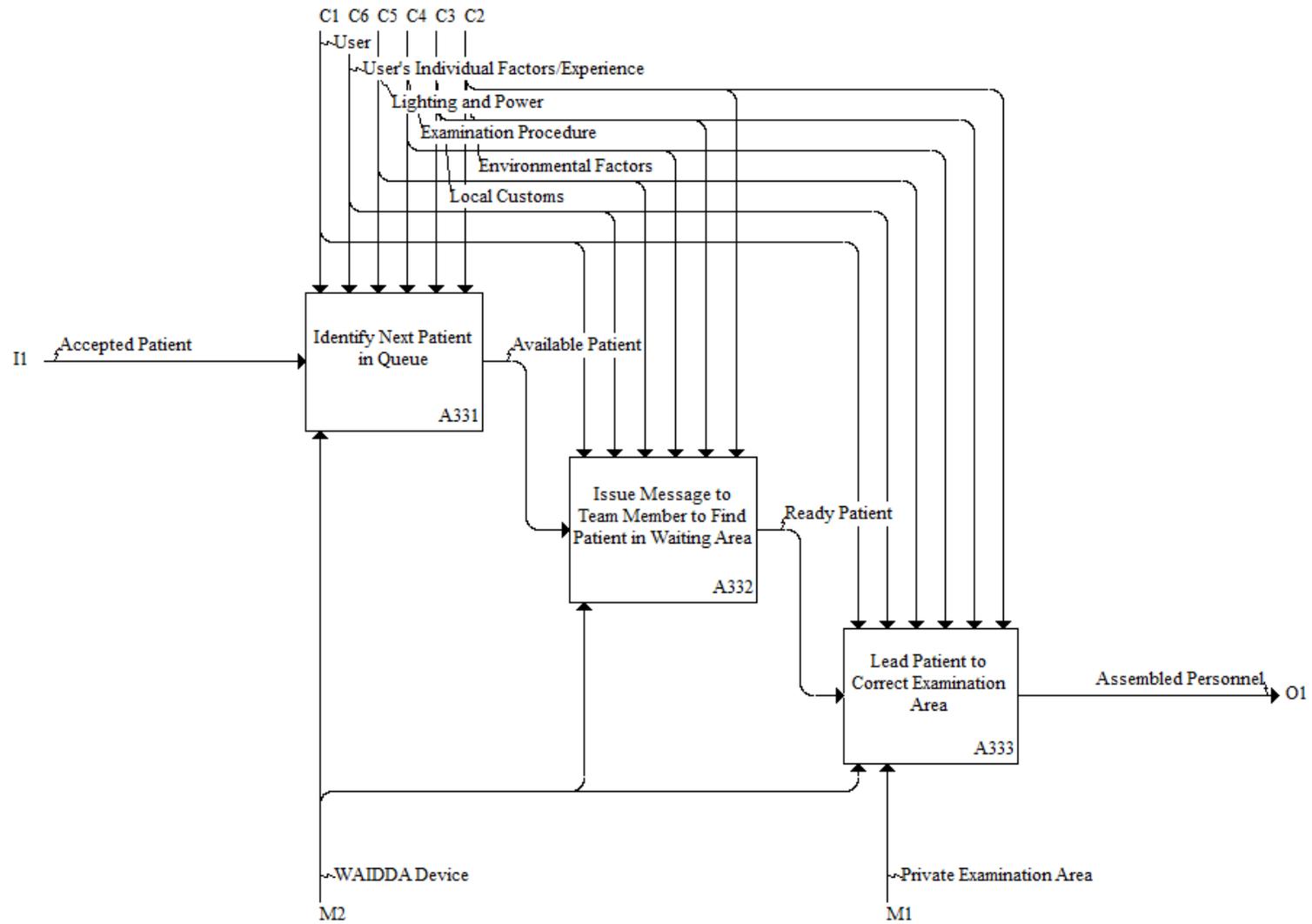
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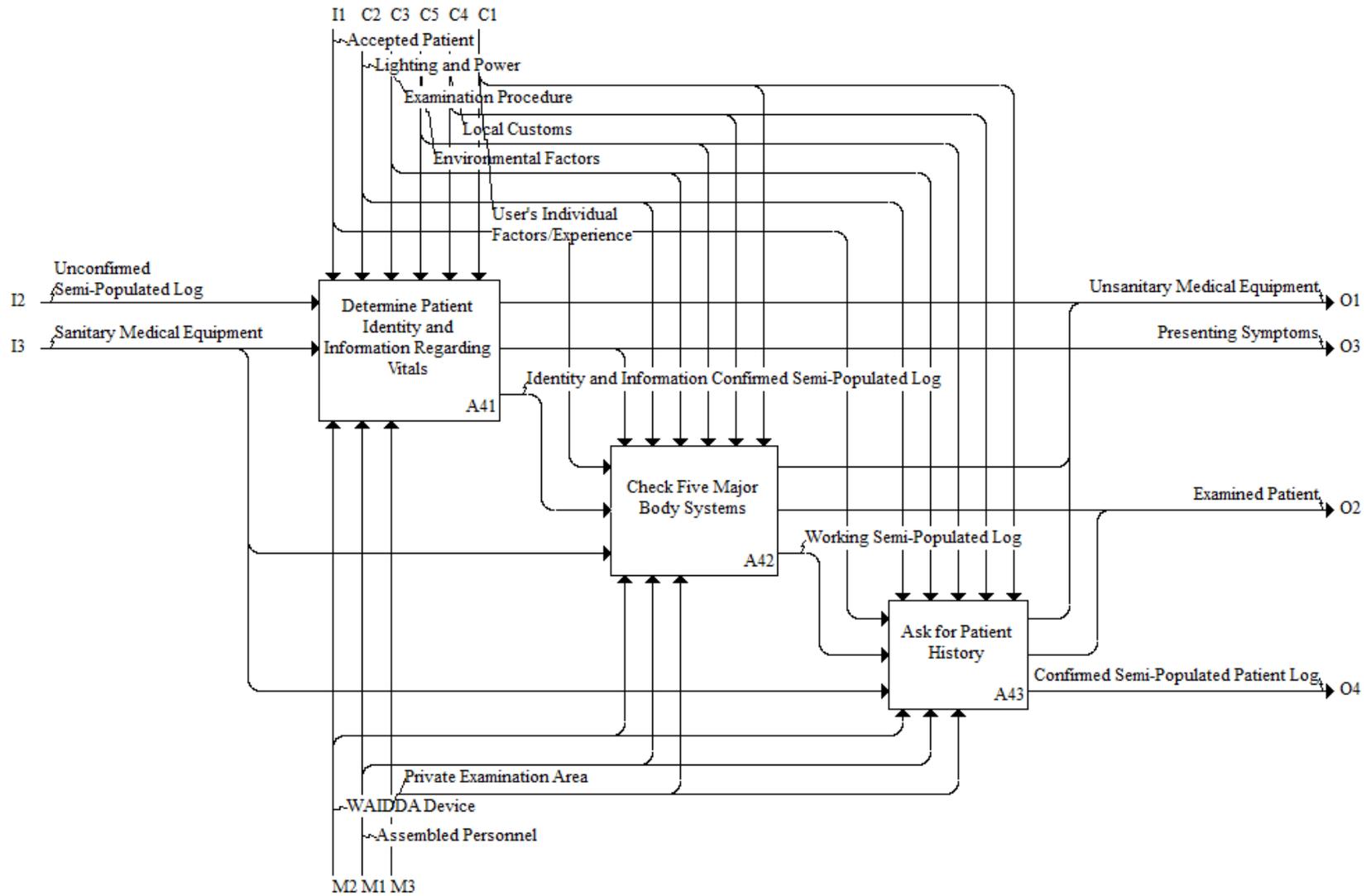
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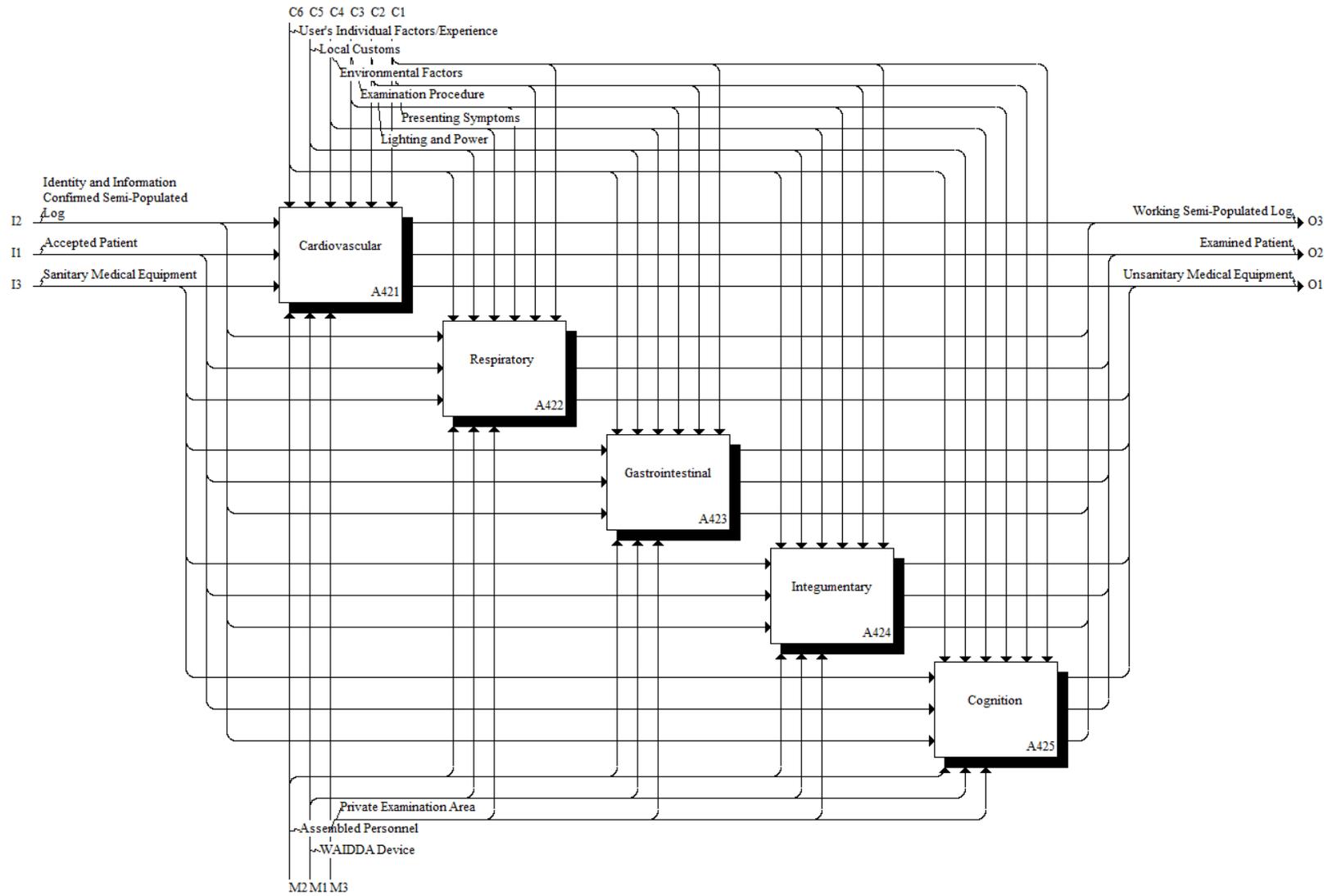
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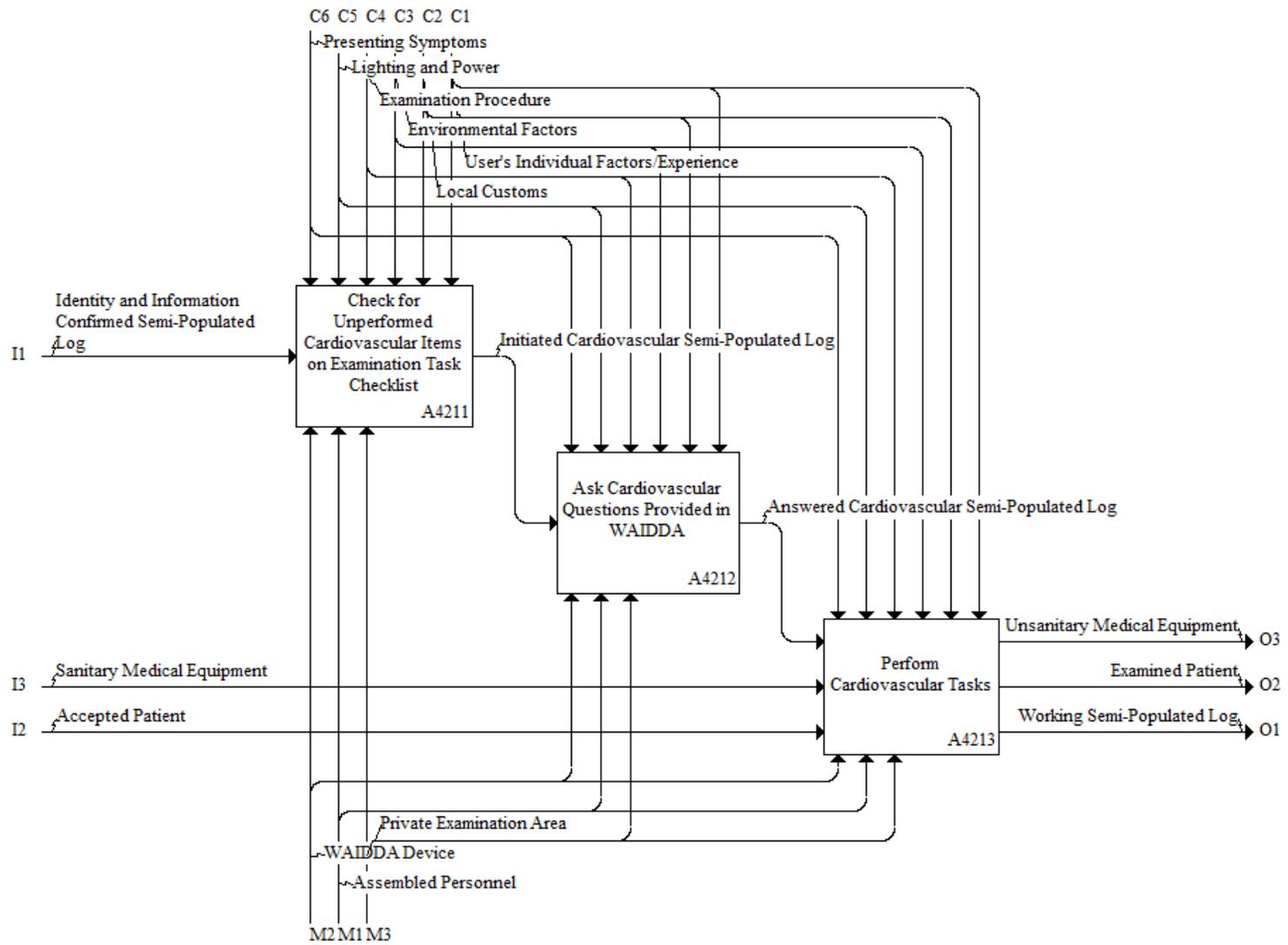
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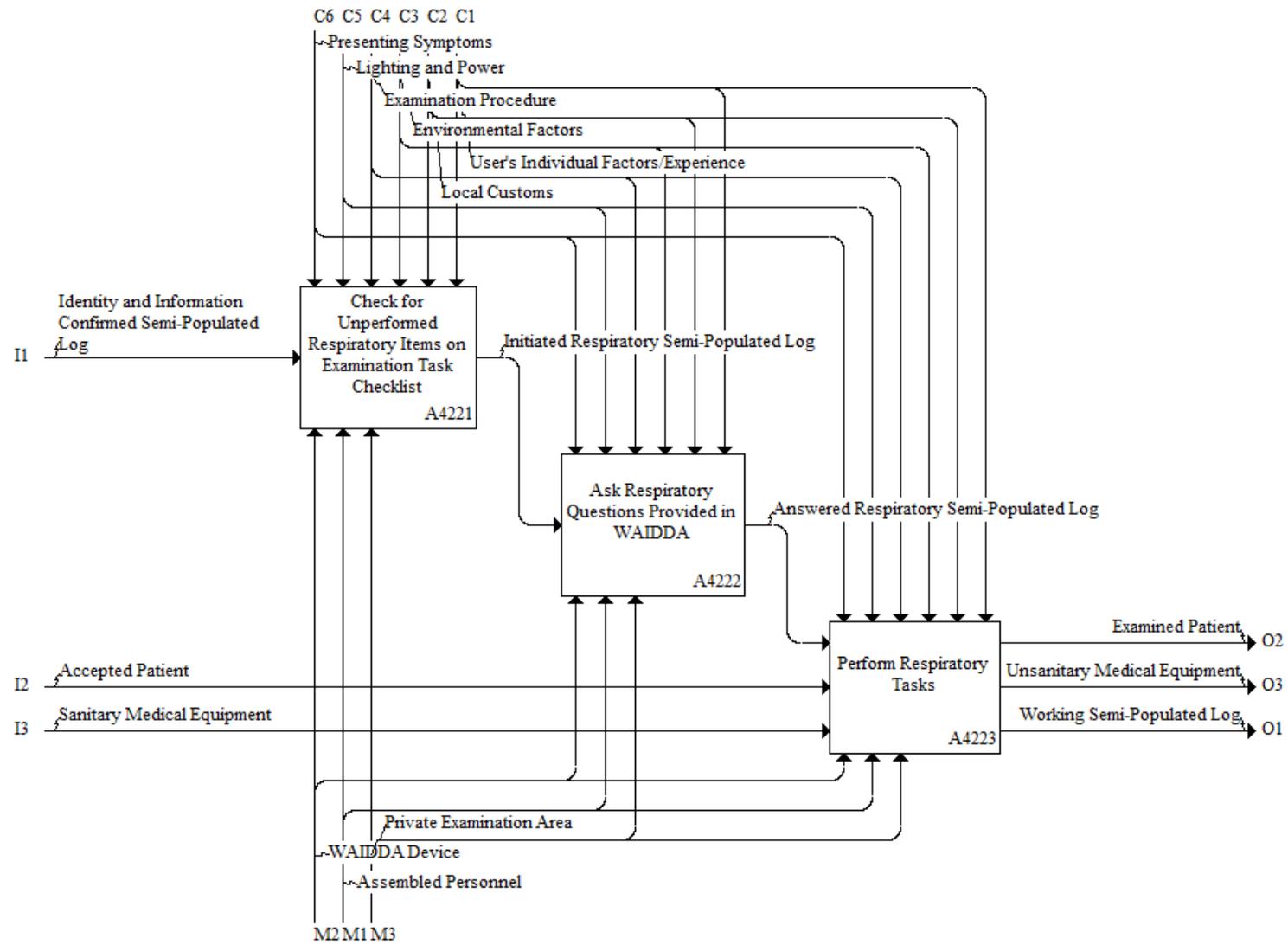
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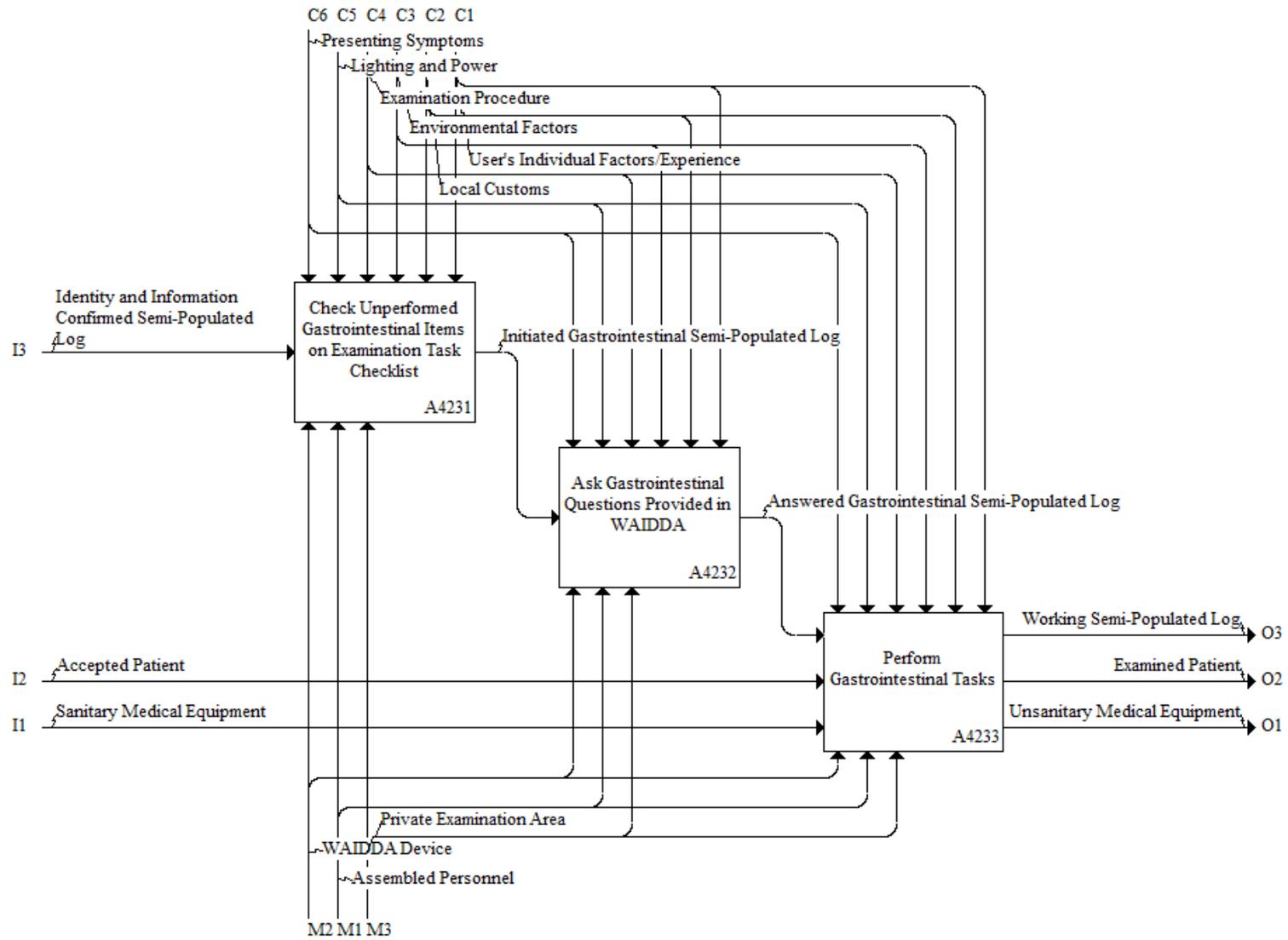
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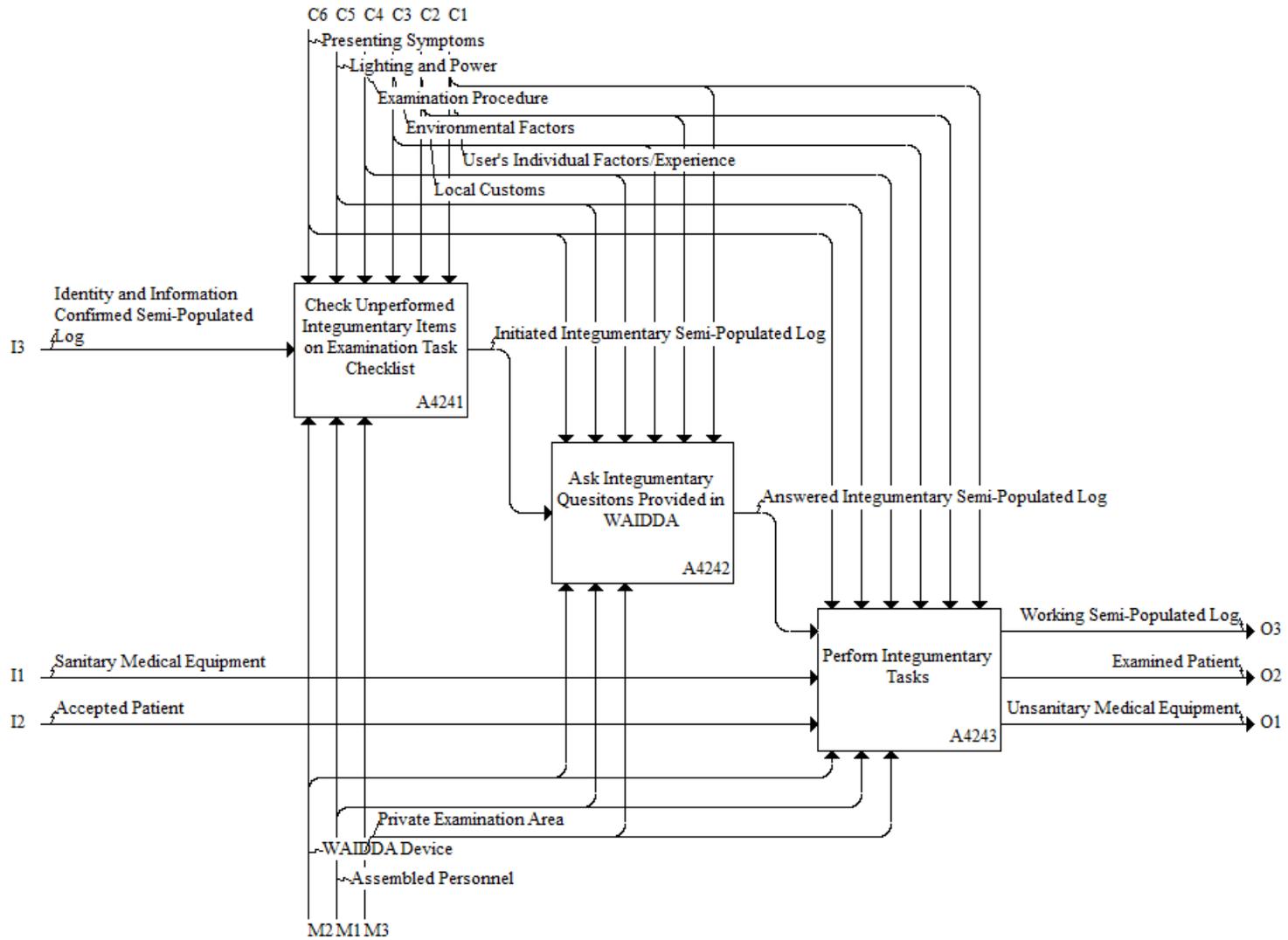
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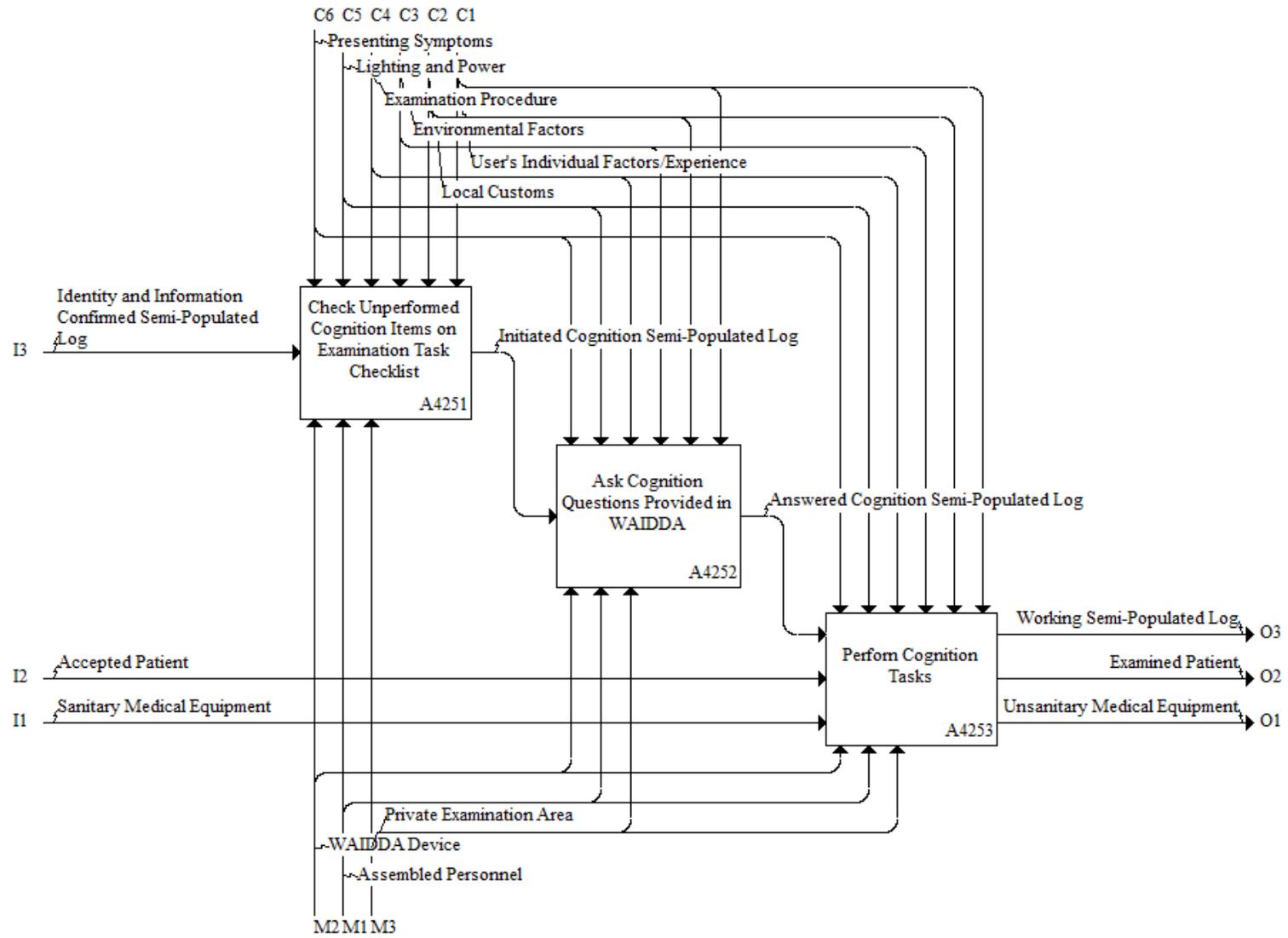
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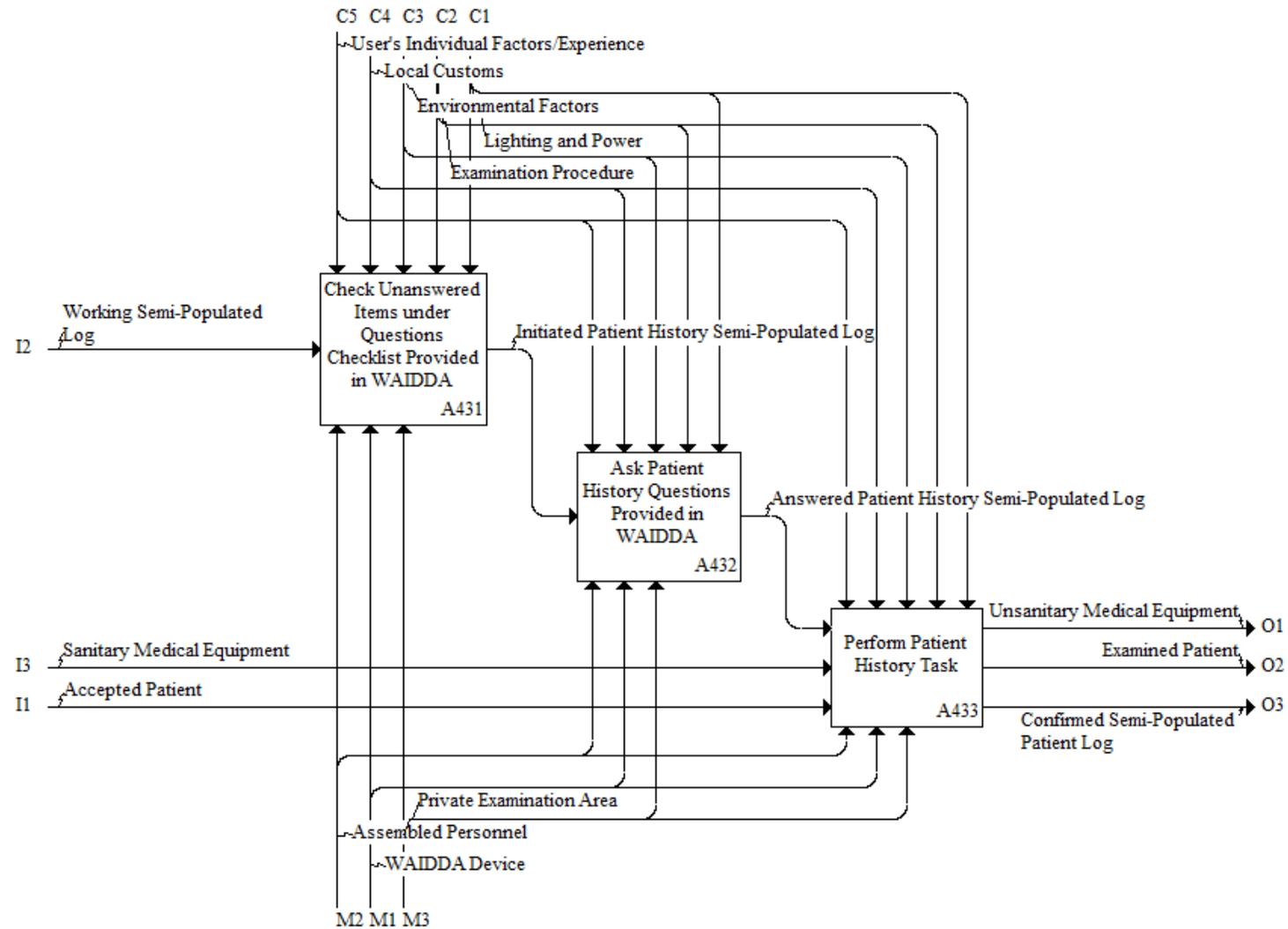
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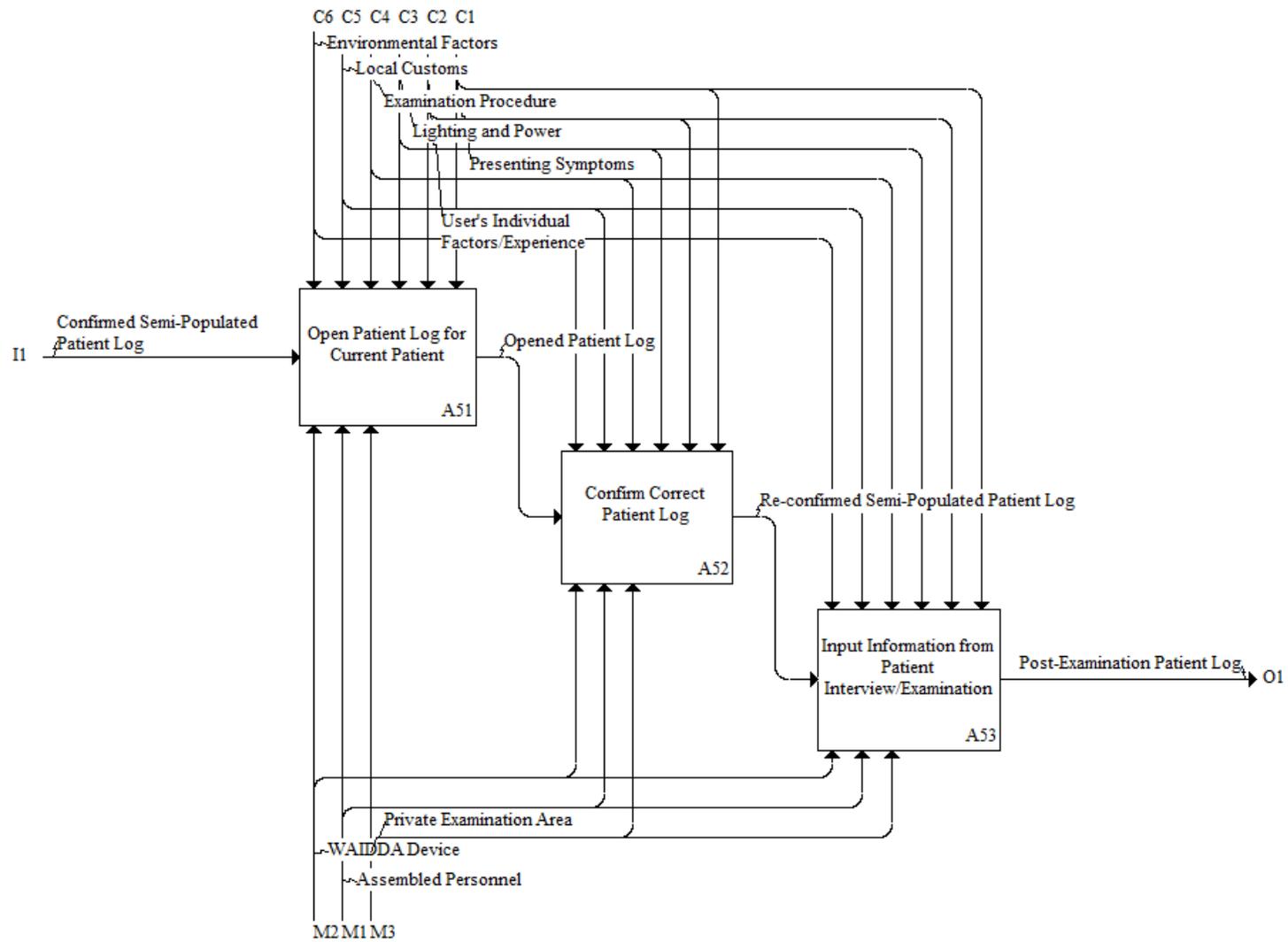
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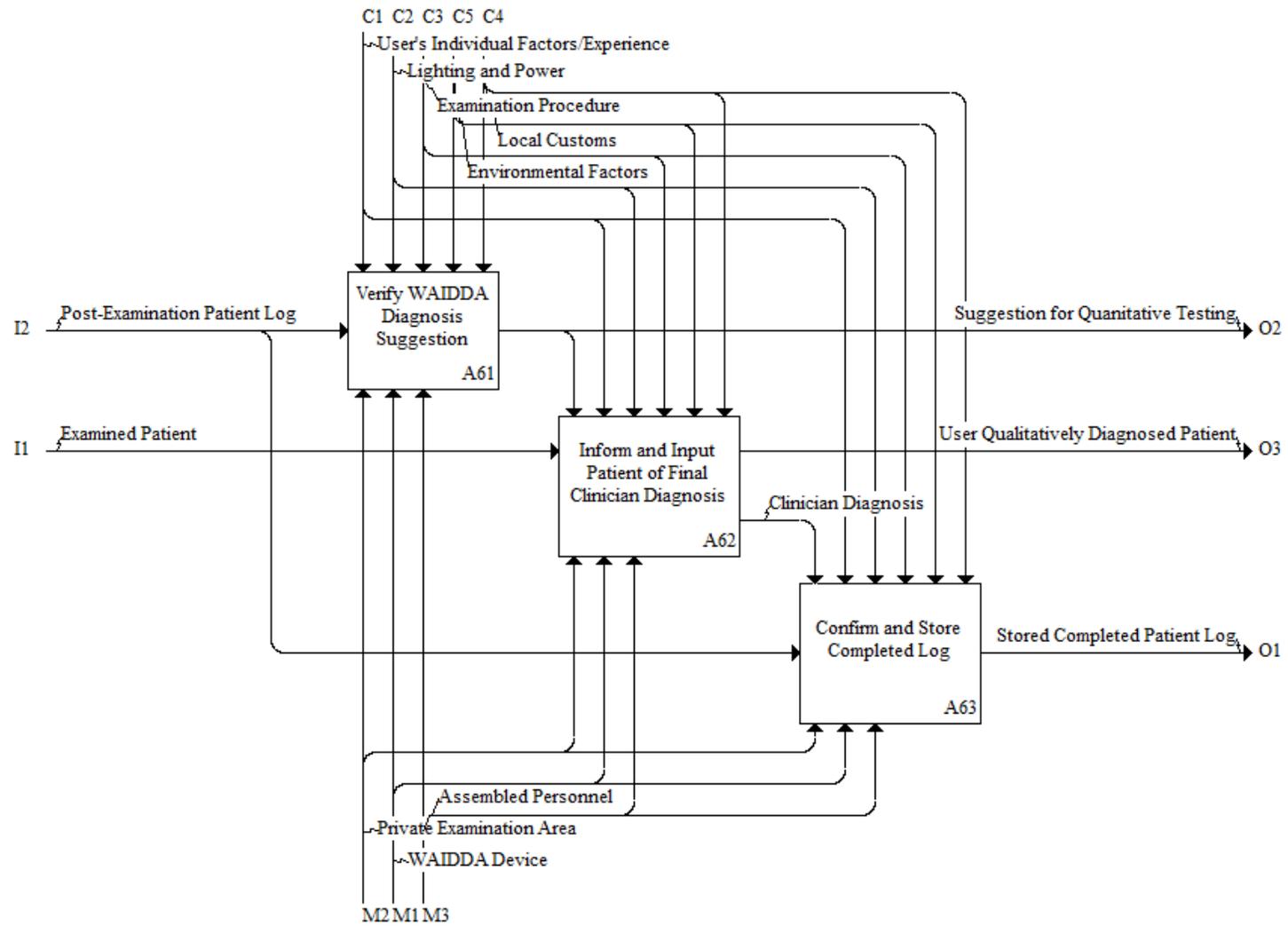
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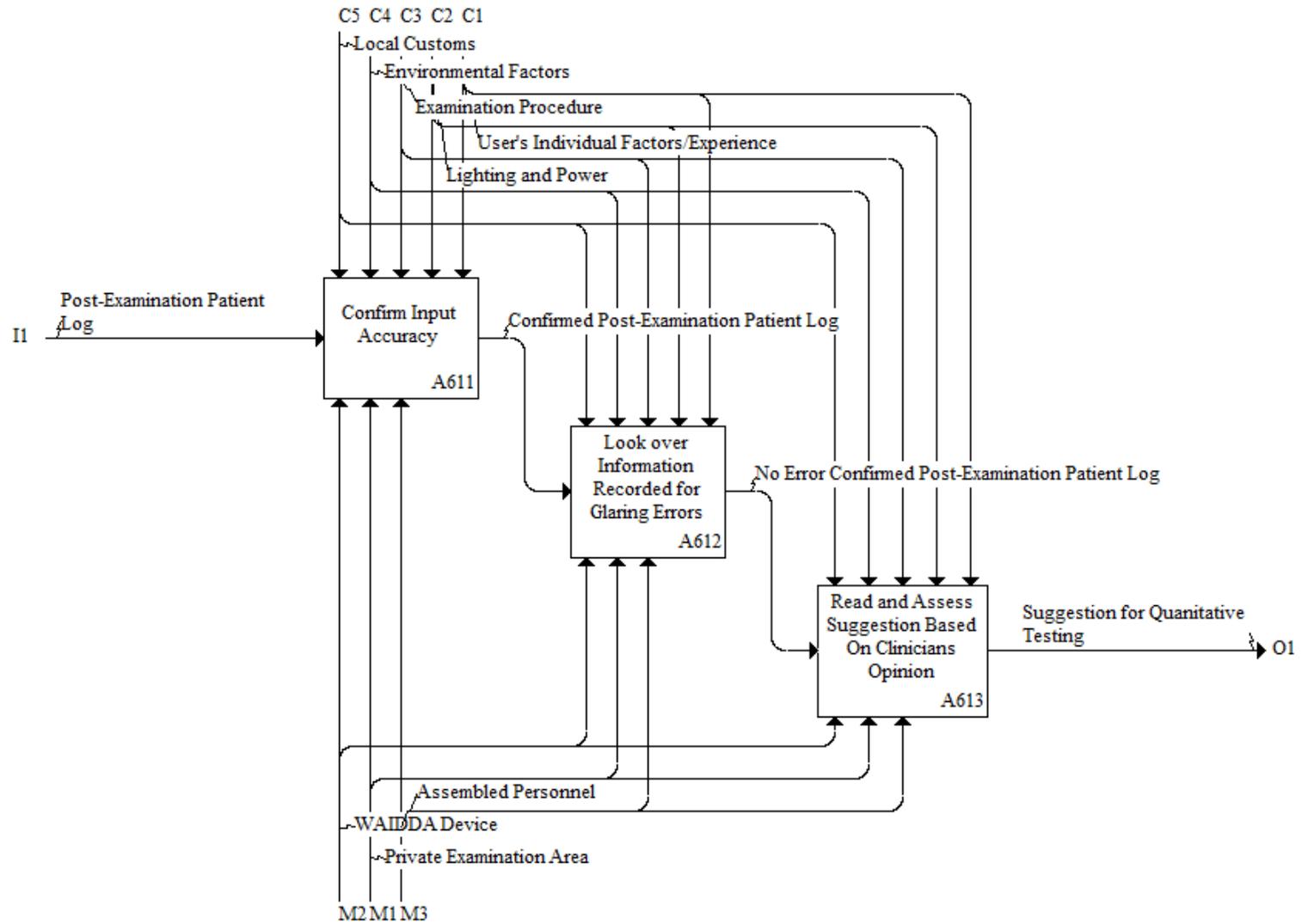
A5:



A6:



A61:



Accompanying Notes for IDEF0 Model

For A-0 Diagram

- A. The purpose of WAIDDA is to suggest a patient diagnosis to the user rather than to make the final diagnosis for the user. WAIDDA will suggest a diagnosis based on user inputs made during the examination process. The decision on the final diagnosis will be left up to the user.
- B. The inputs “Sanitary Medical Equipment” and “New Patient Record” are inputs rather than mechanisms. This is because both concepts are being transformed during the process. “Sanitary Medical Equipment” becomes “Unsanitary Medical Equipment” after use, and the “New Patient Record” gets populated, confirmed, completed, and stored throughout the process, as detailed in the A0 diagram.
- C. “Medical Equipment” refers to all equipment, including Personal Protection Equipment (PPE), that is used and will therefore need to be cleaned and sanitized after the interview/examination process. **The complete list of medical equipment is TBD.**
- D. The control “Patient Information” is not included as a control on the A0 box because this process is modeled such that “Patient Information” will be branched from an output from a child diagram, as seen in the A0 diagram.

For A0 Diagram

- A. Based on the interview with Jerry McIntosh, we modeled our complete patient encounter process to include an initial “Accept Patient” phase (Box A1) separate from the “Interview and Examine Patient” phase (Box A4). The “Accept Patient” phase will take place outside in the general waiting area where patients who come to the clinic will (1) be screened for ebola and (2) meet with a non-clinician member of the team who will take basic background information and vitals (name, initial complaint, weight, height, heart rate, blood pressure). This phase exists to minimize the time required during the actual meeting with the clinician. The “Interview and Examine Patient” phase will be more detailed and require a trained clinician.
- B. During the “Accept Patient” phase, the team member taking vitals will need to start a new patient record to enter the patient information. This record is the same record that is later accessed by the clinician during the “Interview and Examine Patient” phase.
- C. “Accepted Patient Information” encompasses unconfirmed name, height, weight, chief complaint, and vitals of the patient. These will be confirmed by the clinician when he/she sees the patient to ensure the correct record has been opened for the current patient.
- D. For Box A3, “Gather Personnel”, the “Accepted Patient”, “User”, and “Translator(s)” are considered inputs rather than mechanisms since they are being transformed into “Assembled Personnel”. “Assembled Personnel” then becomes a mechanism for the boxes that follow. Gathering personnel is an important step to take in the process; a user (i.e. the clinician) must be available and ready for the patient interview/examination to begin and the appropriate translator must be located and brought to the appropriate location.
- E. All controls listed at the top of the A-0 diagram are applied to each of the boxes and their children.

- F. Final patient records are stored long term and may be accessed by users at some point in the future. The purpose of this feature is to provide a running database of outbreaks and diagnoses given. This information may be sorted by location or other patient demographics to aid users in giving the most accurate and reliable diagnosis.

Appendix D: Infectious Diseases Relevant to WAIDDA

****List of diseases and information pertaining to each that shall be included within the WAIDDA system. This information exists within WAIDDA to allow the algorithm to provide a suggestion for patient diagnosis. These lists and information are available within the WAIDDA for the clinician to access in the event he/she is prompted or wishes to see it.****
Full list of details/information to include for all subsections is being developed, TBD.

WAIDDA shall contain information pertaining to the following infectious diseases:

- A. Dengue
- B. Cholera
- C. Ebola
- D. Malaria
- E. Typhoid
- F. Yellow Fever

WAIDDA shall contain the following information on the listed infectious diseases

- A. Common symptoms
- B. Commonality and Current Outbreaks
 - a. This will be based on the stored information from other patient records to determine areas and periods of outbreak.
- C. Identifying factors of the following symptoms:
 - a. Fever
 - i. Range of fever, Cycles of fever (if periodic) (Full list TBD)
 - b. Diarrhea
 - i. Color, Frequency (Full list TBD)
 - c. Fatigue
 - i. (Full list TBD)
 - d. Muscle pain
 - i. Location (Full list TBD)
 - e. Abdominal cramps
 - i. (Full list TBD)
 - f. Skin conditions, Rashes, and Skin Irritation (See Appendix B for complete details)
 - g. Bleeding
 - i. Location, Quantity (Full list TBD)
 - h. Discoloration of Body Parts
 - i. Location (Full list TBD)
- D. Degree of Severity
 - a. This is separated into the following ranges: none, non-moderate, moderate, moderate-severe, severe. Each range of severity is defined for each symptom with words and images in the table below.
(Table TBD)

E. Stages and Disease Progression

F. Common Causes and Disease Vectors

G. Populations and Climates Most at Risk

H. Deadliness

- a. This is separated into the following ranges given the patient's age, gender, and the current progression of the illness: not deadly, mildly dangerous if untreated, dangerous if untreated, deadly. Each range is defined in reference to disease progression with words and images in the table below.

Disease Name	Vector	Mode	Fever ?	Abdominal/stomach pain?	Vomit ?	Fatigue ?	Headache?	Muscle Pain?	Diarrhea?	Symptoms	Fatal ?	At Risk	Source
Dengue	Mosquitos- Early morning, before dusk	Virus	Yes, High	Severe	Yes, Bloody	Yes				Bloody gums, flu-like, rapid breath	Rare	All	[4]
Cholera	Ingestion of infected food or water contaminated with the bacterium	Infection / Disease			Yes			Yes	Watery	80% of patients do not show symptoms	Often	All	[5,6]
Ebola	Human-human; Contact dead or alive, infected blood	Virus	Yes		Yes	Yes	Yes	Yes	Yes	Sore throat, rash, kidney-liver-impairment, bloody gums/feces	Often	All	[7]
Malaria	Mosquitos – Between dusk and dawn	Parasite	Yes		Yes		Yes			Chills, first symptoms may be mild; infections may be without symptoms	Often	Infants, children, pregnant women, HIV positive individuals	[8]
Typhoid	Ingestion of infected substances	Bacteria	Yes, High	Yes	Yes	Yes, Weak	Yes	Weak	Yes, or constipation	Loss of appetite, rash; rare: internal bleeding	Can be dire	Anyone, those who travel	[9,10]
Yellow Fever	Mosquitos – Aedes and Haemogogus species	Virus	Yes, High in toxic phase				Yes	Yes, Back		Loss of appetite; Blood from face in	Can be dire	Those not vaccinated	[11]

										Toxic phase; Yellowing			
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Appendix E: Ebola Examination

****Instructions for examination and list of physical symptoms and information pertaining to Ebola. This information exists within WAIDDA aid the team members performing the initial screening for Ebola to complete this task safely and effectively. This list is available within the WAIDDA for the user to access in the event he/she is prompted or wishes to see it.** Full list of details/information to include for all subsections is being developed, TBD.**

Instructions on how to physically examine a patient for Ebola. *Full instructions TBD*

List of physical signs to indicate signs of Ebola

- A. Is there bleeding in the eyes, gums, or skin?
- B. (Full list TBD)

Appendix F: Legal Disclaimers and Considerations

****Notes addressing potential conflicts or issues associated with patient information sharing and accountability** Full appendix of details and information to include is being developed, TBD.**

Information, designs, and ideas that resulted directly from information obtained directly from the World Health Organization website in this project are for non-commercial use only. Willamette International is a non-profit Christian organization. The contents of this report were developed solely for course-related work.

Each nation provides and enforces different regulations regarding patient information sharing and accountability. *Full details regarding relevant policies TBD*

During the interview the Jerry McIntosh from Willamette International, he stated that in order to give the most accurate diagnosis, it is sometimes necessary to share patient information with other experts, trained clinicians, and nurses. In the context of humanitarian acts and diagnosing patients in an environment where minimal training is often the only training given to local clinicians, this sharing of information may be exercised with legal concerns (such as being sued) being fairly low on the list of immediate concerns, given *ethical boundaries and limitations*. *Specific ethical definitions and official documentation TBD.*

Appendix G: User Interface Notes

Accompanying Notes for Preliminary Designs for User Interface. Boundaries for the scope of this project were determined during team meetings with Dr. Funk.

The term “patient record” will be used to refer to compilation of patient information as inputted by the user(s). The user interface screens where it is possible to enter data (denoted with light grey boxes, selectable buttons, and checkboxes) and the Suggested Diagnosis screens are considered a part of this record.

For Login screen:

- A. The device containing WAIDDA is assumed to be connected to the Internet and linked to other devices containing WAIDDA, as described by Dr. Funk in previous meetings.
- B. Links for Help and Forgot Username or Password will link users to the appropriate online pages documenting help and steps required to properly utilize WAIDDA. These completed documents are TBD and ultimately outside the scope of this project.

For Main Menu screen:

- A. Examination Schedule and Data Search considered to be outside the scope of this project. The purpose of the slide that would be linked to Examination Schedule is to provide the clinicians and team members with a clear and updated schedule for the remainder of the day. Management and updates will may be performed under these options, but since these exist outside of the diagnosis and examination steps, the screens are not presented in this report. The purpose of the screen that would be linked to Data Search is to allow users to search through old patient records to identify trends or outbreaks of specific infectious diseases.
- B. Examination steps for each of the five major body systems (as described by Jerry McIntosh from Willamette International) shall be presented to the user as prompts (see Requirements and **Appendix B**). The questions and clinical checks the clinician shall perform are listed in **Appendix B** (completion TBD). Ultimately, the full compilation of these examination steps and checks are outside the scope of this project, however the user interface screens created as well as the skeleton lists in **Appendix B** serve as placeholders until full implementation within the final design.

For the Patient Examination screens:

- A. Sample questions are presented to demonstrate how the users may enter varying types of information as prompted by WAIDDA. The questions that will be prompted are listed in **Appendix A** and **Appendix B**. (The completion of both **Appendix A** and **B** is TBD.)
- B. User inputs will be used as inputs to the WAIDDA system to come up with the most likely diagnosis (See notes regarding Suggested Diagnosis screens).
- C. The “Read Only View” screen sample provided refers to the requirement that only one user may edit a patient’s information at a time. This screen is not presented to the clinician

examining the patient but to other WAIDDA users who wish to observe or review the patient patient as it is being completed.

Links

- A. Links to other screens are denoted with button icons or blue and underlined font. These links are provided as clear navigation tools within the preliminary design.
- B. Links to “Severity”, “List”, “Images” will take users to either a table or list of the item specified. For example, a “Severity” link will take users to a table describing or depicting the condition in question and how symptoms rank in terms of severity (See **Appendix B.**) (**Appendix B** completion TBD.).

For Returning Patient Record screens:

- A. The Patient Menu user interface screen is presented since it differs from the one presented for New Patient Records. This screen follows the search screen.
- B. Patient basic information, such as name and birthdate, will be non-editable fields in the Returning Patient Record. This information shall remained consistent with the patient’s previous visit(s), however vitals (heart rate, height, etc. as listed in **Appendix A**) will be subject to change. (**Appendix A** completion TBD.)
- C. The patient record where users will be entering the information from examination and interview questions will be largely the same as the New Patient Record screens presented. The reason for this is that the examination process will not be changed for returning patients. These patients will be classified as returning in order to keep a running record of their personal medical file where possible.

For Suggested Diagnosis screens:

- A. Two sets of Suggested Diagnosis preliminary designs are provided. The team is will clarify with the client and subject matter experts regarding whether the suggested diagnosis is desired as one main suggestion (clearly and explicitly stated, as in Design 1) or as some set of information that will lead the user to their own conclusion (for example, the graph shown in the Design 2). After discussion this with Dr. Funk, it was suggested that the team present both ideas for the time being.
- B. The percentages of likelihood for disease diagnosis would be determined by a TBD algorithm that would take into account the patient’s information and inputs from the clinical examination. These screens were designed under the assumption that in the final design, this has been implemented, however the creation of this complete algorithm is outside the scope of this project. A semi-functional prototype with an early stage of this algorithm will be later provided within the scope of this project and course.
- C. Information regarding these diseases and details that may aid in the clinician in giving their final diagnosis is available within WAIDDA, as detailed in **Appendix D** (completion TBD). These screens were designed under the assumption in the final implementation of WAIDDA the full list of information and details is complete and available, however its compilation and

presentation is outside the scope of this project. A semi-populated list with an early stage of the necessary algorithm will be later provided within the scope of this project and course.

Appendix H: Requirements

Full list of requirements generated as separated by requirement type (functional, structural, human factors, usability and operations) and requirement generation process (IDEF0 and Detailed Task Analysis). These categories were obtained from project requirements and verified throughout the course of the project development based on meetings and all feedback given.

Notes are included by all applicable requirements regarding the implementation in the presented user interface and which task analysis step aided in creating that requirement.

Functional Requirements

1. The diagnostic tool shall contain the listed information about select infectious diseases identified in ***Appendix D***. (Note: **Appendix D** TBD)
(Implementation note: This is reflected in the design by how WAIDDA's system and algorithm provides the user with likely diagnoses of these infectious diseases.)
2. The diagnostic tool shall use the English language to communicate to the clinician/user.
3. The diagnostic tool shall provide a means to identify symptoms as present or not present. (Corresponds to IDEF0)
(Implementation note: This is reflected in the design of the user interface that allows users to indicate with check boxes if a symptom is present or not.)
4. The diagnostic tool shall provide a means to rate the severity of a symptom as listed and defined in ***Appendix D***. (Note: **Appendix D** TBD)
(Implementation note: This is reflected in the design of the user interface that provides clear definitions/descriptions of severity ratings and allows users to indicate the appropriate severity with drop down lists.)
5. The diagnostic tool shall provide means for the user to record each patient's chief complaint, symptoms, and relative clinical diagnosis. (Corresponds to IDEF0)
(Implementation note: This is reflected in the design of the user interface that allows users to freely type items into field boxes.)
6. The diagnostic tool shall recommend/suggest the likely diagnoses based on symptoms and interview results. (Corresponds to IDEF0)
(Implementation note: This is reflected in the design of the user interface that presents a 'suggested diagnoses' screen to users. These were reviewed in a trade study and finalized versions are TBD*.)
7. The diagnostic tool shall be able to store clinician-selected information about the patient for at least the duration of the examination. (Corresponds to IDEF0)
8. The diagnostic tool shall be able to be used on at least a *8" x 5.5"* screen in either the horizontal or vertical orientation.

(Implementation note: This screen size corresponds to small tablets, which has been selected as the operating medium for WAIDDA. The current UI screens reflect this accurately. At least one example of both orientation is presented.)

9. The diagnostic tool shall be able to accept symptoms categorized according to five bodily systems: cardiac, respiratory, gastrointestinal, integumentary, and cognitive. (Corresponds to IDEF0)

(Implementation note: This is reflected in the design of the user interface in the menu for each patient record and in the categorization of the predetermined questions WAIDDA contains, as listed in **Appendix A***.) (**Appendix A** TBD)

10. The diagnostic tool shall accept patient information as listed and defined in Appendix A, Section 1. (Note: **Appendix A** TBD) (Corresponds to IDEF0)

(Implementation note: This is reflected in the design of the user interface in the 'Basic Patient Information' screen, as presented.)

11. The diagnostic tool shall inform the user if it is experiencing issues with *connectivity* or power as soon as it detects the issue(s). (Connectivity type TBD.)

12. The diagnostic tool shall provide images of external *abnormalities* associated with the listed infectious diseases, as shown in ***Appendix B***. (Note: **Appendix B** TBD) (Corresponds to IDEF0)

13. The diagnostic tool shall provide *specific, designated input fields* for user input information. (Corresponds to IDEF0)

(Implementation note: This is reflected in the design of the user interface that provides clear indication of editable fields with clear instruction of what should be inputted. Editable fields are dark grey as opposed to non-editable fields that are white. Each field follows a clear instruction of what information is desired.)

14. The diagnostic tool shall store finalized patient record information in a manner that allows other users to access the information on another device within one minute of the data entry made when inputting patient information.

(Implementation note: This is reflected in the design of the user interface of the Main Menu that allows users to search, browse, and view old patient records. The fine details of these screens are not presented since it is considered to be data management and is therefore outside the scope of this project.)

15. The diagnostic tool shall allow users to correct errors. (Corresponds to IDEF0)

(Implementation note: This is reflected in the design of the user interface where users can view a previous question or pages previously completed.)

16. The diagnostic tool shall be able to continue working idly while the interview/examination is taking place.

17. The diagnostic tool shall provide the user with the option to start a new patient record. (Corresponds to IDEF0)

(Implementation note: This is reflected in the design of the user interface of the Main Menu where users have the option to select 'New Patient Record'.)

18. The diagnostic tool shall provide the user with the option to return to a previously accessed patient record. (Corresponds to IDEF0)
(Implementation note: This is reflected in the design of the user interface of the Main Menu where users have the option to select “Returning Patient Record”.)
19. The diagnostic tool shall be able to inform users when a patient’s record was edited.
(Implementation note: This is reflected in the design of the user interface as exemplified on the presented Search Results screen and Read Only View screens.)
20. The diagnostic tool shall be able to inform users if a patient’s record is currently being edited.
(Implementation note: This is reflected in the design of the user interface as exemplified on the presented Search Results screen and Read Only View screens.)
21. The diagnostic tool shall make available a list of clinical examination checks, as listed in ***Appendix B***, the clinician should perform during the examination. (Note: **Appendix B** TBD) (Corresponds to IDEF0)
(Implementation note: This is reflected in the design of the user interface where the user is prompted specific questions from the listed appendix during the patient interview. The presented UI walks through two examples based on dengue and typhoid case studies.)
22. The diagnostic tool shall provide the user with a suggested quantitative diagnosis at the end of the patient interview/examination based on the user’s inputs. (Corresponds to IDEF0)
(Implementation note: This is reflected in the design of the user interface following the ‘Suggested Diagnosis’ screen where users are presented with available rapid diagnosis tests if any are available. Extensive searches on the World Health Organization website and the interview with Dr. Patel revealed that not all diagnoses will have a rapid diagnosis option in this setting.)
23. The diagnostic tool shall store the final patient diagnosis in the patient record. (Corresponds to IDEF0)
24. The diagnostic tool should present the user with reminders regarding the safe and sanitary use of medical equipment and the WAIDDA device itself.
(Implementation note: This is reflected in the design of the user interface with a pop-up reminder after the initial user record in.)
25. The diagnostic tool should be able to retrieve stored data regarding outbreaks and diseases other individuals have been diagnosed with from where the patient lives.
(Implementation note: This is reflected in the design of algorithm that takes available information into account.)
26. The diagnostic tool shall track patient examination duration time. (Corresponds to Preliminary Design)
(Implementation note: This is reflected in the design of the user interface in the upper right hand corner with a timer clock.)
27. The diagnostic tool shall notify the user at every fifteen minute threshold reached. (Corresponds to Preliminary Design)

(Implementation note: This is reflected in the design of the system that will provide a non-alarming auditory signal to indicate this threshold. The auditory signal will follow design guidelines as discussed in lecture.)

Structural Requirements

1. The diagnostic tool will be in use for at least eight hours straight per day on each device.
2. The information recorded by the diagnosis tool shall be shareable among physicians, nurses, and contagious disease experts. *Information sharing and accountability is addressed in **Appendix F**.* (**Appendix F**, TBD)
3. The diagnostic tool shall allow multiple users to access a patient's information on different devices at the same time.
(Implementation note: This is reflected in the design of the user interface as exemplified in the 'Search Results' and 'Read Only View' screens where the user will be informed that another user is editing or using the patient record.)
4. The diagnostic tool shall only allow one user to input patient information at a time based on login precedence on that patient's record. (Corresponds to Preliminary Design)
(Implementation note: This is reflected in the design of the user interface as exemplified in the 'Search Results' and 'Read Only View' screens where the user will be informed that another user is editing or using the patient record.)

Human Factors Requirements

1. The diagnostic tool shall be *legible* at least *60* cm away from the clinician/user's face.
(Implementation note: This is reflected in the design of the user interface in the font size and contrast. This follows general guidelines for viewing distance for the point font used and is acceptable for viewing if the user sets the tablet on a table surface during use.)
2. The diagnostic tool will use the English language to communicate to the clinician/user. (*This requirement is repeated from a previous section since it applies to multiple requirement categories.)
3. The diagnostic tool will be operated by a user trained for 3 days in English and medical terminology relating to geographically common infectious diseases.

Usability and Operation Requirements

1. The diagnostic tool shall allow users to start a new patient profile within one minute.
2. The diagnostic tool shall aid the clinicians in examining a patient and passing a diagnosis within 15 minutes from intake to the private examination area to final diagnosis.
(Implementation note: The design of the user interface and system aim to help accomplish this ideal time limit by selecting questions and clinical checks that would more quickly identify

information-rich symptom clusters. This is exemplified in the dengue and typhoid case study examples provided.)

3. The diagnostic tool shall allow users to sort through and select old patient profiles for viewing. (Implementation note: This is reflected in the design with the Search option provided.)
4. The diagnostic tool shall prompt the user with questions from a predetermined list, as found in ***Appendix A***, to interview the patient for their history and background. (Note: **Appendix A** TBD) (Corresponds to IDEF0)
(Implementation note: This is reflected in the design of the user interface and system where the user will be prompted with select questions based on chief complaint keywords.)

Requirements Generated from Detailed Task Analysis

1. The diagnostic tool shall prompt the user to confirm the patient's identity before formally beginning the patient examination. (Corresponds to DTA for Node A41)
(Implementation note: This is reflected in the design of the user interface with a pop-up reminder, as shown in the example screens presented.)
2. The diagnostic tool shall prompt the user to confirm that the patient has been inspected for Ebola before beginning the patient examination. (Corresponds to DTA for Node A13)
(Implementation note: This is reflected in the design of the user interface with a pop-up reminder, as shown in the example screens presented.)
3. The diagnostic tool shall prompt the user to use personal protective equipment such as a surgeon mask and gloves before inspecting the patient for Ebola. (Corresponds to DTA for Node A13)
(Implementation note: This is reflected in the design of the user interface with a pop-up reminder.)
4. The diagnostic tool shall allow users to input their final diagnosis. (Corresponds to DTA for Node A62)
(Implementation note: This is reflected in the design of the user interface where the user is clearly provided a textbox to do so.)
5. The diagnostic tool shall be able to save the current patient record at any given point during the interview/examination process even if the patient record is incomplete in the event that the patient becomes deadly ill and immediate action to save the patient is needed. (Corresponds to DTA for Node A41)
(Implementation note: This is reflected in the design of the user interface where the user is able to explicitly save on every screen. This would also be implemented in the system itself such that any navigation away from a page will automatically save the page, as detailed in the System Note provided.)
6. The diagnostic tool shall provide a means to indicate to the user how much progress in the interview/examination process has been completed. (Corresponds to DTA for Node A41)

(Implementation note: This is reflected in the design of the user interface where each question screen shows the current question versus the total number, and the patient menu will show a question set as complete or incomplete.)

7. The diagnostic tool shall be able to record the time, date, and user associated with inputs. (Corresponds to DTA for Node A41)

(Implementation note: This is reflected in the design of the system itself. The user interface will clearly prompt the user to login when first accessing WAIDDA, and the system will automatically record time of inputs as associate changes with users through the login.)

Necessary Requirements from Detailed Task Analysis

1. The diagnostic tool will prompt the user to perform *specific* steps in diagnosing patients who have been identified as unconscious. (*Specific steps available in **Appendix B**, TBD*.) (Corresponds to DTA for A41)

(Implementation note: This is reflected in the design of the system that will present the user with these specific questions if a patient has been identified as unconscious.)

2. The diagnostic tool shall provide a means to transmit a message to an Ebola specialist if patient is qualitatively determined to have Ebola. (Corresponds to DTA for Node A41)

3. The diagnostic tool shall provide instructions how to determine if an individual has Ebola, instructions are provided in ***Appendix E***. (Note: **Appendix E** TBD). (Corresponds to DTA for Node A41)

(Implementation note: As detailed in **Appendix E**, the examination steps required to check for Ebola are outside the scope of this project. A list of steps would be presented to Ebola inspecting users.)

4. The diagnostic tool shall prompt the user to properly remove and dispose of personal protection equipment after inspecting each patient for Ebola. (Corresponds to DTA for Node A41)

(Implementation note: As detailed in **Appendix E**, the examination steps required to check for Ebola are outside the scope of this project. A list of steps would be presented to Ebola inspecting users and reminders would be presented like the Menu Main reminder shown.)

5. The diagnostic tool shall provide the user with information regarding how many rapid diagnostic tests are available if the user decides to quantitatively test a patient. (Corresponds to DTA for A13)

(Implementation note: This is reflected in the design of the user interface following the ‘Suggested Diagnosis’ screen where users are presented with available rapid diagnosis tests if any are available. Extensive searches on the World Health Organization website and the interview with Dr. Patel revealed that not all diagnoses will have a rapid diagnosis option in this setting.)

6. The diagnostic tool shall provide the user with information regarding how much prescription medicine is in stock/available to prescribe to a patient. (Corresponds to DTA for A13)

(Implementation note: This is reflected in the design of the user interface following the 'Suggested Diagnosis' screen where users are presented with available treatments and prescriptions if any are available. For some diseases, such as dengue, specific treatments are not known or available so painkillers or other appropriate options are presented.)

7. The diagnostic tool shall provide the user with a reminder to suggest to the patient to come back to the clinic if their symptoms worsen. (Corresponds to DTA for A13)

(Implementation note: This is reflected in the design of the user interface with pop-up reminders.)

Appendix I: Detailed Task Analysis

The complete Detailed Task Analysis is presented below for three important leaf nodes. Nodes are as presented with the IDEF0 notes (See Appendix C).

A#	Task	Task Performer(s)	Start Cue	Information	Decision(s)	Action(s)	Frequency & Duration*	Location & Environmental Conditions	Potential Hazards & Errors	Comments
A13	Visually Inspect Patient for Ebola	Team member, Potential patient	Potential patient enters the waiting/check in area	Visual appearance or symptoms of patient	Is patient exhibiting visual signs of ebola? For example, is the potential patient bleeding from his/her eyes, gums, and skin? (The complete list of symptoms may be found in Appendix E). Does this individual need to be passed on to another organization to handle ebola	Determine if the potential patient is exhibiting signs of ebola. Determine whether or not to accept him/her as a patient.	Once when the individual arrives at the clinic	Inspection area (outside location, covered area. Separate from the private examination area.)	Patient may have ebola and put clinicians and other patients at serious risk. User may incorrectly determine that the patient does not have ebola when they do. User may incorrectly perform examination and contract or spread the virus.	Inspecting team member must stand a specific distance away from the patient during the visual inspection. Sick individuals shall not have any physical contact with clinicians, team members, or other patients until visually inspected and cleared for ebola. User must slowly walk completely around the patient two times when visually inspecting for ebola. Requirement generated to formally prompt the user to confirm that the patient has been visually checked and cleared for ebola prior to furthering the examination

					cases? How far should the inspecting team member stand from the potential patient?					process. Requirement generated to remind users to use personal protective equipment. Requirement generated to provide a means of contacting a specialist to handle patients who may likely have ebola.
A4 1	Determine Patient Identity and Information Regarding Vitals	User (Trained Clinician)	User (Trained Clinician) and Patient** interaction begin. For most patients (conscious, nonurgent cases) this is when the patient enters the examination area.	Patient Information that will be confirmed, which was originally recorded in the Patient Log by the Team Member in the waiting area, are: Name, Chief Complaint, Height, Weight, Heart Rate, and Blood Pressure. Patient's answers to User's questions. User's questions may be found in Appendix B, for	Does the information from the patient match what is on this list? Does this Patient Log belong to this patient? Are there any immediate signs from the patient that indicate the vitals may be incorrect? (For example 'the patient looks much taller than recorded' or 'the patient is breathing	Determine if the Patient Log must be changed before proceeding	Once formally at the beginning of the examination and subconsciously ongoing as more information is received from the patient	Private Examination Area (lighting provided by natural light and generator power; language is translated by as many translators as is required, usually one)	User may incorrectly confirm Patient Log for the wrong patient. User may proceed with incorrect information regarding the correct patient, for example if an error in weight is not detected	Basic information and vitals are recorded by a Team Member in the waiting area (as described in the interview with Jerry McIntosh) in order to save time during the examination with the User. The user must confirm that the patient he/she is currently seeing is the patient referred to in the Patient Log currently open. Requirement generated to formally prompt the user to check patient identity.

				example: What is your name? What is your initial complaint?	very quickly, therefore the heartrate recorded may be incorrect')					
A6 2	Inform and Input Patient Of Final Clinician Diagnosis	User (Trained Clinician), Patient, Translator(s)	User has reached a final decision on diagnosis	Suggestion presented from WAIDDA, Patient's symptoms, Patient's answers to questions, Patient's background and history, Clinician's experience and opinion	What illness or ailment does this patient have? Does this decision agree with WAIDDA's suggestion, and if not, is there reasonable evidence for this? What treatments or suggestions may be given to the patient?	Decide on and inform the patient of the final diagnosis. Decide on and prescribe treatments or steps towards recovery. Record final diagnosis in WAIDDA.	Once after WAIDDA has given a suggestion for a diagnosis	Private Examination Area (lighting provided by natural light and generator power; language is translated by as many translators as is required, usually one)	User may record incorrect final diagnosis. User may give an incorrect final diagnosis. User may prescribe or suggest inappropriate treatments.	The user decides on a final diagnosis and informs the patient. The final decision is recorded in WAIDDA regardless of whether or not it agrees with the suggestion WAIDDA previously gave. WAIDDA will inform the user of any treatment(s) or suggestions for recovery/rehabilitation to the patient at this time. Requirement generated to explicitly state that WAIDDA will accept user-determined diagnosis separate from WAIDDA suggestion. Requirement

										generated to allow for checks for extreme or deadly cases of illness or ailment.
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*The duration of these tasks in practice will vary between patients, individual cases, and users.

**The patient may be the patient themselves or, in the case of a child or incapacitated individual, a family member or other individual

Appendix J: Trade Study

Questions asked for the trade study as well as the brief introduction provided to participants is presented below. The survey was conducted on SurveyMonkey.

Section 1:

Brief project background and description as provided to the participants.

8 November 2016

This document contains information regarding project referred to in the survey. Please take the time to look over this prior to completing the survey.

PROJECT BACKGROUND AND CONTEXT:

This project is being completed for a Human Factors Engineering course at Oregon State University in contact with Willamette International. Willamette International is a non-profit, Christian organization that works to provide humanitarian assistance in Sierra Leone West Africa.

Our team has been tasked with designing a user interface for the West African Infectious Disease Diagnostic Aid (WAIDDA). This aid is meant to:

- Guide novice and minimally trained clinicians at locations operated by Willamette International in Sierra Leone through a patient encounter
- Focus mainly on helping such clinicians differentiate between common infectious diseases
- Present information to clinicians based on patient symptoms, signs, history, etc. to help them reach their final diagnosis

The current ideated implementation of WAIDDA will be on some portable electronic device, such as a tablet or laptop.

THE SURVEY:

This survey is only concerned with the visual presentation and usability of the user interface design.

You will be presented with two preliminary design ideas for a final diagnosis user interface screen, i.e. the screen where the user will be asked to decide and record their decision on a final diagnosis. .

When completing the survey, try to envision yourself as a clinician in Sierra Leone using WAIDDA in the field. While our expected users will be inexperienced clinicians, any experience you can apply in your answers will be very helpful in helping us identify what changes ought to be made to the design moving forward. Any feedback and comments you may have will be very helpful to us.

The survey is nine questions long. Three of these ask you to rate aspects of the design (1-5 agree/disagree scale), five ask for short comment answers, and one asks for your occupation. I recommend completing the survey on a larger screen than a smartphone (laptop or tablet).

Thank you again for your time and consideration.

Section 2:
Screenshots of the survey questions.

WAIDDA

1.

Directory: [Main Menu](#) > [New Patient Record Menu](#) > Suggested Diagnosis

Elapsed Time: 14: 21
Date: 01 Sept. 2016

Reminder:
Quickly Review Inputs for Errors

Suggested, Most Likely Diagnosis

Malaria

[Other Potential Diagnosis](#)

Available Rapid Diagnostics

Name:	Quantity:
CareStart Malaria HRP2 (P.f)	5 <input type="checkbox"/>
Humasis Malaria P.f Antigen Test	12 <input checked="" type="checkbox"/>

Available Treatments

Name:	Quantity:
Chloroquine (Aralen)	9 <input checked="" type="checkbox"/>
Mefloquine	2 <input type="checkbox"/>

My Final Diagnosis: Malaria

[Need Help ?](#)

Preliminary Design 1

	Strongly Disagree				Strongly Agree
There is too much information presented on this screen.	<input type="radio"/>				
There is not enough information presented on this screen.	<input type="radio"/>				
The information on this screen is not valuable.	<input type="radio"/>				
The information on this screen is valuable.	<input type="radio"/>				
The information on this screen is relevant to making my final diagnosis.	<input type="radio"/>				
The information on this screen is presented clearly.	<input type="radio"/>				
I would like to be able to look at more information than what is presented on this screen before suggesting a final diagnosis.	<input type="radio"/>				
I can tell which fields are editable with user inputs.	<input type="radio"/>				

2. Please briefly describe your overall impression of this user interface design.

3. Please state what you like and dislike the most about this user interface design.

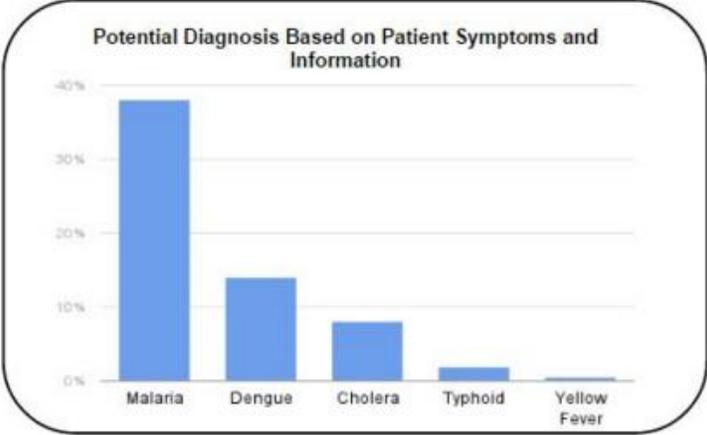
4.

Directory: [Main Menu](#) > [New Patient Record Menu](#) > Suggested Diagnosis

Elapsed Time: 14: 21
Date: 01 Sept. 2016

Reminder:
Quickly Review
Inputs for Errors

**Click on disease
for further detail.**



Disease	Percentage
Malaria	~38%
Dengue	~15%
Cholera	~8%
Typhoid	~2%
Yellow Fever	~1%

My Final Diagnosis:

[Need Help ?](#)

Preliminary Design 2

	Strongly Disagree				Strongly Agree
There is too much information presented on this screen.	<input type="radio"/>				
There is not enough information presented on this screen.	<input type="radio"/>				
The information on this screen is not valuable.	<input type="radio"/>				
The information on this screen is valuable.	<input type="radio"/>				
The information on this screen is relevant to making my final diagnosis.	<input type="radio"/>				
The information on this screen is presented clearly.	<input type="radio"/>				
I would like to be able to look at more information than what is presented on this screen before suggesting a final diagnosis.	<input type="radio"/>				
I can tell which fields are editable with user inputs.	<input type="radio"/>				

5. Please briefly describe your overall impression of this user interface design.

6. Please state what you like and dislike the most about this user interface design.

7.

Both Preliminary Designs are reproduced below.

Directory: [Main Menu](#) > [New Patient Record Menu](#) > Suggested Diagnosis

Elapsed Time: 14: 21
Date: 01 Sept. 2016

Reminder:
Quickly Review Inputs for Errors

Suggested, Most Likely Diagnosis

Malaria

[Other Potential Diagnosis](#)

Available Rapid Diagnostics

Name:	Quantity:	
CareStart Malaria HRP2 (P.f)	5	<input type="checkbox"/>
Humasis Malaria P.f Antigen Test	12	<input checked="" type="checkbox"/>

Available Treatments

Name:	Quantity:	
Chloroquine (Aralen)	9	<input checked="" type="checkbox"/>
Mefloquine	2	<input type="checkbox"/>

My Final Diagnosis:

[Need Help](#)

Complete

Directory: [Main Menu](#) > [New Patient Record Menu](#) > Suggested Diagnosis

Elapsed Time: 14: 21
Date: 01 Sept. 2016

Reminder:
Quickly Review Inputs for Errors

Click on disease for further detail.

Potential Diagnosis Based on Patient Symptoms and Information

Disease	Percentage
Malaria	~40%
Dengue	~15%
Cholera	~10%
Typhoid	~5%
Yellow Fever	~2%

My Final Diagnosis:

[Need Help](#)

Complete

Regarding both designs:

	Strongly Disagree				Strongly Agree
I believe a "Suggested, Most Likely Diagnosis" box would be helpful for the user to have.	<input type="radio"/>				
I believe a "Suggested, Most Likely Diagnosis" box should be included.	<input type="radio"/>				
I believe the graph showing all potential diagnoses would be helpful for the user to have.	<input type="radio"/>				
I believe the graph showing all potential diagnoses should be included..	<input type="radio"/>				
I believe information regarding treatments and rapid diagnostic tests currently available would be helpful for the user to have.	<input type="radio"/>				
I believe information regarding treatments and rapid diagnostic tests currently available should be included.	<input type="radio"/>				

8. Which Preliminary Design would you prefer, if you had to pick between the two?
Please include any comments or concerns you may have regarding these designs.

9. Please tell us your occupation.

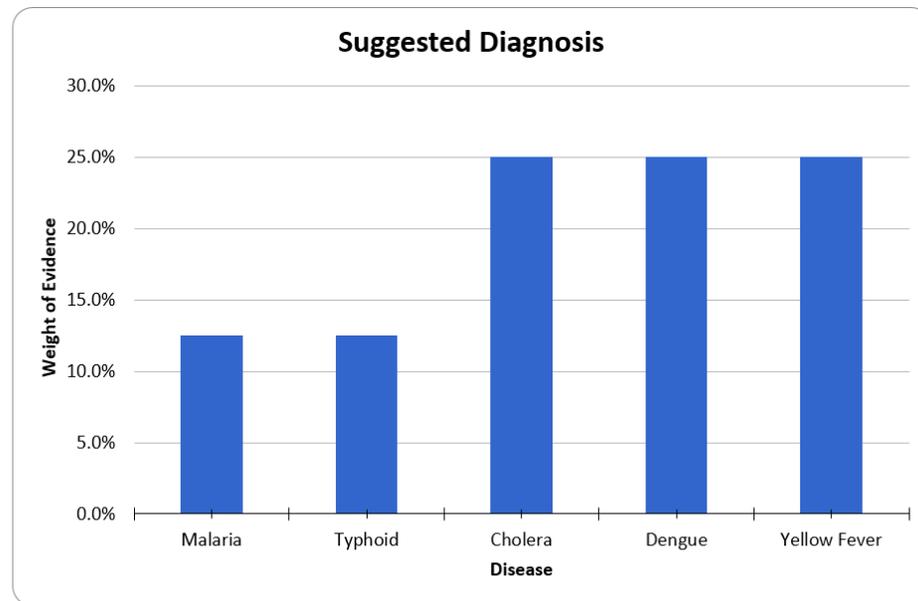
Appendix K: Mock WAIDDA Engine Example of a Patient Presenting Clinical Symptoms of DENGUE

Weights Legend:	Question 1:	Question 2:	Question 3:	Question 4:	Question 5:	Question 6:	Question 7:	Diagnosis Score	Diagnosis Score	Average	Standard Deviation	Standardized Score
	High Fever?	Severe Headache?	Pain Behind the Eyes?	Muscle and/or Joint Pain?	Nausea and/or Vomitting?	Swollen Lymph Glands?	Recently Bitten by Mosquito?					
() Next to Disease Name None: No Relationship (1): Moderate Relationship (2): Strong Relationship	Dengue (2) Typhoid (2)	Dengue (2) Typhoid (2) Malaria (1) Yellow Fever (1)	Dengue (2) Typhoid (2)	Dengue (1) Typhoid (1) Yellow Fever (1) Cholera (1)	Dengue (1) Malaria (1) Yellow Fever (1) Cholera(1)	Dengue Weight (2) Typhoid Weight (2)	Dengue (2) Malaria (2) Yellow Fever (2)					
RESPONSE	YES	YES	YES	YES	YES	YES	YES	RAW	PERCENT			
Malaria	0	1	0	0	1	0	2	4	13.3%	6	3.391164992	-0.6
Typhoid	2	2	2	1	0	2	0	9	30.0%			0.9
Cholera	0	0	0	1	1	0	0	2	6.7%			-1.2
Dengue	0	2	2	1	1	2	2	10	33.3%			1.2
Yellow Fever	0	1	0	1	1	0	2	5	16.7%			-0.3

Matching Diagnoses:

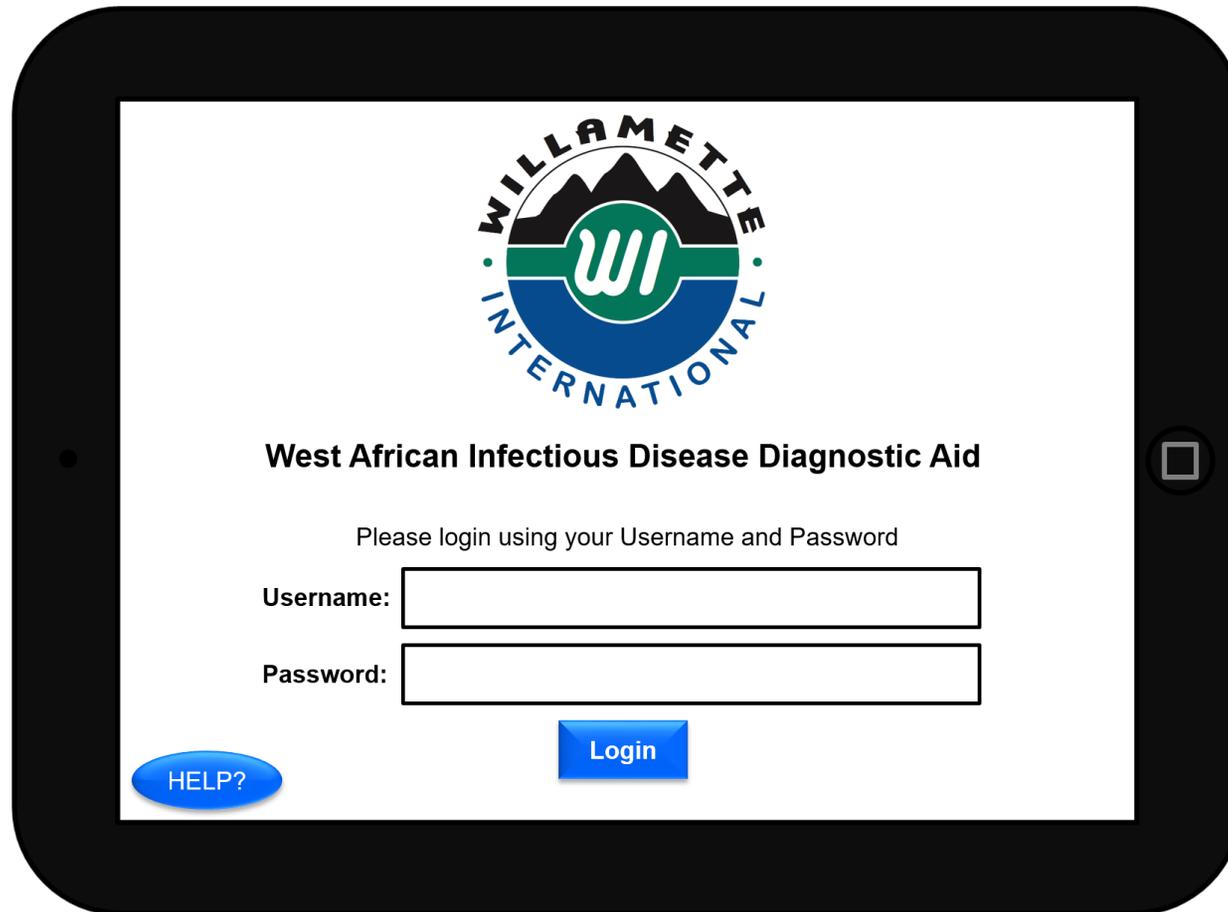
Cholera	25.0%
Dengue	25.0%
Yellow Fever	25.0%

****WARNING: Review Patient Information****



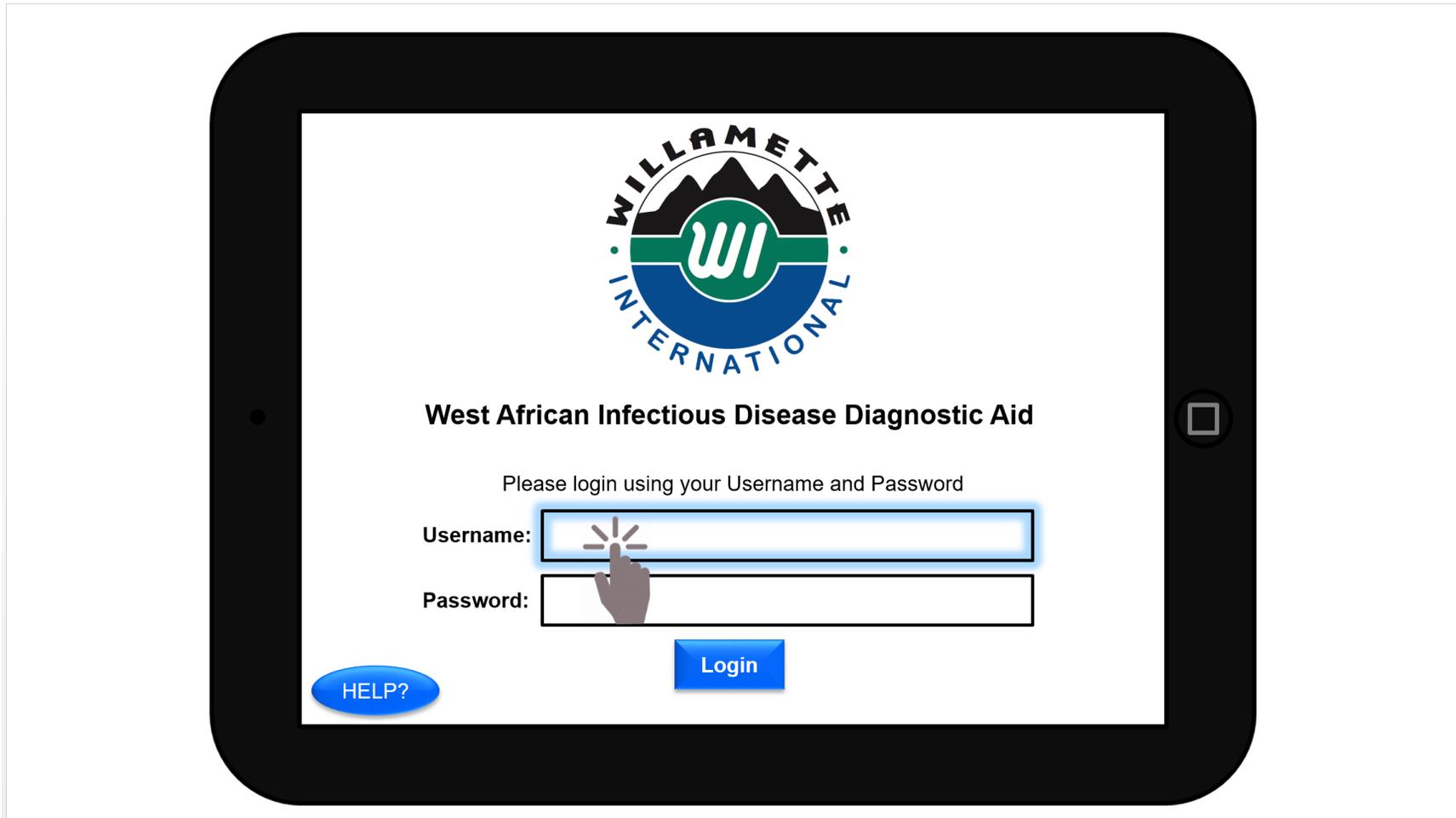
Appendix L: Final UI Design

****All these screens were taken as screen shots and therefore are scaled smaller than the original Preliminary Design. If this was opened in PowerPoint instead of Word they would still be scaled exactly to size. However, to incorporate these in this same document this approach was taken.****



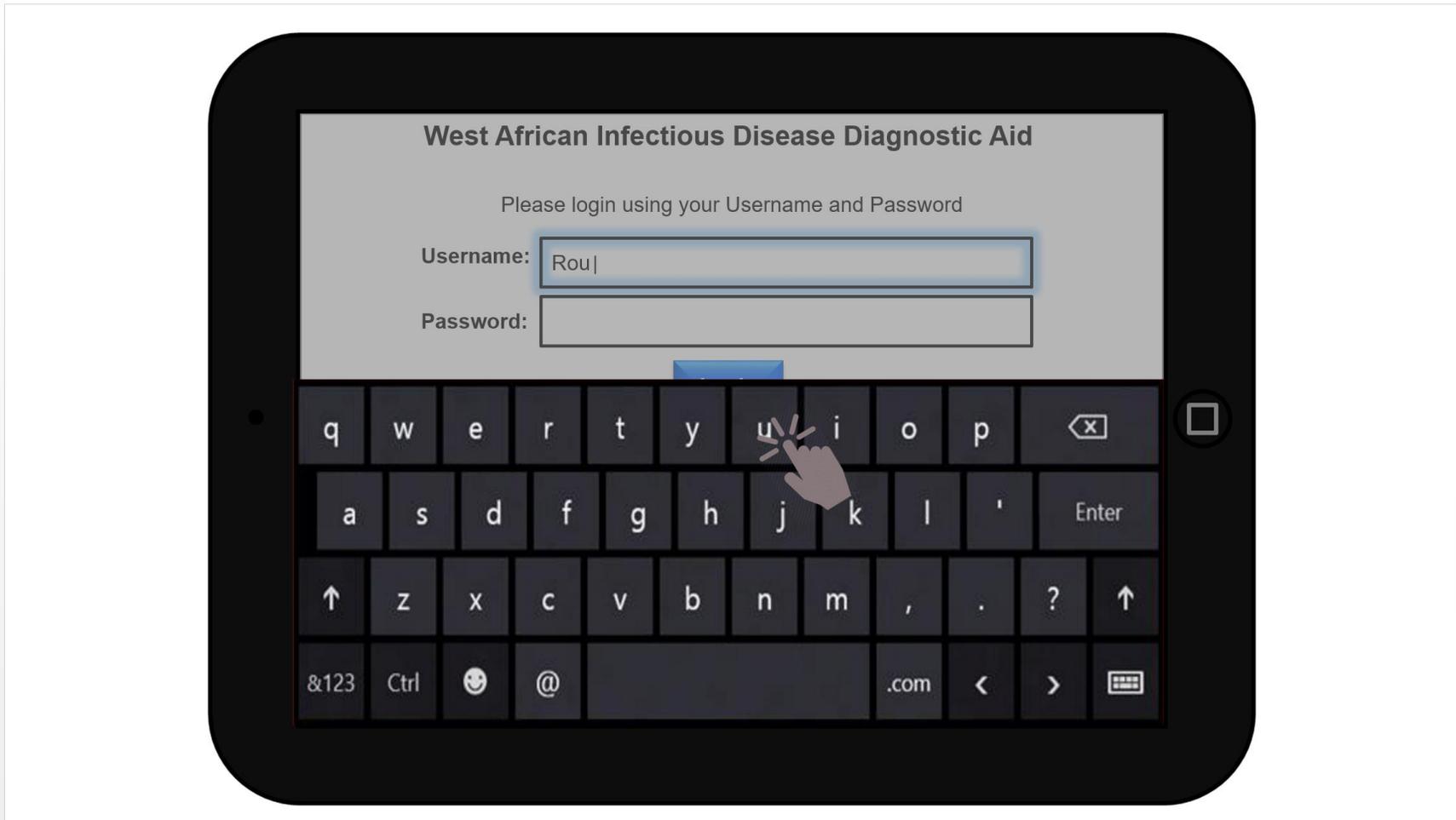
Login Page:

- Users are all prompted to log in to their unique account for systematic quality control purposes.
- The hyperlinks under “Username” and “Password” will direct users to the appropriate help page, *connectivity* means and *what these pages will look like* are TBD and will be considered data managing which is outside the scope of this project.
- The “Login” button will lead users to the screen on the following page.



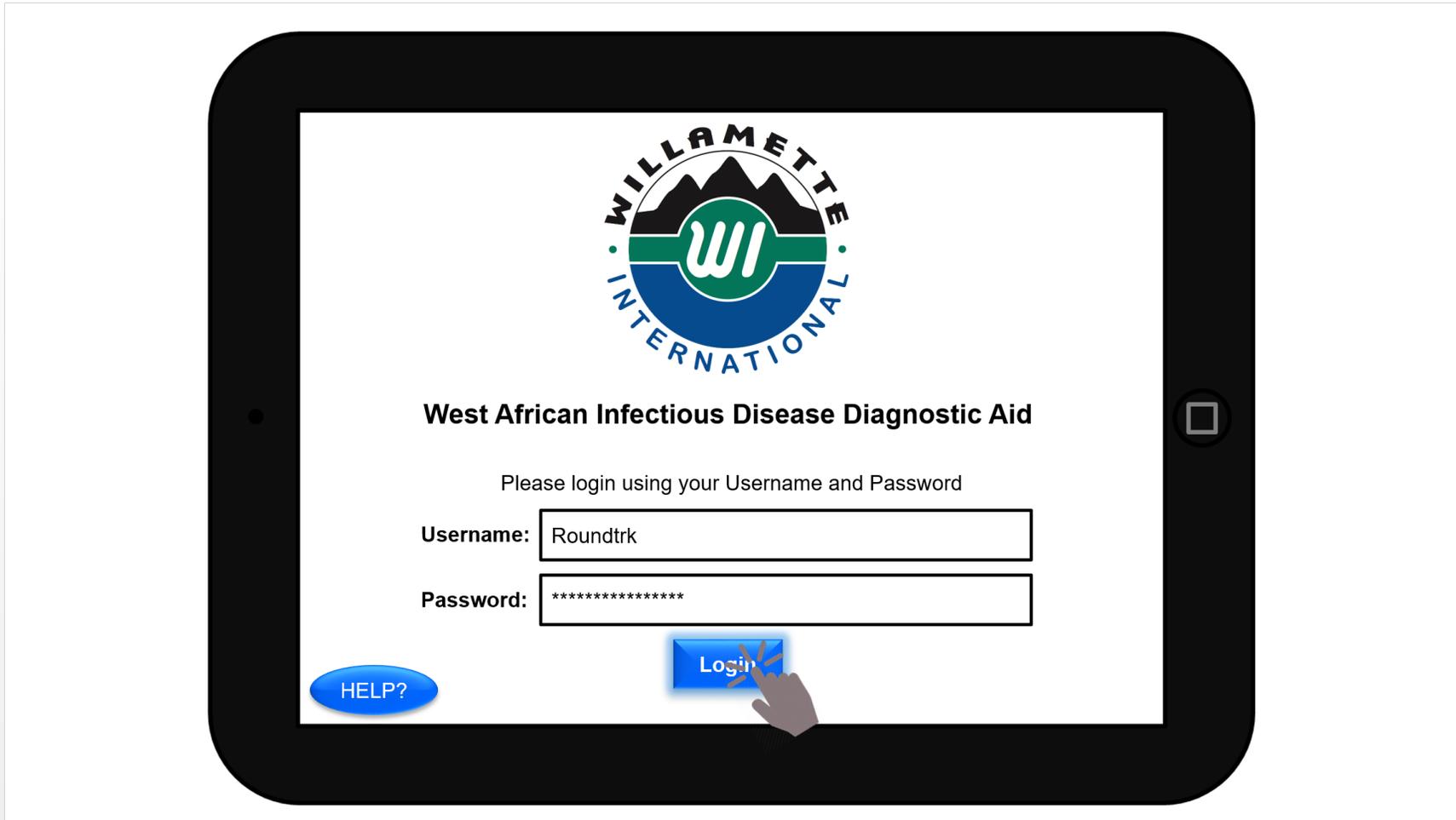
Login Page:

- Users are all prompted to log in to their unique account for systematic quality control purposes.
- The hyperlinks under “Username” and “Password” will direct users to the appropriate help page, *connectivity* means and *what these pages will look like* are TBD and will be considered data managing which is outside the scope of this project.
- The “Login” button will lead users to the screen on the following page.



Login Page:

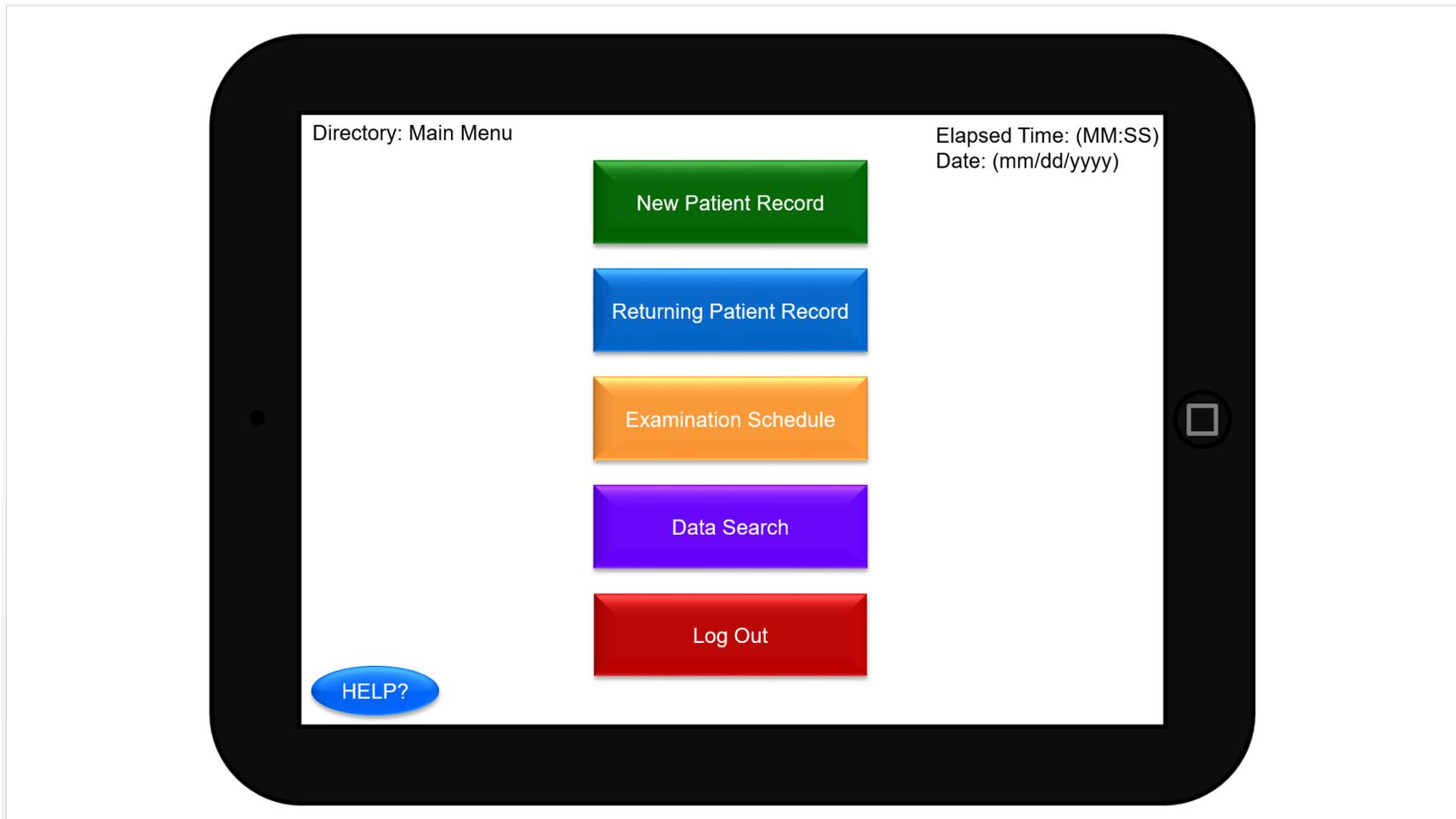
- Users are all prompted to log in to their unique account for systematic quality control purposes.
- The hyperlinks under “Username” and “Password” will direct users to the appropriate help page, *connectivity* means and *what these pages will look like* are TBD and will be considered data managing which is outside the scope of this project.
- The “Login” button will lead users to the screen on the following page.



Login Page:

- Users are all prompted to log in to their unique account for systematic quality control purposes.
- The hyperlinks under “Username” and “Password” will direct users to the appropriate help page, *connectivity* means and *what these pages will look like* are TBD and will be considered data managing which is outside the scope of this project.

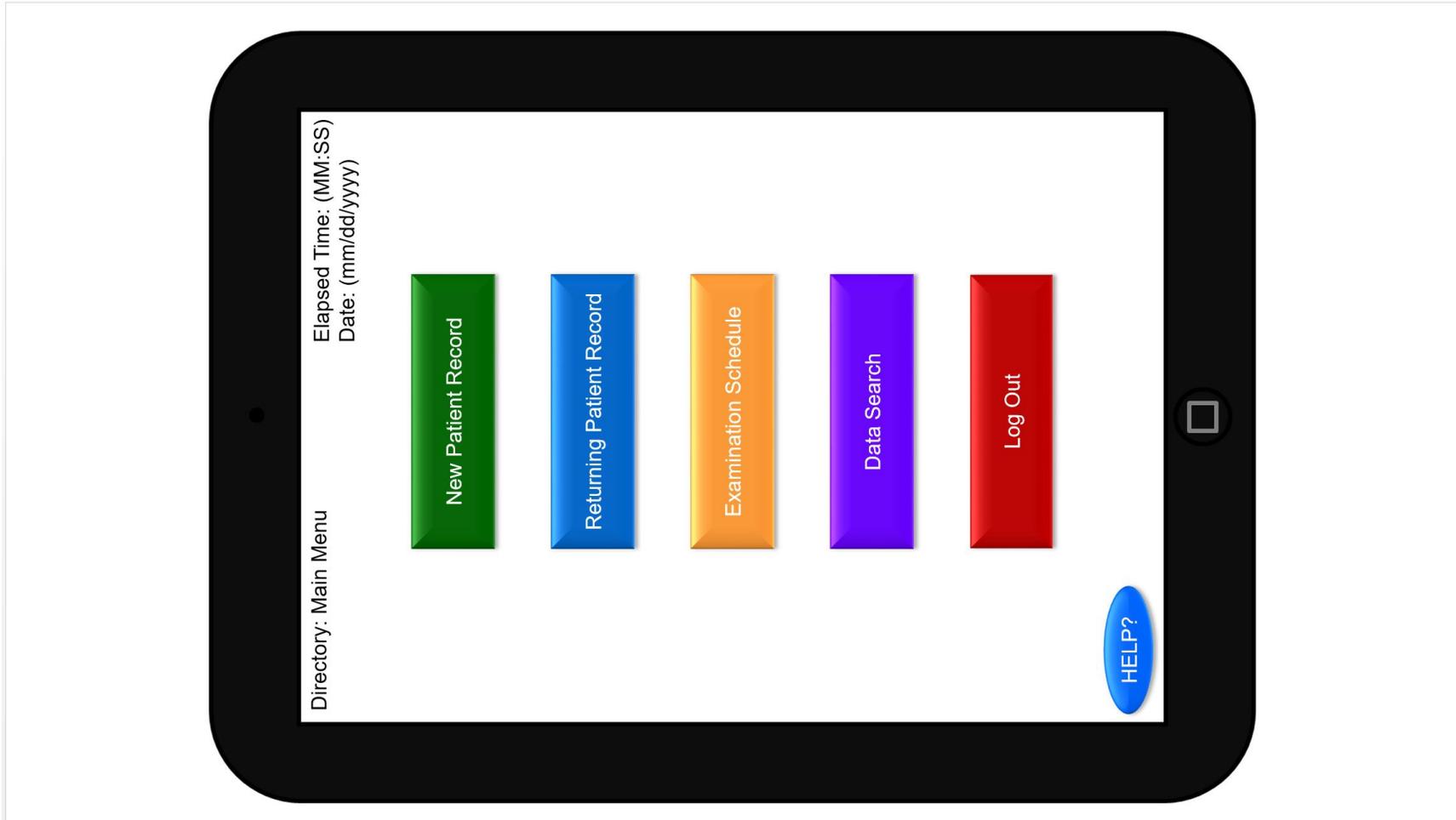
- The “Login” button will lead users to the screen on the following page.



Main Menu:

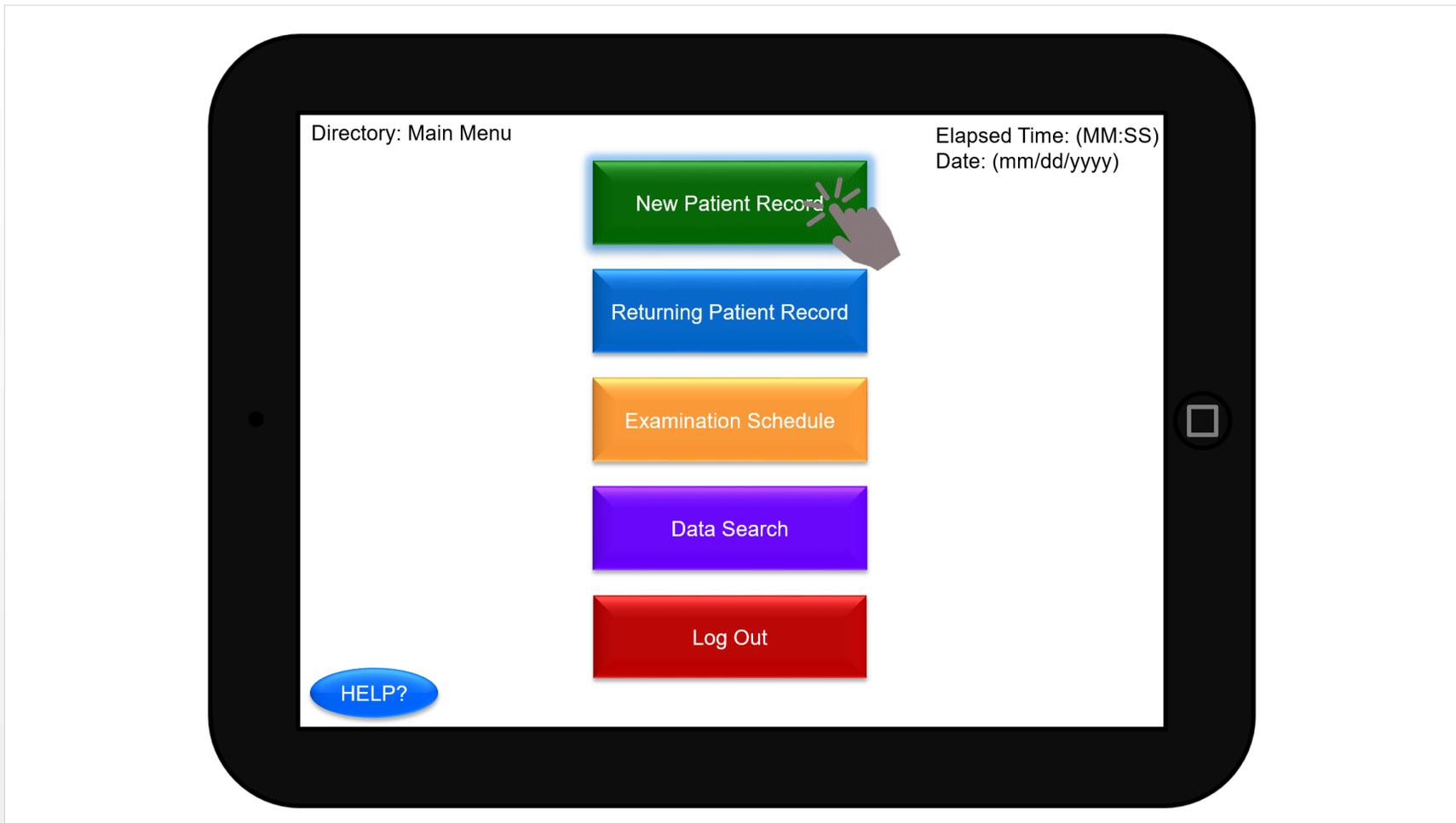
- The “Elapsed Time” counter in the upper right corner is meant to help clinicians be mindful of how long each encounter is taking.

- Each button presented in the Main Menu are colored to match button colors as they will appear in the respective sections, i.e. all “Save” or “Confirm” buttons under “Returning Patient Record” will be the same shade of blue as the Main Menu button. This is meant to lower potential confusion for users since new and returning patient record formats may be similar in some cases.
- “Examination Schedule” and “Data Search” are ultimately outside the scope of this project; please refer to Appendix G for further detail. The “Need Help” link will take users to a screen where a general explanation will be given regarding a general overview of the WAIDDA interface. This help screen is TBD* and may be inserted as an Appendix section as discussed at the previous meeting.



Main Menu: if the user wants to orient the screen vertically this would be an example of how it would look

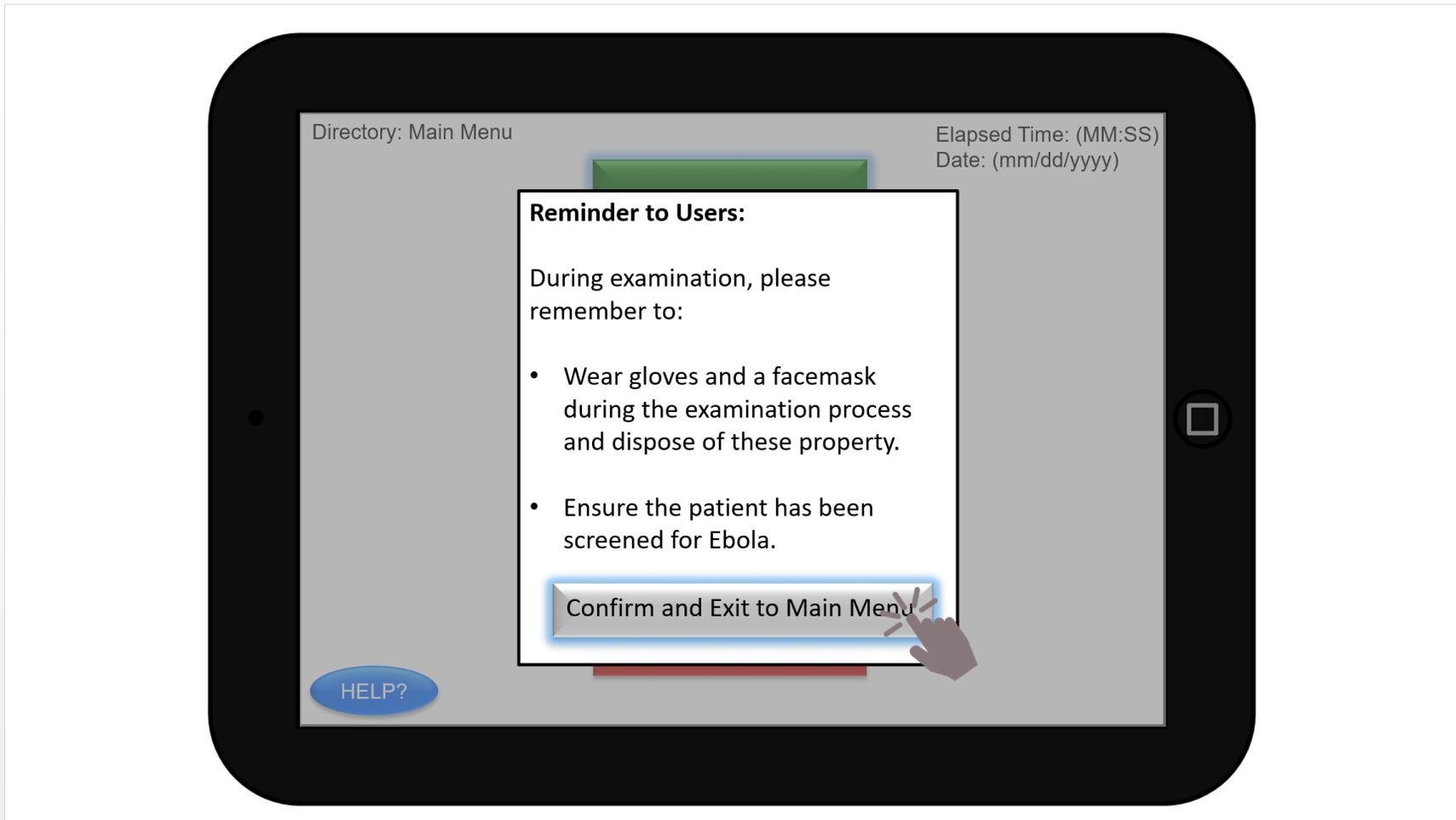
- The “Elapsed Time” counter in the upper right corner is meant to help clinicians be mindful of how long each encounter is taking.
- Each button presented in the Main Menu are colored to match button colors as they will appear in the respective sections, i.e. all “Save” or “Confirm” buttons under “Returning Patient Record” will be the same shade of blue as the Main Menu button. This is meant to lower potential confusion for users since new and returning patient record formats may be similar in some cases.
- “Examination Schedule” and “Data Search” are ultimately outside the scope of this project; please refer to Appendix G for further detail. The “Need Help” link will take users to a screen where a general explanation will be given regarding a general overview of the WAIDDA interface. This help screen is TBD* and may be inserted as an Appendix section as discussed at the previous meeting.



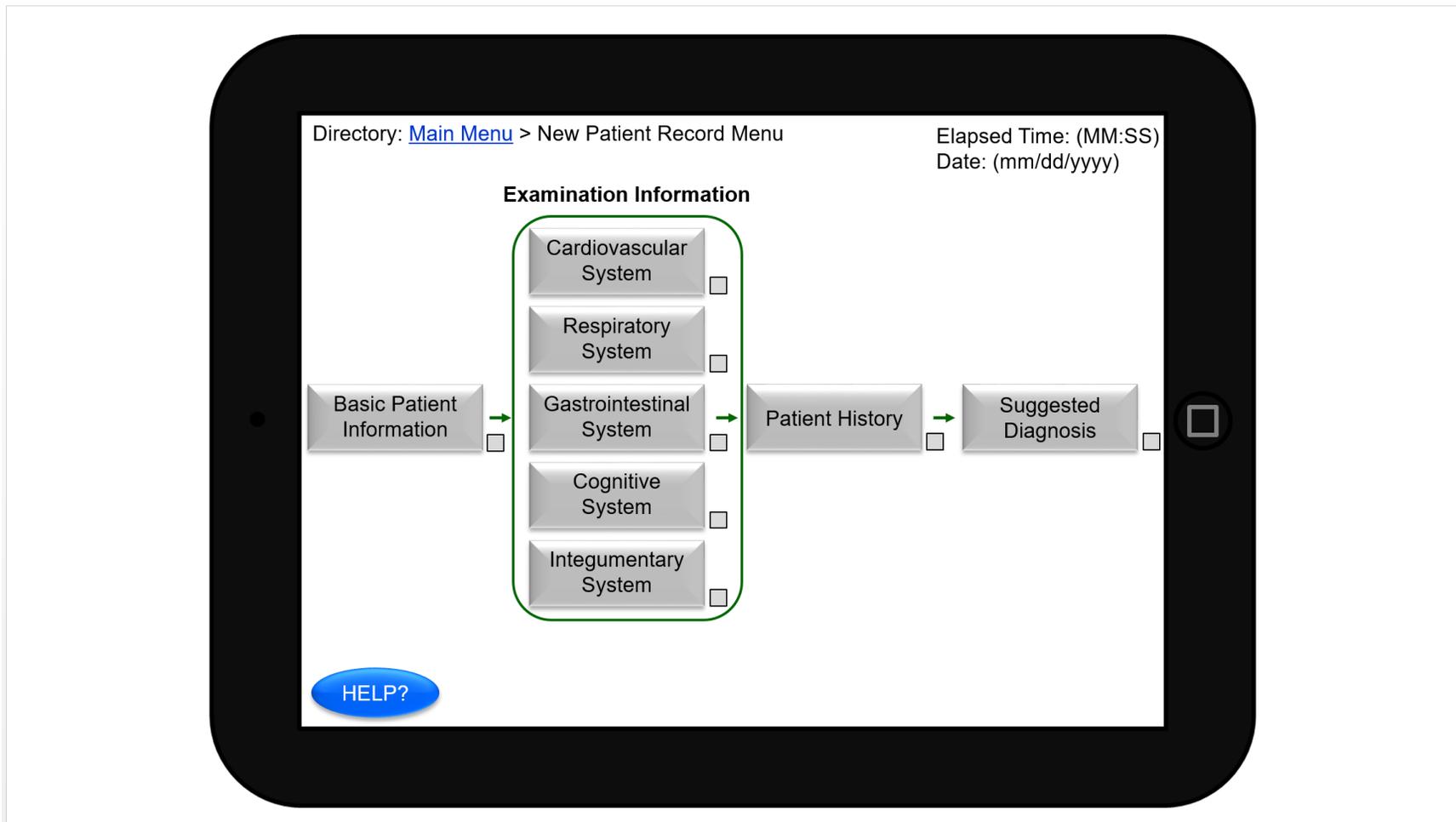
Main Menu:

- The “Elapsed Time” counter in the upper right corner is meant to help clinicians be mindful of how long each encounter is taking.
- Each button presented in the Main Menu are colored to match button colors as they will appear in the respective sections, i.e. all “Save” or “Confirm” buttons under “Returning Patient Record” will be the same shade of blue as the Main Menu button. This is meant to lower potential confusion for users since new and returning patient record formats may be similar in some cases.

- “Examination Schedule” and “Data Search” are ultimately outside the scope of this project; please refer to Appendix G for further detail. The “Need Help” link will take users to a screen where a general explanation will be given regarding a general overview of the WAIDDA interface. This help screen is TBD* and may be inserted as an Appendix section as discussed at the previous meeting.



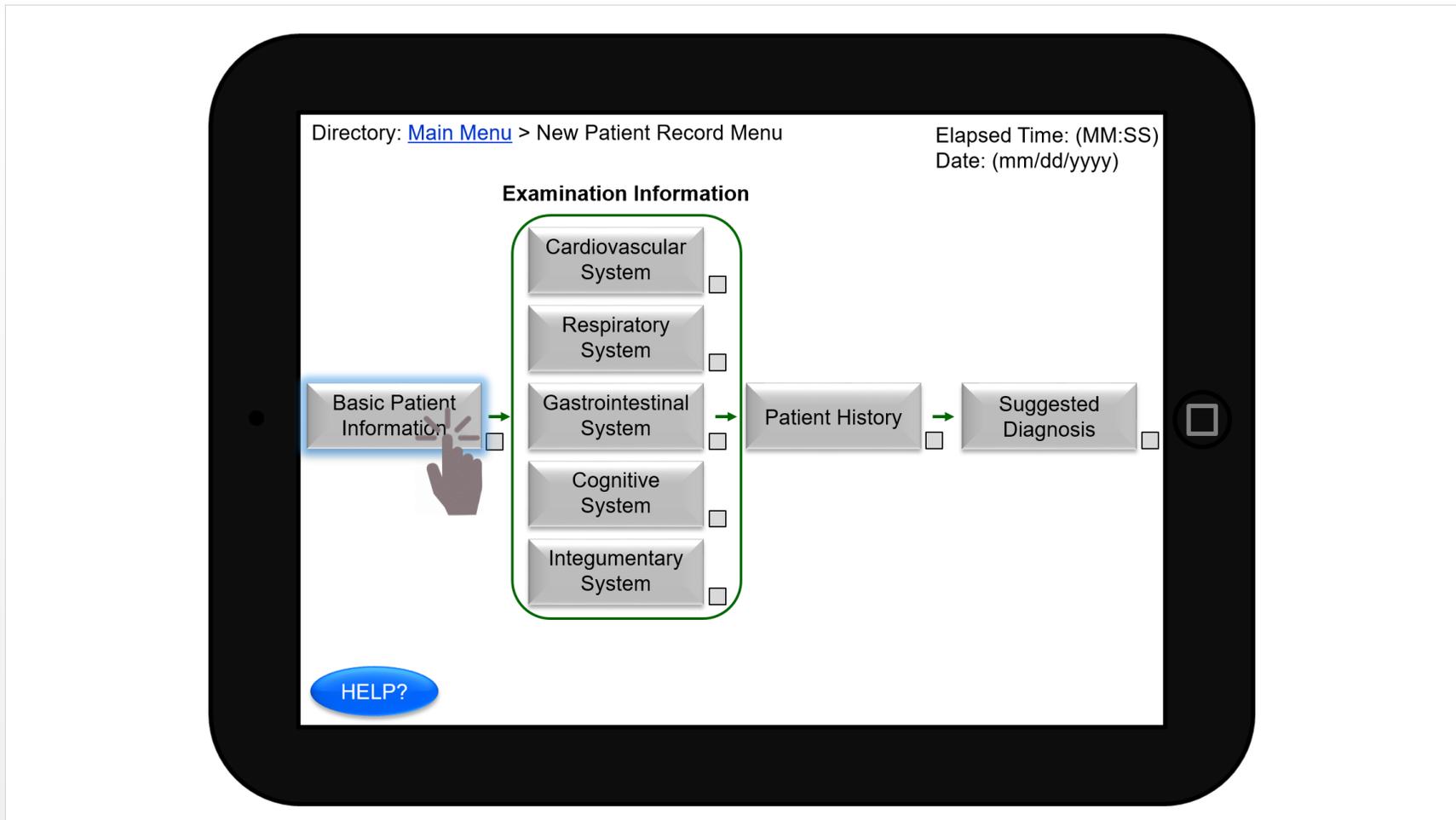
Page intended for after the user logs in. This would occur once after logging in and not in between patient encounters.



New Patient Record Menu:

- This menu is what is shown if the user selects “New Patient Record” under the Main Menu.
- The blank check boxes indicate that there are question(s) under that set of questions and clinical checks that still need to be performed. The green check mark indicates that all required questions and fields have been completed.

- The questions and checks are divided and chosen by the system in accordance to the chief complaint by the system (See Appendix B and example of system).



New Patient Record Menu:

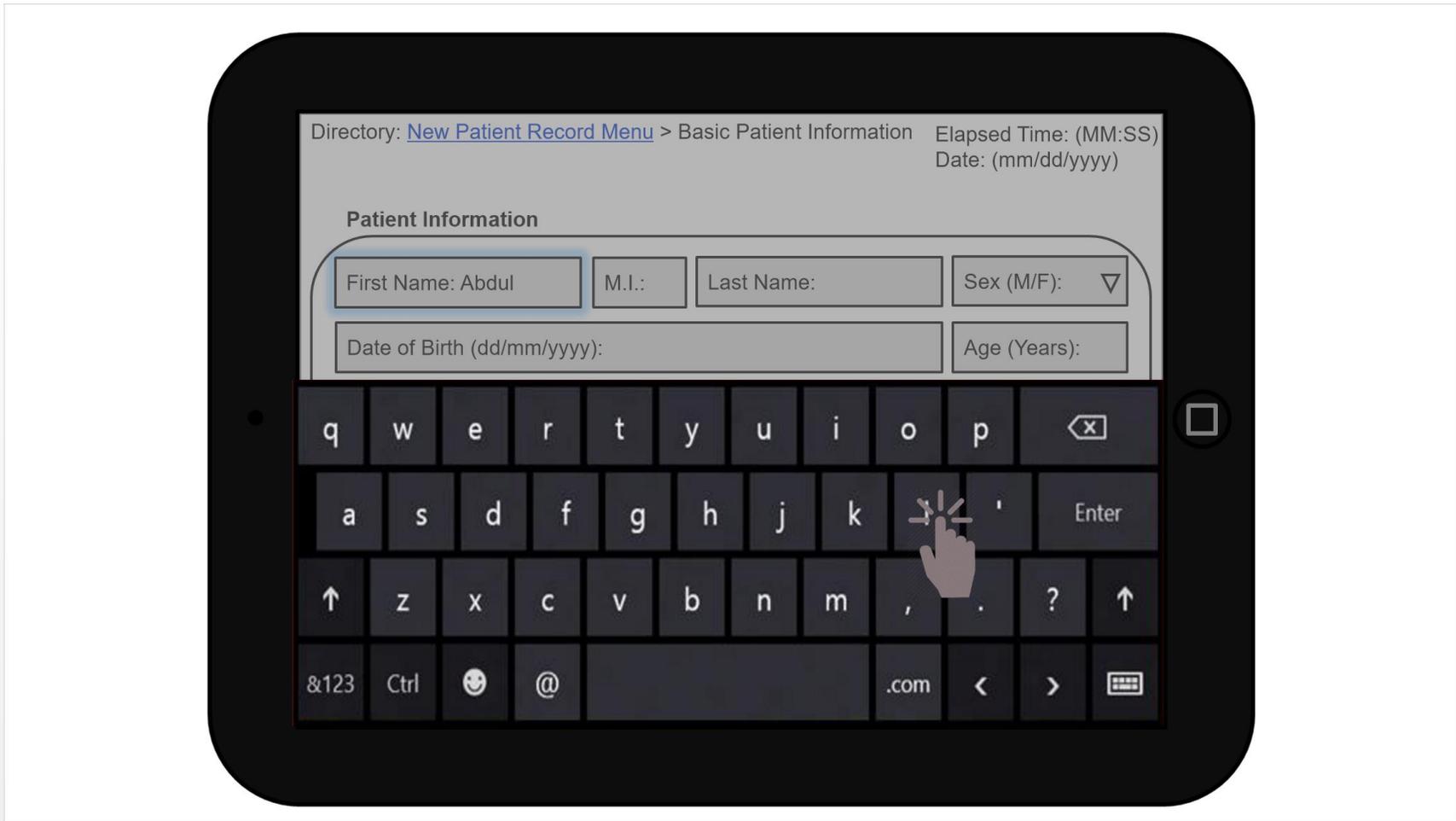
- This menu is what is shown if the user selects “New Patient Record” under the Main Menu.

- The blank check boxes indicate that there are question(s) under that set of questions and clinical checks that still need to be performed. The green check mark indicates that all required questions and fields have been completed.
- The questions and checks are divided and chosen by the system in accordance to the chief complaint by the system (See Appendix B and example of system).

The screenshot shows a mobile application interface for entering patient information. At the top, it displays the navigation path: "Directory: [New Patient Record Menu](#) > Basic Patient Information". To the right of this path, it shows "Elapsed Time: (MM:SS)" and "Date: (mm/dd/yyyy)". Below this is a section titled "Patient Information" which is enclosed in a rounded rectangle. This section contains several input fields: "First Name:", "M.I.:", "Last Name:", "Sex (M/F):" with a dropdown arrow, "Date of Birth (dd/mm/yyyy):", "Age (Years):", "Height (cm):", "Weight (kg):", "BP (mm Hg):", and "Pulse (BPM):". Below these fields is a large text area labeled "Chief Complaint:". At the bottom left of the screen is a blue oval button labeled "HELP?". At the bottom right is a green rectangular button labeled "Create".

Basic Patient Information:

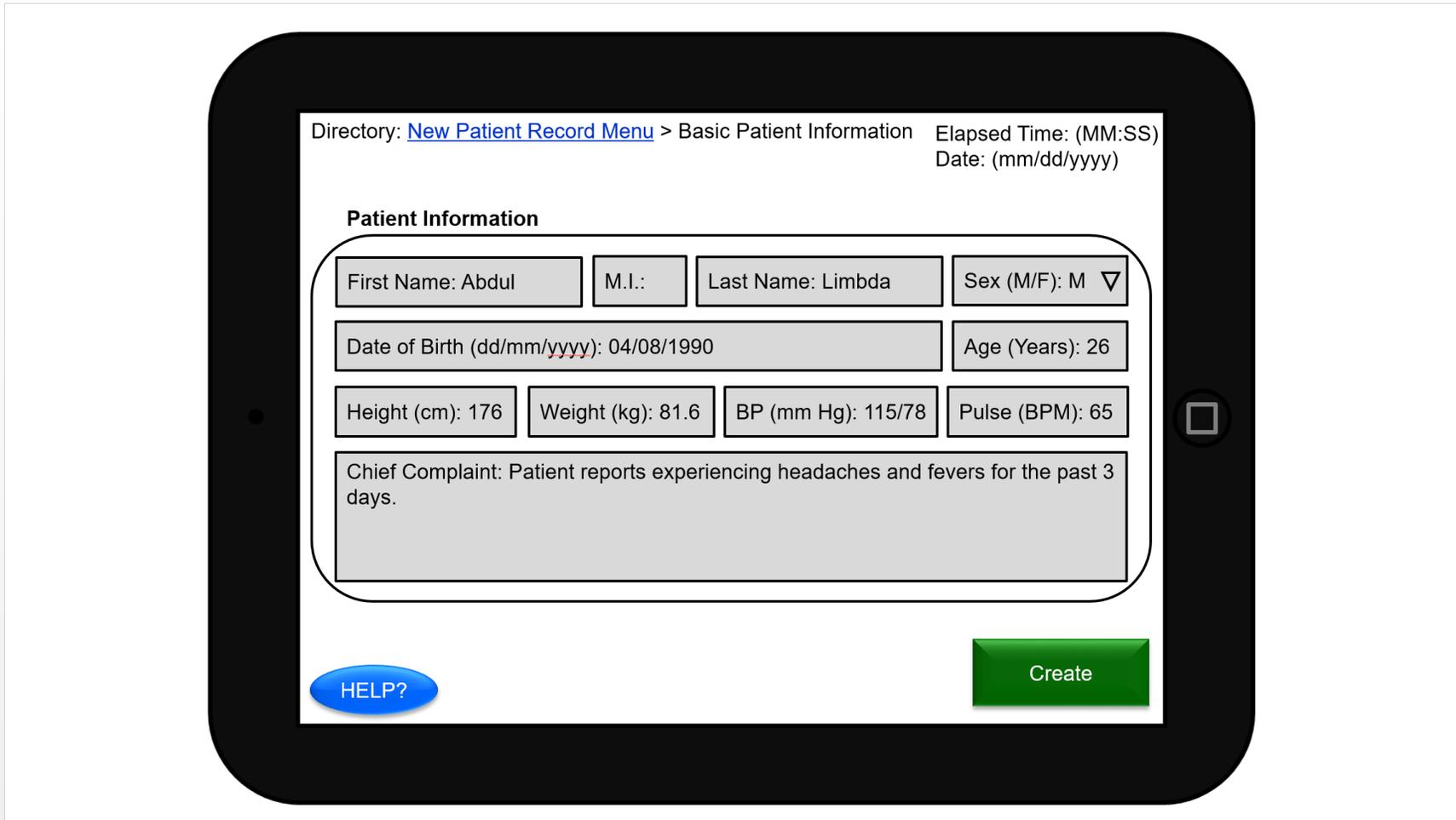
- Fields in dark grey are editable by the user. An example is given for an exemplary and imaginary patient.
- The “Create” button will save the information inputted and take the user back to the Main Menu on the previous page. The green on the “Create” button helps indicate that this screen is for a new patient record, which may be confirmed in the directory in the upper left corner.



Basic Patient Information:

- Fields in dark grey are editable by the user. An example is given for an exemplary and imaginary patient.

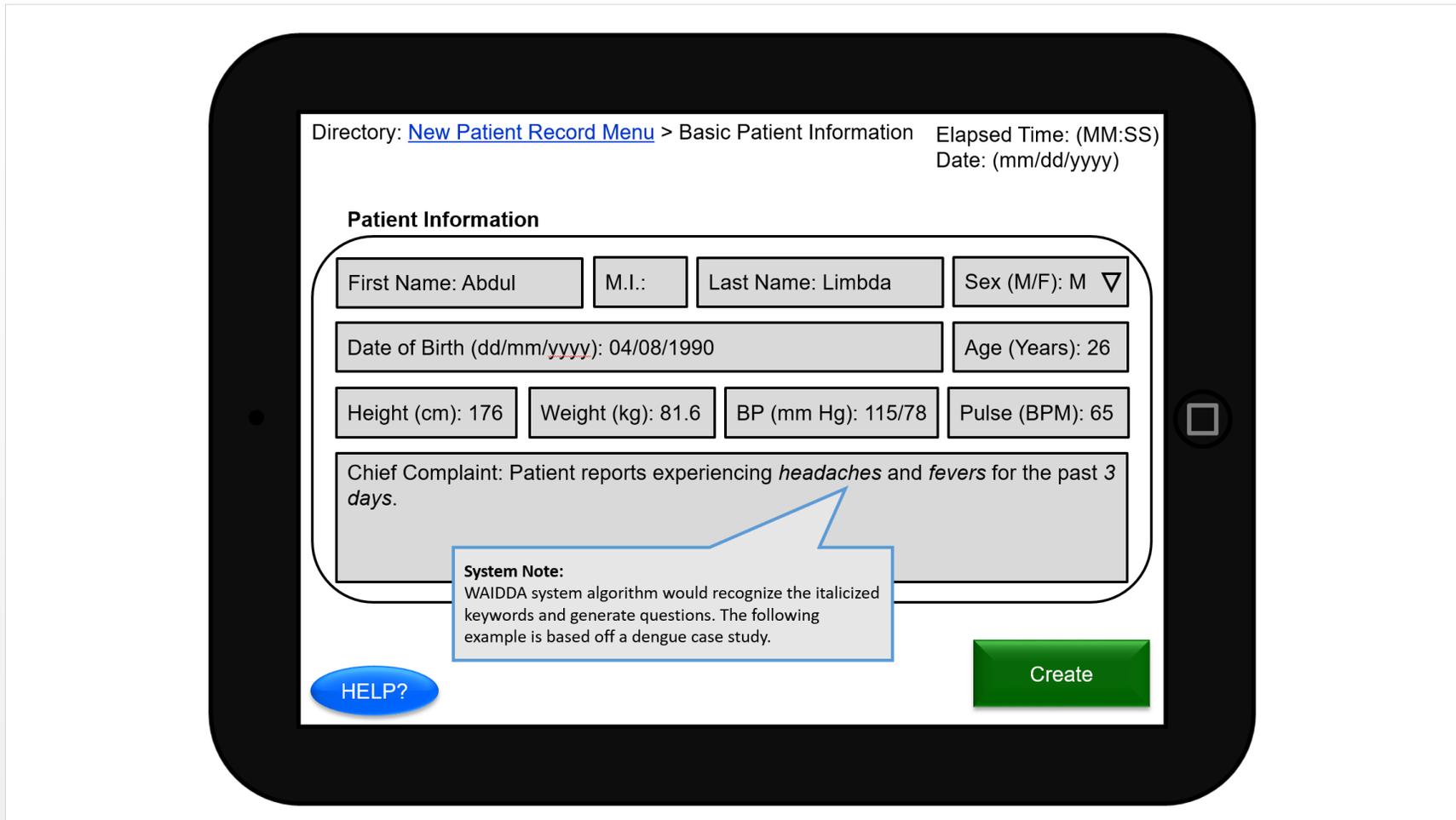
- The “Create” button will save the information inputted and take the user back to the Main Menu on the previous page. The green on the “Create” button helps indicate that this screen is for a new patient record, which may be confirmed in the directory in the upper left corner.



Basic Patient Information:

- Fields in dark grey are editable by the user. An example is given for an exemplary and imaginary patient.

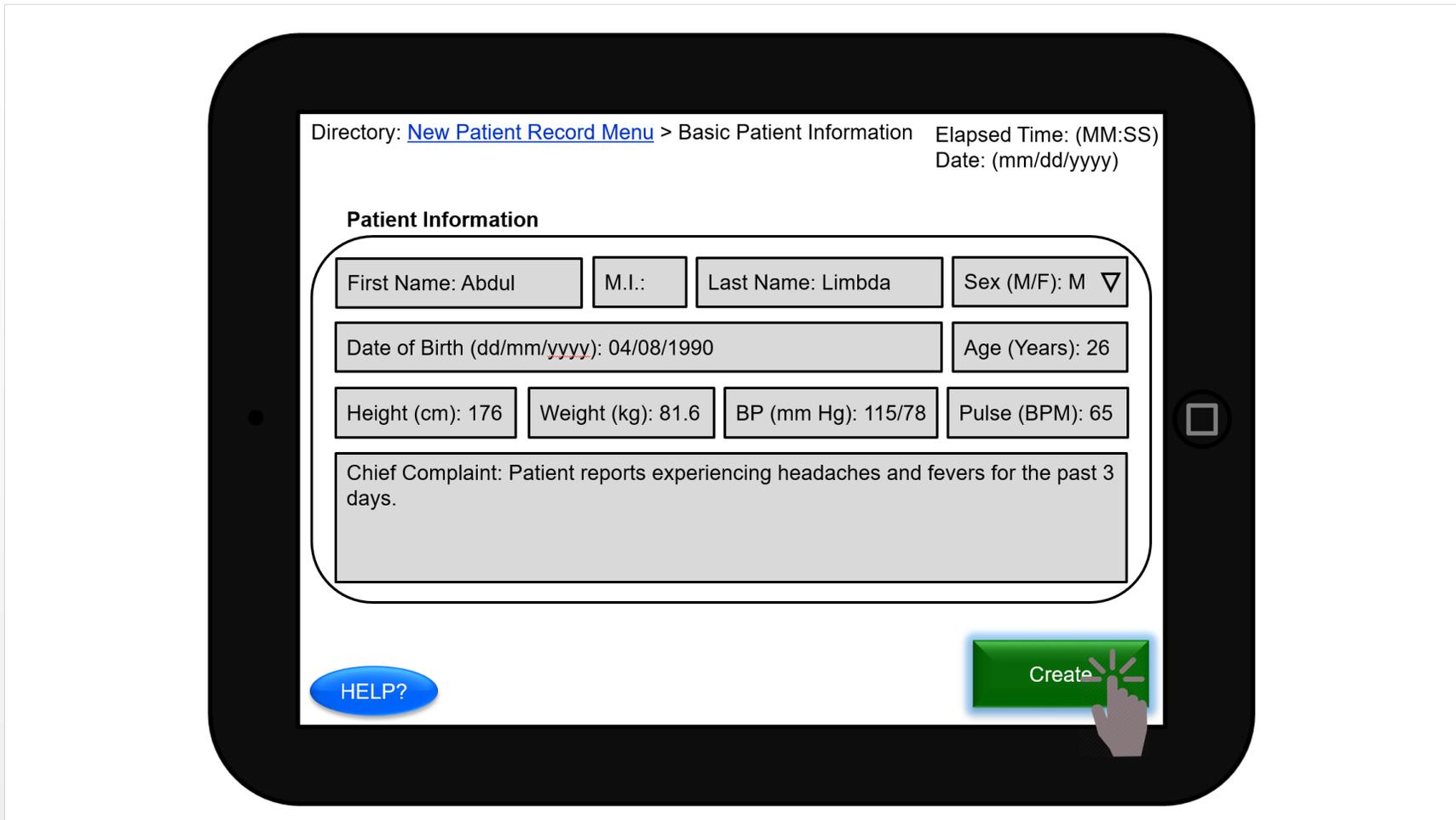
- The “Create” button will save the information inputted and take the user back to the Main Menu on the previous page. The green on the “Create” button helps indicate that this screen is for a new patient record, which may be confirmed in the directory in the upper left corner.



Basic Patient Information:

- Fields in dark grey are editable by the user. An example is given for an exemplary and imaginary patient.

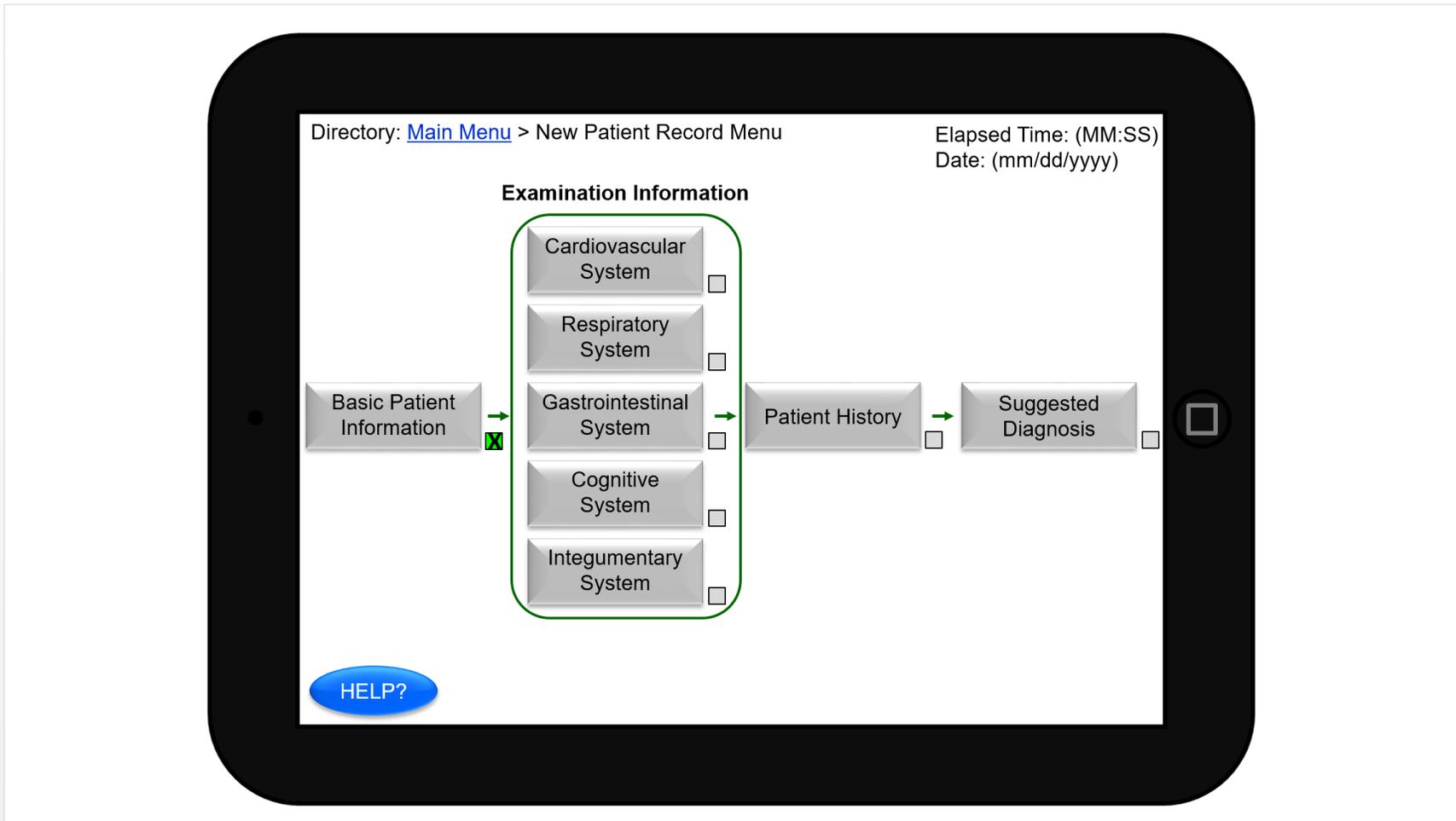
- The “Create” button will save the information inputted and take the user back to the Main Menu on the previous page. The green on the “Create” button helps indicate that this screen is for a new patient record, which may be confirmed in the directory in the upper left corner.



Basic Patient Information:

- Fields in dark grey are editable by the user. An example is given for an exemplary and imaginary patient.

- The “Create” button will save the information inputted and take the user back to the Main Menu on the previous page. The green on the “Create” button helps indicate that this screen is for a new patient record, which may be confirmed in the directory in the upper left corner.



New Patient Record Menu:

- This menu is what is shown if the user selects “New Patient Record” under the Main Menu.

- The blank check boxes indicate that there are question(s) under that set of questions and clinical checks that still need to be performed. The green check mark indicates that all required questions and fields have been completed.

The questions and checks are divided and chosen by the system in accordance to the chief complaint by the system (See Appendix B and example of system).

The screenshot shows a mobile application interface for a medical record. At the top, it displays the directory path: "Directory: [New Patient Record Menu](#) > Cardiovascular System". To the right, it shows "Elapsed Time: (MM:SS)" and "Date: (mm/dd/yyyy)". A blue link "Next Question >" is positioned in the top right corner. The main question is "Have you, the patient, been experiencing chest pain?". Below this, there is a form field with the text "Select their answer: Yes: No: ". Underneath, it says "If Yes, select the [severity](#):" followed by a dropdown menu currently showing "None". A large text area labeled "Notes:" is provided for additional information. At the bottom of the question area, it says "Question 1/2". In the bottom left corner, there is a blue oval button labeled "HELP?". In the bottom right corner, there is a green rectangular button labeled "Save & Go to Next Question".

These answers would point towards dengue based on the case study.

Directory: [New Patient Record Menu](#) > Cardiovascular System

Elapsed Time: (MM:SS)

Date: (mm/dd/yyyy)

[Next Question >](#)

Have you, the patient, been experiencing chest pain?

Select their answer: Yes: No:

If Yes, select the [severity](#):

None



Notes:

System Note:

This link would take users to a Table containing defining and detailing which symptom warrants which severity rating (See Appendix B.)

HELP?

Save & Go to
Next Question

Directory: [New Patient Record Menu](#) > Cardiovascular System Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[Next Question >](#)

Have you, the patient, been experiencing chest pain?

Select their answer: Yes: No:

If Yes, select the [severity](#): None ▾

Notes:

Question 1/2

[HELP?](#) [Save & Go to Next Question](#)

These answers would point towards dengue based on the case study.

Directory: [New Patient Record Menu](#) > Gastrointestinal System Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[< Previous Question](#)

Have you, the patient, experienced vomiting since the onset of their symptoms?

Select their answer: Yes: No:

If Yes, select the [consistency](#) of the vomit, if known:

Notes:

Question 3/3

[HELP?](#) [Save & Return to Main Menu](#)

These answers would point towards dengue based on the case study.

Directory: [New Patient Record Menu](#) > Gastrointestinal System Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[< Previous Question](#)

Have you, the patient, experienced vomiting since the onset of their symptoms?

Select their answer: Yes: No:

If Yes, select the [consistency](#) of the vomit, if known: None

Notes:

Question 3/3

[HELP?](#) [Save & Return to Main Menu](#)

These answers would point towards dengue based on the case study.

Directory: [New Patient Record Menu](#) > Gastrointestinal System Elapsed Time: (MM:SS)
 Date: (mm/dd/yyyy)

[< Previous Question](#)

Have you, the patient, experienced vomiting since the onset of their symptoms?

Select their answer: Yes: No:

If Yes, select the consistency of the vomit, if known:

Notes:

- Unknown
- Watery
- Chunky (with undigested food)
- Nothing (just air)

Question 3/3

[HELP?](#) [Save & Return to Main Menu](#)

These answers would point towards dengue based on the case study.

Directory: [New Patient Record Menu](#) > Gastrointestinal System Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[< Previous Question](#)

Have you, the patient, experienced vomiting since the onset of their symptoms?

Select their answer: Yes: No:

If Yes, select the [consistency](#) of the vomit, if known: Chunky with undigested food ▾

Notes:

Question 3/3

HELP?

Save & Return
to Main Menu

These answers would point towards dengue based on the case study.

Directory: [New Patient Record Menu](#) > Cognitive System

Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[Next Question >](#)

What is your, the patient, first name?

Appropriate Answer: Abdul

Do these match?: Yes: No:

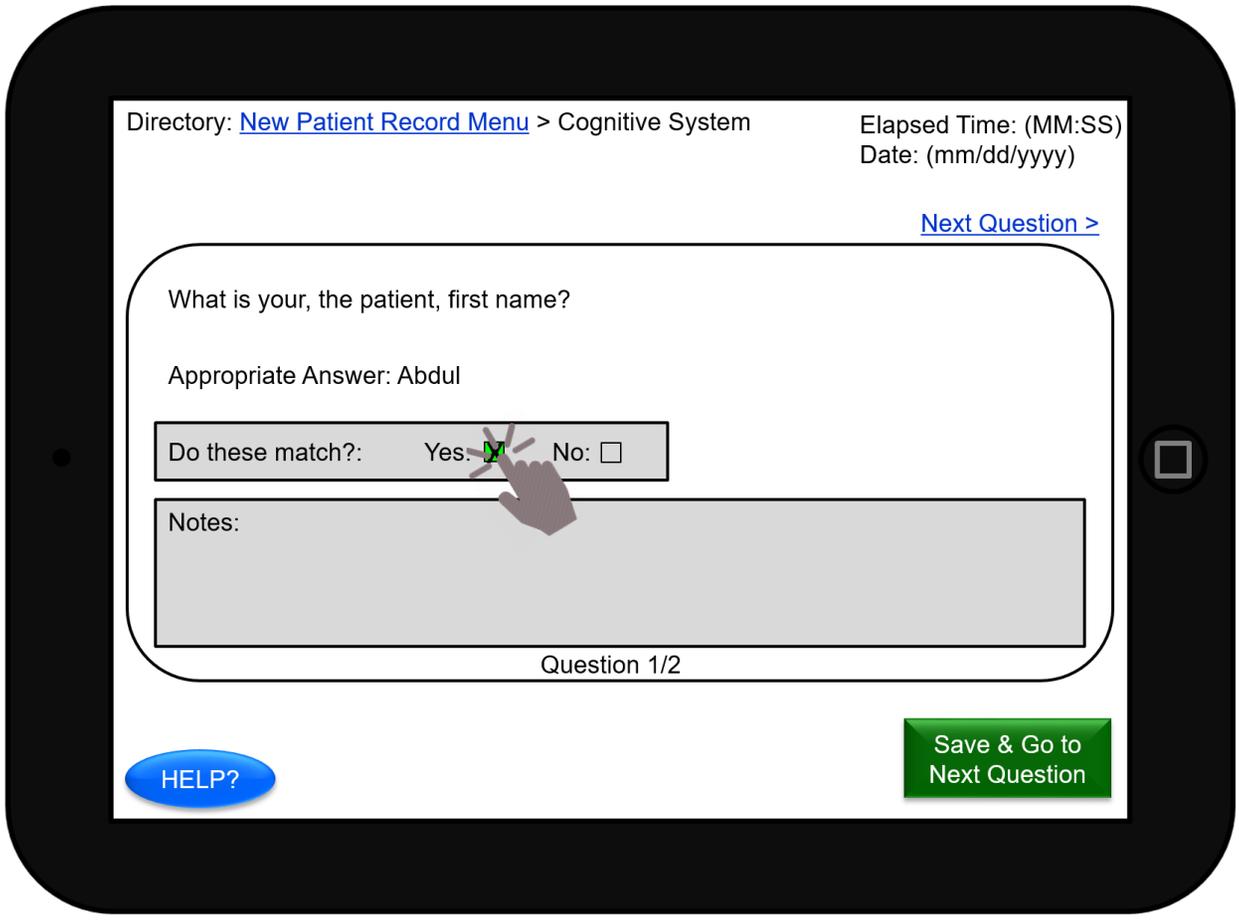
Notes:

Question 1/2

HELP?

Save & Go to
Next Question

These answers reflect a conscious and responsive patient.



These answers reflect a conscious and responsive patient.

Directory: [New Patient Record Menu](#) > Cognitive System

Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[Next Question >](#)

What is your, the patient, first name?

Appropriate Answer: Abdul

Do these match?: Yes: No:

Notes:

Question 1/2

HELP?

Save & Go to
Next Question

These answers reflect a conscious and responsive patient.

Directory: [New Patient Record Menu](#) > Integumentary System

Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[< Previous Question](#)

[Next Question >](#)

Check the patient for rashes on his or her body.

Is this condition present?: Yes: No:

[View Rash Images](#)

If Yes, select
the type of rash:

Allergy

Bumps

Eczema

Seborrheic
Dermatitis

Notes:

Question 2/3

HELP?

Save & Go to
Next Question

Directory: [New Patient Record Menu](#) > Integumentary System

Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[< Previous Question](#)

[Next Question >](#)

Check the patient for rashes on his or her body.

Is this condition present?: Yes: No:

[View Rash Images](#)

If Yes, select
the type of rash:

Allergy

Bumps

Eczema

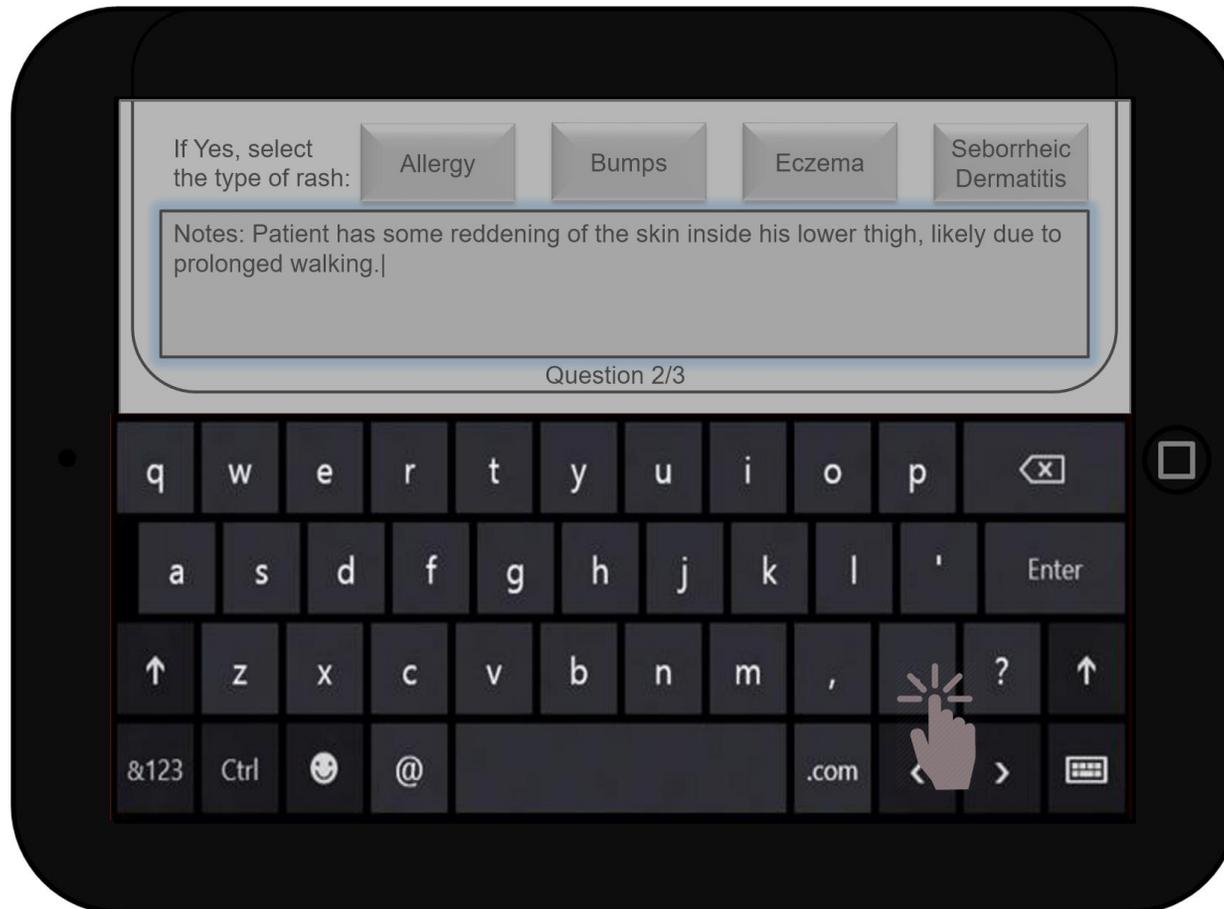
Seborrheic
Dermatitis

Notes:

Question 2/3

HELP?

Save & Go to
Next Question



Directory: [New Patient Record Menu](#) > Integumentary System

Elapsed Time: (MM:SS)

Date: (mm/dd/yyyy)

[< Previous Question](#)

[Next Question >](#)

Check the patient for rashes on his or her body.

Is this condition present?: Yes: No:

[View Rash Images](#)

If Yes, select
the type of rash:

Allergy

Bumps

Eczema

Seborrheic
Dermatitis

Notes: Patient has some reddening of the skin inside his lower thigh, likely due to prolonged walking.

Question 2/3

HELP?

Save & Go to
Next Question

Directory: [New Patient Record Menu](#) > Patient History

Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[Next Question >](#)

Do you, the patient, sleep under a mosquito net?

Select their answer: Yes: No:

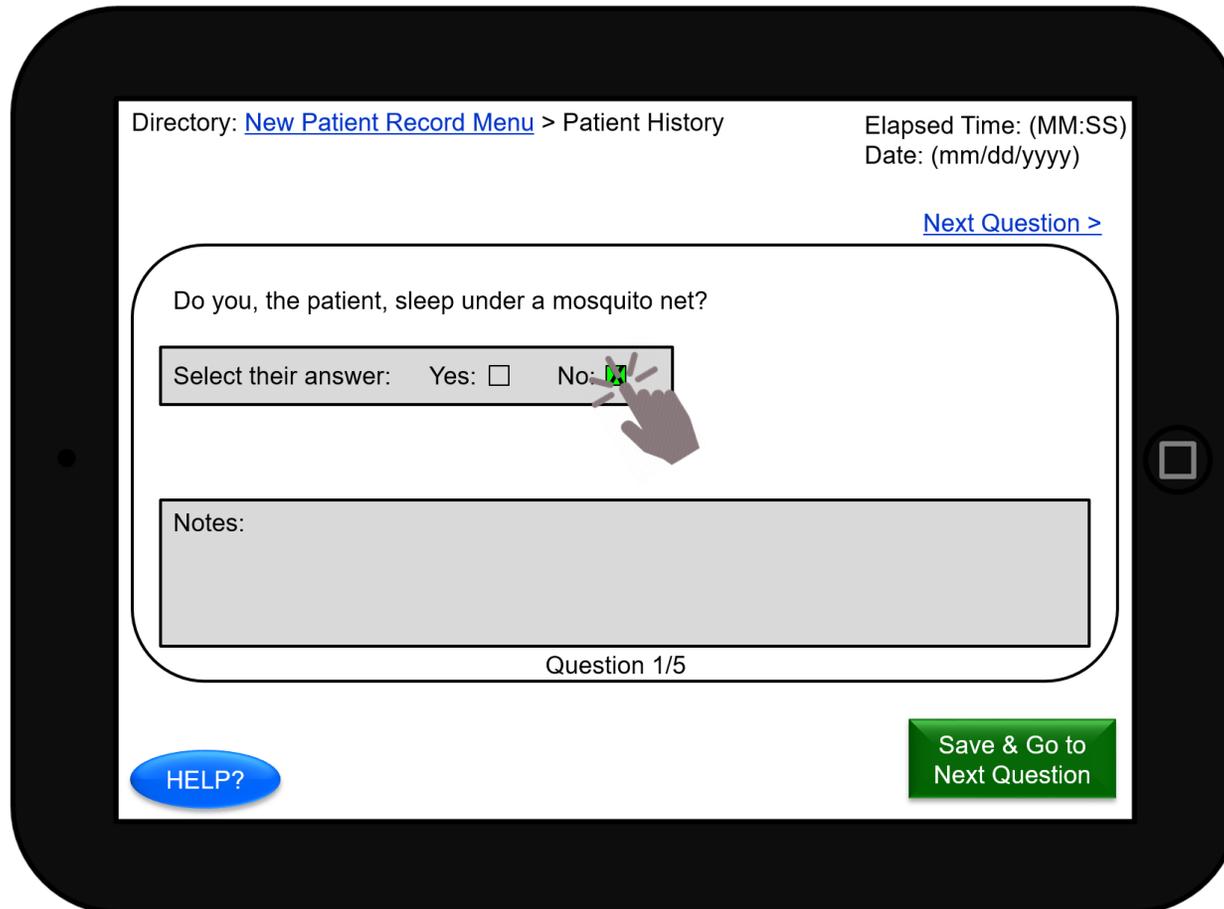
Notes:

Question 1/5

[HELP?](#)

[Save & Go to Next Question](#)

These answers would point towards dengue based on the case study.



These answers would point towards dengue based on the case study.

Directory: [New Patient Record Menu](#) > Patient History

Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[Next Question >](#)

Do you, the patient, sleep under a mosquito net?

Select their answer: Yes: No:

Notes:

Question 1/5

[HELP?](#) [Save & Go to Next Question](#)

These answers would point towards dengue based on the case study.

Directory: [New Patient Record Menu](#) > Patient History Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[< Previous Question](#) [Next Question >](#)

Have you, the patient, been in contact with others who are sick?

Select their answer: Yes: No:

If Yes, select if contact was made for all diseases from this list, if known:

Notes:

Question 2/5

[HELP?](#) [Save & Go to Next Question](#)

These answers would point towards dengue based on the case study.

Directory: [New Patient Record Menu](#) > Patient History Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[< Previous Question](#) [Next Question >](#)

Have you, the patient, been in contact with others who are sick?

Select their answer: Yes: No:

If Yes, select if contact was made for all diseases from this list, if known: (Check List – Incomplete) ▾

Notes:

Question 2/5

[HELP?](#) [Save & Go to Next Question](#)

These answers would point towards dengue based on the case study.

Directory: [New Patient Record Menu](#) > Patient History Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[< Previous Question](#) [Next Question >](#)

Have you, the patient, been in contact with others who are sick?

Select their answer: Yes: No:

If Yes, select if contact was made for all diseases from this list, if known:

Malaria:	Yes: <input type="checkbox"/>	Unknown: <input checked="" type="checkbox"/>	No: <input type="checkbox"/>
Dengue:	Yes: <input checked="" type="checkbox"/>	Unknown: <input type="checkbox"/>	No: <input type="checkbox"/>
Typhoid:	Yes: <input type="checkbox"/>	Unknown: <input checked="" type="checkbox"/>	No: <input type="checkbox"/>

Notes:

Question 2/5

HELP?
Save & Go to Next Question

These answers would point towards dengue based on the case study.

Directory: [New Patient Record Menu](#) > Patient History

Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[< Previous Question](#) [Next Question >](#)

Have you, the patient, been in contact with others who are sick?

Select their answer: Yes: No:

If Yes, select if contact was made for all diseases from this list, if known: (Check Complete)

Notes:

Question 2/5

[HELP?](#) [Save & Go to Next Question](#)

These answers would point towards dengue based on the case study.

Directory: [New Patient Record Menu](#) > Gastrointestinal System Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[< Previous Question](#) **This is a Read Only View**

Have you, the patient, experienced vomiting since the onset of their symptoms?

Select their answer: Yes: No:

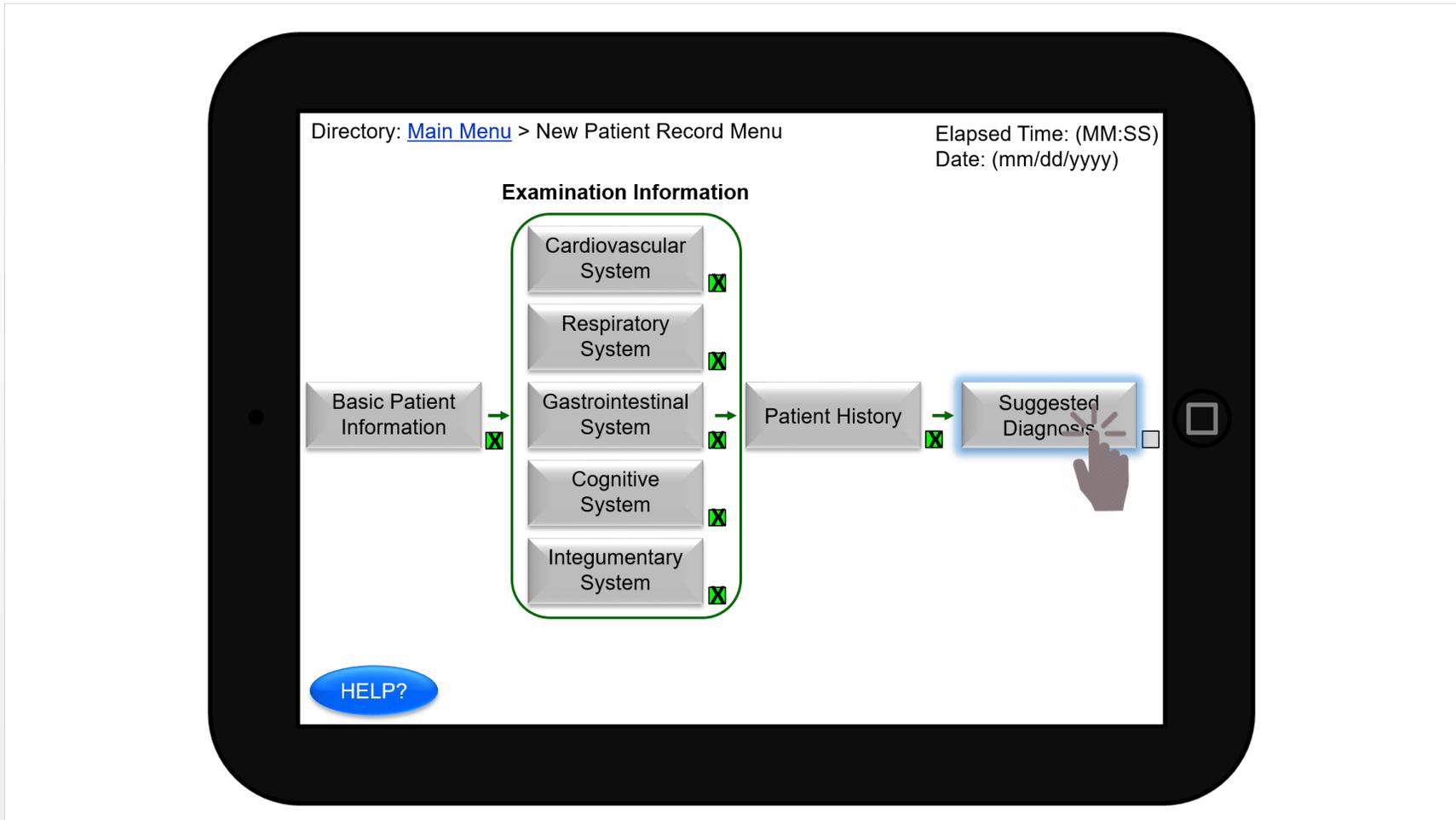
If Yes, select the consistency of the vomit, if known: Chunky with undigested food ▾

Notes:

Question 3/3

[HELP?](#) [Save & Return to Main Menu](#)

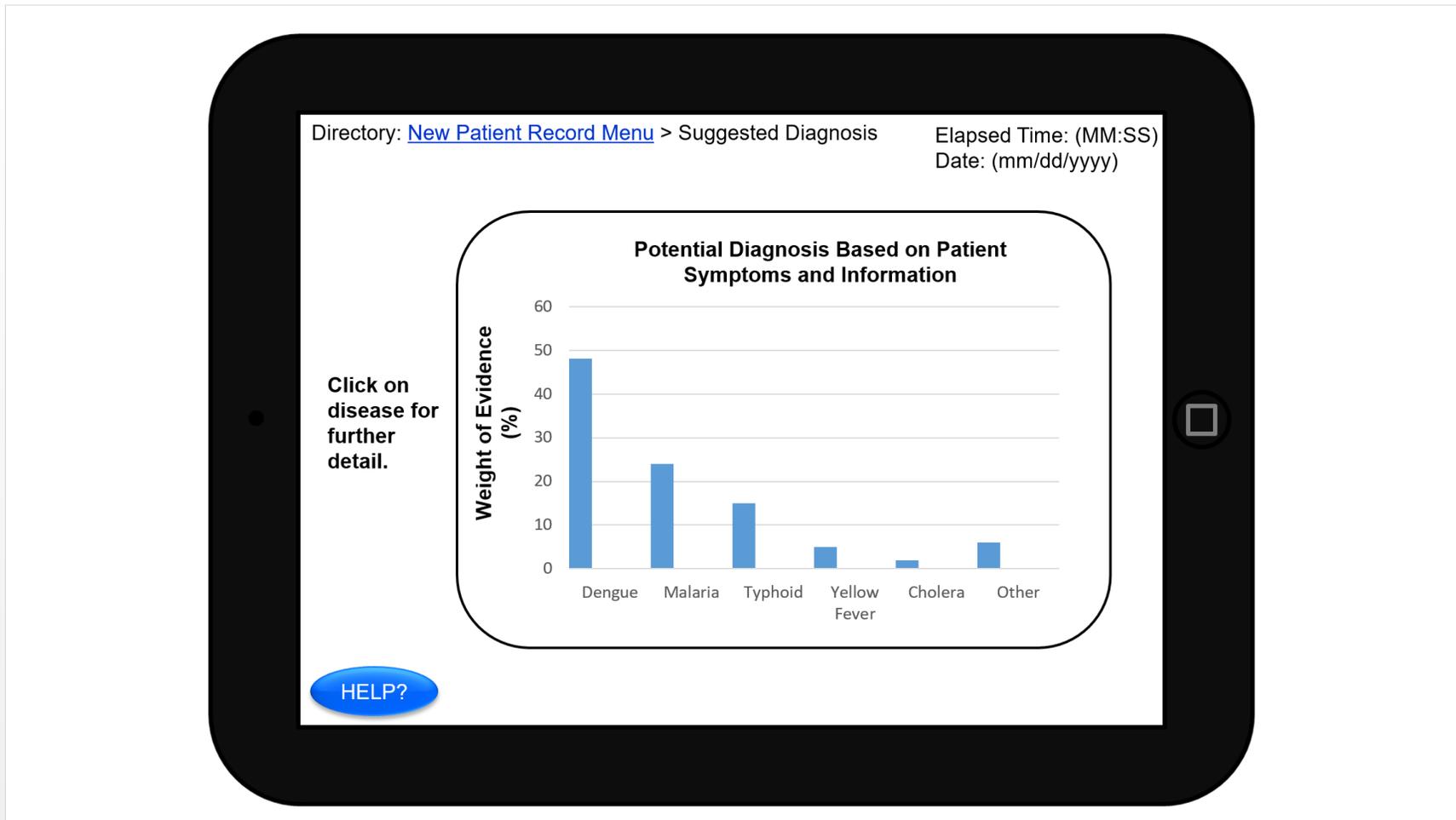
These answers would point towards dengue based on the case study.



New Patient Record Menu:

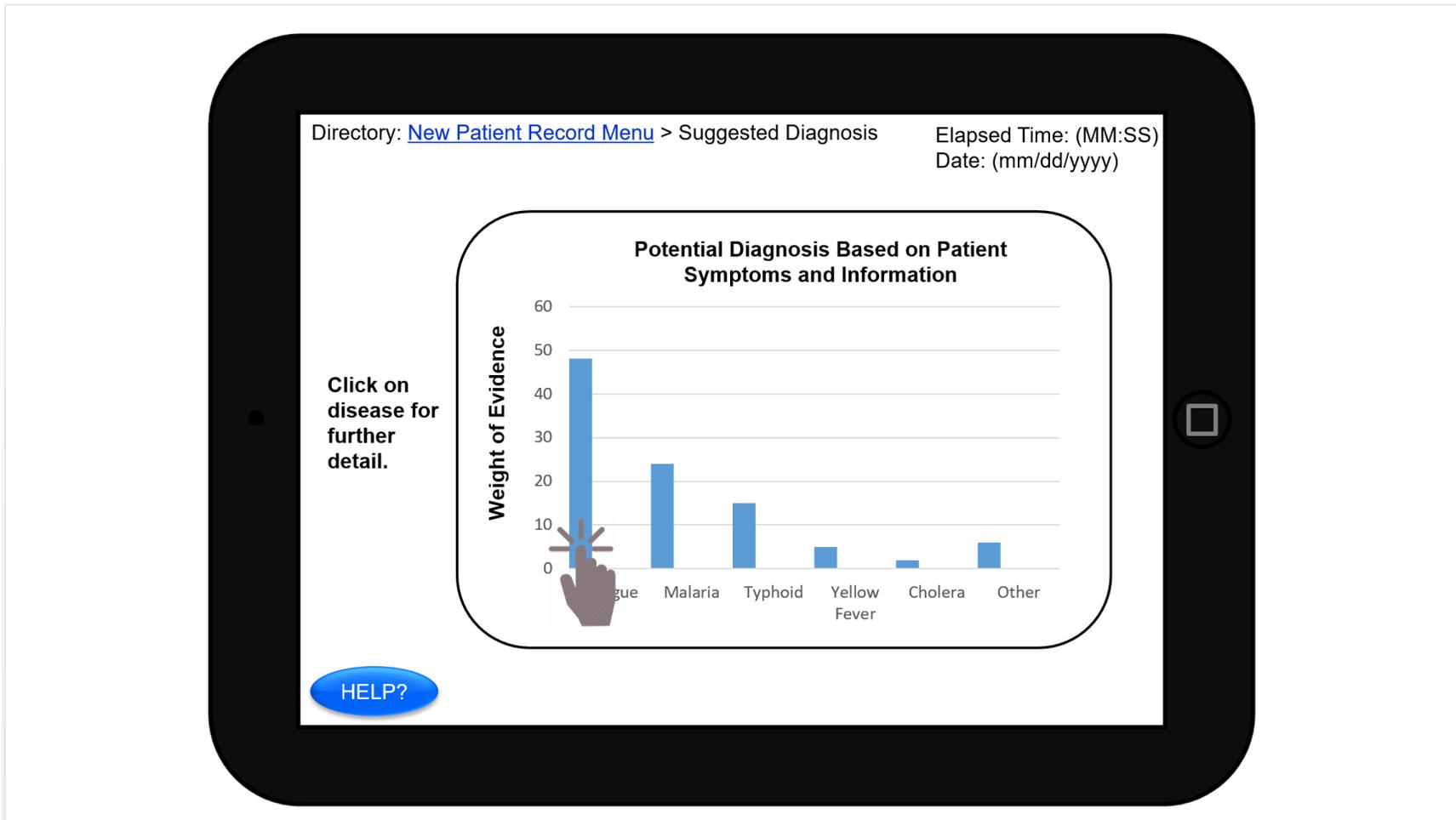
- This menu is what is shown if the user selects “New Patient Record” under the Main Menu.
- The blank check boxes indicate that there are question(s) under that set of questions and clinical checks that still need to be performed. The green check mark indicates that all required questions and fields have been completed.

- The questions and checks are divided and chosen by the system in accordance to the chief complaint by the system (See Appendix B and example of system).
- On this screen, all questions have been answered, and the user may access the suggested diagnosis.



These answers would point towards dengue based on the case study.
Suggested Diagnosis Screen:

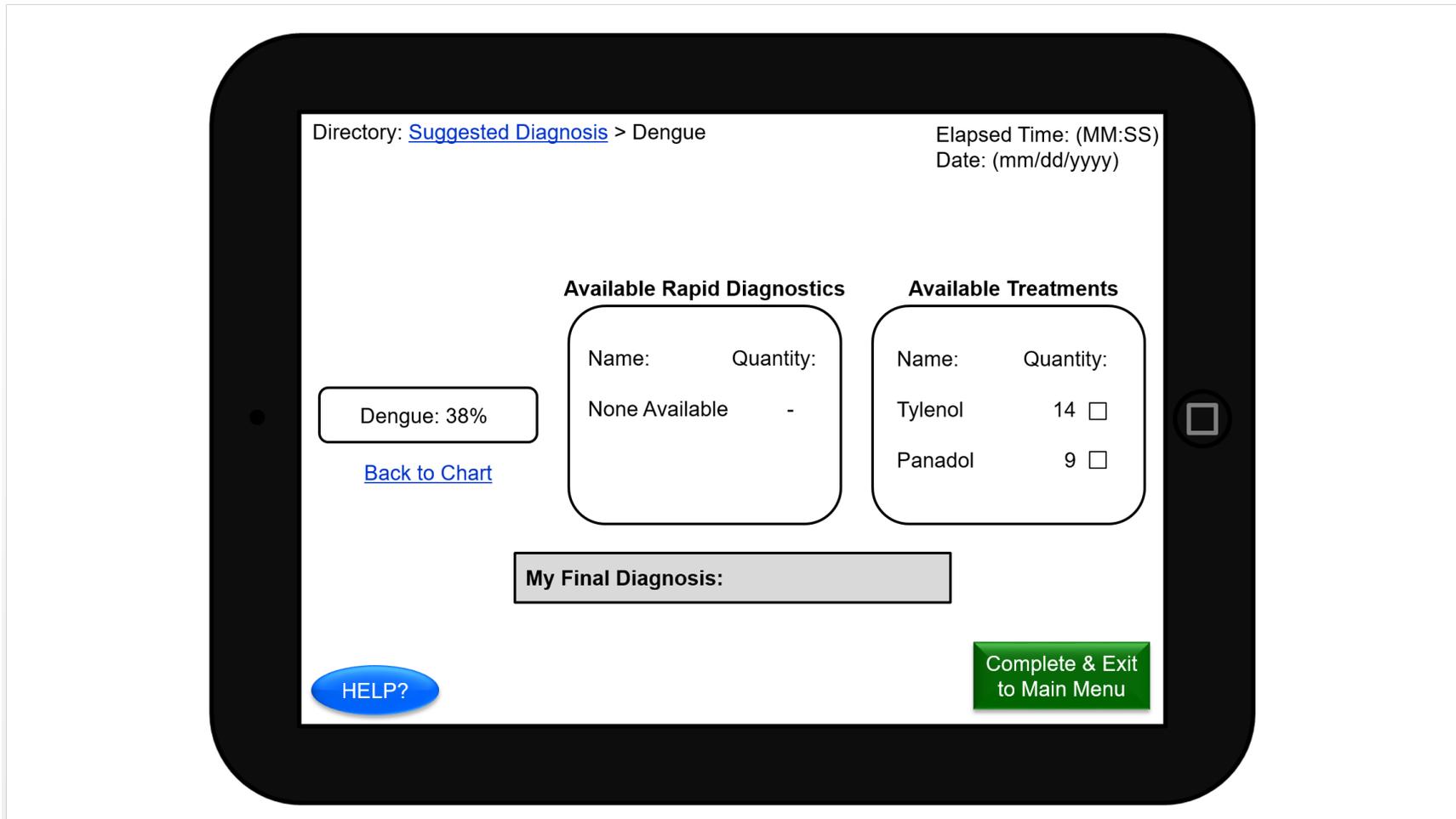
- This is an example of what users would see given the previous answers presented.
- Each bar in the graph represented the relative percentage likelihood of each disease. The infectious diseases that may be diagnosed in WAIDDA are listed in Appendix D. If the system determines that the symptoms and signs inputted do not point towards any of these, then an “Other” diagnosis is presented. Further information would be presented upon clicking the bar.



These answers would point towards dengue based on the case study.

Suggested Diagnosis Screen:

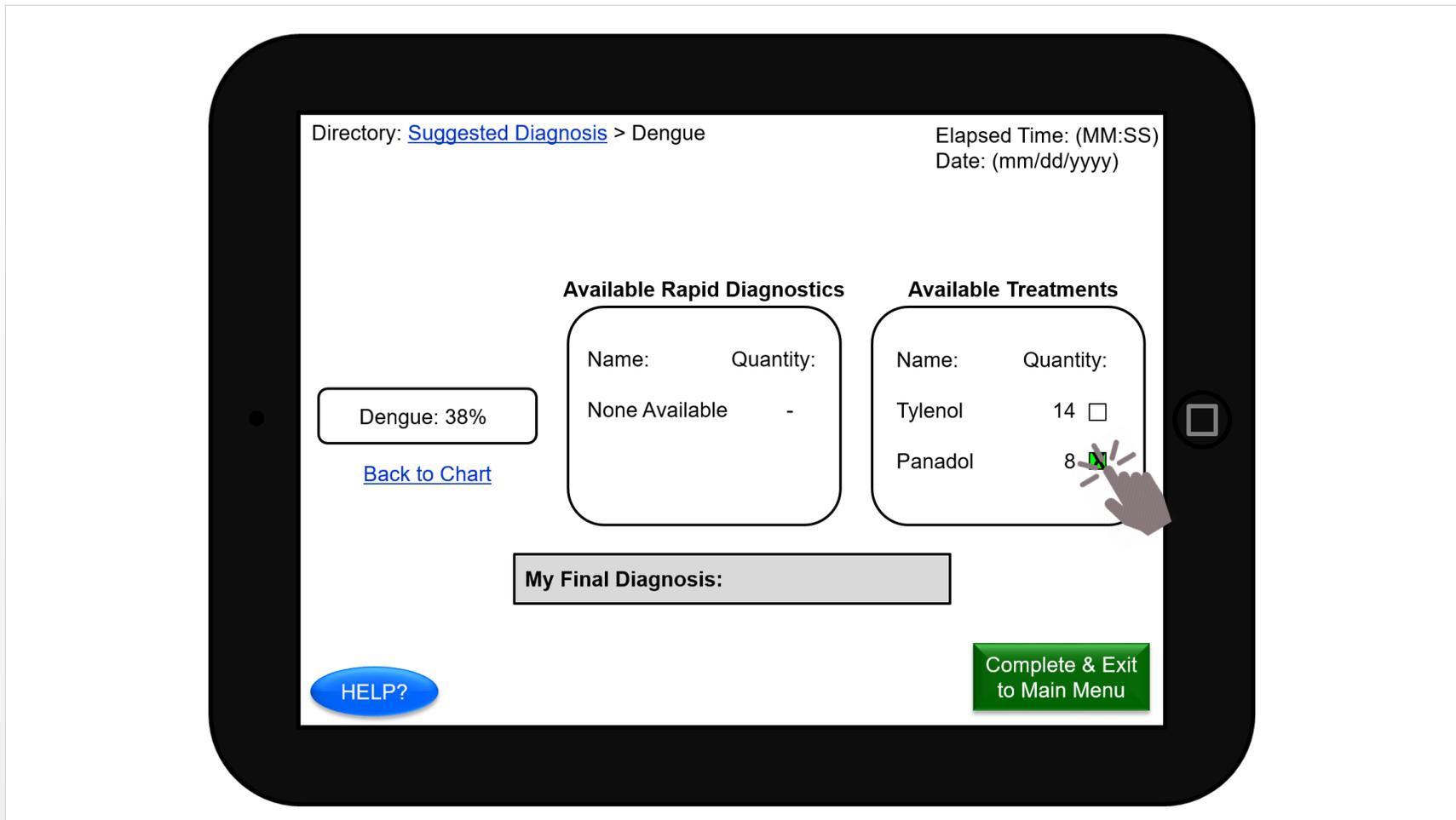
- This is an example of what users would see given the previous answers presented.
- Each bar in the graph represented the relative percentage likelihood of each disease. The infectious diseases that may be diagnosed in WAIDDA are listed in Appendix D. If the system determines that the symptoms and signs inputted do not point towards any of these, then an “Other” diagnosis is presented. Further information would be presented upon clicking the bar.



These answers would point towards dengue based on the case study.

Further Information for Specific Diseases:

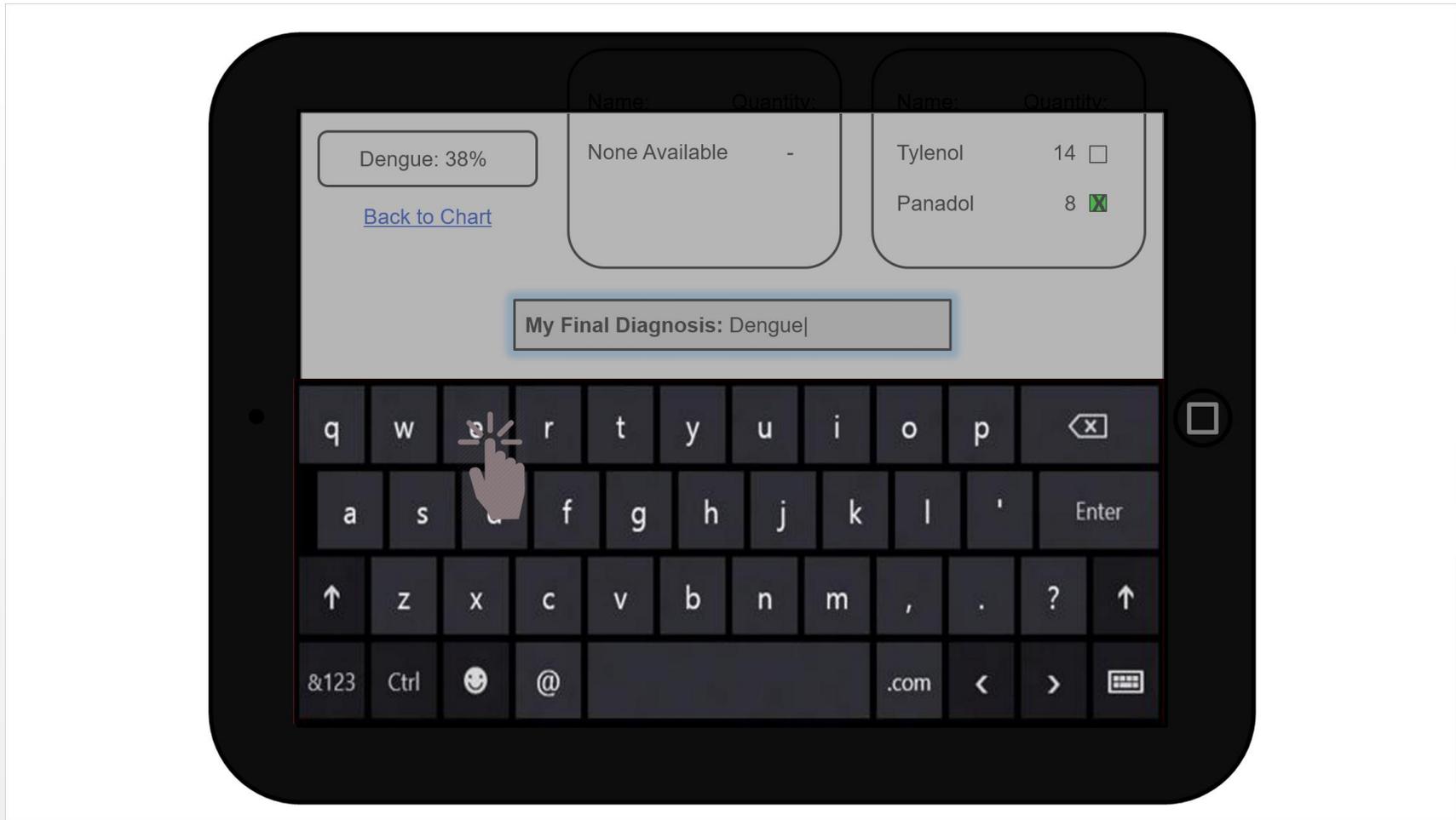
- This is an example of a screen that would follow the Suggested Diagnosis screen for a selected disease. Information regarding available rapid diagnostic tests and treatments.
- For some diseases such as dengue, there are no available rapid diagnostic tests, especially within this setting. Likewise there is no specific treatment; often pain relief is prescribed.



These answers would point towards dengue based on the case study.

Further Information for Specific Diseases:

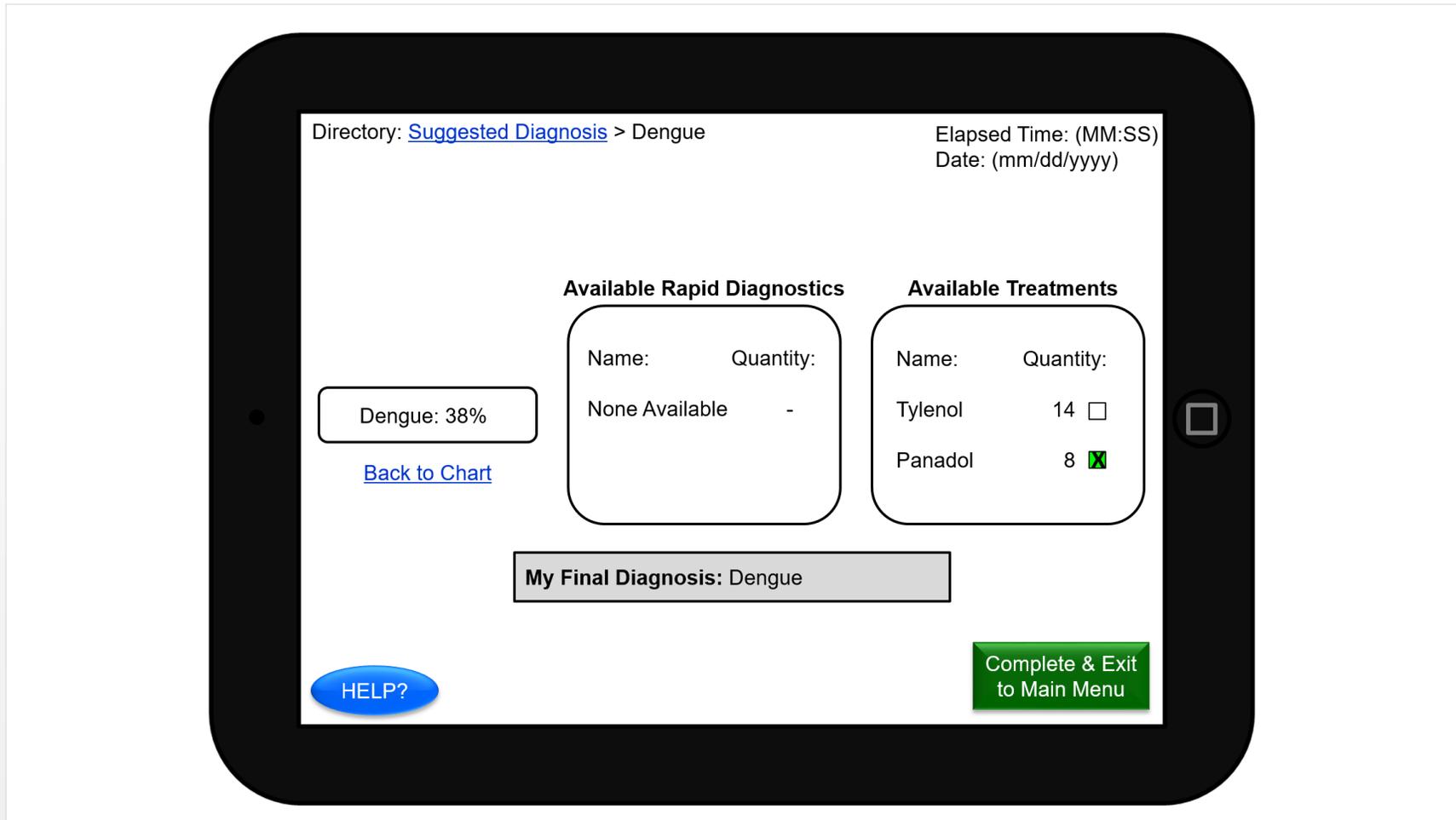
- This is an example of a screen that would follow the Suggested Diagnosis screen for a selected disease. Information regarding available rapid diagnostic tests and treatments.
- For some diseases such as dengue, there are no available rapid diagnostic tests, especially within this setting. Likewise there is no specific treatment; often pain relief is prescribed.



These answers would point towards dengue based on the case study.

Further Information for Specific Diseases:

- This is an example of a screen that would follow the Suggested Diagnosis screen for a selected disease. Information regarding available rapid diagnostic tests and treatments.
- For some diseases such as dengue, there are no available rapid diagnostic tests, especially within this setting. Likewise there is no specific treatment; often pain relief is prescribed.

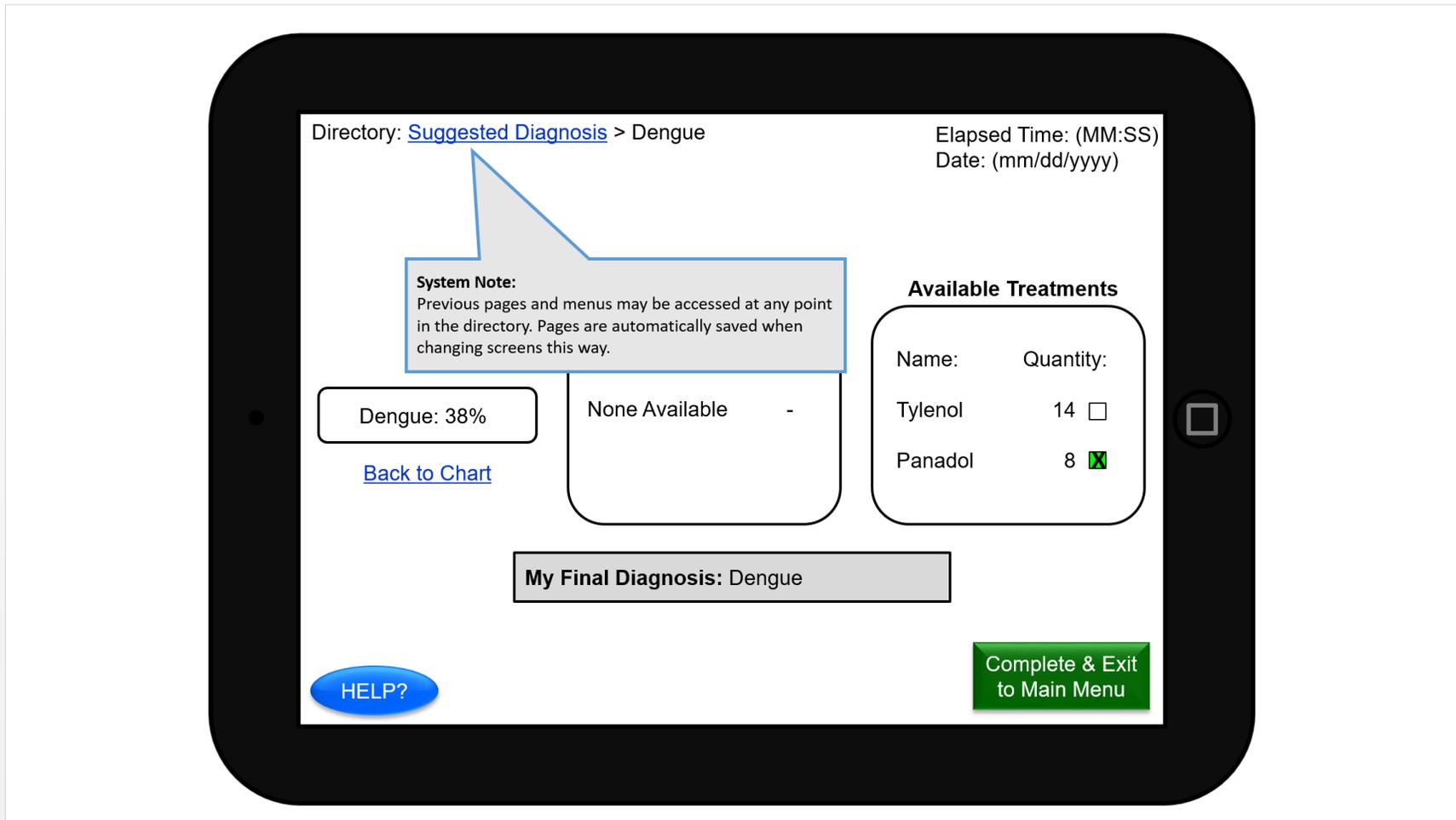


These answers would point towards dengue based on the case study.

Further Information for Specific Diseases:

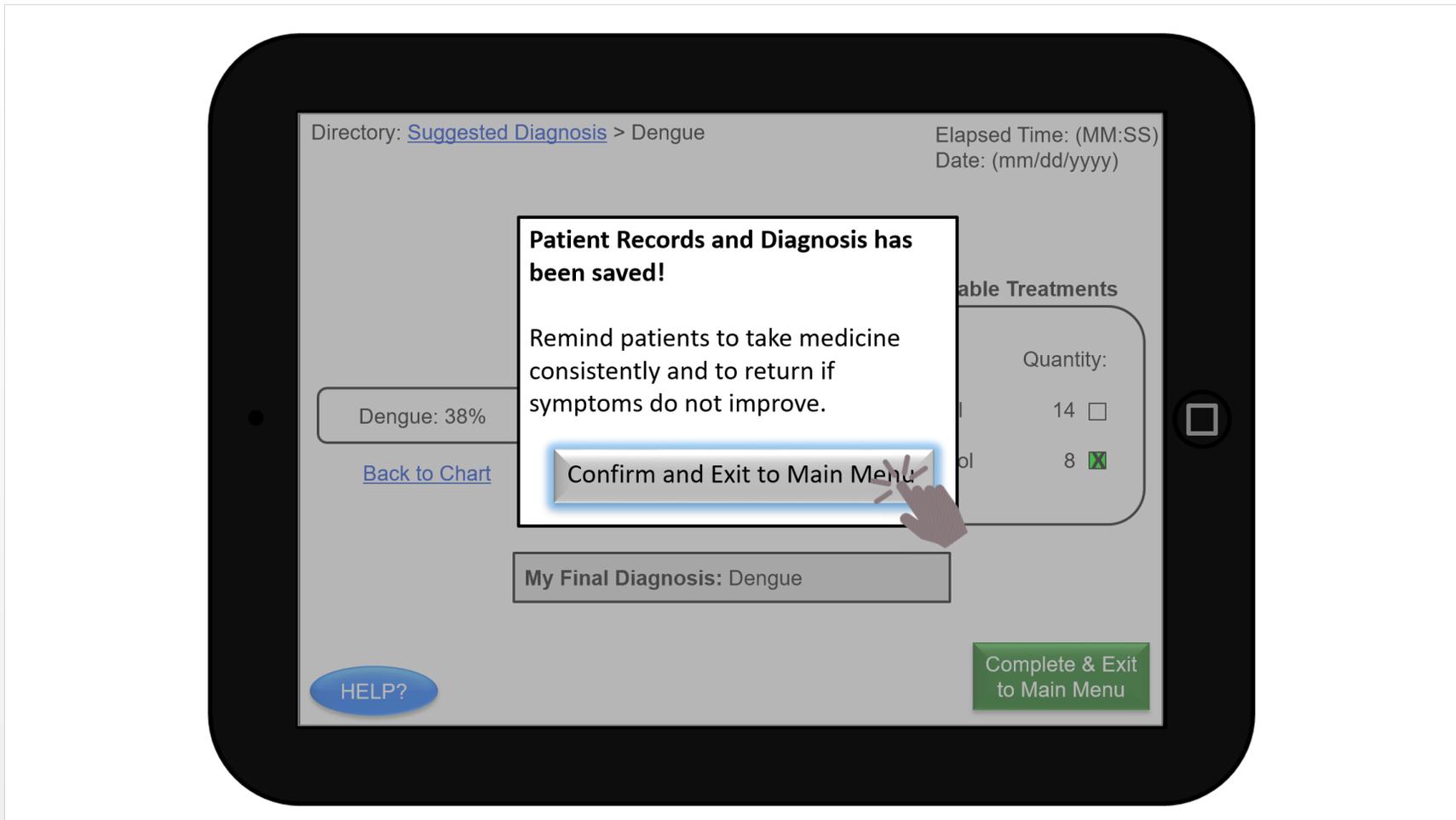
- This is an example of a screen that would follow the Suggested Diagnosis screen for a selected disease. Information regarding available rapid diagnostic tests and treatments.

- For some diseases such as dengue, there are no available rapid diagnostic tests, especially within this setting. Likewise there is no specific treatment; often pain relief is prescribed.

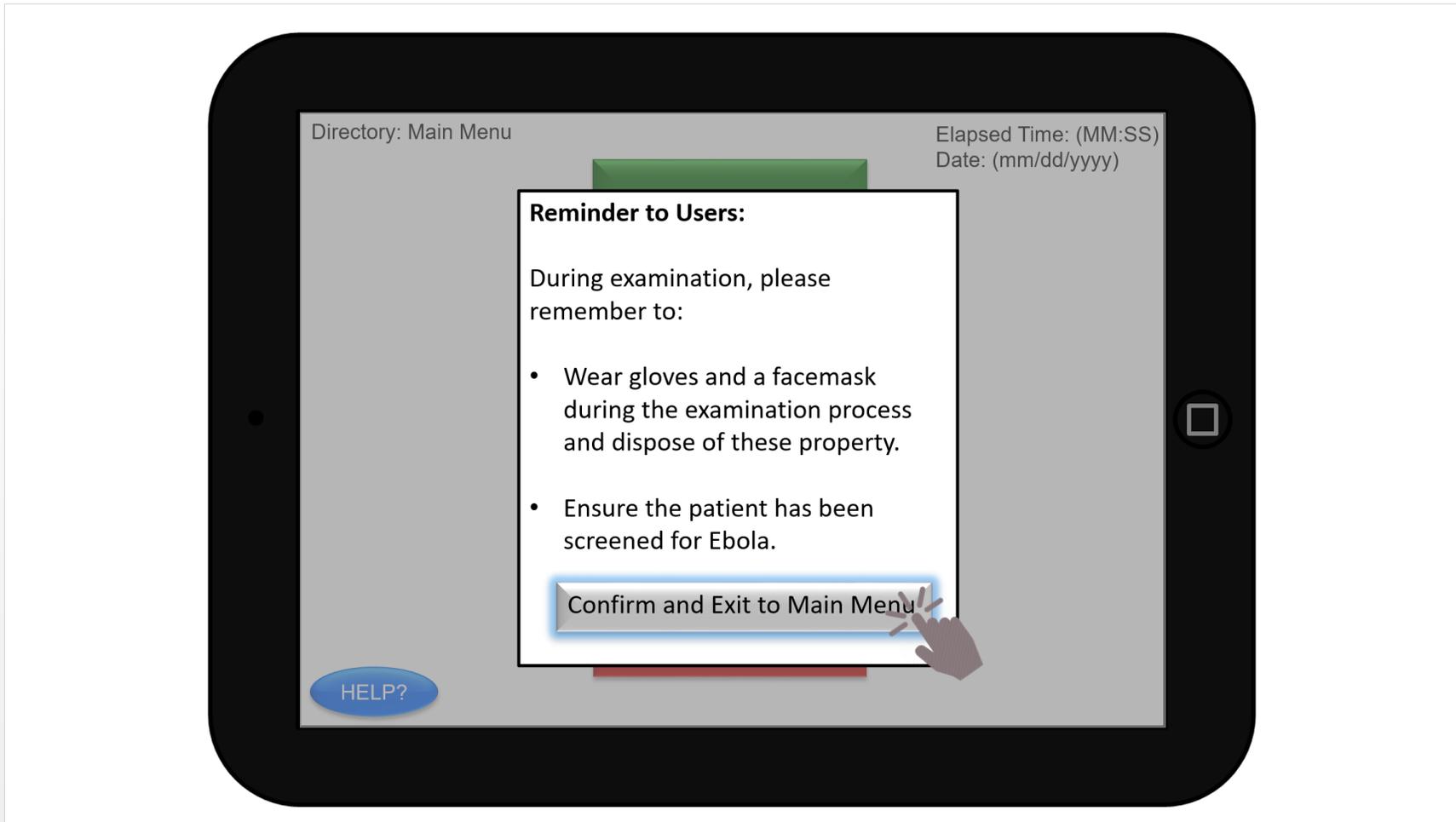


These answers would point towards dengue based on the case study.
Further Information for Specific Diseases:

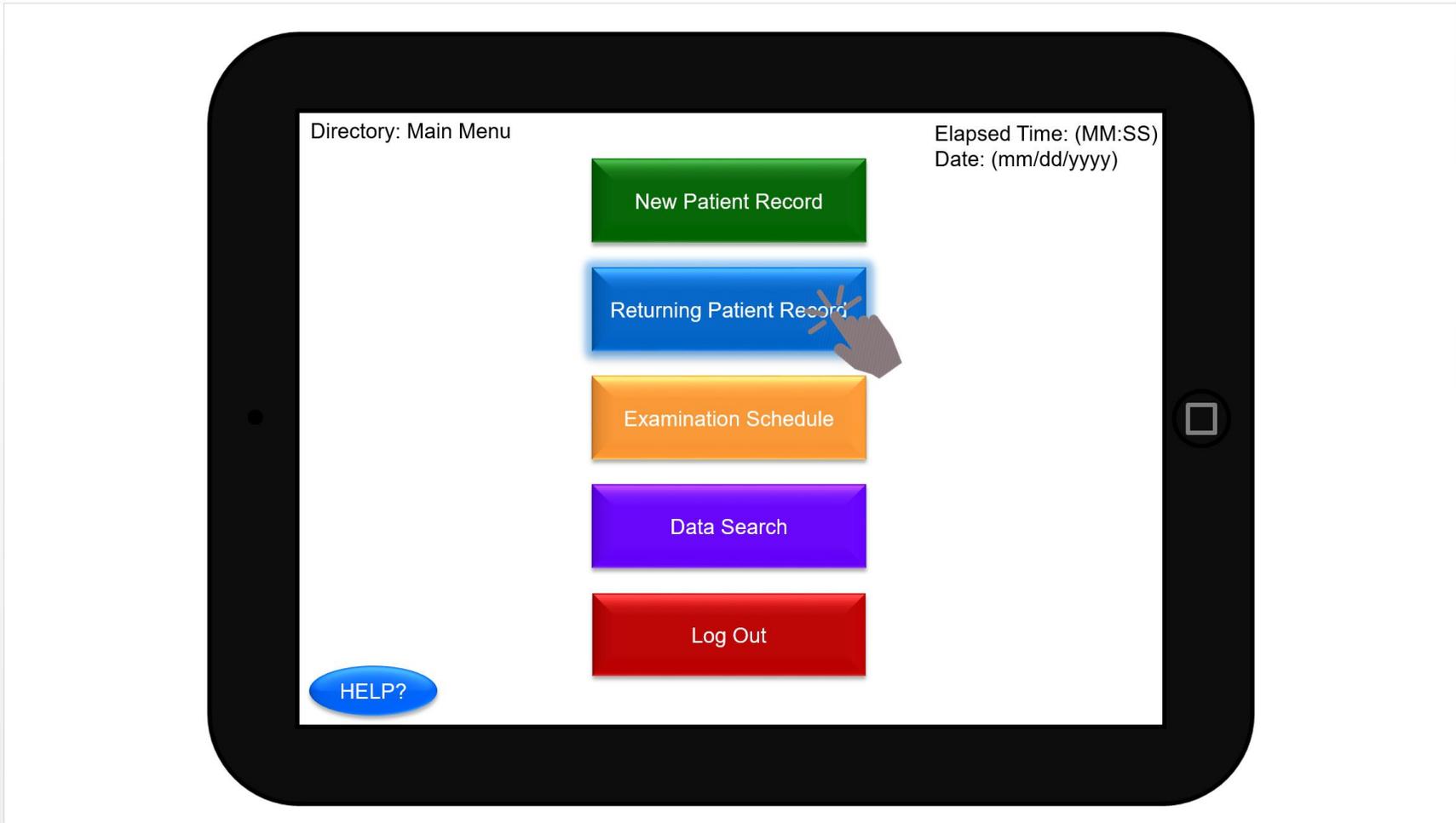
- This is an example of a screen that would follow the Suggested Diagnosis screen for a selected disease. Information regarding available rapid diagnostic tests and treatments.
- For some diseases such as dengue, there are no available rapid diagnostic tests, especially within this setting. Likewise there is no specific treatment; often pain relief is prescribed.



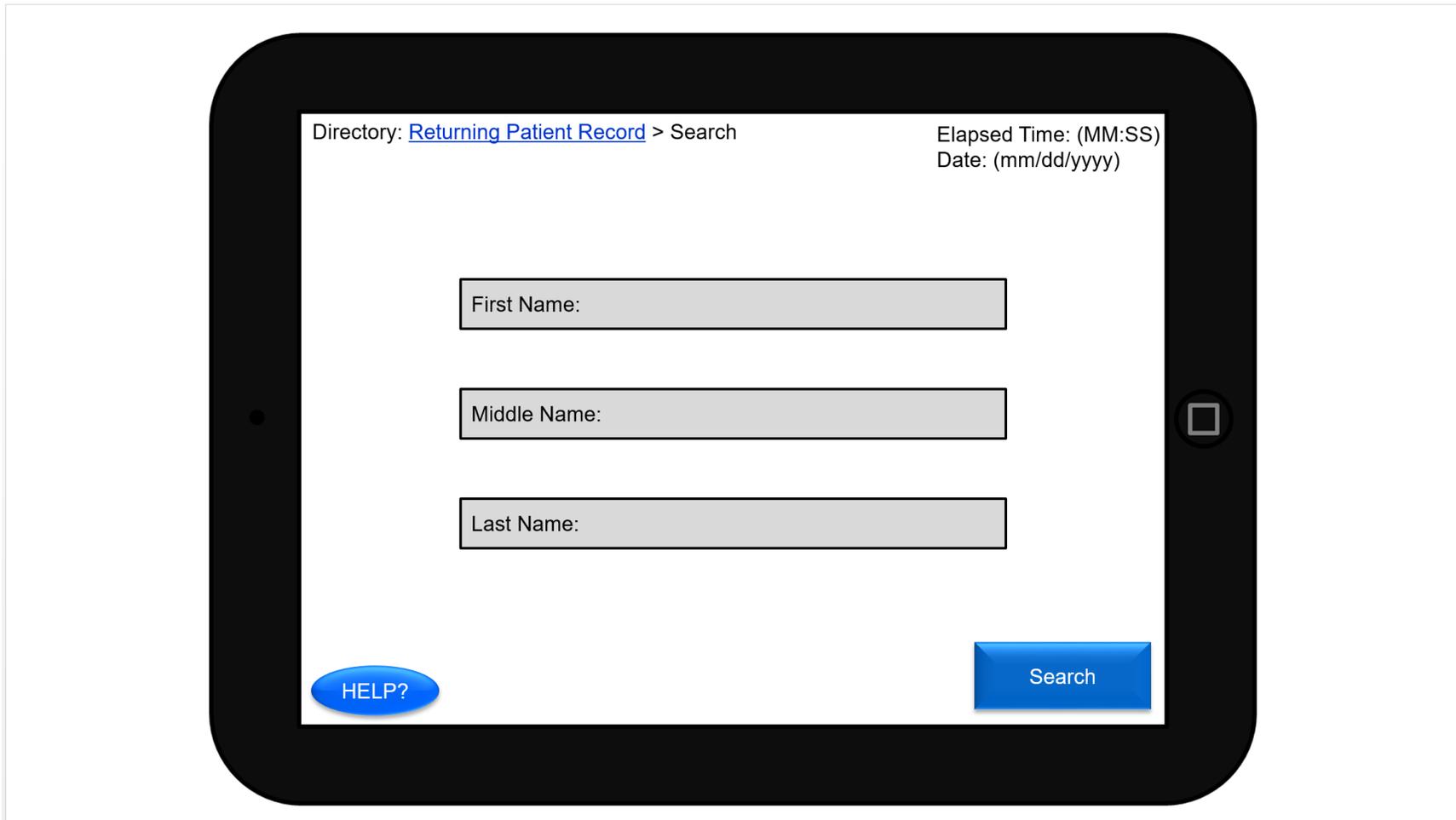
This slide is intended to appear after the user clicks on the Complete button.



Page intended for after the user logs in. This would occur once after logging in and not in between patient encounters.

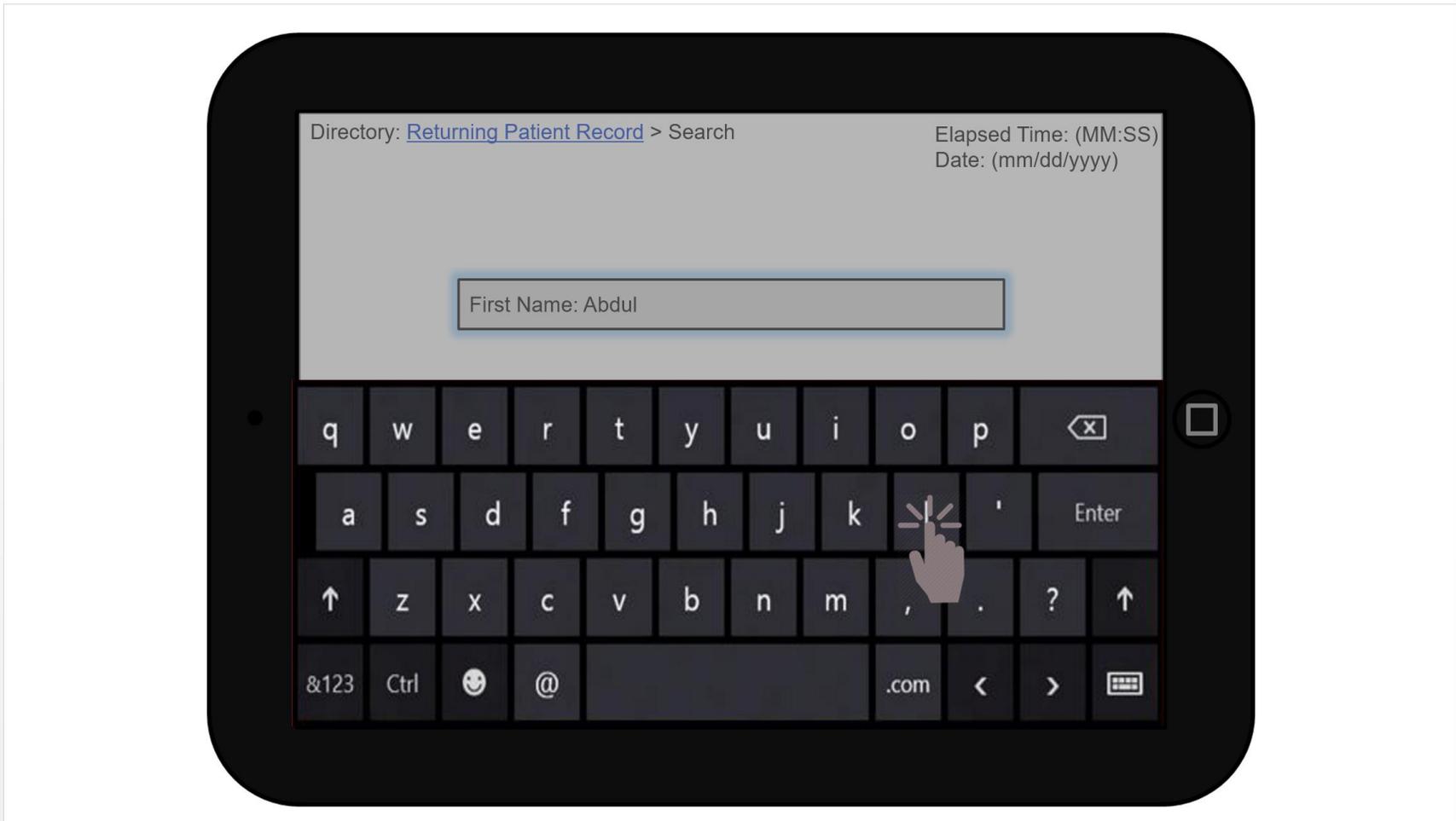


Back at the Main Menu, this time with a returning patient.



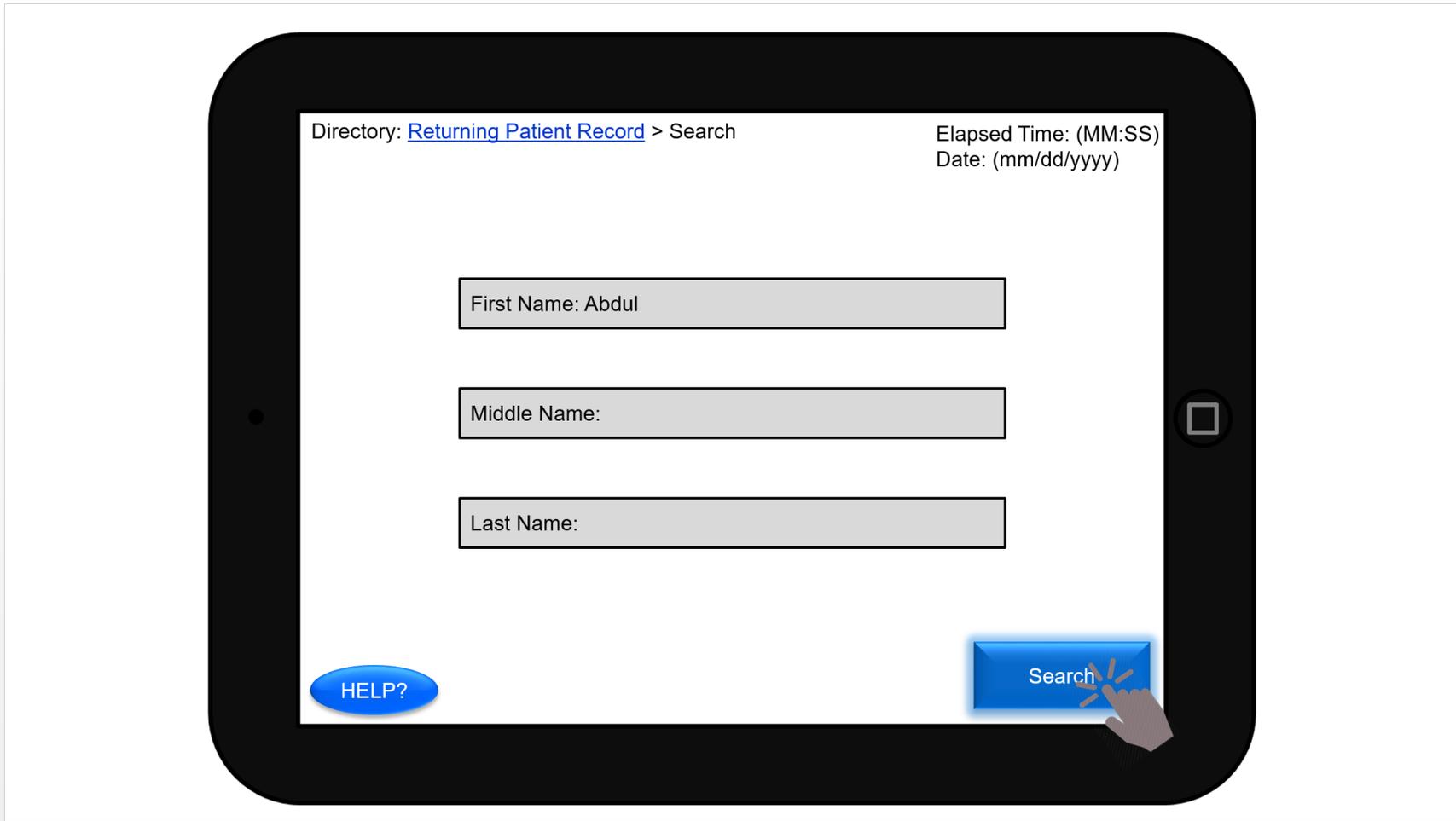
Search Screen:

- This screen is where users may search for patients based on their name.
- The blue search button indicates that this screen may be accessed from the “Returning Patient Records” button from the Main Menu, which may be confirmed in the directory provided in the upper left corner.



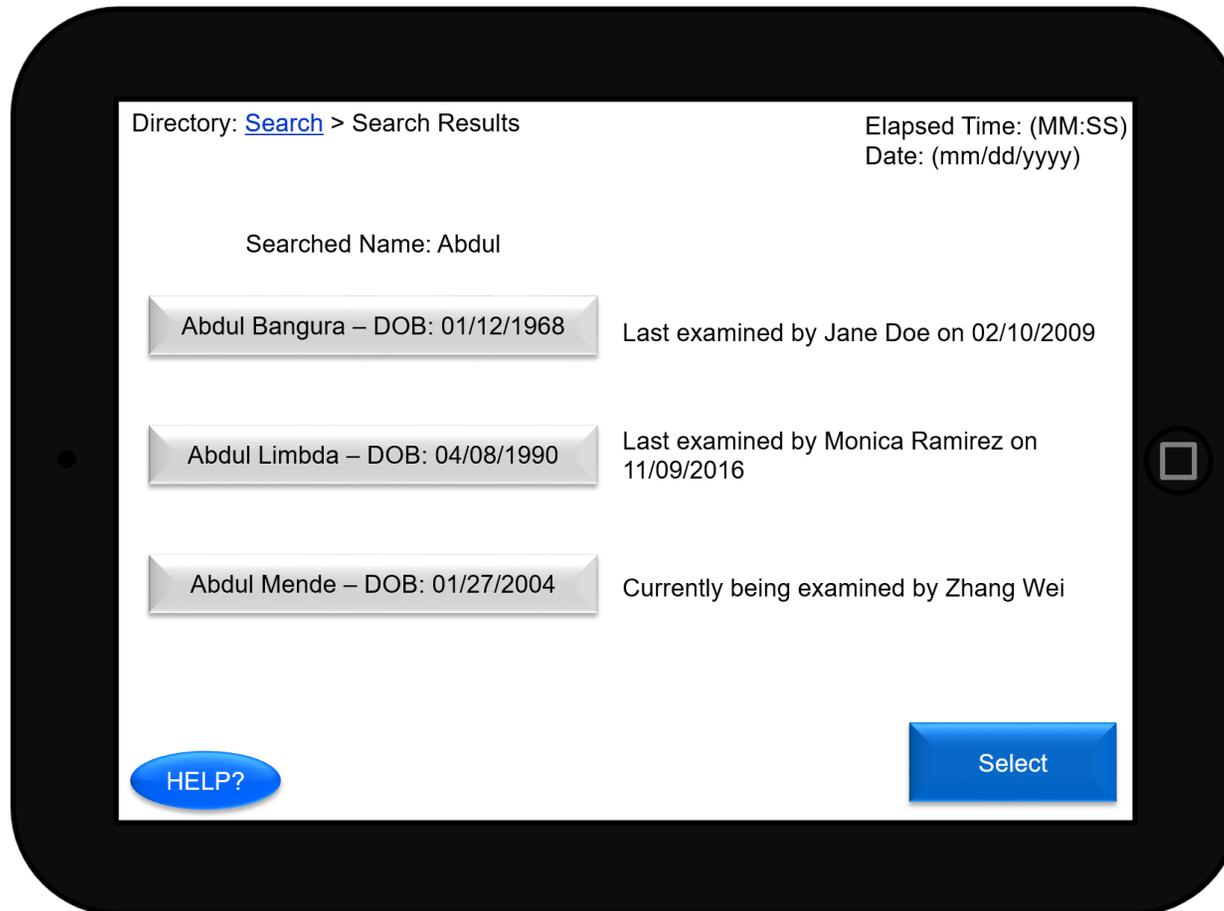
Search Screen:

- This screen is where users may search for patients based on their name.
- The blue search button indicates that this screen may be accessed from the “Returning Patient Records” button from the Main Menu, which may be confirmed in the directory provided in the upper left corner.



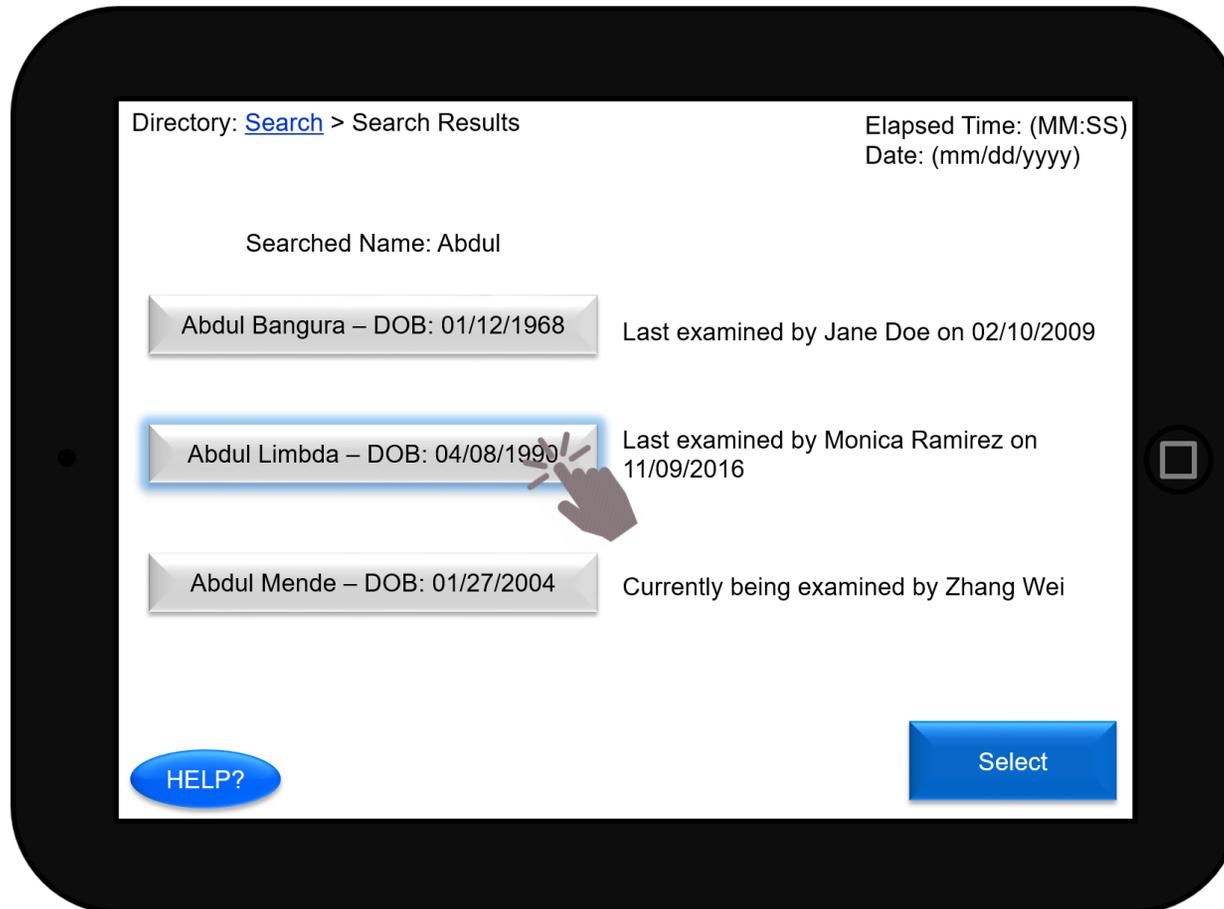
Search Screen:

- This screen is where users may search for patients based on their name.
- The blue search button indicates that this screen may be accessed from the “Returning Patient Records” button from the Main Menu, which may be confirmed in the directory provided in the upper left corner.



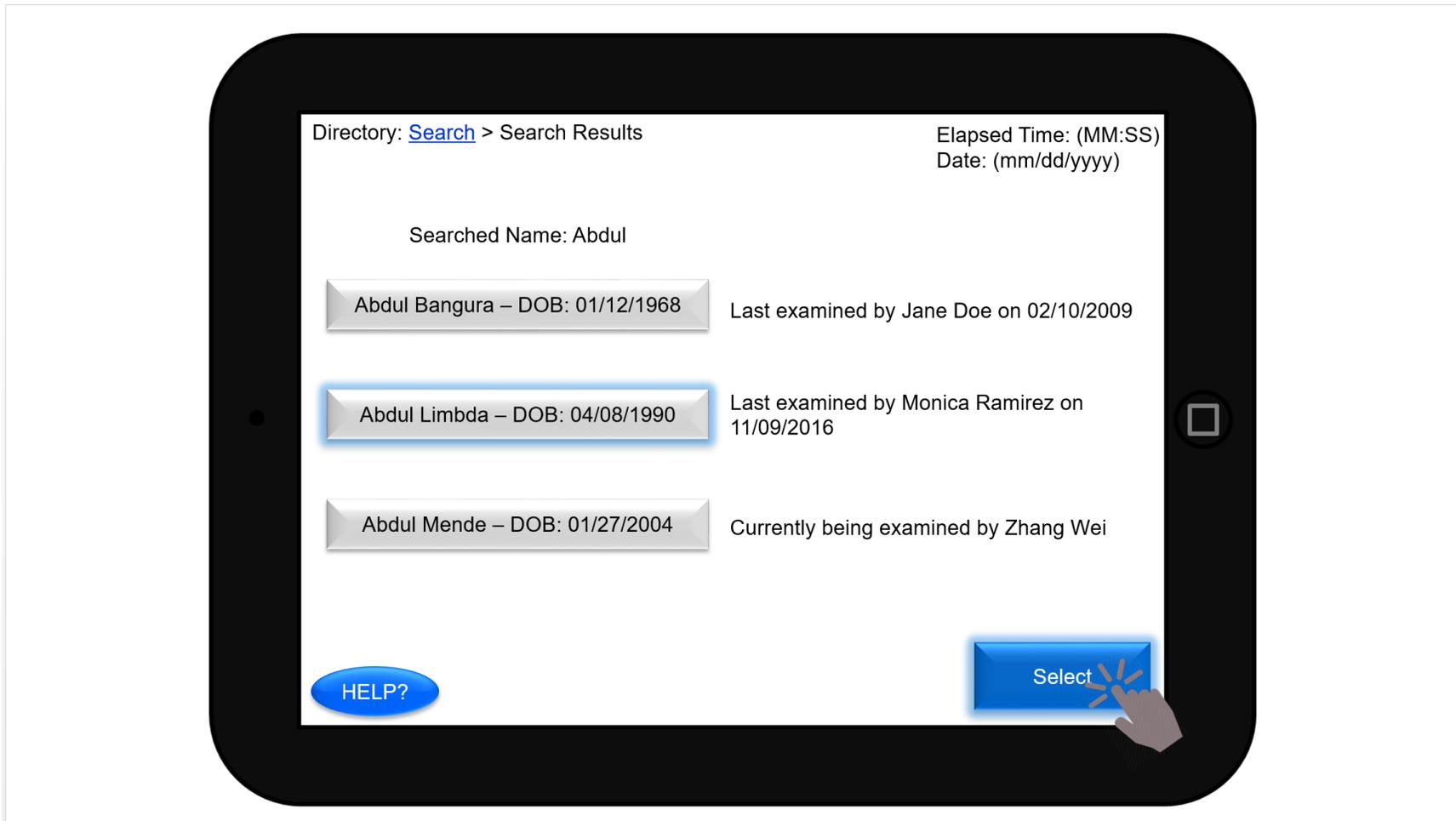
Search Results screen:

- Following the search, the system will present users with a list of matching patients and their date of birth.
- Information regarding when the patient last came in, who examined them, or whether they are currently being examined is also presented.
- In the event that a patient is already being examined, the records will be viewed in a Read Only format, as presented previously.



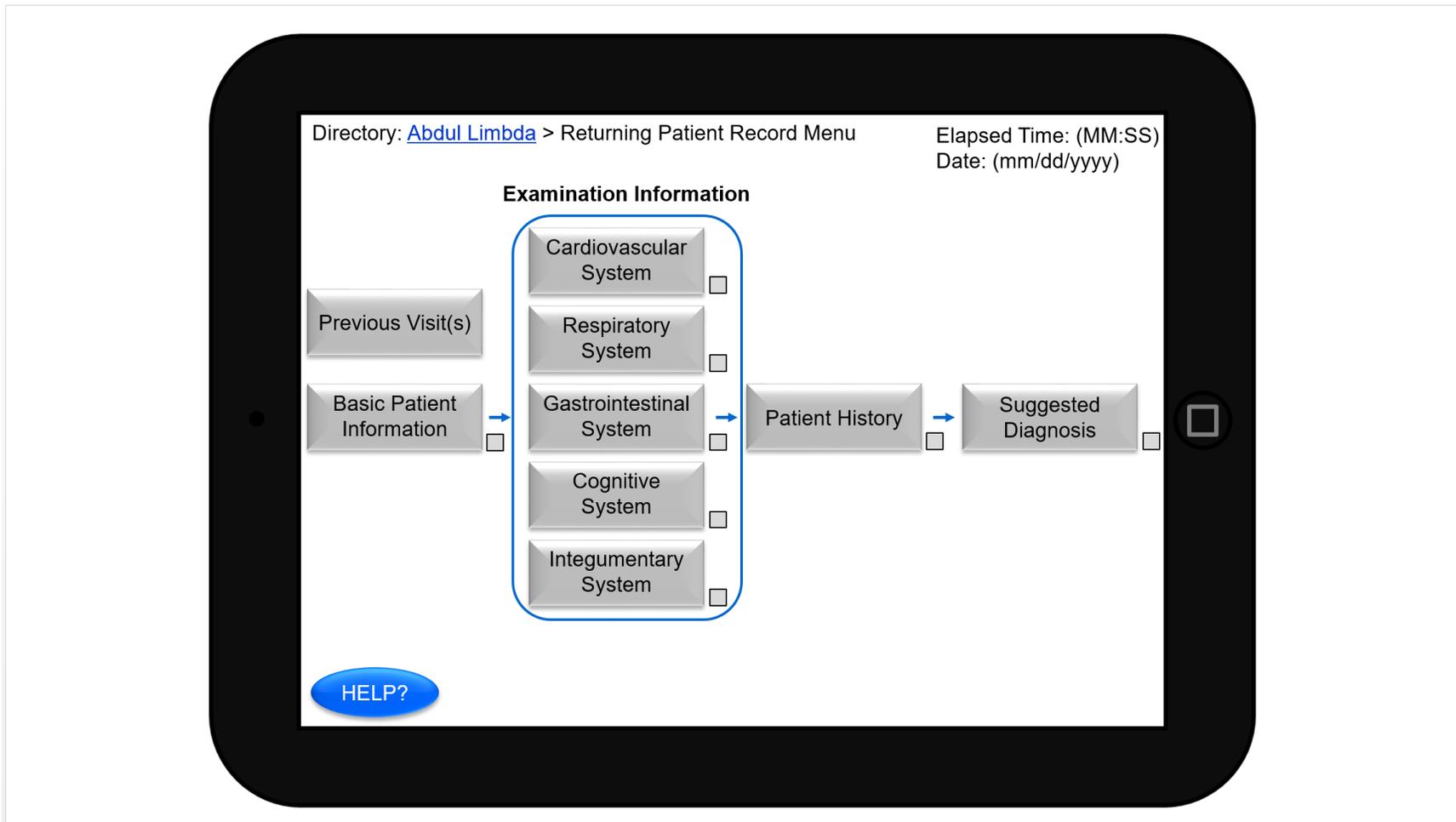
Search Results screen:

- Following the search, the system will present users with a list of matching patients and their date of birth.
- Information regarding when the patient last came in, who examined them, or whether they are currently being examined is also presented.
- In the event that a patient is already being examined, the records will be viewed in a Read Only format, as presented previously.



Search Results screen:

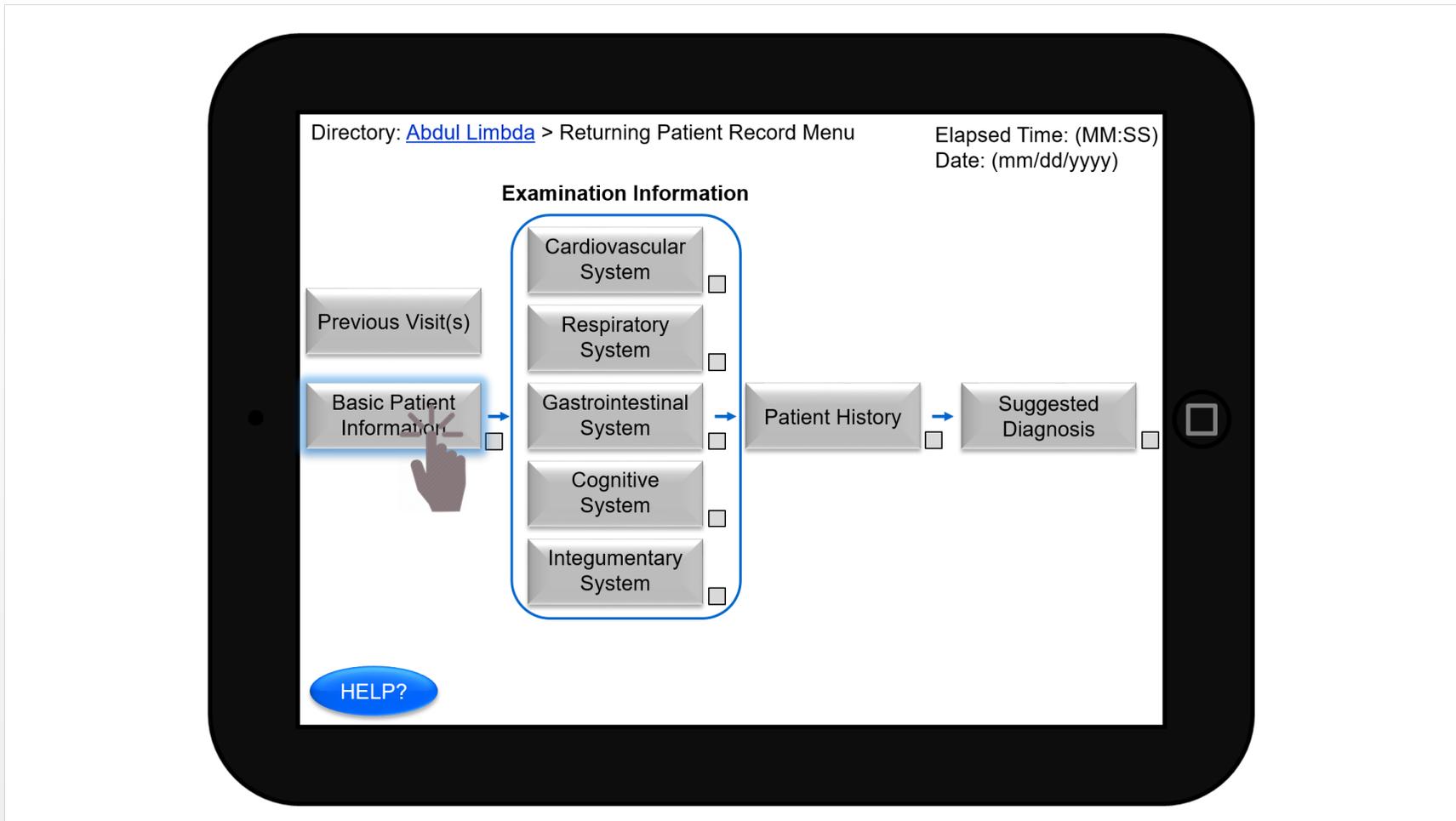
- Following the search, the system will present users with a list of matching patients and their date of birth.
- Information regarding when the patient last came in, who examined them, or whether they are currently being examined is also presented.
- In the event that a patient is already being examined, the records will be viewed in a Read Only format, as presented previously.



Returning Patient Record Menu:

- This menu is what is shown if the user selects “New Patient Record” under the Main Menu.
- The blank check boxes indicate that there are question(s) under that set of questions and clinical checks that still need to be performed. The green check mark indicates that all required questions and fields have been completed.

- The questions and checks are divided and chosen by the system in accordance to the chief complaint by the system (See Appendix B and example of system).
- For the returning patient screen, the user may select the “Previous Visit(s)” button to access Read Only views for any selection of available logs.



Returning Patient Record Menu:

- This menu is what is shown if the user selects “New Patient Record” under the Main Menu.
- The blank check boxes indicate that there are question(s) under that set of questions and clinical checks that still need to be performed. The green check mark indicates that all required questions and fields have been completed.
- The questions and checks are divided and chosen by the system in accordance to the chief complaint by the system (See Appendix B and example of system).
- For the returning patient screen, the user may select the “Previous Visit(s)” button to access Read Only views for any selection of available logs.

Directory: [Returning Patient Record Menu](#) > Basic Patient Information

Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

Patient Information

First Name: Abdul M.I.: - Last Name: Limbda Sex (M/F): M

Date of Birth (dd/mm/yyyy): 04/08/1990

Age (Years):

Height (cm):

Weight (kg):

BP (mm Hg):

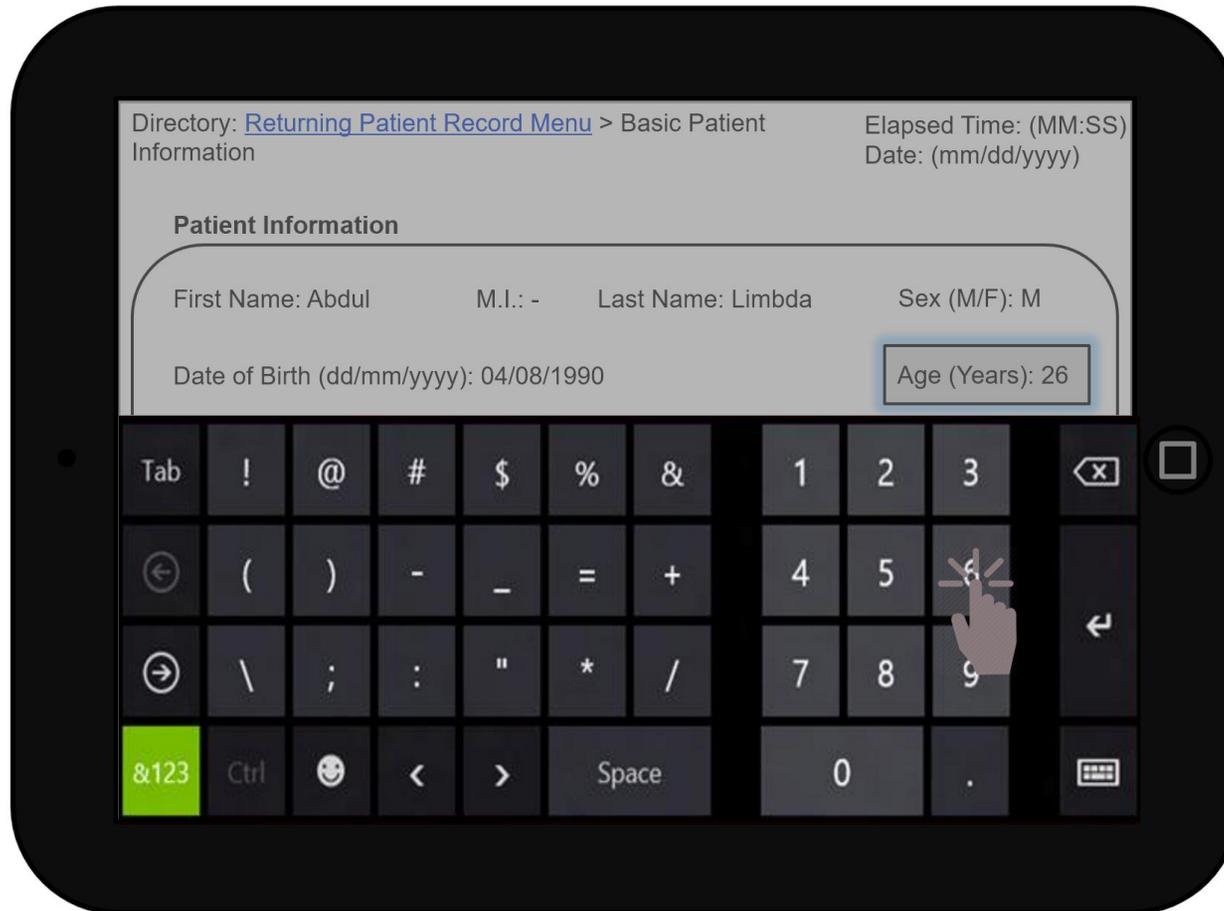
Pulse (BPM):

Chief Complaint:

HELP?

Save

The following returning patient records will be an example based off of a case study for typhoid.



The following returning patient records will be an example based off of a case study for typhoid.

Directory: [Returning Patient Record Menu](#) > Basic Patient Information

Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

Patient Information

First Name: Abdul M.I.: - Last Name: Limbda Sex (M/F): M

Date of Birth (dd/mm/yyyy): 04/08/1990 Age (Years): 26

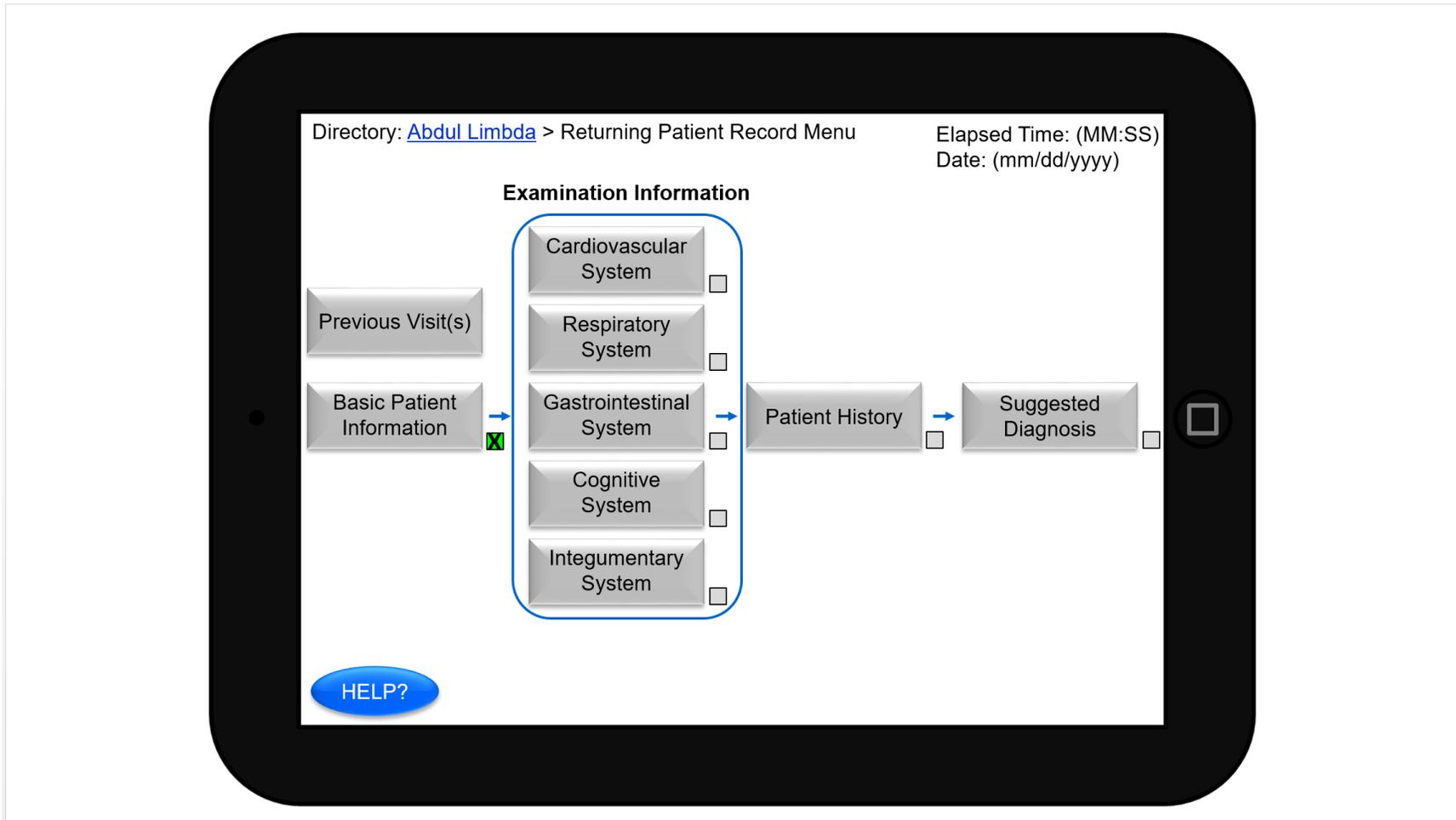
Height (cm): 176 Weight (kg): 81.2 BP (mm Hg): 116/75 Pulse (BPM): 63

Chief Complaint: Patient reports experiencing frontal headaches, fever, and muscle pains.

[HELP?](#) [Save](#)



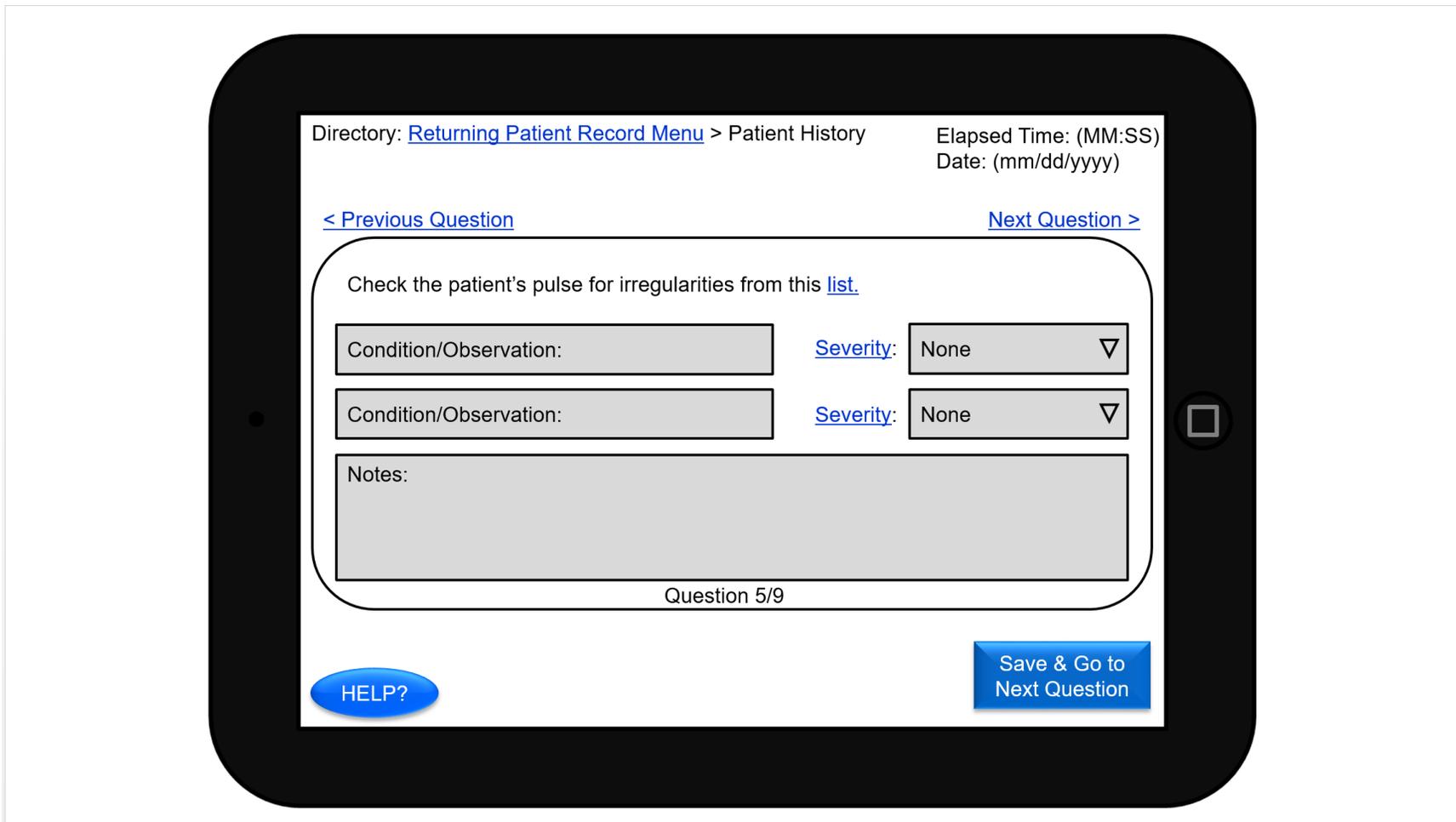
The following returning patient records will be an example based off of a case study for typhoid.



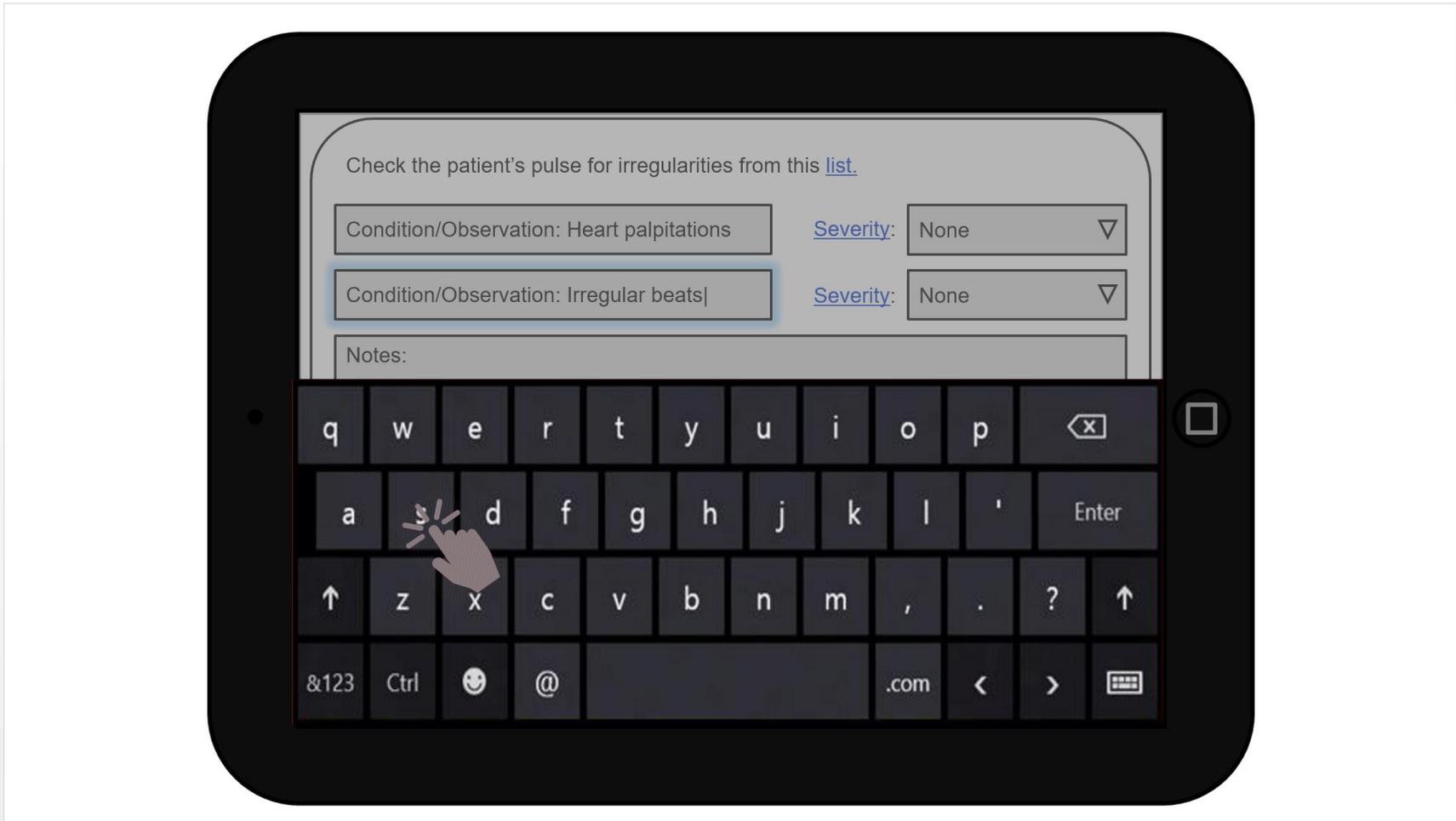
Returning Patient Record Menu:

- This menu is what is shown if the user selects “New Patient Record” under the Main Menu.
- The blank check boxes indicate that there are question(s) under that set of questions and clinical checks that still need to be performed. The green check mark indicates that all required questions and fields have been completed.

- The questions and checks are divided and chosen by the system in accordance to the chief complaint by the system (See Appendix B and example of system).
- For the returning patient screen, the user may select the “Previous Visit(s)” button to access Read Only views for any selection of available logs.



The following returning patient records will be an example based off of a case study for typhoid.



The following returning patient records will be an example based off of a case study for typhoid.

Directory: [Returning Patient Record Menu](#) > Patient History Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[< Previous Question](#) [Next Question >](#)

Check the patient's pulse for irregularities from this [list](#).

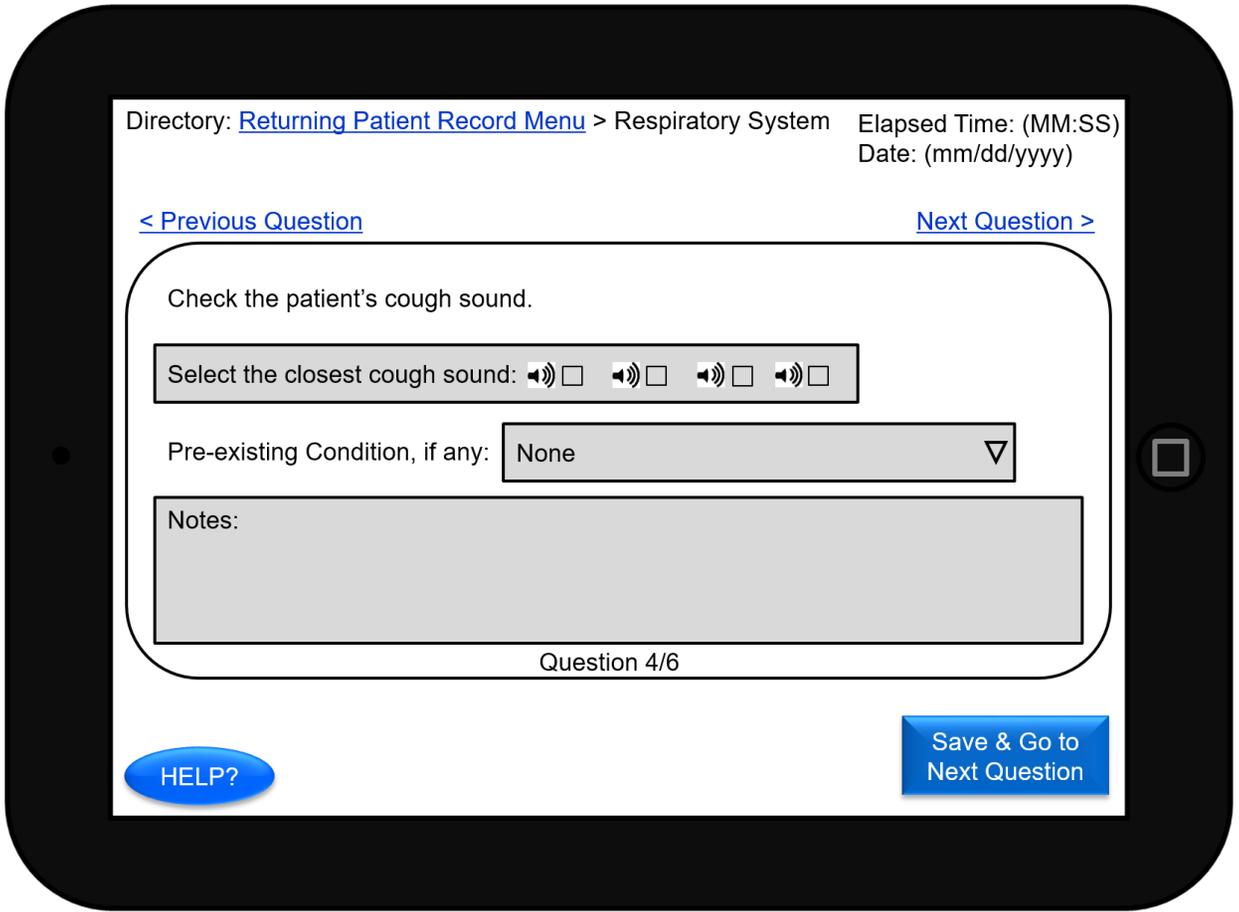
Condition/Observation: Heart palpitations	Severity: None
Condition/Observation: Irregular beats	Severity: None

Notes: No cardiac abnormalities.

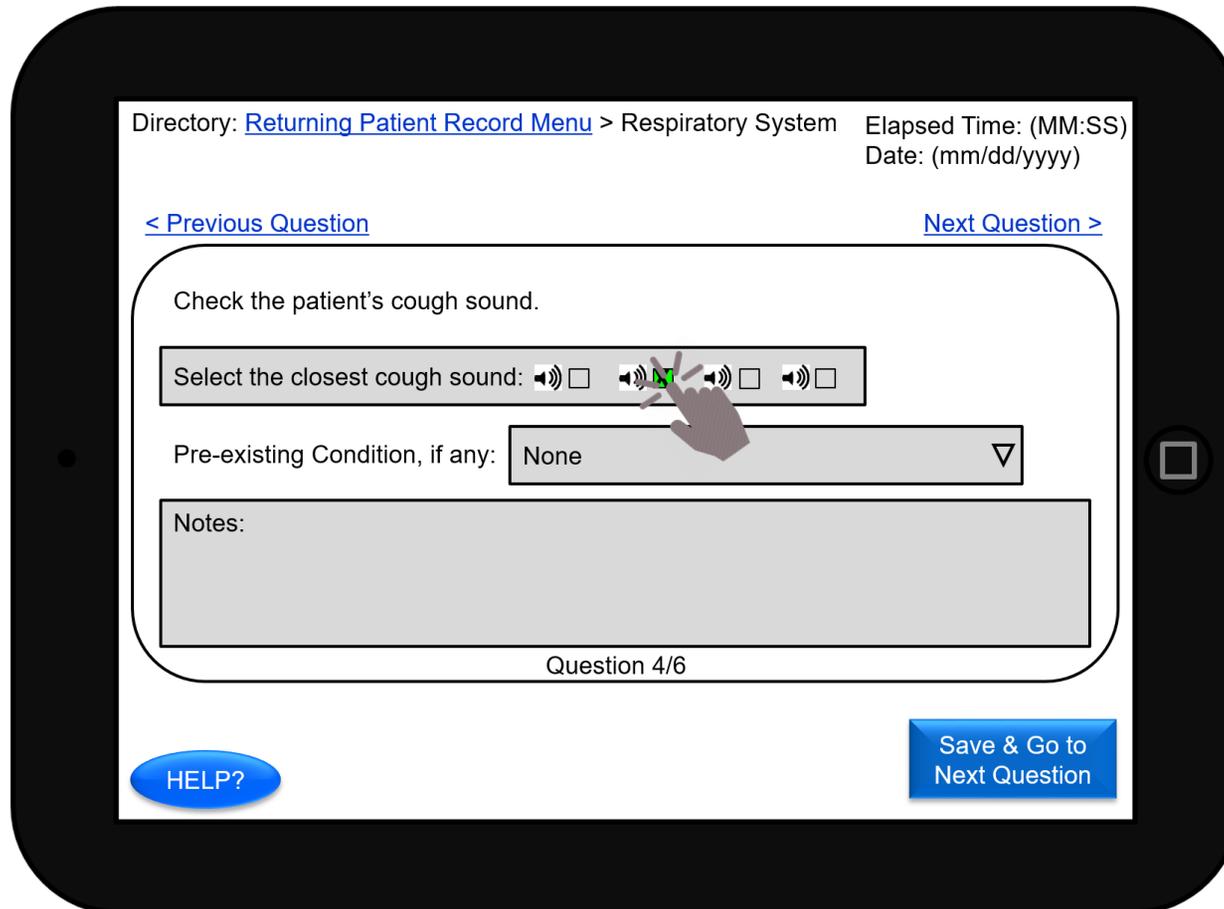
Question 5/9

[HELP?](#) [Save & Go to Next Question](#)

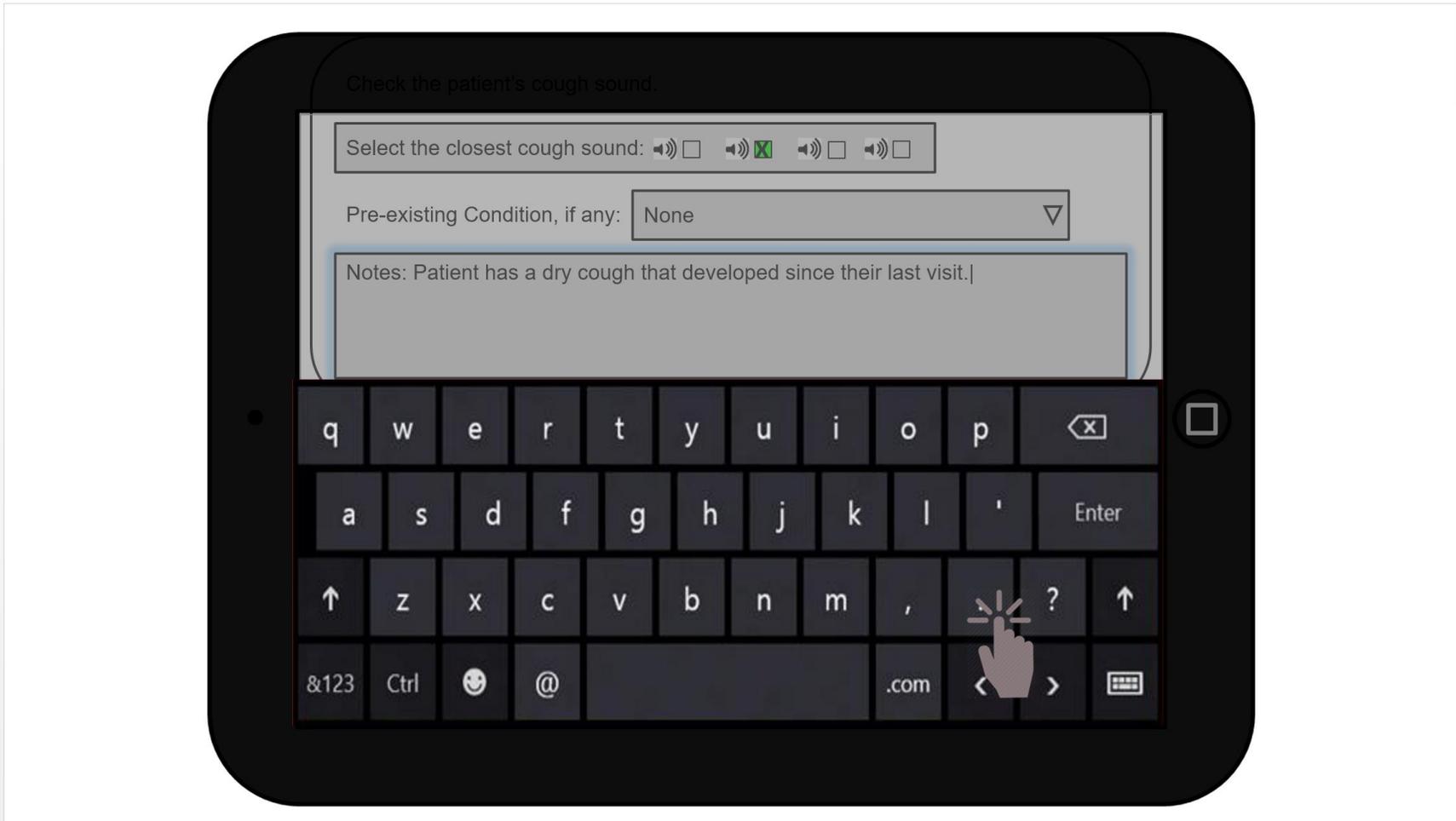
The following returning patient records will be an example based off of a case study for typhoid.



The following returning patient records will be an example based off of a case study for typhoid.



The following returning patient records will be an example based off of a case study for typhoid.



The following returning patient records will be an example based off of a case study for typhoid.

Directory: [Returning Patient Record Menu](#) > Respiratory System Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[< Previous Question](#)

[Next Question >](#)

Check the patient's cough sound.

Select the closest cough sound:

Pre-existing Condition, if any: ▾

Notes: Patient has a dry cough that developed since their last visit.

Question 4/6

HELP?

Save & Go to
Next Question

The following returning patient records will be an example based off of a case study for typhoid.

Directory: [Returning Patient Record Menu](#) > Gastrointestinal System

Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[< Previous Question](#)

Palpate the abdominal region and check percussion.

Is there a palpable mass? Yes: No:

If Yes, the adnominal percussion sounds like:

Notes:

Question 8/8

HELP?

Save

The following returning patient records will be an example based off of a case study for typhoid.

Directory: [Returning Patient Record Menu](#) > Gastrointestinal System

Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[< Previous Question](#)

Palpate the abdominal region and check percussion.

Is there a palpable mass? Yes: No:

If Yes, the adnominal percussion sounds like:

Notes:

Question 8/8

HELP?

Save

The following returning patient records will be an example based off of a case study for typhoid.

Directory: [Returning Patient Record Menu](#) > Gastrointestinal System

Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[< Previous Question](#)

Palpate the abdominal region and check percussion.

Is there a palpable mass? Yes: No:

If Yes, the adnominal percussion sounds like:

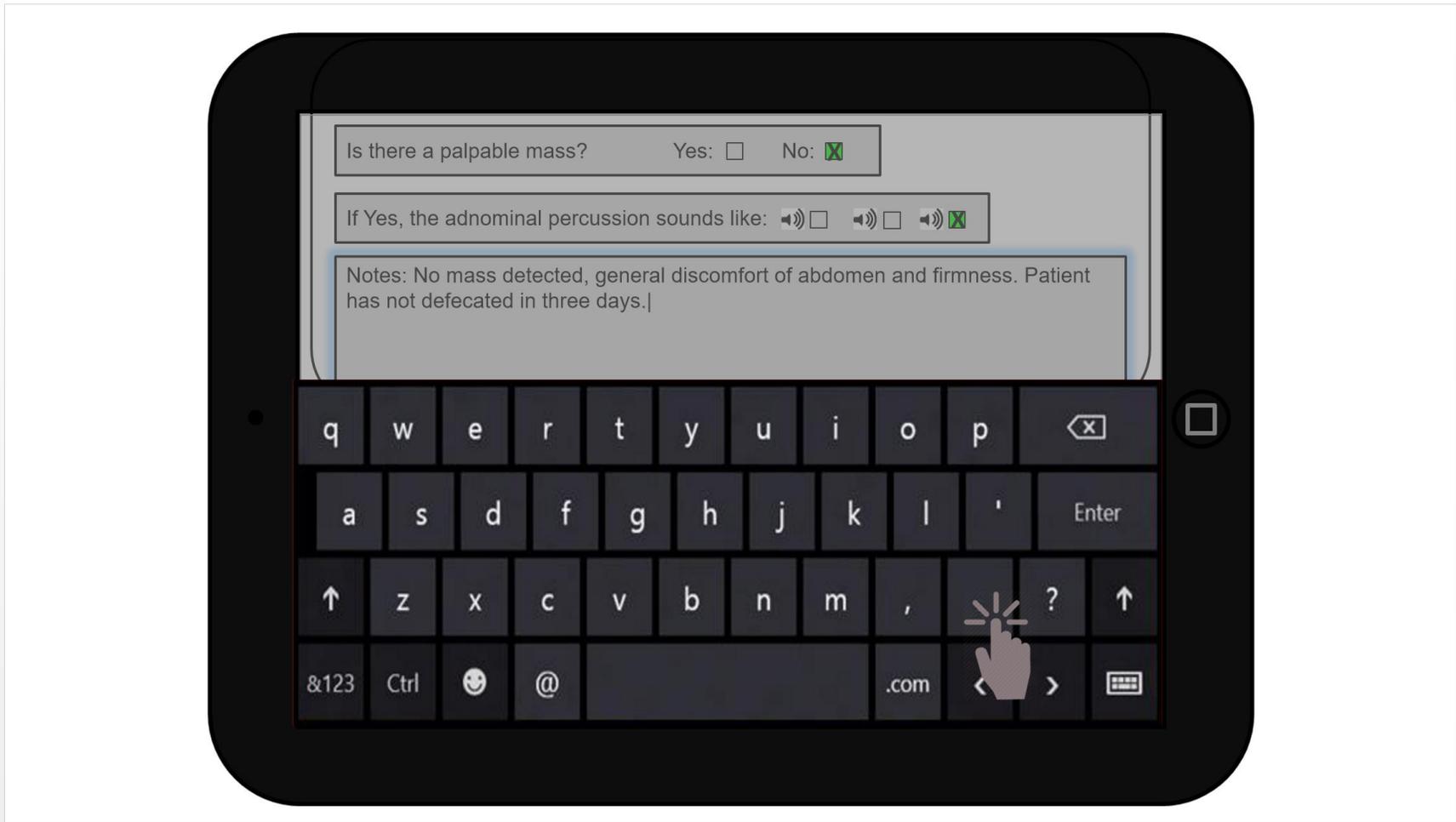
Notes:

Question 8/8

HELP?

Save

The following returning patient records will be an example based off of a case study for typhoid.



The following returning patient records will be an example based off of a case study for typhoid.

Directory: [Returning Patient Record Menu](#) > Gastrointestinal System

Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[< Previous Question](#)

Palpate the abdominal region and check percussion.

Is there a palpable mass? Yes: No:

If Yes, the adnominal percussion sounds like:

Notes: No mass detected, general discomfort of abdomen and firmness. Patient has not defecated in three days.

Question 8/8

HELP?

Save

The following returning patient records will be an example based off of a case study for typhoid.

Directory: [Returning Patient Record Menu](#) > Integumentary System

Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[< Previous Question](#)

[Next Question >](#)

Check the patient for rashes on his or her body.

Is this condition present?: Yes: No:

[View Rash Images](#)

If Yes, select the type of rash:

Allergy

Bumps

Eczema

Seborrheic Dermatitis

Notes:

Question 2/3

HELP?

Save & Go to Next Question

The following returning patient records will be an example based off of a case study for typhoid.

Directory: [New Patient Record Menu](#) > Integumentary System Elapsed Time: (MM:SS)
 Date: (mm/dd/yyyy)

[< Previous Question](#) [Next Question >](#)

Check the patient for rashes on his or her body.

Is this condition present?: Yes: No: [View Rash Images](#)

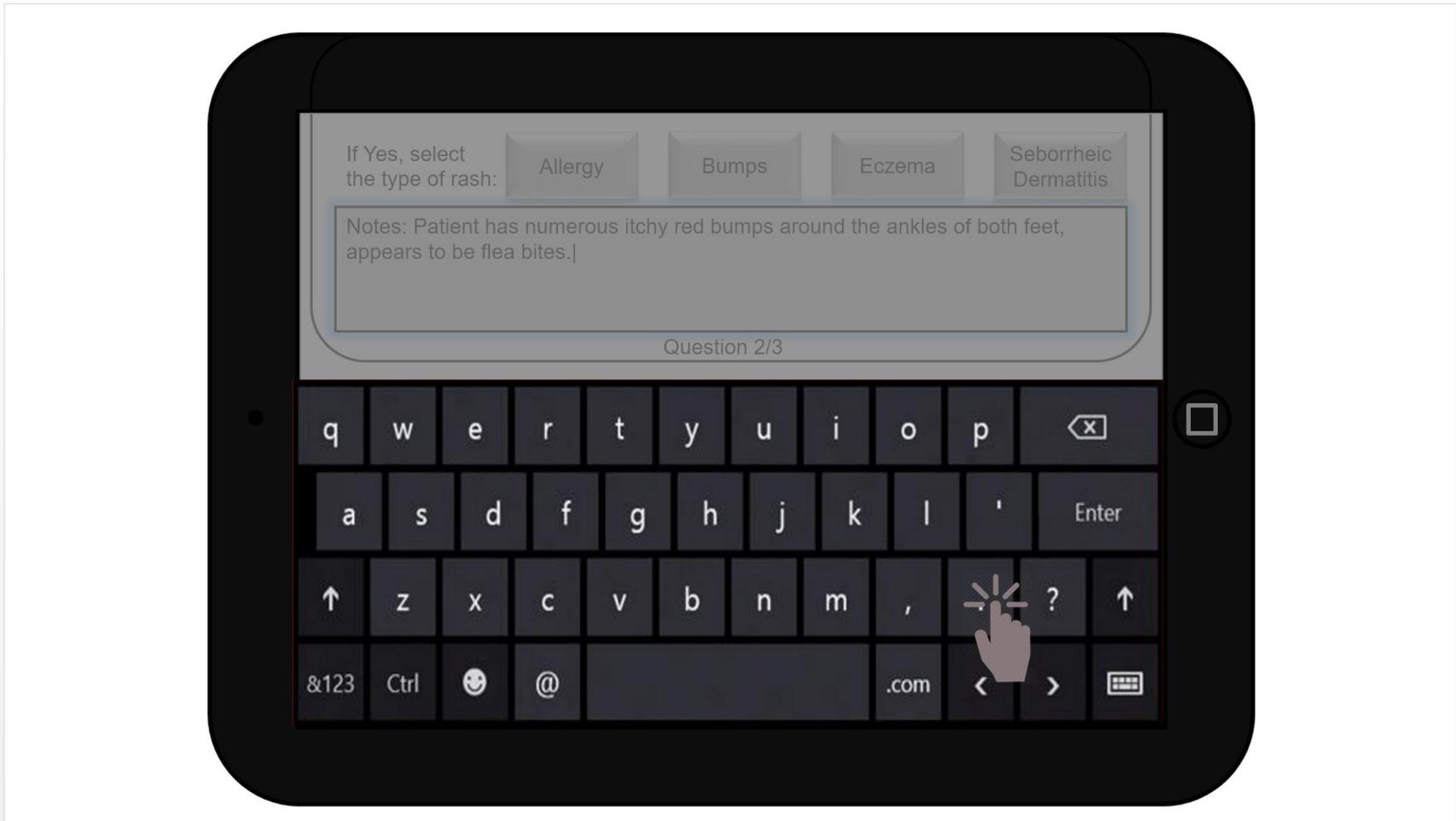
If Yes, select the type of rash: Allergy Bumps Eczema Seborrheic Dermatitis

Notes:

Question 2/3

[HELP?](#) [Save & Go to Next Question](#)

The following returning patient records will be an example based off of a case study for typhoid.



The following returning patient records will be an example based off of a case study for typhoid.

Directory: [New Patient Record Menu](#) > Integumentary System Elapsed Time: (MM:SS)
 Date: (mm/dd/yyyy)

[< Previous Question](#) [Next Question >](#)

Check the patient for rashes on his or her body.

Is this condition present?: Yes: No:

[View Rash Images](#)

If Yes, select the type of rash: Allergy Bumps Eczema Seborrheic Dermatitis

Notes: Patient has numerous itchy red bumps around the ankles of both feet, appears to be flea bites.

Question 2/3

[HELP?](#) [Save & Go to Next Question](#)

The following returning patient records will be an example based off of a case study for typhoid.

Directory: [Returning Patient Record Menu](#) > Patient History

Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

[Next Question >](#)

Have you, the patient, been bitten by an animal (non-insect) in the past (2) weeks?

Is this condition present?: Yes: No:

[View Larger Images](#)

If Yes, select an animal type
and further detail, as prompted:



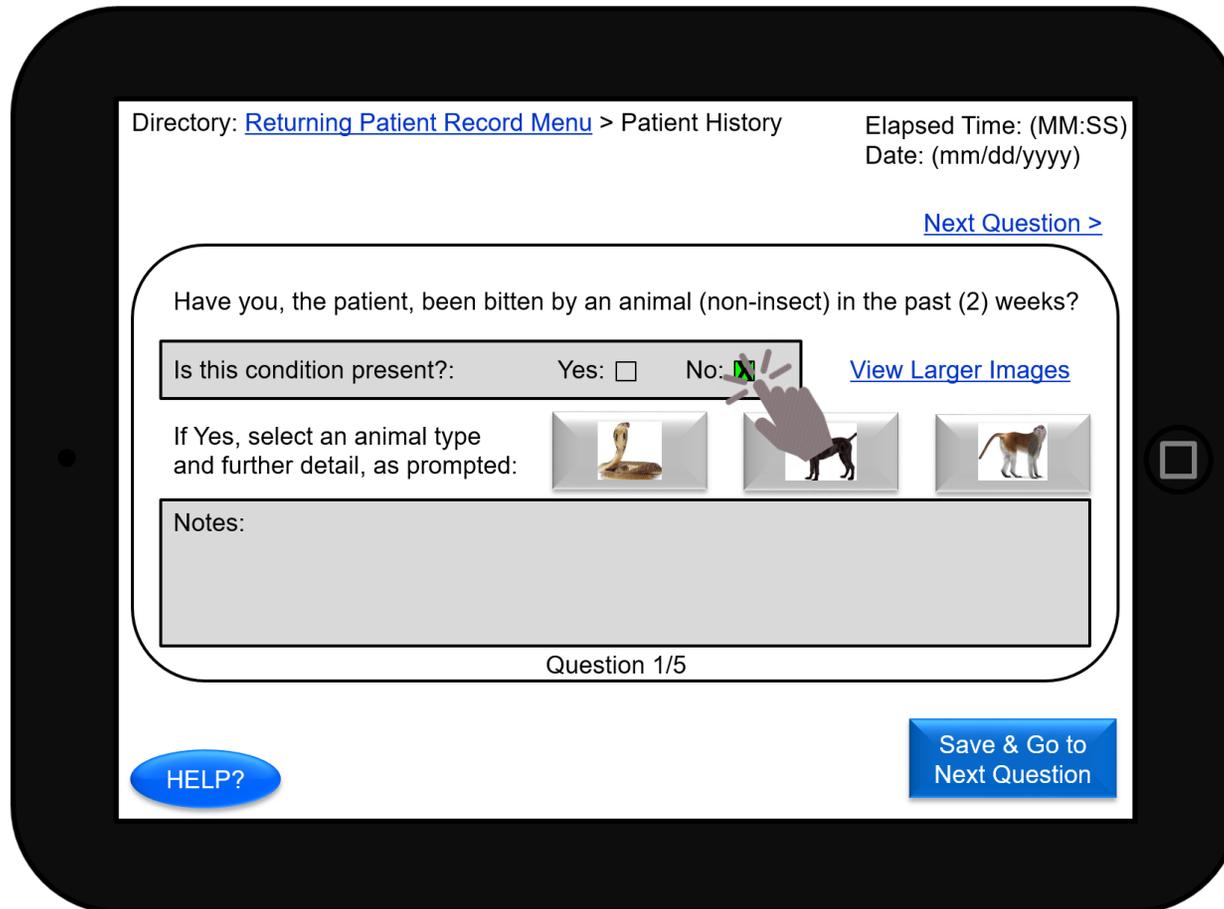
Notes:

Question 1/5

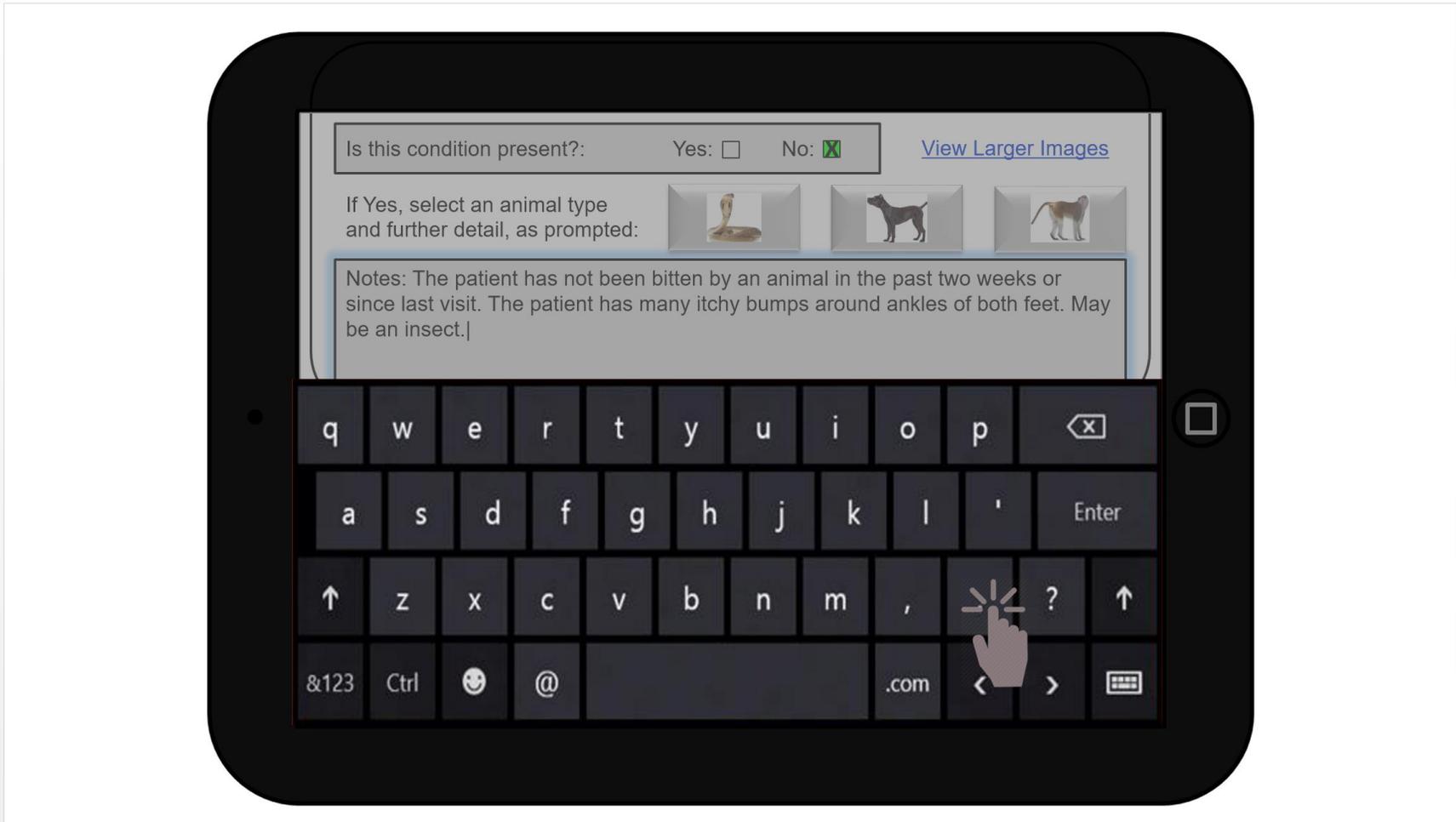
HELP?

Save & Go to
Next Question

The following returning patient records will be an example based off of a case study for typhoid.



The following returning patient records will be an example based off of a case study for typhoid.



The following returning patient records will be an example based off of a case study for typhoid.

Directory: [Returning Patient Record Menu](#) > Patient History

Elapsed Time: (MM:SS)

Date: (mm/dd/yyyy)

[Next Question >](#)

Have you, the patient, been bitten by an animal (non-insect) in the past (2) weeks?

Is this condition present?:

Yes:

No:

[View Larger Images](#)

If Yes, select an animal type
and further detail, as prompted:



Notes: The patient has not been bitten by an animal in the past two weeks or since last visit. The patient has many itchy bumps around ankles of both feet. May be an insect.

Question 1/5

HELP?

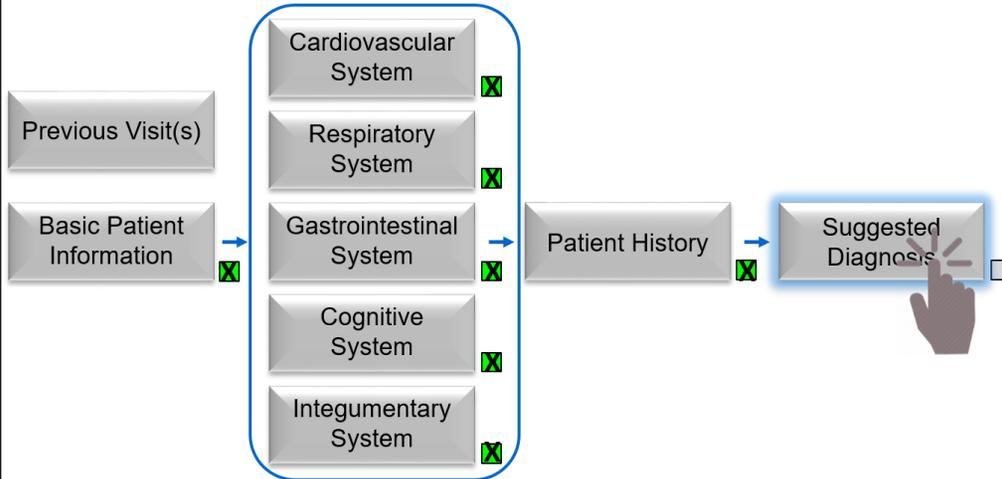
Save & Go to
Next Question

The following returning patient records will be an example based off of a case study for typhoid.

Directory: [Abdul Limbda](#) > Returning Patient Record Menu

Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

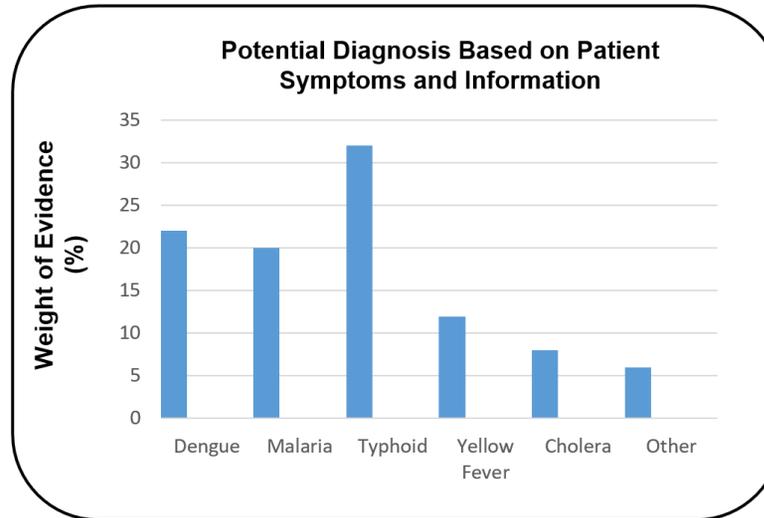
Examination Information



HELP?

Directory: [Returning Patient Record Menu](#) > Suggested Diagnosis Elapsed Time: (MM:SS)
Date: (mm/dd/yyyy)

Click on
disease for
further
detail.

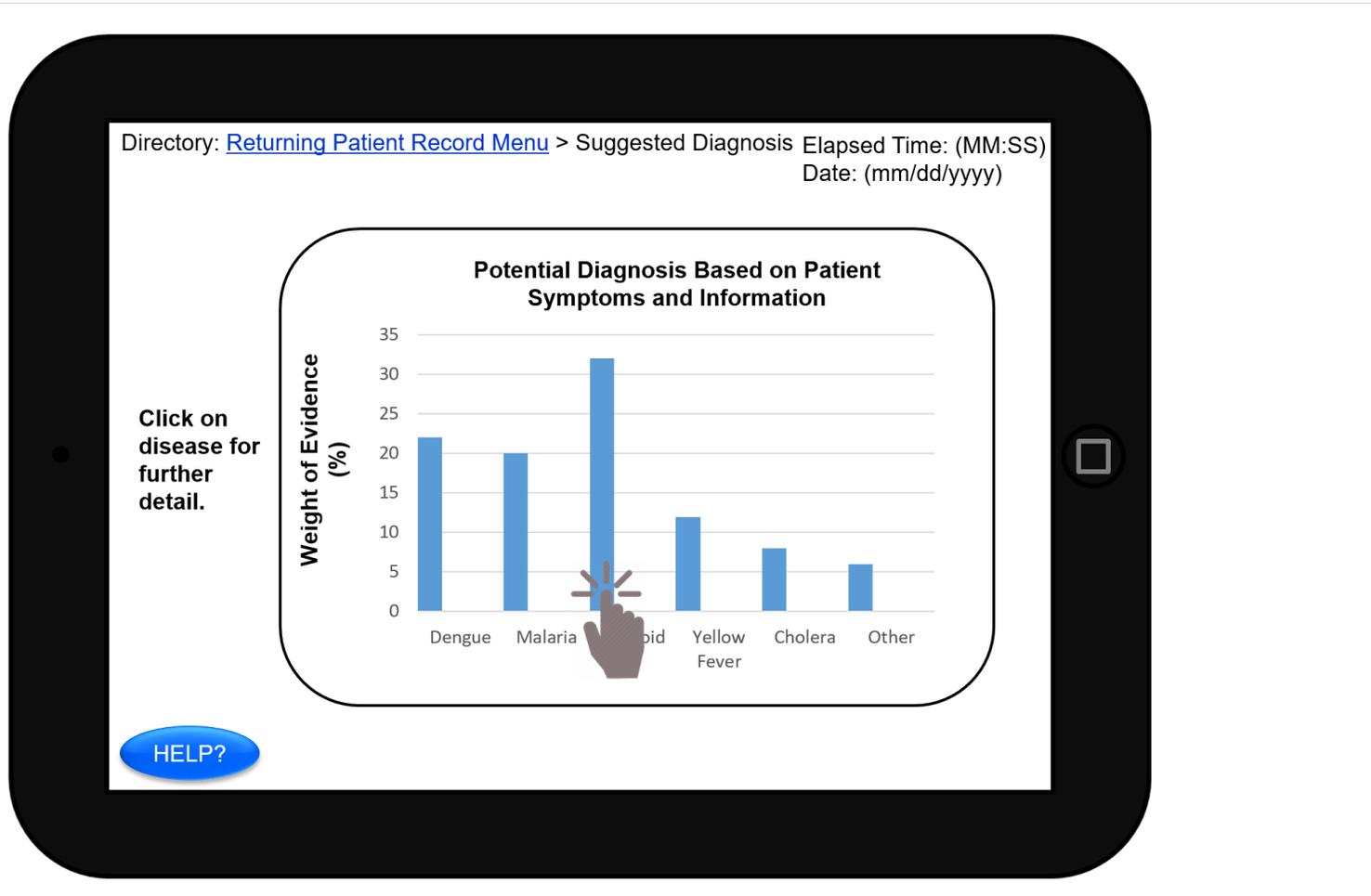


HELP?

These answers would point towards typhoid based on the case study.

Suggested Diagnosis Screen:

- This is an example of what users would see given the previous answers presented.
- Each bar in the graph represented the relative percentage likelihood of each disease. The infectious diseases that may be diagnosed in WAIDDA are listed in Appendix D. If the system determines that the symptoms and signs inputted do not point towards any of these, then an “Other” diagnosis is presented. Further information would be presented upon clicking the bar.

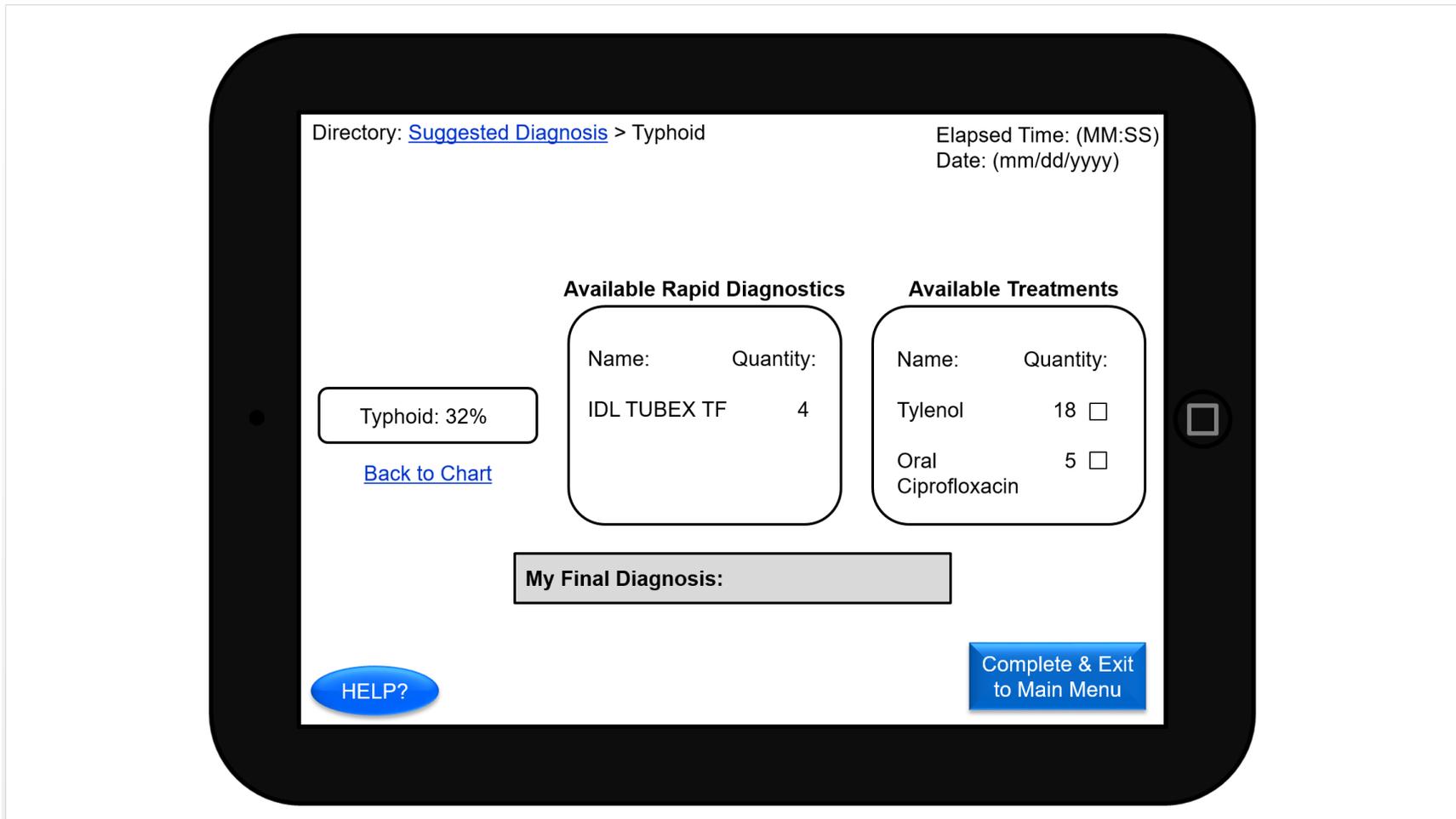


These answers would point towards typhoid based on the case study.

Suggested Diagnosis Screen:

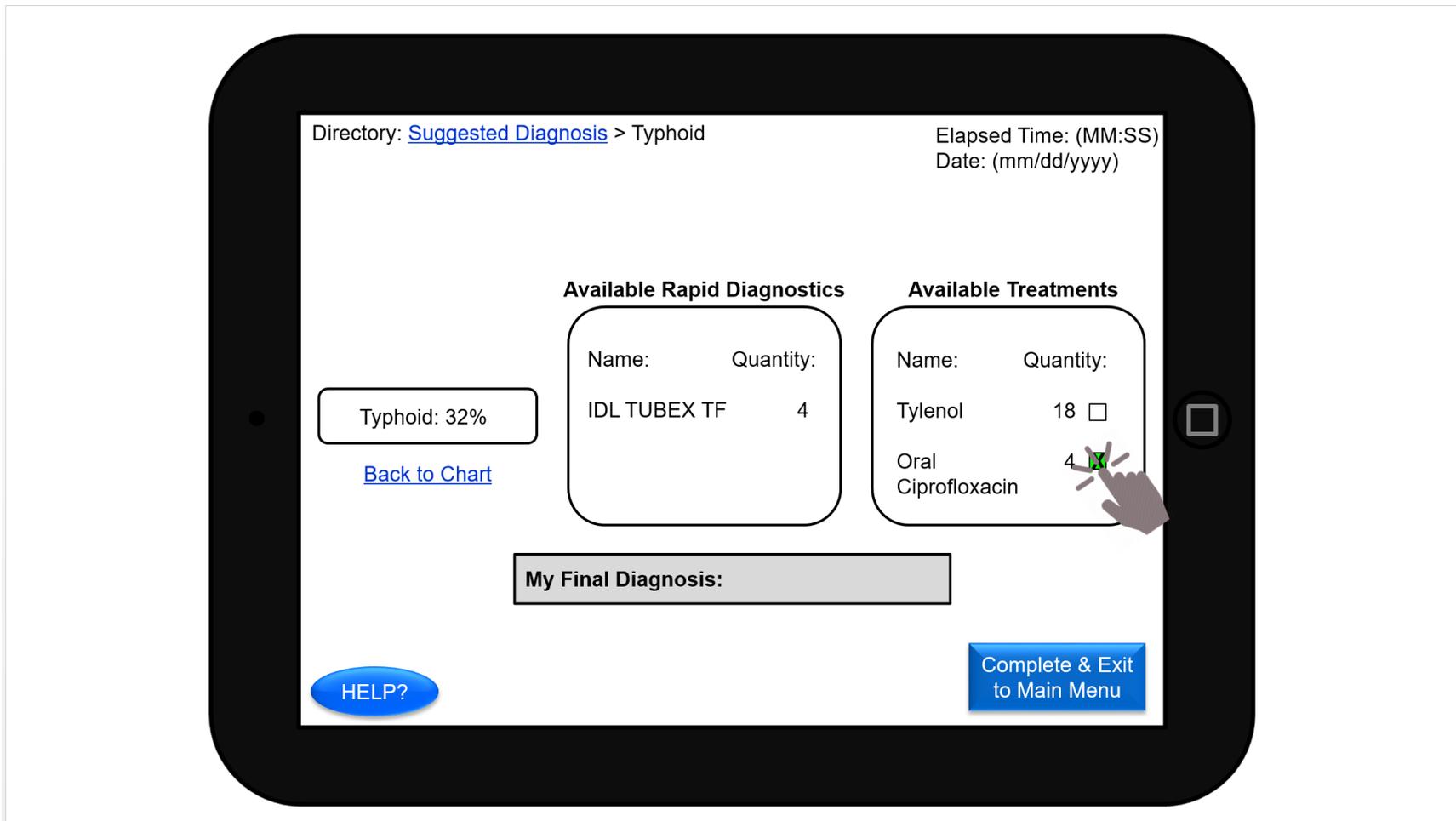
- This is an example of what users would see given the previous answers presented.

- Each bar in the graph represented the relative percentage likelihood of each disease. The infectious diseases that may be diagnosed in WAIDDA are listed in Appendix D. If the system determines that the symptoms and signs inputted do not point towards any of these, then an “Other” diagnosis is presented. Further information would be presented upon clicking the bar.



These answers would point towards typhoid based on the case study.
Further Information for Specific Diseases:

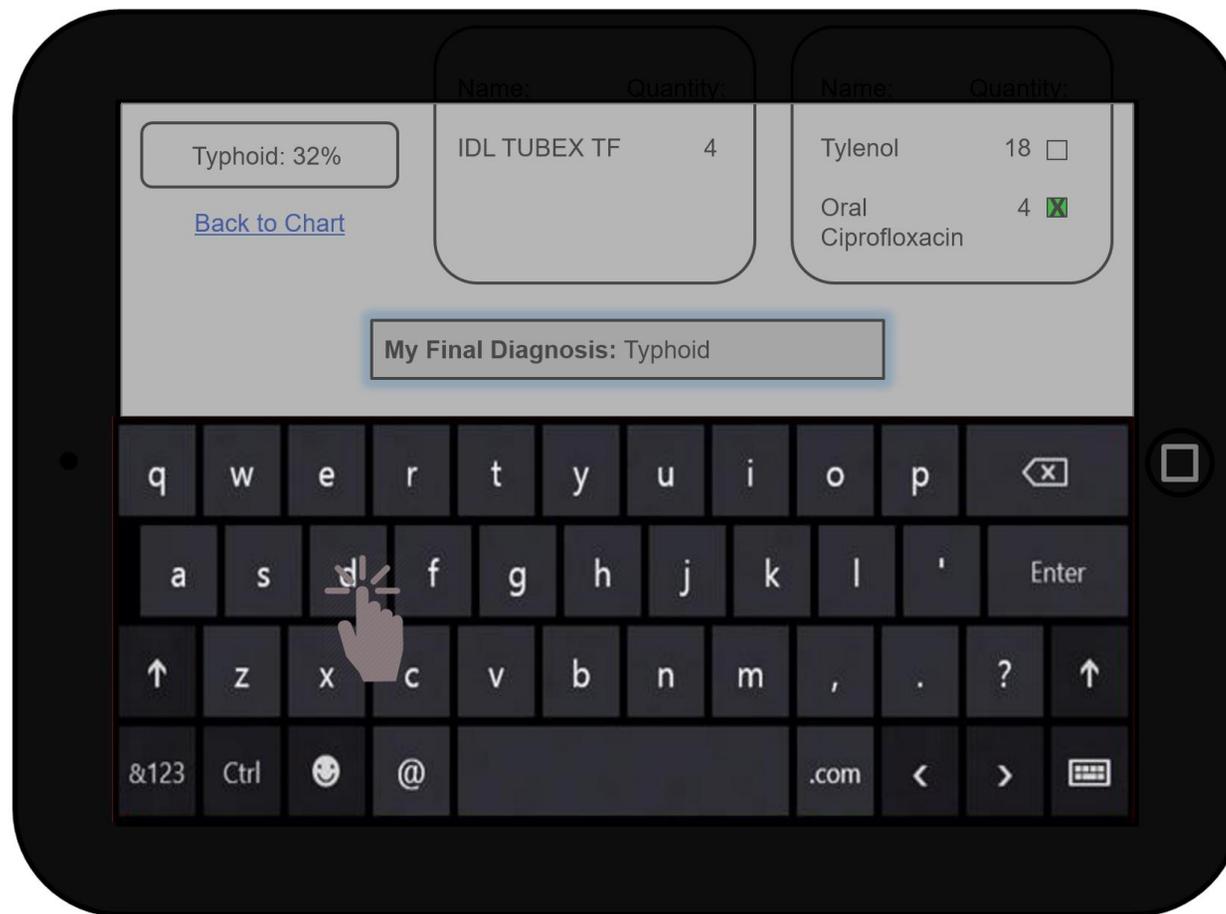
- This is an example of a screen that would follow the Suggested Diagnosis screen for a selected disease. Information regarding available rapid diagnostic tests and treatments.
- For some diseases such as dengue, there are no available rapid diagnostic tests, especially within this setting. Likewise there is no specific treatment; often pain relief is prescribed. For this typhoid example, some inventory is available and is listed.



These answers would point towards typhoid based on the case study.

Further Information for Specific Diseases:

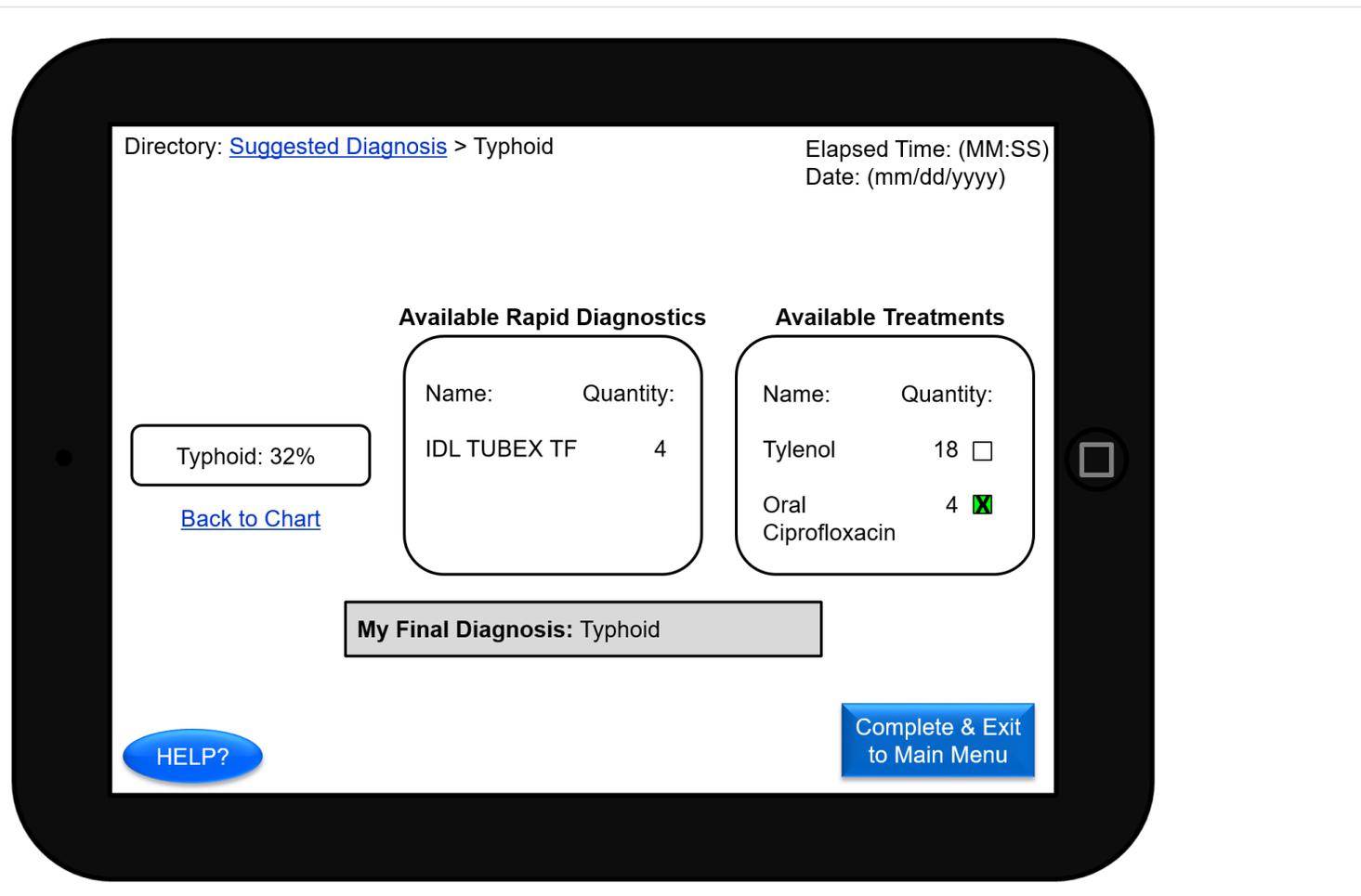
- This is an example of a screen that would follow the Suggested Diagnosis screen for a selected disease. Information regarding available rapid diagnostic tests and treatments.
- For some diseases such as dengue, there are no available rapid diagnostic tests, especially within this setting. Likewise there is no specific treatment; often pain relief is prescribed. For this typhoid example, some inventory is available and is listed.



These answers would point towards typhoid based on the case study.

Further Information for Specific Diseases:

- This is an example of a screen that would follow the Suggested Diagnosis screen for a selected disease. Information regarding available rapid diagnostic tests and treatments.
- For some diseases such as dengue, there are no available rapid diagnostic tests, especially within this setting. Likewise there is no specific treatment; often pain relief is prescribed. For this typhoid example, some inventory is available and is listed.



These answers would point towards typhoid based on the case study.