BRIEF

Veterans Affairs Collaboration for Medication Safety Introductory Practice Experience Using Remote Access to Health Records

Sian M. Carr-Lopez, PharmD,[a,b] Lorrie Strohecker, MD, MPH,[a,b] Yvonne Mai, PharmD, MS,[a,b] Randell K. Miyahara, PharmD,[a,b] Allen Shek, PharmD[a,b]

[a] VA Northern California Health Care System, Mather, California
[b] University of the Pacific Thomas J. Long School of Pharmacy, Stockton, California

Corresponding Author: Sian Carr-Lopez, VA Northern California Health Care System, Sacramento VA Medical Center, 10535 Hospital Way, Mather, CA 95655. Tel: 916-843-2647. Email: Sian.Carr-Lopez@va.gov

Objective. To describe an ambulatory care introductory pharmacy practice experience (IPPE) in medication safety monitoring conducted remotely at the University for first- or second-year pharmacy students in collaboration with a Department of Veterans Affairs (VA) Health Care System.

Methods. A module in medication safety was piloted as part of a required, one-unit IPPE in ambulatory care. Veterans prescribed methotrexate, sulfasalazine or mineralocorticoid receptor antagonists require ongoing laboratory monitoring to screen for adverse drug effects. Working remotely at the school under the direct supervision of VA clinical pharmacists, students accessed electronic health records (EHR), ordered laboratory tests under the prescriber's name, documented notes in the EHR and sent laboratory reminder letters to patients. Students completed a brief survey at the beginning and end of the course; differences were compared using Wilcoxon signed rank test.

Results. During a 15-week course, following a two-week orientation, three sessions were devoted to the medication safety module. Fifty-eight students reviewed 148 patient records, including non-VA electronic records and ordered laboratory tests for 79 patients. Comparing baseline and course-completion surveys, students reported statistically significant changes in their ability to monitor laboratory tests, use a non-simulated EHR to perform patient care, and explain the role of a clinical dashboard to conduct population health activities.

Conclusion. Conducting an ambulatory care IPPE course remotely enabled 58 pharmacy students to participate in medication safety monitoring for ambulatory patients.

Keywords: introductory pharmacy practice experience, medication safety monitoring, ambulatory care, remote access to electronic health records

INTRODUCTION

ACPE Standards 2016 state that introductory pharmacy practice experiences (IPPEs) should expose students to contemporary, frequently encountered practice models and direct patient care activities.[1] Barriers to offering IPPEs include a lack of time for precepting, burden of student orientation to the practice site, geographical distance between the school and practice site, identifying a mutually beneficial time for students to conduct IPPE activities, and student housing issues.[2] Conclusions from a qualitative analysis of common concerns regarding pharmacy experiential education reveal site capacity for student placements continues to be the foremost concern along with concerns about preceptor development and procedures for onboarding students.[3]

The role of pharmacists in the ambulatory care setting is evolving. Opportunities for significant growth of pharmacist-physician collaborations exist in the primary care setting.[4] From 2013 to 2019, the total number of post-graduate year 2 pharmacy residency programs in ambulatory care increased from 65 to 174, highlighting the growth in this area.[5] Proceedings from the American Society of Health-System Pharmacists 2014 Ambulatory Care Conference and Summit highlighted the importance of pharmacist participation as members of patient care teams for ambulatory patients, with responsibilities for patient and population outcomes.[6] IPPEs that prepare students for advanced ambulatory care practice experiences and ultimately a career in ambulatory care practice are desirable, however space and availability of preceptors at health system clinics may limit accessibility. Some pharmacy schools have integrated simulated practice experiences into their experiential curricula to introduce students to ambulatory care practice and help meet ACPE required hours.[7] Limitations to this approach include a maximum of 60 hours applicable to graduation requirements and limited direct patient care experience.

The Department of Veterans Affairs (VA) Clinical Pharmacy Practice Office designates approximately 10% of primary care clinical pharmacy specialist's time each week for population health activities.[8] It is important to expose students to this essential component of clinical care. VA Northern California Health Care System (NCHCS) utilizes population management dashboards to identify Veterans requiring clinical interventions.[9] The medication safety dashboard facilitates laboratory monitoring of specific medications to screen for possible adverse drug reactions. The medications included on the dashboard are determined by pharmacists and physicians. When required laboratory tests results are needed, pharmacists can order the tests and notify patients. These activities do not need to be conducted at the health care facility. A search of the literature did not identify published manuscripts about IPPEs conducted remotely from the health care facility. This paper describes the partnership between a VA health care system and a school of pharmacy whereby pharmacy students participate in medication safety monitoring at the university using remote access to electronic health records (EHR).

METHODS

University of the Pacific, Thomas J. Long School of Pharmacy (UoP) offers an accelerated Doctor of Pharmacy program. Each semester is approximately 15 weeks in length. A collaboration between VANCHCS and UoP was established to provide IPPEs with VA population management initiatives. Pharmacy students, under the direct supervision of VA clinical pharmacists, participated in population health management for Veterans within NCHCS. A required 1-unit pass/fail IPPE in ambulatory care was approved by the school's curriculum committee and faculty. In order to accommodate a large class size, the School divided each class into roughly thirds and provided the ambulatory care experiential training over three semesters. The first required IPPE was offered to 58 first-year students in April 2018. Approximately 10 students were assigned to each of six weekly sections that were 2-hours in length. A medication safety module was developed as part of the course. (Figure 1)

VANCHCS is part of an integrated network of VA facilities that developed clinical dashboards to support population management activities. The Medication Safety scorecard reported the number of patients receiving specific medications and when each patient had key laboratory monitoring parameters checked. Following discussion with VA pharmacists who oversee the medication safety dashboard, the IPPE medication safety module was focused on laboratory monitoring for Veterans prescribed methotrexate, sulfasalazine and mineralocorticoid receptor antagonists. Methotrexate and sulfasalazine require close monitoring for bone marrow, liver and kidney toxicity while mineralocorticoid receptor antagonists such as spironolactone require close monitoring for hyperkalemia.

The population health experiences were conducted at the University and precepted by VA clinical pharmacists. Some preceptors were full-time VA employees, and some were University faculty hired by VA for eight hours per week to perform student precepting for the population health program. Each session was precepted by a minimum of two preceptors. Students were granted remote access privileges to VA's EHR and used personally-owned laptops. Students were oriented to Joint Legacy Viewer (JLV), a clinical application that provides an integrated, read-only display of health data from the Department of Defense, VA, and private sector partners. Student activities comprised reviewing medical records including JLV to see if the required laboratory monitoring was performed within NCHCS or at another facility, ordering laboratory tests when needed for prescriber's signature and sending laboratory reminder letters to Veterans. Student activity was documented in a progress note within the EHR. The number of records reviewed and laboratory tests entered by students was tracked. For every patient assigned, the preceptor documented on a data collection sheet if the laboratory test was no longer needed, if the laboratory results were found in JLV, or if the student ordered the laboratory tests and sent a laboratory reminder letter to the patient.

Students completed a baseline assessment during the first day of the course regarding their experience performing population health activities and again at the end of the IPPE. General items relating to the medication safety module included experience with laboratory monitoring, use of a clinical dashboard and experience with a non-simulated EHR. Responses to questions used a Likert scale and were converted to a numeric value (eg, "Strongly Disagree" = 1 through "Strongly Agree" = 5). If a student did not answer a question either at baseline or post-IPPE, the student's data was removed for that question. Changes in student responses from baseline were evaluated using Wilcoxon signed rank test. Statistics were performed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY). A *p*-value <.05 was considered statistically significant. VANCHCS Research Service reviewed this project and determined no research approvals were required.

Course Overview

The process for student on-boarding and course orientation is provided in Appendix 1. Students were taught how to review the patient's medical record and JLV to determine if laboratory tests were still needed. If recent laboratory

results conducted outside of VANCHCS were found in JLV, students were shown how to enter results into VA's EHR. If no laboratory results were found, the students were shown how to enter laboratory orders for the prescriber to sign and enter a patient laboratory reminder letter into the EHR. Letters were printed remotely to a VANCHCS pharmacy where a technician mailed the notification letter to the patient. Each week during the three-week medication safety module, every student was assigned up to 5 patients to work up. "How to" documents were available for the students to download. (Figure 2) Students performed their medical record review and drafted a progress note, then reviewed their work one-on-one with the preceptor before finalizing the plan, entering laboratory orders or signing the progress note. Students were deemed competent when demonstrating activities listed in Appendix 1. Between the 4-hour orientation during the first two weeks of the course and the three-week patient care module, each student earned 10 hours of medication safety IPPE hours.

RESULTS

Fifty-seven (98.2%) of 58 students completed the surveys. Comparing baseline and course-completion responses, students reported statistically significant changes in their ability to explain the role of a clinical dashboard to conduct population health activities and their experience monitoring laboratory tests and using a non-simulated EHR. (Table 1)

During the three-week medication safety experience, each student spent approximately six hours performing patient care activities. A total of 148 patient records were reviewed. Seventy-nine (53.4%) patients had a total of 160 laboratory tests ordered for provider co-signature. Laboratory tests included a comprehensive metabolic panel to assess for liver enzymes and serum creatinine, a complete blood count to assess white blood cells and platelet counts and a basic metabolic panel to assess serum potassium. Eleven (7.5%) patients had laboratory test results identified in JLV; results were documented in VA's EHR. This obviated the need for the laboratory test. The remaining 58 patients reviewed did not require an intervention. These patients were either recently contacted by another health care team member to obtain laboratory tests, had laboratory results pending or recently completed, or had not refilled their prescription in over 4 months and no longer required laboratory monitoring.

DISCUSSION

Site capacity is a significant challenge in pharmacy experiential education. In one survey of experiential sites, 56.7% of responders had conducted between one and five IPPEs in the previous twelve months and approximately 6% conducted over 25 IPPEs.[2] While most responders conducted five or less IPPEs in the prior year, our model using remote access enabled 58 students to complete a medication safety module as part of an ambulatory care IPPE during one semester. Over 60% of responders stated IPPE site capacity will stay the same until 2020, which may pose a future challenge as student pharmacist enrollment and demand for IPPE sites grow.[2,10] Additionally, simulated IPPEs and those that consist primarily of shadowing a practitioner offer students limited direct patient care experiences.

Three cited primary challenges to increasing quality or quantity of IPPE are time constraints, burden of orientation, and geographic proximity to the college of pharmacy.[2] The course design described in this manuscript provides an innovative solution to those challenges. Currently, there is a paucity of published literature describing the possible utility of remote access to EHR in pharmacy education. Previous literature in pharmacy, medical, and nursing education described the use of training EHR platforms with standardized or simulated patients.[7,11-14] Our unique model uses remote access to a health system's live EHR and real patient data. As such, it is essential to ensure Board of Pharmacy requirements for supervision are met. All patient care activities were reviewed by a pharmacist prior to documenting in the EHR or ordering laboratory tests. IPPE students gained experience performing required laboratory monitoring to ensure medication safety in ambulatory patients; this model avoids common logistical issues of inadequate space or resources at the clinical site. Furthermore, IPPE students were able to enter patient care notes and send laboratory reminder letters while interfacing with a live EHR system. This pilot project involved the implementation of a 3-week module in medication safety following a 4-hour orientation, providing 10 non-simulated IPPE hours. It is reasonable to increase the number of hours dedicated to performing medication safety activities to enhance the return on investment.

ACPE Standards 2016 define the duration of IPPE as a minimum of 300 hours with at least 150 hours balanced between community and institutional health-system settings; offering remote ambulatory care experiences at the school should count towards institutional health-system setting hours.[1] Colleges of pharmacy can explore collaborative models with health-systems as described here to address site capacity or geographic limitations regarding ambulatory care IPPE. However, this approach is not without its challenges. The school of pharmacy must commit to a partnership with the VA facility and provide time in the curriculum, appropriate classroom space to facilitate this type of work, and administrative and technical support (eg, adequate wi-fi bandwidth). Several services within VANCHCS provided significant support including Primary Care, Human Resources Management, Pharmacy and Chief of Staff's Office. Onboarding processes

3

must be carefully coordinated, and timelines met. Hosting the IPPE on campus may cause students to think of the IPPE as another class and not a professional experience. To address this, it became essential to set expectations early such that students dressed and behaved professionally as if they were at the practice site. In-class instruction can be challenging if students rely only on their laptops. Laptop screens have limited space making it difficult to switch between "how-to" documents and VA patient records. In-class demonstration using dual projection to screens in front of the class enabled students to view "how-to" documents with key instructions and a VA EHR simultaneously. Challenges with remote access included technology failures and students forgetting passwords. Lastly, a commitment to quality improvement is needed. Pre-recorded didactic coursework must be updated. Progress note templates should be reviewed for needed enhancements. An evaluation of health-system needs should be conducted so that students' population health management activities reflect current health-system priorities for ambulatory care practice. In this model, VA pharmacists prioritized student activities. For medication safety, VA pharmacists facilitate laboratory monitoring, but the ultimate responsibility remains with the prescriber of the medication. Thus, outcomes associated with the number of laboratory tests completed and whether the results are normal or abnormal are not a part of this experience.

Expansion of pharmacy services in ambulatory care practice is essential, as is the need to prepare a cadre of ambulatory care pharmacy practitioners. Pharmacy leaders offered essential strategies, three of which are addressed with this innovative approach to IPPE.[15] One strategy is to implement virtual and mobile health care for ambulatory patients. Using remote access to electronic health records to conduct population health activities supports virtual care by pharmacy students. A second strategy is to leverage predictive modeling to facilitate population health management. Veterans Affairs, Kaiser Permanente and Indian Health Services effectively use analytics to facilitate population health activities, enabling pharmacists to target patients most likely to benefit from interventions. Exposing students to clinical dashboards that facilitate population health management is valuable. Following the IPPE, students were better able to explain the role of a clinical dashboard to support patient care. A third strategy is to offer expanded training within primary and ambulatory care to students and residents such that students and residents contribute to the health care system at a level appropriate for their professional development. Exposing students to ambulatory care practice during their introductory practice experiences may help to meet future work-force needs.

CONCLUSION

The collaboration between a VA health care system and a school of pharmacy utilizing a medication safety clinical dashboard and remote access to the EHR meets many objectives. VA offers experiential learning without the limitations for workspace and computers at the medical facility. Students are provided real-world introductory experiences with laboratory monitoring to ensure medication safety, navigating VA's EHR and documenting progress notes. Students can perform patient care activities and earn IPPE hours without traveling from the university to a health care facility. VA is a national health care system; thus, this model can be reproduced by other schools of pharmacy in various locations.

ACKNOWLEDGEMENTS

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Table 1. Results of Student Questionnaire Administered on the First and Final Day of the Course

	N=58	Pre	Post
Questionnaire Item I can explain the role of a clinical dashboard to conduct population health activities.	Strongly Agree/Agree	7	47[a]
	Neutral	17	11[a]
	Disagree/Strongly Disagree	34	0[a]
I have experience using a non-simulated electronic health record to perform patient care.	Strongly Agree/Agree	12	53[a]
	Neutral	12	4[a]
	Disagree/Strongly Disagree	33	0[a]
I have experience monitoring laboratory test results.	Strongly Agree/Agree	10	54[a]
	Neutral	17	3[a]
	Disagree/Strongly Disagree	30	0[a]

[a] $p < .05$

Figure 1: Overview of IPPE Curriculum

A. IPPE Course Track

IPPEs	Fall P1	Spring P1	Summer P1	Fall P2	Spring P2	Summer P2
Community I		~190 students [entire class]				
Community II			[1/3 of class]	[1/3 of class]	[1/3 of class]	
Hospital			[1/3 of class]	[1/3 of class]	[1/3 of class]	
Ambulatory Care			[1/3 of class]	[1/3 of class]	[1/3 of class]	
Health Care Outreach		Longitudinal				
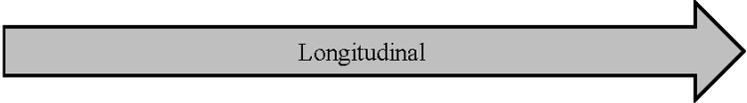
B. Ambulatory Care IPPE Modules

Orientation	Medication Safety	Diabetes	Pain
(2 Weeks – 4 hours)	(3 weeks – 6 hours)	(3 weeks – 6 hours)	(5 weeks – 10 hours)

C. Ambulatory Care IPPE Weekly Sessions
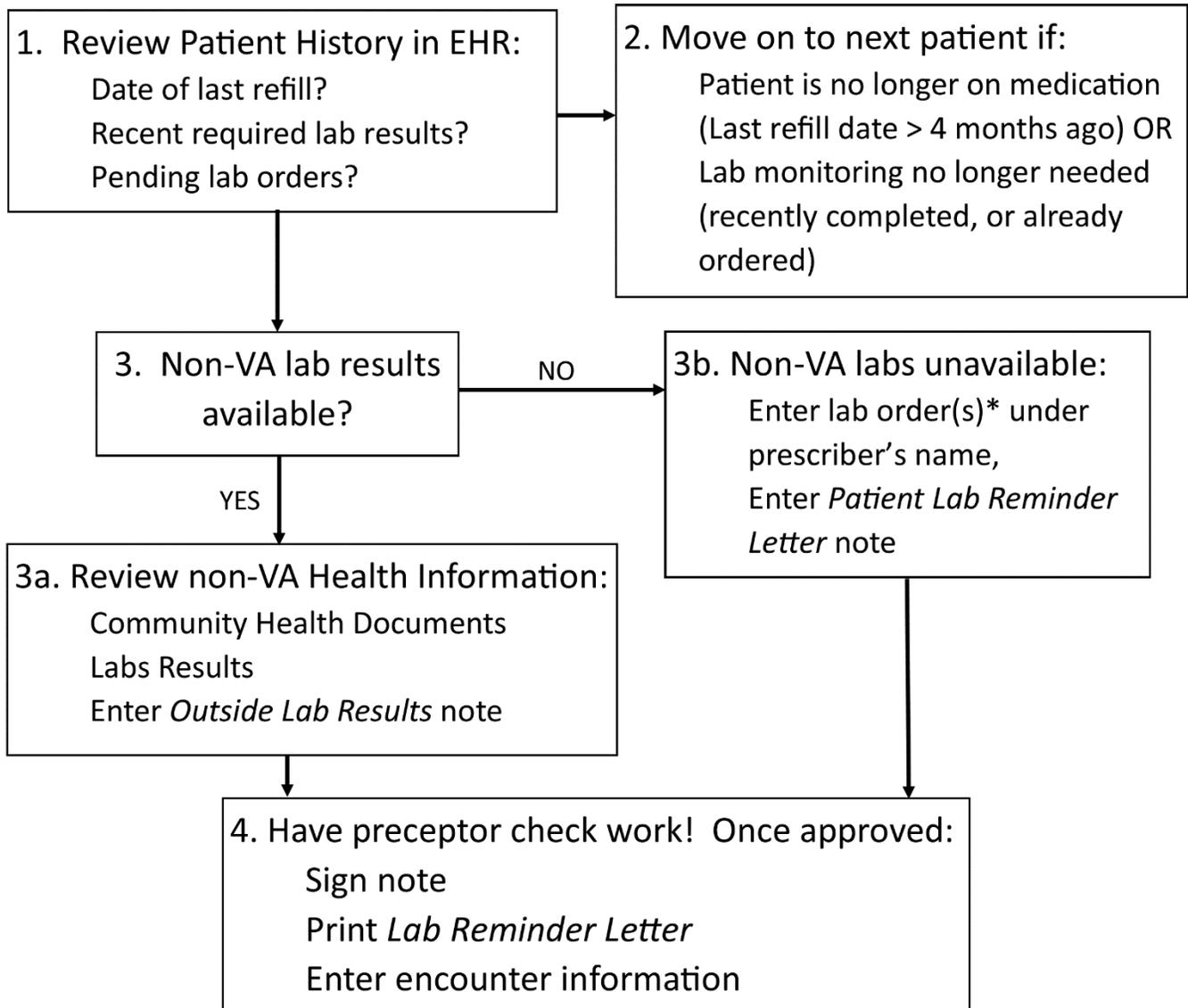(Repeated with no more than ten students per session to facilitate preceptor/student interaction)

Wed	Thu	Fri
Session 1 12:30 – 14:30	Session 3 12:30 – 14:30	Session 5 12:30 – 14:30
Session 2 14:30 – 16:30	Session 4 14:30 – 16:30	Session 6 14:30 – 16:30

IPPE = Introductory Pharmacy Practice Experience, P1 = First year, P2 = Second year

Figure 2: Student Workflow Summary

Medication Safety Review:

1. Review Patient History in EHR:
Date of last refill?
Recent required lab results?
Pending lab orders?

2. Move on to next patient if:
Patient is no longer on medication (Last refill date > 4 months ago) OR Lab monitoring no longer needed (recently completed, or already ordered)

3. Non-VA lab results available?

NO →

3b. Non-VA labs unavailable:
Enter lab order(s)* under prescriber's name,
Enter *Patient Lab Reminder Letter* note

YES ↓

3a. Review non-VA Health Information:
Community Health Documents
Labs Results
Enter *Outside Lab Results* note

4. Have preceptor check work! Once approved:
Sign note
Print *Lab Reminder Letter*
Enter encounter information

*Medication Safety Laboratory Monitoring and Frequency

Drug	ALT	AST	Platelets	WBC	SCr	K
Sulfasalazine	4 mos	4 mos	4 mos	4 mos		
Methotrexate	4 mos	4 mos	4 mos	4 mos	4 mos	
Spironolactone, Eplerenone					7 mos	7mos

ALT = Alanine Aminotransferase; AST = Aspartate Aminotransaminase; WBC = White Blood Cells; SCr = Serum Creatinine; K = Potassium; mos = Months

Appendix 1: Student Onboarding, Orientation and Competency Assessment Items

Onboarding Timeline

3 months prior to start date
Submit *Without Compensation* employee application to Department of Veterans Affairs (VA)
2.5 months prior to start date
Send *Training Qualifications and Credentials Verification Letter* to VA
2 months prior to start date
Students complete on-line *Privacy and Health Insurance Portability and Accountability Act (HIPAA)* and *VA Privacy and Information Security Awareness and Rules of Behavior* training
VA Human Resources (HR) travels to University to obtain student fingerprints for federal background check
No more than 30 days prior to start date
Submit request to VA Office of Information Technology (OIT) – Electronic Health Record (EHR) access
2 weeks prior to start date
HR conducts *swearing in* for new employees
1-2 weeks prior to start date
Arrange Personal identity verification (PIV) card appointment
Submit remote access request

Course Orientation (Four Hours)

First session: 2 hours
    Students complete pre-IPPE survey
    Faculty introductions
    Course expectations, including:
        Syllabus
        Professional standards (white lab coat, no food, HIPAA compliance)
        Grading
        Attendance policy
    Pre-recorded brief overview of VA
    Pre-recorded description of Population Health Management
    Assignment of homework (review indications and lab monitoring parameters for drugs that are part of the Medication Safety initiative)

Second session: 2 hours
    VA OIT Logistics (hands-on experience for students):
        How to remotely log onto VA computer system (including information security, updating/changing/registering VISTA access and verify codes, Signature code, Signature title)
        Pre-recorded *how to navigate VA's EHR*
        Pre-recorded *how to enter a progress note*
        How to navigate Joint Legacy Viewer
    Review of Medication Safety initiative
        Review of students' homework (e.g., discussion of the medications that are part of the initiative)
        Demonstration of VISN 21 Pharmacy Benefits Management Medication Safety dashboard
        Overview of *how to* document and flowchart of initiative
        Step-by-step on-screen demonstration

Competency Assessment

To be deemed competent, the student must demonstrate to the preceptor that she/he is able to perform the following:
    Log onto VA System
    Sign into VA's EHR
    Accurately select patient
    Navigate within EHR to find:
        Medication profile
        Progress notes
        Lab results and pending orders

Conduct search of external health records in JLV
    Find and review pertinent continuity of care documents
    Search and select pertinent lab values to document within the VA EHR
Document findings in VA's EHR by:
    Selecting appropriate clinic location
    Selecting appropriate progress note title
    Accurately entering pertinent information
    Entering appropriate encounter information
Entering laboratory orders under patient's provider's name:
    Accurately identifying which provider to order labs under
    Enter correct lab tests
    Enter appropriate collection date