PATIENTS BEFORE PAPERWORK (PB4P)

Centre for Digital Health Evaluation,
Women's College Hospital Institute for
Health System Solutions and Virtual Care

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ONTARIO HEALTH

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centre for digital health evaluation

WHV
WOMEN'S COLLEGE HOSPITAL INSTITUTE FOR HEALTH SYSTEM SOLUTIONS AND VIRTUAL CARE

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The evaluation team included the following individuals:

CDHE Core Team:

Co-Principal Investigator - Dr. Onil Bhattacharyya, MD, PhD
Co-Principal Investigator - Dr. Payal Agarwal, MD, MSc
Project Lead - Meghan Gilfoyle, PhD, MSc
Postdoctoral Fellow - Sydney Pearce, PhD, (Office of Health System Partnerships, Department of Family and Community Medicine, University of Toronto)
Business Development Associate – Alana Tibbles, MSc
Research Associate – Emily Ha, MSc
Research Coordinator - Lauren Miceli, MPH
Research Assistant – Nishath Uddin, BSc
Research Assistant – Siying Luan, MSc
Subject Matter Expert - Industrial Engineer - Enid Montague, PhD
Subject Matter Expert – Industrial Engineer – Myesha Senior, PhD Student

Patient Partner Evaluators from the Patient Advisors Network (PAN):
Sandra Holdsworth
Jeanette Smith

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For inquiries and comments, please contact:

Centre for Digital Health Evaluation
Women's College Hospital Institute for Health System Solutions and Virtual Care
6th Floor, 76 Grenville Street, Toronto ON M5S 1B2
Email: cdhe@wchospital.ca
Website: https://cdhe.wchwihv.ca/

Acronyms

API	Application Programming Interface
CDHE	Centre for Digital Health Evaluation
eFax	Electronic Fax
EMR	Electronic Medical Record
eReferral	Electronic Referral
FFS	Fee For Service
FHG	Family Health Group
FHO	Family Health Organization
FHT	Family Health Team
HIE	Health Information Exchange
HRM	Health Report Manager
MOH	Ministry of Health
NR	Narrative Review
OH	Ontario Health
OLIS	Ontario Laboratories Information System
OTN	Ontario Telemedicine Network
PAN	Patient Advisors Network
PCPs	Primary Care Professionals
PS Suite	PS Suite EMR (Telus)
RRR	Rapid Realist Review
S/ICMO	Strategy/Intervention-Context-Mechanism-Outcome
WCH	Women's College Hospital
WIHV	Women's College Hospital Institute for Health System Solutions and Virtual Care

Operational Definitions

eConsult: physicians and nurse practitioners use a private and secure web portal to send a specialist a clinical question about their patient and receive a prompt response, generally within two days. (OntarioMD, n.d.)

eReferral: a digital tool that enables quick and secure referrals to be sent and received through an electronic platform between primary care clinicians and specialists/organizations. (eReferral, n.d.)

HRM: Health Report Manager (HRM®) is a digital health solution that enables clinicians to securely receive patient reports electronically from participating hospitals and specialty clinics. HRM electronically delivers Medical Record reports, (e.g. Discharge Summaries), and narrative Diagnostic Imaging (excluding images) reports from sending facilities directly into patients' charts, within the clinician's EMR. (OntarioMD, n.d.)

OLIS: an information repository that gives authorized health care providers access to lab test orders and results from hospitals, community labs and public health labs. (eHealth Ontario, n.d.)

People: in healthcare — including professionals, administrative staff, and patients — are central to the system's dynamics, particularly through their intrapersonal and interpersonal interactions.

Process: refers to the administrative and operational tasks within healthcare, such as coordination of care, patient information management, and provider communication.

Process step(s): refer to any major actions or phases in an administrative or operational process that requires the user to engage with a new interface element of their EMR or other digital health tool, such as opening a new window, interacting with a pop-up, or entering data into a form or field. Each step signifies a distinct interaction necessary to progress through an administrative or operational workflow.

Systems: refers to the overarching policies, structures, and organizations that shape the operational dynamics of healthcare delivery. These components are typically developed through a combination of government oversight and accrediting bodies, with the goal of ensuring practice standards and patient safety.

Tool: refers to the technologies and digital software systems employed in healthcare management and delivery, including how these components function together to integrate into single digital workflows. This integration is critical because it allows for seamless communication and data exchange between various healthcare systems and devices, ultimately improving efficiency, patient care, and decision-making processes. By integrating diverse technologies into cohesive digital workflows, providers can ensure that patient information is accurately shared and utilized throughout the various stages of healthcare delivery, from diagnosis to treatment and follow-up care.

Unnecessary administrative tasks: includes physician administrative tasks that could be eliminated completely, reduced or streamlined in some way, or delegated to another individual (e.g. clerical or administrative staff or clinical colleagues) (Reducing Administrative Burden for Physicians, 2023).

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Executive Summary

BACKGROUND

The Patients Before Paperwork initiative aims to reduce administrative burden for clinicians by digitizing clinical processes and measuring the impact. The primary aim of this phase of our work was to evaluate and compare different referral methods—paper-based, eFax, and eReferral—and their impact on primary care providers. It involves identifying the steps required to complete certain administrative tasks, measuring the time it takes to complete these tasks, and analyzing the processes involved. This approach can be used to improve the design of digital tools and demonstrates a repeatable process to estimate the impact of digitization on administrative burden across the province as new initiatives are rolled out.

OBJECTIVES

1. **Identify and document the steps required and average time to:**
    a. Complete a **referral** for each method (paper-based, eFax, and eReferral)
    b. Log in, search for a patient, and review a test report in the **Provincial Viewer**
    c. Generate and action lab requisitions and prescriptions
2. **Measure and compare the average time** it takes to complete a referral across the three methods (paper-based, eFax, and eReferral).
3. **Analyze and differentiate the processes and steps involved** in each referral workflow (paper-based, eFax, and eReferral) to understand the unique requirements and inefficiencies in each method.
4. **Develop detailed logic models** for Bundle 1 (eReferral, HRM, OLIS) and part of Bundle 2 (eConsult, AI Scribe) products that describe the mechanisms by which digitization (and specific digital tools) can influence administrative burden, experience and quality of care.

METHODOLOGY

We used a mixed-methods approach, including simulations with 10 primary care providers who completed referral, lab requisition, and prescription-related tasks using paper, eFax, and digital tools (for referral only). Time-motion studies captured the time and steps involved, while semi-structured interviews provided insights into provider experiences with these workflows.

KEY FINDINGS

REFERRALS:

- On average, PCPs spent 2 minutes and 53 seconds (*SD =1 min 7 s*) completing referrals using Ocean eReferral. For simple cases, PCPs spent 2 minutes and 53 seconds *(SD = 1 min 3 s)* generating referrals using paper-based workflows and 2 minutes and 38 seconds (*SD = 37 s*) using Ocean eReferral. For complex cases, PCPs spent 3 minutes and 49 seconds *(SD = 1 min 39 s)* completing referrals using eFax and 3 minutes and 8 seconds (*SD = 1 min 28 s)* using Ocean eReferral. Notably, the eFax and paper-based referral workflows only include time spent generating the referrals (e.g., writing the referral letter**, filling out custom referral forms**) and excludes any faxing, printing or task delegation to other staff, such as handoff time. Therefore, **the amount of time spent on eFax and paper-based referrals may be underestimated**.
- **Simple cases** were processed **8.7% faster** with eReferral compared to paper referrals, and **complex cases** saw a **17.9%-time savings with eReferral** compared to eFax referrals.
- Using **eReferral** reduced the number of administrative steps needed to be completed by the PCP, but other challenges arose, such as system errors and incomplete forms.
- **eFax** and **paper workflows** were slowed by manual tasks and outdated address books, leading to more rejections and delays.

Overall, eReferral showed potential to improve PCP and overall office efficiency, but further enhancements could maximize its potential.

PROVINCIAL VIEWER, LABS AND PRESCRIPTIONS:

We also examined the steps and time required to log in, search for a patient and review a test report in the Provincial Viewer and OLIS, which involved 10 steps and 7 steps, respectively. Searching, reviewing, and retrieving lab results in OLIS was a simpler workflow than using the Provincial Viewer, although using the Provincial Viewer may be more beneficial as it has multiple portlets for other sources of data (e.g., visit summaries, diagnostic imaging reports). Additionally, we analyzed the steps and time to generate lab requisitions (8 steps for both TELUS PS Suite and OSCAR Pro EMR) and prescriptions (7 steps for TELUS PS Suite, 11 steps for OSCAR Pro EMR). These tasks revealed variations in process efficiency and highlighted potential areas for improvement.

The report includes a set of logic models for Labs, eConsult, AI Scribe, HRM, eReferral which highlight that reducing administrative burden is one of several value propositions for these tools.

For example, while eReferral is seemingly slightly faster than eFax or paper faxing, its primary value will likely be making it easier to find the right specialist, funneling referrals to providers with shorter wait times, and keeping patients informed about the referral process.

RECOMMENDATIONS

- **Expand Simulations to Real-World Settings:** While the controlled simulations provided valuable insights, pairing these insights with evaluations in real-world clinical environments would offer a more comprehensive understanding of workflow challenges and the impact of digital tools under natural conditions.

- **Address System Usability Issues:** eReferral, despite its time-saving potential, was limited by system errors and incomplete forms. Improvements in user interface design and system stability are necessary to reduce these inefficiencies and improve overall adoption.

- **Standardize and Streamline Processes:** Variations in workflows across platforms (e.g., digital tools and/or EMRs) for similar clinical tasks, such as referrals, generating lab requisitions and prescriptions, and retrieving lab results, highlight the need to streamline steps and minimize unnecessary clicks or manual entries to reduce administrative burden. Additionally, standardizing forms within each workflow is crucial to improve efficiency, reduce frustration, and minimize the time required to complete tasks.

- **Explore Other Areas of Administrative Burden:** Future evaluations should extend beyond referrals, lab requisitions, and prescriptions to include tasks like inbox management and patient communication, which also contribute significantly to administrative workload.

1.0 Background

1.1. Context

The persistence of paper- and fax-based workflows, as well as sub-optimal digital solutions that are not evenly adopted across the health system, are significant contributors to administrative burden and physician burnout. These outdated ways of working can create additional problems, including increased risk of privacy breaches, patient safety risks and slower access to care. As a result, many provinces are focusing on the reduction of administrative burden as a strategy to address human resource shortages and burnout (*cf* Alegbeh and Jones, 2023; Thompson and Lefebvre, 2022; Johnson, 2023).

A priority initiative for Ontario Health (OH), Patients Before Paperwork (PB4P) will enable a clinically led system approach and transformational change, with the aim of ultimately improving how healthcare providers communicate across the health system. The vision of PB4P is to:

1) Deliver safer, timely, and more equitable care for Ontarians.
2) Improve the provider experience by reducing the administrative burden for clinicians (primary care and specialists).

In 2023, WIHV was commissioned to summarize the current state and recommend a framework to measure the shift away from fax use in Ontario's health system (Phase 1). To assess the impact of digital tools on administrative burden, the evaluation framework summarizes findings and key metrics for measuring progress and allow data-driven change management. This report provides additional findings and key metrics to assess the impact on specific clinical processes (Phase 2).

1.2. Purpose and Objectives

The overarching aim of this Phase 2 Evaluation was to develop a robust approach to measure the impact of the various tools that are part of the PB4P initiative, with a focus on PCP's workflow and experience. The specific objectives were to:

1. **Develop detailed logic models** for **Bundle 1 (eReferral, HRM, OLIS)** and part of **Bundle 2 (eConsult, AI Scribe)** products that describe the mechanisms by which digitization (and specific digital tools) can improve administrative burden, clinician and patient experience, and quality of care.

2. **Test hypotheses and measure key metrics about administrative burden** to support the PB4P project through simulated cases collecting baseline data on a sub-set of metrics related to administrative burden. This takes workflow measurements in a simulated a clinical environment at Women's College Hospital Virtual Care Lab to understand the factors and tasks related to a) administrative burden, b) better understanding key workflows such as referrals, and c) continuing to refine and build upon a framework to measure the impact of digital tools when compared to traditional faxed-based processes. The baseline measures collected in this phase are used to understand the time it takes for clinicians to complete specific tasks within their regular workflows (e.g., eFax) compared to the digital alternatives (e.g., eReferral) to provide a greater understanding of administrative burden. This work will also support modelling to quantify changes in administrative burden and the possible impact of the PB4P program.

3. **Beta Test the functions of a 'Living Lab'** that, at maturity, could support the measurement and evaluation of a range of workflows and tools in regular clinical environments. For this project, a small early version of the Living Lab will be beta tested at Women's College Hospital with several simulated cases with providers to allow for comprehensive data collection on key workflows. The findings from the beta test will help in continuing to develop the Living Lab.

2.0 Methodology

2.1. Overview of Data Collection Activities

To achieve the program objectives outlined above, the Centre for Digital Health Evaluation (CDHE) at the Women's College Hospital Institute for Health System Solutions and Virtual Care (WIHV) conducted the following project activities over the course of 6 months (April–September):

a. **Logic Models** analyzing causal pathways from the pre-existing rapid realist review (RRR) and narrative review building on PB4P Phase 1). AI scribes were not included in PB4P Phase 1, therefore a realist approach to analyzing the results of the CDHE AI scribe report (Centre for Digital Health Evaluation, Women's College Hospital Institute for Health System Solutions and Virtual Care, 2024) and additional literature was used to create the AI scribe logic model in a similar manner.

b. **Simulated clinical encounters and workflows** between PCPs and simulated patients (with operational support from OMD as required).

c. **Semi-structured interviews** with PCPs to understand perceptions of tasks within each of the key processes (i.e. reviewing incoming documents, sending referrals) that may be unnecessary and/or especially burdensome.

2.2. Simulations

OVERVIEW OF THE WORKFLOW SIMULATIONS

The Virtual Care Lab (VCL) is a controlled research environment that allows for the evaluation of digital health tools and models of care in an environment that simulates real-world use (Women's College Hospital Launches First of Its Kind Virtual Care Laboratory, 2021). As demonstrated in previous studies, simulations offer a valid approach to measuring clinical workflows as they enable the identification and analysis of the complexities and drivers of administrative burden in a controlled and replicable environment (Doberne et al., 2015; Loomis & Montague, 2022). Through the collection of audio data, video data, and screen recordings, clinical simulations have been identified as a useful method in evaluating the real-world impacts of technology and its impact on health professional's workflow (Borycki et al., 2010).

The VCL is set up to resemble a primary care clinic that supports in-person and remote visits. For the simulations, each of the 10 participating PCPs conducted four different clinical encounters with standardized patients (two simple cases and two complex cases). The patient profiles were developed in consultation with three Board-certified family physicians. "Simple" cases were conceptualized as having easier workflows and lower medical complexity, such as routine referral for straightforward medical issues. In contrast, "complex" cases involved more intricate workflows and greater medical complexity, including multiple comorbidities, medication management, and coordination of care, which demanded more time, detailed documentation, and critical decision-making by the PCPs.

For each standardized patient, participants were asked to conduct a typical encounter and complete medical documentation, two different referrals using a pre-specified referral pathway (e.g., cardiology and dermatology), and any prescriptions or labs they deemed necessary based on their medical expertise. The simulations were anchored by the referral pathway and counterbalanced (i.e., eReferral and paper fax for simple cases; eReferral and eFax for complex cases) to ensure all processes and variability in workflows were comprehensively captured. This approach was guided by principles of human factors engineering and usability measurement,

allowing us to account for potential biases, variations in user interaction, and to enhance the reliability of findings on workflow efficiency and effectiveness.

In the simulations, PCPs were permitted to use any EMR shortcuts, stamps, templates, or other efficiency methods they were accustomed to. In total, 10 participating PCPs completed 40 simulated encounters: 20 encounters using Ocean eReferral workflow, 10 using a paper workflow, and 10 using eFax. Appendix A, provides an overview of the design of the simulated encounters for each participant (Table 12) and an example workflow (Figure 2).

DATA COLLECTION

To collect and analyze data, each encounter was audio and video recorded in its entirety. A time-motion study that leveraged quantitative ethnography methods (Asan et al., 2015) was used to measure the process steps and time spent on key processes by primary care physicians (i.e., generating and sending referrals; ordering new and renewing existing prescriptions; and generating new lab requisitions). Each simulation was live-coded to capture data from each process as it occurred. Additional information about the methodology for the simulations is provided in Appendix A. Appendix B presents the key metrics captured from each of the workflows.

2.3. Qualitative Interviews

Brief semi-structured interviews (15-20 minutes) with 10 PCPs following the simulations were conducted to:

A) Identify the process steps for various administrative tasks (i.e., reviewing incoming documents, generating and sending referrals, ordering and renewing prescriptions, and generating and reviewing labs)
B) Identify PCPs' perceptions of tasks that may be unnecessary and/or especially burdensome in their practice

See Appendix A, 7.3 for the full interview guide. A purposive sampling strategy using OH and CDHE networks was employed to recruit primary care physicians from various practice types (team-based and fee-for-service) and geographic locations (urban/rural) across Ontario. Eligible participants had experience with fax, eFax, and/or eReferral workflows. All interviews were audio recorded, transcribed, and analyzed thematically.

3.0 Results

The results are organized into three sections. Section 3.1 presents the average time taken by PCPs to generate and send referrals using eReferral, eFax, and paper workflows, both overall and stratified by patient case complexity (simple and complex cases). An overview of the overarching process steps to generate and send a referral using eReferral, eFax, or paper-based workflows across two EMRs (TELUS PS Suite and OSCAR Pro EMRs) and a summary of variability and unnecessary steps across all referral methods (i.e., eReferral, eFax and paper fax) is also provided. Section 3.2 presents findings from simulations only and includes the number of steps and average time to generate and review labs and send to generate and refill prescriptions. Finally, Section 3.3 highlights key findings from interview data, discussing insights and recommendations from PCPs to improve the referral process and address administrative burden more generally.

The refined logic models and metrics resulting from the work during PB4P Phase 1 are available in Appendix B. The logic models highlight digital tool strategies that may reduce administrative burden. The metrics highlight how we can track the progress of tool adoption and their impact on administrative burden over time.

PARTICIPANT DEMOGRAPHICS

A total of 10 participants were involved in simulations and semi-structured interviews. Participant characteristics can be found in Table 1.

Table 1. Demographic table of simulation participants (n=10)

Characteristics	N	%
Gender		
Female	3	30%
Male	7	70%
EMR Type[±]		
Telus PS Suite	7	70%
Oscar Pro	3	30%
Practice Location[§]		
West Region	4	40%
Toronto Region	4	40%
East Region	2	20%

[±]Most familiar with this electronic medical record system and used during simulation
[§]Based on Ontario Health Regions

3.1. Referral Workflows

TIME SPENT ON GENERATING AND SENDING REFERRALS

Table 2 presents the average time taken by PCPs to generate and send referrals using eReferral, eFax, and paper workflows, both overall and stratified by patient case complexity (simple and complex cases). The observations for one PCP were excluded from analysis as they were a significant outlier, having completed only two encounters that exceeded two hours in duration. Therefore, the results reflect the average time spent per referral type, aggregated across all encounters ($n_{encounters}$ = 38) and PCPs (n_{PCPs}=9).

Table 2: Summary Statistics of Referral Times

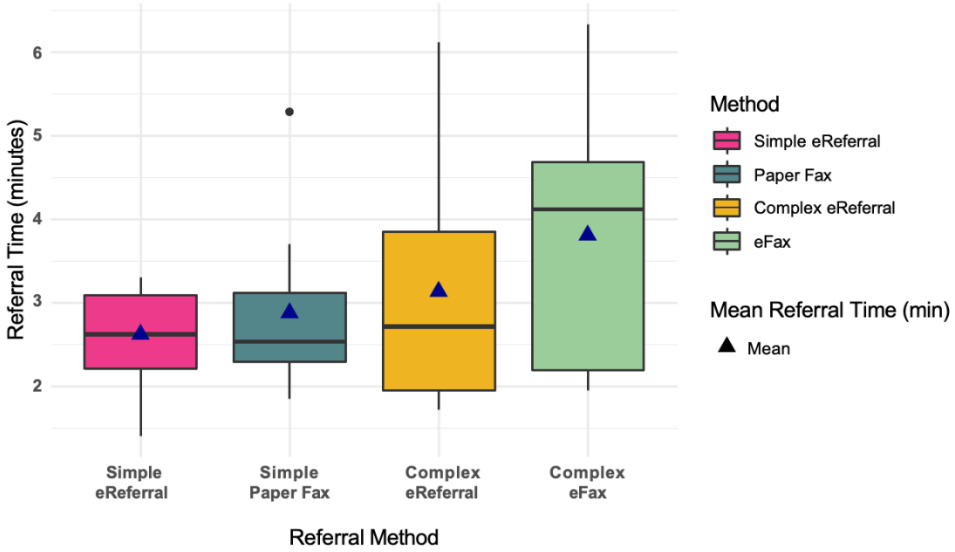
Patient Case	Referral Workflow						Difference[¥]
	eReferral[†]		eFax[‡]		Paper[§]		
	Mean[±]	SD	Mean[±]	SD	Mean[±]	SD	
Patient Case Complexity							
Simple	2 min 38 s	0 min 37 s	–	–	2 min 53 s	1 min 3 s	–8.7%
Complex	3 min 8 s	1 min 28 s	3 min 49 s	1 min 39 s	–	–	–17.9%

[†]Amount of time spent generating and sending a referral using Ocean eReferral.
[‡]Amount of time spent generating and sending a referral using eFax.
[§]Amount of time spent generating and printing a referral prior to hand-off to an administrative, clerical, or referral support staff member for sending (via fax or mail).
[±]Amount of time averaged across all simulated clinical encounters and PCPs.
[¥]Percent difference is calculated using the alternative method as the reference. A negative percent difference indicates that eReferral requires less time than the alternative method (i.e., eFax, paper) whereas a positive percent difference indicates that eReferral takes more time than the alternative method. The differences observed in this study were not statistically significant (p > 0.05), likely due to the small sample size.

On average, PCPs spent 2 minutes and 53 seconds (*SD =1 min 7 s*) completing referrals using Ocean eReferral. For simple cases, PCPs spent 2 minutes and 53 seconds *(SD = 1 min 3 s)* generating referrals using paper-based workflows and 2 minutes and 38 seconds (*SD = 37 s*) using Ocean eReferral. For complex cases, PCPs spent 3 minutes and 49 seconds *(SD = 1 min 39 s)* completing referrals using eFax and 3 minutes and 8 seconds (*SD = 1 min 28 s)* using Ocean eReferral. Comparisons of referral times based on each workflow used and by case type (simple vs. complex) is presented in Figure 1. Importantly, the paper-based workflow only accounts for the time spent generating the referral (e.g., writing the referral letter, completing custom forms, compiling attachments) and excludes the time required to print the documents and hand them off to administrative or clerical staff for sending (via fax or mail). Therefore, when comparing paper-based referral workflows to eReferral, the amount of time is likely **underestimated** as it does not capture actions to send the referral. Time spent on referrals was

not stratified by EMR type (i.e., PS Suite vs OSCAR Pro) but the workflow process steps were (see below for additional detail).

Figure 1: Comparison of average and median time spent on referrals by case type (simple and complex cases)



For simple patient cases, general trends indicated that eReferral workflows were 8.7% faster compared to the paper workflows. For complex patient cases, general trends indicated that eReferral workflows were 17.9% faster compared to eFax workflows. However, statistical significance was not achieved likely due to a small sample size. Importantly, PCPs were permitted to use any EMR shortcuts, stamps, templates, or other efficiency methods they were accustomed to. In addition, for eFax and paper-based referrals, PCPs also had access to pre-populated address books, custom forms with pre-populated patient demographic information, and referral letter templates stored in the EMR. Therefore, the time spent on referrals using eFax or paper-based workflows—including writing the letter, completing the custom form for the referral site, and adding attachments—likely represents an ideal scenario with well managed EMR workflows compared to the variability that exists in real-world clinical practice. The measured workflows for eFax and paper does not account for additional time that might be spent searching for updated addresses, forms, or drafting complex and detailed referral letters. As such, the time savings achieved with eReferral compared to eFax or paper may be even greater in situations where additional steps are required, such as navigating, searching, or troubleshooting within the EMR. For example, if a patient requests a referral to a specific clinic site and the custom referral form is not in the EMR, the PCP may need to independently search for the custom referral form using a

search engine, upload the custom form as an eForm in their EMR, and then proceed to fill complete the form; therefore, adding extra time and steps spent on a referral.

Overall, these findings highlight that eReferral reduced the amount of time spent on referrals compared to traditional paper (simple cases) and eFax methods (complex cases). The efficiency gained through eReferral likely stems from the digital streamlining of manual processes, leading to faster and more efficient communication. The magnitude of time savings from eReferral compared to other referral methods are also underestimated as the additional time required to hand-off a printed referral package to an administrative staff member to fax on the PCPs behalf, was not captured.

PROCESS STEPS FOR REFERRALS

Table 3 and Table 4 presents an overview of the overarching process steps to generate and send a referral using eReferral, eFax, or paper-based workflows across two EMRs (TELUS PS Suite and OSCAR Pro EMRs). Process steps were defined as to any major actions in an administrative or operational process (e.g., generating and sending referrals) that requires the user to engage with a new interface element of their EMR or other digital health tool, such as opening a new window, interacting with a pop-up, or entering data into a form or field. Each step signifies a distinct interaction necessary to progress through an administrative or operational workflow. Importantly, for eFax and paper-based workflows, the process steps only capture actions up until the point of faxing or printing and hand-off to an administrative or clerical staff for action and sending.

For each process step outlined in Table 3 and Table 4 below, there may be multiple clicks or instances where PCPs had to type in information. In addition, the number of clicks and typing instances differed by EMR used. Additional details regarding the process steps, number of clicks, typing instances, and variations in workflows across PCPs are described in further detail below for each of eReferral, eFax, and paper-based referral workflows.

Table 3: Workflow Steps Across Referral Methods (TELUS PS Suite)

Steps†	eReferral	eFax	Paper Fax
1	Add/select attachments to referral	Click “Data” dropdown menu in TELUS PS Suite toolbar	Click “Data” dropdown menu in TELUS PS Suite toolbar
2	Click “Refer” in Ocean toolbar	Click “Pending Test or Consult”	Click “Pending Test or Consult”
3	Launch Ocean eReferral	Click on “Consultations”	Click on “Consultations”
4	Search name of referral site in Ocean eReferral search bar	Type in referral site name	Type in referral site name
5	Click on preferred referral site	Click “Create Letter”	Click “Create Letter”
6	Select reason(s) for referral	Add message to administrative or clerical staff and click “Done”	Add message to administrative staff and click “Done”
7	Click “Send eReferral” button to complete eReferral form	Click “Data” dropdown menu in TELUS PS SUITE	Click “Data” dropdown menu in TELUS PS SUITE
8	Complete eReferral form*	Choose “New Custom Form”	Choose “New Custom Form”
9	Accept terms of use to send eReferral	Search name of custom form for referral site	Search name of custom form for referral site
10	Click “Send eReferral”	Select custom form for referral site	Select custom form for referral site
11	Close pop-up indicating eReferral was sent	Complete custom form	Complete custom form
12		Write referral letter	Write referral letter
13		Add/select attachments for referral	Add/select attachments for referral
14		Fax referral	Print referral package
15			Walk referral package to administrative or clerical staff for sending

†Steps refer to any major actions or phases in the referral process that requires the user to engage with a new interface element, such as opening a new window, interacting with a pop-up, or entering data into a form or field. Each step signifies a distinct interaction necessary to progress through the referral workflow.

Table 4: Workflow Steps Across Referral Methods (OSCAR Pro)

Steps†	eReferral	eFax	Paper Fax
1	Launch Ocean eReferral	Click on “+” next to consultation tab	Click on “+” next to consultation tab
2	Search name of referral site in Ocean eReferral search bar	Complete form	Complete form
3	Click on preferred referral site	Clicks on "Attach file to consultation"	Clicks on "Attach file to consultation"
4	Select reason(s) for referral	Clicks on relevant attachments	Clicks on relevant attachments
5	Click “Send eReferral” button to complete eReferral form	Click on “Done Close Window”	Click on “Done Close Window”
6	Complete eReferral form*	Signs under “Signature” text box	Signs under “Signature” text box
7	Accept terms of use to send eReferral	Click on “Submit and Fax” button	Click on “Submit Consultation Request & Print” button
8	Click “Send eReferral”	Click on “Yes” or “No” radio button under “Would you like to add a cover page?”	Click on Printer icon
9	Close pop-up indicating eReferral was sent	Types in information for cover page	
10		Click on "Submit” button	
11		Click on “Close” button on “Consultation Request Form has been Created”	

†Steps refer to any major actions or phases in the referral process that requires the user to engage with a new interface element, such as opening a new window, interacting with a pop-up, or entering data into a form or field. Each step signifies a distinct interaction necessary to progress through the referral workflow.

In summary, for PCPs using TELUS PS Suite, generating and sending a referral using Ocean eReferral comprised of 11 process steps. In comparison, generating and sending a referral using eFax comprised of 14 process steps and paper-based workflows comprised of 15 steps. For PCPs using OSCAR Pro, generating and sending a referral using Ocean eReferral comprised of 9 process steps. In comparison, generating and sending a referral using eFax comprised of 11 process steps and paper-based workflows comprised of 8 steps. Although not captured in the simulations, PCPs described in the interviews, the additional step of handing off or sending electronically, a paper fax to their administrative staff once completed to fax on their behalf. Upon handoff, PCPs reported that their administrative staff or referral clerk typically reviews the referral to ensure all necessary documents are included, complete, and accurate, often verifying details like patient information, referral reasons, and information requested. Next, the administrative staff or referral clerk prepares the documents for faxing, which may include organizing, scanning, or copying as needed. Finally, they send the referral to the receiving specialist or clinic site and often follow-up to confirm receipt and address any issues or additional requests. Administrative staff or referral clerks typically track referrals and notify PCPs if the referral is rejected or the wait time is

substantial, in which the PCP may request that the referral be sent to another specialist or clinic and the process steps begin again.

> *"We have a referral secretary who's amazing. So, her job is basically every time we send a referral, she tracks the referral. and if we haven't heard within two weeks, which is what the CPSO [guideline] says, especially if you tell us within two weeks, she will follow up and say, hey, are you going to respond to this referral? And that's like she'll message the staff and us. And then she also, theoretically her role, should be when we get those notices saying 8 to 12 month wait, it should go to her and she lets the patient know...."*
>
> ***- Participant 04***

> *"I was working more in a rural setting... and they had a referrals team. I guess all the paperwork was delegated to [the referrals team] so that patient wanted to see symmetry. I would literally just message [the referrals team] and say please refer to the psychiatrist and then I would pull all the relevant information. But then, sometimes that causes a hiccup because then [the referrals team] comes back and they say "oh, but the referral requires this information" and I didn't get that because I didn't have time to pull up the form in the room [with the patient]. So, it's a nice way to delegate when it works but causes a little bit of unnecessary work when you kind of have to go back to the patient and ask for things."*
>
> ***- Participant 06***

The number of process steps can vary due to several factors contingent on the referral methods being used. Table 5 presents an overview of where workflow **variations** may arise when sending a referral, by referral method. However, variability in PCP workflows may exist regardless of the referral method used, including the physician's individual preferences and processes, case-specific demands and the level of administrative support within the practice.

- **Provider-to-Provider** EMR proficiency (e.g., years of experience, familiarity with shortcuts, use of personalized EMR stamps) and level of comprehensiveness in their typical workflows may impact the amount of time spent on referrals and number of processes steps. For example, some PCPs may feel more attachments are needed or provide more detailed information when writing a referral letter.

> *"Yes, the difference being usually in clinic… I don't do [referrals] in front of the patient. So, I felt rushed… I usually let the patient leave and do it. If anything, it takes me longer in clinic because I'm like I'm spending more time writing. I'm just writing details in the referral letter; I want the referral letter to be really useful… like I would usually be putting like a bit more of a paragraph about the patient."*
>
> ***- Participant 04***

- **Medical complexity of patient** may impact the number of tests requested given the patient case and the urgency of the referral. It can also drive differences in the process steps required. For example, simple patient cases may require fewer steps in the referral process because symptoms may be more overt whereas a complex case may require additional steps to comprehensively capture the patient's overall health status, including. requesting more tests as part of the referral. In addition, certain types of referrals may vary in detail required (e.g., a diabetes education referral might require the PCP to complete less steps and provide less information than a mental health referral). This may also vary across referral sites, as forms are not standardized within and across most specialties.

> *"Then there are some groups like in gastroenterology, has a centralized intake program here in Hamilton they've trialed, but that doesn't exist in other communities. And that's not the same for gastroenterology in Guelph for example."*
>
> ***- Participant 08***

- **Availability and level of administrative support** varies across providers and can impact the time it takes to complete a referral, or the method a PCP chooses to refer a patient/ number of steps taken. For instance, some practices have a designated referral secretary:

> *"I mean I used to spend a lot of time initially doing referrals, and just like so much information. I would like for every referral to be great and have all the pertinent information but to do that is just unfeasible. If I'm doing referrals now, they're kind of short, to the point of, what's going to be needed? I find Ocean pretty good as far as finding a service and being able to locate somebody if you're not sure what to do."*
>
> ***- Participant 07***

> *"Our nurse actually who keeps track of them and ensures that the specialist has gotten back to us and that it's all being dealt with, and our secretarial staff deals with fax referrals…."*
>
> ***- Participant 10***

In addition to variations in PCP workflows, there were also **unnecessary tasks or steps**[1] identified by PCPs via the simulations and semi-structured interviews that were consistent across eReferral, eFax and paper-fax methods. The most frequently cited unnecessary task was dealing with referral rejections. Common reasons for rejections noted by PCPs included the referral site is not accepting patients at that time due to an excessively long wait list, the referral site having a new referral form that the referring physician missed, or the referral form being filled out incorrectly. As discussed by Participant 2, depending on these reasons, the process by which PCPs handle the rejection vary:

> *"Referrals often get rejected - at least once a week, maybe even more so...and how it is handled depends on the reason for rejection...Sometimes they're rejected because they just sent back some advice. Sometimes they're rejected because they are full or they don't see that thing. So, then we'll usually in most cases I might just prepare a new letter, copy it, and find a identify new or good receiver and copy and paste the previous referral."*
>
> ***- Participant 02***

Handling rejections and the number of rejections also varies depending on the referral method being used. As highlighted by Participant 1, while they may get rejections more frequently with eFax, they are less challenging to address because they can use the same referral note and send to a new provider, whereas with eReferral they are often tasked with filling out a new referral form.

> *"So, I probably get more rejections from eFax because the address book isn't up-to-date. Managing the rejection is easier than getting a rejection on eReferral...filling out their eReferral form, everyone's is different, it's not like we can just use muscle memory to complete it, whereas like with paper referrals, I can use a lot of muscle memory. I can't do that with eReferral because their forms are different"*
>
> ***- Participant 01***

> *"...I find the biggest thing with ocean eReferral that's not great is like if it rejects the referral, it takes too long. My referral secretary can't redirect it on her own, whereas like my letter [when faxing], she could just like copy and paste the letter and send it to somebody else."*
>
> ***- Participant 01***

[1] Unnecessary tasks/steps: includes physician administrative tasks that could be eliminated completely, reduced or streamlined in some way, or delegated to another individual (e.g. clerical or administrative staff or clinical colleagues) (Reducing Administrative Burden for Physicians, 2023).

Table 5: Summary of variability and unnecessary steps across referral methods

	Variability	Unnecessary
eReferral	a. The number of requests (e.g., tests requested). b. The inclusion of comprehensive patient information, such as the Cumulative Patient Profile[2] (CPP), contributed to the variation in steps. c. EMR proficiency level of PCP d. Availability of EMR shortcuts, stamps, and templates and the amount of detail required within each.	a. System sometimes failed to launch, requiring the PCP to relaunch the platform. b. Challenges with the search function (e.g., map view required the user to scroll to specific location where clinic was situated before clinic name would appear in the directory). c. Required sections of the eReferral form not fully completed leading to error message directing PCP to go back and fill in missing information. d. When essential patient information (e.g., health card number) is not populated in the referral form.
eFax	a. Different methods of accessing the eForm or custom form for the referral within the TELUS PS Suite system. b. Order in which the process steps are completed varies among users; some may open the address book to assign the referral to a specific site first, then fill out the eForm and write the referral letter, while others may address the referral site first, write the referral letter, and then complete the eForm. c. The method used to send the referral, with some opting to use a shortcut to directly eFax, while others manually use the eFax system.	a. Simple management of referrals (i.e., updating patient information) is sent to the physician instead of the secretary or clerk. b. Outdated information in the EMR's address book leading to more frequent rejections.
Paper Fax	a. The different methods to access eForms, which can introduce inconsistencies in how quickly PCPs access the necessary documentation. b. The amount of information automatically populated in the referral letter template varies depending on how the stamp or other efficiency method is configured within the EMR system. c. How much information the primary care provider (PCP) manually inputs into the referral letter. d. Using keyboard shortcuts and other procedural efficiencies which can reduce the number of steps required to print, streamlining the process for some providers but not others, depending on whether they utilize this shortcut.	a. Providers may forget to add necessary attachments, which results in having to resend or amend the referral. b. The consultant's address is not stored in the EMR's address book requiring manual entry, adding extra time and effort. c. The absence of a referral letter template or stamp may mean that the provider needs to manually write a referral letter, which further increasing the number of steps involved.

[2] The CPP (Cumulative Patient Profile) is a comprehensive summary of a patient's medical history, including key details such as past diagnoses, medications, allergies, and other relevant health information.

3.2. Lab and Prescription Workflows *(eFax and Paper only)*

In this section, we present preliminary data exploring the number of steps and average time it takes to generate and review labs and send to generate and refill prescriptions. The data presented here are baseline metrics that provide insight on **eFax workflows** (e.g., refilling a prescription and using eFax to send it directly to a pharmacy) and **paper workflows** (e.g., refilling and then printing a prescription for a patient to refill on their own). In each of the scenarios outlined below, there was no digital comparison.

GENERATING LAB REQUISITIONS – STEPS AND TIME

Time spent generating lab requisitions was captured and summarized for all simulated encounters across eFax and paper-based workflows. PCPs did not generate a lab requisition for every encounter, as PCPs were prompted to use their discretion based on when a lab requisition was needed based on the scenario. On average, physicians spent 29 seconds ($n_{encounters}$= *12 and* n_{PCPs}= *9*) generating lab requisitions. Summary statistics are presented in Table 6.

Table 6: Summary Statistics Generating Lab Requisitions

	Mean±	SD†	Lower CI‡	Upper CI§
Average Time generating lab requisitions	0 min 29 s	1 min 3 s	0 min 8 s	0 min 50s

±Amount of time averaged across all simulated clinical encounters and PCPs.
†Standard Deviation
‡ Lower limit confidence interval
§ Upper limit confidence interval

Generating lab requisitions required 8 process steps if using TELUS PS Suite and 7 process steps for OSCAR Pro EMR. This workflow is presented in Table 7.

Table 7: Workflow Steps for Ordering Labs Across TELUS PS Suite and OSCAR Pro

STEPS†	TELUS PS Suite	OSCAR Pro EMR
1	Click 'Data' from drop down bar	Click + on Forms tab
2	Click 'New Custom Form'	Type file name of eForm
3	Type file name of eForm (e.g., 2013 Lab Requisition template)	Click Lab requisition
4	Click on file	Fill out lab requisition
5	Click 'Choose This Form'	Sign requisition and save
6	Fill out lab requisition	Click Print
7	Click Print	Send message to admin or other clerical staff for tracking and follow-up (if needed).
8	Send message to admin or other clerical staff for tracking and follow-up (if needed).	

†Steps refer to any major actions or phases in the process that requires the user to engage with a new interface element, such as opening a new window, interacting with a pop-up, or entering data into a form or field. Each step signifies a distinct interaction necessary to progress through the workflow.

SEARCHING, REVIEWING, AND RETRIEVING LAB RESULTS USING THE PROVINCIAL VIEWER AND OLIS – STEPS AND TIME

The ConnectingOntario ClinicalViewer (also known as the Provincial Viewer) is a secure, web-based portal that provides real-time access to digital health records including laboratory results, dispensed medications, diagnostic imaging reports and images, and hospital visits. It can take physicians 2 minutes and 39 seconds to access the ClinicalViewer and search for a laboratory result via the Lab and Pathology Results portlet. To save a copy of the laboratory result in the patients' chart, physicians (or administrative staff members) either must 1) print the laboratory result, scan, and upload a copy into the patient chart or 2) save a PDF of the laboratory result to a designated folder on their computer and upload the PDF to a patient chart. This process can take an additional 2 minutes and 28 seconds. Alternatively, physicians or administrative staff members may choose to manually add results into patient charts (amount of time associated with manual entry was not captured in the simulations). Notably, the process to access the ClinicalViewer to search for medications, diagnostic imaging, and other summary reports is the same as laboratory results, as all portlets are available on the same landing page of ClinicalConnect.

As an alternative, physicians may use OLIS, a lab query system, to search for labs. All labs in OLIS may be downloaded by the physician directly into the patient's chart. It can take physicians approximately 48 seconds to access OLIS, retrieve a laboratory result for a patient, and save the result into their EMR. This workflow assumes that the physician has the OLIS connection with their EMR.

Table 8: Summary statistics for searching, reviewing, and retrieving laboratory results using ClinicalConnect and OLIS

	ClinicalConnect	OLIS
Average Time searching, reviewing, and retrieving labs	2 min 39 s	0 min 48 s

In general, it was faster to search, review, and retrieve lab results in OLIS (assuming the OLIS connection is available in the physicians' EMR) than in ClinicalConnect. Searching and reviewing lab results in ClinicalConnect took 10 process steps, with additional process steps to save a copy of the lab results in the patient chart (depending number of steps vary depending on whether the

lab results are scanned, imported as a PDF, or manually entered). In contrast, searching, reviewing, and retrieving lab results in OLIS took 7 process steps, including savings the results in the patient chart. A breakdown of the process steps is provided in Table 9.

Table 9: Workflow Steps for Searching, Reviewing, and Retrieving Lab Results using ClinicalConnect and OLIS

STEPS†	ClinicalConnect	OLIS
1	Launch ClinicalConnect via web browser	Launch OLIS
2	Enter login credentials via Single Sign-On or ONE ID	Select Provider
3	Search for patient using Health Card Number (HCN), MRN/CHRIS Client #, or advance search functions	Enter start and end date and any filters
4	Select desired patient's profile and click "View Selected Patient"	Click search
5	Select filters to organize view of portlets (e.g., customize the timeline interval to display a date range)	Enter patient name in search bar
6	Navigate to the "Lab and Pathology" results tab and expand results window	Search for relevant laboratory results
7	Search for relevant laboratory results	Click on relevant laboratory results and click on "Retrieve Selected Lab" to download results into EMR
8	Click on lab result attachment to review	
9	Click Print to either print a hard copy of the lab result or save PDF	
10	Upload results into patient chart	

†Steps refer to any major actions or phases in the process that requires the user to engage with a new interface element, such as opening a new window, interacting with a pop-up, or entering data into a form or field. Each step signifies a distinct interaction necessary to progress through the workflow.

GENERATING AND REFILLING A PRESCRIPTIONS – STEPS AND TIME

Time spent generating and refilling prescriptions was captured and summarized for across all simulated encounters. Similarly for lab requisitions, PCPs did not generate or refill a prescription for every encounter, as PCPs were again prompted to use their discretion based on when a lab prescription was needed depending on the scenario. On average, physicians spent 39 seconds ($n_{encounters}$= *14 and* n_{PCPs} = *9*) refilling prescriptions or generating a new prescription for a single medication. This does not include any time that may be spent on clinical decision making to determine the most appropriate medication, dosage, frequency, or quantity (e.g., searching UpToDate for potential drug-to-drug interactions). Summary statistics are presented in Table 10.

Table 10: Summary statistics generating and refilling prescriptions

	Mean±	SD†	CI Lower‡	CI Upper§
Average Time generating and refilling prescriptions	0 min 39 s	1 min 16 s	0 min 13 s	1 min 4s

±Amount of time averaged across all simulated clinical encounters and PCPs.
†Standard Deviation
‡ Lower limit confidence interval
§ Upper limit confidence interval

For PCPs using Telus PS Suite, on average generating and refilling prescriptions required 10 process steps to generate a new or refill a prescription. For OSCAR Pro, physicians undergo 9 process steps. This workflow is presented in Table 11.

Table 11: Workflow steps for generating and refilling prescriptions across TELUS PS Suite and OSCAR Pro EMRs.

STEPS†	TELUS PS Suite	OSCAR Pro EMR
1	Open prescriptions tab (via keyboard short cut, clicking on drug name, etc.)	Click + on Medications tab
2	Type in name of drug	Type name of drug
3	Press ‘enter’ on keyboard and ‘Choose a Medication’ screen pops up	Click on drug name from dropdown option
4	Click on drug name with appropriate dosage	Add quantity and refills
5	Clicks “PRN” check box	Add instructions
6	Add frequency, quantity and refills	Click on ‘Preferred Pharmacy’
7	Adds instructions	Add preferred pharmacy
8	Click on “Pharmacy” drop down menu	Click save
9	Select or add preferred pharmacy	Send to pharmacy or Print
10	Click ‘Print’ or ‘Fax’’	

†Steps refer to any major actions or phases in the process that requires the user to engage with a new interface element, such as opening a new window, interacting with a pop-up, or entering data into a form or field. Each step signifies a distinct interaction necessary to progress through the workflow.

3.3. Areas of focus for improving referral process and reducing PCP administrative burden

Interviews also revealed important insights and recommendations to improve the referral process and address administrative burden more generally.

1. **Delegate Inbox Management:** Many participants suggested delegating the management of inbox items, particularly those related to lab results, consultation reports, and discharge summaries. By having someone screen inbox items and prioritize urgent matters, PCPs could focus on more critical tasks. However, several participants raised concerns about the legal responsibility to review all items in their inbox, even if non-urgent. One participant noted that despite the potential for delegation, physicians are ultimately accountable for ensuring that nothing important is missed, which complicates efforts to offload this task to others. For example, errors in prioritization could lead to missed urgent results, posing risks to patient safety and leaving PCPs legally vulnerable.

> *"I think probably like inbox items could probably be delegated if there was somebody sort of like screening inbox items to more urgent stuff that needed to be seen right away versus like and you know just like little things highlighted as far as next steps I think would be the... is probably like the biggest burden I found is just having to go through every single inbox item, find out what's kind of the next step or what the pertinent information is..."*
>
> ***- Participant 07***

2. **Increase adoption of eReferral from specialists:** While eReferral was described as generally fluid and straightforward to use, its full potential was underscored by PCPs as limited by the fact that not all specialists are available on the platform. Expanding the number of specialists on eReferral would make it easier for physicians to transition fully to the system, reducing reliance on alternative methods like eFax. Encouraging wider adoption by specialists would improve efficiency and streamline the referral process. This was underscored by participant 8:

> *"While eReferral is generally fluid and straightforward to use, its full potential is limited by the fact that not all specialists are available on the platform. Expanding the number of specialists on eReferral would make it easier for physicians to transition fully to the system, reducing reliance on alternative methods like eFax. Encouraging wider adoption by specialists would improve efficiency and streamline the referral process."*
>
> ***- Participant 08***

3. **Simplify and Standardize Forms:** A recurring theme was the need for consistency across referral forms, especially between different specialties. Participants noted that inconsistent forms contribute to administrative inefficiencies. Additionally, the inclusion of unnecessary fields, such as preferred language, added to the cognitive load required to create and submit a comprehensive referral.

"...forms are the thing that's the most time consuming. I mean, forms can definitely be simplified. And standardized, you know, a lot of the time its like, OK, I want to send this person for an ultrasound. And now I have to find out, or like they don't know where to go. So, I have to look where they live and then if they find a place near them and then I have to find that specific form when it could just be so easy. If there was just like Ontario ultrasound, you just fill it out and send it. So, I don't know. Yeah, kind of like the searching for forms finding the appropriate form, filling out the form takes a lot of time."

- Participant 06

4. **Reduce Redundancy:** Several participants highlighted the redundancy of receiving multiple reports, such as lab and imaging results, through various channels (e.g., HRM, fax, or paper). Participant 4 emphasized the frustration of receiving duplicate faxes from pharmacies and clinics, which added to the time required to process and review documents. Streamlining the information flow and reducing unnecessary duplication could significantly reduce the administrative burden. Further, the responsibility to review every incoming report remains a challenge, particularly when redundant reports increase the risk of missing urgent or time-sensitive information amid the clutter.

"So, we get a lot of reports like lab reports, imaging reports, HRM, and then the day later get a fax, multiple faxes from pharmacies asking for prescriptions. And we've already sent it. The next day, they've sent another fax, and I think that's just because faxes are delayed. So, they've sent something three times."

- Participant 04

5. **Utilize eConsults for Quick Advice:** Participant 7 emphasized the value of eConsults to quickly obtain specialist advice without overloading specialists with unnecessary in-person referrals. Building out a more robust eConsult system could reduce the number of referrals and enable PCPs to manage more cases within their practices, thereby saving time and reducing the burden on specialists.

" And what I've found helpful is you could continue to be more utilized is the eConsults compared to eReferral. I think the eConsults is a really great service. So, if there was a database built out more alongside of eConsults, because a lot of times you just have a question, and you can stop the specialists from getting plugged up with in person referrals, where they can just kind of give you a little bit of advice."

- Participant 07

6. **Improve HRM Labeling:** Another key issue was the lack of clear labeling of files in HRM, which resulted in PCPs spending extra time deciphering reports. Participant 5 recommended clearer labeling, such as identifying reports as "consult notes" or "ortho notes," to make triaging and managing inbox items more efficient. Without this clarity, PCPs face accountability challenges in ensuring that no critical information is missed in the deluge of incoming messages.

> *" I think the main thing about HRM is just like, it would be nice if it was labelled like: consult note, ortho note… not every single thing just being pink medical records cause I have to go in and label it…"*
>
> ***- Participant 05***

7. **Address the Burden of Form Completion:** In addition to referrals, participants pointed out that other forms, such as insurance, disability, and compensation forms, are time-consuming and cannot be delegated. Participant 9 emphasized the need for solutions that address this burden, as these forms are often required but not reimbursable.

> *" Referrals is definitely a long one. There are forms like insurance forms and disability and reimbursement, workmen's compensation, all of those things you can't delegate and they're time consuming…. There are forms like one patient wants a bigger seat on a plane because of some mobility issue, but most doctors would charge you because you can't bill for it."*
>
> ***- Participant 09***

By addressing these recommendations, such as improving inbox management, reducing redundancy, and streamlining referral processes, reductions in administrative burden could be achieved, allowing PCPs to focus more on patient care and less on paperwork. However, any solutions must consider the legal responsibilities and accountability challenges that PCPs face in ensuring that all patient information is properly reviewed and acted upon, even when administrative tasks are delegated.

4.0 Discussion

4.1. Summary

The results demonstrate differences in the time required to complete referrals using eReferral, eFax, and paper workflows. On average, PCPs spent 2 minutes and 53 seconds completing referrals via eReferral, compared to 3 minutes and 49 seconds using eFax, and 2 minutes and 53 seconds using paper-based workflows. However, the paper workflow time does not account for the additional steps required to print and hand off the referral to administrative staff for sending,

or the steps taken *after* handing off a paper referral to an administrative staff member, so that they can send a fax on behalf of the PCP, suggesting that the actual time for paper workflows is underestimated.

eReferral workflows were faster for both simple and complex patient cases, with simple cases showing a general trend of 8.7%-time savings compared to the paper workflow, and complex cases demonstrating a general trend of 17.9%-time savings compared to the eFax workflow. These efficiencies are seemingly due to the digital streamlining of manual processes, such as the automated population of fields and the ability to complete the process with fewer steps. However, variability in the number of steps was observed across PCPs, depending on factors such as the amount of information required in the referral form, the urgency of the referral, and the completeness of patient data, such as the Cumulative Patient Profile (CPP).

Challenges were noted in the eReferral system, particularly around system failures, incomplete form sections leading to errors, and difficulties with the search function. Similar issues of inefficiency were found in the eFax and paper-based workflows, particularly due to outdated address books and manual entry requirements, which caused delays and referral rejections. These findings emphasize the need for more robust digital solutions to further reduce administrative burden and improve efficiency across referral workflows.

Despite these challenges, **eReferral appears to offer several key efficiencies over eFax and paper-based fax methods by eliminating redundant steps.**

1. eReferral removes the need to create tracking messages and instructions for secretarial staff, streamlining the process for the physician.

2. eReferral consolidates the task of filling out a PDF and generating a referral letter into a single step, reducing the workload for providers.

3. eReferral avoids the need to continually update the address book, as it automatically pulls up-to-date referral contact information, preventing potential errors and delays caused by outdated addresses in eFax and paper systems.

4. eReferral reduces the amount of follow-up paperwork that secretaries must handle, such as sending the referral manually and tracking its progress, offering a more efficient workflow for both clinicians and administrative staff. This highlights the potential of

eReferral to simplify administrative processes and decrease the burden on primary care teams.

While eReferral is seemingly slightly faster than eFax or paper faxing, its primary value will likely be making it easier to find the right specialist, funneling referrals to providers with shorter wait times, and keeping patients informed about the referral process (see eReferral logic model, informed by Phase 1 report, in Appendix B). Each of the tools have detailed logic models which highlight a range of impacts, but we have focused on the empirical results for eReferral in this report to demonstrate a general approach to measuring administrative burden.

4.2. Limitations

A key limitation of this study is the small sample size used in the simulations, which may limit the generalizability of the findings. With only a small group of PCPs participating, the variability in practice styles, referral habits, and system interactions may not be fully captured. As a result, the findings may not reflect the full range of experiences that could occur in a larger, more diverse population of PCPs. Furthermore, the small sample size likely impacted the ability to detect statistically significant differences, as the observed differences did not reach statistical significance. Future studies with a larger sample size would help to confirm these results and provide more robust insights into the effectiveness and efficiency of the referral systems in real-world settings.

Another limitation is the sole use of simulations rather than naturalistic observations, which may not fully capture the complexities and unpredictability of real-world clinical environments. Simulations, while controlled and standardized to provide an accurate measure of the difference in time to do the same task, lack the variability and spontaneous challenges that providers face in day-to-day practice. This controlled setting may result in findings that are less reflective of the actual workflow processes and disruptions that could be present in naturalistic settings. Future research incorporating naturalistic observations would provide a more comprehensive understanding of the PCPs workflow and time to complete tasks in real-world conditions. Despite these limitations, conducting simulations provides a level of detail regarding workflow steps and how they contribute to time spent on administrative burden that, to our knowledge, has not been available elsewhere as other jurisdictional efforts have relied primarily on self-report surveys to date. The living lab approach has also proven successful in the evaluation of other digital health tools, including AI scribes (Centre for Digital Health Evaluation, Women's College Hospital Institute for Health System Solutions and Virtual Care, 2024). As we continue to build the living

lab approach, data from this type of work (e.g., time-motion simulation studies) will provide key insights to understand the drivers of burden identified in other methods within the lab (e.g., site observations, additional interviews, surveys) as it provides a uniquely controlled environment to map and test specific elements of potential workflows.

4.3. Recommendations & Next Steps

Based on the findings from this evaluation we propose the following recommendations and next steps:

- **Expand Simulations to Real-World Settings:** While the controlled simulations provided valuable insights, conducting evaluations in real-world clinical environments would offer a more comprehensive understanding of workflow challenges and the impact of digital tools under natural conditions.
- **Address System Usability Issues:** eReferral, despite its time-saving potential, faced system errors and incomplete form challenges. Improvements in user interface design and system stability are necessary to reduce these inefficiencies and improve overall adoption.
- **Standardize and Streamline Processes:** Variations in workflows across platforms (e.g., digital tools and/or EMRs) for similar clinical tasks, such as referrals, generating lab requisitions and prescriptions, and retrieving lab results, highlight the need to streamline steps and minimize unnecessary clicks or manual entries to reduce administrative burden. Additionally, standardizing forms within each workflow is crucial to improve efficiency, reduce frustration, and minimize the time required to complete tasks.
- **Explore Other Areas of Administrative Burden:** Future evaluations should extend beyond referrals, lab requisitions, and prescriptions to include tasks like inbox management and patient communication, which also contribute significantly to administrative workload.

5.0 Conclusion

In conclusion, this evaluation highlights the potential of digital tools like eReferral to streamline workflows in Ontario's primary care system. While eReferral identified time savings from generation to the point of sending a referral compared to eFax (for complex cases) and paper

workflows (for simple cases), system usability issues and workflow variations remain areas for improvement. Expanding evaluations to real-world settings and addressing broader administrative tasks will be crucial next steps in optimizing these solutions. By continuing to refine these tools and processes, Ontario's healthcare system can help to reduce administrative burden and enhance patient care.

6.0 References

Alegbeh, A., & Jones. (2024). Patients before paperwork. Accessed January 23, 2024. https://20336445.fs1.hubspotusercontent-na1.net/hubfs/20336445/red_tape/pdfs/Patients_Before_Paperwork_Report_2023.pdf

Asan, O., Chiou, E., & Montague, E. (2015). Quantitative ethnographic study of physician workflow and interactions with electronic health record systems. *International journal of industrial ergonomics*, *49*, 124–130. https://doi.org/10.1016/j.ergon.2014.04.004

Borycki, E., Kushniruk, A., Anderson, J., & Anderso, M. (2010). Designing and Integrating Clinical and Computer-based Simulations in Health Informatics: From Real-World to Virtual Reality. InTech. doi: 10.5772/8962

Centre for Digital Health Evaluation, Women's College Hospital Institute for Health System Solutions and Virtual Care. (2024). Clinical Evaluation of Artificial Intelligence and Automation Technology to Reduce Administrative Burden in Primary Care. https://km4s.ca/wp-content/uploads/Clinical-evaluation-of-artificial-intelligence-and-automation-technology-to-reduce-administrative-burden-in-primary-care-2024.pdf

Centre for Digital Health Evaluation, Women's College Hospital Institute for Health System Solutions and Virtual Care. (2024, March 28). *Patients Before Paperwork (PB4P).*

Doberne, J. W., He, Z., Mohan, V., Gold, J. A., Marquard, J., & Chiang, M. F. (2015). Using High-Fidelity Simulation and Eye Tracking to Characterize EHR Workflow Patterns among Hospital Physicians. *AMIA ... Annual Symposium proceedings. AMIA Symposium*, *2015*, 1881–1889.

eHealth Ontario. (n.d.). *Ontario Laboratories Information System (OLIS) standard*. https://ehealthontario.on.ca/en/standards/ontario-laboratories-information-system-standard

Ereferral. eHealth Centre of Excellence. (n.d.). https://ehealthce.ca/eReferral.htm

Johnson, K. (2023). Joint Task Force to Reduce Administrative Burdens on Physicians. Doctorsmanitoba.ca. Accessed January 23, 2024. https://assets.doctorsmanitoba.ca/documents/Admin-Burden-Progress-Report-May-30.pdf

Loomis, A., & Montague, E. (2022, July). Scenario-Based Methods for Hard-to-Reach Populations in Healthcare. In *International Conference on Human-Computer Interaction*.

OntarioMD. (n.d.). About HRM. Retrieved March 14, 2024, from https://www.ontariomd.ca/products-and-services/health-report-manager/about-hrm.

OntarioMD. (n.d.). Overview. Retrieved March 27, 2024, from https://www.ontariomd.ca/products-and-services/health-report-manager/overview

Reducing Administrative Burden for Physicians. (2023, August 4). https://assets.doctorsmanitoba.ca/documents/physicians-admin-burden-playbook.pdf

Thompson, O., & Lefebvre, B. (2022). *The journey to interoperability in BC healthcare*. Bchimps.org. Accessed January 23, 2024. https://www.bchimps.org/resources/Documents/2022%20Events/HIMSS%20BC%20-%20Journey%20to%20Interoperability%20in%20BC%20Healthcare_2022Mar.pdf

Women's College Hospital Launches First of Its Kind Virtual Care Laboratory. (2021, March 9). Women's College Hospital. https://www.womenscollegehospital.ca/womens-college-hospital-launches-first-of-its-kind-virtual-care-laboratory/

7.0 Appendix A: Simulations

7.1. Protocol

Prior to participants, all PCPs provided informed consent. In preparation for the simulation, each PCP received a patient list, which included the patient's name, date of birth, reason for visit, and appointment time. PCPs were asked to treat each visit as if it were a typical encounter with a returning patient and reviewed the patient's history as part of the workflow. PCPs were encouraged to complete documentation during the visit, but flexibility was allowed to align with their usual practice, including documenting afterward the visits. However, all documentation had to be completed before proceeding to the next patient.

7.2. Design of Simulation Workflow

In total, 10 participating PCPs completed 40 simulated encounters: 20 encounters using Ocean eReferral workflow, 10 using a paper workflow, and 10 using eFax. The study design for the simulated encounters by PCP is presented in Table 12.

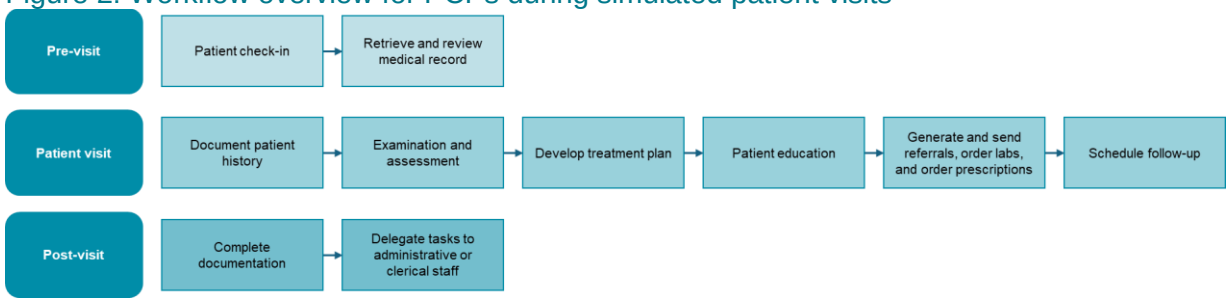
Table 12. Overview of the simulated encounters by PCP[†,‡]

Participant #	Patient 1 (Simple)	Patient 2 (Simple)	Patient 3 (Complex)	Patient 4 (Complex)
PCP 1	eReferral	Paper referral	eReferral	eFax
PCP 2	eReferral	Paper referral	eReferral	eFax
PCP 3	eReferral	Paper referral	eReferral	eFax
PCP 4	eReferral	Paper referral	eReferral	eFax
PCP 5	eReferral	Paper referral	eReferral	eFax
PCP 6	eReferral	Paper referral	eReferral	eFax
PCP 7	eReferral	Paper referral	eReferral	eFax
PCP 8	eReferral	Paper referral	eReferral	eFax
PCP 9	eReferral	Paper referral	eReferral	eFax
PCP 10	eReferral	Paper referral	eReferral	eFax

[†]The simulations were anchored by the referral pathway to ensure variability in workflows were captured.
[‡]The simulations were counterbalanced (i.e., eReferral and paper-based referral for simple cases; eReferral and eFax for complex cases) to ensure comprehensive capture of all processes given time constraints. This approach was guided by principles of human factors engineering and usability measurement, allowing us to account for potential biases, variations in user interaction, and to enhance the reliability of our findings on workflow efficiency and effectiveness.

Figure 2 provides an overview of the workflow conducted by PCPs pre-, during-, and post-visit, for each patient visit.

Figure 2: Workflow overview for PCPs during simulated patient visits



7.3. Provider Interview Guide

INTERVIEW GUIDE

Provider Experience

1. Today you used three workflows to do a referral (printing paper and faxing, using eFax, and eReferral). How was your experience with each of them?
   - Did you prefer one over the other? Why?
   - Where there any parts that were easy? Were there any parts that were hard?
   - Are there any common issues that were missed in the simulation that you experience day to day? *(for providers with previous experience)*
2. What workflows (printing paper and faxing, using eFax, or eReferral) do you currently use in your office?
   - Do you prefer one over the other? Why?
3. What are some barriers or facilitators to using the different workflows?
   - How did the simulations today compare to what you might do in the office?
4. Can you please walk us through the most common steps that you would take to send a referral? For example, do you complete it the appointment or do you start the documentation and finish it at another time (e.g., during admin time)?
   - How might others in your office be involved in the process?
   - What happens to any paper faxes you might print to fax manually? What is the usual workflow?
5. What is the usual workflow in your office for referrals that are rejected?
6. When thinking about the simulations today and/or your process in your office, are there any steps in the referral process you would deem as 'unnecessary'? Can you explain what

these tasks are? How much time do you think is spent completing these unnecessary tasks?

- *Prompt:* Are there any steps in the referral workflow that could be simplified, delegated or eliminated? Can you explain what the tasks are and provide more detail if it's being simplified or delegated?

7. Is there anything else you would like to share with me about your experiences with the Referral process and how it could be improved?
8. Do you have any questions for me today?

8.0 Appendix B: Logic models, terminology, and metrics

Logic models: The Rapid Realist Review (RRR) (Centre for Digital Health Evaluation, Women's College Hospital Institute for Health System Solutions and Virtual Care, 2024), supported by the Narrative Review (NR) and internal expertise, characterized tool features and strategies that can reduce administrative burden (i.e., potentially beneficial strategies to implement). The logic models provide a visual flow of how these strategies first activate key mechanisms for users (which are most often PCPs). Mechanisms are typically how users interact with the tool to facilitate their practice, or their changed clinical and administrative experiences based on use of the tool. The mechanisms are summarized into 2 cumulative mechanisms that show the main path of how mechanisms then activate our proximal desired outcome of interest: administrative burden. The RRR also found that many strategies and mechanisms influencing administrative burden were also beneficial for quality of care, access to care, and safety of care (Centre for Digital Health Evaluation, Women's College Hospital Institute for Health System Solutions and Virtual Care, 2024), which is shown. We hypothesize that improving the proximal outcomes will also improve the perceived value of the tools by potential users, facilitating adoption, usage, and reach (distal outcomes).

Therefore, the logic models draw the relationship between i) improving the functions and usability of the tools (strategies), ii) the experiences and use of the tools (mechanisms), iii) the resulting improvements in administrative burden, quality, access, and safety, and iv) the overall PB4P goal of increasing digital tool adoption, usage, and reach to reduce fax use.

Metrics: We have proposed a set of operational metrics to track the progress of tools in meeting outcomes of interest; the goals of the PB4P program and the supportive components identified within the logic models. Metrics should be measured periodically (e.g., quarterly, yearly, or at the start and end of the program depending on feasibility and availability of vendor data) to track change.

Each outcome has at least one scorecard metric which provides a quick, overall look into progress made in an outcome over time. Each scorecard metric has at least one explanatory metric that is meant to provide insight into how and why the scorecard value is being seen. Therefore, the

scorecard metrics can be used to track and present progress over time, and the explanatory metrics can be used to understand, explain, and investigate ways to improve upon the scorecard metric if desired change isn't being met.

Each metric has a suggested source of data. When listing OH as a source, we recognize that agreements with product vendors would likely need to be established by OH to procure the data.

Explanations of terminology used in the logic models and metrics are available below their relevant tools**.** Some terminology has nuances and varied meanings across tools and will be repeated as needed. Otherwise, terms will be explained only when they first appear.

8.1. Labs

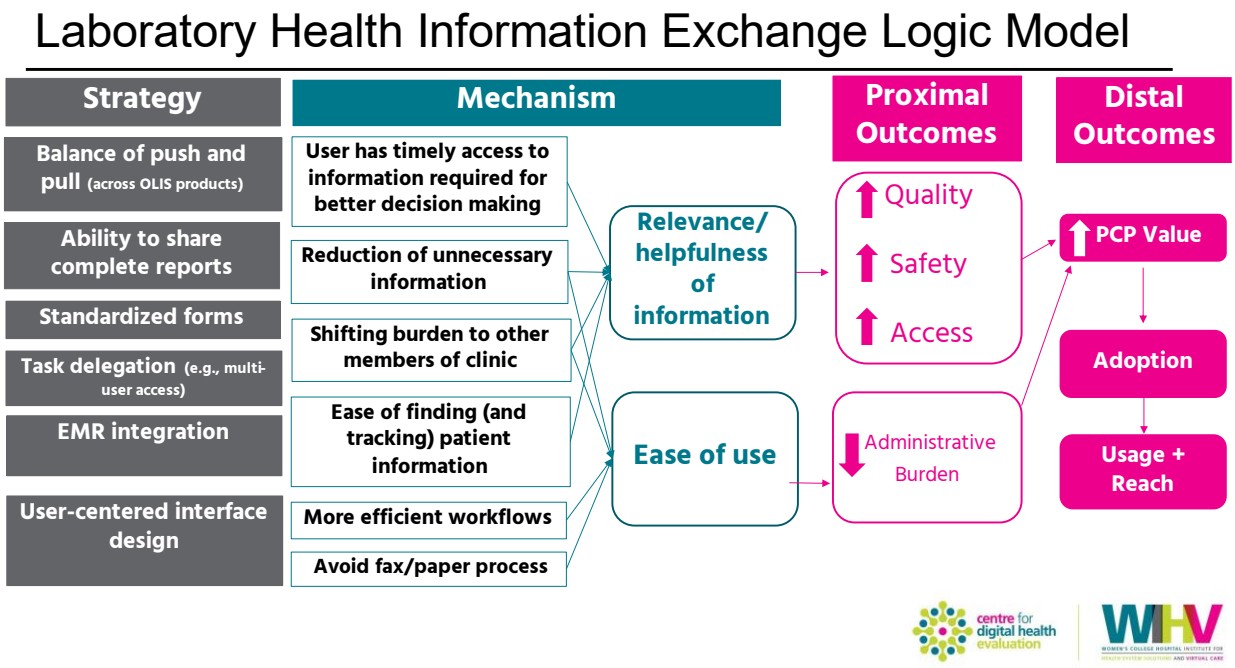


Figure 3. Logic model for the relationship between administrative burden and adoption of laboratory health information exchange tools in Ontario.

TERMINOLOGY EXPLANATIONS

Balance of push and pull: An appropriate balance of push (also known as direct) and pull (also known as query-based) health information exchange pathways is context-dependent and centers the user's perspective for what information they feel they need sent to them immediately and what information should be made accessible when they act to retrieve it (i.e., only when they need it to inform practice). For OLIS, this may require the need to create new versions that enable users to

manage and coordinate a balance of push (e.g., automated alerts) and pull (e.g., information that they would like to request when appropriate/necessary) across them.

Standardized forms: This encompasses forms that use consistent terminology, required fields, and that are routinely used for a given report type. When creating a standardized form (e.g., test requisition/request forms), user-centered features may also be concurrently considered to select what terminology is used, what fields are required to best inform care, what steps or information may be removed, the addition of embedded supportive tools (e.g., clinical decision-support language), and the improvement of processes through which standardized forms are created, filled, and sent.

Ease of finding information: Ease of finding information refers to how easy it is for users to access laboratory reports and requests, find the specific report they need among other reports, and search through report contents to find the information that they need. Improving ease of finding information will require user-centered changes across these processes and should improve the speed at which PCPs find information and the likelihood that they find the most appropriate information to inform practice.

Task delegation: Task delegation refers to the ability to distribute tasks across multiple professionals and, ideally, assign them to the most appropriate individuals that allows team members to work at the top of their license. Enabling task delegation can involve changes within team processes as well as within OLIS tools themselves by implementing a usability feature that provides multiple team members with access to the same tool portal, allowing teams to determine their preferred administrative workflow. This contributes to an appropriate shifting and distribution of tasks.

EMR integration: Integration with EMRs refers to the tool's ability to communicate with and/or become directly embedded within the EMR. Defined levels of EMR integration will need to be created through further research and simulation but may include abilities such as auto-population of OLIS report and request information directly into EMRs and a shared login interface.

User-centered interface design: User-centered interface design is the processes of centering the users' experience and needs into how we design tools and critical consideration of the workflow tools are situated in. Building this will require context-specific assessment (i.e., Ontario-specific processes) to identify critical usability features that would improvement the experience of users and, ideally, their likelihood to adopt and continue meaningful use of tools. Some usability

features that may be beneficial include search and filter functions, auto-sorting and categorization, highlighting important information through formatting, reducing overall amount and length of reports, embedding pdf readers, reduced steps/interfaces/clicks, reduced logins, and other tailored features that enable users to identify and access the information they need in a timely, low burden manner. This should be accompanied by changes to surrounding OLIS workflow processes that users find cumbersome (e.g., creating new staff workflow of who, what, and where certain steps in the laboratory report and request management process are completed).

Relevance/helpfulness of information: Relevance of information refers to the ability to find and access pertinent information to inform practice decisions and tasks at hand through OLIS. This means that useful information is pushed to PCPs through OLIS, while low relevance information (including redundant information) is not sent. Ideally, PCPs will be able to easily find all the relevant laboratory report and request information that they need to identify, understand, and act on the most appropriate next steps in their patients' care. Several strategies and mechanisms contribute to the overall relevance of information found in OLIS by PCPs.

Ease of use: Ease of use refers to the overall usability experience created by tools, with cumbersome tools that contain unnecessary steps/information and that do not perform well in current workflows having low ease of use and those that effectively support users in their work through appropriate steps/information and seamless workflow having high ease of use. Several strategies and mechanisms contribute to the overall ease of use of tools like OLIS (and its various versions).

OLIS METRICS

Table 13: Laboratory Health Information Exchange Tools (i.e., OLIS) Metrics

Type of Metric	Associated Outcome	Metric Level	Metric	Suggested Data Source
Overall Metrics for OLIS/Laboratory HIEs (Will need to be measured individually for all versions of OLIS and potentially stratified via EMR used. Some metrics may not be applicable to all versions.)	**Adoption**	**Scorecard**	Number of registered OLIS users	OH
		Explanatory	Number of registered OLIS users (primary care)	OH
			Number of registered OLIS users (labs, hospitals, specialists)	OH
			Number of non-physicians/NPs who have access to OLIS	OH and Living Lab
	Usage and Reach	**Scorecard**	Number of requisitions sent over OLIS/month	OH
			Number of reports sent over OLIS/month	OH
			Number of reports accessed over OLIS/month	OH

		Explanatory	Number of requisitions sent over OLIS/month (stratified by region and user type)	OH
			Number of reports sent over OLIS/month (stratified by region and user type)	OH
			Number of reports accessed over OLIS/month (stratified by region and user type)	OH
			Number of users who have sent at least 3 requests via OLIS/month	OH
			Number of users who have sent at least 3 reports via OLIS/month	OH
			Number of users who have accessed at least 3 reports via OLIS/month	OH
	Reduction in Administrative Burden	**Scorecard**	Total hours of administrative burden saved from adopting OLIS per user per month (in comparison to fax/paper workflows)	OH and Living Lab
		Explanatory	Difference in avg time spent in OLIS test/report requisitioning vs fax requests	Living Lab
			Difference in avg time spent in OLIS accessing reports vs fax reports	Living Lab
			Difference in avg time spent in OLIS sending reports vs fax reports	Living Lab
	Fax Reduction	**Scorecard**	Number of faxes avoided/month (# of faxes per task estimated by living lab or OH/vendors)	OH and Living Lab
		Explanatory	Avg # of OLIS test/report requests sent per user per month	OH
			Avg # of OLIS reports sent per user per month	OH
			Avg # of OLIS reports accessed per user per month	OH
	Provider Experience/ Value	**Scorecard**	Net Promotor Score (NPS) by user	OH and Living Lab
			User satisfaction	OH and Living Lab
	Balance of push/pull pathways	**Scorecard**	User satisfaction with appropriateness of documents pushed (directly sent automatically)	OH and Living Lab
		Explanatory	% of documents sent over OLIS+ deemed to be "valuable" by user	OH and Living Lab
Value-add Strategies and Interventions (Will need to be measured individually for all versions of OLIS and potentially stratified via EMR used. Some metrics may not	**Ease of finding Relevant Information**	**Scorecard**	Time spent interpreting laboratory reports	Living Lab
		Explanatory	Clinician reported ease of finding information	OH and Living Lab
			Number of high importance usability features (identified via living lab) implemented for version of OLIS	OH and Living Lab
	EMR Integration	**Scorecard**	Number of EMRs with medium to high integration with OLIS	OH and Living Lab
		Explanatory	Establish definitions of levels of integration	Living lab

be applicable to all versions.)			Level of integration for each EMR product (stratified by AI scribe product)	Living lab
			Clinician experience with EMR Integrations	OH and Living Lab
	User Centered Interface Design	**Scorecard**	Clinician experience with usability through NPS	OH and Living Lab
		Explanatory	Number of high importance usability features (identified via living lab) implemented for version of OLIS	OH and Living Lab

PROVINCIAL CLINICAL VIEWER METRICS

Table 14: Provincial Clinical Viewer Metrics (including but not limited to OLIS via provincial clinical viewer)

Type of Metric	Associated Outcome	Metric Level	Metric	Suggested Data Source
Overall Metrics for Provincial Clinical Viewer (PCV)	**Usage and Reach**	**Scorecard**	Number of PCPs registered for PCV (stratified by region and practice type)	OH
		Explanatory	Number of times PCV accessed by PCPs per month (stratified by region and practice type)	OH
			Number of non-physician users who access PCV	OH and Living Lab
			Result types most accessed in provincial viewer	OH and Living Lab
	Reduction in Admin Burden	**Scorecard**	Total hours of admin burden saved per month through reduction in time required to access and find a result (in comparison to paper/fax process)	OH and Living Lab
		Explanatory	Average time required to access PCV and find results	Living Lab
			Average clicks required access PCV	Living Lab
			Average clicks required to find a set of results in PCV	Living Lab
	Fax Reduction	**Scorecard**	Number of faxes avoided per month from program baseline	OH and Living Lab
		Explanatory	Number of faxes avoided per PCV access	Living Lab
	Provider Experience/ Value	**Scorecard**	Net Promoter Score (NPS) by PCP	OH and Living Lab
Value-add Strategies and Interventions	**EMR Integration**	**Scorecard**	Number of EMRs with medium to high integration with PCV	OH and Living Lab
		Explanatory	Establish definitions of levels of integration	Living Lab
			Level of integration for each EMR product (stratified by AI scribe product)	Living lab
			Provider experience on EMR Integrations	OH and Living Lab
	User Centered Design	**Scorecard**	Provider experience with usability using NPS	OH and Living Lab

		Explanatory	Provider reported experience with UCD enhancements	OH and Living Lab
			Number of high importance usability features (identified via living lab) implemented	OH

8.2. eConsult

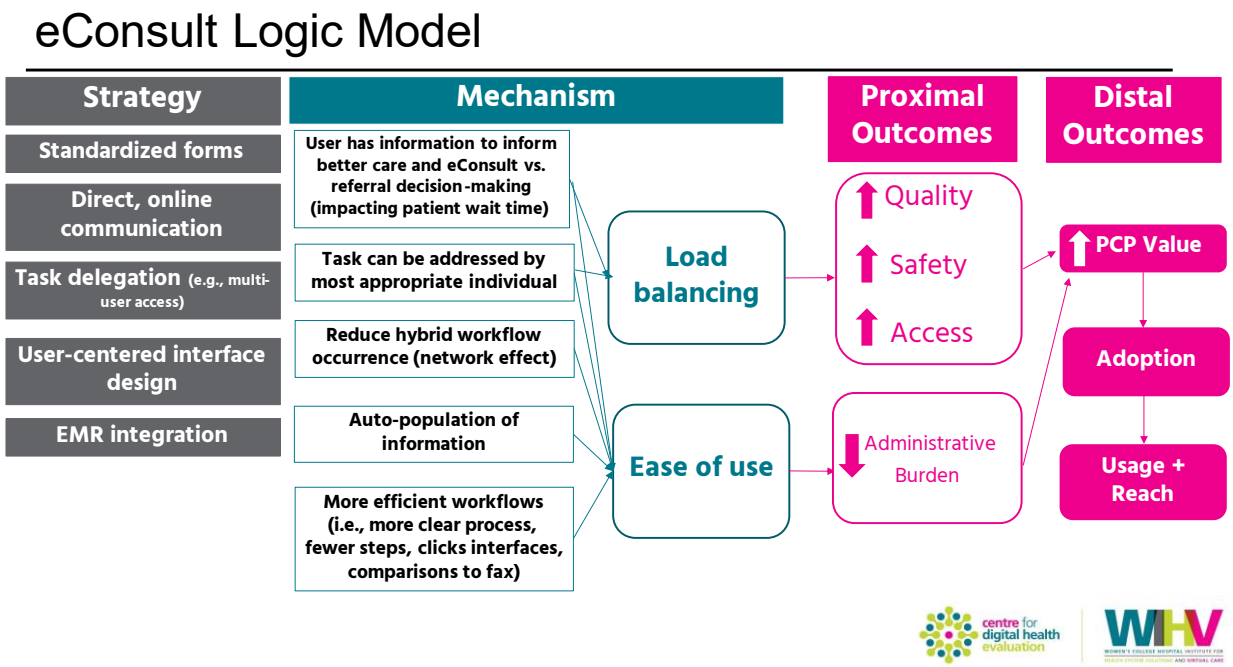


Figure 4. Logic model for the relationship between administrative burden and adoption of eConsult tools in Ontario.

TERMINOLOGY EXPLANATIONS

Standardized forms: This encompasses forms that use consistent terminology, required fields, and that are routinely used for a given consult type. Forms are standardized for large regions or entire jurisdictions, typically by specialty type. When creating a standardized form, user-centered features may also be concurrently considered to select what terminology is used, what fields are required to best inform care, what steps or information may be removed, the addition of embedded supportive tools (e.g., clinical decision-support language), and the improvement of processes through which standardized forms are created, filled, and sent.

Load balancing: Load balancing refers to the ability to appropriately manage consultations and necessary referrals across the system (facilitated through fast consult turnaround, redirection of inappropriate consults, support for eConsult and referral decision-making, matching

consult/referral decisions to patient needs, etc.) which can reduce administrative load on physicians while improving care safety and access. Several strategies and mechanisms contribute to the overall load balancing ability of tools like eConsult.

ECONSULT METRICS

Table 15. eConsult Metrics

Type of Metric	Associated Outcome	Metric Level	Metric	Suggested Data Source
Overall Metrics for eConsult (stratified by product where appropriate and feasible)	**Adoption**	**Scorecard**	Number of registered eConsult users	OH
		Explanatory	Number of registered eConsult users (primary care)	OH
			Number of registered eConsult users (specialists)	OH
	Usage and Reach	**Scorecard**	Number of eConsults created/month	OH
			Number of eConsults completed/month	OH
		Explanatory	Number of eConsults created per primary care user per month	OH
			Number eConsults created per month (stratified by per requested specialty and region)	OH
			Number of eConsults completed per specialist user per month	OH
			Number of eConsults completed per month (stratified by specialty and region)	OH
			Number of primary care eConsult users who created at least 3 eConsults per month	OH
			Number of specialist eConsult users who completed at least 3 eConsults per month	OH
	Administrative Burden	**Scorecard**	Average time to complete eConsult form	OH and Living Lab
		Explanatory	Average time to complete eConsult form by request type	OH and Living Lab
			Number of steps to complete eConsult form by request type	OH and Living Lab
	Provider Experience/ Value	**Scorecard**	Net Promotor Score (NPS) by user	OH and Living Lab
Value add Strategies and Interventions (stratified by product where appropriate and feasible)	**Standardized Forms**	**Scorecard**	Number of standardized eConsult forms implemented	OH
		Explanatory	% of standardized forms started	OH
			% of standardized forms completed (stratified by specialties)	OH
			Average number of required fields per standardized form	OH
			User experience with standardized forms using NPS	OH and Living Lab

	EMR Integration	**Scorecard**	Number of EMRs with medium to high integration with eConsult tools	OH and Living Lab
		Explanatory	Establish definitions of levels of integration	Living lab
			Level of integration for each EMR product (stratified by AI scribe product)	Living lab
			Provider experience on EMR Integrations using NPS	OH and Living Lab
	User Centered Interface Design	**Scorecard**	Provider experience with usability using NPS	OH and Living Lab
		Explanatory	Number of high importance usability features (identified via living lab) implemented for eConsult tools	OH

8.3. AI scribe

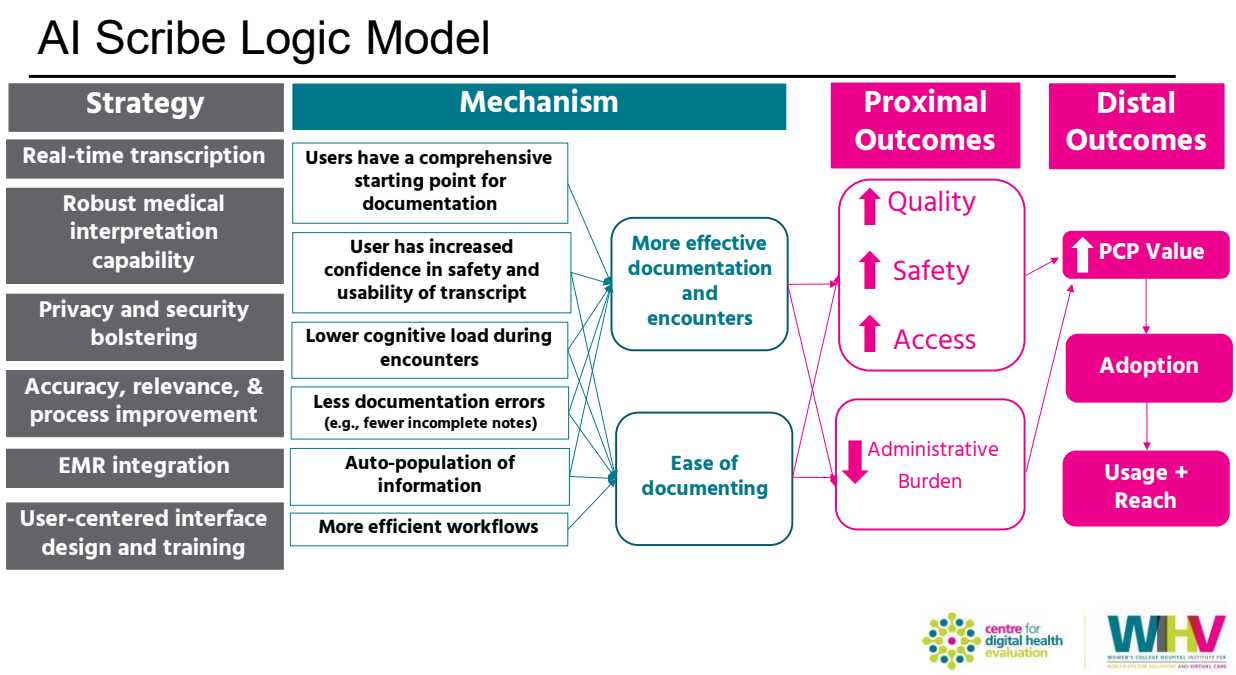


Figure 5. Logic model for the relationship between administrative burden and adoption of AI scribe tools in Ontario.

TERMINOLOGY EXPLANATIONS

Medical interpretation: This feature analyzes note content and can support users' interpretation and decision-making. Use of this feature may reduce cognitive load in-visit, but final decision-making must be maintained by the PCP and regulations that address ethics considerations for use of this type of tool feature should also be supported.

More effective documentation and encounters: More effective documentation and encounters refers to several ways in which AI scribes can support clinical documentation and practice, including resolving documents faster when appointments are fresh in a clinician's mind, enabling clinicians to spend more time focused on patients through better documentation workflows, and facilitating more complete notes than a clinician working alone. Several strategies and mechanisms contribute to the overall effectiveness of documentation and encounters.

Ease of documenting: Ease of use refers to both the overall usability experience created by tools and its impact on the documentation experience for PCPs, including the cognitive load associated with documentation. Cumbersome tools that contain unnecessary steps/information, hat do not perform well in current workflows, and do not ease the burden of documenting would be considered having low ease of documenting and those that effectively support users in their work through appropriate steps/information, seamless workflow, and reduction of clinician workload having high ease of documentation. Several strategies and mechanisms contribute to the overall ease of documentation.

AI SCRIBE METRICS

Table 16. AI Scribe Metrics

Type of Metric	Associated Outcome	Metric Level	Metric	Suggested Data Source
Overall Metrics for AI Scribe (stratified by product where appropriate and feasible)	**Adoption**	**Scorecard**	Number of registered AI scribe users	OH
		Explanatory	Number of registered AI scribe users (primary care)	OH
			Number of registered AI scribe users (specialists)	OH
	Usage and Reach	**Scorecard**	Number of clinical encounters where AI scribes were used per month	OH
		Explanatory	Number of clinical encounters where AI scribes were used per month (stratified by user type and encounter type)	OH
			Number of clinicians who have used AI scribes in more 3 encounters per month	OH
			Number of clinicians who have used AI scribes in more 20 encounters per month (stratified by FTE status if available)	OH
	Reduction in Admin Burden	**Scorecard**	Total time saved by across all full-time PCPs with active AI scribe licenses per week I.e., # of active license users * 3.3 hours (Centre for Digital Health Evaluation, Women's College Hospital Institute for Health System Solutions and Virtual Care, 2024)	OH

			Avg time saved on patient encounter documentation per AI scribe user per month (changes based on amount of usage per user)	OH
		Explanatory	AI scribe use per month	OH
			Avg time saved on patient encounter documentation per AI scribe primary care user per month	Living Lab
			Avg time saved on patient encounter documentation per AI scribe specialist user per month	Living lab
			Avg time from note creation to saving in EMR	OH and Living Lab
			Avg time notes spend in basket	OH and Living Lab
			Avg time from note creation to provider sign-off	OH and Living Lab
			Avg active AI scribe recording time per encounter	OH and Living Lab
	Provider Experience/ Value	**Scorecard**	Net Promotor Score (NPS) by PCPs	OH and Living Lab
		Explanatory	Avg reported impact of AI scribe on cognitive burden	OH and Living Lab
			Avg reported impact of AI scribe on work-life during encounters	OH and Living Lab
			Avg reported impact of AI scribe on after-hours work	OH and Living Lab
Value add Strategies and Interventions (stratified by product where appropriate and feasible)	**Accuracy**	**Scorecard**	Avg clinician reported accuracy of AI scribe (stratified by product and type of user)	OH and Living Lab
		Explanatory	Avg clinician reported accuracy of AI scribe per type of encounter (stratified by product and type of user)	OH and Living Lab
	EMR Integration	**Scorecard**	Number of EMRs with medium to high integration with AI scribe tools	OH and Living Lab
		Explanatory	Establish definitions of levels of integration	Living lab
			Level of integration for each EMR product (stratified by AI scribe product)	Living lab
			Clinician experience with EMR Integrations using NPS	OH and Living Lab
	User-Centered Interface Design	**Scorecard**	Clinician experience with usability using NPS	OH and Living Lab
		Explanatory	Number of high importance usability features (identified via living lab) implemented for eReferral tools	OH and Living Lab

8.4. HRM

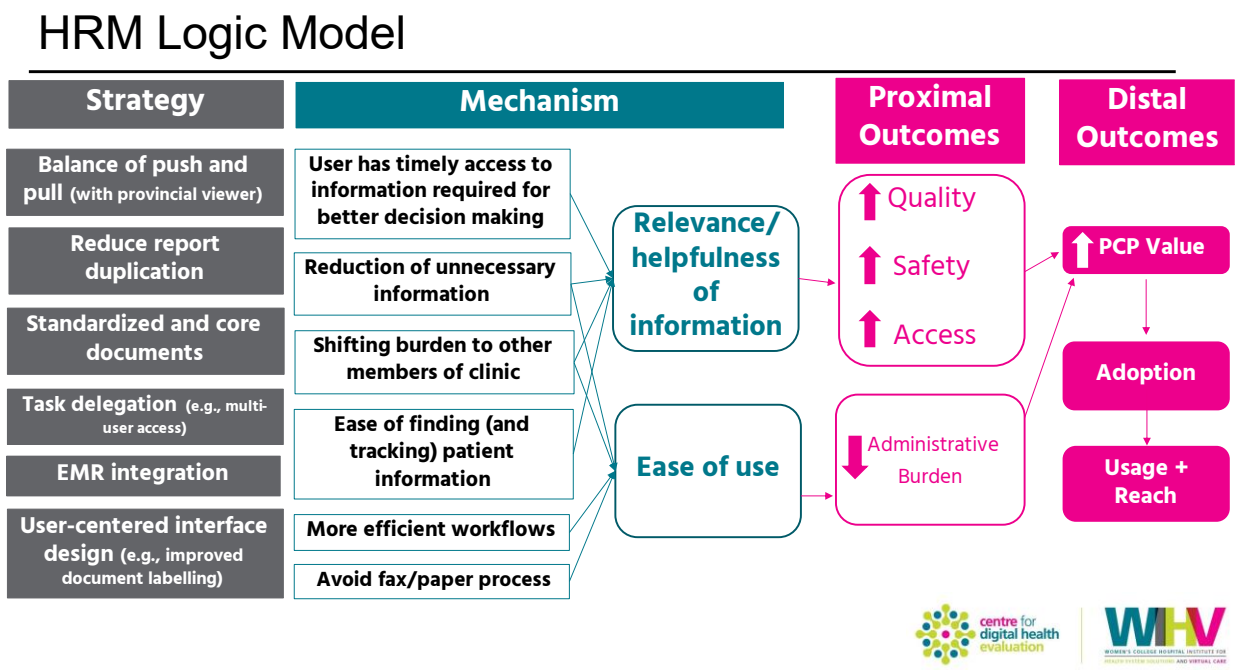


Figure 6. Logic model for the relationship between administrative burden and adoption of HRM in Ontario.

TERMINOLOGY EXPLANATIONS

Balance of push and pull: An appropriate balance of push (also known as direct) and pull (also known as query-based) health information exchange pathways is context-dependent and centers on the user's perspective regarding what information they feel they need sent to them immediately and what information should be made accessible when they act to retrieve it (i.e., only when they need it to inform practice). In the Ontario HRM context, changing the existing system to have improved balance of push and pull pathways for PCPs will likely require reducing the amount of pushed information sent through HRM to just a set of necessary core documents (determined through user-focused research and inquiry) and widespread access to EMR integrated provincial viewer pull-pathways to access additional information when they determine they need it to inform their practice.

Reduce report duplication: This refers to the reduction of reports being sent over both fax and HRM, as well as setting standards for when reports need to be resent (e.g., assess necessity to resend reports with only minor changes), who sends reports (to reduce accidental overlap and duplication), and make it easier for PCPs to find the reports they are looking for (e.g., limit number

of reports sent, integrate with EMR, allow key term searchability, improve layout) to reduce need to resend reports.

Standardized and core documents: This encompasses forms that use consistent terminology, required fields, and that are routinely used for a given report type, as well as what documents should be automatically pushed due to importance (as opposed to pulled) called core documents. When creating a standardized document, user-centered features may also be concurrently considered to select what terminology is used, what fields are required to best inform care, what steps or information may be removed, the addition of embedded supportive tools (e.g., clinical decision-support language), and the improvement of processes through which standardized forms are created, filled, and sent. The HRM taskforce has identified categories of documents that may be suitable as core documents and the push pathway. The living lab may be able to further examine the potential categorization of documents.

Relevance of information: Relevance of information refers to the ability to find pertinent information to inform practice decisions and tasks at hand through HRM. This means that useful information is pushed to PCPs through HRM, while low relevance information (including redundant information) is not sent. Ideally, PCPs will be able to easily find all the relevant report information that they need to identify, understand, and act on the most appropriate next steps in their patients' care. Several strategies and mechanisms contribute to the overall relevance of information found in HRM (and provincial viewers) by PCPs.

HRM METRICS

Table 17: HRM Metrics

Type of Metric	Associated Outcome	Metric Level	Metric	Suggested Data Source
Overall Metrics for Hospital Report Manager (HRM)	**Usage and Reach**	**Scorecard**	Number of PCPs signed up for HRM (stratified by region and practice type)	OH
		Explanatory	Number of documents sent over HRM/month (stratified by region)	OH
			Number of non-physicians/NPs who have access to HRM	OH and Living Lab
			% of documents from hospitals to PCPs that are sent by HRM	OH and Living Lab
	Reduction in Admin Burden	**Scorecard** (stratified by sending/receiving facility)	Total hours of Admin Burden saved per month through reduction in HRM in volume and duplication	OH and Living Lab
			Total hours of administrative burden saved from adopting HRM per user per month (in comparison to fax/paper workflows)	OH and Living Lab

		Explanatory	Avg time spent by PCP reviewing inbox items in HRM per month	Living Lab
			Average number of HRM inbox items per PCP per month	Living Lab
			% of documents sent over HRM deemed to be "valuable" by PCP	Living Lab
			% of documents sent over HRM deemed to be unnecessary by PCP	Living Lab
	Fax Reduction	**Scorecard**	Number of faxes avoided/month from program baseline	OH and Living Lab
		Explanatory	Avg # of faxes avoided by HRM for each PCP	Living Lab
	Provider Experience/ Value	**Scorecard**	Net Promotor Score (NPS) by PCP	OH/vendor (via survey) and Living Lab
Value-add Strategies and Interventions	**Balance of Push and Pull of Documents** (HRM + clinical viewer metrics on next page)	**Scorecard**	% of hospitals who have implemented Core Document Set	OH
		Explanatory	Number of hospitals approached to implement Core Document Set	OH
			Number of hospitals in process of change to adopt Core Document Set	OH
			% of documents sent over HRM deemed to be "valuable" by PCP	Living Lab
	Duplications (fax and HRM)	**Scorecard**	Number of hospitals that have initiated duplication reduction strategies	OH
		Explanatory	% of HRM documents that are also sent by fax	Living Lab
	Ease of Finding Information (standardized documents**)**	**Scorecard**	% of hospitals who have implemented Standardized Document Names (e.g., LOINC)	OH
		Explanatory	Number of hospitals approached to implement Standardized Document Names	OH
			Number of hospitals in process of change to adopt Standardized Document Names	OH
	EMR Integration	**Scorecard**	Number of EMRs with medium to high integration with HRM	OH and Living Lab
		Explanatory	Establish definitions of levels of integration	Living lab
			Level of integration for each EMR product (stratified by AI scribe product)	Living lab
			Clinician experience with EMR Integrations	OH and Living Lab
	User Centered Interface Design	**Scorecard**	Provider experience with usability using NPS	OH and Living Lab
		Explanatory	Number of high importance usability features (identified via living lab) implemented for HRM	OH
			Number of HRM taskforce recommendations implemented	OH

			Time to review a HRM document multiplied by the reduction in number of low relevance HRM documents per month	OH and Living Lab

8.5. eReferral

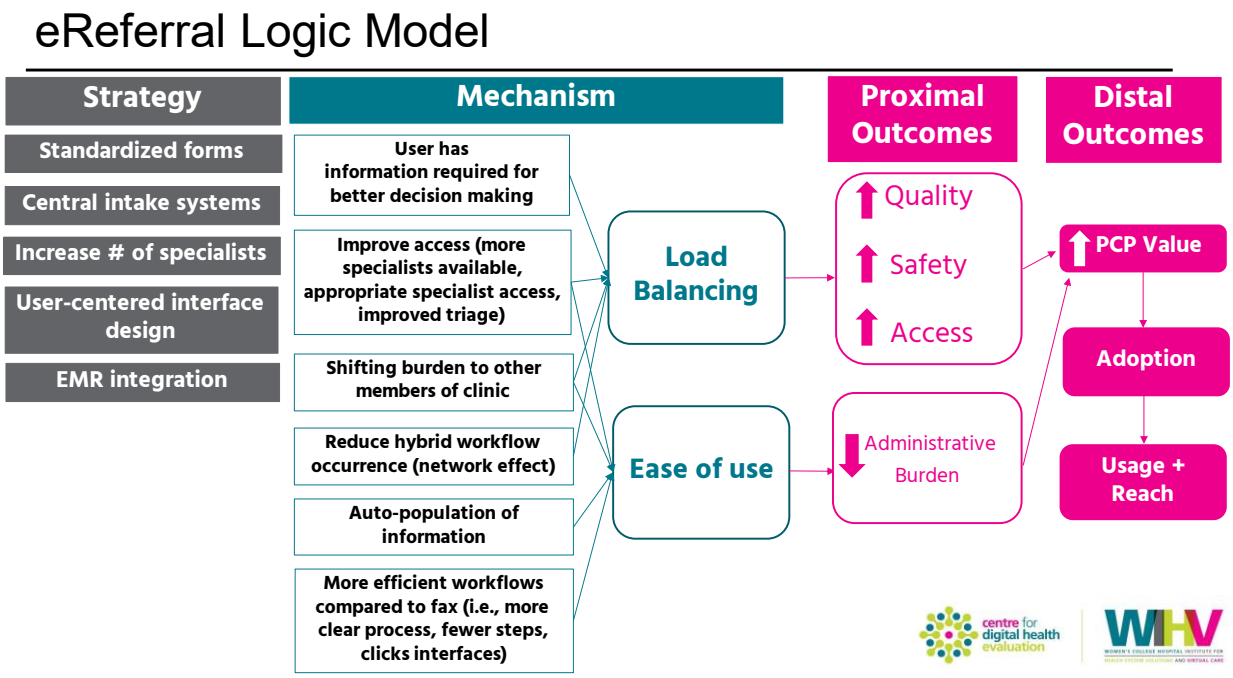


Figure 7. Logic model for the relationship between administrative burden and adoption of eReferral tools in Ontario.

TERMINOLOGY EXPLANATIONS

Standardized forms: This encompasses forms that use consistent terminology, required fields, and that are routinely used for a given referral type. Forms are standardized for large regions or entire jurisdictions, typically by specialty type. When creating a standardized form, user-centered features may also be concurrently considered to select what terminology is used, what fields are required to best inform care, what steps or information may be removed, the addition of embedded supportive tools (e.g., clinical decision-support language), and the improvement of processes through which standardized forms are created, filled, and sent.

Central intake system: This refers to central referral management systems that all referrals are sent to (in this case, all Ontario eReferrals). Central systems will act to triage and send referrals to most appropriate specialists based on a variety of factors such as availability and location of specialists. When specialists decline referrals sent to them through the central system, the system

should also manage the redirection of referrals to the next most appropriate specialist. This process repeats until referrals are accepted and PCPs should have access to the status of their sent referrals throughout. Central systems can be specialty-specific but, ideally, should include all specialties.

Increase # of specialists: Increase the number of specialists listed in and actively using eReferral to reduce occurrence of hybrid workflows (i.e., PCP use of both fax referral and eReferrals), referrals stalled in eReferral system and declined referrals.

Load balancing: Load balancing refers to the ability to appropriately manage referrals across the system (facilitated through clear waitlist times, automatic triage and redirection, matching referrals to patient needs, etc.) which can reduce administrative load on physicians while improving care safety and access. Several strategies and mechanisms contribute to the overall load balancing ability of tools like eReferral.

Reduce hybrid workflow occurrence (network effect): This mechanism refers to how often and how many individuals use both digital and manual workflows to complete their referrals, ok thawhich may contribute to administrative burden and inconvenience. Network effect recognizes that the more individuals are using a product or workflow, the more valuable the product becomes to adopt. For eReferral, the more users (particularly specialists) that are available through the platform requesting and accepting referrals, the more valuable the product is for other users to adopt and communicate through instead of other workflows. This will reduce the occurrence of hybrid workflows over time.

EREFERRAL METRICS

Table 18: eReferral Metrics

Type of Metric	Associated Outcome	Metric Level	Metric	Suggested Data Source
Overall Metrics for eReferral	**Usage and Reach**	**Scorecard**	Number of eReferrals generated/month	OH
		Explanatory	Number of eReferrals generated per user per month	OH
			Number eReferrals generated per requested specialty per month	OH
			Number of eReferrals generated by region	OH
			Number of eReferrals generated by practice type	OH
			% of referrals that are eReferrals	OH and Living Lab

	Reduction in Admin Burden	**Scorecard**	Total hours of admin burden saved through adoption of eReferral (in comparison to fax)	OH and Living Lab
		Explanatory	Average time saved across complete referral process from generation to accepted appointment (in comparison to paper/fax process)	Living Lab
			Number of clicks to complete an eReferral (stratified by form type)	Living Lab
			Number of clicks required to complete each phase of the full eReferral process	Living Lab
	Fax Reduction	**Scorecard**	Number of faxes avoided per month from program baseline	OH and Living Lab
		Explanatory	Avg number of faxes generated for a single referral (stratified by specialty)	Living Lab
	Provider Experience/ Value	**Scorecard**	Net Promotor Score (NPS) by PCP	OH (via survey) and Living Lab
Value-add Strategies and Interventions	**Standardized Forms**	**Scorecard**	Number of standardized eReferral forms implemented	OH
		Explanatory	% of standardized forms started	OH
			% of standardized forms completed (stratified by specialties)	OH
			Average number of required fields per standardized form	OH
			PCP experience with standardized forms using NPS	OH and Living Lab
	Central Intake (CI)	**Scorecard**	Number of eReferrals generated through the CI (stratified by speciality)	OH
		Explanatory	Avg time from generated to accepted referral (T1)	OH
			% of physicians with wait times listed	OH
			% of total referrals across the province conducted through central waitlist	OH and Living Lab
			PCP experience with CI using NPS	OH (via survey) and Living Lab
			Patient experience with CI	OH (via survey) and Living Lab
	Increase Number of Specialists	**Scorecard**	Number of specialty physicians on eReferral (stratified by region)	OH
		Explanatory	Number of hospitals onboarded	OH
	EMR Integration	**Scorecard**	Number of EMRs with medium to high integration with eReferral tools	OH and Living Lab
		Explanatory	Establish definitions of levels of integration	Living lab
			Level of integration for each EMR product (stratified by AI scribe product)	Living lab
			Provider experience with EMR Integrations using NPS	OH and Living Lab

	User Centered Interface Design	**Scorecard**	Provider experience with usability using NPS	OH (via survey) and Living Lab
		Explanatory	Number of high importance usability features (identified via living lab) implemented for eReferral tools	OH and Living Lab