



Shared Care Final Project Report

Project Title	Community Pathway of Care for Suspected Deep Vein Thrombosis (DVT) Cases (SCC5100)
Project Timeline	May 1, 2023 - March 31, 2025
Fundholder / Organization	Fraser Northwest Division of Family Practice
Physician Leads	Dr. Jennifer Yun, Family Physician Lead Dr. Jon Braunstein, Emergency Medicine Lead
Project Lead	Cindy Young
Date of Submission	April 8, 2025



ABSTRACT

Introduction

In the Fraser Northwest region, there has been an increasing number of patients presenting to the Royal Columbian Hospital (RCH) and Eagle Ridge Hospital (ERH) Emergency Departments (ED) hoping for urgent access to blood work and ultrasound imaging. However, high patient volumes at the ED often lead to long wait times and sometimes patients are asked to return on a different day for their ultrasound appointment as appointments are no longer available on the same day. This amounts to frustrations for patients as they must wait at the ED again for the results of their imaging scan. The aim of the project is to reduce the number of ultrasound workups in the ER by at least 5% by establishing a safe and efficient care pathway through primary care. This includes increasing awareness of timely ultrasound imaging access and promoting guidelines around initiating Novel Oral Anticoagulants (NOACs)/Direct Oral Anticoagulants (DOACs) in the Primary Care Providers (PCPs) office.

Methods

The project established and created a streamlined algorithm for suspected DVT patients by collaborating with radiologists, emergency (ER) physicians, hematologists and PCPs. Methods to disseminate this algorithm include electronic newsletters, posting on Pathways BC, individual reach outs to PCPs and Medical Office Assistants (MOAs). Educational workshops were held to increase confidence with diagnosing and managing DVT patients and knowledge in how to access timely imaging in the community. To evaluate project outcomes, a mixed-methods design of collecting both qualitative and quantitative data was used.

Results

The project improved timely access to imaging, allowing PCPs to have reliable access to imaging to manage suspected DVT patients in the community. Although ED data showed that there was less than 1% change in doppler imaging visits at the ED following the implementation of the DVT algorithm when compared to pre-implementation, standardized decision-making protocols based on patients' anticoagulant status helps to avoid unnecessary ED visits. Changes to imaging reports enhanced communication between PCPs and radiologists. Education sessions increased provider knowledge in diagnosing suspected DVT patients in primary care, greater confidence in initiating anticoagulation therapy and awareness of timely ultrasound imaging options in the community.

Conclusion

In summary, this project successfully enhanced care for suspected DVT patients by improving PCPs confidence in the work up process and increasing access to timely imaging options in the community. To ensure sustainability, established protocols will remain in place, ongoing communication will be maintained through various mechanisms and future collaboration between PCPs and ER physicians in spring 2025 will foster relationships and address broader challenges at the ED.



INTRODUCTION

The Fraser Northwest Division of Family Practice (FNW DoFP) encompasses family physicians in New Westminster, Coquitlam, Port Coquitlam, Port Moody, Anmore and Belcarra representing the catchment area of the Royal Columbian and Eagle Ridge Hospitals. The FNW DoFP deeply respects and acknowledges the privilege of being able to work on the ancestral, traditional and unceded territory of the Coast Salish Nations, including the K^{wikwə́}ə́ləm (Kwikwetlem) and Qiqéyt (Key-Kayt) nations. The FNW DoFP remains mindful of the health inequities and is committed to better understand the needs of Indigenous peoples.

Problem Statement

Deep Vein Thrombosis (DVT) is a condition where a blood clot forms in a deep vein. In some circumstances, it can be life threatening if the clot dislodges and travels to the lungs, causing a pulmonary embolism. Depending on the patient's symptoms and history, urgent blood work, ultrasound imaging and initiation of anticoagulation treatment must be completed in a timely manner to avoid complications. In the Fraser Northwest region, there has been an increasing number of patients presenting to the Royal Columbian Hospital (RCH) and Eagle Ridge Hospital (ERH) Emergency Departments (ED) hoping for urgent access to blood work and ultrasound imaging. However, high patient volumes at the ED often lead to long wait times and sometimes patients are asked to return on a different day for their ultrasound appointment as appointments are no longer available on the same day. This amounts to frustrations for patients as they must wait at the ED again for the results of their imaging scan.

It is possible to manage these patients safely in primary care in a similar timeframe and would help to improve the patient experience and reduce ED visits. More information about best practices and reliable access to urgent blood work and imaging in the community is needed to prevent administrative burdens faced with coordinating appointments in primary care and straining ED resources. Guidelines recommend starting anticoagulation for high-suspicion cases while awaiting imaging, giving PCPs additional time to arrange the necessary tests and reduce the risk of serious complications.

Aim Statement

The aim of the project is to reduce the number of ultrasound workups in the ER by at least 5% by establishing a safe and efficient care pathway through primary care. This includes increasing awareness of timely ultrasound imaging access and promoting guidelines around initiating Novel Oral Anticoagulants (NOACs)/Direct Oral Anticoagulants (DOACs) in the PCPs office.



METHODS

Interventions, Activities, and Deliverables

1. Developed a Streamlined Approach for Suspected DVT Patients

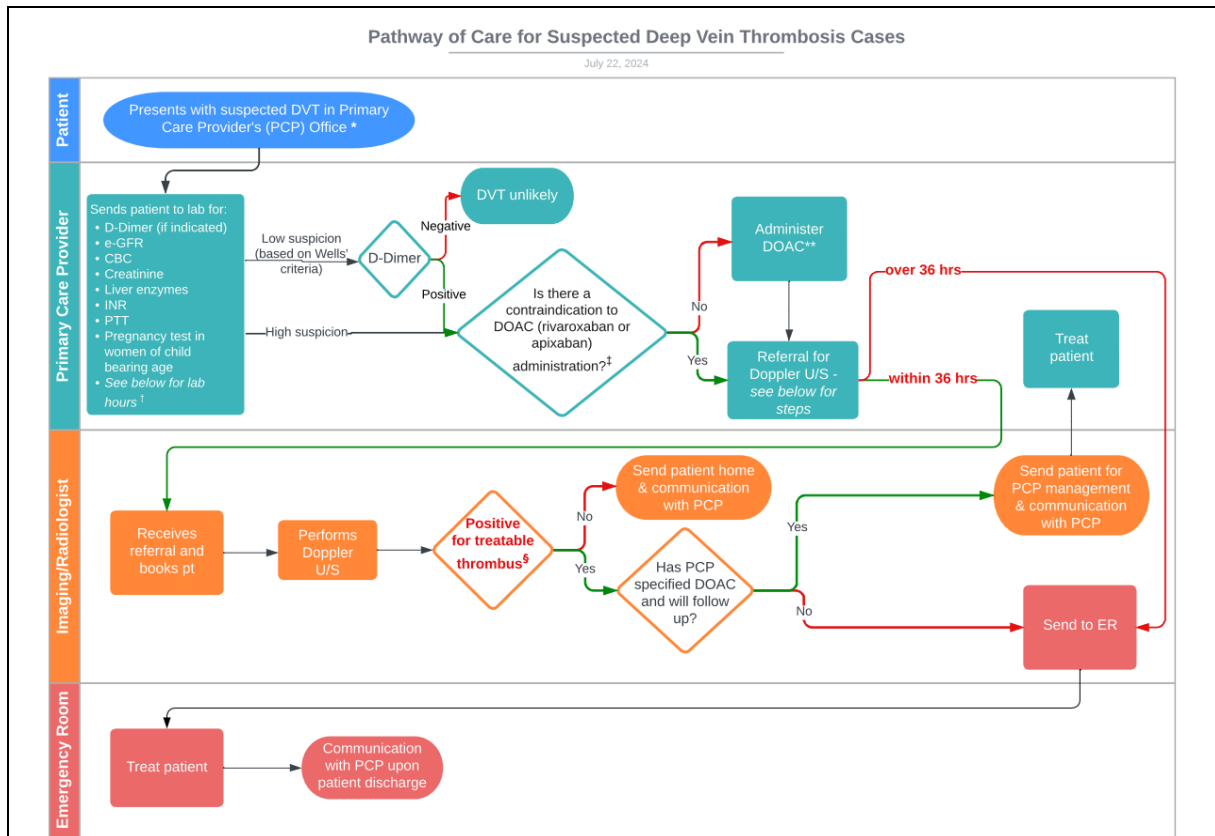
Dr. Jonathan Braunstein, an ER physician, initiated the project and collaborated with Dr. Jennifer Yun, a hospitalist, and Dr. Kenneth Wong, radiologist, to begin discussions about a more efficient pathway for DVT assessments. To ensure the work up process is done in the community instead of at the ED, it is important to ensure family physicians can get access to reliable expedited ultrasounds and are aware they can prescribe novel anticoagulants while waiting for imaging results to eliminate unnecessary ER visits. Urgent blood work is accessed in the community through LifeLabs or hospital labs and urgent imaging is available through RCH, ERH and MedRay Imaging. Discussions with Dr. Wong revealed that MedRay had more capacity, with 16 ultrasound rooms—more than the combined total at RCH and ERH.

This led to the decision to organize an “**Ask the Expert (ATE)**” educational session to increase PCPs awareness about MedRay's increased imaging capacity. The event was on May 5th, 2023 and had a total of 68 attendees. The event strengthened communication between ER physicians, PCPs, and radiologists. Additionally, it helped to increase awareness of the availability of timely access to imaging within the community and best practices to initiate anticoagulation therapy for suspected DVT cases, enabling early blood clot management. Please refer to [Figure 1](#) in the appendix to view the visual summary of the event.

2. Finalized the Algorithm

The ATE session as well as regular committee meetings provided key insights into DVT related challenges, including delays in blood work results due to patient or appointment availability and barriers to scheduling ultrasounds, such as limited morning appointment slots and the administrative burden required to coordinate bookings with patient availability. Additionally, responses from a FNW DoFP wide member survey helped to understand expected wait times for imaging, PCPs comfort in managing suspected DVT cases, and factors influencing ED referrals.

Based on these findings, the committee finalized an **algorithm for suspected DVT cases** (refer to [Figure 2](#) for the full algorithm). The algorithm outlines the process for managing suspected DVT cases in a primary care setting based on low and high suspicion of DVT. Two key changes were proposed in the process: **1) the indication of a patient's anticoagulation status on the imaging requisition and 2) the standardization of diagnostic reporting from radiologists.**



Indicating whether a patient is on anticoagulation medication will help the radiologists determine whether the PCP can safely manage the patient in the community or if an ED visit is required if the patient has a positive DVT scan. Previously, there was no standardized approach for radiologists to communicate ultrasound results. Radiologists would often refer all positive scans to the ED, regardless of if the patient was on anticoagulation or not. Under the new pathway, patients on anticoagulation with a positive ultrasound are redirected to their PCP instead of the ED, ensuring a more efficient workflow and reducing unnecessary hospital visits. Based on these details established, radiologists have a more clear decision making framework on whether to direct the patient to the ED or back to the PCP.

3. Dissemination of the Algorithm

In June 2024, the DVT algorithm was disseminated and shared out in various ways, including through the FNW's electronic newsletter, on Pathways BC, and through individual reach outs to physicians and MOAs to share pertinent information about the project and the algorithm.

A Town Hall event was hosted on September 16, 2024 to further share the algorithm and learnings with more PCPs in the region. A total of 33 attended the event. Radiologist Dr. Wong provided an overview of DVT diagnosis and outlined key details to include in requisition forms, particularly noting when a patient had been started on anticoagulation treatment. He also provided recommendations on the referral process to receive timely ultrasound imaging



appointments. Following this, hematologist Dr. Chan shared insights on DVT treatment protocols and clarified when an ED visit would be necessary. The session concluded with discussions, where attendees reflected on their current workflows and challenges. Please see [Figure 3](#) for the visual summary.

Target Population

This initiative primarily targets patients with suspected or confirmed DVT. It also involves PCPS, ER Physicians, radiologists, hematologists, and nurse practitioners who play a role in the patient's circle of care within the Fraser Northwest region.

Engagement Strategy

Various methods were utilized throughout the project to engage with stakeholders. The committee included one ER physician, one radiologist, one hematologist, five family physicians, and the medical imaging director at Fraser Health Authority. These stakeholders participated in ongoing meetings and contributed to the project's design and implementation. We also engaged with additional PCPs via interviews and a division wide member survey to provide additional insights on experiences with diagnosing, managing and treating DVT patients. As MOAs play an important role in faxing referrals and following up on appointments, we interviewed MOAs to understand their challenges and frustrations, as well as to share information about bloodwork and imaging options in the community.

Data Collection Methods

The evaluation approach included a mixed-methods design (e.g., collection of both qualitative and quantitative data) with physicians, specialists and program administrators. The number of patients visiting the ER for ultrasound imaging were collected through Electronic Medical records (EMRs) at ERH and RCH. Qualitative data pertaining to provider and patient satisfaction were obtained through a patient journey map, in addition to surveys and interviews. Refer to [Table 1](#) to view the specific data collection methods for this project.

RESULTS

Improved Patient Experience

Goal/Anticipated Outcome	Results
Increased patient satisfaction in going to their Primary Care Provider for DVT care	After implementation of the algorithm, a patient was invited to share their experience seeking care for suspected DVT. A journey map, created by a graphic facilitator, shows that the patient hesitated to visit the ER due to past experiences with long wait times and instead saw her family physician. They promptly referred her for bloodwork and an ultrasound. The patient was contacted the same day for an ultrasound imaging appointment but chose to wait to complete her lab appointment first which was one week later. The results of the



bloodwork led her doctor to cancel the ultrasound, though concerns were raised about the delay. The patient admitted she hadn't grasped the urgency and thought she needed to complete the blood work first. A snippet of the journey map is below, refer to [Figure 4](#) for the full graphic.



Luckily, the patient managed to avoid an ED visit and did not have DVT. This patient journey highlights the following:

- access to ultrasound imaging was timely but there is need to improve access to bloodwork for urgent cases as some facilities are appointment based only with no walk-in availability which can cause delays
- the importance of the PCPs role to communicate clear steps to the patient

Physician Lead Close Out Feedback Survey

The Shared Care physician lead feedback survey was distributed to the two physician leads at the end of the project. An average score of 90% was reported when asked if the project led to improved patient experience. The survey results can be found in [Figure 5](#).

Improved Provider Experience

Goal/Anticipated Outcome	Results
Increased Primary Care Provider confidence and satisfaction in managing and supporting their	<u>Educational workshops:</u> The ATE on DVT was hosted on May 2, 2023, with a total of 57 respondents who completed the post-event survey. Below are the highlights of the survey:



patients with DVT by understanding the available supports accessible in the community

Increased provider understanding around initiating Novel Oral Anticoagulants (NOACs)/Direct Oral Anticoagulants (DOACs) in the primary care provider's office

Physicians agreeing that the training and resources supported their learning

Improved communication between primary care providers and specialists

- An average score of 83% (n=54) was reported by attendees with knowing how identify the signs and symptoms of patients with DVT
- Average scores of 81% (n=54) was reported on the level of agreement that attendees could diagnose, develop a treatment plan, and manage the care for patients with DVT
- 87% (n=49) of attendees agreed or strongly agreed that the session provided them with tools and resources that they can practically apply

The pre and post event survey results are in [Figure 1](#).

The post-event survey for the **DVT Town Hall** on Sept 16, 2024 was completed by a total of 33 providers. Below are the results:

- 91% (n =30) expressed feeling confident or very confident in knowing how to diagnose patients with suspected DVT
- 78% (n = 28) expressed feeling confident or very confident in initiating anticoagulation therapy while waiting for ultrasound confirmation; whereas 12% (n=4) were somewhat confident
- An attendee noted, *"I may just go ahead and start apixaban for those who I suspect may have DVT. Normally, I don't start anticoagulation - I send to ER"*

4 Shared Measures were also incorporated into the post-event survey:

- Average scores of 88% was reported on the level of agreement that the project improved overall satisfaction with provision of patient care, care communication with other physicians and collegiality between family physicians and specialists (M0001, M0007, M0011)
- An average score of 90% was reported on the level of agreement that the project improved coordination of care with other physicians (M0005)

The pre and post event survey results can be found in [Figure 3](#).

Provider Feedback:

A follow up survey was sent to the attendees of the DVT Town Hall but due to the limited responses received, feedback was gathered via **email**. The questions aimed to assess whether PCPs had any challenges in keeping DVT patients out of the ED.

- 3 out of 4 that responded encountered patients with suspected DVT and successfully avoided ED visits. One provider noted that some patients needed to be referred to the ED due to clinical indications, including complexities and underlying risk factors requiring a full workup.



- Providers also emphasized that the DVT algorithm was a valuable resource, enabling them to make timely and efficient ultrasound referrals while appropriately redirecting other referrals.

Referral data obtained from MedRay Imaging revealed a significant improvement in the percentage of PCPs indicating whether patients are on anticoagulation therapy in their requests. In January 2023, prior to the project's start date, 30% indicated if a patient was on anticoagulants. In January 2025, 64% of providers noted anticoagulation status on their referrals, showing an **increase of 34%**. This information is critical for radiologists in determining whether patients with a positive scan can be safely managed by their PCP or need to be referred to the ED for anticoagulation treatment.

A **committee feedback survey** was distributed following each meeting and a total of 35 responses were gathered. 97% (n=33) of providers found that participating in committee meetings provided them the opportunity to improve communication with their colleagues (e.g., physicians, allied health and health authority staff).

As mentioned above, the **Shared Care physician lead feedback survey** was distributed to the two physician leads at the end of the project. An average score of 90% was reported when asked if the project led to improved coordination of care between family physicians and specialist care and 80% when asked about if the project led to improved provider experience.

Improved Population Health

Goal/Anticipated Outcome	Results
Decreased ER visits requiring ultrasound workups Increased community provider awareness about availability of access to timely ultrasound imaging in the community	<p>Attendees of the DVT Town Hall reported the following as it pertained to the awareness of community resources. An average score of:</p> <ul style="list-style-type: none">• 89% in knowing when to refer patients to the ED (n=33)• 90% in knowing where to access labs in the community, including walk-in hours (n=33)• 93% in knowing where to access community-based ultrasound imaging (n=33) <p>Data from a primary care clinic in New Westminster revealed that among the 11 DVT cases seen in 2024, patients who accessed ultrasound imaging after the implementation of the DVT algorithm</p>



TEMPLATES AND FORMS

Increased awareness around availability of walk in lab hours

experienced significantly shorter wait times for imaging. Before the algorithm was implemented, patients typically waited 4-5 days for an appointment. After the implementation of the algorithm, wait times ranged from 0-4 days.

A **committee feedback survey** was distributed to committee members following each meeting, resulting in a total of 35 responses. 82% (n=28) of providers found participating in committee meetings facilitated improvement (indirectly or directly) in services at their facility and/or community.

As mentioned above, the **Shared Care physician lead feedback survey** had an average score of 80% when asked if the project led to improved population health outcomes.

Reduced per Capita Cost of Health Care

Goal/Anticipated Outcome	Results
Decreased ER visits requiring ultrasound workups resulting in saved system costs	<p>Hospital Data:</p> <p>Data on doppler ultrasound visits in the ED were extracted from the EMRs at RCH and ERH. These visits were analyzed in relation to the number of ED visits each month. The findings show that there was less than 1% change in doppler visits at the ED following the implementation of the DVT algorithm when compared to average baseline values, suggesting minimal impact on imaging utilization in the ED. Refer to Figure 6, 7 and 8 for the graphs.</p> <p>In addition, the Shared Care physician lead feedback survey reported a 80% average score when asked if the project reduced the per capita cost of care.</p>

DISCUSSION

Interpretation

Improved Access to Imaging and Communication

The PCPs involved in this project reported improved timely access to imaging and being better able to manage their patients in the community, successfully avoiding ED visits. This suggests the positive impact of the project in ensuring these urgent cases are dealt with in a timely manner and the importance of reducing wait times to improve patient care. As a result of the standardized decision making protocols based on patients' anticoagulation status, radiologists are also no longer sending patients on anticoagulants with a positive scan to the ED. PCPs also reported that the new standardized imaging reports were clear and easy to interpret. The results and feedback suggests improved communication between PCPs and radiologists.



Increased Provider Knowledge

As a result of the education sessions and knowledge sharing for PCPs in the community, more PCPs showed an increase in knowledge and best practices related to suspected DVT patients. More PCPs are aware of the protocols around initiating anticoagulants for patients while waiting for imaging and how to access timely imaging. We can assume that the PCPs engaged through this project are more invested in managing their patients in the community and avoid sending their patients to the ED, resulting in a change in the utilization of the resources in the system.

Limitations

Although the project aimed to see a 5% decrease in ED visits for doppler imaging initially, data from 2024 showed less than a 1% difference in ED visits when comparing before and after. Several limitations can affect the findings, including small sample sizes, difficulty interpreting fluctuations in ED visits, and potential confounding factors. A longer post-intervention data collection period and additional historical data would help identify trends. It is also important to note that the algorithm only applies to patients without contraindications to anticoagulants. For example, pregnant patients cannot receive the standard oral anticoagulants typically available in primary care and require a different class of anticoagulants which is administered parenterally at the hospital. Other contributing factors to ED visits can include limited access after-hours and weekends. As well, due to limited patient data collected throughout this project, there are gaps in assessing the anticipated outcomes we initially noted in the evaluation plan.

Lessons Learned

A success of the project was the collaboration across multiple disciplines (radiology, ER, primary care, hematologist) which allowed the group to establish agreed upon best practices and processes. By ensuring patients are on anticoagulation while waiting for imaging results and communicating the importance of including whether a patient is on anticoagulants or not on the imaging request, patients are not being directed to the ED for care. As a result of the standardized protocols, the imaging reports are easy to read and next steps are clear to providers.

Remaining Gaps and Challenges:

One gap that remained in the project is engaging with LifeLabs for urgent access to D-Dimer blood work. Anecdotal feedback from PCPs have reported that as a result of this project, ultrasound imaging appointments are often more quickly available than blood work. Since the D-Dimer test is intended to be completed before imaging to help determine the necessity of an ultrasound in low suspicion cases, this delay can impact the diagnostic workflow. Additionally, as ultrasound imaging is more costly, it's important to streamline this process to ensure resources are being utilized efficiently. Another challenge is limited availability of lab and imaging after hours and on weekends.

Some process and communication improvements could have been made in this project. Anticoagulation information is not always included in the imaging requisition despite our efforts at sharing this information with PCPs. Changing the requisition forms to include this field is not feasible as the forms are universal and not specific to DVT cases. Physicians emphasized the



need for ongoing information sharing with other PCPs to highlight the importance of including this information. We will be updating Pathways to include this information on imaging clinic profiles as a reminder. More engagement and communication is also needed to target PCPs that were not engaged in the project.

Although out of scope for this project, there are further opportunities to improve this pathway of care by understanding other models of care such as a “one stop shop” clinic where patients can get DVT blood work and imaging tests done in one visit at the same place and time. For example, Dr. Tony Wan, an internal medicine physician at the St. Pauls Thrombosis Clinic who implemented such a pathway for suspected DVT cases reveals this is a more cost efficient and patient centered approach as patients value the convenience of not having multiple visits i.e. one visit for D dimer, second visit for ultrasound, third visit to family physician to talk about treatment and likely a 4th visit with a thrombosis/hematologist down the road.

CONCLUSION

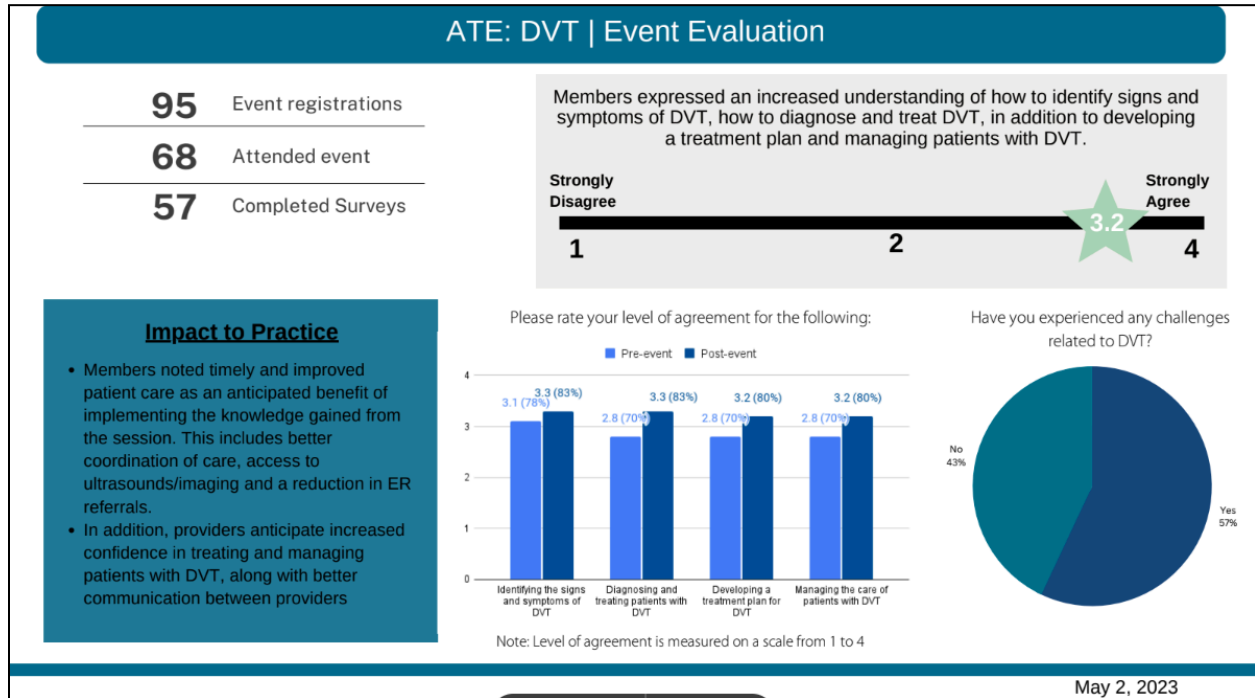
In summary, providers engaged in this project collectively worked together to improve care for suspected DVT patients leading to improved outcomes. Ensuring timely access to imaging played a key role in reducing unnecessary ED visits by ensuring patients are managed in primary care. This streamlines care but also minimizes patient frustrations by avoiding long ED wait times when not required. The protocols and processes established will be sustained operationally at the imaging facilities and the algorithm will remain accessible on Pathways. Regular communication about the algorithm will be shared with PCPs through the FNW DoFP newsletter for continued information sharing. The project will also utilize the Shared Care sustainability funds to ensure updates and a refresh of the information is shared with the community.

Recognizing the broader systemic challenges such as increased ED wait times and limited access to primary care, an engagement with PCPs and ER physicians will be held in the spring of 2025 to bring together the two groups to collaborate on ways to improve communication and reduce strain on the healthcare system.



APPENDICES

Figure 1: ATE - evaluation visual summary





TEMPLATES AND FORMS

Figure 2: Suspected DVT Algorithm - view the full algorithm [here](#)

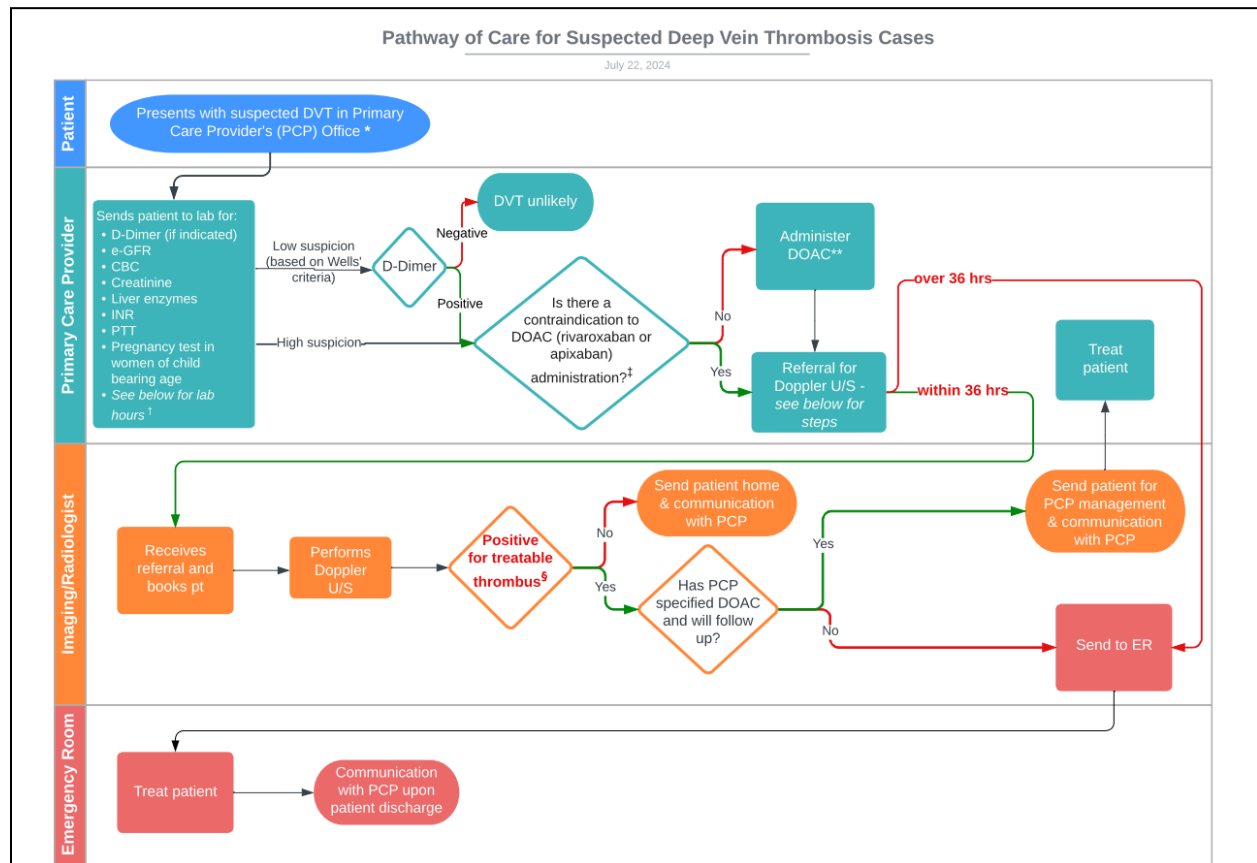




Figure 3: DVT Town Hall - evaluation visual summary

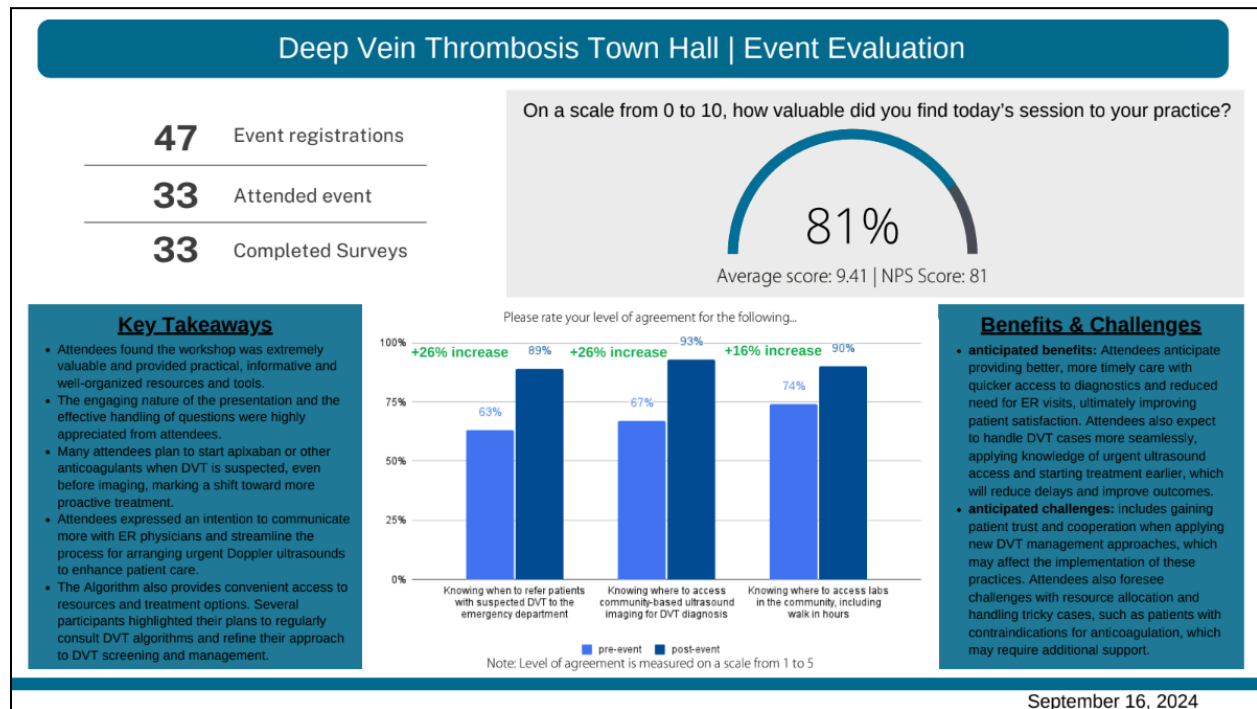




Table 1: Data Collection Methods

Data Collected	Method
Needs Assessment	<ul style="list-style-type: none">- Public patient survey- Interviews with family physicians and MOAs- EMR data collection - # of imaging visits at the ED
Patient Experience	<ul style="list-style-type: none">- Patient journey mapping
Provider Experience	<ul style="list-style-type: none">- Interviews with PCPs and MOAs- Email reach outs to PCPs- Focus group following implementation- Post-event surveys- Committee feedback survey- Physician lead close out survey
Imaging and ED data	<ul style="list-style-type: none">- EMR data from the hospital and PCP- Referral data from MedRay



Figure 4: Patient Journey Map

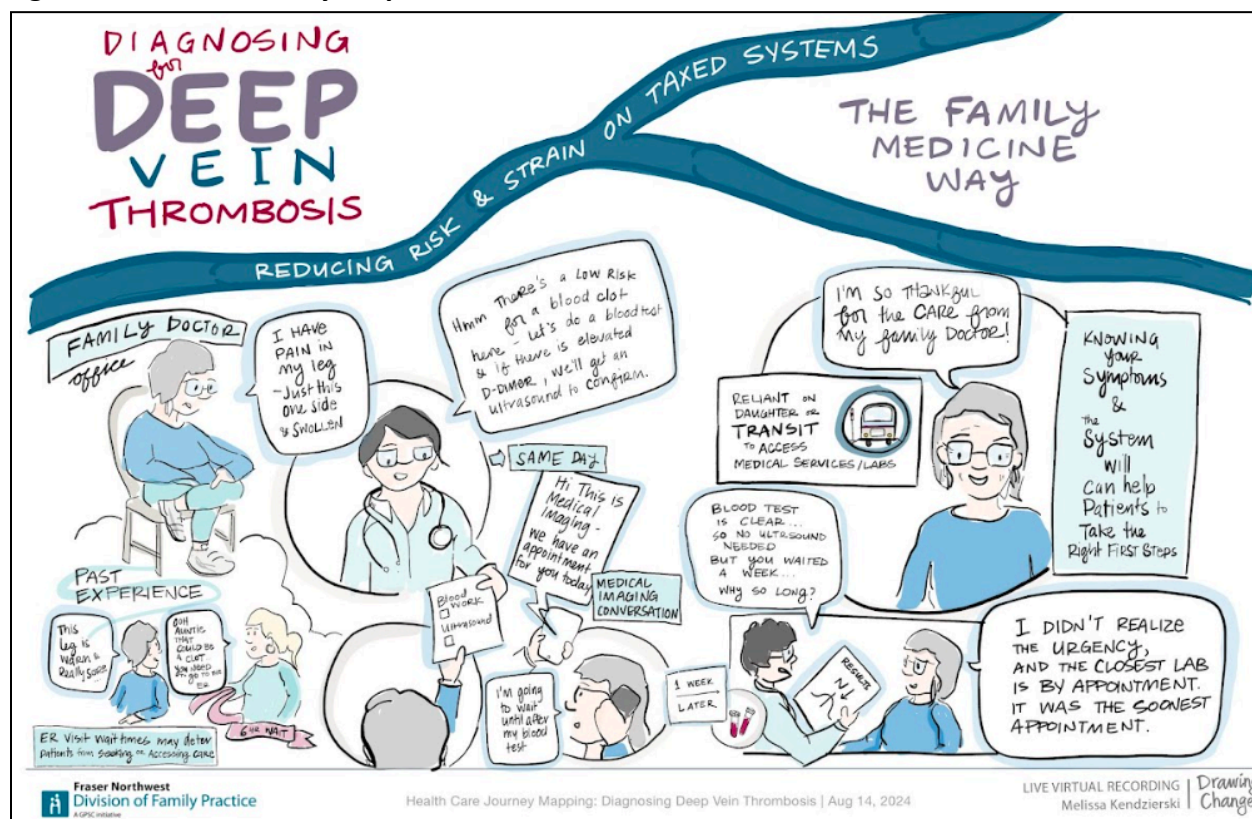




Figure 5: Physician Lead Close Out Survey

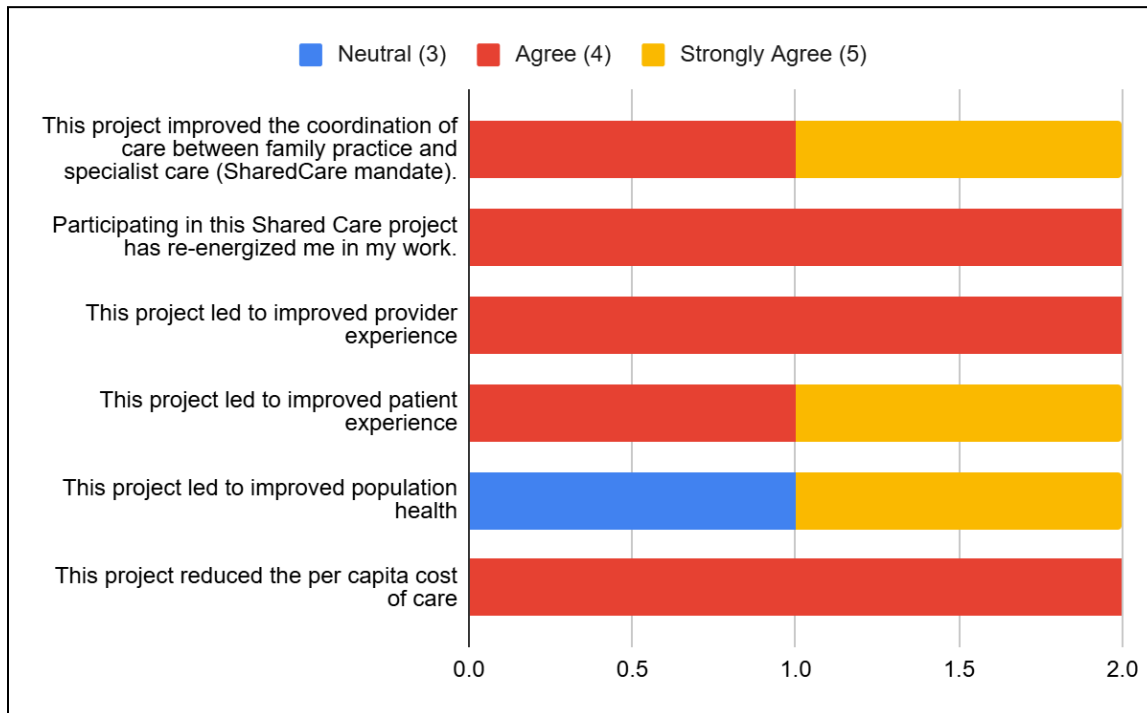


Figure 6: RCH ED and Doppler Imaging Visits

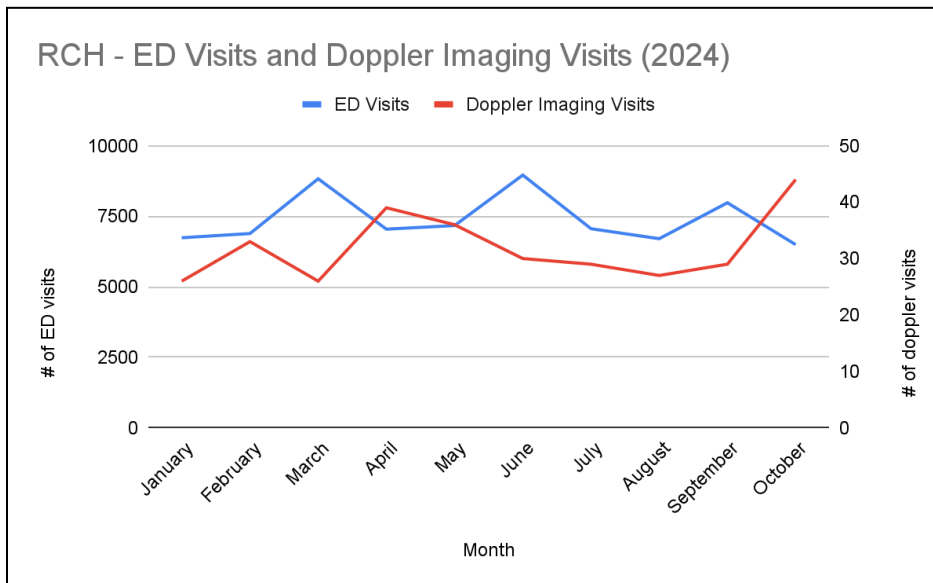




Figure 7: ERH ED and Doppler Imaging Visits

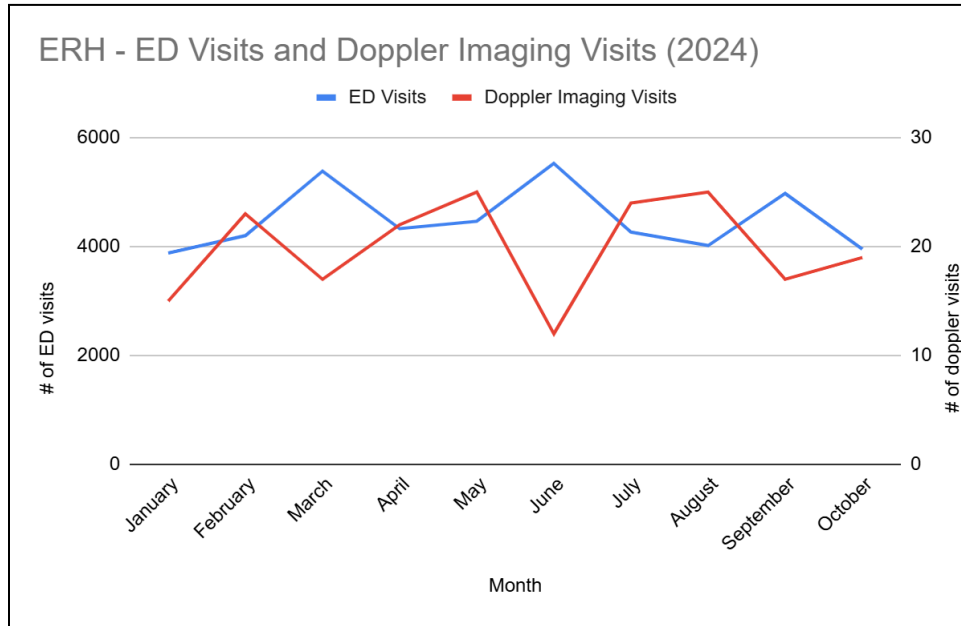


Figure 8: Percentage of Doppler Imaging Visits Compared to ED Visits

