

Asthma Control - User Guide

CDC, Georgia Tech, Team Epidemics

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Github link

<https://github.gatech.edu/gt-hit-spring2018/Asthma-Control>

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Overview

Asthma guidelines suggest having a patient's asthma control evaluated regularly. This application is a working prototype used to ask patients a series of questions appropriate to their age group, evaluate their current control of their asthma across the domains of risk and impairment, and provide recommended action steps for treatment based on EPR-3 asthma guidelines. This information is then stored to a FHIR server.

Epidemics Application

Introduction

Epidemics is a web application. It is typically run at a care provider's office and would be integrated with an EHR (Electronic Health Record) application. The provider would select the patient and work with the patient to answer a set of relevant questions and submit the responses to a computer server which would analyze and present to the provider treatment recommendations, which can be modified by the provider. The application is designed to be highly interoperable with the use of Fast Interoperability Health Resources (FHIR) standards.

Setup and running




















Epidemics application runs locally with the default configuration. For installation and software packages needed for running Epidemics, please *see installation manual*. Once installed and configured, the application is launched by navigating to <http://localhost:8081>. When you have successfully installed and configured the application, the home page should look like the image below.


Epidemics


Patients

Help

Patients

	Name 	Actions		
	Rafael Pagac	 Edit	 Delete	Start Assessment
	Vilma Littel	 Edit	 Delete	Start Assessment
	Germaine O'Connell	 Edit	 Delete	Start Assessment
	Adele McGlynn	 Edit	 Delete	Start Assessment
	Jarrett Monahan	 Edit	 Delete	Start Assessment
	Raina Hackett	 Edit	 Delete	Start Assessment
	Laurianne Weimann	 Edit	 Delete	Start Assessment
	Lila Dach	 Edit	 Delete	Start Assessment

 Add Patient

 Import Patient from FHIR

Select a patient

The end user (a clinician, with a patient) is presented with the list of patients from which they can select one for whom the assessment will be performed. Selecting the *"Start Assessment"* icon in the row of the desired patient will launch the questionnaire.

The questionnaire launched depends on the age of the selected patient as of the day that the questionnaire is being taken. Patients are grouped to either 0-4, 5-11, or 12+ years of age in accordance with the EPR-3 guidelines. Each age group receives different questions in their questionnaire.

Clicking the filter icon will allow the end user to begin searching by patient name. Clicking it again will close the filter.

The patient list page also contains controls for [editing patient](#) details, [adding new patients](#) and [importing patients](#).

On this page the end user can view historical visit information by clicking the drop down arrow next to the patient's name, if present, and clicking *"Details"* on the visit they would like to review.

Asthma control questionnaire

The end user will be presented with questions about the patient's control of asthma one question at a time. Each question must be answered to proceed. The user selects a question by clicking anywhere in the button associated with that answer, and upon clicking the button for the selected answer will change color.

To change an answer, the end user clicks on a button for another answer to select that answer. Once an answer has been selected, the "Next" button will become enabled, allowing the user to proceed to the next question in the questionnaire.

A sample image of a question for a child patient will look like the image below.

The screenshot shows a web interface for an asthma assessment. At the top is a navigation bar with 'Epidemics', 'Patients', and 'Help' links. The main heading is '0-4 yrs of age - Asthma Control Assessment'. Below this is the question 'Night time awakenings in previous 2-4 weeks'. There are three radio button options: '<= 1x/month', '> 1x/month' (which is selected and highlighted in dark blue), and '>= 1x/week'. At the bottom left is a progress indicator '2/5', and at the bottom right are 'Previous' and 'Next' buttons.

Epidemics Patients Help

0-4 yrs of age - Asthma Control Assessment

Night time awakenings in previous 2-4 weeks

☐ <= 1x/month

☒ > 1x/month

☐ >= 1x/week

2/5

Previous Next

At any time during the question-answering portion, if the user wants to return to a previously answered question and adjust their answer they can press the "Previous" button. The answer they previously selected will remain highlighted, and they can change answers, as before, by selecting the button of another answer.

On the final question the "Next" button is replaced with a "Submit" button, to end the portion of the

questionnaire consisting of questions for the end user. When this button is pressed, the application will calculate the levels of asthma control in accordance with the EPR-3 guidelines and return this information to the patient.

Asthma control assessment

The application uses the patient's responses to each of the questions to calculate asthma control in the **Risk** and **Impairment** domains according to the EPR-3 guidelines for the patient's age group. Each domain's control level is calculated independently.

Treatment plan

After the user submits the questions and these control levels are calculated they are displayed to the end user along with **Recommended Actions for Treatment**, also provided by EPR-3 guidelines. Each domain receives recommended actions for treatment.

The result of the analysis and treatment plan recommendation are seen in the sample image below.

EpidemicsPatientsHelp

Asthma Control includes 2 domains: impairment and risk.

Level of control is based on the most severe impairment or risk classification.

Impairment Domain: Very Poorly Controlled

Recommended Action for treatment (editable) :

- Consider short course of oral systemic corticosteroids,
- Step up (1-2 steps), and
- Reevaluate in 2 weeks.
- If no clear benefit in 4-6 weeks, consider alternative diagnoses or adjusting therapy.
- For side effects, consider alternative treatment options.

Risk Domain*: Very Poorly Controlled

Recommended Action for treatment (editable)

- Consider short course of oral systemic corticosteroids,
- Step up (1-2 steps), and
- Reevaluate in 2 weeks.
- If no clear benefit in 4-6 weeks, consider alternative diagnoses or adjusting therapy.
- For side effects, consider alternative treatment options.

More on impairment and risk:

Impairment is the frequency and intensity of symptoms and functional limitations the patient is experiencing or has recently experienced

Risk is the likelihood of either asthma exacerbations, progressive decline in lung function (or, for children, reducing lung growth), or risk adverse effects from medication. This calculator uses only asthma exacerbation history to assess risk and does not include the other components of risk.

*At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma control. In general, more frequent and intense exacerbations (e.g. requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate poorer disease control. For treatment purposes, patients who had >= 2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have not-well-controlled asthma, even in the absence of impairment levels consistent with not-well-controlled asthma.

Transmit to FHIR

FHIR Resources

Questionnaire

Questionnaire Response

Patient

Care Plan

"Well Controlled" is presented to the user in a green panel, "Not Well Controlled" is presented in yellow, and "Very Poorly Controlled" is presented in red.

These **Actions** are presented as editable to the end user. This allows for the clinician to customize the action steps for an individual patient (e.g., add patient-specific context for clarity or add or remove action steps) if desirable. To edit, click into the panel and begin typing.

Saving externally

When the end user is ready to save the asthma control levels they press the *Transmit to FHIR* button to save information from this questionnaire.

The end user will transmit the questionnaire (if it doesn't already exist) and responses to the questionnaire, patient information, and asthma control levels and actions for treatment to FHIR by clicking the *Transmit to FHIR* button.

If data has been stored to FHIR, a section at the bottom of the Results page provides options for the end user to retrieve and review the information they've just stored to FHIR. Clicking any of the available links will open a browser tab containing the information returned from FHIR for that FHIR resource. The result of the FHIR transmission are seen in the sample image below.

This result is being rendered in HTML for easy viewing. You may access this content as [Raw JSON](#) or [Raw XML](#), or view this content in [HTML JSON](#) or [HTML XML](#). Response generated in 3ms.

HTTP 200 OK

Response Headers

X-Powered-By: HAPI FHIR 3.3.0-SNAPSHOT REST Server (FHIR Server; FHIR 3.0.1/DSTU3)
Content-Type: application/fhir+xml;charset=utf-8

Response Body

```
1  {
2    "resourceType": "Questionnaire",
3    "id": "2913933",
4    "meta": {
5      "versionId": "1",
6      "lastUpdated": "2018-04-22T18:37:46.862+00:00"
7    },
8    "title": "0-4 yrs of age",
9    "status": "active",
10   "date": "2018-04-22T18:43:35+00:00",
11   "publisher": "Aarsh Talati",
12   "description": "Asthma Control Assessment: 0-4 yrs of age",
13   "item": [
14     {
15       "linkId": "agl_1",
16       "text": "Asthma symptoms in previous 2-4 weeks",
17       "type": "choice",
18       "required": true,
19       "repeats": false,
20       "readOnly": false
21     },
22     {
23       "linkId": "agl_2",
24       "text": "Night time awakenings in previous 2-4 weeks",
25       "type": "choice",
26       "required": true,
27       "repeats": false,
28       "readOnly": false
29     },
30     {
31       "linkId": "agl_3",
32       "text": "Interference with normal activity in previous 2-4 weeks",
33       "type": "choice",
34       "required": true,
35       "repeats": false,
36       "readOnly": false
37     },
38     {
39       "linkId": "agl_4",
40       "text": "Short-acting beta2-agonist use for symptom control in previous 2-4 weeks (not prevention of exercise-induced bronchospasm)",
41       "type": "choice",
42       "required": true,
43       "repeats": false,
44       "readOnly": false
45     },
46     {
47       "linkId": "agl_5",
48       "text": "Exacerbations requiring oral systemic corticosteroids",
49       "type": "choice",
50       "required": true,
51       "repeats": false,
52       "readOnly": false
53     }
54   ]
55 }
```

Edit patient details

In this screen, a patient's current details are shown. Details can be edited and saved from this page. A sample edit of patient details is shown below.

Data Label	Patient Data
Username	<div>cory.rempel</div>
Password	<div></div>
Active	<div>true</div>
Person Type	<div>PATIENT</div>
First Name	<div>Rafael</div>
Middle Name	<div>Cassandra</div>
Last Name	<div>Pagac</div>
Contact Phone	<div>05942567846</div>
Contact Email	<div>meagan.borer@example.com</div>
Contact Fax	<div>1-776-561-7474x2407</div>
Address Line1	<div>296 Zemlak Lakes Apt. 213</div>
Address Line2	<div></div>
City	<div>Estellfort</div>
State	<div>Alabama</div>
Zip	<div>64442-4566</div>
Birthday	<div>2015-03-17T00:00:00.000+0000</div>

Save Patient

Add patient

When "Add Patient" button on the home page is clicked, a blank form is shown whcih can be edited to add details about the patient. This screen can also be used to add a doctor entity as well. Adding doctor entities is not fully functional as it is out of the scope of our project. A sample add of patient details is shown below.

Epidemics	Patients	<input type="text" value="Search patient"/>	<input type="button" value="Submit"/>	Help	Aarsh ▾
-----------	----------	---	---------------------------------------	------	---------

Data Label	Patient Data
Username	<input type="text"/>
Password	<input type="password"/>
Active	<input type="text" value="true"/>
Person Type	<input type="text" value="PATIENT"/>
First Name	<input type="text"/>
Middle Name	<input type="text"/>
Last Name	<input type="text"/>
Contact Phone	<input type="text"/>
Contact Email	<input type="text"/>
Contact Fax	<input type="text"/>
Address Line1	<input type="text"/>
Address Line2	<input type="text"/>
City	<input type="text"/>
State	<input type="text"/>
Zip	<input type="text"/>
Birthday	<input type="text"/>

Import patient from FHIR

Clicking the "Import Patient from FHIR" button will navigate the user to a screen where they can search the FHIR server for the patient they would like to import. This search can be done by name or by FHIR ID. When the patient is found, pressing the "Import" button imports the patient to the local database (see image below)

FHIR: Import Patient

Search by

☒ Name

☐ ID

Given name

As it exactly appears in FHIR

Looks good!

First Name


Family name

As it exactly appears in FHIR

Looks good!

Last Name

Search

Name	Address Line 1	Address Line 1	City	State	Fax	Email	Phone	Birthday	Action
Ramesh Manian			Menlo Park	CA				12/31/1999	 Import

and brings the end user to the [edit patient screen](#), in case they need to update any information for this patient. Clicking the "Save Patient" button returns the end user to the home page.

Navigation Bar

In addition to the information held on each page specific to that page, each page contains a common navigation bar across the top of the page with clickable links. This navigation bar is the same across all pages of the application.

- Patient
 - This link redirects to the home page, where a user can select a patient
- Help
 - This page links to a small page offering guidance, a subset of this user guide.