USER PERCEPTIONS AND SATISFACTION OF A CUSTOMIZABLE EMR HOMEPAGE

THE IMPACT OF A CUSTOMIZABLE HOMEPAGE IN AN ELECTRONIC MEDICAL RECORD ON USER PERCEPTIONS AND SATISFACTION: A MIXED METHODS APPROACH.

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TITLE: The impact of a customizable Homepage in an electronic medical record on user perceptions and satisfaction: A mixed methods approach.

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Lay Abstract

Due to stressful work conditions, primary care doctors and clinic staff often face burnout. To help, a new feature called the Homepage was added to the TELUS Collaborative Health Record, a digital tool that clinics use to manage patient information. This Homepage allows users to customize and personalize their work interface, making it easier and more efficient to use. The study looked at how doctors and staff felt about this new feature and how satisfied they were with it. Feedback was mostly positive, with users appreciating the improvements and suggesting ways to customize the Homepage and make it even more helpful. These insights will help improve the Homepage and make it a better tool for reducing stress and improving the daily work experience for healthcare providers.

Abstract

BACKGROUND: Healthcare provider burnout is a concern in primary care, necessitating innovative solutions to improve user experience and reduce work-related stress. A novel Homepage feature has been introduced in the TELUS Collaborative Health Record (CHR), an electronic medical record (EMR) solution. The Homepage is tailored to offer existing CHR clients a more customizable and personalized experience. It includes information not typically seen in EMRs, creating a more user-friendly platform for their daily work.

PURPOSE: This study evaluates the initial user perceptions and end-user satisfaction of the CHR Homepage.

METHODS: TELUS CHR clients who are family physicians and administrative staff working in primary care clinics took part in qualitative semi-structured interviews before the full release of the Homepage (n = 13), and these and other CHR users were asked to complete a mixed-methods cross-sectional survey four weeks after the Homepage launch (n = 12). Data analysis involved thematic analysis of interview texts and questionnaire responses, along with statistical analysis of quantitative data using non-parametric tests.

RESULTS: The analysis of interviews and surveys revealed that users perceived the Homepage positively, and most were "moderately satisfied." However, users suggested further improvements, such as providing more actionable information, expanding customization options, and addressing specific user needs.

CONCLUSIONS: The study provided valuable insights into the user experience of the CHR Homepage, informing quality improvements and refinements for future CHR Homepage releases. The findings can inform EMR solution developers when conducting user testing of EMRs by considering customizable features that primary care users desire to enhance their experiences. Understanding user perceptions and incorporating user feedback can help developers address user concerns and improve user satisfaction, ultimately enhancing user experiences in primary care settings.

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- TELUS Health provided funding for participant honoraria during participant recruitment
- TELUS Health employed Puneet Seth (PS) and Sukhman Tamber (ST) during a portion of the study.
- TELUS Health no longer employs PS as of August 2023, who has no financial affiliation with the organization.
- ST completed an 8-month internship at TELUS Health from May 1st, 2023, to December 31st, 2023. She continued to work part-time until July 31st, 2024, while pursuing her studies.

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List of Acronyms and Abbreviations

Admin(s) – Administrative staff member(s) of a healthcare clinic.

CHR – Collaborative Health Record

EDT - Expectation Confirmation Theory

EHR – Electronic Health Record

EMR – Electronic Medical Record

P1, P2, … – Interview Participant 1, Interview Participant 2, etc.

R1, R2, … – Survey Respondent 1, Survey Respondent 2, etc.

TA – Thematic Analysis

TAM – Technology Acceptance Model

TPI - Trainee Principal Investigator

Declaration of Academic Achievement

The following is a declaration that the work presented in this thesis was completed by Sukhman Kaur Tamber. Guidance at all stages of the research (study design, data collection, data analysis) conducted for this thesis was provided by Dr. Puneet Seth, Dr. Cynthia Lokker, and Dr. Teresa Chan. Sukhman Kaur Tamber was responsible for writing this manuscript. Dr. Puneet Seth, Dr. Cynthia Lokker, and Dr. Teresa Chan contributed to manuscript review and revision.

1 Introduction & Background

1.1 The Alarming Link Between Electronic Medical Records and Burnout

Occupational burnout is a persistent problem among healthcare workers, including those in primary care (Gerteis et al., 2023; De Hert, 2020; Li et al., 2022; Monsalve-Reyes et al., 2018). In 2023, the Ontario Medical Association (OMA) reported a crisis in primary care, highlighting record levels of burnout among family doctors. Family doctors spend an average of 19.1 hours per week on documentation and administrative tasks (OMA, 2023). The 2022 Commonwealth Fund International Health Policy Survey, conducted across ten high-income countries, revealed that most primary care physicians have experienced increased workloads and burnout since the pandemic began (Gunja et al., 2022).

Previous research has linked burnout to electronic medical record (EMR) use (Arndt et al., 2017; Asgari et al., 2024; Babbott et al., 2013; Li et al., 2022; Lo et al., 2020; Schwappach & Ratwani, 2023; Shanafelt et al., 2016). However, before understanding this relationship further, it is essential for us to take a step back and understand what EMRs are. EMRs are an electronic record of a patient's medical information stored on a computer (National Cancer Institute, n.d.). According to Honavar (2020), there are a few expectations about what EMRs are from a patient and organizational perspective and what users who directly interact with EMRs expect. Electronic medical records (EMRs) should enhance patient care by ensuring accuracy, aiding clinical decision-making, and improving information accessibility. From an

operational perspective, EMRs should provide vital healthcare statistics for service planning and management. EMR users expect detailed patient documentation, standardized templates and order sets, disease coding, regulatory compliance, prevention of medication errors, optimized workflows, and efficient data compilation for analysis and research (Honavar, 2020). Given how much healthcare professionals rely on EMR systems to support patient care and better patient outcomes, we must understand why they contribute to burnout.

Exploring the issue of EMR usage and burnout, three central themes were found in the literature: 1) technical and design-related concerns, 2) administrative and workflow burden, and 3) impact on personal and professional well-being. With respect to technical and design-related concerns, the biggest challenge includes poor usability and functionality issues. Poor usability and functionality refer to interface complexity, navigation challenges, and overall system design flaws that make EMRs difficult to use (Arndt et al., Asgari et al., 2024; Li et al., 2022; Lo et al., 2020; Schwappach & Ratwani, 2023). In terms of the second theme, it looks at how the additional time and effort required for documentation and other non-clinical tasks leads to increased administrative and workflow burden (Asgari et al., 2024; Babbott et al., 2014; Li et al., 2022; Lo et al., 2020; Schwappach & Ratwani, 2023; Shanafelt et al., 2016). Finally, the third theme, which focuses on the impact on personal and professional well-being, demonstrates that EMR usage outside of work hours has a negative effect on personal time and well-being (Arndt et al., 2017; Asgari et al., 2024; Babbott et al., 2013; Li et al., 2022; Lo et al., 2020; Schwappach & Ratwani, 2023; Shanafelt et al., 2016). On a professional level,

perceived deficiencies in support from healthcare organizations, such as inadequate training, technical assistance, and involvement in decision-making processes, can worsen the stress associated with EMR use (Babbott et al., 2014; Li et al., 2022; Schwappach,& Ratwani, 2023).

However, despite the extensive research linking EMR usage to burnout, there is a need for more targeted interventions (DeChant et al., 2019; Li et al., 2022; Lo et al., 2020). Interventions can focus on addressing one or more of the identified themes, such as improving EMR design, reducing administrative burdens, or enhancing the overall work environment. Kang and Sarkar (2024) conducted a systematic review looking at what interventions have been used to reduce EMR-related burnout. These include EMR modifications, the use of scribes, training, and a combination of training and modifications (Kang & Sarkar, 2024).

This study aims to address the technical and design-related aspects by introducing a Homepage feature in an existing EMR system. The feature seeks to enhance user experience by providing a more intuitive and user-friendly entry point into the EMR platform. By focusing on improving workflow efficiency and user satisfaction, we explore whether this specific EMR modification can reduce burnout among healthcare providers. The core ideas behind the Homepage were how clinical and administrative users could be presented with a more user-friendly entry into the medical record platform and an overall desire to improve user satisfaction/perceptions of the system.

1.2 Understanding the Homepage Concept

The term "Homepage" was initially coined by Tim Berners-Lee, the inventor of the World Wide Web, in 1990 (Hoffmann, 1990). He created the first Homepage for the World Wide Web project at CERN, which described the basic features and principles of the web (Hoffmann, 1990). Homepages evolved from simple text-based documents to more complex and interactive web pages that incorporate multimedia elements, such as images, videos, animations, and audio (Nielsen & Tahir, 2001). With time, Homepages also became more personalized and customized to suit the preferences and needs of different users and contexts (Tidal, 2013).

A Homepage is the main or introductory page of a website or web-based application that typically serves as a table of contents, a summary of the site's purpose and content, and a guide for navigation (Nielsen & Tahir, 2002). Homepages are essential for attracting and retaining users and conveying the site's credibility, usability, and relevance (Liu et al., 2016; Tidal, 2013). Homepage design, layout, functionality, and content can vary depending on the type, purpose, and audience of the website (Nielsen & Tahir, 2002). They are often the first impression users have of a web-based application and, therefore, play a crucial role in influencing users' satisfaction, engagement, trust, and loyalty (Liu et al., 2016; Tidal, 2013). A Homepage needs to balance aesthetic appeal, functionality, usability, and relevance to meet users' expectations and goals (Liu et al., 2016; Agarwal & Chatterjee, 2018). Some of the constraints and challenges that Homepages are subjected to include limited screen space, diverse user preferences and

behaviours, changing user needs and expectations, and dynamic web environments (Agarwal & Chatterjee, 2018; Lazar & Greenidge, 2009).

In healthcare digital solutions, a Homepage can ground users, be a starting point, a launch pad to other areas in the system, and be the initial guide for their interactions. The relevance of a Homepage in an EMR lies in its potential to serve as a user-centric, customizable, and personalized entry point, aligning the EMR system with its users' specific preferences, tasks, and objectives. By introducing this EMR modification, we aim to create a more engaging and supportive environment for healthcare providers, potentially mitigating burnout and enhancing their overall experience.

1.3 What is the CHR Homepage?

The Collaborative Health Record (CHR) is a modern cloud-based EMR and patient engagement solution that allows clinicians, patients, and clinic staff to collaborate, communicate, and manage the delivery of care (TELUS Health, n.d.-a). TELUS Health, a division of the TELUS Corporation, is a for-profit company and a global provider of health and well-being services and products encompassing physical, mental, and financial health. Their services include preventive health assessments, virtual care solutions, nutrition coaching, fitness programs, mental health support, lifestyle management, group health benefits solutions for insurers, consulting services, employee wellbeing training, and eClaims. Additionally, for healthcare practitioners, TELUS Health offers several different EMR solutions, including the CHR.

In March 2024, TELUS Health launched a new feature in the CHR - a customizable Homepage. The TELUS Health Product Team designed the Homepage with the goals of creating a customizable and personalized entry point into the CHR platform that provides users with a lighter start to their day, enhances their connection with their clinic, provides an overview of their shift, presents key metrics, and delivers the latest clinic and industry updates. By achieving these goals, the Homepage aims to create a more engaging user experience, ultimately contributing to reduced healthcare provider burnout and improved patient care.

The Homepage, in the context of the CHR, refers to the initial landing page that practitioners and staff see upon logging in. In the mock-ups of the CHR Homepage in *Figures 1* and *2*, at the top, a header displays the clinic name, date and time, clinic address, and phone and fax numbers. Below this header, users see their name, a greeting message (good morning/afternoon/night), and a mini weather icon showing the current temperature. The main section of the Homepage consists of customizable widgets. A widget is an element of a graphical user interface that displays information or provides a specific way to interact with a system or application (Kirvan, 2022). These widgets include the Today's Overview, Bulletin Board, Referrals, Shortcuts, Your Stats, Inventory, Photo, and Public Health Feed. In the top right corner, a cog/gear icon lets users customize which widgets are displayed. All widgets are shown by default but can be added or removed as needed. The Homepage has two versions: the Staff view and the Practitioner view. The difference between the Staff and Practitioner views is that the Practitioner view does not contain the Inventory widget. There are also some differences

in the content of the Today's Overview, Shortcuts, and Your Stats widgets. The remaining Bulletin Board Referrals, Photo, and Public Health Feed widgets are the same in both views. Detailed descriptions of the widgets and the key differences can be viewed in *Table 1.*

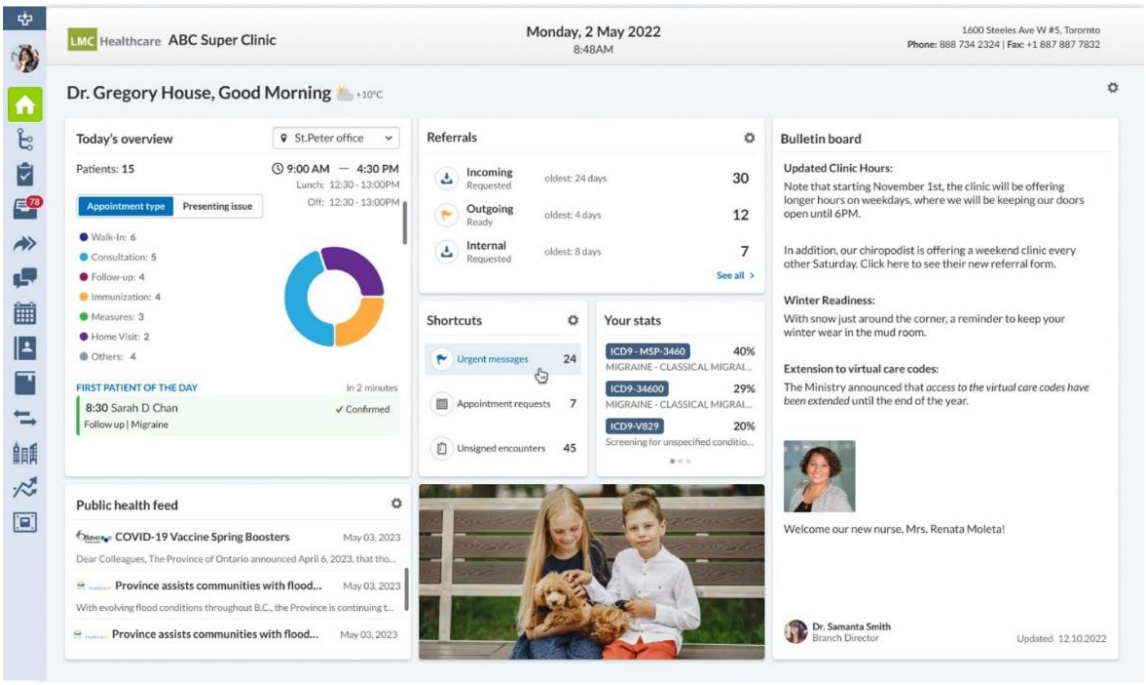

Figure 1. Practitioner View of CHR Homepage

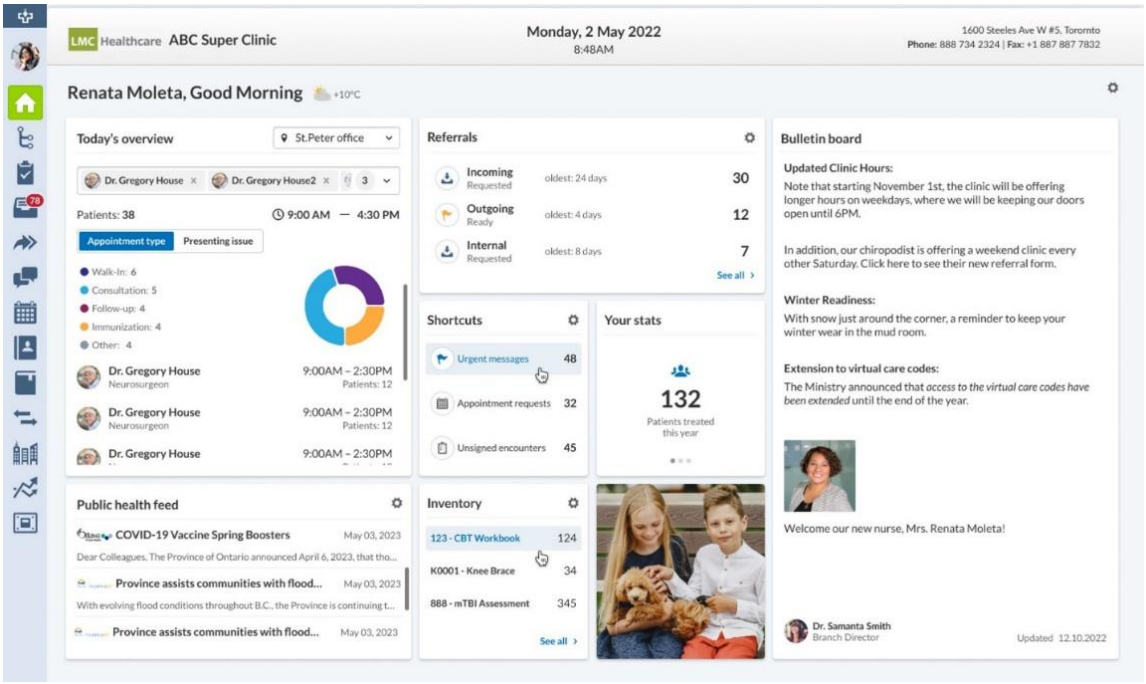

Figure 2. Staff View of CHR Homepage.

Table 1. *Widgets in Both Staff and Practitioner Views*

Widget Name	Description	practitioner	staff
Bulletin Board	○ Specific authorized users with the correct permissions can click on the cog icon to edit the content, including text, pictures, and hyperlinks. ○ It serves to keep all users in the clinic connected in a physical or remote environment, similar to how some clinics may have a bulletin board in their offices.	x	x
Referrals	○ Provides an overview of Incoming, Internal, and Outgoing Referrals. It displays their statuses, the age of the oldest referral, and the total number of referrals in each category. ○ Clicking on "Incoming," "Internal," or “Outgoing” will take the user to the referrals tab with that specific filter applied. ○ If a clinic has more than three referral lists, the displayed list can be personalized by clicking the cog icon in the widget. Referral lists can be added or removed by clicking on the cog icon. ○ At the time of the interview, the widget only accommodates a maximum of three referral lists.	x	x
Photo	○ The CHR Homepage can be personalized by uploading any picture of the user’s choice. ○ Clicking on the widget will redirect users to Files on their devices. Then, they browse and select the picture they want to upload. The selected picture will then be displayed in the widget.	x	x
Public Health Feed	○ Displays public health feeds covering various topics, such as drug recalls, health updates, COVID updates, and more. They are available both by province and all of Canada. ○ Users can customize which RSS feeds to include on the Homepage by clicking on the cog icon within the widget.	x	x

	○ Initially, all RSS feeds are enabled by default, but specific feeds can be turned on or off according to user preferences.		
Today's Overview	○ Displays the total number of patients for the day. ○ Users can view working hours and scheduled breaks. ○ If users work in multiple locations (that also use the CHR), they can choose the specific office or location by selecting a drop-down menu near the top of the widget. ○ Viewing provider information: • The widget's search bar allows Staff users to search for providers working in the clinic. Information can be viewed for a single provider or multiple providers. Providers can be added or removed as needed, and the widget updates the information as they are added or removed. • Users will find details about each provider, such as the total number of patients they will see that day, their working hours, and their job title, next to their name. • If no providers are selected, the default display shows the total number of appointment types and patient issues for all patients booked in the office that day. ○ Users can also switch between viewing **appointment types** and **presenting issues** for the selected provider(s). • In the **appointment type** view, a pie chart shows a breakdown of the types of appointments (for example, six walk-ins, five consults, four follow-ups). • In the **presenting issues** view, a pie chart shows the reasons for a patient visit. (For example, headache, fatigue, heart disease, etc.).		x
Today's Overview	○ Displays the total number of patients for the day. ○ Users can view their working hours and scheduled breaks. ○ If users work in multiple locations (that also use the CHR), they can choose the specific office or location by selecting a drop-down menu near the top of the widget.	x	

	○ Users can switch between viewing **appointment types** and **presenting issues**. • In the **appointment type** view, a pie chart shows the breakdown of appointment types (e.g., six walk-ins, five consults, and four follow-ups). • In the **presenting issues** view, a pie chart shows the reasons for patient visits. (For example., headache, fatigue, heart disease, etc.) ○ Users can access details about the first patient of the day, including their name, appointment time, confirmation status, and more. • Clicking on the first patient takes the Practitioner user to the first patient's encounter note.		
Shortcuts	○ Allows users to select two quick deep links within the CHR for easy access. ○ In the first iteration of the Homepage, the two default shortcuts are **urgent messages** and **appointment requests**. As the system evolves, in future Homepage launches, users are expected to have more options and the ability to customize what they see. ○ The **urgent messages** shortcut directs users to their inbox, specifically filtering for urgent messages. ○ The **appointment requests** shortcut leads users to the calendar section of the CHR, displaying all pending appointment requests that need confirmation.		x
Shortcuts	○ Allows users to select three quick deep links within the CHR system for easy access. ○ In the first iteration of the Homepage, the three default shortcuts are **unsigned encounters**, **urgent messages**, and **appointment requests**. As the system evolves, in future Homepage launches, users are expected to have more options and the ability to customize what they see. ○ In the **unsigned encounters** shortcut, clicking the icon takes the Practitioner user to the unsigned encounters section of the CHR, where	x	

	you can review, add notes, documentation and letters, and ultimately sign off on the encounter. o The **urgent messages** shortcut directs users to their inbox, specifically filtering for urgent messages. o The **appointment requests** shortcut leads users to the calendar section of the CHR, displaying all pending appointment requests that require confirmation.		
Your Stats	This widget provides "nice-to-see statistics." Here, users can track: o The number of patients seen this week/month/year by the user. o The total number of faxes a Staff user has sent (this week/this month/this year). o The count of patients a Staff user has checked in (this week / this month / this year).		x
Your Stats	This widget provides "nice-to-see statistics." Some examples of what Practitioner users can view include: o Top 3 diagnostic codes (as a %, over last 30 days) o The total number of patients you've treated this year. o The total number of Qnaires (questionnaires) completed by patients.	x	
Inventory	o Provides a snapshot of the three most important products to track their stock availability. The widget can display a maximum of three items. o A user can select a specific item for more details or click "See all" to access the complete inventory page (where it redirects to Settings > Products page in the CHR). o Users can customize which items they can see by selecting the cog or gear icon displayed in the widget.		x
*The “User Type” column indicates whether the widget is available in either Staff or Practitioner views. In some instances, widgets are available in both views but may display different information depending on the user's role.			

Literature in web design and user experience highlights the importance of Homepage aesthetics and relevance to improve user satisfaction (Liu et al., 2016). By focusing on this one area of the CHR, the aim is to see if any meaningful improvements or changes could be made to overall perceptions and experiences of feeling "burnt-out." The current study seeks to understand if changes to the Homepage will affect administrative staff and clinician satisfaction with their work, if the Homepage is successful in making the CHR more user-friendly and accessible, and by doing so, if it could ultimately help reduce stress. While the primary focus will be on the TELUS CHR, we may learn some insights about customizable Homepages and user experience, which may be applicable to other EMR solutions.

A significant point to note is that the CHR Homepage is *not* a dashboard. A significant body of literature discusses clinical dashboards in EMRs, so we felt it is worth differentiating the two. To reiterate, for this study's purposes, a Homepage is the entry point or main landing page for a website, software platform, or information system. Dashboards collect, assess, and display information regarding performance indicators (Helminski et al., 2022). The goal is for dashboards to enable users to efficiently visualize relevant data for making informed decisions and enhancing clinical and/or organizational effectiveness (Helminski et al., 2022). While the CHR Homepage contains a few statistics that visualize data, it is not its sole purpose. The CHR already has an analytics dashboard feature that predates the Homepage (TELUS Health, n.d.-b).

1.4 Literature Review

To explore the literature on homepages in EMRs, several databases were searched on November 9, 2023. We especially wanted to explore how EMR systems support entry into their platforms from the perspective of user design and usability. When conducting an initial literature search on the topic, the following terms were used for the "homepage" concept: homepage, home page, home screen, landing page, main page, entry point, entry page, front page, start page, start screen, welcome page, welcome screen, index page, portal page, root page, initial page, initial screen, opening page, and opening screen. Additionally, to further refine the search, user design and usability terms were included: design, software design, design thinking, design research, product design, usability, user-centred design, usability testing, UX, user experience, interface, and user design. The "homepage" and "design" search terms were used in combination with "electronic medical records" and "electronic health records." Databases used in the search are PubMed, Web of Science, ACM Digital Library, Embase/OVID, ProQuest, Prospero, and EBSCOhost. Out of 1697 results, there were 188 duplicates and 1568 articles to screen. Following the initial title and abstract screening, 226 articles were included in the full-text screening. Articles were included in the full-text screening if they referred to terms such as EMR/EHR usability, design, development, interfaces, evaluation, deployment, implementation, or creation in the title or abstract. Only seven articles were deemed relevant and included in the final literature analysis after the full-text screening. Among these seven articles, there were mentions of a home page, home screen, home menu, main screen, overview interface tool, first screen, or first page.

Based on the literature search, there is limited relevant peer-reviewed academic research on the topic of Homepages within EMR solutions, and this is a relatively unexplored theme. In articles where the concept of a Homepage is mentioned, it is typically focused on a single specific purpose, such as serving as a data collection tool (Otokiti et al., 2021), an EMR menu screen or a launch pad to other areas in the EMR (Mutiara et al., 2012), clinical overview (Jensen & Bossen, 2016; Malaviya & Gogia, 2010; Xie et al., 2016) or dashboard.(Soejima et al., 2021; Tweya et al., 2016). In other words, Homepages are solely "functional" in that they are designed for a specific activity or task in mind. Additionally, in two of the articles, the layout of the Homepage was not described in detail (Jensen & Bossen, 2016; Otokiti et al., 2021). The overall sense was given that the full value and advantage of the home page space is not being fully utilized as it pertains to EMR design. The bulk of the articles reported on systems used in hospital care settings (Jensen & Bossen, 2016; Mutiara et al., 2012; Otokiti et al., 2021; Soejima et al., 2021; Xie et al., 2016) and specialty care (Malaviya & Gogia, 2010; Tweya et al., 2016) versus outpatient primary care.

Table 2. *Literature Review Analysis*

Author(year)	Healthcare Setting	Country	Article Description/Context	How is the Homepage used or described?
Soejima et al. (2021)	Hospital	Japan	• In the EMR used at Saiseikai Kumamoto Hospital, a visualization tool is incorporated on a home page or home screen. • The tool displays graphs that compare each patient to similar cases.	• The home screen displays four diagrams representing various data points related to hospital stays, costs, assessments, and variances from the norm within the EMR system. • It appears that this "Homepage" is intended to be used like a clinical dashboard.
Otokiti et al. (2021)	Hospital	United States	• Researchers at Mount Sinai Hospital collected input from hospital clinicians to improve the user-centered design of their EMR, Epic Systems.	• The home page was used to collect data from a built-in form embedded in the Homepage via a link. • The article only references the home page as a data collection tool. • Does not detail what else is available on the home page.
Mutiara et al. (2012)	Hospital	Indonesia	• The authors discuss creating an electronic website for medical records using OpenEHR specifications. • EHR designed to support the Healthy Indonesia 2015 vision.	• The authors describe including a home menu, which is visible to all users upon logging in and from where users can see other menus such as the dashboard, users, patients, referral letters, medical support, transactions, reference, user guide, FAQ and logout. • The Homepage is a launch pad for other areas of the EMR website.
Jensen & Bossen (2016)	Hospital	Denmark	• Discuss the challenges associated with generating	• While the authors do not mention a "Homepage," they use an overview

Author(year)	Healthcare Setting	Country	Article Description/Context	How is the Homepage used or described?
			comprehensive clinical summaries in EMRs and gathering data from various sources in the EMR to display it all on a single screen. • The purpose of developing a summary interface tool was to visualize patient information and present it in a way that allows users to understand the volume and scope of available data, how the data points are related, and any missing data.	interface tool resembling some CHR Homepage widgets, such as Today's Overview and Your Stats.
Malaviya & Gogia (2010)	Specialty care (rheumatology)	India	• Describes a face-sheet tab, which is the first screen that appears on a rheumatology-specific EMR application.	• On the face-sheet tab, users can search for patients, create new patient records, view their demographics, view diagnoses and specifications using ICD-10 coding, and view disease status from disease activity score (DAS) tables – all on a single screen.
Xie et al. (2016)	Hospital	China	• They collected and analyzed inpatient medical record home page data for 1496 specialties of Traditional Chinese Medicine. • The data acquired in their analysis includes information on the institution and patients,	• While it is unclear if all the data collected appeared on a single screen upon entry into the medical record platform, the authors describe how the first page of the EMR contains the original data of different kinds of medical statistics.

Author(year)	Healthcare Setting	Country	Article Description/Context	How is the Homepage used or described?
			hospital admission and discharge, diagnostic and surgical information, doctor's notes, and expenses.	
Tweya et al. (2016)	Specialty care (HIV-infected and tuberculosis (TB) patients)	Malawi	• The article describes the development of an EMR system for TB/HIV co-infected patients.	• The first page of this system is a dashboard that shows basic patient information, the next scheduled clinic appointment, and tabs for overview, current visit, past visit, and printouts/other.

Jensen and Bossen (2016) found that 65% of hospital departments did not use the overview interface tool. A possible reason for this lack of use was the absence of passionate and dedicated employees to configure the overview at the departmental level. Even in departments that did use the interface, it was only part of a broader information-seeking strategy. Additionally, physicians handling complex or long-term patient cases found the tool difficult to use. These issues discussed in the Jensen & Bossen (2016) article are also relevant to the CHR Homepage and will be discussed further in this paper.

1.5 Objectives

By examining existing literature on Homepage design and deploying a pilot rollout with user feedback collection, the study seeks to:

1. To evaluate the user perceptions and satisfaction with the Homepage design. More specifically, ***what are the user perceptions and satisfaction with the Homepage design of an EMR solution among clinical and administrative users in primary care settings in Canada?***
2. Relay insights from the interview and questionnaire with the TELUS CHR Product Team to enhance future iterations of the Homepage.

For this study's purposes, user perception refers to the ***initial*** attitudes, beliefs, and expectations that individuals hold before using the new feature. User perception is affected by both user needs and values and involves how users interpret and make sense of their interactions with products beyond just their functional aspects (Nurkka et al., 2008). It encompasses the meanings, values, emotions, and experiences users attach to

products, which users may not always easily articulate (Nurkka et al., 2008). Before engaging with the product or feature, users may form preconceived notions about its functionality, usability, and potential benefits based on prior knowledge or marketing information (Nurkka et al., 2008). User perception plays a crucial role in shaping the user's initial mindset and emotional response towards the product, ultimately impacting their overall experience and satisfaction.

In this study, user satisfaction pertains to the research participant's ***post-use evaluation*** of a product or feature based on the extent to which it meets or fails to meet their initial expectations (Zviran & Erlich, 2003). It is defined in the context of "success" with the product, as users assess whether their specific needs, expectations, and preferences were fulfilled during their interaction (Bano et al., 2017). User satisfaction can be influenced by various factors such as user involvement in system development, perceived usefulness, overall user experience, organizational support, user attitude toward the system, top management support, user expectations, user skills, and ease of use (Mahmood et al., 2000).

Other terms that may be necessary to differentiate include user experience and usability. User experience, or UX, is a person's attitudes, behaviours, emotions, and interactions while using a particular feature (Law et al., 2009). It encompasses an individual's entire experience with a product or service. It includes their feelings when interacting with the product, understanding how it works, and whether it fulfills their goals/needs/expectations in any context of use (Hassan & Galal-Edeen, 2017). Additionally, user experience considers user characteristics, internal states, cultural

differences, product characteristics, brand image, advertisements, and previous experiences (Hassan & Galal-Edeen, 2017). The relationship between usability and user experience is intertwined within the broader concept of user experience, where usability focuses on the ease and effectiveness of using a product and is considered a crucial component of user experience (Hassan & Galal-Edeen, 2017). Usability also refers to the extent to which specified users can use a product to achieve specified goals in a specified context of use (Hassan & Galal-Edeen, 2017). Furthermore, usability frameworks may include elements such as the user, technology, task, and environment (Hassan & Galal-Edeen, 2017).

2 Methods

The study had two phases. Initially, one-on-one interviews of clinical and administrative staff in primary care assessed their perceptions of the "homepage" concept and their initial impressions of a Homepage mock-up. A questionnaire assessed user satisfaction and how the Homepage had affected their workflows at least four weeks after the new feature was turned on. The insights we gained were shared with the CHR Product Team to enhance future iterations of the Homepage feature. A mixed methods approach was taken to capture a more holistic picture of how users viewed the Homepage feature in the initial developmental stages compared to post-launch and if any divergent or contradictory perspectives would emerge during different evaluations (Wasti et al., 2022).

2.1 Research Setting & Participants

Existing TELUS CHR clients who are family physicians and administrative staff working in primary care clinics were invited to exploratory qualitative semi-structured one-on-one interviews before the full release of the Homepage, and these and other CHR users were also asked to complete a cross-sectional survey four weeks after the Homepage launch. All participants were categorized into two user types – clinical and administrative (admin) users – depending on their role within their clinics. The eligibility criteria, along with definitions of clinical and admin users, for the participants were:

2.1.1 Inclusion Criteria:

- *Existing CHR Clients***:** The user must have been actively using the TELUS Collaborative Health Record (CHR) system for at least three months.
- *Administrative or Clinical Users:*
- *Administrative Users:* Defined as holding administrative roles (e.g. medical office assistants, receptionists, office workers, clinic managers, etc.) in a primary care clinic and accessing the CHR as "Staff" users.
- *Clinical Users:* Defined as family physicians who are actively involved in patient care in a primary care clinic and have access to the CHR as "Practitioner" users.
- *Full-time CHR User:* Should be using the CHR at least three or more days per week on average.
- *Regions*: British Columbia, Alberta, Manitoba, Ontario, New Brunswick, Prince Edward Island (provinces in Canada where the CHR is available).

2.1.2 Exclusion Criteria:

- *Beta-Testers:* As part of the development phase of the CHR, some clinics had access to the unfinished Homepage feature to test out bugs and collect feedback before the full release. It is easier to get feedback from these customers as they have participated in beta testing in the past and other CHR research initiatives. However, they will be excluded to ensure participants have not been influenced by prior exposure to the Homepage, personal preferences, technical expertise, or biases that can influence their feedback.

2.2 Phase 1: Interviews

2.2.1 Interview Guide Development

The interview guide was developed and piloted with co-investigators and TELUS Health Homepage project team members to ensure the understandability of questions and the flow of the interview structure. Research participants were asked to observe a mock-up environment that displayed the Homepage feature. The interview explored themes of initial user perceptions and attempted to understand how the deployment of this new feature would affect users working in primary care settings. A semi-structured approach to interviewing was taken, where key questions were used to guide and define areas to be explored. However, some flexibility allowed for discussing themes and topics most relevant to the participant. The complete interview guide is included in *Appendix 1.*

2.2.2 Recruitment and Data Collection Methods

The Client Service Managers (CSMs) in the Account Management Team at TELUS Health supported recruitment as they served as a point of contact with CHR clients and customers. CSMs provided the primary contact information for 24 clinics using the CHR. The trainee principal investigator (TPI), the interviewer, sent emails inviting identified users to participate in the study. The email contained a Google Calendar scheduling link, sent through a TELUS email, allowing the participant to schedule an interview time based on the availability of both the participant and the interviewer. Once the participant received a booking confirmation, the consent form was sent at least one week before the interview.

One-on-one, semi-structured interview sessions with participants were conducted during January-February 2024. Informed written consent was obtained prior to the interview. Interviews were conducted virtually over Zoom using a McMaster account and lasted approximately 60 minutes. The Zoom meeting was configured per the guidelines of Research and Innovation at McMaster University (n.d.). The Zoom meeting was recorded locally to the TPI's TELUS laptop computer. Upon completion of the interview session, clinicians received a gift card of $175 in value and admin users received $75. As an additional step, participants were offered the opportunity to follow up via email or phone post-interview if any clarifications or further comments came to mind.

2.2.3 Data Processing and Analysis

The interviews were audio-recorded, transcribed verbatim, and de-identified prior to analysis. Any identifying information was removed from the transcripts before

analysis. The recording was uploaded to Word Online to transcribe the audio to create a document with the initial transcript. The transcript was then reviewed manually to ensure clarity and to remove any identifying information. Field notes were also captured after each interview to assist with reflection and analysis. Software used for thematic coding included Microsoft Word and NVivo.

A hybrid inductive and deductive thematic approach was used for analyzing interview data and open-ended survey responses. In deductive thematic analysis, the themes or codes used in qualitative data categorization are pre-determined by either existing literature or experience. Inductive analysis involves the generation of new themes from the data without having any preconceptions (Proudfoot, 2022). Thematic analysis (TA) involves six phases: familiarization with the dataset, coding, generating initial themes, developing and reviewing themes, refining/defining/naming themes, and writing up (Braun & Clarke, 2021). TA can involve a realist or essentialist theoretical framework, which focuses on reporting the experiences, meanings and reality of participants (Braun & Clarke, 2006). Meanwhile, the constructionist method examines how events, realities, meanings, and experiences are shaped by various discourses within society (Braun & Clarke, 2006). This study chose the essentialist or realist method over a constructionist methodological framing. A combined deductive/inductive thematic approach was chosen because using both inductive and deductive analysis techniques can offer a more comprehensive understanding of the data (Proudfoot, 2023). This includes insights driven by data that prioritize participant voices as well as theories imposed on the data. Additionally, a hybrid thematic approach also fits with a realist perspective,

emphasizing the importance of understanding underlying meaning, mechanisms, and structures – which is compatible with mixed methods research (Proudfoot, 2023).

Reflexive journaling was done throughout data collection and analysis to ensure all insights and patterns in the data were captured. According to Braun & Clarke (2021), there are no strict rules on how to keep, how often, how much, or even what to record in a reflexive journal. A reflective journal is a place to store and record thoughts for later exploration, reflection, and creating meaning (Braun & Clarke, 2021). Reflexive writing occurred before the interview, immediately after the interview, throughout data analysis, and when writing. Reflective questions that were considered when journaling included daily thoughts, personal assumptions, beliefs, existing knowledge, insights learned, connection with the participant, what needed to change or challenges faced, and any other thoughts that arose throughout the qualitative process. Reflexive writing, in the form of journaling and note-taking after interviews with participants and during TA, was used to intentionally bring attention to any perspectives and assumptions that may have arisen. The discussion includes the biases and assumptions that arose in this process, and a reflexive writing sample is included in *Appendix 3*.

While there are various procedures for conducting TA, all involve developing patterns of meaning through coding (Braun & Clarke, 2021). "Big Q," or fully qualitative research, falls under reflexive research and writing, valuing the subjectivity of both participants and researchers. It encourages transparency, reflexivity, and criticality throughout the research process (Braun & Clarke, 2021; Forbes, 2024). One method to achieve this is by maintaining a reflexive journal, allowing researchers to reflect on their

assumptions and the subjective nature of coding (Braun & Clarke, 2021). Reflexive writing is a tool used to bring intention to the decisions, assumptions, contexts, power dynamics, and highlight knowledge/thinking gaps that may occur during the research process (Olmos-Vega, 2022). In Big Q methodology, when analyzing data, the researcher brings their existing knowledge to the dataset, to develop and understand patterned meaning in relation to the data. After immersing themselves in the data, researchers code to explore and parse meaning, developing and refining themes from the codes and the dataset.

Pre-determined themes for deductive TA included user perception and user satisfaction. Initial user perception and end-user satisfaction informed the types of questions asked in the interview and the follow-up questionnaire. These themes were determined based on preexisting literature on user experience, user research, and usability evaluation (Zhuang et al., 2016; General Services Administration, n.d.). Additional themes and/or sub-themes were uncovered following data collection through inductive analysis.

2.3 Phase 2: Survey

2.3.1 Survey Development

The follow-up questionnaire was a cross-sectional survey that was developed and piloted with co-investigators and TELUS Health Project Team members to ensure the understanding of the questions and the overall flow of the survey before sending it to research participants. The survey questions included a combination of multiple-choice and open-ended questions. Additionally, some of the questions were adapted from the

System and Use Assessment (SUA) survey developed by Canada Health Infoway (2015). The SUA is designed to assess user satisfaction, user adoption, use, and the information and system quality of a health information system, such as EMRs (Canada Health Infoway, 2015). From the SUA, only the questions from the first section that looked at overall user satisfaction were relevant and included in our questionnaire.

The questionnaire began by asking for identifying information and demographic-based questions, such as the participant's profession and the Canadian province/territory they worked in. Next, it included questions aimed at capturing user satisfaction once the participant had the opportunity to use the tool. On average, users took 8 minutes and 14 seconds to complete the survey, which is included in *Appendix 2*.

2.3.2 Recruitment and Data Collection Methods

The CHR Homepage was released to all TELUS clients in March 2024, and the survey was sent out in April 2024. Four weeks after the Homepage was released, interview participants were followed up with via email to complete a follow-up questionnaire. Additionally, CSMs were contacted again to identify any additional clients who might be interested in the survey but did not participate in the interview. Participants from 31 clinics were contacted to participate in the survey. Assuming that, at minimum, one family physician and one admin staff could be recruited from each clinic, the assumed total population size is 62. However, we acknowledge that the actual population size is likely to be higher as clinics can have more than one physician or admin staff working at their clinic. Unfortunately, we do not have access to those numbers, which is

why we can only assume. Assuming the minimum possible population size of 62, a confidence level of 95%, 1.96 z-score, a population proportion of 50%, and a 5% level of significance or margin of error – a sample size of 54 or more is needed. The conventional margin of error and confidence levels were used in this calculation (Kadam & Bhalerao, 2010). The population proportion is unknown, so a value of 50% or 0.5 is assumed (Webb, 2023).

Participants were sent an email containing the consent form and a link to the survey embedded in it. The survey was conducted using Microsoft Forms. Informed written consent was obtained via the survey platform at the start of the questionnaire. Upon completing the questionnaire, participants had the option to provide their email to be entered into a raffle for a chance to receive one $100 gift card.

2.3.3 Data Processing and Analysis

The survey responses were downloaded from Microsoft Forms to a secure TELUS computer, and the data were exported to a Microsoft Excel file. The data were stored in a password-protected file, reviewed/cleaned for clarity, and de-identified before analysis. Software used for data analysis of the quantitative questions in the survey included a combination of Microsoft Excel and RStudio. When analyzing the qualitative data in the survey, like in the interviews, NVIVO and Microsoft Word were used. Most of the questions in the survey included ordinal scales, where there is an order to the values in the scale, but the differences between the values may not be consistent (Hubbard & Evans, 2010). Statistical tests for ordinal data included non-parametric tests

such as the Mann-Whitney U, Wilcoxon signed rank test, the Exact Test of Goodness of Fit, and the Fisher's Exact test (Sedgwick, 2015). The remaining questions were open-ended and, therefore, qualitative. For those questions, the same analysis method was used as mentioned for the interviews.

The insights gleaned from data analysis from the interviews and questionnaire/survey responses were shared with the TELUS CHR Product Team in June 2024 to improve future iterations of the Homepage.

2.4 Consent, Ethics, and Data Management Procedures

The Hamilton Integrated Research Ethics Board (HiREB) reviewed and approved the study under project #16877. An interview transcription was completed using Word Online, and the data was stored in OneDrive, which deviated from the approved protocol. To address this issue, a protocol deviation form has been submitted to HiREB. Participants were informed about the study's purpose, procedures, financial disclosure, potential risks and benefits, reimbursement, confidentiality, participation and withdrawal procedures, access to study results, and contact information for questions. They were assured that their responses would be de-identified and their confidentiality maintained throughout the research. Participants were also informed that they could withdraw from the study at any time without consequences and without impacting the services they received from TELUS.

When contacting participants for recruitment and subsequent communications, a TELUS email was used, and a TELUS email signature was included. While not explicitly acknowledged, there was an assumed understanding between the researcher and

participants that the investigator's relationship with TELUS Health would influence the interpretation of the results. This bias could not be entirely avoided, so the most honest approach was to accept it openly. Additionally, a disclaimer regarding the TPI's position at TELUS was included at the end of each email, in the consent forms, and at the start of the survey.

After eligible participants were identified by CSMs and agreed to participate, they were assigned an alias for the remainder of the study. An encrypted document linking participant identities with their aliases was kept in an encrypted file on the TPI's secure TELUS computer. The interviews were conducted and recorded via a McMaster Zoom account. Per the guidelines by McMaster University's Research and Innovation website (n.d.), recordings were saved to a local computer rather than to the cloud-based service wherever possible. After the de-identified recording transcript was uploaded to the TPI's McMaster OneDrive account, the recording was immediately deleted from the TELUS laptop and OneDrive accounts.

De-identified interviews and questionnaire responses were transferred through secure, password-protected data transfer via TELUS Google Drive accounts, OneDrive, or encrypted USB drives. The only people with access to this information are the TPI and research team members. However, all information being analyzed was provided to the research team members in a de-identified and coded format that ensured it could not be linked back to other personal data. Lastly, the data will be kept for five years, after which the USB key will be destroyed per ethics protocol.

3 Results

3.1 Participants

The CSMs provided the primary contact information for 24 clinics utilizing the CHR as their EMR. However, only nine clinics responded. 13 individual users from nine unique clinics participated in one-on-one interviews. Of the 13 that participated, seven were administrative staff (53.85%), and six were family physicians (46.15%). Additionally, 31 clinics were contacted to participate in the survey, out of which participants from 10 clinics responded. In total, 12 individual users from 10 clinics completed the follow-up survey, with nine users being administrative staff (75%) and three users family physicians (25%).

Notably, eight of the 13 individuals who participated in the interviews (61.54%) also completed the survey. Among these dual participants, six were administrative staff (46.15%), and two were family physicians (15.38%). *Table 3* summarizes the demographic characteristics of the participants involved in the evaluation activities.

Table 3. *Demographic and professional characteristics of survey and interview participants.*

	Survey	**Interview**
N	**12***	**13**
Years of Experience Working in Role, mean	~ 12.6 years	~ 17.8 years
Minimum	1 year	1 year
Maximum	43 years	43 years
Role		
Administrative Staff	9	7
Family Physician	3	6

Province		
Alberta	2	1
British Columbia	3	2
Manitoba	3	3
Ontario	4	7
Type of Clinical Practice		
Community Health Centre	1	N/A
Comprehensive Family Medicine	N/A	1
Family Health Centre	2	N/A
Family Health Group	N/A	3
Family Health Team/My Health Team	2	7
Independent Practice	5	2
Primary Care Health Unit	2	N/A
*Eight users participated in the interviews and the survey (six administrative staff and two-family physician users).		

Table 4 provides a detailed breakdown of administrative staff into specific categories: administrative assistant, clinic/office manager, Medical Office Assistant (MOA), and medical receptionist. The initial classification of users into family physician and administrative/admin staff categories was based on pre-existing user roles in the CHR system. Staff CHR users and Practitioner CHR users have access to slightly different features, reflecting the two versions of the Homepage tailored for these distinct user types. Initially, having the two distinct user types was helpful given the pre-existing classification. However, through the participant interviews and survey, it became clear that the "admin" user category encompasses a variety of job roles with unique needs and expectations, unlike family physicians, where the role is much more consistent amongst participants within this group. In the results, an effort was made to distinguish what types of admin users made specific comments, but this did add an unexpected layer of complexity to the analysis.

Table 4. *Breakdown of Administrative Staff Users*.

Admin Role Type	Survey	Interview
Administrative Assistant	1	1
Clinic/Office Manager	6	3
Medical Office Assistant (MOA) & Medical Receptionist	1	1
Medical Office Assistant (MOA)	1	2
TOTAL	**9**	**7**

In the sections below, shorthand notation will refer to interview participants and survey respondents. Interview participants will be denoted with a 'P.' For example, P1 for Interview Participant 1, P2 for Interview Participant 2, etc. Survey respondents will be denoted with an 'R,' so R1 for Survey Respondent 1, R2 for Survey Respondent 2, and so on.

3.2 Interview

The interview was structured into three key sections: a pre-CHR Homepage walkthrough, a Homepage walkthrough, and a post-CHR Homepage walkthrough. The pre-CHR Homepage walkthrough was done to gauge initial CHR usage and perceptions and to understand users' mindsets at the outset. The Homepage walkthrough offered users a chance to see the Homepage in its entirety and to provide comments/feedback based on what they had seen. In the post-walkthrough section, users were asked questions to gather more information about their thoughts about the Homepage.

3.2.1 Pre-CHR Homepage – Establishing Expectations

In the pre-CHR Homepage walkthrough, users were asked about their past experiences with CHR and EMR use, their perceptions of the "current" CHR landing page, and their preferences for what they would like to see upon logging into the CHR. Again, in this instance, "current" refers to before the Homepage release as the Homepage was not yet available at the time of the interview.

3.2.1.1 CHR Ranking (Overall)

The interview began by asking participants to rate their experience with the CHR Homepage before the Homepage implementation. This was to establish a baseline understanding of users' perceptions of the CHR. *Table 5* includes a summary of comments by user, user type, how they ranked the CHR numerically, and the rationale behind the ranking.

Table 5. *Ranking the overall CHR experience.*

Alias	User Type	CHR Rating	Reasoning (Summarized Comments)
P1	Physician	7	Efficient and intuitive, but specific issues affecting efficiency have persisted for three years despite feedback. Superficial fixes have been implemented, but major issues remain unaddressed.
P2	Admin	8	User-friendly and easy to learn compared to other EMRs. The system has potential and has shown improvements over time. Feedback is considered and addressed, albeit slowly.
P3	Admin	6	Initially struggled with the system but has seen improvements. Office flow has improved, but small issues still significantly impact administration, leading to a moderate rating.
P4	Physician	8	Appreciates the progress from paper charts to EMRs, especially the ease of accessing information like diagnostic imaging and labs. Believes the system can

			further improve patient care and transparency. Described ongoing data entry challenges.
P5	Physician	8	Recently transitioned to CHR and is pleased with its features and responsiveness to user requests. Appreciates the flexibility and updates.
P6	Admin	7-8	Generally satisfied with the system's functionality but finds the support lacking, especially when resolving issues through the chat feature. New staff find it easy to learn, but support issues affect overall satisfaction.
P7	Admin	6	Identified features that could improve usability and speed, such as linking family members and automatic document naming. Currently, these are missing, affecting the user experience.
P8	Admin	5	Familiar with the system out of necessity but does not find the CHR to be impressive. Has learned to work with because that was what they were given.
P9	Physician	9	Finds the system aligns well with their practice, particularly enjoying the scheduler, encounter experience, and patient communication. Overall flow is smooth.
P10	Admin	7-8	Finds CHR user-friendly and intuitive. Scheduling and workflow customization are highlights, but there are occasional support issues and glitches after updates.
P11	Admin	7	Lacks the ability to easily navigate between encounter and patient file, requiring cumbersome workarounds. Compares less favorably to other EMRs like Oscar, which offer smoother workflow integration.
P12	Physician	7.5-8	Generally intuitive but still learning after several months. Transition from previous EMR (Wolf) has some formatting and title inconsistencies that need adjustment.
P13	Physician	8	Finds CHR easy to use with helpful features like secure communication and integrated video, though video often requires patient coaching. Issues with flow sheets and cumbersome form creation remain.
*The table summarizes findings from a question in which respondents were asked to rate their satisfaction with the current CHR system on a scale from 0 (not at all satisfied) to 10 (most satisfied), with 5 being neutral. Participants then explained their scores, providing feedback and experiences related to the CHR. Notably, these ratings			

and comments were given before users had seen or used the CHR Homepage. Participant comments were summarized for clarity and conciseness.

As shown in *Table 5*, prior to the implementation of the CHR Homepage, users had mixed perceptions of the overall CHR system. On the one hand, P1 and P2 praised the CHR for its efficiency, intuitiveness, user-friendliness, and ease of learning and use. P4 noted that it offered better ease of access to information than paper charts, and P10 highlighted its flexibility, allowing users to create customized workflows for tasks such as callbacks and managing internal referrals. P5 commended the CHR team for their responsiveness, while P2 saw great potential in the software.

However, several users identified notable challenges and areas for improvement. Despite providing feedback to TELUS, P1 felt that efficiency issues remained unaddressed, which slowed down the EMR. P3, an administrative user, described initial struggles with adoption but noted improvements: “We see things improving and things happening. We aren't struggling. Our flow is... doing good. As far as our office flow. Yeah, we're doing OK, but am I at a fantastic point? No.” P4 pointed out that data entry and encounter completion processes were time-consuming and noted the lack of full integration with eChart, a Manitoba system that consolidates lab, prescription, and immunization information. P11 highlighted the difficulty of navigating between encounter notes and patient files, which required opening multiple tabs, making it a time-consuming process.

Support was another area of concern. While the CHR team was generally responsive, the chat support feature was ineffective in resolving issues promptly,

particularly following updates that caused certain functionalities to break. P6 emphasized the need for more timely support to address these problems. Additionally, P12 described the flow sheets as cumbersome and noted that transitioning from other EMRs to the CHR involved a learning curve, with some documents appearing unusual due to different formatting.

Despite these issues, P6 found the scheduling feature to be smooth and mentioned that new staff in their clinic found the CHR easy to learn. P13 appreciated helpful features like secure messaging and integrated video, although the latter required some patient coaching. While the CHR system had many strengths and potential, users felt that further improvements were needed to address efficiency issues, enhance support, and improve integration to fully realize its capabilities. CHR user P2 put it succinctly when they said, “It is user friendly so it's very easy to learn compared to other EMRs that I've worked on. So it has a lot of potential. We're not there yet. That's why I give it an 8 because I know we can do so much more with it.”

3.2.1.2 Impression of the “Current” Landing Page

Next, users were asked to remember what default landing page they were directed to upon logging into the CHR. This was followed by a screen-sharing session where the interviewer showed the current default landing page, the “Patient List.” The interviewer also showed how users could change their default landing page by navigating to Settings > Personal Information > Landing Page. Alternative options for the landing page included Inbox, Outbox, Settings, Schedules, Qnaires, Referrals, and Contacts. Participants were then asked if they knew this option to change the default landing page.

The discussion then moved to users' perceptions of the current landing page and its utility. Participants were asked how they felt about the initial landing page they encountered after logging in. The results from this question can be found in *Table 6*. It summarizes each user's key preferences and impressions regarding their default landing pages.

Table 6. *User impressions of the landing page in the CHR.*

Alias	Summary of Comments	Current Landing Page
P1	• Opens patient list, calendar, and inbox daily. • Prefers Inbox as the default landing page. • Limited exploration due to a busy schedule.	Patient List
P2	• Where they go after logging in varies (Patients, Schedules, Inbox). • Thinks it's good for most roles but personally prefers Inbox or Schedules. • Believes patients would be the best default for other staff in their clinic.	Patient List
P3	• Sees the schedule as being crucial for controlling their workflow and says it is “all I care about.”	Schedule
P4	• Focus is on patient data entry. Concerned if the Homepage will contribute to more data entry. • Neutral about the current landing page.	Patient List
P5	• Prefers the schedule as the landing page. • Likes to see the day overview first.	Schedule
P6	• Uses the patient list but suggests schedule for resident doctors in clinic. • Concerned about privacy and confidentiality with the Patient List being the default landing page. • Neutral about changing the default landing page.	Patient List
P7	• Prefers messages or schedule first. • Feels the current landing page is not helpful for their tasks.	Not sure, possibly Patient List
P8	• Finds the schedule important for workflow. • Likes their set landing page and finds it beneficial	Schedule

P9	• Checks the schedule first thing in the morning and then moves to the inbox. Mentions that this workflow works best for them.	Schedule
P10	• Prefers Inbox as the default landing page. • The first thing they do after logging in is check inbox and chat messages, and this system works for them.	Inbox
P11	• Finds the schedule clear and easy to use. • Suggests other areas they might be interested in changing the default landing page to (besides scheduling) include inbox and patient list.	Unsure, but user always goes to their Schedule first
P12	• Uses patient list but opens multiple windows for CHR. • Heard from other colleagues in their clinic that the landing page is a bit "bare," but that they think it's "fine." • Neutral about changing the default landing page and doesn't see it affecting their workflow.	Patient List
P13	• Looks at their weekly and daily schedule first. • Switches between schedule and inbox for throughout the day. Goes to patient encounters right from their schedule.	Schedule
*Summary of user comments regarding their current landing page in the CHR. Includes additional user comments detailing their preferences, workflow impacts, and specific concerns. The feedback was collected prior to the participant's exposure to the Homepage.		

As shown in *Table 6* above, the landing page for users P1, P2, P4, P6, P7, and P12 is set to the CHR system's default, which is Patient List. However, once users were aware that this could be changed in the settings, P1 and P7 indicated that they would change it to their inbox or schedule. At the time of the interviews, P3, P5, P8, P9, and P13 had already set their landing page to their schedule, and P10 had set the Homepage to the inbox. When asked about their preferences, participants like P2, P4, P6, P11, and P12 exhibited neutrality or mixed preferences, indicating that their current landing page does not significantly impact their workflow, and they just head to where they need to go without much forethought. Overall, there is a notable inclination towards the Inbox and Schedule, as these two views appear to be the most relevant for most participants' workflows.

3.2.1.3 Other EMRs mentioned by users

Participants were asked about their past experiences and interactions with different EMR solutions to see if they had ever seen a Homepage-like feature elsewhere. If they had, they were asked to describe the default landing page of those systems and their feelings about it. Other EMRs mentioned by users included PS Suite, P&P Data Systems Inc., Epic, MEDITECH EHR, Omnimed, AS400, Accuro, Jonoke, TELUS Wolf EMR, Oscar, Med Access, Connect Care, Sunrise Clinical Manager (SCM), Purkinje, Nightingale on Demand, and GlobeMed.

Based on the participants' recollections during the interviews, 10 out of 13 users could not remember what the default landing page looked like in those EMRs or if they had a Homepage-like functionality. This does not necessarily mean these EMRs lack a Homepage-like feature; it simply indicates that the users could not remember. The only exceptions were P&P Data Systems Inc. and Jonoke. For P&P Data Systems Inc., P1 recalled specific details about the landing page, noting, “On the left of the login page it [gave] you 3 options. You could push calendar, you could push registration module, or you could push utilities module. And then so I would log on, hit the calendar module, go right to the calendar."

For Jonoke, one admin and one physician user from the same clinic, in separate interviews, recalled a “status screen.” According to their descriptions, the status screen was not a Homepage. However, it included features such as a drop-down menu for navigating to other areas of the EMR and information like the number of letters to complete, the number of lab results to review, the number of emails, and other

unspecified information. A physician user commented that when they transitioned from Jonoke to CHR, they felt the loss of these features and found CHR somewhat lacking in this regard,

> *"Used it [Jonoke] for [20 years] when we switched [to CHR]. It has been a while. So, I know they had a status page. […] had things like number of letters to-do, number of lab results to review, number of emails… But I am actually forgetting what all the categories were, but I do remember it because... Because it wasn't there in the CHR. So, then I thought, we lost something there."* - P9

P6, when trying to recall what the status screen for the Jonoke EMR system, said

> *"Trying to think of what our default was for there. I think it was defaulted on a page where we actually had to probably more like what you're going to say, the Homepage is going to be, because I think we had to actually click into scheduler or click into patients' kind of thing... Yeah it wasn't. There weren't icons, but I think we had like a drop-down."* - P6

3.2.1.3 What do users want to see after logging in to the CHR?

In the final question of this section, participants were asked about their preferences for what they would like to see upon logging into the CHR. The purpose of this question was to gather insights into their expectations for a landing page and to identify the functionalities they desired in a Homepage. *Table 7* below presents key elements desired in a landing page/Homepage, and the frequency and type of users requesting these features.

Table 7. *Feature preferences for CHR landing page.*

What do users want to see	Description	Number/type of users that mention this
Schedule	Nearly all users prefer to see the schedule first. It helps them prepare for the day, know which patients are coming in, and allocate resources accordingly.	7 admins, 5 physicians

Inbox	Prefer to see their inbox first as it helps them catch up on messages and tasks that need immediate attention. One admin user also mentioned monitoring multiple inboxes or messages from different team members.	4 admins, 5 physicians
Combination of Inbox and Schedule	Some went back and forth between deciding whether it was their schedule or inbox first thing. Two physician users said that they would like to have a split screen or combination of their inbox and schedule.	3 admins, 4 physicians
Tasks and Reminders	Physician users mentioned the importance of having a "to-do" list or some type of task/reminder system after logging in. This would help them prioritize their work and stay organized throughout the day. Some examples of what would be included in a “to-do” list include the number of letters to-do, the number of lab results to review, the number of emails, and other categories.	2 physicians
Billing	The desire for more billing tools that provide insights into visits that haven't been billed and other billing-related information.	1 admin, 1 physician
Analytics Information	A clinic manager preferred seeing analytics, billing analytics, and an overview of the day's activities (number of physicians in clinic today, number of patients booked). This would help them track performance metrics, patient volumes, and billing status.	1 admin
Incomplete Visits (or Pending Encounters)	A physician user compared another EMR, Wolf, with the CHR and how they missed seeing visits/encounters that they haven’t finished.	1 physician
Prenatal Charts	The same physician user who discussed pending visits from the Wolf EMR also mentioned how they missed seeing prenatal charts.	1 physician
*Outlines what features users desire on the CHR landing page, describing the specific functionalities and the number and types of users who mentioned these preferences. Key elements include the schedule, inbox, a combination of inbox and schedule, tasks and reminders, billing, analytics information, incomplete visits, and prenatal charts.		

There appears to be a clear preference for certain features to be prioritized on the default landing page of the CHR. Nearly all users, except for one out of a total of thirteen, mention that they would like to see their schedule, as it helps them prepare for the day and manage clinic operations effectively. The second most desired element includes the inbox as first thing in the morning, participants describe that they like to catch up on

inbox messages, with a total of nine users highlighting this. A notable number of users, seven in total, expressed a desire for a combination of the inbox and schedule, with two physicians suggesting a split-screen view to accommodate both.

Additionally, two physician users emphasized the importance of having a task list or reminders to help prioritize their work. One physician referenced a "to-do" screen from another EMR, Jonoke, which provided a comprehensive overview of tasks, including letters to-do, lab results to review, and emails. For the full comment regarding Jonoke, see *section 3.2.1.3.* At a clinic management level, one user preferred seeing analytics and billing information to track performance metrics and patient volumes. There is also a desire for enhanced billing tools from one admin and one physician user. Furthermore, one physician user mentioned missing features from another EMR called Wolf, such as incomplete visits and prenatal charts.

3.2.2 Homepage Walkthrough

In this section, the TPI conducted a walkthrough of the CHR Homepage. Family physicians were provided with an overview of the Practitioner view, while administrative staff users received an overview of the Staff view of the CHR Homepage. The walkthrough began with an overview of the Homepage's layout, starting with a description of features such as the Top Header and gear icon before delving into the functionality of each widget. Descriptions of the Bulletin Board, Referrals, Photo, and Public Health Feed widgets can be found in *Table 1*. Participants were asked for their impressions and feedback on each widget, which are summarized in *Tables 11, 12, 16, &*

17. The Today's Overview, Shortcuts, Your Stats, and Inventory widgets differ slightly between Staff and Practitioner users. Descriptions of these widgets are provided in *Table 1*. Participants' impressions and feedback are summarized in *Tables 10 & 13-15*.

3.2.2.1 Top Header

The Top Header of the Homepage displays the clinic name, date and time, clinic address, phone and fax numbers, a greeting message based on the time of day, and the current temperature. Participants were asked for their impressions and feedback, which is summarized below in *Table 9.*

Table 8. *Perceptions and feedback on the Homepage Top Header.*

Observation	Description	Participant Quotes
Weather Information - Negative Feedback	Found the weather information redundant as they can easily access it elsewhere.	When asked if they would like to see on the Homepage, P1 replied, "Not really, no. I know it's morning and I know what the weather is when I drive in. And plus, my Windows desktop at the bottom right, it tells me what the weather is"
Weather Information - Positive Feedback	Some appreciate having the weather displayed for convenience.	"Yeah… I think that looks good. I'm always checking the weather" - P9
Clinic Details (Name, Address, Phone Number, Fax Number) - Positive	Some users see value in having quick access to these details, especially for new or remote staff or those who may need to refer to them frequently.	"I think especially for new staff and we've just like hired 3 new staff in the last month and half. Is that just even have the phone number and the fax number there is good . And even just older, like other stuff, all of a sudden you just have that memory blank of, like, what's your fax number again? And if that would be right there for you. So no,

		I think that's a good idea, yeah." - P6
Clinic Details (Name, Address, Phone Number, Fax Number) - Neutral	Users who work from a single clinic and are familiar with the clinic's details find this information redundant. However, also mention that if working at multiple clinics where they are not always familiar with these details, do see the value in it.	"I know where I work, and I know my phone number. It doesn't need to be there, right? […] I would wonder if it's for a clinic where doctors are either - it's either like a large mega clinic where there's multiple practitioners. Or, it's one of those clinics where, like a walk-in clinic, where people come in and out. […] I could see [it] being useful for that kind of a clinic. But for a private family clinic or a small two or three person practice where you know where you are and you have your phone number memorized? It's not as much value." -P1
Clinic Details (Name, Address, Phone Number, Fax Number) - Negative	A single user found the top header to be completely unnecessary.	"Yeah, I think it's redundant to have the name of our location and our address and our phone number, our fax number. We're all well aware, so it's probably just taking up valuable space for something else that it's not necessary." – P10
Date and Time (Neutral/ Negative)	A few had mixed feelings towards the date and time as it is already displayed on their computers or have a smartwatch.	When asked if they find date and time information useful, "I can't say yes and I can't say no. You know, because like most of the time, I know the date. I know the time, I have my Apple Watch"-P11
Date and Time (Positive)	Two administrative staff appreciate having this information readily available.	"I think the date is great." -P3 "I like it. Yeah. That's good to have, right? Just like I mean that way our fax number is really visible for any staff that need to pass it on, but just even the date and the time because sometimes our computer's time is not accurate so… So that that's our IT issue." -P6
Suggestion: Customizability	Suggestion to make the Top Header optional or	"Make the top header an option. Uh, it looks good. I mean, is it

and Option to Hide	customizable. Consider saving space on the Homepage and making more room for widgets by moving certain elements within the header or by removing it entirely.	really needed? No, but I mean. It looks good." -P2
*Summarizes participant feedback on various elements of the CHR Homepage Top Header, including weather information, clinic details, date and time display. Additionally, it includes user suggestions for customizability and captures positive/neutral/negative perceptions from different user types.		

The feedback on the CHR Homepage's Top Header revealed a range of opinions among users. Regarding the weather information, one physician found it redundant as it could be easily accessed elsewhere, whereas three physicians and three administrative staff appreciated its convenience and seeing it on a Homepage. The clinic details portion of the Top Header, which includes information such as the name, address, phone number, and fax number, received both positive and negative feedback. Two physicians and two administrative staff liked the quick access to clinic contact information, especially for new or remote staff. On the other hand, two admins and one physician user thought it was redundant, especially for those working in a single location, but acknowledged how it could be useful to other healthcare organizations with multiple clinic locations. The date and time information display was considered to be completely redundant by two physicians and one admin, as this information is already available on their personal devices. Conversely, two admins appreciated having this information readily available as one admin noted that their clinic computers have the wrong time set due to an ongoing IT issue. Among users with negative perceptions of the Top Header, there was a suggestion

from one physician and one admin to make the Top Header optional or customizable to save space for widgets.

3.2.2.2 Gear Icon

A gear (or cog) icon on the Homepage is prominently located in the top right corner of the screen, just below the top header. This icon serves as a customization tool for users, allowing them to select which widgets they want to display on their Homepage. By default, all available widgets are shown, as seen in *Figures 1* and *2* above. Users can hide specific widgets, and when they do, the remaining widgets automatically resize to occupy the available space. The widgets also vary in size to accommodate the resizing.

During the interviews, feedback on the gear icon was limited, with only one participant, P3, a clinic manager, commenting on it. Initially, the participant had difficulty locating the icon due to its size. However, after it was pointed out, the participant remarked, "No, no, I totally see it now. Actually, seeing it, I got it. It's cute. I like that." The comment indicates that once the icon's location was made clear, the participant had a positive reaction towards it.

3.2.2.3 Today's Overview

Table 9. *Perceptions and feedback on the Today's Overview widget.*

Observation	Description	Participant Quotes
Display Available Appointments	There is a preference for showing available appointments rather than just booked appointments, especially for staff responsible for scheduling.	"Hey, to be honest, I think that [available appointments] would be the only helpful information for us to see in this view because as a staff, it's fairly irrelevant how many appointments there are in the full day for a practitioner. It

		would be more important to see, in a quick glance, how many appointments are available that day. And whether there's none, then we know going into it as soon as the phone rings that there's nothing available" -P10
Focus on Daily Schedule	Participants expressed a preference for a view that focuses on the schedule for the day (as in a complete list of all patients to be seen that day) rather than detailed statistics on appointment types and presenting issues.	"I personally would prefer a viewer. It just gives me my schedule for today listing, everybody for today." -P12
Next Patient Information	There is interest in seeing information about the next patient to be seen, rather than just the first patient of the day.	"I don't see the point of first patient of the day maybe a next patient would be more useful. Or first patient to be seen? Or next patient to be seen?" -P1
Next Patient Information #2	One physician describes how their clinic has multiple exam rooms. For them, seeing next patient in exam room 1 or next patient in exam room 2 would be more helpful.	"So if you had two patients there. There are the two room slots. And, you know, room one is empty, but room two's got Bob in it. And a dynamic changing of those two. So that I know what, who's in what room without having to go look at the calendar. That would be useful. So like maybe seeing instead of first patient of the day next patient in exam Room 1, next patient and exam Room 2." -P1
Variability in Interest for Appointment Type & Presenting Issues	Participants have varying levels of interest in appointment types and presenting issues:	
	Not at all useful – 2 physicians, 3 admins	"Just personally, I don't have a use for all this information." -P1
	Both useful – 2 admins	"Yeah, very much like that. Again, just these numbers to... That, you don't necessarily do a lot, it just brings the day into a bit more focus to see problems or to see consistency somewhere that

		you know maybe brings me to other thoughts. Yeah, I like that." -P3
	Presenting issue only – 1 physician	"What do I think about this? So it looks good. It's I don't know. Because of the way that we've set up our CHR, we kind of made a few mistakes on appointment types and we minimized the number of appointment types available and instead presenting issue is the most useful thing. So it's very cool that you can select that option." -P5
	Appointment type only – 2 physicians; 1 admin	"They [MOAs] might want to see the appointment type like if there's a pre-op or if it's a driver's medical or if it's an initial prenatal complete… Like they would probably want that broken down? I could see the MOAs potentially maybe wanting to use that. But the presenting issue, like again, the actual diagnosis, I don't think any of our staff would really use it, as opposed to the doctors probably." -P6
*Lists user preferences, feedback, and suggestions regarding the display of the Today's Overview widget on the CHR Homepage. Additionally, it captures the varying levels of interest in appointment types and presenting issues widget views among the two user types. The feedback is categorized by the number and type of users who mentioned each observation.		

The Today's Overview widget primarily included suggestions on what should be focused on and what types of information users wanted to see in the widget. Two admins preferred displaying available appointments rather than just existing booked appointments, especially for scheduling staff. A focus on the daily schedule, showing a complete list of all patients to be seen that day, was favoured by two physicians and one

admin over detailed statistics on appointment types and presenting issues. Four physicians showed significant interest in seeing information about the next patient to be seen, not just the first patient of the day. Additionally, one physician from a clinic with multiple exam rooms suggested it would be more helpful to see the next patient information in each exam room rather than the first patient of the day on their schedule. Interest in appointment types and presenting issues varied: two physicians and three admins found it not useful, two admins found both useful, one physician was interested only in presenting issues, and two physicians and one admin were interested only in appointment types.

3.2.2.4 Bulletin Board

Table 10. *Perceptions and feedback on the Bulletin Board widget.*

Observation	Description	Participant Quotes
Positive Feedback	Overall, there is mostly positive feedback about the bulletin board feature. Participants generally find the Bulletin Board feature useful for internal communication, reminders, and announcements. It provides a centralized place for important messages and updates.	"I like the, you know, the bulletin board idea. I mean, some of our docs use the, you know, the chat button a lot. I'm not a great fan of that because I'm trying to stay focused on things at hand and from there, but I think you know bulletin board would be very good for our clinic, because we have the number of docs who don't read emails and whatever and here, you know, we could, you know, just the reminders, right?" -P4
Virtual Environment Support	One physician user sees the Bulletin Board as being valuable in a virtual or web-based environment where staff may be working remotely or travelling.	"Well I'm away right now. Like the beauty of CHR. Because you're web-based. I go off to another country. And at the end of the day, I just click,

		crack open my laptop and I can go on and do my stuff. So, a bulletin board like that actually would be quite helpful. Yeah, they're [admins/MOAs] able to send messages and keep me up to date on what's going on in the office. So I think it would be useful for that." -P1
Preference Over Chat Function	Some participants prefer the idea of the Bulletin Board over the existing chat function in the CHR for clinic-wide communication as it ensures that messages are not missed or overlooked.	"I think the bulletin board would be good actually because we just use a chat, right now to update. So this might be a good idea just so you can always continue updating whatever so everyone actually sees it. As a chat, not everyone might look at. Doctors have so many that come in a day. But the bulletin board might be good." -P7
Suggestion: Timed Announcements/ Alerts	There is interest in pre-scheduling announcements or introducing timed alerts on the bulletin board for future events or reminders.	"Well, I mean, whether it's that or having like, you know, the ability to schedule like a like an alert or skylight or highlight or things like that that would show up in the on the home page. So whether it's you know there's a flu clinic today... I mean or like because these are scheduled things and.... I mean the flu clinic, I guess would go in the bulletin board too, but it's if it's something that you're planning in advance, and you want to put a reminder in right? Or maybe it's like a day like a reminder for the day kind of thing and that you could put anything in there?" -P13
Suggestion: Potential Enhancement	An admin user would like to see features like font size adjustments and the ability to change the color of the text to	"Wondering if that would be like a bit more in their face than the chat. […] If you can add colour to it, then just like

	highlight important messages for better visibility.	the text could be like different colours, then that would be helpful. And you know the other thing would be is sometimes if you can just change the font size." -P6
*Includes user feedback and suggestions for the Bulletin Board widget. It captures positive feedback on its usefulness for internal communication and highlights specific interests in potential enhancements, such as virtual environment support, preference over the chat function, timed announcements, integration with schedules, and suggestions/potential enhancements. The feedback is categorized by the number and type of users who mentioned each observation.		

The feedback on the Bulletin Board widget was predominantly positive, with five physicians and five administrative staff members finding it useful for internal communication, reminders, and announcements, as it provides a centralized location for important messages and updates. One physician emphasized how this feature could be helpful and valuable in a virtual or web-based environment, particularly for staff working remotely or travelling. Some participants, including a physician and two administrative users, preferred the Bulletin Board over the existing chat function for clinic-wide communication, as it ensures that messages are not missed. There was interest in potential enhancements, such as pre-scheduling announcements or introducing timed alerts for future events or reminders, as mentioned by one physician and one administrative staff member. Additionally, one physician suggested integrating the Bulletin Board with schedules to display relevant information on specific days or during certain events. An administrative staff member proposed suggestions for better visibility, such as the ability to change the font size and text colour to ensure that important messages stand out.

3.2.2.5 Referrals

Table 11. *Perceptions and feedback on the Referrals widget.*

Observation	Description	Participant Quotes
Positive Feedback	Users expressed positive feedback about the features, such as the statistics (the number of referrals in each category, age of oldest referral, and statuses), ability to track referrals, and referral management.	"I like this, and I like it because it's they can see how at a glance like wow, there's like 30 incoming. We need to work on those today as opposed to the internal or the outgoing kind of thing. We need to nail those down." -P6
Differing Needs Between Primary Care Physicians, Admin Staff, and Specialists #1	Physician users mention that they often delegate referral management to administrative staff and may not find the referral widget as useful to track incoming/outgoing referrals.	"Yeah. I'm not sure you know, as a family doc, I'm not sure how beneficial that is. When I do a referral, it goes out. My medical office assistant will, you know, old school. But that's the way it is. Goes through fax and you know, she handles that kind of thing." -P4
Differing Needs Between Primary Care Physicians, Admin Staff, and Specialists #2	Family physician users said this widget may be more useful for physicians working in specialty care to know how far or behind they are in their workflow, but that it is less relevant for primary care.	"I'm not sure how this segment would really help me, but I think for the specialist in terms of incoming, you know could be very beneficial for them. So they would know what's on their list that they have to review to see whether they're going to accept that that consult." -P4
Administrative Benefits	Administrative staff find value in tracking referral statistics for oversight and management purposes, such as monitoring	"Well for me, because I oversee every single administrative function, any kind of statistics like

	outgoing referrals and analyzing referral wait times	this. And like the appointments and all that stuff would be very useful for me as a manager. UM, so, uh, I know this is the staff view, but I don't know if staff view includes management, but it would be definitely very useful for me." -P2
Variable Adoption and Usage	Some participants do not currently use the referral tab or widget in their workflow, as it is either not part of their role or they prefer alternative methods, such as using their inbox for referral management.	"You know, to be honest, I don't look at it. I've never had it in my workflow to look at it because the staff are so good about it, I just... I'll be honest, I don't think I'll use it." -P12 "This wouldn't be helpful to us at all. We don't use the referrals tab. We were trying to use it for the practitioners who do accept referrals and it did not prove to be helpful for our clinic. So we've found our own way to manage referrals through inboxes instead." -P10
Suggestion: Desire for more actionable information	Emphasize the importance of actionable information, such as identifying pending referrals requiring follow-up (e.g. having an alert/trigger after 30 days if an outgoing orthopedic consult hasn't received a confirmation date), rather than just presenting referral statistics (e.g. number of incoming/outgoing referrals).	"But in terms of the widget like the information that we're getting from there, just knowing what the number of referrals are is probably not that helpful. But knowing like what is, are there any that require action like are there any still pending that have not been done

		that kind of thing, right?" -P13
Suggestion: More filters and options	Admin users would like to include the option of filtering by the provider, a healthcare specialty, or referral status (instead of just viewing referral lists).	"This is great. Presuming that when you click in this, it's going to go to the incoming and where you've got a certain search already, like set for which doctors you want and stuff, right?" -P6
*Describes the user perceptions and feedback regarding the Referrals widget on the CHR Homepage. It includes feedback on its features, differences in needs between users, and suggestions. The feedback is categorized by the number and type of users who mentioned each observation.		

The Referrals widget was generally positively received, with three physicians and four admins highlighting its usefulness and potential benefits for staff and management. In particular, administrative users found the referrals widget helpful for tracking statistics, managing referrals efficiently, and staying organized. However, there were differing needs between primary care physicians, administrative staff, and specialist physicians. Two physicians mentioned that they often delegate referral management to administrative staff and may not find the widget to be relevant. Three family physicians noted that the widget might be more relevant for specialist physicians to track their workflow but less so for primary care. On the other hand, administrative staff valued the widget for tracking referral statistics, monitoring outgoing referrals, and analyzing wait times, as noted by four admins. Variable adoption and usage were observed, with some participants not using the referral tab or widget due to role differences or preference for alternative methods, such as using their inbox, as three admin users pointed out. One physician mentioned their clinic's recent adoption of the CHR and expressed interest in

using the widget once their clinic's referral processes are more established. Two family physicians suggested the need for more actionable information, such as alerts for pending referrals requiring follow-up. Additionally, there were suggestions for more filtering options by provider or referral status (one admin) and the ability to sort/filter by provider or healthcare specialty (one physician).

3.2.2.6 Shortcuts

Table 12. *Perceptions and feedback on the Shortcuts widget.*

Observation	Description	Participant Quotes
Overall Widget Feedback	Participants generally found the shortcuts widget useful and appreciated having quick access to important areas in the CHR	"Oh, I like that." -P1 "Yeah, that's totally handy." -P5 "This is good. I like it." -P8
Feedback for Unsigned Encounters (only available to physician users)	Four out of six physician users liked this shortcut option and saw themselves using it.	"Definitely would use unsigned encounters." -P9
Feedback for Urgent Messages (Negative)	Two participants questioned the need for this shortcut. A physician user mentioned that all inbox messages are urgent. An admin user said unless they can specify which inbox users can see urgent messages, it wouldn't be useful.	"Unless we can specify which inbox, that [urgent messages shortcut] would not be helpful to our support staff team. We don't typically get those. Where they come to is our support staff inbox. Which is where all of our callbacks are managed, so any messages that come from doctors that are urgent for patients, come into the support staff inbox." -P10

Feedback for Urgent Messages (Positive)	Some found the shortcut for urgent messages valuable, especially for addressing time-sensitive issues promptly.	"This is the most, most, most important feature. Because sometimes when we are dealing with the inbox, we see like we see a blood work for any or example X-ray or blood for any patient which like need an urgent action." -P11
Feedback for Appointment Requests (Positive)	Admin users in particular think it might be useful and helpful for managing their tasks.	"I think it's great. Again, it's in their face. […] Because right now, you can't see the appointment request unless you actually scroll all the way down on the left-hand side. If you've got like, we've got 20 some doctors. And so if that 20th Doctor has one, you have to literally scroll all the way down to see and this would like if they would see it a lot easier and not maybe miss it quite as quickly." -P6
Feedback for Appointment Requests (Negative)	Some physician users do not see themselves using it as the admins in the clinic typically handle this and saw no value in it.	"Appointment requests, yeah, I don't really deal with those." -P12
Feedback for Appointment Requests (Negative) #2	One admin user mentions that the patient portal is not enabled in their CHR environment, so the appt requests may not be as useful to them.	"I don't think these shortcuts are for us. Probably only because we are not working on appointment request, so it doesn't affect us [as the patient portal is not enabled]."
*Presents user feedback and suggestions for the CHR Shortcuts Widget. It also presents specific comments on the types of shortcuts in the widget. The feedback includes both positive and negative perceptions from different user types, detailing the number and types of users who mentioned each observation.		

The overall Shortcut widget feedback was mainly positive among admin users, with four admins and one physician appreciating the quick access to important areas in the CHR. When it is broken down by the specific shortcut types offered in the widget, four out of six physician users liked the "unsigned encounters" shortcut for and saw themselves using it. However, the "urgent messages" shortcut received mixed feedback. Two participants questioned its necessity, with one physician noting that all inbox messages are urgent and an admin suggesting a shortcut for all unread messages instead. Another admin user mentioned that they rarely mark messages as urgent, making the "urgent messages" shortcut option less beneficial to them. Despite this, two physicians and three admins found the "urgent messages" shortcut valuable for addressing time-sensitive issues. One admin suggested improving it by allowing filtering to specific inboxes, which would help support staff manage shared clinic inboxes more effectively. The shortcut for "appointment requests" was seen as helpful by four admins for task management, but three physicians did not find it valuable as admins typically handle appointments. Additionally, one admin noted that the patient portal was not enabled in their CHR environment, rendering the "appointment requests" shortcut useless as their clinic would not receive any.

Additional shortcut options suggested by family physician CHR users include a shortcut that takes you directly to draft billing, a shortcut for accessing all prenatal charts or forms for prenatal patients, a growth charts shortcut, a shortcut that directly highlights and takes you to billing issues or errors for quick attention, a shortcut that lets you send a quick message to all staff, and just any shortcuts to areas in the CHR that are not intuitive

and would typically take many clicks to get to. On the other hand, one admin CHR user suggested a shortcut for unread chat messages.

3.2.2.7 Your Stats

Table 13. *Perceptions and feedback on the Your Stats widget.*

Observation	Description	Participant Quotes
Neutral feedback	Found the Your Stats widget interesting but not necessarily essential to their workflow.	"Yeah, I'd say a solid "meh." The ICD codes […] For the last 30 days. So I mean, yeah, like that's interesting. Umm... Yeah. And I think like, that's helpful. But like number of patients treated this year? Completed Qnaires? I don't think are particularly helpful." -P13
Positive feedback	Some appreciate the novelty of seeing the stats being presented this way.	"Definitely very cool to see those numbers. I mean, there, there are things that you don't really ever see stats on. You see them in a different way, but. Yeah. No, that's very cool." -P3
Negative feedback	One admin user expressed a lack of interest in or relevance of the stats in the widget to their practice.	"I can't see this being helpful. […] It's irrelevant […] Yeah, just there's more helpful information to put on the Homepage." -P10
More customization	Add more stats options and give users more choice in what stats to display. An admin user suggested that certain statistics may be more relevant to certain roles or specialties within the clinic, emphasizing the need for customization based on user roles.	"Yes, it's useful if we can customize it because, like, for instance, patients you've seen this month, it would be a clinic as a whole -- instead of per floor or per provider, whatever. So, if we're able to customize it even better because you know, we looked at primary care different than we look at the specialists." -P2

Relevance - Patient's you have seen this week/month/year #1	A physician user liked the reminder of the number of patients treated as it might be encouraging to see in a moment of burnout, they get a reminder of all the patients they have seen	"Yeah, like you said, good to see maybe for some of us it's encouraging to see the number of people that we've treated or to get a reminder of what we see a lot of, especially in those moments of burnout and you realize, oh goodness, I've seen so many mental health codes. So yeah, yeah, that's nice. That's a feel good widget." -P5
Relevance - Patient's you have seen this week/month/year #2	An admin user questioned its value as they don't see it as helpful or why that number would ever matter.	"So for staff, we don't really need to have the patients that you've seen this month." -P6
Relevance - Number of faxes sent	Admins said that it was either irrelevant or were uncertain about its utility.	"Same with faxes sent. I can't see that being helpful for practitioners. Again, it's easy enough to search that information in the analytics, right, I would rather see more helpful information on the Homepage." -P10
Relevance - Number of patients checked in #1	One admin user said this stat might be meaningful is interested in seeing number of patients registered	"I like the thing about patients you've checked in. Which would be meaning which ones they have registered." -P6
Relevance - Number of patients checked in #2	Another admin user says this stat is irrelevant.	"I can't see this being helpful. The number of patients you've checked in. I don't know why that would ever matter." -P10
Do not include statistics on Homepage	An admin user commented that they want to see no statistics at all. That the Homepage would not be a good place for it. Would rather use the Homepage as a clinic resource page rather than worrying about stats (the analytics tab is sufficient for stats).	"No stats... Using it more as a clinic resource page versus worrying about stats." -P10
*Presents user feedback on the Your Stats widget and includes additional suggestions for making the statistics more actionable and customizable and adding relevant		

statistics based on user roles and needs. The feedback captures perspectives from both administrative staff and physicians and includes the number and types of users who mentioned each observation.

The feedback on the "Your Stats" widget was mixed, with some participants finding it interesting but not essential to their workflow (three physicians, two admins). Positive feedback came from one admin and two physicians who appreciated the novelty of the presented statistics. However, one admin expressed a lack of interest in the information given, finding the three default statistic options irrelevant to their practice. There was a desire for more actionable stats, as noted by one physician, and more customization options, as suggested by two admins. An admin also emphasized the need for role-based customization, as certain statistics may be more relevant to specific roles or specialties. Opinions on specific stats varied: one physician found the reminder of the number of patients treated encouraging, while an admin questioned its value. The number of faxes sent was deemed irrelevant by two admins, and opinions on the number of patients checked in were split, with one admin finding it meaningful and another finding it irrelevant. One admin suggested not including statistics on the Homepage, preferring it to be a clinic resource page.

Additional statistics suggested by admin and family physician CHR users include the number of patients seen per month with various breakdowns such as clinic-wide, specialty type, appointment type, and provider. Physician CHR users were interested in the number of messages read and sent to patients, family doctor-specific stats on chronic disease tariffs, a breakdown of inbox messages (by the number of messages with file attachments, faxes, or just messages), outstanding billing, quality of care metrics (such as

completion rates for screenings number of patients due for vaccinations, and number of patients due for a follow-up) and access to care statistics (wait times for appointments). Admin CHR users suggested statistics on the number of no-shows, cancellations, or rescheduled appointments, the number of x-rays and prescriptions, the number of appointments booked and completed each day, and financial metrics like how much was billed this month and projections for next month based on historical billing data.

3.2.2.8 Inventory

Table 14. *Perceptions and feedback on the Inventory widget.*

Observation	Description	Participant Quotes
We do not track inventory	Some users mentioned that their clinic does not track inventory at all.	"We don't really keep track of inventory. The only thing that we have for our products and all our invoicing is like doctors notes and forms and stuff like that." -P3
Unsure if inventory is tracked in clinic	A few users were unaware if inventory was tracked at all in the clinic	"We do like ordering but, I, we use like an ordering system we don't get the inventory… Yeah. So I don't know if any. I don't think we do inventory at all." -P7
Do not use CHR for inventory	Two users stated that their inventory management processes are handled outside of the CHR	"So currently all of this [inventory] is being done outside of the CHR." -P2
This widget is not helpful	One participant found the Inventory widget unhelpful and suggested hiding it from the Homepage, emphasizing the need for prioritizing more important feature requests in the CHR that have been pending for some time.	"Totally unhelpful for us. We don't keep inventory in the CHR. […] based on the number of times I've said that so far, for the amount of work to go into creating those things to then just be able to hide them so it's.... much more important feature requests that we've been

		waiting on for 2 1/2 years since we started using the CHR that I wish they would put the time and attention into.... Rather than creating widgets that aren't helpful." - P10
Suggestion #1	Introduce an integration with the scanning system/software used at the clinic or set it up so that each time an item is scanned, or an invoice is created, it is automatically reflected in the inventory.	"It's [Inventory widget] definitely a good initiative if it can be expanded, you know, because like right now, every time that they take something, they have to scan it and it goes.... So I don't know what system they're using exactly right now.... But if there's a way to do it within the CHR, like let's say somebody buys a knee brace for instance, and we're creating an invoice for it, it automatically takes it off. That would be great." -P2
Suggestion #2	One admin user mentioned that have three items to display isn't really useful for anybody as in the medical field there is a lot of inventory to deal with. They recommend displaying all inventory items and just adding a scroll option within the widget.	"The thing the least appealing here for me is the inventory because I don't find that you know having three items is umm really useful to anybody, because usually when you're in a medical field, there's a lot of inventory. So I think that one definitely is the least appealing because there's so much more that can be done with that." -P2
*Includes user feedback on the CHR Homepage's Inventory widget, including observations about the inventory tracking practices that already exist among the participant clinics, the relevance of the widget, and suggestions for improvement. The number and types of users who mentioned each observation is included.		

The feedback on the CHR Homepage's inventory widget indicated that there might be limited use and mixed opinions. Three admins mentioned that their clinics do

not track inventory, while two were unsure if inventory tracking occurred in their clinics. Two admins stated that their inventory management processes are handled outside of the CHR. One participant found the inventory widget unhelpful and suggested hiding it from the Homepage, emphasizing the need to prioritize more essential feature requests. Suggestions for improvement included integrating the widget with the clinic's scanning system or software to automatically update inventory when items are scanned, or invoices are created, as mentioned by one admin. Another admin recommended displaying all inventory items with a scroll option within the widget, as having only three items displayed was not helpful, given the extensive inventory typically managed in the medical field.

3.2.2.9 Photo

Table 15. *Perceptions and feedback on the Photo widget.*

Observation	Description	Participant Quotes
Neutral Feedback	While some participants said that they may not find the Photo widget useful themselves, they recognized that others might appreciate it, especially those who do not have their own desk space to display personal photos.	"I mean I guess because nobody has their own desk or per se, so they can't really put frames of their family or anything. So I mean, some people may like it. Is it something that's a must, or that's what we say useful? Not really, but I mean, you know, I do see some people -- sometimes they put pictures of their kids on their locker or whatever. So I'm sure some people would appreciate this." -P1
Positive Feedback	Some saw the photo widget as a nice feature that could add a personal touch to the otherwise plain CHR interface.	"I think it kind of will upgrade, like so because CHR right now is so like plain I think. It would give us a little bit of our own. So for like here we all use different

		computers. If we switch where we are. So it would be nice to because we so we can't have really like a specific photo anywhere. That's kind of nice." -P7
Negative Feedback	Some participants expressed that they personally do not have a use for the Photo widget as they already have physical photos on their desks or do not feel the need for such customization.	"I don't really have a use for that [Photo widget]. And I have pictures on my desk. You can't see them, obviously, but they're up there. I'm fine with my current set-up. Don't care." -P1
Concerns and Considerations #1	One participant was concerned about the potential for users to upload inappropriate content	"Yeah, I think. I think that sounds reasonable. I think the clinic wide logistics that I would be thinking about there is what are other people going to do, are they going to do anything bad... are they going to upload something to the computer that they shouldn't. Or don't we want them doing that at all? Or but? But otherwise, I think it's a nice touch." -P9
Concern and Considerations #2	Difficulties in managing the maximum file size.	"I mean the maximum file size again, that's going to be complicated for people. Are they going to? If it's a hard thing to do to get it right, I would. That would be a question." -P9
Concern and Considerations #3	An admin user mentioned that they ask staff to not upload many pictures onto the computers at the clinic because it clutters up space. Mentions that they would have to tell their staff to only have a certain number of pictures before uploading or upload using the CHR mobile app on their phone.	"We do ask staff to not really upload very many pictures onto the computers just because it does like clutter up the computers. But we could probably just tell them they can only have certain number of pictures. On their on their phone file but yeah, otherwise I think it's a nice idea. I think it's it's good for them to have like, just like you say. So they always try to have a picture on their desk anyway. So this would be on their desktop then so." -P6
*Presents user feedback on the Photo widget and captures concerns and considerations. The number and types of users who mentioned each observation is included.		

Feedback related to the Photo widget was mixed. Some participants, including three admins and two physicians, said that while they might not find the widget useful for themselves, others might appreciate it, particularly those without their own desk space. Positive feedback came from two physicians and two admins who saw the photo widget as a nice feature that could add a personal touch to the otherwise plain CHR interface. However, one physician and one admin expressed that they did not have a use for the widget, as they already had physical photos on their desks or did not feel the need for such customization. Participants raised concerns, including the potential for users to upload inappropriate content (one physician), difficulties in managing the maximum file size (two physicians), and the issue of cluttering up computer space with photos, as mentioned by one admin. This admin suggested limiting the number of photos allowed on clinic computers or using the CHR mobile app for uploads to manage space effectively.

3.2.2.10 Public Health Feed

Table 16. *Perceptions and feedback on the Public Health Feed widget.*

Observation	Description	Participant Quotes
Positive Feedback	Participants expressing interest in having access to timely updates from public health authorities, saving them time from having to manually check various sources for information such as bookmarked websites or professional emails.	"So for these feeds, I actually really do like this because if I were to sit and talk about some of the things that I don't have enough time in a day for, this that I've got on my book, on my google bookmarks is I've got, you know, our public health one. Our OMA one and a lot of these pages, umm.... Do you have, like, weekly reports or stuff like that? Like feeds happening and I don't have enough time in a day,

		nor to even remember […] Just that putting it all there in one place and in my face and just that one click would be a huge thing definitely for me, I like that. So would it have?" -P3
Negative Feedback	One admin user was completely indifferent to this widget. They prefer concise, broken-down and summarized updates rather than lengthy notifications.	"I don't tend to read anything which does not give me my information within within two seconds." -P8
Mixed Admin Feedback	Admin users in management roles noted that the widget would be useful for management and providers who need to stay informed about public health announcements and updates. However, they expressed concerns about potential confusion among frontline staff if they were also given access to the widget.	"For the frontline staff, they wait for instructions from us. So I would not have them have something like this because if they were to have that, they would probably just say, oh, well, now it's.... Well, no, you have to wait for direction from management. So I would say and not maybe a very good thing for most people on the front line, but definitely for providers or management." -P2
Admin User Concerns	One admin user raised concerns about the widget being a potential distraction if the widget were accessible to all staff members and suggested options for restricting access based on roles or preferences. They note it would be helpful for practitioners, but not as much for support staff.	"Interesting, but perhaps distracting. […]Well, the fact that our support staff team wouldn't necessarily need to be completely up to date on a public health feed. But when you start seeing the posts around it and maybe seem interesting and divert your attention to that rather than the other tasks that are needing to be done." -P10
Suggestion (Introduce Notifications)	Introduce a notification (like how on a Windows desktop news sometimes will pop up). Otherwise, the news/public health feed might get missed.	"I don't know how many people would look at it. But it would be like you know how on a normal screen it pops up like on a normal desktop […] Yeah. Like, like on your smartphone or whatever on the bottom it kind of comes up with like the

		weather and whatnot. And I feel like a lot of people click on that and see." -P7
Suggestion (Categorize Content in Feed)	A physician user would like the information to be categorized in terms of what is urgent/most urgent.	"Yeah, that's really neat. And there's just three. Like, can you like, and I guess like categorize it in terms of, there's urgent things or whatnot." -P13
*Table shows user feedback on the Public Health Feed widget. It also highlights concerns and provides suggestions for improvement. The number and types of users who mentioned each observation is included.		

The Public Health Feed widget feedback was also varied. Positive feedback came from two admins and one physician who appreciated timely updates from public health authorities, saving them from manually checking various sources. However, one admin was indifferent, preferring concise, summarized updates over lengthy notifications. Admins in management roles found the widget helpful in staying informed about public health announcements but were concerned about potential confusion among frontline staff if they also had access. One admin suggested restricting access based on roles or preferences to avoid distractions for support staff. Suggestions for improvement included introducing notifications to ensure updates are noticed, as mentioned by one admin, and categorizing information by urgency, as suggested by one physician.

There was also interest in customizing the sources of information displayed in the widget, with suggestions for integrating updates from professional organizations, regional health authorities, and specific medical specialties. Specific examples include Medscape, professional college websites (e.g., College of Physicians, College of Surgeons, College of Nurses), Docs Manitoba, Ontario Medical Association (OMA), Ontario Health, Doctors of BC (with interest in LFP payment and province attachment system

information), Physicians CPA (for bulletins on billing changes), medical/professional organizations providing legal information for healthcare providers, bulletins from Regional Health Authority websites, billing updates, CHR updates (either in a separate widget or part of a larger "News" feed), Choosing Wisely, and CMAJ (e.g., hypertension guidelines).

3.2.2.11 Overall Widget Sentiments

Each of the participant comments regarding the Homepage widgets was analyzed to see if the overall sentiment of a single user towards that specific widget was either "positive," "neutral," or "negative." The results of this analysis can be viewed in *Figure 3* below for both administrative staff and family physician users. *Figure 4* displays the widget ratings for administrative/admin staff users only, and *Figure 5* displays the widget ratings for family physician users. The graphs in *Figures 3-5* were created by categorizing users' comments on each widget as being "positive," "negative," or "neutral." Physician users do not have access to the Inventory widget. Therefore, n=13 for the Shortcuts, Bulletin Board, Today's Overview, Public Health Feed, Photo, Referrals, and Your Stats widgets. n=7 for the Inventory widget.

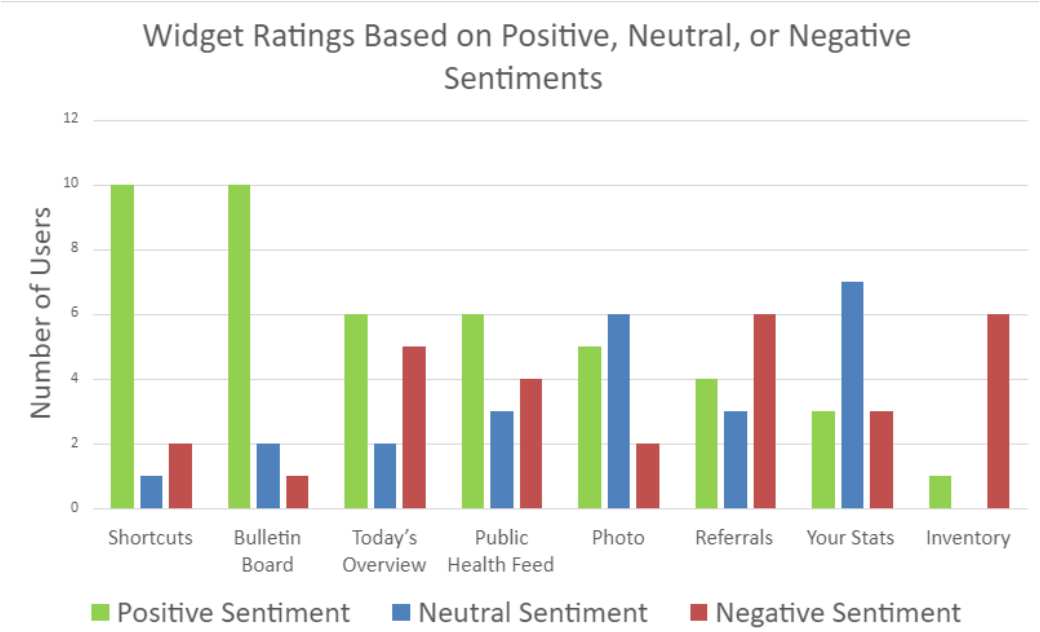

Figure 3. Widget ratings that are based on positive, neutral, or negative sentiments.

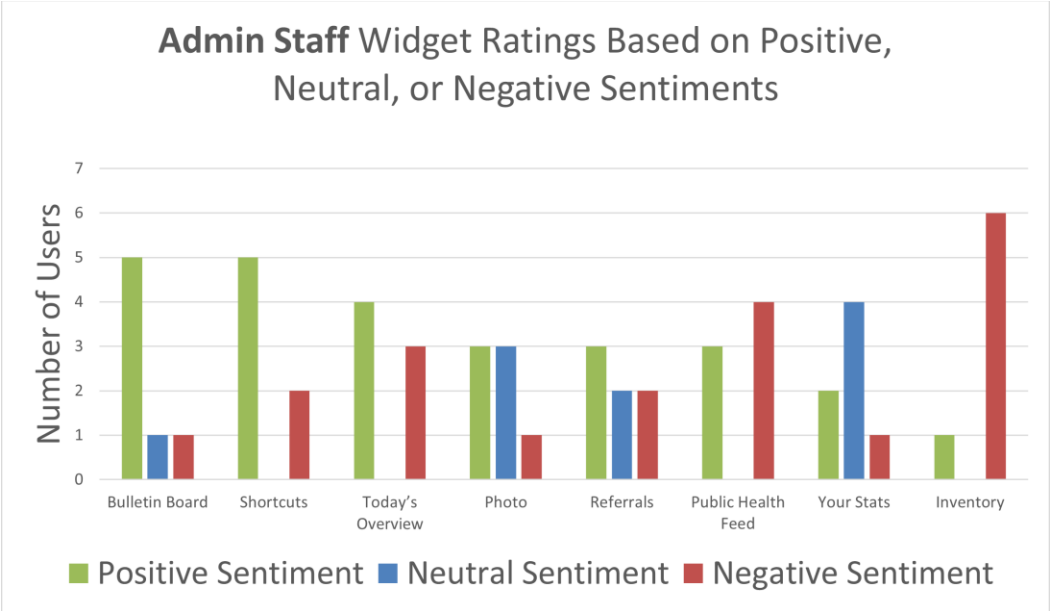

Figure 4. Admin staff widget ratings are based on positive, neutral, or negative user sentiments.

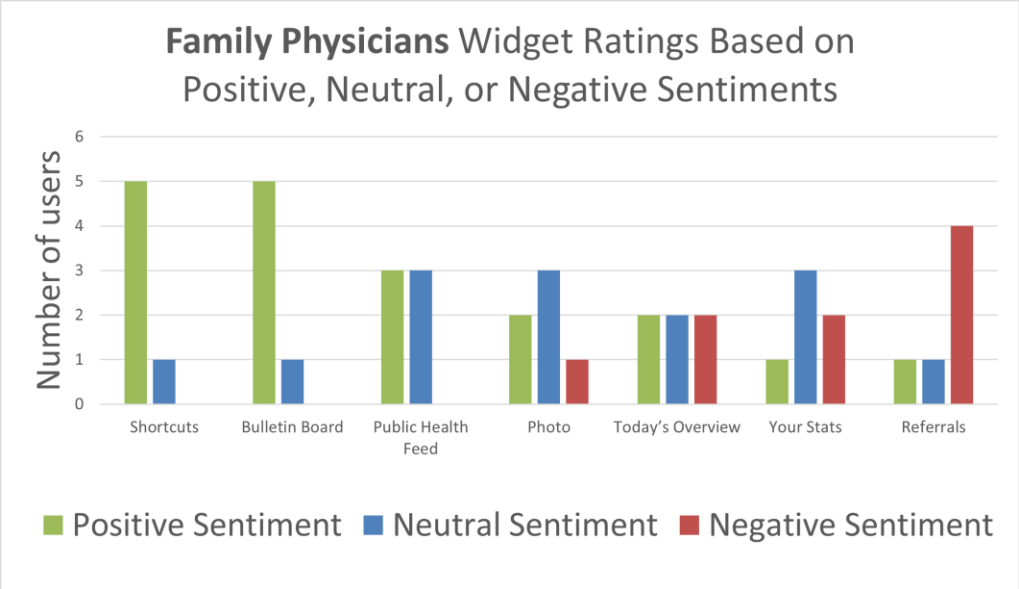

Figure 5. Family physician widget ratings are based on positive, neutral, or negative user sentiments.

3.2.3 Post-CHR Homepage Walkthrough

In this portion of the interview, participants were asked to share their overall impressions and initial perceptions of the Homepage based on the walkthrough provided. They were questioned about what they found most appealing and any aspects they did not like. Participants were also asked to suggest one additional function or widget they would add to the Homepage and explain its value. Additionally, they reflected on previous EMRs or other software solutions they had used, identifying any valuable Homepage features or widgets from those systems. Users also rated the overall usefulness of the Homepage on a scale of 0-10 and provided feedback on what would be required for the Homepage to achieve a perfect score. The interview concluded with a discussion of the

perceived advantages and disadvantages of using the Homepage in the context of their role as a physician.

3.2.3.1 Overall Impression of Homepage

Users have varying opinions on the value and utility of the new Homepage feature. Some interview participants find it valuable and appreciate the mix of information provided, as described by admin user P2, "I think this, where it has a mix of both information, where it's a bulletin board and statistics that we can look at. I think the combination is really nice." Other users expressed concerns about the relevance and usefulness of certain widgets or features. Admin user P7 states, "I think it's if we use all of the. If we use every... all of the widgets then it would be helpful. But at the moment the only one I would have up is possibly the bulletin board." For more details, see *Figure 3* above about widget sentiments to identify the most and least popular widgets among the participants interviewed. Physician user P4 liked the layout and colour scheme of the Homepage, "Yeah, in some ways it's refreshing. You know, I like the layout. I like the, you know, the colours." There was also a general appreciation for the customization options available for the Homepage, with participants liking the ability to add or remove widgets based on their preferences and needs. Physician user P12 states,

> *"I like the fact that it's customizable. You get rid of stuff you don't like? And I think we won't really know the utilization until we use it. Everybody has their preferences, so kind of proceed with caution if you will... But I think would be neat to try."* -P12

Despite initial skepticism from some participants, there was an acknowledgment of the potential for certain widgets to become more useful over time, especially as users become more familiar with them and as clinic needs evolve,

> *"I think overall impression would be good. And I imagine, like, anything new, once one's using it, you learn what you're actually using. I'm pretty sure what I would do is whatever is available, I'd probably put it all on there. And if over time I thought, hey, I'm never really looking at that, then would I, with the settings thing, kind of remove it. That might be one strategy?"* -P9

Users also acknowledged that the usefulness of the Homepage feature may vary based on the clinic's specific needs and workflows. One physician user commented that the clinic's small size and unique dynamics would influence how they utilize the bulletin board widget and that the clinic would need an internal staff meeting to make the most of the bulletin board feature,

> *"And the bulletin board.... So we have a very small clini. There is 3 physicians, 3 staff and I mean that -- and we might get a fourth physician in there. But, so, like, I don't know what we would use that for. I think we would need to think as a group about what would be helpful."* -P13

3.2.3.2 Likes and Dislikes

Participants highlighted several aspects they liked about the new Homepage. The most popular widgets, as detailed in *Figure 3*, included today's overview, the bulletin board, your stats, the public health feed, the photo widget, and shortcuts. The ability to customize the Homepage layout and choose relevant widgets was highly valued, allowing users to tailor the interface to their specific needs and preferences. However, one admin user, P8, noted that customization is only valuable if the right options are available, stating, "The option to customize without having what I can actually add would be useless." Participants also appreciated the visual presentation of the Homepage, finding it visually appealing and easy to navigate, with effective use of colour and clear separation of different sections. Additionally, the widget-based concept and layout were praised for making it easy to access relevant information and navigate the Homepage,

> *"Yeah, I think I like the widget concept that you can define what you want and it sounds like even within each widget some there'll be some customizability, that I think will be good. I think the layout is pretty appealing. I think the little the little boxes that sort of separate things out is good."* -P10

Some participants, particularly solo practitioners, felt that certain widgets or information were not relevant to their specific circumstances, leading to a perception of extraneous or unnecessary information,

> *"The extraneous information that I just don't need. […] But for my unique circumstance, it isn't. But I'm not dismissing it or, or disregarding it. Just in my personal [experience] it doesn't have personally ... but I can see where it would be useful. I see the value, just not in my personal circumstance."* -P1

There was also uncertainty about the usefulness of certain features in daily workflows, especially if users have specific preferences for accessing information,

> *"I find the stats fairly irrelevant. Like I said, the feed might be distracting. We don't use inventory, so I guess it depends a little bit on your use. Inventory could be helpful if you were actually using that. The overview, I don't see as being helpful. I don't think that practitioners would spend much time looking at that. They would directly go to their schedule or to their day sheet.... So those if... if it could be those 3 widgets [bulletin board/announcements, resources, shortcuts], yeah, that that would make it really helpful and worthwhile."* -P10

As demonstrated in the previous quote, one admin user singled out the inventory widget as being the least appealing. Additionally, another physician user mentioned that certain widgets, such as referrals or your stats, may not be relevant or useful in their current roles or workflows. A few users mentioned that it was still too early to determine what they disliked, with one physician noting that any disliked widgets could be removed from the Homepage,

> *"It's hard to say how much a new feature is, would be of use. You know, and so there's that thing of like you build it because you can. But is it going to be of use? And it's hard to say for me personally […] It's hard for me to say how I would find this useful because of the way my current flow is, but for others, certainly this would be a nice option for them."* -P5

3.2.3.3 Other Widget Ideas

Participants suggested several additional widget ideas to enhance the CHR Homepage. These included an Inspirational Quote of the Day and a Joke of the Day to add a touch of positivity. For billing, they proposed a widget highlighting any billing issues, signed encounters missing billing, outstanding billing, pending billing, total billing per month, and a breakdown of private and OHIP billing. They also suggested a widget for CHR Updates/Release Notes. For message management, participants recommended not just an "urgent messages" shortcut but an Inbox Overview with the number of urgent and non-urgent messages, noting that "they're all urgent." An Inbox Widget could provide a quick view of messages, showing who sent them and a snippet of the content, with the ability to scroll within the widget. A Resource Widget was proposed for storing and sharing internal clinic files, such as manuals and support documents, with team members.

Some users also wanted more “actionable” statistics, including stats on referrals, appointments, types of visits, population health, and quality measures, as well as integrating provincial-level data. They suggested inbox stats breaking down items into files, faxes, and messages, and stats on available appointment slots for support staff to book, with the ability to toggle between different sections or pods in larger clinics. Two physicians talked about incorporating a to-do list or task management widget to track outstanding tasks like unsigned encounters, pending referrals, or urgent messages. One physician mentioned another EMR (Jonoke) that included a status screen providing an

overview of tasks needing completion, such as letters to do, lab results to review, and emails.

Other suggestions included a Bookmark widget for users to add quick links to external sites, a widget displaying a List of Patients Booked Today instead of Today's Overview with a pie chart, and a Chat widget showing the number of new chats since the last login, chat notifications, and a preview of who sent the message and its content. Finally, participants wanted more integrations with provincial-level systems like Ocean, eReferral, and the Digital Health Drug Repository to better connect this information with the CHR.

3.2.3.4 Rating Usefulness/Utility of the Homepage

In this question, interview participants were asked to rate on a scale of 0-10, how would they rate the overall usefulness of the Homepage based on what they'd seen in the Homepage walkthrough. A score of zero represents that the Homepage is "not at all useful," five is "neutral," and ten is "highly useful." After giving a score, users were then asked a follow-up question. If the Homepage is not considered to be a "10," then what would be required to raise the score to a 10? The results from both questions are shown in *Table 17*.

Table 17. *User ratings and improvement suggestions for the CHR Homepage.*

Alias	Rating	Why	Improvement
P1	5	Feels indifferent towards the Homepage. Sees the utility but prefers more customization to remove unnecessary elements. Some frustration as this user has	More customization options to tailor the Homepage to individual needs. Prefers a very simplified and slimed down version of the Homepage that

		requested other CHR updates and is instead getting a Homepage, which is a feature that was not requested.	contains only the shortcuts, bulletin board, and public health feed.
P2	6	Inventory widget doesn't fit their needs. Prefers more customization that includes more stats, more referrals information.	Provide extensive customization options similar to dashboard and summary views, allowing users to select and arrange widgets according to their workflow requirements.
P3	9-10	Homepage seen as highly useful, and foresees utility in its implementation.	No specific improvement suggestions provided.
P4	9	Likes the format.	Allow for more individualization of some of the options. Customization of widget content to accommodate varying user preferences, such as personalized stats and referral options.
P5	7-8	Sees potential usefulness but will not know exactly until it has been implemented into their workflow.	More customization features to allow users to select and prioritize widgets according to their specific roles and preferences.
P6	10	User thinks that the Homepage is highly beneficial, particularly for facilitating workflow organization and task prioritization.	No specific improvement suggestions provided.
P7	3	Does not see themselves using these widgets and does not think the Homepage will be useful.	Add a chat/inbox widget so that users can have a quick preview of all messages.
P8	7	No further explanation was provided as to why they gave this score.	Add in a billing widget, more statistics that help them get a big overview of what is going on in their clinic.
P9	8	The Homepage will be useful, but it will take some time to get used to it.	No specific improvement suggestions provided.
P10	2	The Homepage got a low rating due to its lack of essential features and suggests adding	Incorporate external links for easy access to clinic resources like shared calendars and schedules.

		external links for improved clinic management.	
P11	9-10	Views the Homepage favorably. No further explanation was provided as to why they gave this score.	Include urgent news alerts related to outbreaks, statistics around no show rates.
P12	5	Views the Homepage neutrally. No further explanation was provided as to why they gave this score.	Include a full list of patients instead of today's overview and the message management features (refer to the Other Widget Ideas under *section 3.2.3.3*).
P13	8	Homepage rated positively. No further explanation was provided as to why they gave this score.	Include quality standards and other statistics that are more "actionable."
*The above table displays the scores/ratings and the feedback from interview participants on the overall usefulness of the CHR Homepage. The "Why" column includes an explanation of why users gave that score, and the "Improvement" column shows what feedback users provided to increase the usefulness/utility of the Homepage.			

In *Figure 6* below, Homepage utility/usefulness ratings were categorized into three sentiment categories and displayed in a pie chart. Ratings 0-4 were categorized as negative, 5-6 as neutral, and 7-10 as positive. Most users, 62%, had positive sentiments towards the Homepage, showing that the majority view the Homepage favourably. This is followed by 23% neutral and 15% negative sentiments.

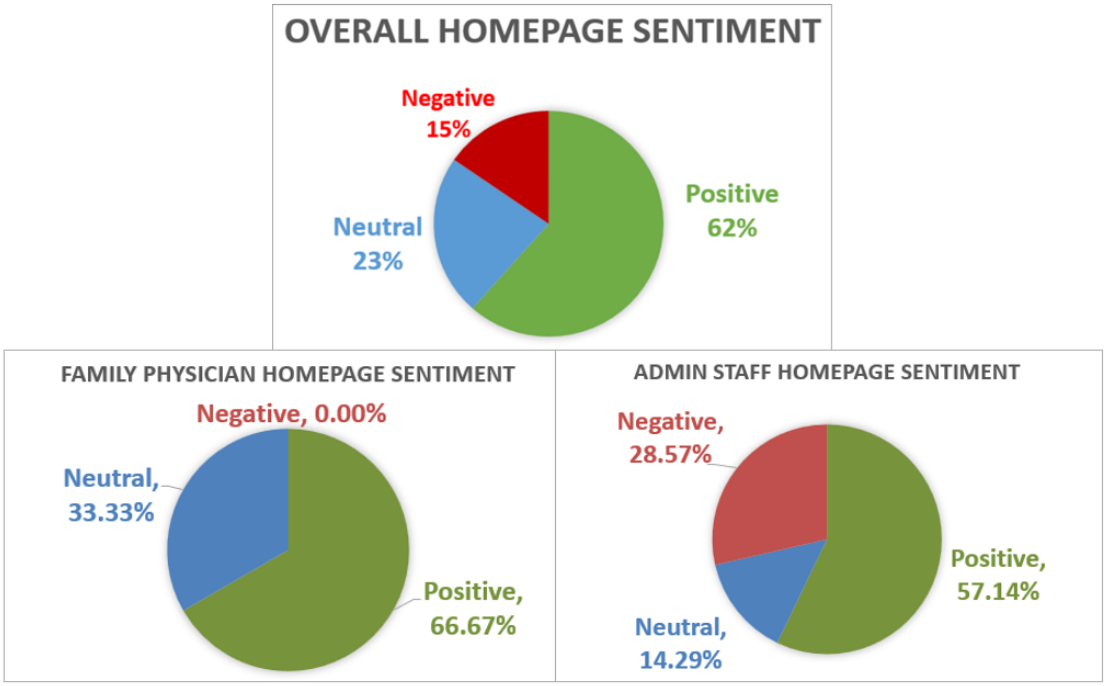

Figure 6. Pie charts of overall, family physician, and admin staff Homepage sentiments based on user ratings on an 11-point rating scale, where 0-4 are categorized as negative, 5-6 as neutral, and 7-10 as positive.

3.2.3.5 Perceived Advantages/Disadvantages

The Homepage had several perceived advantages and disadvantages according to user feedback. Among the advantages, users appreciate having a quick overview of their workload, bulletin board updates, and important data as soon as they log in. Admin staff user P3 states, "The advantage would definitely be, as soon as I log in, I have a quick view of where everything is at, what's new in the bulletin board, like what I'm going to be dealing with. It just gives me a better idea of how I'm going to manage my day." The bulletin board feature is particularly valued for facilitating communication among staff members and streamlining processes such as team updates,

> "*Because I have to send out, I'm generally the point person for sending out those notifications to staff. So, if we're for example, when we plan our new year party*

> *being able to link that information, the sign-ups right to the bulletin board, let's say. Or those kinds of things."* -P10

Furthermore, the Homepage improves efficiency and ease of access by providing essential information, thereby reducing the time spent navigating through different sections of the EMR and minimizing the need for multiple clicks, as highlighted by physician user P5, "For those times where I don't have something in mind, the moment I log in, this is a good place to land to just give me options for where, where I could go at that moment."

In terms of perceived disadvantages, two administrators expressed a desire for more control over the widgets and layout for all users in their clinic, citing the lack of full and complete customization as a potential drawback,

> *"For example, for the Homepage, if I could, as a clinic administrator, set up OK, here's what I'd like it to look like first, and then people [other staff in clinic] can add or change widgets as necessary. [Otherwise] even if those widgets were added, I would have to send out a message saying hey, make sure that you add these widgets so that you see this information.... and that's just time consuming and it's unnecessary for practitioners to be spending their time uploading headers to a CHR. Right? Whereas that's my role. So if there was a little bit more customizability from an administration point that impacted all the users of your CHR [environment]. That I could see being very helpful."* -P10

A physician user raised concerns about the Homepage potentially distracting them from their primary tasks or adding unnecessary complexity to their workflow,

> *"Will it [Homepage] distract me from what I would normally do? Will it actually change my workflow, and will I, after two months, say, oh, you know what? Somehow, it's making things less efficient […] I think the thing I'd be watching for is, is it doing something that's keeping me more efficient or is it one more screen to look at that I don't really need to look at?"*

Additionally, three physicians preferred direct access to their schedule or inbox over the Homepage, depending on their workflow preferences. Physician user P1 specifically

noted that the Homepage adds an extra click to their workflow if their goal is to access the inbox or schedule, which can be seen as a disadvantage, "There's no disadvantages [to the Homepage], it's just something I gotta get through to get to the inbox. It adds a click to my day."

3.3 Survey

3.3.1 Homepage End-User Satisfaction

The main intent behind the survey was to look at post-use user satisfaction. The distribution graph seen in *Figure 7* shows how survey respondents evaluated the user satisfaction of the Homepage at least four weeks after the Homepage was launched to all CHR users. CHR users (n=12), comprised of two user types, including family physicians and admin staff, were asked how satisfied they were with the Homepage. "Satisfied" refers to the ease and functionality of the Homepage itself, the quality of the information given, and the quality of the services provided. They were then asked to rate their satisfaction on a scale from highly satisfied, moderately satisfied, neither satisfied nor dissatisfied, moderately dissatisfied, and not at all satisfied.

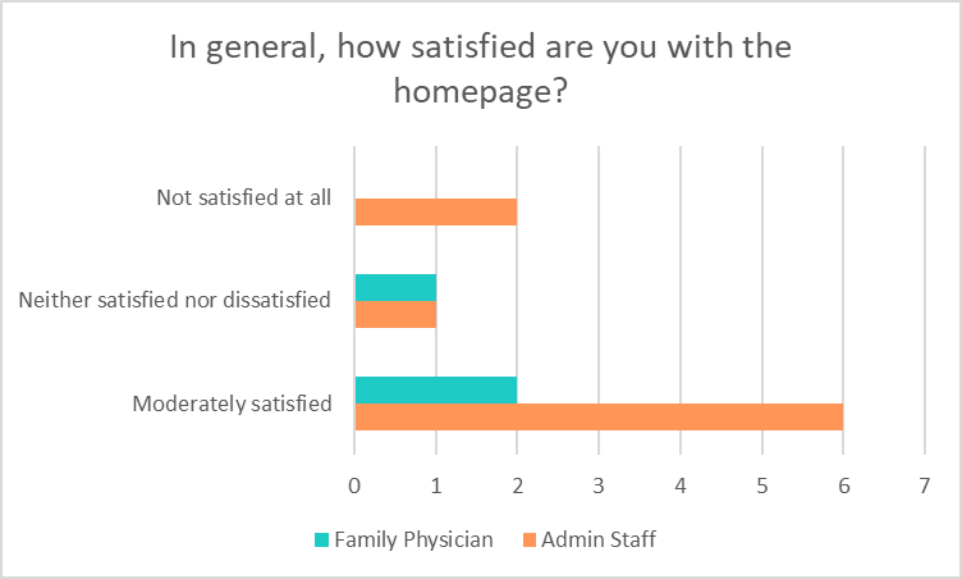

Figure 7. Distribution of CHR Homepage user satisfaction ratings.

Figure 7 shows the distribution of satisfaction ratings among CHR Homepage users, revealing a generally moderate level of satisfaction. The sample included 12 participants, with 75% (9/12) representing administrative users and 25% (3/12) representing family physicians. Most respondents (66.67%, 8/12) reported being "moderately satisfied" with the Homepage. Additionally, 16.67% (2/12) indicated they were "neither satisfied nor dissatisfied," and 16.67% (2/12) reported being "not satisfied at all." The scale used in the user satisfaction rating question is ordinal. Ordinal variables are categorical and possess an inherent ranking, but the distances between categories are not defined (Willard, 2020). With ordinal data, central tendency can only be measured using the mode and median (Willard, 2020). For the user satisfaction question, the mode and median are “Moderately Satisfied.” Given the ordinal nature of the satisfaction scores and the small sample size, we employed the Mann-Whitney U test to compare the means of two independent groups, namely, the two different user types (Leon, 1998). Each

category was converted into a numerical score as follows: “highly satisfied” - 100, “moderately satisfied” - 75, “neither satisfied nor dissatisfied” - 50, “moderately dissatisfied” - 25, and “not satisfied at all” - 0. This conversion was necessary because rank-based tests, such as the Mann-Whitney U test, operate on the ranks of data rather than raw data (Leon, 1998). Converting the ordinal categories to numeric values allows statistical software, such as RStudio, to perform the required calculations without assuming equal intervals between numeric values (Mangiafico, 2016).

In the context of the user satisfaction survey question, the alternative hypothesis states that the distribution of satisfaction scores differs between administrative staff and family physicians, suggesting a potential difference in central tendency or overall distribution between the two groups. To test the alternative hypothesis, a Mann-Whitney U test was conducted using RStudio, with a significance level (α) of 0.05 and a 95% confidence interval. The analysis produced a p-value of 0.912 and a confidence interval of [-74.99995, 25.00000]. Since the p-value exceeds the alpha threshold of 0.05, we fail to reject the null hypothesis. Consequently, we conclude that there is no statistically significant difference in the distribution of satisfaction scores between administrative staff and family physicians.

Additionally, the high p-value ($p=0.912$) suggests that any observed differences in satisfaction scores between the two groups are likely due to random chance rather than an actual underlying difference. However, it is important to consider that the small sample size ($n=12$) may result in insufficient power to detect a difference, even if one exists. The lack of statistical significance does not necessarily imply the absence of a difference; it

could be attributable to the sample size being too small to detect a difference (Faber, 2014).

3.3.2 Survey Questions Involving Nominal Scales

Apart from the Homepage end-user satisfaction question, the remaining quantitative questions in the survey utilize nominal scales. Nominal variables are categorical and lack intrinsic order (Willard, 2020). The questions in this section are categorized as strongly agree, moderately agree, moderately disagree, and strongly disagree. They also include greatly increased, increased, did not change, decreased, and greatly decreased. However, these questions also include options such as “not sure” or “not applicable,” which classifies these scales as nominal rather than ordinal, as those options do not have an inherent rank.

The next set of quantitative questions asks survey respondents to indicate their level of agreement or disagreement with each of the following statements: the Homepage improves my productivity; the Homepage improves the quality of care I can provide; the Homepage makes my job easier; the Homepage enhances our ability to coordinate the quality of care; and the Homepage improves the quality of my decision-making. Respondents rated each statement on a scale ranging from strongly agree to strongly disagree, with options for "not sure" and "not applicable." These questions were adapted from the SUA survey tool. *Figure 8* presents the distribution of responses for each statement.

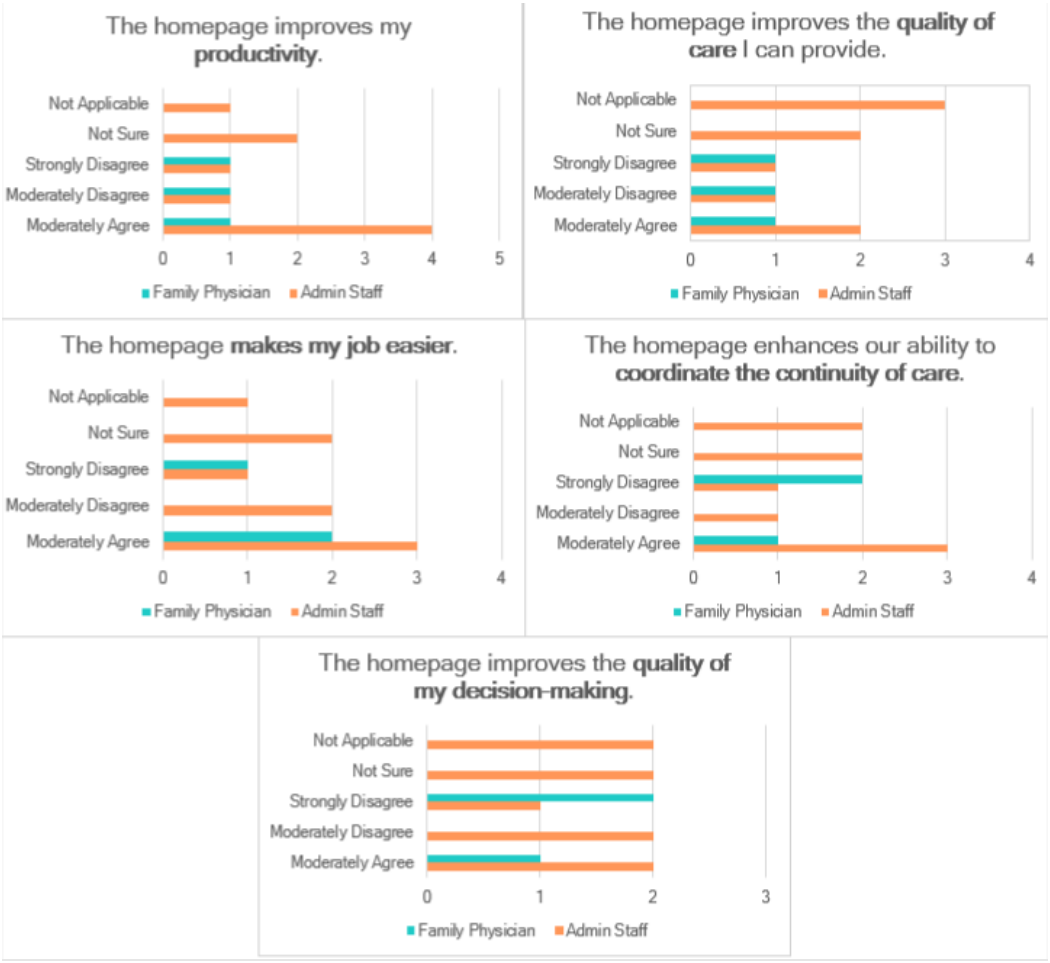

Figure 8. Distribution of responses to statements on Homepage impact. The figure shows that "moderately agree" was the most common response for statements on productivity and ease of job (41.67%, 5/12). Responses to the quality of care and decision-making statements were more varied, with "moderately agree" and "not applicable" each at 25% (3/12). For care coordination, 33.33% (4/12) of users "moderately agreed."

Next, users were asked how much their productivity increased or decreased due to the use of the Homepage and how much the quality of patient care provided increased or decreased due to the use of the Homepage. For these two questions, users were asked to rate on a scale of greatly increased, increased, did not change, decreased, greatly decreased, or not sure. These questions were adapted from the SUA survey tool. The distribution graphs from these two questions can be viewed in *Figure 9.*

Figure 9. Distribution of responses on changes in productivity and quality of patient care. The left graph shows that 83.33% (10/12) of users reported no change in productivity, with 8.33% (1/12) indicating an increase and 8.33% (1/12) expressing they were unsure. The right graph reveals that 75% (9/12) of users observed no change in the quality of patient care, while 8.33% (1/12) reported an increase, and 16.67% (2/12) were not sure.

Statistical tests completed for these questions include the Exact Test of Goodness of Fit (multinomial) and the Fisher's Exact test. The Exact Test of Goodness of Fit looks at the probability of getting a result like the observed data (Webb, 2023). The alternative hypothesis for this test states that there is a significant difference between the observed and expected distribution of responses within the survey questions (Webb, 2023). Conversely, Fisher's Exact Test is used to determine if there are non-random associations between two categorical variables (Webb, 2023). The hypotheses are framed around the independence of the two variables (Webb, 2023). The alternative hypothesis for this test states that there is an association between the type of user (admin or physician) and their responses to the statements posed within the survey questions. *Table 18* below includes a list of the survey questions and corresponding reference variables that further refer to the hypothesis test results shown in *Table 19*.

Table 18. *Survey questions and the corresponding short-form reference variable.*

Survey Question	Reference Variable
The Homepage improves my productivity.	*productivity
The Homepage improves the quality of care I can provide.	*quality
The Homepage makes my job easier.	*easier
The Homepage enhances our ability to coordinate the continuity of care.	*continuity
The Homepage improves the quality of my decision-making.	*decision-making
Please rate how much your productivity has increased or decreased due to the use of the Homepage.	*productivity rate
Please rate how much the quality of patient care you provide has increased or decreased due to the use of the Homepage.	*quality rate
*The reference variables were determined by pulling in key terms from the original questions.	

Table 19. *Hypothesis testing of survey questions involving nominal variables.*

Variable	Statistical Test	p-value
productivity	Exact Test of Goodness of Fit (multinomial)	0.543
productivity, *admin productivity, *physician productivity	Fisher's Exact Test	1
quality	Exact Test of Goodness of Fit (multinomial)	1
quality, *admin quality, *physician quality	Fisher's Exact Test	0.7545
easier	Exact Test of Goodness of Fit (multinomial)	0.543
easier, *admin easier, *physician easier	Fisher's Exact Test	1
continuity	Exact Test of Goodness of Fit (multinomial)	0.8155
continuity, *admin continuity, *physician continuity	Fisher's Exact Test	0.6273
decision-making	Exact Test of Goodness of Fit (multinomial)	1

decision-making, *admin decision-making, *physician decision-making	Fisher's Exact Test	0.4273
productivity rate	Exact Test of Goodness of Fit (multinomial)	0.004115
productivity rate, *admin productivity rate, *physician productivity rate	Fisher's Exact Test	1
quality rate	Exact Test of Goodness of Fit (multinomial)	0.03131
quality rate, *admin quality rate, *physician quality rate	Fisher's Exact Test	1
*The "admin" or "physician" added before some of the response variables represents that the original data associated with the corresponding question was split into responses by admin users and responses by physician users, respectively.		

As shown in *Table 19*, most statistical tests, except for two, yielded non-significant results. As previously mentioned, the small sample size (n=12) may limit the power of the tests to detect a difference, even if one exists. The first significant result (p=0.004115) was found for the question: "Please rate how much your productivity has increased or decreased due to the use of the Homepage." The second significant result (p=0.03131) was found for the question: "Please rate how much the quality of patient care you provide has increased or decreased due to the use of the Homepage."

For the first significant result, the p-value less than 0.05 indicates a significant difference between the observed and expected distribution of responses among the categories (greatly increased, increased, did not change, decreased, greatly decreased, or not sure) when participants rated whether their productivity increased or decreased due to Homepage use. Therefore, an additional post-hoc test was needed to determine whether each category deviated significantly from the expected number. We started by conducting an exact binomial test for each category compared to the sum of all other categories, as

per McDonald (2014). First, we compared the 10 “Did not change” responses to the remaining 2 non-“Did not change” responses against the expected 5:1 ratio. The p-value from this test is 1, which is above the significance level of 0.05, indicating that there are not significantly more “Did not change” responses than expected. Next, we compared the 1 “Increased” response to the remaining 11 non-“Increased” responses against the expected 11:1 ratio. The p-value from this test is 0.00000000001492, which is below the significance level of 0.05, indicating significantly fewer “Increased” responses than expected. However, since we conducted three tests simultaneously, we applied the Bonferroni correction, dividing the significance level (0.05) by the number of comparisons (3) to obtain a new significance level of 0.0167. The Bonferroni correction adjusts probability (p) values because of the increased risk of a type I error when making multiple statistical tests (Armstrong, 2014). Since 0.00000000001492 is smaller than the new significance level of 0.0167, we can confirm that there are significantly fewer “Increased” responses than expected. If we conduct another test comparing the “Not sure” to the non-“Not sure” responses, we expect to see the same p-value as when comparing the “Increased” responses. Therefore, we can also conclude that there are significantly fewer “Not sure” responses than expected. In conclusion, the test revealed significantly fewer observed “Increased” and “Not sure” responses in the data than expected.

For the second significant result, the p-value less than 0.05 indicates a significant difference between the observed and expected distribution of responses among the categories (greatly increased, increased, did not change, decreased, greatly decreased, or

not sure) when participants rated whether the quality of patient care provided increased or decreased due to Homepage use. Again, we conducted a post-hoc test to see how much each category deviated significantly from the expected number. First, we compared the 9 "Did not change" responses to the remaining 3 non-"Did not change" responses against the expected 3:1 ratio. The p-value from this test is 1, which is above the significance level of 0.05, indicating that there are not significantly more "Did not change" responses than expected. Next, we compared the 1 "Increased" response to the remaining 11 non-"Increased" responses against the expected 11:1 ratio. The p-value from this test is 0.00000000001492, which is below the significance level of 0.05, indicating significantly fewer "Increased" responses than expected. However, since we conducted three tests simultaneously, we applied the Bonferroni correction, dividing the significance level (0.05) by the number of comparisons (3) to obtain a new significance level of 0.0167. Since 0.00000000001492 is smaller than the new significance level of 0.0167, we can confirm that there are significantly fewer "Increased" responses than expected. Finally, we compared the 2 "Not sure" responses to the remaining 10 non-"Not sure" responses against the expected 5:1 ratio. The p-value from this test is 0.000000786, which is below the significance level of 0.05, indicating significantly fewer "Not sure" responses than expected. Since 0.000000786 is smaller than the new significance level of 0.0167, we can confirm that there are significantly fewer "Not sure" responses than expected. In conclusion, the test reveals significantly fewer observed "Increased" and "Not sure" responses in the data than expected.

3.3.3 Most Used and Least Used Widgets

The remaining quantitative survey questions are not included in the SUA. In this part of the survey, participants were asked to select which widgets on the Homepage they used the most or used the least. They were limited to selecting a maximum of two options. The widget options included: Today's Overview, Public Health Feed, Referrals, Photo, Inventory, Shortcuts, Your Stats, and Bulletin Board. The distribution of responses can be viewed in *Figure 10.*

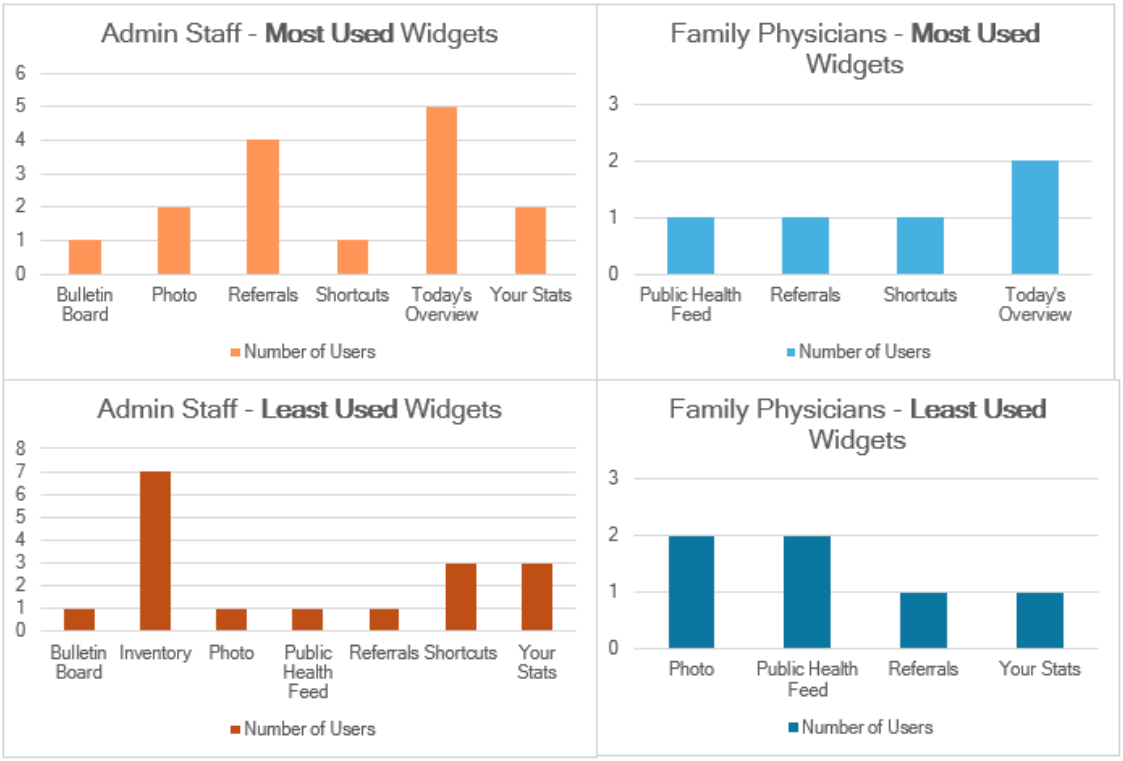

Figure 10. Distribution of responses to the most used and least used widgets. The responses do not add up to 12 as users could select up to two responses.

As shown in *Figure 10*, among administrative users, the most used widgets are Today's Overview (5/15), followed by Referrals (4/15), with Photo (2/15), Your Stats (2/15), Bulletin Board (1/15), and Shortcuts (1/15) each receiving fewer selections. The least used widgets include Inventory (7/17), Shortcuts (3/17), and Your Stats (3/17). For

family physicians, the most used widgets are Today's Overview (2/5), with Public Health Feed (1/5), Referrals (1/5), and Shortcuts (1/5). The least used widgets among physicians, shown in the bottom left graph, include both Photo (2/6) and Public Health Feed (2/6), followed by both referrals (1/6) and Your Stats (1/6).

After answering the most used and least used widgets questions, users were also given the option to expand on their choices through a free text-based question. The question asked participants to explain why or why they do not use certain widgets based on their responses to the previous questions. Survey respondents 1, 2, 5, 9, and 10 all expressed a level of dissatisfaction with the current widgets available in the CHR. R1, a clinic manager, mentioned that they "do not use inventory or referrals in the CHR," indicating that the corresponding Inventory and Referrals widgets introduced on the Homepage would also be unused. R2, another clinic manager, expressed frustration as they experienced a technical issue where the number of urgent messages shown in the Shortcuts widget was incorrect, "Showing I have 49 but I have none. This causes an unnecessary sense of panic." A family physician user, R5, found that the Your Stats widget did not include any helpful information and was "not able to tailor to my practice, referrals [widget] too general - would be helpful [if] could just see my outgoing referrals." R9 and R10, family physician and admin staff users, respectively, thought that none of the widgets on the Homepage were helpful to them and that they rarely looked at the Homepage. R9 distinctly said, "It [the Homepage] does not add any value to my day or workflow." R12, a family physician user, had nothing positive or negative to add about

the widgets, “We have honestly not had enough time to personalize and really utilize the features of the Homepage. Just been too busy to put any focus on it."

Statistical tests completed for these questions also include the Exact Test of Goodness of Fit (multinomial) and Fisher’s Exact test, as the responses also involve a nominal scale. The alternative hypothesis for the Exact Test of Goodness of Fit tests states that there is a significant difference between the observed and expected distribution of responses within the survey questions. Additionally, the alternative hypothesis for the Fisher’s Exact tests states that there is an association between the type of user (admin or physician) and their responses to the statements posed within the survey questions. *Table 20* shows the results of the tests.

Table 20. *Statistical analysis of survey responses on most and least used Homepage widgets.*

Survey Question	**Response Variable**	**Statistical Test**	**p-value**
Which widgets on the Homepage do you use the **most**? Please select a maximum of two options.	most_used	Exact Test of Goodness of Fit (multinomial)	0.2037
Same as the cell directly above.	most_used, *admin_most_used, *physician_most_used	Fisher’s Exact Test	0.6749
Which widgets on the Homepage do you use the **least**? Please select a maximum of two options.	least_used	Exact Test of Goodness of Fit (multinomial)	0.442

Same as the cell directly above.	least_used, *admin_least_used, *physician_least_used	Fisher's Exact Test	0.07894
*The "admin_" or "physician_" added before the response variable represents that the original data associated with the corresponding question was split into responses by admin users and responses by physician users, respectively.			

As shown in *Table 20*, all the results have p-values greater than 0.05 and thus indicate insignificant results. However, it should be noted that the Fisher's Exact test conducted on the least used widgets question, comparing admin and physician users, yielded a p-value of 0.07894. While it still fails to reject the null hypothesis and shows there is no significance between the admin and physician values due to a p-value greater than 0.05, it is relatively "close enough" where there may be a statistically significant association between the least used admin widgets and the least used physician widgets. The small sample size is potentially hiding a result that may be significant, leading to a type II error (Nayak, 2010).

3.3.5 Homepage Likes, Dislikes, Suggestions, and Additional Comments

The survey ended with a few additional open-text response questions. These were optional questions where users were asked what they liked/disliked about the Homepage, if there were any improvements to suggest, and if they had any additional comments.

3.3.5.1 What do you like about the Homepage?

Three participants responded to this question. R1 who is a clinic manager, R5 a family physician, and R12 a family physician. R1 sees that the Homepage has potential "to enhance communication in our clinic, however the way it is currently set up does not

enhance communication." Their later response to the improvements question shows what R1 recommends to improve communication. R5 likes the layout of the Homepage and highlights specific features of the Homepage, such as the "visit types and number of patients booked," which can be seen in Today's Overview, the Photo, and the Bulletin Board widgets. Similar to their response to the optional follow-up to the free-text most/least used widgets, R12 says, "Looks like it will have some benefits - I really do like that it is one place to bring a bunch of information together for our team. Unfortunately, we have had zero time to focus or play around with it."

3.3.5.2 What do you dislike about the Homepage?

The main points of dissatisfaction with the Homepage came from three administrative and one family physician users and were primarily centred on the relevancy of the widgets and the accuracy of the information displayed. R1 noted that the widget options were not helpful for their clinic, and "our practitioners do not use it." R2 said "incorrect info" and R5 said they could not tailor the Homepage to their practice. The final response in this section is from R10, who said that they do not use any of the available widgets, so the Homepage was deemed "useless" in their case.

3.3.5.3 What improvements would you suggest?

Suggested improvements came from two family physicians and two administrative users. A suggestion by R1 was to transform the Homepage into a communication board with sections for important announcements, resources, and

notifications. This would enhance communication within the clinic and provide a centralized place for referencing important information. R1 states,

> *"The Homepage would be put to much better use in our clinic if it was used as a communication board. If there were a section for important announcements that notified all team members, if there were a section for resources where we could link our clinic-specific information for reference, and if the bulletin board offered notifications as well, since no one will check the Homepage if they aren't notified that there is something new on it."* - R1

Another suggestion by R5 was to allow the removal of widgets and offer different options in the Your Stats widget, such as population health metrics. R10 wanted to give clinic managers the ability to toggle what widgets are available on the Homepage and just wanted to increase the availability of widgets "that our clinic would benefit from, then I think the home page would be beneficial." They did not specify what those widgets were in the survey. However, since they also participated in the interview portion of the study, refer to *section 3.2.3.3* above for examples of other widget options. R9 expressed their frustrations by stating, "I am frustrated CHR spent time creating this Homepage when there are many other clinical areas that are in need of improvement (such as prenatal forms, chart printing issues from our migrated data)."

3.3.5.4 Do you have any additional comments?

Additional comments included frustration that time was spent on creating the Homepage when there remain other clinical areas in the CHR that need improvement, such as prenatal forms and chart printing issues. Refer to the previous section for comments by R9. Participant R10 mentioned that they would be interested in providing more feedback in a few months after having more time to explore the Homepage feature.

3.4 Interpreting Interview and Survey Results

The sections below compare the interview and survey results, examining the overlaps and where they diverge regarding key themes, insights, and user needs. First, there will be a discussion of the themes generated from the qualitative data followed by a quantitative analysis of end-user satisfaction. Next, the initial Homepage rating will be compared with the end-user satisfaction score. Finally, widget expectations and sentiments between admin staff and family physicians during both phases of the study will be compared.

3.4.1 Qualitative: Themes

To answer the original research question - *what are the user perceptions and satisfaction with the Homepage design of an EMR solution among clinical and administrative users in primary care settings in Canada* - pre-determined deductive themes included initial user perception and end-user satisfaction. Qualitative data from the interviews informed the initial user perception theme and the surveys informed the end-user satisfaction theme. Inductive themes that arose from the analysis of both interview and survey data include customization, burnout and workflow fatigue, communication and connection, unmet user needs, and visual appeal. The sections below explain how these themes were determined and include relevant user quotes.

3.4.1.1 Initial User Perception

Going back to the original definition, again, for the purposes of this study, initial user perception refers to the initial attitudes, beliefs, and expectations that individuals

hold before using the Homepage. This can be answered by looking at the findings from the interviews, which showed users the Homepage before actual use. The initial user perception can be further broken down in two ways: 1) by examining the overall initial perception of the Homepage, and 2) by analyzing the user's perceptions of individual widgets.

The overall initial user perceptions of the CHR Homepage were generally positive but mixed, with specific insights being revealed into how the Homepage could be seen as beneficial in practice and identifying areas for improvement. When asked to score the Homepage from zero to ten, the ratings ranged from a minimum of two to a maximum of ten. As shown in *Figure 6* above, 62% (8/13) of all users had an initial positive sentiment towards the Homepage, 23% (3/13) were neutral, and 15% (2/13) were negative. When we compare the sentiments by user type, 57.14% (4/7) of admin users had a positive initial perception of the Homepage, 14.29% (1/7) were neutral, and 28.57% (2/7) had negative sentiments. Among family physician users, 66.67% (4/6) were positive, and 33.33% had negative initial perceptions of the Homepage.

As shown in *Table 17,* Among the users with "positive" sentiments towards the Homepage, they mentioned that they found the Homepage to be useful, could see themselves using it, liked the format, and thought it was beneficial for organizing workflow and tasks. However, even among those who had positive sentiments, further critiques/improvements mentioned include the need for more individualization/customization, more personalized/actionable statistics, and recommended the addition of a billing widget. Others, despite the positive sentiments,

say they will not truly know the full value until it is integrated into their workflow and that it will take time to adjust to using it. Users with “neutral” sentiments towards the Homepage felt indifferent and frustrated that other CHR updates/feature requests were sidelined in favour of the Homepage. They requested more customization and more tailored widgets and features. Among users with "negative" sentiments about the CHR Homepage, their perceptions were that it lacked any practical utility, would not be used in its current state, and felt specific key features, such as communication or clinic management widgets, were missing.

During the Homepage walkthrough, users provided specific feedback related to the new widgets introduced on the Homepage. *Tables 10-17* summarize the widget feedback from interview participants. *Figure 3* displays the sentiments for both user types. The most popular widgets are the Bulletin Board (ten positive, two neutral, and one negative user sentiment) and Shortcuts (ten positive, one neutral, and two negative). The remaining widgets, from most to least popular, include the Public Health Feed (six positives, three neutral, and four negatives), Today’s Overview (six positives, two neutral, and five negatives), and Your Stats widgets (three positives, seven neutral, and two negatives. The least popular widgets appeared to be the Referrals (four positives, three neutral, and six negatives) and Inventory (one positive and six negatives) widgets.

The interviews revealed that admin users have the most positive sentiments towards the Bulletin Board widget and Shortcuts widget, with the Shortcuts widget having one more negative sentiment than the Bulletin Board, as shown in *Figure 4*. The Today’s Overview widget had the third-highest number of positive sentiments and the

third-highest number of negative sentiments, suggesting that the Today's Overview widget had a very mixed reception among admin users during the interview. This is followed by the Photo, Referrals, and Your Stats widgets, which had a mix of positive and negative sentiments. The least popular widgets among admin users included the Public Health Feed and the Inventory widget, with Inventory having the highest negative sentiments.

As seen in *Figure 5*, family physician users also rated the Shortcuts and Bulletin Board widgets very positively during the interviews, followed by the Public Health Feed, Photo, Today's Overview, Shortcuts, and Referrals widgets. The Referrals widget was the most negatively rated among physician users. Compared to admin users, physician users were more likely to rate the Referrals widget negatively but viewed the Public Health Feed more positively.

The initial user perceptions of the CHR Homepage and its widgets reveal a complex but overall positive reception, with important nuances based on user type and specific features. While most users expressed positive sentiments, indicating that they find the Homepage potentially useful, the need for further customization and personalized features was a recurring theme. Neutral sentiments often stemmed from indifference or frustration over unmet expectations, while negative sentiments highlighted concerns about the Homepage's practical utility in its current form. In terms of widgets, admin users tended to favour the Bulletin Board and Shortcuts widgets, reflecting a preference for tools that support streamlined communication and workflow. Family physicians,

while also positive about the Bulletin Board and Shortcuts, showed a stronger interest in the Public Health Feed but expressed dissatisfaction with the Referrals widget.

3.4.1.2 End-User Satisfaction

Connecting this back to the definition mentioned earlier, end-user satisfaction refers to the research participant's post-use evaluation of a product or feature based on the extent to which it meets or fails to meet their initial expectations (Zviran & Erlich, 2003). To understand end-user satisfaction, this can be addressed by looking at the findings from the survey, which showed how users felt about the Homepage four weeks after release. The qualitative end-user satisfaction thematic analysis is based on user responses to the open-ended free-text questions. These questions centred around what users liked/disliked about the Homepage, any improvements they would suggest, and if they had any additional comments.

Section 3.3.5 goes into further detail about the qualitative responses from the survey. Regarding some of the Homepage's positive aspects, some users, like R1 and R12, believe in its long-term potential, and R5 likes the layout. R1 believes it could enhance communication within their clinic; however, it does not do so in its current state. Similarly, R12 appreciates that it centralizes information for the team but that they haven't had enough time to interact with the Homepage. Aspects of the Homepage that users were dissatisfied with include the relevancy of the widgets, lack of customization, and perceived misallocation of resources. In terms of the relevancy of the widgets, users like R1 and R2 felt that the widget options were not helpful, with R2 specifically mentioning "incorrect info." R10 considers the Homepage "useless" as they do not use

any of the available widgets. With respect to customization, R5 and R10 express frustration over the inability to tailor the Homepage to their specific needs. R5 wants more customization options in the Your Stats widget, while R10 wishes for greater flexibility in choosing available widgets. Finally, some users, such as R9, are frustrated that time was spent on developing the Homepage when other clinical areas, like prenatal forms and chart printing, still need improvement.

To increase user satisfaction with the Homepage, improvements suggested by users include transforming the Homepage into a communication board and, as stated repeatedly, increasing customization. R1 suggests turning the Homepage into a communication board with sections for important announcements, resources, and notifications. This would enhance its utility as a central communication tool within the clinic. Users like R5 and R10 recommend allowing more flexibility in widget selection and the ability to customize widgets to better suit their clinic's needs.

While some recognize the Homepage's potential and appreciate certain features, the overall sentiment points to a need for improvement in relevance, accuracy, and customization. Users want the Homepage to align more with their specific needs and for the development focus to shift to more pressing clinical issues.

3.4.1.3 Customization

The most significant theme from the analysis was a strong desire for customization. Participants expressed a clear need for the ability to tailor the CHR Homepage to their specific requirements, with the ability to customize and personalize

contributing to the Homepage's appeal. The feedback presented by users emphasized the need for customization options in various widgets, such as the Top Header, Bulletin Board, Referrals, and Shortcuts. This flexibility allows users to tailor the system to their specific workflows and preferences, enhancing overall satisfaction and usability. Users appreciated the flexibility to add/remove widgets to suit their preferences. P9, a family physician, commented, "I think I like the widget concept that you can define what you want, and it sounds like even within each widget some there'll be some customizability, that I think will be good." Users also mentioned the desire to hide widgets or interface elements that are not relevant to their work. For example, some participants found the Top Header to be redundant and preferred the option to hide it. This ability to customize the visibility of elements ensures that the interface remains uncluttered and focused on the most important information was seen as important for some users. P10, a clinic manager and admin user states, "I think it's redundant to have the name of our location and our address and our phone number, our fax number. We're all well aware, so it's probably just taking up valuable space for something else." The ability to customize enhances the user experience by allowing individuals to tailor the Homepage to their specific needs and preferences.

However, customization is not just about personal preferences regarding individual widgets but also about optimizing the interface to better suit their professional roles and the unique needs of their clinics. Additionally, in conjunction with the theme of customization, there was a need for more actionable information. When physician user

P13 was asked about what additional widgets they would be interested in seeing on the Homepage, they mentioned they would like to see

> *"Quality measures that are actionable, that helps us. If you think about it like as a population health approach, right to and again speaking from a family physician like we are expected to take a population health approach, but we are not supported in taking, or even trained in taking population health approaches. So our EMRs, and this is something that I think vendors like overlook is... Is that the EMR guides us in our work so much. And I really think, should be leveraged to support high quality care. […] EMRs are not just, you know, a useful tool for a physician or a clinic, right? It is the way we practice. It dictates the care we provide and how we approach not the care we provide... but about how we interact with information, with patients, with each other, all of that. It influences so much, and not just being not just information getting. Right? Or not, just a repository for information."* -P13

As demonstrated in the quote above, P13 expressed a strong desire for actionable information customized to their needs rather than just displaying static data. This feedback demonstrates the critical role of EMRs in guiding daily clinical practice, not just as tools for information storage but as systems that actively support high-quality care. P13's perspective highlights the need for EMRs to evolve beyond their traditional roles and become integral components in the practice of population health, enabling physicians to better manage patient care through actionable insights and data. This evolution requires that EMR vendors and developers prioritize features that support the practical needs of healthcare providers, ensuring that the systems are not just repositories of information but active partners in delivering care. Another example is that in the Referrals widget, feedback is shown in *Table 11*, two physician users wanted alerts and triggers for follow-up actions rather than just a list of referrals. This stresses the importance of designing features that not only present information in a widget-style format on a Homepage but also facilitate decision-making and task management.

While some users emphasized the importance of having more stats and referral information readily available, others highlighted the need for a clean and minimal interface that only displays the most relevant widgets. The ability to add, remove, and rearrange widgets was frequently mentioned as a crucial feature that would significantly enhance the user experience. This flexibility would allow users to create a workspace that is efficient and personalized, which may improve their workflow and productivity. P2, a clinic manager and admin user, shared that

> *"If I could customize it to what my needs are, more stats, more referral stuff. If everybody could customize it in a way, what's best for their view, and what they need. Like how we customize other views in the system. Being able to adjust the Homepage according to our specific job demands would be awesome and would elevate the Homepage to a 10 for me."* - P2

The analysis also revealed distinct differences in the needs and preferences of users based on their roles within the clinic. These specific needs and preferences, dependent on user role, also impact what widgets individual users are interested in. Family physicians, for example, are primarily interested in widgets that provide patient scheduling information, such as the Today's Overview and specifically pointed out the patient appointment types, viewing scheduled breaks, and the first patient of the day as aspects of the widget that they liked. Some family physicians also found the Referral widget to be less helpful as looking at referrals is not part of their role. A family physician describes,

> *"I'm already seeing things that would be very helpful to me. Such as, I like the appointment type. I got the overview with the number of patients. I guess if I had blocked off time for a meeting it would be there as well like that kind of meeting time or something like that? And yeah, so I find that helpful first patient of the day, that's great. The referral section to me is probably not that useful as a family*

> *doctor. I'm not getting referrals, I'm only sending them out and I don't need to follow that. That's the admin function."* -P13

What is interesting to note is that the needs and preferences of "administrative" users seemed to vary the most, depending on what level or role they held in their clinic/organization. Medical receptionists require tools that facilitate administrative tasks and provide quick access to essential information. A clinic manager noted,

> *"I do like the [appointment] requests [in the Shortcut widget] because then you can deal with those quickly... Sometimes they can be forgotten when they just show up along the scheduling tab there, and because we have so many practitioners in that list... you're scrolling through quite a long list to see any requested appointments. So being able to see those at a quick glance and address them at a quick glance before the day begins for our reception team could be helpful.* -P10

Managers and clinic administrators expressed a need for high-level analytics and performance metrics that offer a comprehensive overview of clinic operations. A clinic manager states,

> *"So, I want to know from a big picture whether I have adequate staffing, you know how many patients are we seeing, how many prescriptions are we generating, how many X-rays are we or ultrasounds are we generating? I'd like to see something [...] without having to go into the analytics to be able to do all of that." -P8*

Moreover, the size of the clinic also seemed to play a significant role in determining the relevance of various Homepage features/widgets and preferred customization options. Solo practitioners and small clinics often have different needs than larger, multi-doctor practices. For example, in smaller clinics, the information displayed in the Top Header, such as the clinic name, address, and contact information, would be unnecessary as both the clinical and admin staff in the clinic would likely only be working in a single location and would already be aware of that information. In contrast, larger clinics with multiple

locations may benefit from seeing the Top Header and the Bulletin Board feature, as it could make it easier to communicate with multiple practitioners at once. An admin staff user comments,

> *"As far as location in that [Top Header], I think that this is like many things, being the solo practice, not having lots of locations. We do have our different clinicians and different schedule, but we're not dealing with like lots of doctors coming in and location is always here. So that kind of stuff doesn't really affect us, but I like that. [....] As long as that that is done in a meaningful way, I think the bulletin board will be great. And I think for larger clinics where there, you know there isn't as much sort of face-to-face interaction on a regular basis, I think that'll be like really important and that would be like someone's role to make sure that that's up to date."* -P3

Recognizing these differences, it is essential to design the Homepage with scalability in mind, providing customizations that can be easily adapted to both small and large clinic environments. Customization needs to account for personal preferences, optimize the interface to better suit professional roles, and account for clinic size.

3.4.1.4 Burnout & Workflow Fatigue

During the interviews and survey, participants commented on how the Homepage could affect or has affected their workload, workflow, efficiency, and productivity. Their responses revealed insights into the broader theme of burnout and workflow fatigue. On the positive side, a participant noted that seeing the number of patients treated or the ICD codes in the Your Stats widgets can be encouraging in moments of high burnout. A family physician says,

> *"Yeah, like you said, good to see maybe for some of us it's encouraging to see the number of people that we've treated or to get a reminder of what we see a lot of, especially in those moments of burnout and you realize, oh goodness, I've seen so many mental health codes."*-P5

However, a negative sentiment echoed by some users included being too busy to explore all features of the CHR due to patient volume, administrative tasks, and phone calls, which leaves little time to explore CHR features like the Homepage. A family physician user, P1, states, “There are large parts of the program I just haven't had a chance to explore, because I've been so busy.” Another family physician user, R12, comments “We have honestly not had enough time to personalize and really utilize the features of the Homepage. Just been too busy to put any focus on it...hope to give it more priority this summer.”

Another critical issue identified was email fatigue, where participants expressed frustration over the excessive number of emails from various sources, such as public health and professional organizations. Introducing the Public Health Feed widget on the Homepage could help to organize public health information in one designated place, reducing some of the clutter from inboxes. A family physician user highlights,

> *“To our professional e-mail, especially the public health things and well, I would say that we get several a week - some that you want to look at, and some you just don't have time to look at. Just having that there and if we could somehow get the public health feed into the system, so it takes it off our individual emails and into this widget. I think that would be great. [....] But then you're starting to, you know flood another area. I think adding you know other [Public Health] agencies and whatever - now you start to get the clutter and you know the turn off from, you know, here we go again - just too much info.” -P4*

However, integrating more information into the CHR without careful consideration could lead to information overload and clutter, diminishing its effectiveness. P9, another family physician, states, “The public health feed, I think it could be a good thing. Unless we're tuning it out because we are finding it's not relevant."

Additionally, one user mentioned feeling overwhelmed by the CHR's complexity and the volume of work they handle daily. This comment was made before the admin user, P3, had seen the Homepage. While not revealed in the survey, as they did not participate, it is possible that feelings of being overwhelmed may also influence how the Homepage is interacted with and perceived. They emphasized the need for an EMR that minimizes technical issues and is more efficient,

> "*I've been in specialty medicine as well as family medicine and basically... Honestly, I've become a lot more of, uh, helping the admins with phones and everything lately. It's really hard for me to kind of get away lately because of the volume that we're dealing with. We're very overwhelmed with patients, phones and everything. So I've really had to - a lot of my stuff on that have had to be pushed on the back burner. Stuff that I normally would be working on to kind of, you know, extra projects, even billing has been a struggle to get done. We've been really overwhelmed here. So it's hard to find time to also even do stuff like this because I needed [to do] so much as just answering phones and everything. So I've been at really had my hands in with the phones, checking in patients, and everything. Just extra support for them. So yeah, that's. That's me. Yeah, I mean it's, it's always been chaos. But what we're kind of facing this last year, and doesn't seem to be getting any better. It's just a pretty a real struggle. So we really look for an EMR that isn't giving us those extra technical issues."* -P3

A few users mention reducing the number of clicks and a desire for a more streamlined interface, as the current system is perceived as click-heavy. A physician user states,

> *"I mean, again, to get to certain parts of the of the interface of the software, it can be click heavy, so commonly used, you know, so unsigned encounters, I can find that by going into my analytics and running a report. I can also find it, I believe in my patient view, with the little eyeball that gives me, like my patient overview thing, but that's a few clicks to get to that. So I, off the top of my head, other places that require lots of clicks that I want to get to a lot... I'll have to get back to you. As we go along, maybe something will pop up, but again, reducing the number of clicks will be a plus for this product."* -P5

In terms of the survey findings, one admin user, R4, noted that they see the introduction of the Homepage to the CHR has "slowed system down." While the user did

not explicitly state how the system was slowed down, based on the context, it was assumed that the introduction of the Homepage introduced an additional click at login, which implies that the Homepage had a negative impact on their workflow.

3.4.1.5 Communication & Connection

The third theme looks at the potential impact of the new Homepage on communication and connection within clinics. The interviews and survey responses revealed the need for improved communication tools that integrate seamlessly with existing workflows. Two participants preferred integrating well-known third-party communication tools like WhatsApp and Microsoft Teams into the CHR, due to the limitations of the existing CHR chat function. For instance, a clinic manager, emphasized the efficiency of WhatsApp for clinic communication, suggesting that integrating such tools could enhance connectivity,

> *"The way our clinic currently functions it would, it wouldn't make a significant amount of difference because we are already connected outside the app. As is not very structured clinic in the terms of formal roles and things like that. So, you know we I look at it as one family and we have, you know, 50 people in, in our WhatsApp family group. [....] So it's just a lot more convenient, right? I would have to log in to CHR to talk to anybody. You're.... I could be, you know, "Hey, question for you. Do you do you want to have the clinic timings from 10-6?". Who's not going to be able to make it at you know, up to 6:00 on this particular day? So it becomes very boring to actually log in to CHR and send them an official chat request or whatever. Now if I... Or let's take a poll. OK. What is the next office party? What are we going to do? You know, it becomes very difficult to do that through the [CHR] chat."* -P8

The key widget on the Homepage designed for inter-clinic communication, the Bulletin Board, garnered mostly positive and a few negative reactions. While 10 out of 13 interview participants had positive sentiments with some users mentioning that they saw

the Bulletin Board as a valuable tool for enhancing team connection and reducing the reliance on email. A physician CHR user noted,

> *"I like the bulletin board in terms of the communication piece. I talk to about 23 docs and a bunch of other allied health professionals. Communication is, you know, a big piece. Let's say I'm too busy for emails, but I open up the EMR, it's there. So, I think it's good from a functional standpoint."* -P4

However, there were also some users who were skeptical about its effectiveness without proper usage and notifications. A clinic manager states

> *"So it has the potential to increase communication in the clinic setting... But the way it stands right now, it wouldn't help much with that. Especially with the bulletin board like, I can see the bulletin board still functioning as that use, if you had access to an important announcements that would actually send a notification. And resources. As it stands the way it is, I can't see myself using it a whole ton because there's no guarantee that people are actually going to look at it. Whereas when you send an inbox message. They have a notification every practitioner is going through their inbox, right? Everyone's receiving a notification, so it's much more likely to be read and reviewed."* -P10

The bulletin board was particularly appreciated for its potential to centralize important updates and foster a sense of community through engaging content. However, the success of this feature hinges on clear guidelines for its use and active participation from all team members. R1, who is also P10, comments,

> *"The Homepage would be put to much better use in our clinic if it was used as a communication board. If there were a section for important announcements that notified all team members, if there were a section for resources where we could link our clinic specific information for reference, and if the bulletin board offered notifications as well, since no one will check the Homepage if they aren't notified that there is something new on it. These changes would greatly enhance clinic communication as currently there is no good way to reference resources or information - right now we have created a fake patient called "practitioner announcements" where we link information such as specialist office closures or updates etc. If there were a clinic resource section we could reference all of these things on a communication page which would prove immensely helpful. Also since the chat was updated and we cannot include links, there is not a great way to reference other documents for our clinic. This could all be saved by making the*

Homepage a communication page that can be tailored to the specific needs of a clinic."

This quote demonstrates the role the Homepage could play in enhancing communication and connection within clinics by converting the Homepage into a communication board with sections for important announcements, resources, and notifications. This would enhance communication within the clinic, provide a centralized place for referencing important information, and streamline communication to improve clinic coordination and efficiency.

While the idea of centralizing internal communication within the CHR through the Bulletin Board widget is appealing, users have a clear preference for integrating familiar, third-party tools like WhatsApp and Microsoft Teams to overcome the limitations of the existing CHR chat function. The feedback also reveals a cautious optimism towards the Bulletin Board widget as a potential communication hub. Participants appreciate its ability to centralize updates and foster team cohesion, but its success depends on how it is implemented in their clinics. Without having a designated team member who continuously updates the widget, the Bulletin Board risks being overlooked. Overall, while the Homepage offers promising features for clinic communication, its ultimate effectiveness will depend on how well it integrates with existing workflows and whether it can encourage consistent use among all team members.

3.4.1.6 Unmet User Needs

Two participants consistently voiced their grievances with the CHR, highlighting specific features that have been requested for years but remain unaddressed. For instance, family physician user P1 expressed frustration over removing a useful fax feature that allowed quick and efficient communication. "There's like other stuff that I've been begging for, for three years. Instead, getting a new Homepage which I never asked for," they noted, emphasizing the disconnect between user needs and the updates being implemented. This sentiment was echoed by another user, a clinic manager, who discussed the lack of improvements to the existing CHR chat function, which no longer supports hyperlinks, thereby complicating internal communication,

> *"When we initially signed up for CHR, the chat function was much more useful, and I've given plenty of feedback on the chat function, and no updates have happened to it. We can no longer send links in the chat that include a hyperlink that you could just click on to go somewhere."* -P10

The same user commented on the perceived misalignment in the prioritization of updates. They felt that essential features and improvements that would significantly enhance their workflow and efficiency were being overlooked in favour of less critical updates, “It just feels like, why is this priority over other things much more important.” This frustration was further illustrated in the follow-up survey responses, where again, the same user expressed discontent over the prioritization of new features that did not address their immediate needs, such as the new home page, while critical areas of the CHR system remained unimproved. The unmet needs and past unaddressed feature requests impact users' daily workflows and efficiency and how the Homepage is viewed in terms of both user perception and user satisfaction. These grievances underscore a significant

disconnect between user needs and the CHR's update priorities. The frustration expressed by participants highlights the adverse effects of unaddressed feature requests on daily workflows, ultimately impacting overall user satisfaction and perception of the Homepage's value.

3.4.1.7 Visual Appeal

In total, seven interview participants and one survey participant made positive comments regarding the Homepage's visual appeal and layout. The participants noted the aesthetic and design elements of the CHR Homepage, and how this could contribute to a positive user experience. The visual appeal of the Homepage was frequently mentioned as a key strength. For instance, P4, a family physician user, noted, "First, it's pleasing to the eye. Second, it's functional. And I'm hearing that it can be individualized. Those are all the all the pluses, right? I think, you know, having a little bit of colour to your day is always good as well." P7, an MOA, mentioned, "The layout's very nice and everything's there. And then on the Today's Overview [widget], the diagrams are nice to look at." Moreover, R5, a family physician user, when asked what they like about the Homepage, commented "nice layout, visit types and number of patients booked [Today's Overview], Photo, Bulletin Board." While it was unclear if the Today's Overview, Photo, and Bulletin board widgets also contributed to the "nice layout" comment posted by R5, another user P6, a MOA admin staff user, describes how the arrangement of the widgets contributes to the visual of the Homepage,

> *"Just that it's so visual right in front of your face. Like I think you can miss things as much as you can now, because if you don't click into referrals, you don't actually see how many there are. If you don't click into your e-mail, you actually don't see. I mean, you'll see the little number, but it doesn't actually tell you if*

> *they're urgent or not so. So just those kind[s] of things, it's great to have that visual as soon as you log in to see what's happening."* -P6

The positive feedback about the Homepage's visual appeal and layout emphasizes its role in enhancing the user experience. Participants praised the aesthetic and functional aspects, noting that the design not only adds visual appeal but also contributes to the overall usability of the CHR, making essential information easily accessible. A favourable perception of the Homepage's design elements suggests that its visual strengths contribute to improved user perception and satisfaction.

3.4.2 Quantitative: End-User Satisfaction

The survey results indicated that most users were moderately satisfied, approximately 66.67%, with the new Homepage, as shown in *Figure 7*, while 16.67% were "neither satisfied nor dissatisfied," and 16.67% were "not satisfied at all." The user satisfaction ratings, being ordinal, were analyzed using the Mann-Whitney U test to compare the satisfaction levels between the two user types. This test revealed no statistically significant difference between the satisfaction scores of administrative staff and family physicians (p-value = 0.912). This suggests that any observed differences in satisfaction scores did not show a statistically significant difference between administrative staff and family physicians. A possible reason why there was no statistically significant difference between the two user types is that both may have had similar experiences with the new Homepage, mostly seen as moderately positive by most users. While the Homepage was well-received based on the survey findings, there are

areas for improvement, particularly regarding the relevance of certain widgets in user workflows.

Most users (83.33%) reported no change in their productivity due to the Homepage. Similarly, 75% reported no change in the quality of patient care provided. Only a small fraction noted any increase; those responses were significantly fewer than expected. Most statistical tests indicated non-significant results, likely due to the small sample size. However, two questions about productivity and quality of care showed significant differences in response distributions, indicating fewer "increased" and "not sure" responses than expected.

Overall, the most used widget among both user types included the “Today’s Overview,” with the least used being the “Inventory widget. The most used widgets among admin users included "Today’s Overview" and "Referrals," while the least used was "Inventory." Family physicians also frequently used "Today’s Overview" but found "Photo" and "Public Health Feed" the least useful. When users were asked what they liked or disliked about the Homepage, a few responded, saying that they appreciated the potential for improved communication and the layout of the Homepage. However, other users disliked the lack of relevant widgets and inaccurate information. Suggestions for improvement included transforming the Homepage into a communication board and allowing more widgets to be customized to their specific needs.

3.4.3 Quantitative: Comparing Before and After Homepage Ratings

Section 3.2.3.4 discusses rating the usefulness and utility of the Homepage based on initial user perceptions gathered from one-on-one interviews. The data collected in this question, although qualitative, also included numeric scores. A final statistical test was conducted to compare these initial perceptions, or before scores, with the user satisfaction scores, or after scores. The Wilcoxon signed-rank test was employed to compare the medians of non-normally distributed or ordinal data (Webb, 2023). Due to only eight participants being common between the interview and survey, the sample size for this test is n=8. The alternative hypothesis tested is that there is a difference between the paired scores before and after the Homepage release. *Table 21* below presents the results of the test.

Table 21. *Statistical analysis comparing before and after Homepage ratings*.

Alternative Hypothesis	**Statistical Test**	**p-value**	**Confidence Interval, 95%**
There is a difference between the paired scores before and after the Homepage release.	Wilcoxon signed rank test	0.2048	[-9.999942, 25.000043]
*The "before" refers to participant responses to the rating the usefulness/utility of the Homepage question asked in the one-on-one interviews (see *section 3.2.3.4*). The "after" refers to the responses collected in the Homepage user satisfaction question in the survey (see *section 3.3.1*).			

As shown in *Table 21*, we fail to reject the null hypothesis since the test reveals that the p-value (0. 2048) is greater than the 0.05 significance level. Therefore, there is not enough evidence to conclude that there is a significant difference between the before and after Homepage satisfaction scores, suggesting that the Homepage release might not have had a substantial impact on satisfaction. However, it's also important to consider the

small sample size (n=8), which might affect the power of the test to detect a significant difference.

The table below compares user ratings and satisfaction scores for the CHR system and the Homepage feature based on interviews and surveys.

Table 22. *Comparing Interview and Survey CHR and Homepage Scores and Ratings.*

Interview Alias	**Survey Alias**	**User Type**	**Interview: CHR Rating**	**Interview: Homepage Rating (Initial User Perception)**	**Survey: Homepage Score (End-User Satisfaction)**
P1	n/a	Physician	7	5	n/a
P2	R8	Admin	8	6	Moderately satisfied
P3	R12	Admin	6	9-10	Moderately satisfied
P4	n/a	Physician	8	9	n/a
P5	n/a	Physician	8	7-8	n/a
P6	R3	Admin	7-8	10	Moderately satisfied
P7	R10	Admin	6	3	Not satisfied at all
P8	n/a	Admin	5	7	n/a
P9	n/a	Physician	9	8	n/a
P10	R1	Admin	7-8	2	Not satisfied at all
P11	R11	Admin	7	9-10	Moderately satisfied
P12	R7	Physician	7.5-8	5	Moderately satisfied
P13	R5	Physician	8	8	Moderately satisfied
n/a	R2	Admin	n/a	n/a	Neither satisfied nor dissatisfied

n/a	R4	Admin	n/a	n/a	Moderately satisfied
n/a	R6	Admin	n/a	n/a	Moderately satisfied
n/a	R9	Physician	n/a	n/a	Neither satisfied nor dissatisfied
*The table compares the CHR and Homepage ratings from interviews and surveys. Ratings range from zero to ten for the interview CHR and Homepage initial perception levels and from “Not satisfied at all" to “Highly satisfied” for the survey end-user satisfaction scores.					

It is worth noting that both admin users, P7 and P11, who initially expressed negative sentiments towards the Homepage during the interviews, indicated in the survey that they were “not satisfied at all” with the Homepage post-use. This suggests that participants' initial perceptions of the Homepage had not changed from the initial point during the interview to four weeks after the Homepage’s launch in the survey. The admin and physician users who selected “neither satisfied nor dissatisfied” only took part in the survey and did not participate in the interview. Furthermore, all users who in the interview provided a usefulness/utility score ranging from five to ten, indicating a neutral or positive sentiment, rated the Homepage as "moderately satisfied" in the survey. Admin users P6 and P11 gave high Homepage ratings. They reported being moderately satisfied in the survey, which was interesting because even though these users initially rated the Homepage as a "10," they did not express being "highly satisfied" after four weeks. Based on the feedback, it appears that for most users who participated in the interview and survey, their initial perceptions of the Homepage did not change four weeks post-use, and in the cases of P6 and P11, they may have gone slightly down. Again, these findings are backed up by the results presented in *Table 21,* where the results of the Wilcoxon signed rank test concluded that there was not a statistically significant difference between

the before and after Homepage satisfaction scores, suggesting that the Homepage release might not have had a substantial impact on end-user satisfaction.

3.4.4 Comparing Widget Expectations & Sentiments in Interview and Survey Responses

This section examines users' expectations of the Homepage before and after their interaction with it. *Section 3.2.1.3* focuses on initial user expectations gathered through interviews before the Homepage walkthrough. *Section 3.2.2.11* discusses user sentiments about the widgets after the Homepage walkthrough, comparing which widgets were most and least popular. It explores differences in user feedback before and after interacting with the Homepage, highlighting how perceptions changed once users integrated the widgets into their workflows.

3.4.4.1 Before Homepage Walkthrough: Initial Expectations

Table 7 above summarizes the findings of the interview question "What do you want to see after logging in to the CHR?" and includes interview participants' landing page feature preferences. This question was notably asked before participants could see the Homepage. From most frequently requested features to least frequently requested, users want to see their schedule, inbox, combination of schedule and inbox, tasks and reminders, billing, analytics information, incomplete visits/pending encounters, and prenatal charts. Compared to what users received on the Homepage, some initial perceptions and expectations were met – but there were also gaps.

When it came to discussing what users wanted to see when they first logged in, it simply included being re-directed to already existing views in the CHR such as the Schedule, Inbox, Analytics module, Billing dashboard, tracking unsigned encounters (which can be done in Analytics, patient folders, Schedule dashboard, Visits dashboard, or the Practice Profile dashboard). During the interview, participants were told that the default landing page could be changed in Settings. Given the vast number of features and customization options in the CHR, just being given the knowledge that the landing page could be changed in the settings was helpful for some users.

One of the widgets on the Homepage that aligned with what users wanted to see includes the Today's Overview widget. In this widget, users saw an overview of the day's schedule, including the total number of patients, working hours and scheduled breaks, breakdown of patients by appointment type and presenting issue, information about the "first patient of the day," and more. A complete description of the Today's Overview widget can be viewed in *Table 1*. When compared to what users wanted to see, there appeared to be some overlap in this case. Regarding the survey results, this result was echoed as the most used widget amongst admin staff (5 users) and family physicians (2 users) was the Today's Overview widget.

Another aspect of the Homepage that aligned with what users wanted to see included the unsigned encounters shortcut. Before seeing the Homepage, one physician user expressed interest in viewing incomplete visits or pending encounters information. When physician users were shown the "unsigned encounters" Shortcut option, four out of the six physicians interviewed expressed interest in it and saw themselves using it, as

described in *Table 12*. What is interesting to note is that from the interviews, the Shortcuts had one of the highest overall positive sentiments among both user types (10/13), as shown in *Figure 3*. However, three admin users in the survey mentioned that the Shortcuts was the least used widget. Only one admin and one physician user noted that it was their most used widget, as described in *Figure 10*. The "unsigned encounters" shortcut is only available to Practitioner CHR users, so perhaps additional shortcut options for admin users still need to be explored. Suggestions on what to include can be found in *Table 12*.

A widget on the Homepage that appeared to be the most controversial and was mentioned in the least used survey question included the Your Stats widget. An Analytics module/dashboard already exists in the CHR, so the intention behind the Your Stats widget was not to replicate what already existed in the CHR but to include what the Product team called "nice-to-see statistics." However, some of the users did not see the value in the statistics that were being shown. Instead, they offered alternative statistics to view, with one admin saying that they did not want to see statistics on the Homepage at all – that there was already another place for it. During the interview portion, users described how, in the Your Stats widget, they wanted to see billing analytics, patient volumes, performance metrics, and other suggestions that can be viewed in *Table 13*. In *Figure 3*, most of the sentiments were neutral (7/13), and an equal number of users saw the widget as being positive (3/13) and negative (3/13). The users who provided neutral feedback thought the widget was interesting but unnecessary for their workflows, as summarized in *Table 13*. In *Figure 10*, when looking at the graphs for the most used and

least used widgets, two admins said the Your Stats widgets were most used, and three admins and one family physician said they were least used. Based on the users' perceptions and satisfaction, there appears to be a need for analytics on a Homepage. Still, more thought should be put into what types of statistics/analytics are displayed while allowing the option to customize and personalize what they want to see.

Landing page features/widgets that users wanted to see – but did not get to – include widgets related to the inbox, tasks & reminders, billing, and prenatal charts. This information has been taken to the TELUS Health Product team to inform future design iterations of the Homepage.

3.4.4.2 Post-Homepage Walkthrough: Widget Sentiments

The interview findings revealed user sentiments about the widgets, and the survey findings showed that certain widgets were the most and least used by different user types during the study. This usage data provides insight into which features were found most/least valuable and relevant to users. The most popular widgets during interviews included the Bulletin Board and Shortcuts, with the least popular being the Referrals and Inventory. During the surveys, the most used widgets included Today's Overview and Referrals, and the least used included Inventory and Your Stats.

Figure 10 shows that the Today's Overview widget was one of the most used features among both user types who responded to the survey. The CHR users appreciated its ability to provide a snapshot of their daily schedule, including appointments and presenting issues. It helped users quickly assess their day's workload and manage their

time effectively. Compared to the interviews, interview respondents had a more mixed distribution of sentiments, which shows that the initial perception of this widget became more positive once users started incorporating the widget into their workflows, especially among admin users.

The referrals widget was the second most used among administrative users in the survey. This is interesting as the Referrals widget had the second-highest negative sentiments during the interviews, as shown in *Figure 3*. However, as shown in *Figure 5*, most negative sentiments came from family physicians, who often delegate referral management to administrative staff. They do not find the referral widget as useful and think that specialist physicians may find it more helpful for their workflows. It was found to be less relevant among primary care physicians, as shown in the interview observations detailed in *Table 11*.

Consistently, in both the interviews and survey, the Inventory widget was the most negatively received among administrative staff CHR users, as shown in *Figures 1 and 6*. Amongst family physicians, the least used widgets include the Photo and Public Health Feed, with two physicians in each category mentioning that these widgets are used the least. Compared to the widget sentiments documented during the interviews, this was seen as odd and deviated from the initial perceptions of these widgets. No clear explanation was given for why physicians rated these widgets lower in the survey.

With respect to the Bulletin Board, the widget was generally well-received during the interviews, as shown in *Figure 3*. Participants appreciated its utility for internal

communication, with 10 out of 13 participants having positive sentiments towards it. However, when it came to the survey, it appeared the actual reception of the widget was underwhelming. In the most used widgets survey question, refer to *Figure 10*, only one out of nine admin users mentioned it as a most-used widget. Family physicians did not mention it as a most-used widget at all. For admin users, the Bulletin Board was mentioned by only one out of nine respondents as a least-used widget. Again, family physicians did not mention it as a least-used widget.

The Your Stats widget received mixed feedback during the interviews, as shown in *Figure 3*. Overall, it had the most neutral sentiments, seven out of 13, compared to all the other widgets. While some participants appreciated its functionality, others were indifferent or did not consider it particularly useful. In the survey results, as shown in *Figure 10*, the "Your Stats" widget had a moderate level of use, with some variation between admin users and family physicians. Among admin users, the "Your Stats" widget was mentioned as one of the most-used widgets by a small portion of respondents, though it was not a top contender. Two out of the nine admin respondents identified it as frequently used. However, among family physicians, three out of three said it was one of their most used widgets. Interview and survey feedback indicated that while the widget had potential value, it might not currently offer enough relevant information to justify its frequent use.

4 Discussion

4.1 Were User Expectations Met?

Users' expectations were partially met. While the initial user perception of the Homepage was generally positive (62%), as shown in Figure 6, after four weeks of using the Homepage, 66.67% of users, as shown in Figure 7, were only moderately satisfied. There was no significant improvement in end-user satisfaction scores after users integrated the Homepage into their workflows, as shown in *Table 21*. As per *section 3.4.2*, two users who initially rated the Homepage highly, giving a score of 9-10, did not report being "highly satisfied" after using it for four weeks, indicating a potential decline in satisfaction. Users appreciated some features, like the Today's Overview widget, but expressed frustration with the lack of customization and the perceived irrelevance of certain widgets. This suggests that while the Homepage met some initial expectations, there were also significant gaps that impacted overall satisfaction.

A theory that comes from the domains of social psychology and consumer research is the Expectation Disconfirmation Theory (EDT), where customer satisfaction is influenced by expectations, disconfirmation, and performance (Oliver, 1993). Disconfirmation refers to the difference between a customer's initial expectation and the actual observed performance (Elkhani & Bakri, 2012). Users in the study initially had varied expectations, some of which were unmet, leading to positive but moderate satisfaction levels. This aligns with the idea that when expectations are not fully met, satisfaction may decline (Oliver, 1993; Zhang & Chen, 2021). This theory could help

explain the satisfaction levels observed, especially when customization and the perceived relevancy of widgets were lacking.

Another theory or model that is widely used in social sciences includes the Technology Acceptance Model (TAM), which proposes that a user's willingness to accept a technology is dependent upon the perceived usefulness and the technology's perceived ease of use (Davis, 1989). A user's perception of ease of use and usefulness can influence their intention to use the technology and their attitudes toward it (Alsyouf et al., 2023). The dissatisfaction expressed could be linked to these constructs, suggesting that the Homepage did not fully meet users' perceived usefulness criteria.

Some themes that emphasize negative user perception and dissatisfaction will be further explored. These include the lack of customization, burnout and workflow fatigue, the need for better communication and connection tools, and unmet user needs. Additionally, we will explore themes that highlight positive perception and satisfaction, such as the potential for customization, increased communication and connection, and visual appeal. Due to the variability and mixed reception of some aspects of the Homepage, there is considerable overlap among the themes.

4.2 Identified Themes

Examining the interview and survey results, some common positive themes regarding the Homepage included the potential for customization, increased communication and connection, and visual appeal. Users valued the ability to customize the Homepage according to their specific needs. Adding, removing, or rearranging

widgets could allow users to tailor the interface to their preferences, enhancing the overall user experience described in *section 3.4.1.3*. In the interviews, when it came to the communication and connection theme, the Bulletin Board feature received positive feedback for its role in facilitating internal communication. As discussed in *section 3.4.1.5*, participants found it helpful to post important updates, reminders, and announcements, which helped keep all clinic staff informed and connected. The Homepage's visual appeal, including the general layout and design, described in further detail in *section 3.4.1.7*, added to its user-friendliness and made it intuitive to use. Users appreciated the clear organization and the easy accessibility of important information directly upon logging in.

Customization, burnout and workflow fatigue, communication and connection, and unmet user needs are also common negative themes in both the interview and survey. While customization was generally appreciated, participants desired even more options. For example, some suggestions were customizing the Top Header, adjusting font sizes and colours on the Bulletin Board, and having more control over the types of information displayed in various widgets. Most of the negative comments around burnout and workflow fatigue, as seen in *section 3.4.1.4*, involved concerns about how the Homepage could add an unnecessary click at the start of the day, contributing to click fatigue and interfering with where the user wants or needs to go. As described in the article by Rodriguez Torres et al. (2017), users are less likely to use and interact with an EMR if the system is perceived to be too click-heavy and if it results in “mouse click fatigue.” Other concerns include the Homepage being cluttered with irrelevant widgets or information

that is not needed by the user, being too busy to explore the Homepage, and not seeing its potential due to pre-existing busy workloads and feeling overwhelmed.

4.2.1 Customization

Positive, neutral, and negative feedback surrounding the Homepage all discuss customization and the need for more options. Literature that discusses customization in the context of EMR systems focuses on how more custom options grant users more control and authority, enabling a more tailored experience that meets individual needs and preferences (Baquero & Taylor, 2017). Other benefits of customization include improved user satisfaction, enhanced patient care, and flexibility (Sinsky et al., 2021). When EMRs are customized to align with user preferences and practices, it can lead to higher engagement and satisfaction – while also reducing burnout (Sinsky et al., 2021). Additionally, customization could help to enhance patient care by allowing clinicians to incorporate specific protocols that cater to individual patient circumstances.

However, some of the drawbacks of customization include increased complexity and a need for more support and training (Sinsky et al., 2021). Customization can lead to a more complex system that may be harder to navigate, potentially increasing the cognitive workload for clinicians (Sinksy et al., 2021). Moreover, the extra options introduced for the sake of customization will also require additional training for users to understand and find the options that work best for them – which can be both time-consuming and resource-intensive (Sinksy et al., 2021). While existing research focuses on EMRs overall, we could extend the findings to individual features in the EMR, such as

the Homepage. The benefits and drawbacks of EMR customizability are likely to be the same for individual EMR components as well.

4.2.2 Burnout & Workflow Fatigue

Positive aspects of this theme include that certain widgets, like "Your Stats," can offer a sense of accomplishment and encouragement, particularly during high-burnout periods. For instance, family physicians appreciated seeing the number of patients treated or frequently used ICD codes, which helped them reflect on their work positively. However, the research also uncovered significant challenges. Many users, particularly physicians, expressed that the high volume of patients, administrative tasks, and phone calls left them with little time to explore the CHR features, including the Homepage. This lack of time to engage with the system was a recurring theme, indicating that while the Homepage could be useful, its potential remains untapped due to overwhelming workloads. Unfortunately, some of the negative aspects of this theme align with the broader literature on burnout among healthcare professionals, where high cognitive load and complex systems contribute to stress and decreased efficiency (De Hert, 2020; Budd, 2023; Alobayli et al., 2023).

4.2.3 Communication & Connection

When discussing communication and connection, the key widget on the Homepage designed for inter-clinic communication, the Bulletin Board, garnered mostly positive but also some negative reactions. A clinic administrator pointed out that the bulletin board could be a great tool to improve clinic communication. However, they

emphasized that for it to be effective, someone in the clinic needs to be responsible for updating the board. Connecting this back to the Jensen & Bossen (2016) article discussed in the literature review, in the absence of dedicated individuals who are configuring and updating the tool/widget, the full benefits of it cannot be materialized, and it will simply take up unwanted space on a screen. Another admin user adds that the Bulletin Board could be improved by having everyone in the clinic receive notifications when new posts or changes are made to make everyone aware of the updates. Full participant comments can be seen in *sections 3.2.2.4 and 3.4.1.5*.

As discussed in *section 3.4.4.2*, the survey showed an underwhelming reception of the widget despite the Bulletin Board being generally well-received during the interviews. Research indicates that understanding and adopting new EMR features requires significant training (Boonstra et al., 2014). Given the constant changes in healthcare environments (Noteboom et al., 2017), users typically need time to adapt to and fully grasp updates in EMR systems (Huang et al., 2020). The discrepancy between the positive interview feedback and the underwhelming survey results may be attributed to a lack of awareness of the widget, the absence of designated individuals to manage it, or insufficient time for clinics to determine who should take on this responsibility.

4.2.4 Unmet User Needs

The participants who provided negative feedback on the Homepage were mostly critical of the Homepage's relevance and functionality. P7, who did not see themselves using the widgets, doubted the Homepage's usefulness and suggested adding a chat/inbox

widget for a quick preview of messages. P10 gave the Homepage the lowest rating, criticizing the lack of essential features and recommending incorporating external links for better clinic management, such as shared calendars and schedules. Both participants criticized the perceived misalignment between the updates being prioritized and the features they had repeatedly requested to enhance their workflows. The negative perceptions of the Homepage due to unmet needs can be linked to the TAM, which suggests that perceived usefulness is a critical determinant of technology acceptance (Davis, 1989; Alsyouf et al., 2023). When users perceive that updates do not address their core needs, their overall acceptance of the technology decreases, leading to lower satisfaction and potentially reduced usage. Additionally, unmet needs, such as those described by the participants, can disrupt workflows, increasing feelings of burnout and reducing efficiency (Budd, 2023).

4.2.5 Visual Appeal

Table 17 shows user ratings, why they gave the Homepage a particular rating, and what improvements could be made to the Homepage to increase their rating. The participants who rated the Homepage positively highlighted its usefulness and potential benefits. P3 and P6 gave the highest ratings, noting the Homepage's utility and significant contribution to workflow organization and task prioritization. P4 liked the overall format and layout of the Homepage, P9 and P5 acknowledged its usefulness, and P8, P11, and P13 also viewed the Homepage favourably. The positive feedback can be tied to the theme of visual appeal. Lazard et al. (2016) talk about how aesthetic evaluations are often made quickly and can significantly impact how users perceive the usability of the

interface. For healthcare professionals, a visually appealing design can enhance the user experience, making the system seem more intuitive and easier to navigate (Lazard et al., 2016).

4.3 Novelty of the Homepage in an EMR

The literature review indicated that the concept of a Homepage in EMRs has not been widely explored or utilized to its full potential. Most Homepage mentions in the literature were functional, focusing on specific tasks or providing clinical overviews rather than being a comprehensive, customizable "entry point" for users. Much of the literature was also focused on hospital care settings, with limited research on Homepages in outpatient primary care settings. The results of the literature review can be found above in *Table 2*.

Section 3.2.1.3 summarizes the findings of the interview, in which participants were asked about their past experiences and interactions with different EMR solutions to determine if they had encountered a Homepage-like feature in other systems. Most users (10 out of 13) could not remember the default landing page in those EMRs or if they had a Homepage-like functionality. The only exceptions were P&P Data Systems Inc. and Jonoke. Those who used P&P Data Systems Inc. and Jonoke remembered specific functionalities that served as entry points to other areas in the EMR or provided overview information. For instance, two participants recalled a "status screen" in the Jonoke system that provided an overview of tasks such as letters to do and lab results to review. However, this feature was not as comprehensive or customizable as the CHR Homepage,

which includes multiple widgets and personalized widgets. Participants with experience using various other EMR systems (e.g., PS Suite, Epic, MEDITECH EHR, Omnimed, AS400, Accuro, TELUS Wolf EMR, Oscar, Med Access, Connect Care, Sunrise Clinical Manager (SCM), Purkinje, Nightingale on Demand, and GlobeMed.) generally did not recall any feature like the Homepage introduced in the CHR system. This lack of recall suggests that the concept of a dedicated, customizable Homepage is not a common feature in the EMRs they had used previously.

Based on the research findings, it can be said that the concept of a "Homepage," as implemented in the TELUS Collaborative Health Record (CHR) system, represents a novel and unique feature not commonly found in other EMR systems previously used by the participants. Additionally, based on internal subject matter experts in TELUS Health who are familiar with the Canadian EMR landscape, there are components, features, and design elements in the CHR Homepage (photo widget, bulletin board, and the public health feed) that are not currently present in "Homepages" or landing pages in other EMRs. This gap underscores the novelty and potential impact of the CHR Homepage in streamlining workflows and enhancing user experience.

4.4 Lessons Learned & Proposed Recommendations

Table 23 outlines some key lessons learned or takeaways in response to the identified themes and proposed recommendations.

Table 23. *Key takeaways and recommendations.*

Key Takeaway	Recommendations

Customization is crucial: Users value the ability to personalize the Homepage to fit their specific workflow needs, and different user groups have different needs.	• Expand customization options and allow users to adjust settings based on clinic structure and role. • Need for more training and support • More research is needed on what customization options other user types (outside of admin staff and family physicians) need.
Burnout and workflow fatigue: The Homepage may contribute to burnout if it adds unnecessary clicks or irrelevant information.	• Minimize click fatigue by implementing an option to bypass the Homepage. • Provide training and support to help users understand options and minimize the potential for unnecessarily complex interfaces and increased workload fatigue.
Enhanced internal clinic communication: Users see the potential for the Bulletin Board widget to improve clinic communication, but they suggest further improvements.	• Transform the Homepage into a communication board with sections for announcements, resources, and notifications.
Unmet user needs: There is a gap between the features users want and those currently available on the Homepage.	• Conduct a thorough needs assessment to address unmet user needs.
Visual appeal: A well-organized and visually appealing interface enhances user satisfaction.	• Solicit regular feedback on visual design to ensure it aligns with user preferences.

A major takeaway is the significance of customization, which users value for personalizing the Homepage to fit their specific workflow needs. However, the current level of flexibility may not be sufficient for all users, indicating a need for more granular customization options. Expanding these features—such as allowing modifications to the Top Header, font sizes, and widget content—would enhance user control over the interface. Customization should also be adaptable to the diverse needs of different user

groups, including administrative staff and physicians. While this study focused on admin staff and family physicians, further research into the preferences of specialty physicians, nurse practitioners, and allied health professionals could provide additional insights. Environment-specific customization should also be developed, tailored to clinic structures (e.g., single vs. multiple locations), and role-based options for different user groups. Finally, effective use of customization options requires targeted training and support to ensure users can fully leverage these features and optimize their workflows. Users need clear guidance on how to leverage these features to optimize their workflows. Offering tailored training sessions will help users fully understand and utilize the available customization options, thereby maximizing the benefits of a personalized EMR Homepage experience.

Another important consideration is the potential for the Homepage to contribute to burnout and workflow fatigue, particularly if it adds unnecessary clicks or displays irrelevant information. The balance between offering helpful features and avoiding additional cognitive load is delicate, and failure to achieve this balance can result in user dissatisfaction and decreased efficiency. To address this, minimizing click fatigue by implementing an option to bypass the Homepage for those who prefer starting on a different screen could be beneficial. Additionally, providing training to help users navigate and customize their Homepage effectively so that they can understand the options available to them and minimize the potential for unnecessarily complex interfaces and increased workload fatigue.

While generally well-received as an internal communication tool, the Bulletin Board widget can be improved to be even more effective. To enhance communication within the clinic, users recommended converting the Homepage into a communication board with sections for important announcements, resources, and notifications, which could centralize and streamline communication within the clinic.

Furthermore, there is a significant gap between the features users want and those currently provided on the Homepage. This misalignment can decrease the Homepage's perceived usefulness and overall acceptance, leading to frustration and disengagement from the CHR system. To bridge this gap, conducting a thorough needs assessment to identify the most requested features and prioritize their development in future updates is crucial. Addressing these unmet needs will help align the Homepage with user expectations and increase its perceived usefulness.

Lastly, a visually appealing and well-organized interface plays a crucial role in enhancing user satisfaction. To ensure the interface meets users' needs and preferences, regularly soliciting feedback on the visual design is recommended. This feedback will help guide ongoing improvements and maintain high user satisfaction with the EMR's visual appeal.

4.5 Limitations

4.5.1 Reflexivity and Acknowledgement of Biases

During the study and at the time of writing, the TPI was employed by TELUS Health. This employment relationship inevitably shaped the analysis of the data. TELUS Health had certain expectations regarding the research, and these expectations, whether consciously or unconsciously, influenced the investigator's perspective. In keeping with the values of reflexive research and writing, it is essential to acknowledge that the creation of codes and themes was influenced by the investigator's preconceived notions, assumptions, and reflections. Themes do not passively emerge from the data; rather, the researcher plays an active role in developing and reporting these themes (Braun & Clarke, 2021). This reflexive approach recognizes that the researcher's background, including their employment with TELUS Health, impacts their interpretation of the data.

4.5.2 Sample Size

One of the primary limitations of this study is the survey sample size. To achieve a 95% confidence level with a 5% margin of error, the survey required at least 54 participants, according to the sample size calculations described in *section 2.3.2*. This was determined based on the information provided by CSMs at the time of recruitment, where 31 clinics were contacted to participate in the survey, with an expectation of recruiting at least one family physician and one administrative staff member from each clinic, resulting in a total population size of 62. Only participants from 10 clinics responded to the survey (n=12). In the end, we were unable to meet our original goals due to some unexpected challenges.

The first challenge included the lack of available or willing participants to take part in the research. One of the primary reasons for this goes back to the original systemic issues currently dominating healthcare – healthcare staff and provider burnout. During the interview, some participants admitted feeling busy/overwhelmed and lack of availability in their schedules. The lack of healthcare clinical and administrative staff availability, healthcare staff burnout, and coupled with the overall pervasive strain on the healthcare system (De Hert, 2020) are all factors that could have resulted in less interest and ability to participate in this research project. The second challenge we faced was the length of time it took to correspond with CSMs. CSMs themselves are very busy managing the accounts of CHR clients and may not be able to respond as quickly to recruitment requests. This relatively small sample size, with an uneven distribution among the two user types, has several implications regarding generalizability, capturing a range of diverse perspectives, statistical significance, and other biases.

The findings from this study may not be generalizable to all primary care settings in Canada or to all users of the TELUS Collaborative Health Record (CHR) system. The small sample size limits the ability to extrapolate the results to a broader population (Faber & Fonseca, 2014). When reaching out to CSMs for recruitment, it should be noted that CSMs only have access to 10% of the total CHR client base. This significantly restricts the pool and limits the variety of perspectives that can be collected. The participants who chose to participate in the study may have different characteristics or experiences compared to those who did not. A study by Mazor et al. (2002) notes that

even with random selection, it does not ensure that those who respond to a survey or participate in interviews also represent their respective populations.

Beyond low response rates, the systematic differences between respondents and nonrespondents also cause concern and lead to nonresponse bias (Halbesleben & Whitman, 2013). The potential nonresponse bias in this study could have influenced the findings, making them less representative of the entire user base. While the study aimed to capture a range of perspectives from both administrative staff and family physicians, the small number of participants may not fully represent the diversity of experiences and needs within these groups.

Moreover, important insights from other user roles, such as nurse practitioners, allied health professionals, or physicians from other specialties, could have also been missed. The limited sample size may not capture the full range of feedback, particularly for features that may be relevant to different types of users. For example, when comparing the conflicting findings from the interview and survey data, the mixed feedback on widgets like the Referrals might reveal more distinct and clear patterns with a larger and more diverse sample. Furthermore, with the limited number of participants, it is challenging to achieve statistical significance in quantitative analyses (Faber & Fonseca, 2014). This constraint limits the ability to draw robust conclusions about the impact of the new Homepage features based on statistical tests.

In interview-based usability research, the general rule of thumb is to recruit 5 people per user segment, where user segmentation is the practice of dividing groups

based on shared characteristics, needs, or status (Rosala, 2021). Given the resource limitations and the TELUS Health Product team's information on sample sizes in their other projects, a sample size of 13, with seven admin users and six physician users, seemed reasonable. This sample size was believed to be sufficient to achieve qualitative data saturation.

4.5.3 Burnout and Potential Lack of Interest

The pervasive strain on the healthcare system has contributed to significant levels of burnout among healthcare professionals (Gerteis et al., 2023; De Hert, 2020; Li et al., 2022; Monsalve-Reyes et al., 2018). This burnout could potentially influence the level of interest and engagement in participating in studies such as this one, which evaluates new features within an existing EMR system. Given the high levels of burnout that are inherently assumed, some healthcare professionals may have chosen not to participate in the survey. Due to time constraints and overwhelming workloads, those experiencing the most strain might be less inclined to engage in additional activities, such as research studies like this one. Engaging healthcare professionals in studies can be particularly challenging during times of systemic strain. Diehl et al. note that burnout can impact professional commitments and work engagement (2021). Participants may be less likely to want to talk to researchers working for EMR vendors for a single feature if they are already feeling burnout and feel that their time would be better spent elsewhere. Therefore, recruitment and sustained engagement are hindered when potential participants are dealing with high levels of stress and workload (Luna et al., 2023). This

situation may lead to a self-selection bias where those who are less affected or more interested in new EMR features are overrepresented in the study results (Nilsen et al., 2013).

Additionally, non-participation can skew the results, as the feedback might predominantly come from those who are less affected by burnout. Furthermore, individuals who lack interest in a specific feature may be less likely to participate in related surveys or studies. A study by Groves et al. (2004) examines how participant interest in the research topic influences survey participation decisions. There are different factors that play into whether someone decides to participate in a research study, which may include the importance of the research topic for the individual, whether the organization conducting the study is reputable, and the amount of the cash reward or type of incentive (Groves et al., 2024). A combination of all these factors could have played a role. It's crucial to consider whether the low participation was due to CHR users finding the Homepage topic or widgets irrelevant or not beneficial. This was mentioned by two admin users, R1 and R10, and one physician user, R9, who took part in the survey.

4.6 Future Research

Based on the findings from the current study, there are a few areas for future research. The first would be to investigate how the frequent updates and changes to the CHR system impact users' workflows and overall satisfaction. The CHR is an ever-evolving cloud-based EMR. Given the constant changes and updates to the system, it may be important to investigate how these changes impact users and what is being done

at an organizational level to address ongoing client training and support. Second, more research is needed to look at diverse user types or user groups in EMRs in general and what are the specific customization needs and preferences of different user groups within the healthcare setting. Understanding these preferences can guide the development of more tailored and user-centric features within EMR systems and how they impact users' workflow efficiency and satisfaction. Finally, it is important to conduct ongoing research to understand the long-term impact of the widgets on users, even months or years into the future, to gain further insights. A physician who took part in the survey mentioned that due to their busy schedule, they didn't feel they had enough time to engage with the Homepage and wished the survey had been sent out one to two months later. Due to time constraints on the research project, this wasn't possible. However, it may be beneficial for TELUS Health to conduct ongoing user research on this topic.

5 Conclusion

The overall impact of a Homepage in an EMR on clinical and administrative users working in primary care settings in Canada was generally positive. Most users were "moderately satisfied," and the Homepage was seen as potentially enhancing workflow efficiency, assisting in the prioritization of tasks, allowing for some level of personalization, and offering tools to assist with internal communication. Users appreciated the customization options and generally liked the layout and overall visual appeal. However, it was found that there remain areas for further improvement, particularly in providing more actionable information, expanding customization options, and addressing specific user needs that were highlighted during the study. Moreover,

statistical analysis shows that survey respondents who were also interviewed had similar satisfaction scores before and after the CHR Homepage release. This indicates that their initial perceptions did not change, and the release had no effect on end-user satisfaction.

Introducing a customizable Homepage in the TELUS Collaborative Health Record (CHR) system represents a novel feature that enhances the user experience compared to previous EMRs used by participants. The lack of similar features in other EMRs underscores the innovation and potential impact of the Homepage concept. By addressing the fragmented and often inefficient workflows in traditional EMRs, the CHR Homepage could still provide a centralized, user-friendly platform that caters to the diverse needs of primary care users, ultimately improving satisfaction and efficiency. However, the study's limitations, especially regarding sample size, must be addressed before this can be confirmed.

Our analysis highlights several areas where the product team at TELUS Health can focus their efforts to improve the Homepage. While most of the feedback received is qualitative and dependent on user input, it offers valuable insights that can lead to functional, workflow, and design improvements. The feedback suggests a strong desire for more extensive customization options, better integration of actionable information, and enhancements that further streamline daily tasks.

Given the research project's timeline constraints, the information gathered will be provided to the product team to inform design improvements. However, the TPI is unaware of the specific improvements or decisions that will be made. The product team

will consider user experience feedback and decide on enhancements based on the technical feasibility, engineering capacity, and commercial viability determined by TELUS Health. While the researcher has completed the analysis portion, the ultimate decision on utilizing this information rests with the TELUS team.

In conclusion, the CHR Homepage has shown significant potential in improving user satisfaction and efficiency in primary care settings. The insights gained from this study provide a strong foundation for ongoing enhancements, ensuring that the Homepage continues to evolve in line with user needs and technological advancements. Future research should focus on refining these features and exploring additional ways to support primary care healthcare professionals in their roles.

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Appendix 1: Interview Guide

Welcome, Preamble, and Verbal Consent

Thank you for agreeing to participate in this study which is looking at the impact of a customizable Homepage in an electronic medical record.

Our goal is to understand your current experience of when you first log in to the CHR and explore how the introduction of this new feature, called the Homepage, might alter that experience. We will start by first discussing your current CHR experience, I will then be guiding you through a walkthrough of the Homepage, gather your thoughts on the CHR Homepage, and assess your overall satisfaction with the new feature.

As mentioned in the email, I am Sukhman Tamber, an eHealth master's student from McMaster University, working with the TELUS Health Product team on this research project. Dr. Puneet Seth is supervising this project, along with Dr. Cynthia Lokker and Dr. Teresa Chan from McMaster University.

This interview will take approximately one hour and will be audio and video recorded. If you prefer, you can participate in this interview via audio only by turning off your camera. Your privacy will be respected, and no information about you will be published or released without your permission. Any organizations or individuals mentioned will be de-identified in any reports. Your identity will remain anonymous, and your privacy will be protected during the follow-up questionnaire as well. That said, there is always a small risk of unforeseen incidents occurring which could make it possible to identify you, so we do caution against providing highly detailed accounts of any specific encounters that could be linked back to you, your team members, or your patients.

Also just to let you know - during the interview, you can skip questions or stop the interview at any time without providing a reason.

I'm now going to ask you some consent questions. I have [received/not received] your written consent form. However, I will also be confirming verbal consent as well.

We may contact you via email to confirm your responses and give you a chance to correct any misunderstandings. However, if you prefer not to be contacted again after this interview, that is also fine.

Do you agree to be contacted via email after this interview to review the post-interview analysis?

<Participant Responds>

May we contact you via email four weeks after your clinic has access to the Homepage to complete a questionnaire?

<Participant Responds>

Can you please verbally confirm your consent to being audio recorded?

<Participant Responds>

[If camera is on] -> And, please verbally confirm your consent to being video recorded.

<Participant Responds>

Alright. Do you have any questions for me before I turn on the recorder?

< Answer questions, if needed.>

Great. I'm turning on the recorder now.

Getting to Know the Participant

We will start with some questions about you and your role at your clinic.

1. What is your official job title or position?
2. How long have you worked in your current role at the clinic?
    a. Follow-up: How long have you worked in this role overall?
3. Which province or territory in Canada are you calling from? Is that where you live and work?
4. Can you briefly describe the type of clinical practice you work in? For example, is it a walk-in clinic, part of a family health team, or a family health organization, among others?

Thank you. I'll now be moving on to the next section where I will be asking you questions about your perceptions of the CHR and current usage.

SECTION 1: User Perceptions about EMR Landing Page(s) and Current/Past Experiences Around CHR Use

Just to reiterate, the purpose of today is to get a sense of what your experience is like after logging in to the CHR, and to explore how the introduction of the Homepage might alter that experience once it's implemented. While I'm open to hearing any comments you may have about other areas of the CHR, I want to highlight that our primary focus is on gathering insights related to the Homepage.

Now, I'm going to ask you questions about how you currently use the CHR and your perceptions around the CHR.

1. On a scale of 0-10, how satisfied are you with the current state of the CHR? (Where 0 = not at all satisfied, 5 = neutral, and 10 = most satisfied)
    a. Can you explain why you gave it that score?
2. When you log in to the CHR, can you recall what page you are automatically taken to? Which page first appears on your screen?

    < Participant responds>

    Alright! I'm now about to share my screen. I have two screens—one where I can see you and another with the prototypes. If you notice me looking around, it's because I'll be switching between the two screens. I apologize if this seems distracting, and I appreciate your understanding.

    [Show screengrab of patient list and where you can change the default landing page].

    Here, you can see that currently when you first log in to the CHR, it automatically directs you to "Patient List". However, this can be changed by going to settings > personal information > landing page.] Examples of other landing page options include patient list (default), inbox, outbox, settings, schedules, qnaires, referrals, and contacts.

    a. Follow-up: Were you aware you could change the default landing page to other places in the CHR?

3. The first screen you see after you log in to the CHR is called the landing page. How do you feel about the current landing page and its utility?
4. Have you used other electronic medical record or EMR solutions?
    a. If yes □ Do you remember what the default landing page looked like?
        i. If yes □ Can you describe how you felt about that default landing page?
        ii. If no □ move on to next question.
    b. If no □ move on to next question.
5. What is the first thing you want to see after you log in to the CHR?

That was the end of the first section. In the next section, we will walk you through the CHR Homepage, a new feature currently in the design and testing phases. The purpose of

the Homepage is to improve the user experience of when you first log in to the CHR. It will be a customizable and personalized landing page that provides a lighter start to your day, offers a high-level overview of your clinic schedule and key metrics, and delivers the latest updates from the field and your clinic.

SECTION 2: CHR Homepage Walkthrough

Now, let's begin the walkthrough of the Homepage. The Homepage serves as the landing page when you log in to the CHR. There are two versions of the Homepage: Staff view and Practitioner view. For the sake of time, I will be showing you the [Practitioner] view based on your role.

Before we proceed, I want to emphasize that we value your honest opinion and subjective feedback. Please feel free to provide your feedback without worrying about hurting our feelings. Our goal is to make the Homepage useful and valuable to you, so your honesty will help us identify areas for improvement.

The Homepage consists of multiple widgets. A widget is an element of a graphical user interface that displays information or provides a specific way to interact with a system or application.

Above the widgets, the top header displays the clinic name, the date and time, clinic address, phone and fax numbers. Right next to the name, you also see a good morning/afternoon/evening message and the current temperature.

Before I continue with my description of the Homepage, what do you think about the top header? (What is your first impression? Any feedback or thoughts?)

< Participant Responds >

Thank you.

Right below the top header, in the top right corner of the screen, you will find a cog icon that allows you to customize which widgets you want to see. By default, all widgets are displayed. Additionally, the widgets have different sizes. If you choose to hide a specific widget, the remaining widgets will automatically resize to occupy the available space.

Here, we have an example of what an empty widget state with a minimal number of widgets may look like. Alternatively, you can leave the empty widget state blank or click on it to add a new widget.

During this walkthrough of the Homepage, I will describe each widget and its functionality. After presenting a widget, I will pause, allowing you time to share your thoughts and provide feedback before we proceed to the next widget.

Before I proceed, do you have any questions about the purpose of the Homepage, what is a widget, or anything else that I have discussed so far?

<Participant Responds >

Great! We will start with the Today's Overview widget.

[Refer to *Tables 1-3* for descriptions of widgets]

[After each widget description, pause to ask participants, "What are your thoughts regarding this widget?"]

We have now completed section 2. In the next section we are looking to get your initial thoughts about the Homepage.

SECTION 3: User Experience of the Homepage

Based on the walk-through provided, I'm now going to ask questions about your thoughts around the Homepage.

1. Now that we have looked at the widgets individually, I want to take a step back and ask – what was your overall impression of the Homepage?
2. What did you find most appealing about the Homepage?
3. Were there any aspects of the Homepage that you didn't like?
4. If you could add one more function or widget to the Homepage, what would it be?
    a. Follow-up: Why would this be valuable to you?
5. Thinking back to previous EMRs or other software solutions you have used in your clinic/practice, did it have any valuable Homepage features or widgets?
    a. Follow-up: If so, what was the widget and please explain why it was valuable to you?

Now, let's move on to the final section.

SECTION 4: User Satisfaction and Additional (?) Questions

1. On a scale of 0-10, how would you rate the overall usefulness of the Homepage based on what you've seen? (0 = not at all useful, 5 = neutral, and 10 = highly useful)?

    a. Follow-up: If not a 10 – What would be required for you to think that the Homepage is a 10?
2. What advantages do you see in using the Homepage, considering your role as a physician?
3. What disadvantages do you see in using the Homepage, again in the context of your role as a physician?

Closing

Before we part ways, do you have any closing thoughts with respect to the Homepage? Any final thoughts or questions?

<Participant Responds>

Thank you for your time and valuable input today. Your feedback will greatly contribute to the ongoing development of the TELUS CHR and my research as a student at McMaster University. As a reminder, we will be sending you a follow-up questionnaire via email four weeks after the Homepage has been enabled in your clinic. We will be in touch soon and I look forward to continuing our work together!

Appendix 2: Survey Questions

Consent Preamble

This research project is a joint effort between McMaster University and TELUS Health. The study is being conducted by Sukhman Tamber for her thesis project under the supervision of Dr. Puneet Seth. Additional co-investigators include Dr. Cynthia Lokker and Dr. Teresa Chan from McMaster University. Members of the research team on the TELUS side include Victoria Phan, Senior Project Manager and team lead for the Homepage Project, and Katie Hill, Senior Design Specialist.

You are invited to take part in this study on a new feature, the Homepage, in the Collaborative Health Record (CHR). The purpose of the study is to understand how adding a customized Homepage to the CHR can affect family doctors and administrative staff working in primary care. We are hoping to learn how you feel about the new Homepage feature, your experiences while using the Homepage, how it affects your overall experience of using the CHR, and whether you are satisfied with it.

Information from this study will be used in my thesis and may be used in journal articles, presentations, or books. Confidentiality will be respected in each of these contexts; we will not use your name or any information that would allow you to be identified.

The survey should take approximately 10 minutes to complete. For your time you will be entered into a draw for a chance to receive a $100 gift card. To learn more about this study, particularly in terms of any risks or harms associated with the study, how confidentiality and anonymity will be handled, withdrawal procedures, incentives that are promised, how to obtain information about the study's results, how to find helpful resources should any questions or tasks make you uncomfortable or upset etc., please read the Letter of Information.

If you wish to exit from the survey, please close the browser window.

To participate in this study, you must meet the criteria mentioned below.

1. Are you an existing CHR Client who has been actively using the TELUS Collaborative Health Record (CHR) system for a minimum of three months or more?
    - Yes
    - No
2. Are you one of the following: An administrative staff member holding an administrative role (e.g. medical office assistant, receptionist, office worker, clinic

manager, etc.) in a primary care clinic and has access to the CHR as a "Staff" user. OR A family physician/general practitioner that is actively involved in patient care in a primary care clinic and has access to the CHR as a "Practitioner" user.
    - Yes
    - No
3. Do you use the CHR for at least three or more days per week (on average)?
    - Yes
    - No

This study has been reviewed by the Hamilton Integrated Research Ethics Board (HiREB) and received ethics clearance under project #16877. The HiREB is responsible for ensuring that participants are informed of the risks associated with the research, and that participants are free to decide if participation is right for them. If you have any questions about your rights as a research participant, please call the Office of the Chair, HiREB, at 905.521.2100 x 42013.

Confirmation of Consent

If you haven't read the Letter of Information yet, click the link below to view and download it for your records: https://drive.google.com/file/d/1cVk-544E52-FvOx0nIZK2EDz8C2eM6MG/view?usp=sharing

1. Having read the consent preamble, participant criteria, and the Letter of Information, I understand that by clicking the "Yes" button below, I agree to take part in this study.
    - YES, I agree to participate in this study
    - NO, I do not agree to participate in this study.

End of Survey (if selected No on any of the questions from 1-4)

Thank you for your interest in this study. We acknowledge that you may either:

- Not meet the criteria
- Choose not to proceed.

To exit the survey, simply close the browser window. Your responses will not be collected or stored unless you click "Submit." Thank you for your understanding.

Please provide the following information:

1. Please enter your full name in the text box below (first and last name).
2. Enter your email address in the text box below (please use business email address).

3. Can you verify that you have access and have been able to use the Homepage for at least the last 2-3 weeks?
4. What is your profession?
    - Administrative support staff (e.g. medical office assistant, receptionist, office worker, clinic manager, etc.)
        - You selected "administrative support staff" in the previous question. Could you please provide more specific details about your role? For instance, are you a medical office assistant (MOA), receptionist, office worker, clinic manager, or do you hold another type of administrative position? This information will help us better understand your role within your clinic/organization.
    - General practitioner/family physician
    - Other
        - You selected "other" in the last question. Please specify your role/profession by entering your response in the text box below.
5. Approximately how many years of experience do you have in your profession? (Enter numerical values only.)
6. What type of clinical practice do you work in?
    - Community Health Centre
    - Family Health Centre
    - Family Health Team
    - Independent Practice
    - Integrated Health Network
    - Physician Integrated Network
    - Primary Care Health Unit
    - Walk-in Clinic
    - Other
        - You selected "other" in the last question. Specify what clinical practice type you work in by entering your response in the text box below. Please be as detailed as possible.
7. What province/territory do you work in?
8. In general, how satisfied are you with the Homepage? By “satisfied” we mean, the ease and functionality of the Homepage itself, the quality of the information given, and the quality of the services provided.
    - Highly satisfied
    - Moderately satisfied
    - Neither satisfied nor dissatisfied
    - Moderately dissatisfied

- Not satisfied at all

9. Please indicate your level of agreement or disagreement with each of the following statements below. [Response Options: Strongly Agree, Moderately Agree, Strongly Disagree, Not Sure, Not Applicable]
    - The Homepage improves my productivity.
    - The Homepage improves the quality of care I can provide.
    - The Homepage makes my job easier.
    - The Homepage enhances our ability to coordinate the continuity of care.
    - The Homepage improves the quality of my decision-making
10. Please rate how much your productivity has increased or decreased due to use of the Homepage:
    - Greatly increased
    - Increased
    - Did not change
    - Decreased
    - Greatly decreased
    - Not sure
11. Please rate how much the quality of patient care you provide has increased or decreased due to the use of the Homepage:
    - Greatly increased
    - Increased
    - Did not change
    - Decreased
    - Greatly decreased
    - Not sure
12. Which widgets on the Homepage do you use the most? Please select a maximum of two options. (Please note that [the image] you are currently seeing the Staff view of the Homepage.)
    - Today's Overview
    - Public Health Feed
    - Referrals
    - Photo
    - Inventory
    - Shortcuts
    - Your Stats
    - Bulletin Board

13. Which widgets on the Homepage do you use the least? Please select a maximum of two options. (Please note that [the image] you are currently seeing the Staff view of the Homepage.)
    - Today's Overview
    - Public Health Feed
    - Referrals
    - Photo
    - Inventory
    - Shortcuts
    - Your Stats
    - Bulletin Board
14. Optional. Please explain why or why not you use certain widgets, based on your responses to the previous questions. The available widgets on the Homepage are: Today's Overview, Public Health Feed, Referrals, Photo, Inventory, Shortcuts, Your Stats, Bulletin Board.
15. Optional. What do you like about the Homepage?
16. Optional. What do you dislike about the Homepage?
17. Optional. What improvements would you suggest?
18. Optional. Do you have any additional comments?

Thank you for participating! Just two final questions before we go...

1. I would like a summary of the study results sent to me via email.
    - Yes
    - No
2. I would like to enter into the draw for a chance to receive the $100 gift card.
    - Yes
    - No

Appendix 3: Reflexive Journal Entries

Reflections on Preparing for Interviews

For my eHealth thesis project, I researched what Homepages are and whether the concept of a "Homepage" exists in other EMRs. What I found most interesting is that, traditionally, EMRs are more functional and centred around performing administrative duties. I find myself contrasting this with the goals of TELUS and the Product Team, who focus on making the CHR Homepage acknowledge the user, emphasizing the human experience rather than just data entry.

Considering what I know about the Product Team's goals, my biggest concern is to what extent will I need to differentiate that from my own learnings, and how will that influence how I interact with the research and interpret the findings? As someone employed by TELUS, how I frame my questions will undoubtedly lead to specific biases that may be unavoidable.

I need to be careful and mindful of balancing the roles and responsibilities of a student researcher vs. being an employee of a company. To mitigate these biases, I have an independent thesis committee that isn't employed by TELUS overseeing the research. This committee provides an external perspective and ensures that my research remains objective and unbiased. Additionally, I plan to employ reflexivity and continuously reflect on my position and potential biases throughout the research process, documenting these reflections in my journal.

Reflecting on my First Interview

I had my first interview today, and I'm having some difficulty writing this entry. It's taking me a while to process and structure my thoughts coherently.

Being my first interview, I felt a little nervous, even though I already had two pilot interviews or "test runs." The participant was very friendly. However, I noticed that as a physician CHR user, they wanted to rush through some of the answers. I got the sense that they just wanted to "get on with the interview," which made me feel that I may have rushed through some of my questions as well. Although, it could have just been my own nervousness.

Other thoughts and observations are that I need to be more flexible and a better listener to ask better follow-up questions. I think I am too reliant on my "semi-structured" script.

While this ensures I cover all the necessary questions, it may prevent me from extracting the full potential of the data from the person I'm interviewing.

After reviewing the recording and transcript, I noticed I keep using a few of the same filler words. This was also observed during my pilot interviews. I need to be careful and mindful of that moving forward.

Some suggestions for me moving forward are planning and allowing for more flexibility. Perhaps identify what questions are essential/key, but also include follow-up prompts that allow for more in-depth conversation. Moreover, it might also help to focus on developing active listening skills. Another user researcher at TELUS suggested that I summarize the participant's words before moving on to the next question.

Reflecting on my Final Interview

I definitely feel like I have come a long way from my first interview. I feel much more comfortable asking follow-up questions at this stage and have learned to partially live with awkward pauses. This gives the participant time to provide additional details or share another perspective. There were times in the interviews where a participant would say, "Here's what I think about the widget," but upon further reflection, would also say, "Here's how my receptionist might think about it," or "Here's how the specialists might use it." I found these types of insights to be the most interesting.

Throughout the interviews, I have faced ongoing recruitment challenges. There were three instances where participants signed up but did not attend the interviews. I followed up with all three, and only one responded. I understand that various factors could be at play here: busy schedules, scheduling conflicts, loss of interest in the study, potential technical difficulties, etc. However, it's still pretty demoralizing when you're all prepped and ready to start an interview, and no one shows up. One of my assumptions about why some may sign up to participate and then not show up may be occupational burnout. Nevertheless, these are just my own assumptions and biases that I'm projecting based on the research that I'm doing, and it is hard to say for sure that occupation burnout is the true cause.

I have been speaking to my supervisor about ways to alter my approach, such as clearer communication in emails, sending out meeting reminders 24 hours before the interview and re-evaluating past communication to see if I was unclear. However, at the end of the day, sometimes things happen beyond our control, and you learn to take things in stride.

Even now, I don't think my interviewing skills are perfect. I have been going over the recordings, and the most torturous aspect is having to listen to my own voice and hear all the "umms," "so," and "you know" that I say every minute or so. It was worse initially, and I have noticed it decrease, but it hasn't completely disappeared. After transcription, I will be moving on to coding soon, and I'm already overwhelmed by the amount of data I will have to sift through.

Reflecting on Interview Coding

The biggest challenge for me was just the sheer volume of data. In the first few days of coding, I found myself taking multiple breaks and having to step away, just because I didn't know where to even begin. My solution for getting around this mental block was to find ways to break the data up into smaller and more manageable sections. For example, creating a table of just participant characteristics and grouping together comments by question. This was also the first time I had used the NVIVO software, and I underestimated how long it would take to figure out how to best use it.

My coding process so far has been to first identify passages of text that are linked by a common idea, categorize what is mentioned, and group together concepts. I found it helpful to look at what stage a specific line of text or participant response was given during the interview. For instance, was it before the Homepage was shown, during the Homepage walkthrough, or post-walkthrough? Next, I analyzed the codes based on user type to see if specific patterns emerged. Then, I examined which widgets or features participants referenced and determined if the text segment conveyed a positive, neutral, or negative sentiment.

Most of my coding was not done in a linear fashion, and I found myself switching back and forth between different ways of coding. I preferred to look at the transcripts one interview at a time for the first round of coding, and then in another round, go question by question for all participants at once. I have various documents with all 13 participant responses, organized by question, and complete transcripts. Having both formats helped me view the text in different ways and perspectives, and this assisted me in generating new codes.

Once I had my codes, 79 in total, I created a digital whiteboard and made a sticky note for each code. This helped me better visualize and group codes together, leading to the creation of themes.

Reflections About the Survey and Survey Coding

The survey was sent out four weeks after the Homepage was released. Just like in the interviews, recruitment challenges remain a concern. Currently, other CHR user research projects coincide with the CHR Homepage research. I have been advised to avoid contacting certain clients to prevent oversaturation of communication from TELUS. I have been working with a colleague to gain access to a client list, but permissions are needed, and given the limited time I have left with the company, it doesn't seem feasible at this stage.

Beyond the recruitment issues, I find the survey results and participant comments interesting. One participant described how their busy schedule prevented them from fully exploring the Homepage. They felt the four-week timeline was insufficient and wished they had an additional 1-2 months. Due to timeline constraints, extending the survey release was not possible. In hindsight, I now wish I had reviewed additional literature or conducted further investigation into what a more appropriate timeline would be. Users need time to learn about a new feature, understand how it works, determine if it can be successfully implemented in their workflow, and work with it before forming an opinion. Their thoughts could change drastically after one month, six months, or even up to a year – and I wish I had more time to investigate this.

I didn't have as much qualitative content in the surveys compared to the interviews. Only six out of the 12 participants responded to the optional open-text questions. Two factors may have influenced this limited response rate to the open-text questions. First, some participants might have felt constrained by time, especially given the busy schedules common in healthcare. Secondly, the survey format itself might not have been conducive to eliciting detailed qualitative feedback. Participants might have found it easier and quicker to respond to multiple-choice questions rather than typing out in-depth answers.

Reflecting on Writing

The writing process has been challenging, particularly for the results and discussion sections. I find myself least satisfied with these parts of the paper. I wanted to include all the observations and suggestions for improvement mentioned by participants in the study. However, the sheer volume of information, especially regarding the numerous widgets, makes it challenging to present everything within the recommended word count.

Initially, I attempted to use tables of "comment summaries" to condense the information. However, feedback indicated that this format might not be the most effective. Full quotes are preferred, as they better capture the participants' voices and provide a richer, more

authentic representation of their experiences. This approach makes sense, as this stays most true to the realist qualitative method chosen for this study, but it also adds to the challenge of staying within the word limit. My biggest concern is adhering to the page count while presenting a comprehensive and meaningful analysis. To address this, I am focusing on balancing the inclusion of detailed participant quotes with concise and relevant summaries. Additionally, I am considering grouping related quotes and observations, which may help streamline the presentation of findings while preserving the depth of participant data.

There have been moments when I have felt the urge to rush through the writing process to meet deadlines. However, I have had to remind myself that to truly understand and accurately depict the participants' experiences, it is essential to approach the writing thoughtfully and with care. It is important to take the time to analyze and present the data carefully.