

Let's Talk Informatics

ED Wait Times Prediction Tool

- Audience audio and video options have been disabled.
- To interact in the Q & A portion of the presentation, select Q & A from the top menu bar, then type your question.
- Today's session is being recorded and registered guests will be emailed a link to access.
- Want to stay informed about future sessions? Get on our mailing list here: letstalkinformatics@nshealth.ca.



Let's Talk Informatics

ED Wait Times Prediction Tool


Conor J. Newcombe

January 25th 2024

Acknowledgement

We acknowledge that we are gathered today
in Mi'kma'ki (*Mig-**maw**-gee),
the traditional ancestral unceded
territory of the Mi'kmaq (*Mig-**maw**) people.





Informatics utilizes health information and health care technology to enable patients to receive best treatment and best outcome possible.

Let's Talk Informatics Objectives

This series is designed to enable participants to:

- Identify knowledge and skills healthcare providers need in order to use information now, and in the future.
- Prepare health care providers through an introduction to concepts and experiences in Informatics.
- Acquire knowledge to remain current by becoming familiar with new trends, terminology, studies, data and news.
- Collaborate with a network of colleagues to establishing connections with leaders who can provide advice on business issues, best-practice and knowledge sharing.

Conflict of Interest Declaration

I do not have an affiliation (financial or otherwise) with a pharmaceutical, medical device, health care informatics organization, or other for-profit funder of this program.

Session Specific Objectives

- At the conclusion of this activity, you will be able to:
 - Explain where the value is for an ED Wait Times Prediction Tool.
 - Describe the technical components used for the ED Wait Times Prediction Tool.
 - Understand how monitoring utilization of the tool yields key insights.

Introduction

- Nova Scotia Health has 35 Emergency Departments (EDs)
- ED Wait Times, are defined as the duration between a patient arriving at the ED and the time they are initially assessed by a care provider.
- Predictions are targeted towards less severe encounters (CTAS 3, 4, or 5).
- View it live here: <https://www.nshealth.ca/emergency-care/emergency-department-wait-times>

Examples of ED Wait Times in Canada



Estimated Emergency Department Wait Times



The estimated wait time to see a physician is approximate and for information only.

The wait time is based on the average patient and does not reflect the wait for those who are critically ill or injured, or those with minor conditions. **We provide care to the most critical cases first.**

Wait times can change unexpectedly, based on demand. See our [FAQs](#) to learn more.

Calgary **Edmonton** Grande Prairie Lethbridge Medicine Hat Red Deer

Jan 22, 4:32 pm (updated every two minutes)

2 hr 1 min

[Devon General Hospital](#)

Open 24 hours

5 hr 56 min

[Fort Sask Community Hospital](#)

Open 24 hours

3 hr 33 min

[Grey Nuns Community Hospital](#)

Open 24 hours

2 hr 5 min

[Leduc Community Hospital](#)

Open 24 hours

4 hr 10 min

[Misericordia Community Hospital](#)

4 hr 51 min

[Northeast Community Health Centre](#)



Life-threatening Emergencies

For life-threatening emergencies please **call 911** or go directly to your nearest emergency department.



Health Link

If you have health concerns or you're not sure where to go for help, speak to a nurse on this free, 24/7 telephone service. To contact Health Link **dial 811**.

Know Your Options Before You Go

Emergency departments are for those who are seriously ill or injured, with potentially life-threatening conditions.

[Know your options](#) so you can get the care you need when you need it.



[Health Link](#)



[Family Doctor](#)

<https://www.albertahealthservices.ca//waittimes/waittimes.aspx?msclkid=03f1cdaed11e11ecb490496bd1b16580>

Examples of ED Wait Times in Canada



Sunnybrook Emergency Department wait times

Here you can see the time that most patients will wait to see a doctor in Sunnybrook's Emergency Department today. These wait time predictions are updated every 15 minutes. Predicted wait times are based on a patient's arrival time.

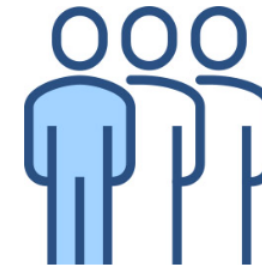
As a trauma centre, Sunnybrook's Emergency Department provides care to some of the sickest, most critically injured patients in Ontario. Due to the need to see the sickest patients first, your wait time may be longer or shorter than the time displayed on this website.

The information on this page is automatically updated every 15 minutes.

As of January 22 at 3:15 p.m.



For patients currently arriving in the ED, the majority* will be seen within **5 hours and 31 minutes**



Number of patients:
In Emergency Department: **94**
Waiting for physician: **26**

<https://sunnybrook.ca/content/?page=ic-emergency-ed-wait-times>

**Wait times vary based on a person's condition. Those who are seriously ill or injured will be seen sooner than other patients.*

Examples of ED Wait Times in Canada



Winnipeg Regional Health Authority Office régional de la santé de Winnipeg

Current Emergency Department Wait Times

Due to rapidly changing demands and the need to see the sickest patients first, your own wait time may be more or less than the time displayed here.

Last updated: 2:30 PM

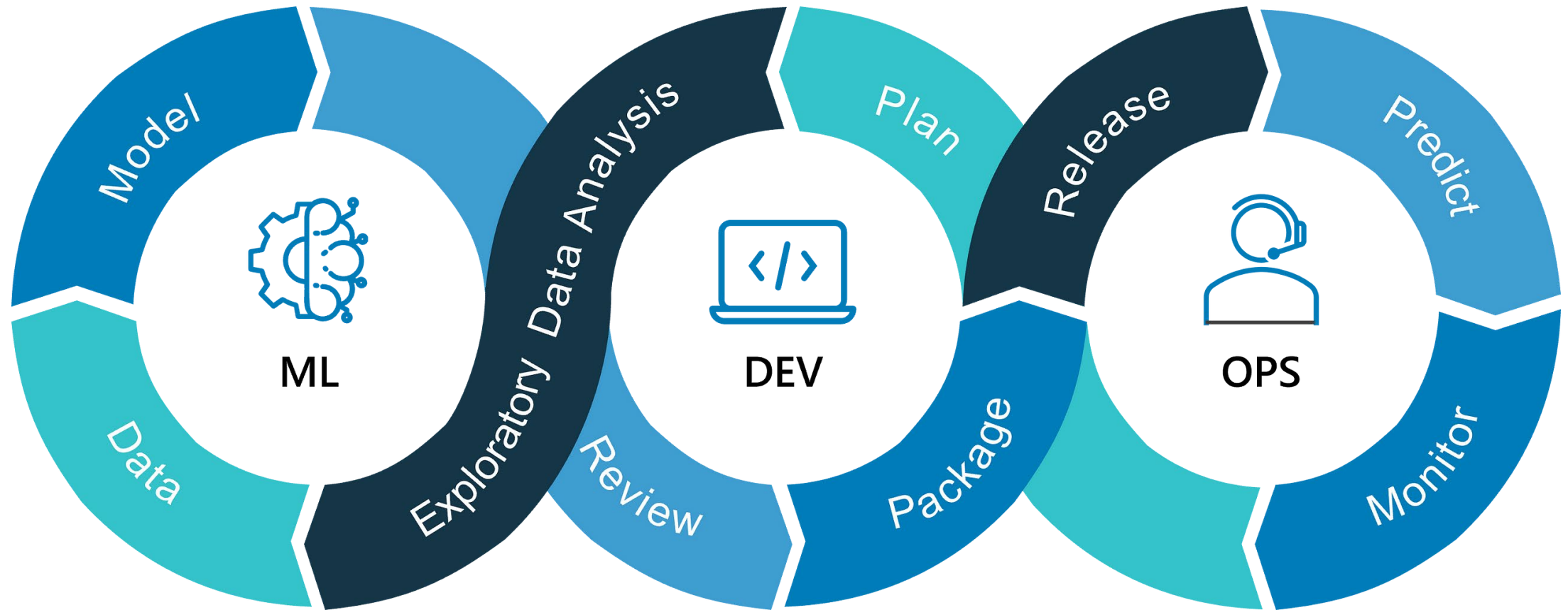
EMERGENCY DEPARTMENT	WAITING	TREATING	WAIT TIME
Grace Hospital	18	51	8 hrs
Health Sciences Centre - Adult	48	53	8.5 hrs
Health Sciences Centre - Children's	16	14	5.25 hrs
St. Boniface Hospital	31	48	11.75 hrs

<https://wrha.mb.ca/wait-times/?msclkid=03f38390d11e11ec9812e745b6ded7fa>

Our Key Objectives

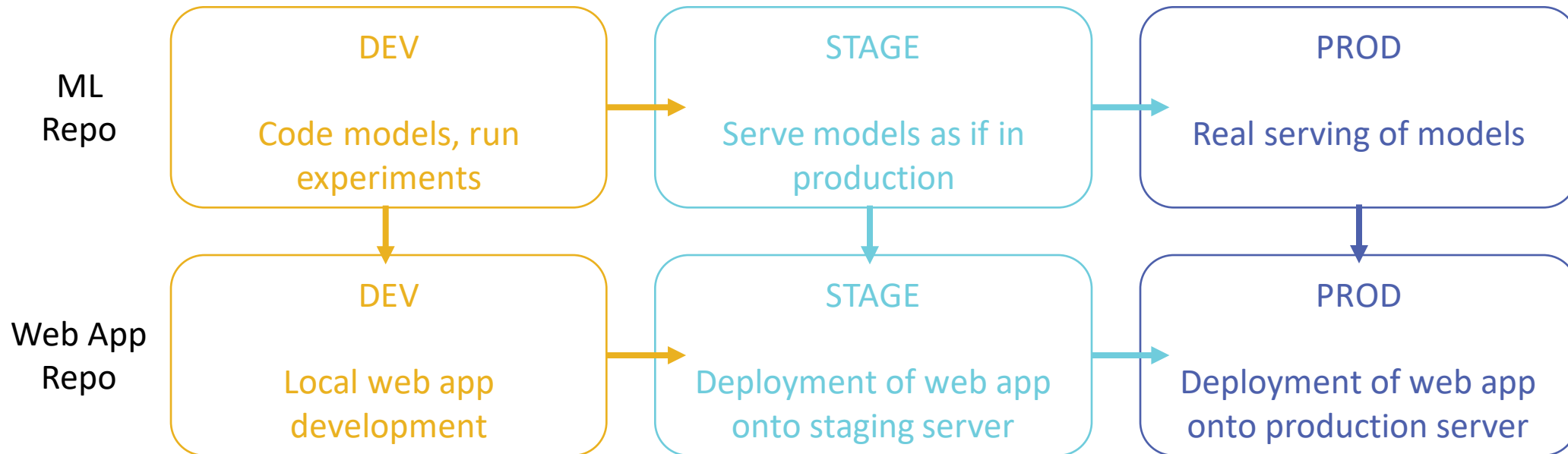
1. Provide a forecast of predicted ED wait times, such that patients can set their expectations hours ahead of their planned arrival.
2. Produce an upper and lower prediction on each future hour, thus creating a wait time range. Ensure the ranges are narrow enough to be separable across EDs, such that users can make an informed decision as to which ED to visit.
3. Include ED site information within the tool (e.g., ED location, distance from user, and opening hours), such that users are better prepared for their ED visit.

MLOps of ED Wait Times



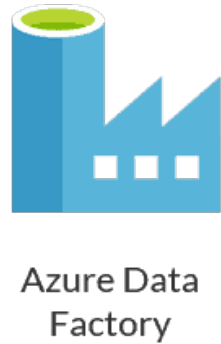
MLOps of ED Wait Times Cont.

- We follow the 'code first' methodology for developing our models.
- Three distinct environments (source controlled using git):



- Standardize, Parameterize, and Automate as much as possible.

Overview of Tools Used



Input Data

- ED data is captured by different EHR systems (Meditech and STAR).
- These data are combined to create the ED Encounters dataset (updated hourly).
- ED Encounters capture the following:
 - T2P (Time to Provider Assessment)
 - CTAS (Canadian Triage and Acuity Scale Level)
 - Arrival Datetime
 - Provider Assessment Datetime
 - Left ED Datetime
 - Unique Provider ID
- Data is transformed into hourly time-series format (averages and counts).

Prediction Model

- Forecasts made using a version of the Prophet forecasting procedure.
- The model we developed takes a novel approach, using both 'global' and ED site specific trends and seasonalities. Thus producing one model for all ED sites.
 - This allows smaller sites (with lower data volume) to leverage the data of larger sites (with high data volume).
- Target T2P and covariates are used as lagged regressors (using historical data).
- For each ED, the model outputs a 12 hour forecast, with confidence intervals, creating wait time range forecasts (rounded to the nearest 15mins for end-user clarity).

Presenting ED Wait Times



Presenting ED Wait Times Accessibly

- The tool conforms with Web Content Accessibility Guidelines (WCAG) 2 Level AA Conformance.
- Striving for WCAG AA meant ensuring:
 - Color contrast is at least 4.5:1
 - Alt text used for images/graphs that convey meaning
 - Navigation elements follow a logical path
 - Inputs are accurately labeled
 - Information can be conveyed through a screen reader
- The tool is responsive, allowing it to be viewed on large desktop screens or smaller mobile device screens.

Monitoring Utilization

- In-house development has enabled full control over user utilization metrics.
- Enabled by Google Analytics, user 'events' on the app are tracked across all platforms.
- This provides a wealth of insights into the tool's true end-user utilization.



Visits

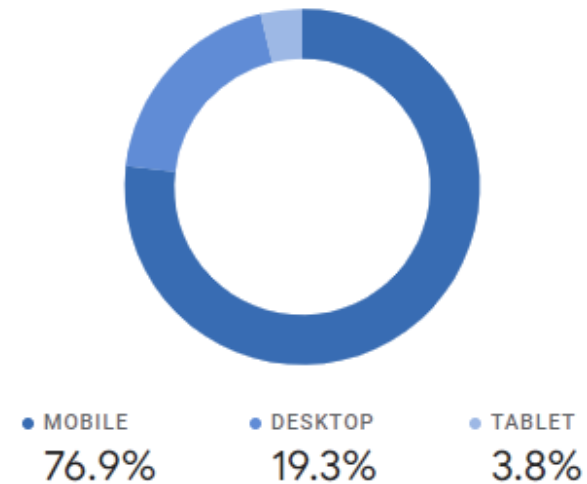
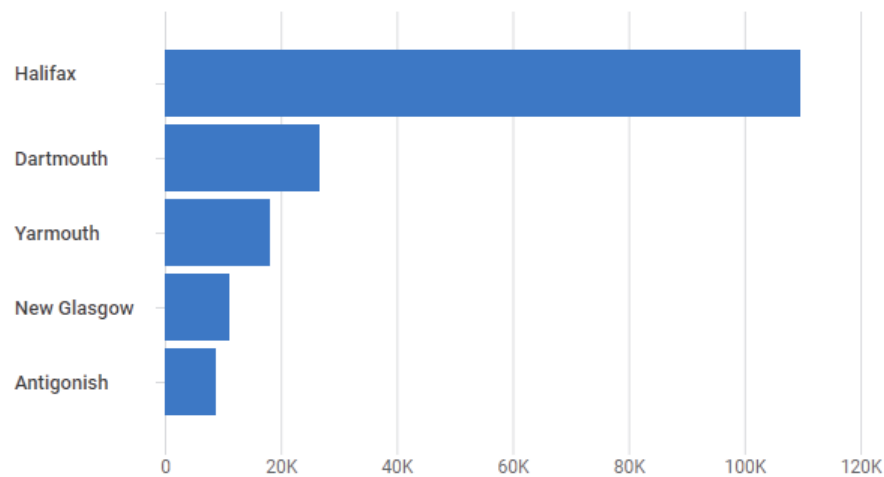
- 18,000 views on launch day.
- Over 350,000 views since launch.
- Typically see 1,400 views per day (close to the average number of ED visits per day), peak times between 8am – 8pm, no significant difference between weekdays.
- 67% of traffic comes from nshealth.ca, the remaining 33% is from YourHealthNS.



Demographics and Technology

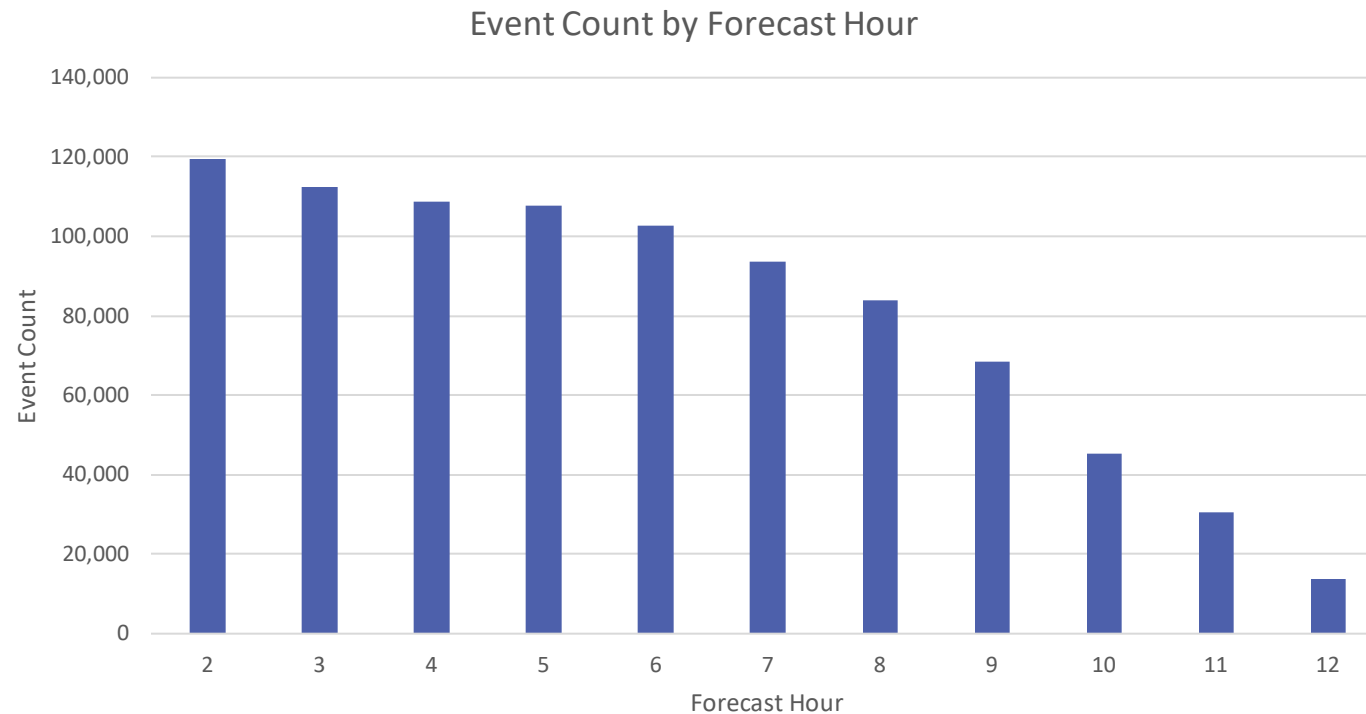
- Users allow the app to use their location 98% of the time – this enables distance calculations, and for us to see where visits originate.
- 42% of traffic originates from Halifax, followed by Dartmouth (10%) and Yarmouth (7%).
- Users mostly access the tool via a mobile device (81%).

Views by City



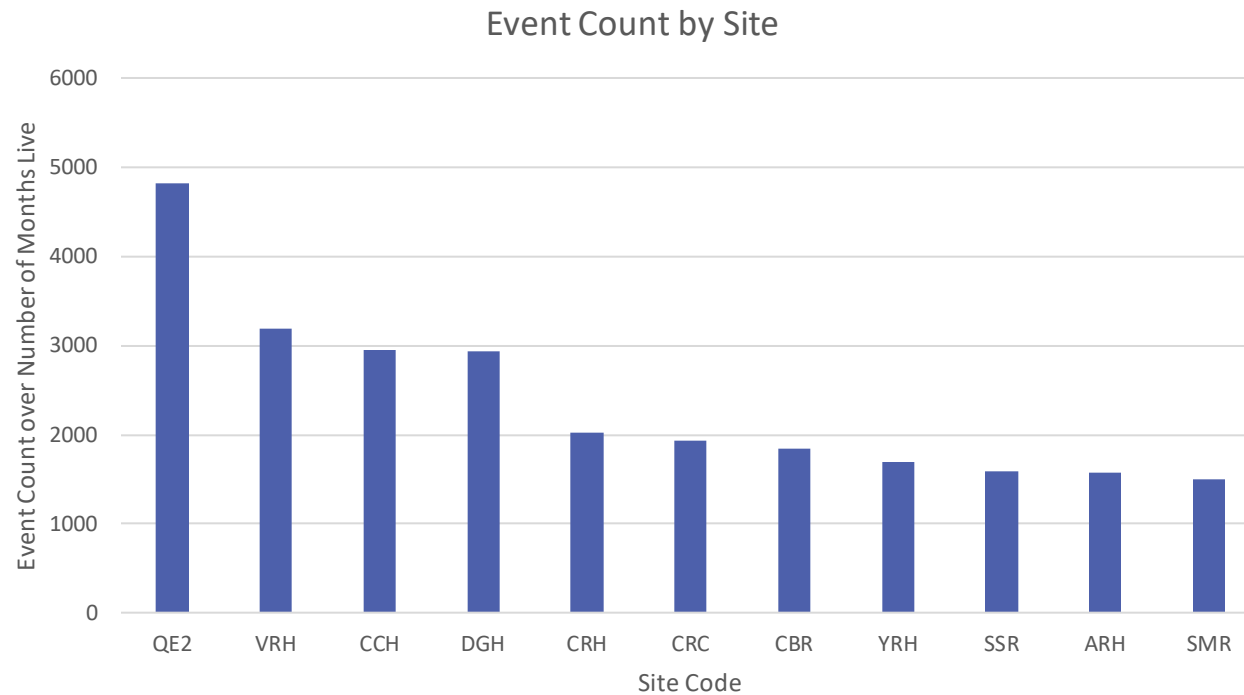
Forecast Slider Feature

- Users tend to be more interested in seeing the forecasts for the next 6 hours (first hour is the default when the app loads).



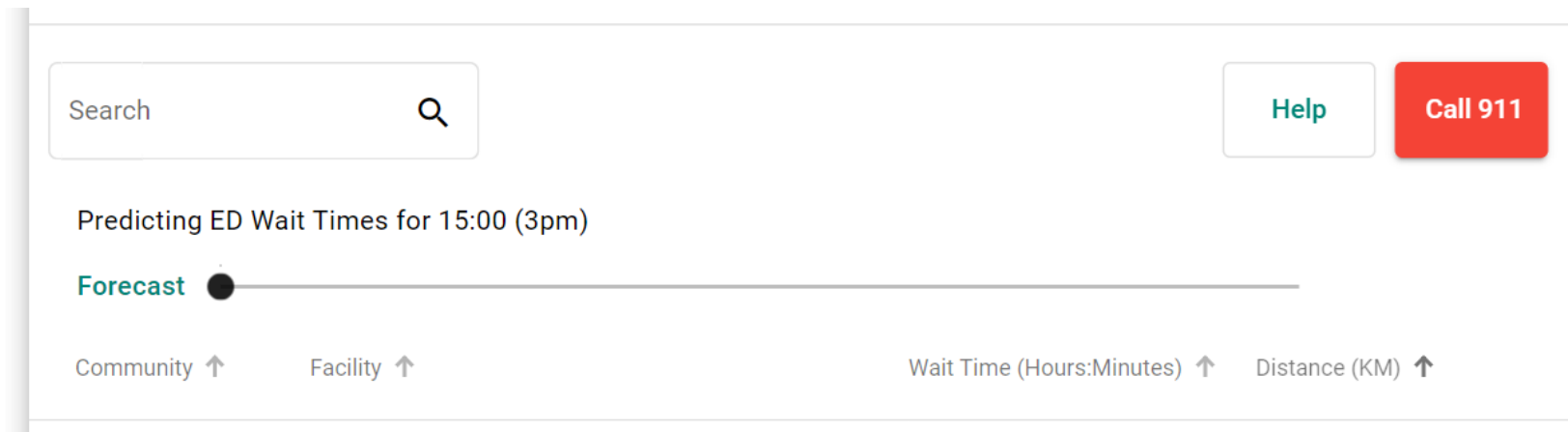
ED Site Forecast Graphs Feature

- ED site forecast graphs are utilized, around 15,000 clicks per month.
- Typically, a user selects 2 sites per session – this could be them comparing two sites to determine which one to visit.



Under-utilized Features

- Search Field – Only 9% of users utilized.
- Sort Columns – Only 6% of users utilized.
- Help Button – Less than 1% of users utilized.
- Call 911 Button – Clicked by nearly 400 users, confirmed by only 25.



Future Developments

- More ED sites of course!
- Continuous improvement of the tool.
- ED Wait Time Dashboards on screens within EDs. Displaying further status information e.g. number of patients waiting.

Conclusion

We can now describe, explain, and understand the following:

- The value for an ED Wait Times Prediction Tool:
 - Setting patient expectations
 - Empowering the public in making informed decisions
- The technical components used for the ED Wait Times Prediction Tool:
 - MLOps Technology
 - Forecasting Model
 - Web App
- Monitoring utilization of the tool yields key insights:
 - How users interact with the data
 - Which features users are more interested in

Let's Talk Informatics Certifications

- **Digital Health Canada** - participants can claim 1CE hour for each presentation attended.
- **College of Family Physicians of Canada and Nova Scotia Chapter** - participants can earn one Mainpro+ credit by providing proof of content aimed at improving computer skills applied to learning and access to information.
- **Canadian College of Health Information Management** - approves 1 CPE credit per hour for this series for professional members of Canada's Health Information Management Association (CHIMA).



Thank you

Need More Info?

letstalkinformatix@nshealth.ca

