OREGON HEALTH & SCIENCE UNIVERSITY

SCHOOL OF MEDICINE – GRADUATE STUDIES

Finding an Electronic Health Record System for Bridges Collaborative Care Clinic: A Preliminary Assessment of Requirements and Vendor Options

By

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A CAPSTONE

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IRB APPROVAL

The proposed activity in this capstone was reviewed by OHSU IRB board under ID STUDY00019776 and was determined to not be research involving human subjects. IRB review and approval was not required.

LIST OF ABBREVIATIONS

BCCC	Bridges Collaborative Care Clinic
CID	Clinical informatics department
EHR	Electronic health record
FCC	Free and charitable clinic
HIPAA	Health Insurance Portability and Accountability Act
LIP	Licensed independent practitioner
OCA	Off-campus authorization
OHSU	Oregon Health & Science University
OSU	Oregon State University
PAS	Patient access services
PSU	Portland State University
QI	Quality improvement
SaaS	Software as a service
SFRC	Student-run free clinic
SOM	School of Medicine
TPI	Transitions Project Inc.

ABSTRACT

Student-run free clinics (SRFC) are a subset of free and charitable clinics, which aim to provide healthcare services and resources to local underserved populations. Oregon Health & Science University (OHSU) joined a multi-institutional collaborative effort to establish Oregon's first SRFC. On October 7th, 2017, Bridges Collaborative Care Clinic (BCCC) was launched to provide low-barrier access to free healthcare and social services for vulnerable populations in the Portland metro area. BCCC is led by a volunteer base of inter-professional students who seek to develop skills in the healthcare arena while providing a much-needed service for the community, while under the supervision of faculty. Paper-based documentation has been used since the clinic's inception to record the provision of care, and they are attempting to implement an electronic health record (EHR) system in order to fully realize the documented benefits, such as continuity and coordination of care. Through online research and field research including observations, meetings, and interviews with OHSU and BCCC stakeholders, the nature of SRFCs are described, as well as BCCC and its history. This information was used to discern the clinic's unique constraints, considerations, and requirements for an EHR. At the time of writing, BCCC is pursuing full autonomy from OHSU, thus limiting the ability to create a full evaluation and selection matrix, but a preliminary exploration of vendor options is discussed. OHSU's Epic and athenahealth are currently being considered as EHR options since they entail charitable resources and meet BCCC's requirements. BCCC will need to decide their long-term route, so a complete needs assessment and vendor analysis can be performed to fully evaluate EHR options.

INTRODUCTION

Student-Run Free Clinics

Several models of clinics have emerged that provide free or charitable services, which form an important network of safety-net organizations across the country for individuals who are economically disadvantaged, uninsured, underinsured, or otherwise have limited access to facilities [1]. Utilizing volunteers, staff, or a mix, these clinics focus on providing healthcare care services, such as medical, dental, pharmacy, vision, and/or behavioral health [1]. Some clinics are completely free-of-charge, have sliding fees regardless of the ability of the patient to pay, or receive federal or state reimbursement [1]. Given the charitable nature, many have a 501(c)(3) tax-exempt status [1].

Like other free and charitable clinics, student-run free clinics (SRFC) are volunteer-based, pro bono healthcare clinics that aim to provide medical care to underserved populations [2]. While typically being an extension of academic medical universities, they are comprised of students in multidisciplinary healthcare fields, ranging from students providing direct patient care (student doctors, nurses, physician assistants, dentists) to others providing administrative (health management, public health, policy) and support services (pharmacy, social work, counseling) [2]. They provide an opportunity to enrich education with real-life experience under the purview of licensed practitioners, while also providing a safety net for patients who are uninsured, homeless, or otherwise have low income and limited access to healthcare [2].

The SRFCs have been filling a gap in patient access and coverage as evidenced by their growth in size and numbers. Although the amount of people covered by health insurance is at a historic high [3], the number of SRFCs around the nation has more than doubled in the past 9 years (both studies involved surveying Association of American Medical Colleges member institutions) [4]. Among these locations, they most frequently provide chronic disease management, specialty care, laboratory services, imaging, pharmaceuticals, and interdisciplinary services [4]. Limited research has been done showing the quality of care being provided; however, they have been shown to provide quality care in chronic conditions, such as hypertension and diabetes, as well as helping navigate access for mental health [4].

Although there is a multitude of free and charitable clinics scattered around Oregon, Bridges Collaborative Care Clinic (BCCC) is Oregon's first student-run free clinic (SRFC), which opened its doors in October of 2017. The charitable nature of these clinics limits financial resources, and as a result, EHRs can be cost-prohibitive compared to paper records. Thus, BCCC has been using paper records for documentation since initiation and currently continues to function this way.

Paper vs. Electronic Health Records

Overall, EHRs have the capability of improving several components surrounding the provision of healthcare, especially within populations who are underserved, including documentation, process measures, guideline adherence, outcome measures, and potentially the quality and efficiency of care [5]. However, EHRs can also have a negative effect on process and outcomes, so these should be regularly monitored and evaluated to ensure goals and expectations are being met [5]. Overall, these results reflect

more specifically on the fundamental differences between paper and EHR records, to which EHRs can facilitate the following [6]:

- Instant, simultaneous, and remote access to patient records
- Data security and back-up mechanisms to protect the unauthorized use and destruction of records
- Different ways to summarize, trend, and visualize data
- Reminders and clinical decision support, including screening and other preventive measures, which can enhance patient safety
- Clinical research and reporting

Most saliently, EHRs promote continuity and coordination of care: two concepts that are vital for promoting health outcomes, especially for those in at-risk demographics. According to the Agency for Healthcare Research and Quality (AHRQ), care coordination "…involves deliberately organizing patient care activities and sharing information among all of the participants concerned with a patient's care to achieve safer and more effective care [7]." Another similar concept is continuity of care, which focuses more on the quality of care over time [8]. In other words, both concepts encompass the idea of having the right information accessible to the right people, at the right place, and at the right time, to deliver high-quality and high-value healthcare. When operating on paper-based records, this becomes very difficult to achieve.

Furthermore, EHRs also help ensure compliance with state and federal laws when it comes to governance and standards. Per HIPAA, medical records need to be legible,

readily available, and stored properly to protect against loss, destruction, or unauthorized use [9]. The security measures that must be taken are described within three safeguards, including [9]:

1. Physical, e.g., limiting physical access to facilities and electronic media
2. Administrative, e.g., policies that dictate user access management with workforce training with management/evaluation processes
3. Technical, e.g., controls for access, audit, and integrity, as well as transmission security

In summary, moving from paper-based documentation to an EHR can allow multiple benefits [6] and has been shown to improve outcomes in environments such as SRFCs [5]. EHRs also help ensure proper security and confidentiality measures to protect patient information [9]. These points help demonstrate the value of pursuing an EHR in a SRFC but also highlight the considerations that must be taken to ensure technical and operational requirements are met when governing an EHR. These are integrated within the needs requirements and constraints discussed below.

Types of EHRs

There are several configuration options available when it comes to running an EHR system. In terms of hosting, these include:

- **Self-hosted:** The clinic has complete control over the servers and data, and is responsible for supplying and housing the hardware, maintaining the software and database, purchasing the EHR (unless it is open sourced),

and also performing maintenance tasks such as updates, backing up data, and protecting against various threats [10]. As a result, this option requires potentially more financial resources and technical expertise [10].

- **Outsourced:** This is similar to the self-hosted option; however, the servers are located in a data center, thus removing the need to buy and maintain the server and associated hardware [10]. The clinic still has control over the data, but will still need to purchase and maintain the EHR and necessary hardware, software, and network connection to access the EHR remotely [10]. There are more options for support and has more security against the threats of self-hosting, but there can be additional costs [10].

- **Software as a service (SaaS):** The EHR is cloud-based and customers pay a subscription, rather than licensing software [10]. There is less control over the data and customization options; however, this requires less infrastructure for hardware, software, and networks, and has fewer demands for local expertise [10]. Out of all options, this is potentially the lowest cost and most feasible for clinics with limited resources [10].

Past Projects

A literature search was performed to survey the field for any published material with similar aims, which yielded only a few manuscripts and one that was particularly relevant. However, none had focused discussion on the particular barriers sustained while considering EHR options, including that of the sponsoring organization, for a nascent

clinic that is multi-institutional since inception and while considering pursuing continued sponsorship vs full autonomy.

The thesis manuscript by Streeter underwent a similar process of detailing the challenges and requirements for implementing an EHR for seven paper-based UC Davis SRFCs [11]. Although the UC Davis Health System uses a comprehensive Epic installation, as stated by the author, it was not discussed as a viable option for the student clinics [11]. Similar to BCCC and SRFCs in general, the UC Davis clinics also had large constraints for budget and a frequently revolving base of student volunteers [11]. However, it appears that the UC Davis clinics were not multi-institutional from the outset, and the clinics had already reached independence at the time of writing [11], thus removing a complicating factor also addressed in this paper.

Furthermore, Streeter does well in outlining various lessons learned during the planning phase, which helped guide some of the methods used in this paper for field research. More specifically, Streeter emphasizes [11]:

- The importance to fit the EHR to the clinic
- Actually going to the clinic to observe and document workflow and requirements
- Having discussions with those actually performing the work, rather than just administrators and medical directors

These lessons reflect the greater need of being able to discern practical requirements for an EHR, not just the technical. Also, the cooperation and

communication with clinic leadership and volunteers helps create buy-in. Both of these factors are important in successfully choosing and implementing an EHR.

METHODS

Overview

This project took a pragmatic approach to discern the operational needs for an EHR. There is a multitude of guides available online that detail the process for implementing an EHR based on the experiences from the healthcare community at large. Many of these are based upon and created for clinics and healthcare organizations with traditional funding, staffing, and operations, rather than SRFCs. As a result, the guides contain many steps that are not germane to SRFCs and do not take into consideration the large financial and operational constraints that arise from limited and sporadic funding streams, as well as a continuously revolving staff of volunteers. The AMA STEPS Forward for Electronic Health Record (EHR) Software Selection and Purchase (https://edhub.ama-assn.org/steps-forward/module/2702748) was selected for its generally universal approach, and its simple and flexible procedure for outlining implementation steps.

Some modifications were made to the guide from its original form to fit the nature of BCCC with the final version listed below. Given the fact that the limited financial capabilities of BCCC will greatly influence the selection of a sustainable EHR vendor, what was originally step five (assess financial capabilities) was moved to what is currently listed as step three, thus displacing the following steps sequentially. This was decided because insecure financial streams will be BCCC's largest constraint and will limit the options when it comes to potential infrastructure configurations and EHR selection.

Additionally, at the time of writing this paper, BCCC remained stalled in the process of determining their status when it comes to autonomy (to become completely independent including liability coverage vs remaining an assumed entity of OHSU). Therefore, it was decided to forego creating a formal needs assessment document, which dramatically shifts criteria for each constraint depending on the route. Instead, a constraints assessment was performed to outline the largest considerations for EHR selection that are present regardless. Steps five (select an EHR vendor) and six (negotiate key contract terms) were omitted since the final selection and authorization of an EHR will rely on who ultimately holds autonomy and liability of BCCC.

1. Use resources to make an informed decision
    a. Seek help and guidance to make informed assessments and decisions about EHR selection and purchase, such as from similar clinics, colleagues, and local organizations.
2. Determine practice needs
    a. Determine needs by measuring the level of preparedness among staff and prioritizing practice needs.
3. Assess financial capabilities
    a. Assess financial capabilities to select a long-term sustainable EHR.
4. Determine EHR requirements

    a. Select the type of EHR software and technical configurations that will work best in the clinic based on level of preparedness, practice needs, constraints, and priorities.

5. Select an EHR vendor

    a. Explore potential vendors, arrange demonstrations, and obtain proposals to assess vendor capabilities and pricing to evaluate vendors to facilitate selection.

6. Negotiate key contract terms

    a. Seek legal aid to develop a negotiation strategy that takes into consideration clinic needs, standard contract terms, state and federal laws, and thresholds for walking away.

For the design of this project, the steps in this guide were separated in two phases:

- The Field Research phase, including: steps one (use resources to make an informed decision), two (determine practice needs), and three (assess financial capabilities).
- The Evaluation phase, including: step four (determine EHR requirements) and parts of step five (explore potential vendors).

Phase 1: Field Research

Use resources to make an informed decision, determine practice needs, and assess financial capabilities.

The methods in this phase took inspiration from the lessons learned and approach used by Streeter. In their dissertation, they noted the importance of observing and interviewing those who are actually performing the work in order to properly assess and fit the EHR to the clinic through observations, meetings, and interviews with appropriate stakeholders of the clinic. This project used the following combination of high-level forums for information gathering to help discern business and technical requirements for an EHR:

- **Observations:** Visually surveyed the clinic and shadowed volunteers to document clinical operations and procedures, workflows across roles, current and potential limitations such as for space and network infrastructure, any tools/hardware being used. Also took the opportunity to discuss with volunteers their experience, as well as any hopes or worries concerning an EHR.

- **BCCC Meetings:** Attended meetings with BCCC leadership to better understand the history and status quo of the clinic, such as current and projected operating numbers and baseline statistics, as well as the leadership structure and governance. Used the opportunities to discuss updates and present findings to the clinic, receive feedback, and promote buy-in for the EHR implementation process.

- **BCCC Survey:** Distributed a survey comprising of eight free-text questions (**Table 1**) to help quickly form a preliminary gauge of the clinic leadership's perception of current processes and readiness, opportunities, and challenges for an EHR. The survey, created using Google Forms and

distributed as an email link, was sent to the co-chairs of BCCC representing each operational function (team). Responses were collected and the information used to gain an understanding of assumptions, identify an EHR champion from the team to coordinate efforts, and to guide further questions in the other forums.

- **OHSU and BCCC Stakeholder Meetings:** Attended meetings between BCCC leadership and OHSU stakeholders to follow the conversations around OHSU's current governance and oversight of BCCC, the potential of BCCC becoming completely autonomous, and how these factors might affect the EHR implementation process.

- **OHSU Interviews:** Performed informal, semi-structured interviews (**Table 2**) with individual OHSU stakeholders across departments (such as clinical informatics, information technology, legal advice, etc.) to ask any follow up questions and about their involvement with BCCC, experience and role at OHSU, and any further insight on any considerations and barriers.

- **Vendor Discussions:** Reached out to potential vendors for information regarding their EHR, services, prices, and any charitable programs to support FCCs or SRFCs.

A running timeline document was maintained including all the information that was obtained either electronically (by email, instrument, or typed in real-time) or by

handwritten notes that were later typed and summarized. The salient information was later distilled and summarized to inform the results of this paper.

Table 1

Survey Questions for BCCC Leadership

Ref.	Questions
1	What is your name and which team do you represent?
2	What is currently working well with the paper-based charting system?
3	What is currently lacking with the paper-based charting system?
4	What would your ideal Electronic Health Record (EHR) be able to do?
5	Do you have any specific concerns or considerations for your team's use of an EHR?
6	What are your worries regarding the adoption of an EHR?
7	What would your team need for a successful EHR implementation?
8	Please provide the name and email of one person on your team who would be willing to champion the EHR for your team:

Table 2

Semi-Structured Questions for OHSU Stakeholder Interviews

Ref.	Questions
1	Tell me about your background and role here at OHSU?
2	What has been your involvement with BCCC, if any? If not, what do you know about BCCC?
3	From your role and perspective, what are the facilitators and barriers to implementing OHSU's Epic at BCCC while they are an entity of OHSU?
4	What are the facilitators and barriers to implementing OHSU's Epic at BCCC if they become completely autonomous from OHSU?
5	What about a third party EHR if BCCC remains an entity of OHSU?

Ref.	Questions
6	What about a third party EHR if BCCC becomes completely autonomous from OHSU?

Phase 2: Evaluation

Determine EHR requirements and explore potential vendors.

To effectively evaluate available EHR options and determine the best fit for BCCC taking into consideration all requirements and constraints, the information collected during the Field Research phase was distilled in several ways:

- **Workflow Mapping:** Used Microsoft Visio to map a swim lane process chart that depicts high-level duties and handoffs across roles from when the patient arrives to check out.
- **Constraints:** Categorized and described the largest impediments that should be considered when determining needs and exploring potential vendors.
- **EHR Requirements:** Organized and listed the most important baseline requirements and relevant features of an EHR regardless of long-term decision for autonomy.
- **Explore Potential Vendors:** Compared two preliminary vendor options, OHSU's Epic and athenahealth offered by the charitable program athenaGives, using the determined constraints. Typically vendors would be assessed and compared with an evaluation matrix that includes EHR

requirements, priorities, and constraints; however, given the transitional state of BCCC, a complete matrix cannot be completed, so EHR options were compared using just the constraints.

RESULTS

Phase 1: Field Research

From the period of December 19, 2017 to May 1, 2019 a total of 21 forums were held for gathering information. The timeline is outlined in **Table 3** and categorized by forum type, as well as the purpose. The counts for each type of forum are displayed in **Table 4**; the majority of which were BCCC meetings (8) and OHSU interviews (7).

The forums for information gathering with BCCC including three meetings with the quality improvement (QI) team, two with the steering committee, one with the Coalition of Community Health Clinics (CCHC, a local nonprofit that provider advocacy for FCCs), as well as attending an all-volunteer recruiting meeting, distributing a survey (1), and performing a day of observation (1). The survey was sent out December 29, 2017 and received responses from six out of seven team (**Table 5**) leads and with the exception of Dental.

For OHSU, seven interviews were held with representatives from fields including: three with the clinical informatics department (CID), one with information technology (IT), one with legal advice (LA), one with patient access services (PAS), and one with the school of medicine (SOM).

There were two meetings joining stakeholders from BCCC (co-chairs) and OHSU (CID, IT, LA, PAS, and SOM).

There were two meetings with the EHR vendor athenahealth.

These categories or numbers do not include any passive or informal communications, such as through email or phone, which were held on occasion to provide status updates to certain volunteers of BCCC or OHSU stakeholders.

Table 3

Timeline for Field Research

Date	Forum Type	Purpose
12/19/2017	BCCC Meeting: QI Team	Introductions; goal setting; preliminary planning.
12/29/2017	BCCC Survey	Gauge BCCC's perceptions on readiness, opportunities, and challenges for an EHR.
1/11/2018	BCCC Meeting: QI Team	Discuss preliminary findings for EHR options; plans for surveying EHR goals/needs.
1/31/2018	BCCC Meeting: Steering Committee	Present results of survey; discuss potential EHR options.
2/22/2018	BCCC Meeting: QI Team	Check in; prepare for meeting with OHSU.
3/1/2018	OHSU and BCCC Stakeholder Meeting	Discuss potential of Epic vs other vendor; plan of action.
3/8/2018	BCCC Meeting: All Volunteer	Open house for recruiting; state of affairs and future goals.
3/24/2018	BCCC Observation	Clinic walkthrough.
3/27/2018	OHSU Interview: CID	Follow up from walkthrough; discuss needs.
4/26/2018	OHSU and BCCC Stakeholder Meeting	Follow up from first meeting; plan of action.
5/11/2018	OHSU Interview: CID	Follow up questions from OHSU meeting; discuss 3rd part vendor options.
5/16/2018	OHSU Interview: IT	Discuss IT perspective of Epic vs 3rd party vendor.

Date	Forum Type	Purpose
5/16/2018	OHSU Interview: LA	Discuss legal perspective of Epic vs 3rd party vendor.
5/23/2018	Vendor Discussion	Discuss athenaGives program.
5/25/2018	OHSU Interview: PAS	Discuss patient access/registration perspective of Epic vs 3rd party vendor.
6/21/2018	OHSU Interview: SOM	Discuss BCCC history and relationship; SoM perspective of Epic vs 3rd party vendor.
9/17/2018	BCCC Meeting: CCHC	Discuss liability options offered by county.
11/26/2018	Vendor Discussion	Preliminary demo of athenahealth EHR.
11/30/2018	OHSU Interview: CID	Discuss athenahealth demo.
1/17/2019	OHSU and BCCC Stakeholder Meeting	Discuss options for liability/autonomy.
5/1/2019	BCCC Meeting: Steering Committee	Check in.

Table 4

Counts for each Meeting Type

Meeting Type	Count
BCCC Meetings (7), Survey (1), or Observation (1)	9
OHSU and BCCC Meetings	3
OHSU Interviews	7
Vendor Discussions	2
Total	**21**

Table 5

BCCC Operational Teams

Team Name
Marketing & Community Relations
Dental
Operations
Program Development
Quality Improvement
Resource Management
Training & Education

History.

BCCC, Oregon's first SRFC, originally launched through efforts by OHSU leadership, backed by growing interest for inter-disciplinary projects from faculty and students alike, which allowed for quick and easy buy-in to establish a SRFC. After scouting for local organizations that already have a footprint for serving those experiencing homelessness in Portland, a partnership was formed with TPI, a local non-profit organization that provides a broad array of services, resources, and tools for housing, social, and health services.

It was an early goal for BCCC to have a multi-institutional foundation, which would allow more inclusive and balanced inter-professional participation from other local students, clinicians, and healthcare/administrative leadership in the community. As a

result, local universities with which OHSU already has academic partnerships, Portland State University and Oregon State University, were engaged to effectively leverage the strengths from each. After two years of collaboration and planning, the first kick-off meeting was held in January of 2016 to start building the operational and oversight structures. Pursuant much hard work from those involved in the early stages, BCCC opened its doors in October of 2017.

Sponsorship.

Although the goal from the outset was full autonomy for BCCC to allow independence in long-term development, the easiest route to get started was for OHSU to provide initial sponsorship. In simple terms, this involved OHSU creating the "scaffolding" in which BCCC would grow and become established with the plan to later dismantle this scaffolding leaving BCCC as a full standing organization.

BCCC started out as an academic venture and assumed business entity of OHSU with affiliation agreements with TPI. Along with this, OHSU has an off-campus authorization (OCA) for their preceptors and for the students, which extends malpractice and liability insurance, and allows BCCC to operate as a rotation site for OHSU students. The students receive credits while volunteering as long as OHSU preceptors oversee this academic activity.

Initial start-up resources and funding has come from OHSU SOM, in addition to a renewable grant from the Bacon Endowment Fund, outside donations, and private in-kind donations. Since the clinic is completely charitable in the services provided, 501(c)(3)

non-profit status was eventually reached in September of 2018 and will allow a greater ability to raise independent funds.

BCCC is currently working with CCHC to explore the potential of obtaining liability insurance through Multnomah County to cover the preceptors and the students. Obtaining this would allow BCCC to become fully autonomous and pursue its original goal of becoming a multi-institutional clinic with equal representation from the participating universities and organizations. Autonomy would also allow full flexibility in accepting a range of volunteers from the community without being bound by OHSU's workforce processes and limitations, particularly the time it takes to credential, onboard, and train.

While offering county coverage for preceptors is viable, there is no precedent for offering student coverage. Furthermore, it would be difficult to totally remove OHSU's primary professional liability of their students and preceptors within any academic capacities, regardless of external options. Even if there were options available, OHSU would no longer be able to maintain their agreements allowing BCCC to serve as a rotation site, thus complicating the ability for students to obtain academic credit for their work. Currently, BCCC is still attempting to evaluate the best route that will serve their long-term goals.

Continuing the path to a full a needs assessment, vendor analysis, and EHR selection will hinge on BCCC's final decision. There are significantly different considerations depending on who will be the organization with final authority. OHSU may be willing to donate resources to help BCCC implement an EHR regardless of their decision to pursue autonomy, including hosting an instance of Epic or a third party EHR.

Leadership structure.

The Board of Directors is responsible for the strategic guidance and continuous support of BCCC. Members include representatives from each of the universities (OHSU, OSU, and PSU), as well as from TPI staff and those with lived experience with homelessness. This diverse representation is a unique asset to BCCC that ensures the growth and sustainability of participant-centered care. Four student leaders (co-chairs) representing the three universities oversee the operation of the clinic, which is supported by the work of the seven teams.

Current operations.

BCCC is currently operating in the TPI Clark Center Annex in Portland, Oregon. Half-day clinic sessions operate on a walk-in basis every other Saturday, and an average of 6-7 Clark Center participants are seen per session (**Table 6**). All care is provided free of charge. Two multi-purpose rooms at the Clark Center are set aside for this purpose. BCCC has a locked cabinet in one of these rooms to store supplies between sessions.

The student volunteers represent multidisciplinary fields from their respective universities (**Table 7**), and under the supervision of faculty and residents, they have so far been able to coordinate a variety of services such as direct health screenings, basic primary care, sub-urgent care, health education, medication management, and assistance with navigating and referring to other services and resources, all with the aim to bridging the gap to established primary care. As the infrastructure improves, they are operating every other Saturday with plans on expanding to other clinic locations and expanding their service offerings, such as health workshops, and basic dental cleanings and

procedures. They are also planning on opening more clinics at TPI locations, as well as offer more frequent clinics as resources permit (**Table 7**).

Table 6

Current and Projected Operational Numbers

Clinic Site	Session Frequency	LIPs per Session	Support per Session	Patients per Session	Yearly Visits
Clark Center	Every other Saturday	3	9	7	161
Willamette Center	Every 2 weeks*	3*	9*	7*	161*
Columbia Center	Every 2 weeks*	3*	9*	7*	161*
Bud Clark Commons Dental Clinic	Monthly*	1*	2*	9*	108*
				Total	***591****

Note. The clinic sites that are *italicized* were not yet open at the time of this paper. The asterisk (*) denotes projected frequencies or values. LIP, licensed independent practitioner, including medical, pharmacy and nursing preceptors at medical clinics, and the dental preceptor at the dental clinic. Support student users at medical clinics include triage, two navigators, nursing student, two medical provider students, pharmacy student, care coordinator, and clinic administrator; for the dental clinic includes dental or pre-dental student.

Table 7

Student and Preceptor Representation

Institution	Predominant Fields
OHSU	Medical, PA, dental, nursing, other pre-health undergrad/masters/PhD
OSU	Pharmacy, public health
PSU	Public health, community health, policy, social work, counseling
Preceptors	Faculty volunteers from OHSU, OSU, and PSU health programs, community experts in various fields from business to health programs

Phase 2: Evaluation

Workflow mapping.

The observation day was performed fairly soon after BCCC opened the clinic, so the clinic workflow was rather nascent. Overall, the steps (**Figure 1**) from patient check-in to discharge are rather fluid depending on the volunteers and resources readily available, but the process is similar to what can be found in a traditional ambulatory clinic. The most notable observations and associated concerns include:

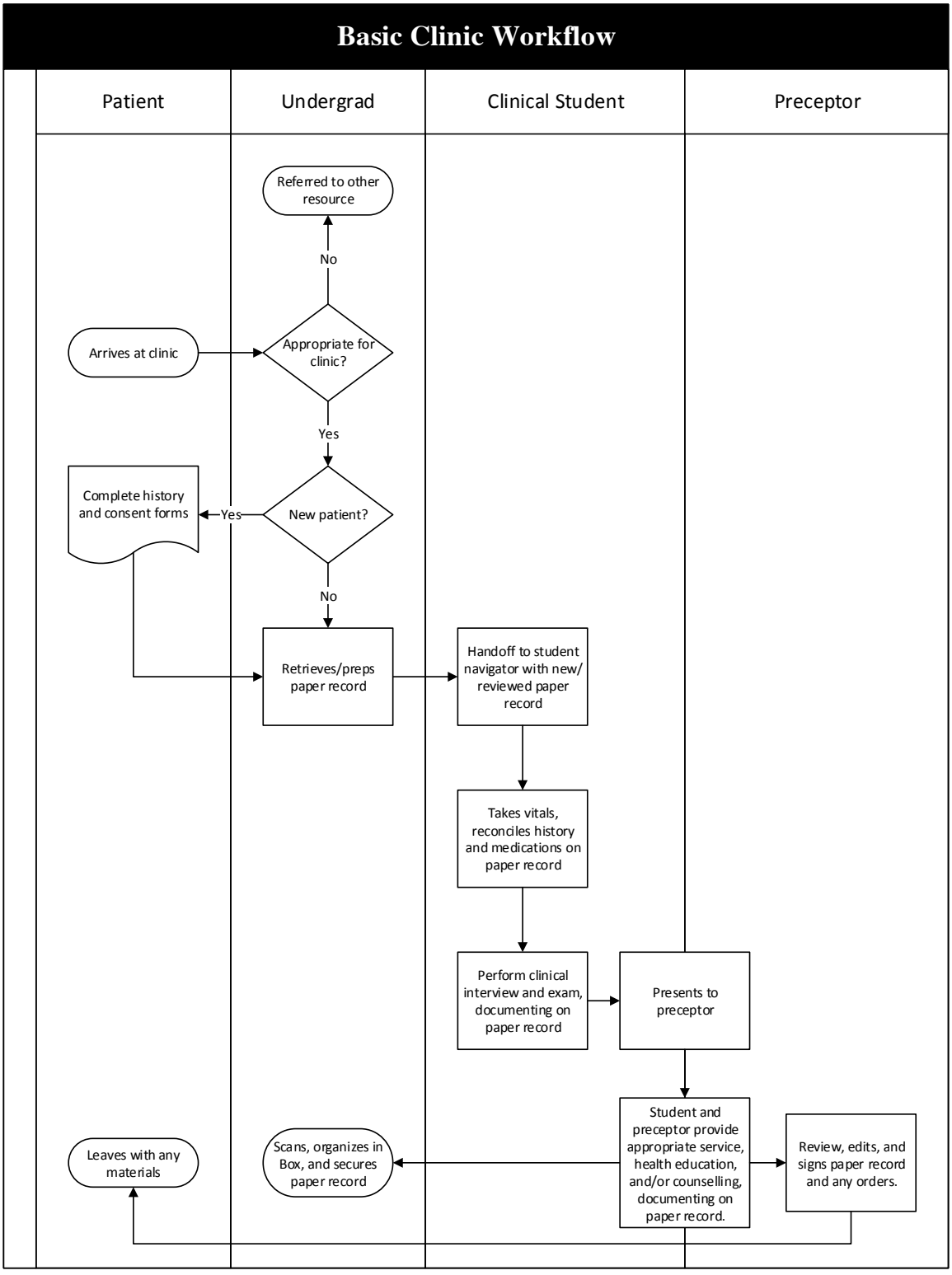
- There are multiple, rotating clinical and nonclinical volunteers involved directly and indirectly in the patient's care, from reception and chart prepping, to taking vitals, reconciling medications, interviewing and examining patients, recording any outside results, providing counseling and education, obtaining preceptor review and sign off, discharging patients, as well as finalizing, scanning, and organizing paper chart

materials in Box. It can be difficult to provide collaborative care with concurrent processes only one paper record.

- There is no BCCC-owned hardware besides an encrypted, OHSU-owned laptop used for scanning and handling patient chart materials in Box (OHSU's approved cloud-storage solution approved for secure file collaboration, including protected health information). Concerns have been expressed concerns about this process in terms of the amount of effort and time it takes, difficulty to share records and coordinate care, inability to provision access controls, and potential for breach in patient privacy and security. Furthermore, many of the records are illegible due to handwriting and there is no way to easily track or report data.
- A secured wireless network connection is available but shared with TPI, which also presents a concern for breaching secure information.
- There is no specific software or interfaces being used for any clinic functions, besides Box for online file storage. It can be difficult to complete the paper records in time or from home.
- Only basic screening and referral services are currently offered, but as resources ramp up, they are hoping to provide basic primary care and dental services with point-of-care labs and radiography.
- All prescriptions are currently either handwritten or called into a partnered pharmacy.

Figure 1

Basic Clinic Workflow across Roles



Constraints.

The following are the largest constraints faced by BCCC:

- **Financial**: Funding for BCCC comes from sporadic grant awards and fundraising efforts, creating a large constraint when it comes to the ability to purchase, implement, and maintain an EHR with any technical requirements, such as associated hardware, software, and labor costs. While having a functional EHR will assist in the necessary data collection and reporting that would facilitate achieving future grant awards, there are very limited financial resources committed to getting started. OHSU may be agreeable to providing donated resources; however, this may be limited by the priorities of other projects.

- **Technical**: BCCC is still rather new in its development and since it has been utilizing paper records, there is no technical infrastructure available from which to build. The Clark Center clinic has been using the wireless internet network owned and shared by TPI, therefore limited in its overall bandwidth and security capacity. The only hardware owned by BCCC includes a scanner/printer, which the volunteers use to scan and organize patient records via a secure, encrypted connection to an OHSU Box account from an encrypted OHSU-owned laptop. There is currently no other dedicated hardware or devices, such as desktops, laptops, network, server, peripherals, or any associated equipment that would be required to establish a secure technical infrastructure for internal hosting an EHR.

Furthermore, there are no available resources or volunteers for sustainable IT expertise and systems administration.

- **Operational**: The high turnover of volunteers presents difficulty when it comes to onboarding, training, and maintaining standard operations and workflows. Given the high turnover in those who volunteer and provide regular oversight at BCCC, there is little stability in having standard, consistent governance of operations, workflows, training, documentation, data collection, privacy/security, and provisioning access. There are also many interdisciplinary students that work under a few preceptors, creating strain for proper oversight of work.

EHR requirements.

Throughout the field research, the clinic has identified multiple EHR requirements organized by activity across the categories of handling patient visits, workflow and features, interfaces, and governance (**Table 8**). These are also compared with current processes. Many of the requirements reflect technical and operational constraints to help overcome the difficulties currently faced.

Table 8

BCCC Requirements for EHR

Activity	Current Process	EHR Requirement
Patient Visits		
Patient registration and scheduling	• Manually record demographic information and scheduling	• Collect custom required demographic information

Activity	Current Process	EHR Requirement
		• Schedule appointment by type and allow reminders for follow ups
Chart review	• Sift through files in Box	• Quickly review prior documentation, visit history, medications, chief complaint; review and trend data, results, vitals • Audit history to track volunteer roles and access
Documentation	• Manual with paper templates	• Accommodate interdisciplinary visit/note types • Support macros and shareable standard templates • Provide continuity of care and health maintenance tracking
Medications	• Manually documented	• Track, reconcile, and refill medications (formulary or non) • Record medication/vaccine administration
Problem list	• Manual with paper templates (inconsistent)	• Problem list tracking and care plan tracking
Prescriptions	• Handwritten at point of care or called into local partnered pharmacy	• Transmit electronically or print prescriptions for local pharmacies
Referrals	• Provide resources verbally, by handouts, or handwritten referrals	• Transmit electronically, print, and record (custom) referrals to local organizations • Document results • Print continuity of care documentation
Laboratory/imaging	• Manual documentation	• Transmit electronically/print requisitions for labs/imaging to local organizations • Manually record results

Activity	Current Process	EHR Requirement
Patient education	• Currently providing printed or typed handouts.	• Library to print standard materials from EHR or send electronically to PHR • Print patient instructions and follow up information
Billing	• N/A	• N/A
Workflow and Features		
Overall usability	• N/A	• Easy to learn with simple navigation
Review and signing	• Manual	• Allow student creation and pending of notes and orders for preceptor co-sign
Concurrent user access	• Individual review of paper records	• Allow concurrent access to a patient to facilitate flexible, concurrent workflows
Tasking and messages	• Email	• Allow messaging and sending tasks to users • Alert users of new results to review
Document imaging	• Manually scan into Box	• Scan and attach documents to patient charts
Reporting	• Manual data collection and reporting	• Ad-hoc reporting with user-defined metrics (conditions, time-motion, patient volume, demographics, etc.)
Interfaces		
Laboratory/imaging	• N/A	• Interoperate with point-of-care lab/imaging equipment
Health information exchange	• N/A	• Exchange patient information with surrounding hospital EHRs (Epic)
Patient communication	• N/A	• Support different methods of patient communication (phone, email, portal)
Governance		

Activity	Current Process	EHR Requirement
Privacy/security	• Store paper records in lock box until scanning into Box • Difficult to maintain access and restrictions	• Observe state and federal (HIPAA) regulations regarding patient privacy, security, and confidentiality with all essential functions. • Easily provision and rescind access with role-based security profiles
Remote access	• N/A	• Access EHR from personal devices while in the clinic, future additional locations, and from home
Nodes/departments	• N/A	• Be able to establish future BCCC clinic locations

Potential vendor options.

The two vendor options assessed at the time of this paper with OHSU's Epic and the athenahealth platform as offered through their charitable program for FCCs called athenaGives (**Table 9**). These options remain possible regardless of BCCC's plans for autonomy.

Athenahealth would offer a faster timeline for implementation given OHSU's priorities for implementing Epic at partnered locations. They also offer resources to implement and maintain their standard platform at no cost. The EHR meets BCCC's requirements and is overall a simple, cloud-based (software as a service) platform that is easy to use, comes with online training resources, and is accessible from any mobile device with internet. As a result, it does not require a large infrastructure and could be scaled with the clinic's growth. BCCC, if autonomous, would have sole governance of

the EHR. However, if under OHSU liability, OHSU would need to vet the system, be able to enter the service agreement with athenahealth, and establish access procedures, such as release of information, but BCCC would have more flexibility with governance.

Implementing OHSU's Epic, a licensed EHR that is hosted by OHSU, at BCCC is also an option. This would require much more technical and financial resources for infrastructure, implementation, and maintenance; however, it is possible to ask OHSU for this as a donation. The timeline for implementation might be prolonged given other priorities, but consultants could be used to expedite this at an additional cost, that could be covered with the donation as well. Epic is a fully-featured EHR and meets the clinic's requirements but would require a full needs assessment to allow customization to BCCC's needs. There are no legal or operational hurdles with this path. If BCCC decides to dissolve from OHSU, then contracting and financial agreements would need to be established to continue service.

Table 9

Constraint Considerations for Potential Vendors

	OHSU Epic	**athenahealth**
Type	Licensed EHR hosted by OHSU	Software as a service
Financial	• Costs associated with licensing Epic encounters and concurrent database load could be negligible given BCCC's relatively minimal operational numbers • Majority of costs would come from required hardware and network infrastructure, and from hiring consultants to do an	• Their standard EHR platform and services to implement and maintain are provided as charity • Could cost to build non-standard interfaces for devices and other software • BCCC would buy any required hardware (desktops, scanners, etc.) and internet services

	OHSU Epic	athenahealth
	estimated 300 hours of work to implement Epic at BCCC • OHSU might be willing to donate cost needed to implement; would need to create detailed formal request • BCCC would pay for internet services • BCCC would have to contract with OHSU at cost if the separate in the future	
Technical	• EHR is hosted and managed by OHSU with licensing agreement • Consultants or OHSU employees would need to be used to implement and manage • Many features but would need to be pared down and customized for BCCC • Would require secure, encrypted hardware and network/internet access • Can be accessed remotely and accommodate clinic growth	• Athenahealth would provide staff to implement and manage • OHSU would need to vet the system across all stakeholders (legal review, release of information, etc.) and enter appropriate agreements with vendor • Athenahealth has had some difficulty with master service agreement stipulations and other academic medical centers surrounding liability/ indemnification clauses • Athenahealth will not negotiate since free service • Can be accessed remotely and accommodate clinic growth
Operational	• All volunteers seen as OHSU workforce/volunteers and require standard onboarding and training • OHSU governs account provisioning • Would need to follow OHSU practices, policies, and guidelines	• BCCC would need to develop standard protocols for governance • Many students/preceptors would need to learn new EHR • Has simple interface, online learning, many options for customization and personalization

	OHSU Epic	athenahealth
	• Would need to use OHSU central patient registration, which was not staffed on Saturdays but now has plans to do this • More difficult to have access to some functions, such as reporting	• Can accommodate different workflows for pending, reviewing, signing clinical data and notes

DISCUSSION

In order to properly understand and assess the operational needs for an EHR at BCCC, it is important to gain understanding of SRFCs as a whole but the clinic specifically with their unique workflow, constraints, and requirements. Given the of temporary nature of the volunteer workforce, it is extremely difficult to maintain consistency across the organization, and therefore the final EHR selection should help accommodate this lability as much as possible.

The scope of this paper was limited given the indeterminate future of BCCC and their autonomy. Going forward, once BCCC decides its future, the foundations of this project can be used to flesh out a full needs assessment and selection matrix, which can be used to evaluation EHR options to the full extent to determine the best fit. It will also be crucial to identify longstanding clinical leadership who can provide consistent oversight and be a liaison between the EHR vendor and the clinic.

Currently the best options given the status quo are OHSU's Epic or pursuing the athenahealth EHR through the athenaGives charitable program. No published literature was found directly addressing the option of implementing the EHR of a sponsoring organization within their SRFC, but this project has determined that it is indeed feasible, along with the necessary considerations. Minimizing the constraints across financial, technical, and operational aspects will be important in selecting a sustainable option. This is reflected in the SaaS EHR hosting model. However, if OHSU is willing to donate the resources for their self-hosted Epic platform, then this option should be considered as well.

The caveat overlying these options is ensuring that the long-term plans of the clinic and options fully evaluated, since it can be very difficult to transition data should an EHR transition be pursued. In terms of OHSU's Epic, the clinic might need to contract the resources and services should they leave OHSU's umbrella. Additionally, SaaS models, particularly free EHR programs, can quickly change their agreements or become subscription based. This is the case with PracticeFusion, a previously free SaaS EHR that was widely used by FCCs, which was acquired by the competitor Allscripts and transitioned to a paid subscription model [12]. In fact, athenahealth was recently acquired by Veritas Capital [13], but it was assured that their product nor the athenaGives program would change as a result; however, this possibility should be considered.

CONCLUSION

SRFCs, like other FCCs, help address an important disparity in our healthcare system by providing healthcare and social services to underserved populations, while offering valuable learning opportunities to the next generation of healthcare providers. When suited with an EHR, SRFCs can optimize the care being delivered with the various features that promote continuity and coordination of care. The unique constraints of the SRFC model need to be considered when determining the requirements and evaluating an EHR for a clinic to ensure proper adoption, sustainable use, and positive outcomes. BCCC has several viable options when it comes to implementing an EHR but will need to do a full vendor analysis once determining the long-term trajectory for the clinic.

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