STANDARDIZED AUTOMATED NOTIFICATION PROCESS FOR SAFE AND EFFECTIVE MANAGEMENT OF TEST RESULT DELIVERY IN A VA FACILITY

A DOCTOR OF NURSING PRACTICE PROJECT SUBMITTED TO THE OFFICE OF GRADUATE DIVISION OF THE UNIVERSITY OF HAWAI'I AT MĀNOA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF NURSING PRACTICE

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Keywords: timely notification normal and abnormal test results, missed test results, patient safety

DEDICATION

This work is dedicated to my late father, Carlito Arde whose words of encouragement and push for persistence rings in my ears even many years after his passing, and emphasized the importance of education. To my loving mother, Aurea Alminar Arde, who's taught me to work hard for the things that I aspire to achieve, and that nothing is impossible.

To my beautiful daughters, Alyssa and Nani, who were at hand as my cheerleaders. You both have been my inspiration, my strength, and the drive to keep going. I love you both.

This work is also dedicated to my loving and caring husband, Levi, who has been a constant source of support and encouragement during the challenges of doctoral education and life. I am truly thankful and lucky for having you in my life. I am grateful for your understanding and unconditional love during these demanding past two years.

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Abstract

Laboratory and other diagnostic tests are often performed on patients to assist in diagnosing illnesses or monitoring health status. Failure to communicate follow-up test results, especially abnormal tests, is a major safety issue since delays to diagnosis and treatment can potentially result in patient harm. However, the best ways to communicate test results to patients in primary care are unknown. Additionally, the provision of timely accurate test results assists patients in integrating the information so that personal health decisions can be made.

A quality improvement project was conducted and implemented at a Veterans Administration facility in Honolulu, Hawaii. The goal was to implement a standardized and consistent automated test result notification process while focusing and improving on providers' challenges with proper test result delivery. The Iowa Model Revised was the conceptual framework that guided this project. The literature review revealed that many different factors can affect the timely notification of test results. The literature clearly indicates that when abnormal test results are not communicated in a timely manner, patient safety is at risk.

The intended outcomes for the project were at least 90% of abnormal test results were communicated to the patients within seven days and the expected implications were- providers' increased adherence to the test results delivery process and improved patient health outcomes. The pre-implementation assessment revealed that 5% of abnormal test results communicated to the patients in March 2016. The quality improvement project was implemented in June 2016.

The post-implementation chart review and provider need assessment and satisfaction questionnaire results were suggestive that the providers' compliance with test result reporting increased. Though the goal of 90 percent of the providers notifying patients of their abnormal

test results in a seven-day period was not achieved, it was improved from a low 5% pre-implementation to a high of 81% post-implementation. Although the project was conducted over a short timeframe, it was effective in engaging the providers to adopt the practice change. Thus, the implementation of a standardized and consistent automated test result notification process appeared to be beneficial for both the providers and patients.

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LIST OF ABBREVIATIONS

AACN	American Association of Colleges of Nursing
ACC	Acute Care Clinic
ACOS	Associate Chief of Staff
APRN	Advanced Practice Registered Nurse
CAC	Clinical Applications Coordinator
CBOC	Community Based Outpatient Clinic
CDC	Centers for Disease Control and Prevention
CPRS	Computerized Patient Record System
CVT	Clinical Video Telehealth
DACOS	Deputy Associate Chief of Staff
DNP	Doctorate of Nursing Practice
EB	Evidence Based
EBP	Evidence Based Practice
EHR	Electronic Health Records
EPRP	External Peer Review Program
FAX	Facsimile
IT	Information Technology
OIG	Office of the Inspector General
PACT	Patient Aligned Care Team
PCP	Primary Care Provider
PICO	Problem – Intervention – Comparison – Outcome
QEB	Quality Executive Board
QI	Quality Improvement
QRCT	Quasi Randomized Control Trial

RCT	Randomized Control Trial
RN	Registered Nurse
TJC	The Joint Commission
UIHC	University of Iowa Health Clinics
VA	Veterans Administration
VAMC	Veterans Administration Medical Center
VAPIHCS	Veterans Administration Pacific Islands Healthcare System
VHA	Veterans Health Administration
VISN	Veterans Integrated Sierra Network
VISTA	Veterans Information System and Technology Architecture
WHO	World Health Organization

Chapter 1. Executive Summary

Introduction

This chapter is the summary and the overview to the study. It is organized in four major sections and begins with the introduction that covers the project's background and problem. In the introduction section, the conceptual framework which guided the project, literature review and synthesis, and project's innovations/objectives are summarized. Lastly, the methods, results, and discussions that will provide an overview of the project results, its implications, and the limitations of the project are also summarized.

Background/Problem. Appropriate and timely communication of test results are important elements of high- quality health care (Leekha, Thomas, Chaudry, & Thomas, 2009). In the delivery of patient care, there are thousands of laboratory and diagnostic tests ordered by providers every day. However, the inaccurate or untimely notification of tests is a major safety issue and can result in delayed diagnosis and treatment that may adversely affect patient outcomes (Abjudeh et al., 2009 and World Health Organization [WHO], 2008). Electronic notification of abnormal test results via the electronic health record (EHR) may facilitate timely follow-up, particularly in outpatient settings where many results are not immediately life-threatening and not reported to patients (Hysong et al., 2011). However, there are challenges and barriers to timely notification of normal and abnormal test results by providers to their patients.

The purpose of this Doctor of Nursing Practice (DNP) project was to determine the barriers to timely abnormal test reporting and implement strategies such as a standardized and consistent notification process for safe and effective delivery of test results. This DNP quality

improvement (QI) project was implemented at the Veterans Administration Pacific Islands Healthcare System (VAPIHCS), ambulatory care clinics (ACC) in Honolulu, Hawaii. The goal was that by the end of fiscal year 2017, a standardized and consistent automated test result notification process would be implemented using clearly defined processes and guidelines.

Conceptual Framework. The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care (University of Iowa Health Clinics [UIHC], 2015) was the conceptual framework for this QI project.

Literature Review & Synthesis. The literature review revealed five areas of significance: 1) consequences of untimely tests reporting; 2) provider perspectives of notification methods; 3) patient preferences and satisfaction; 4) notification methods; and 5) impact of EHRs. Evidence of the studies focused mainly on documentation in the medical record. Based on the literature, when abnormal test results are not communicated in a timely manner, the major concerns were patient safety and delayed diagnoses that could potentially be life-threatening (Callen, Westbrook, Georgiou, and Li, 2011).

Innovation/Objectives. The objectives of this DNP project were: (a) at least 90% of the abnormal test results are communicated within seven days; (b) a standardized and automated test result notification process was established and implemented; and (c) 100% of the providers identify the most significant barriers to implementation.

Methods

Design. This DNP project was implemented in a sequential manner spanning an 11-month period, from January 2016 to December 2016. The DNP project was conducted in five phases: (1) baseline data collection review; (2) pre-implementation provider need assessment

and satisfaction questionnaire; (3) implementation of a standardized and consistent automated test result notification process; (4) post-implementation provider needs assessment and satisfaction questionnaire; and (5) post-implementation data collection review.

Practice Change Description. The goal of this DNP project was that by the end of the fiscal year 2017, a standardized and consistent automated test result notification process would be implemented using clearly defined processes and guidelines. The expected outcomes of this DNP project were that providers would be familiarized with facility's best practices for patient test result notification process; a standardized and automated test result notification was planned; providers' notification timeliness of abnormal test results increased to at least 90%, and barriers to implementation were identified.

Setting and Sample. This project was implemented at the VAPIHCS ACC located on the grounds of Tripler Army Medical Center (TAMC) in Honolulu, Hawaii. Participants were the 13-full-time licensed and VA credentialed primary care providers who were in the patient aligned care teams (PACTs).

Data Collection. The DNP student conducted baseline monthly chart reviews during the five months prior to project implementation via a random pull of more than 100 laboratory and radiologic abnormal and normal test results ordered by the 13 PACT providers. The results of the baseline chart reviews of randomly pulled laboratory and radiologic test results were compared with the monthly chart reviews of randomly pulled laboratory and radiologic test results post-implementation. A provider need assessment and satisfaction questionnaire was distributed to the participants at one - month pre-implementation and at 6-month post-

implementation. A post-implementation data collection review was conducted monthly throughout the duration of the project for comparison with the baseline data.

Results

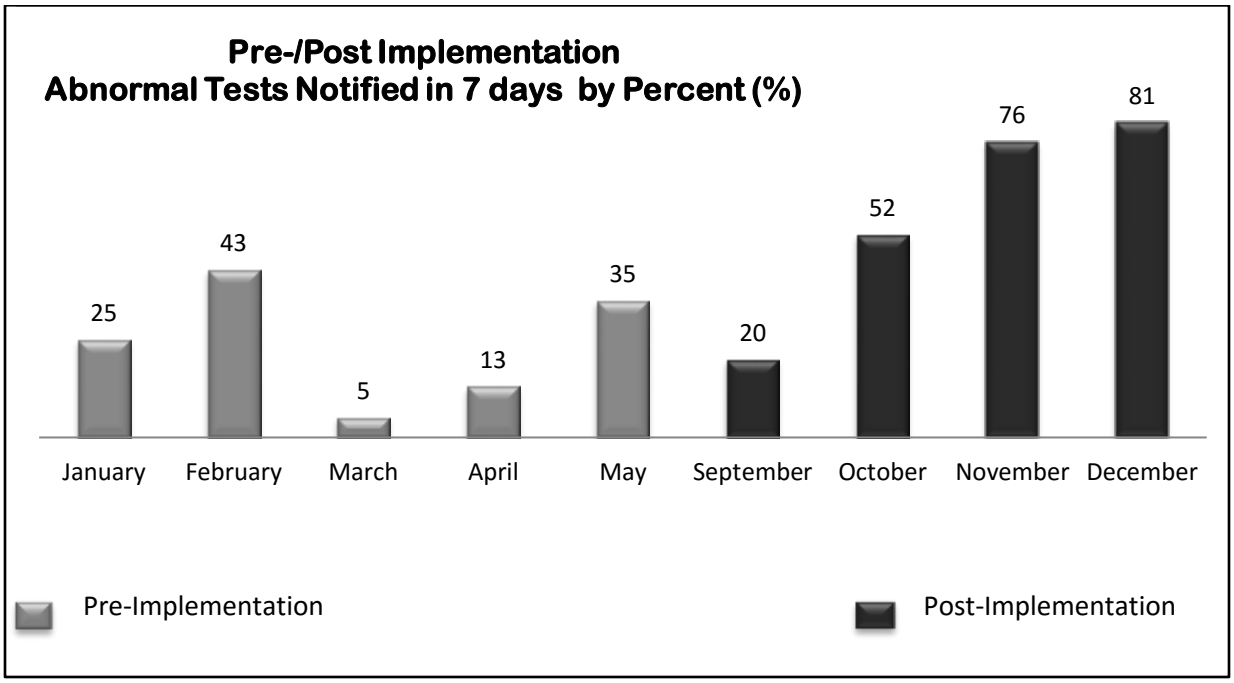
Description of Participants. A total of 13 licensed and VA credentialed primary care PACT providers were the participants who work at VA Honolulu ACC.

Data Analyses Findings.

Provider Needs Assessment and Satisfaction Questionnaire. The pre-implementation and post- implementation provider need assessment and satisfaction questionnaire were analyzed and compared in terms of the providers' (1) barriers of timely notification and (2) their satisfaction with the current test result notification process and their current ability to address abnormal test results on a daily basis. Results indicated that number of alerts received was the number one barrier.

Chart Review. The post-implementation chart review revealed there was a significant increase of abnormal test results communicated from low 5 percent pre-implementation to a high of 81 percent post-implementation. However, the goal of 90% of the abnormal test being communicated within a 7-day period was not reached, it was suggestive that the providers' compliance with test result reporting increased.

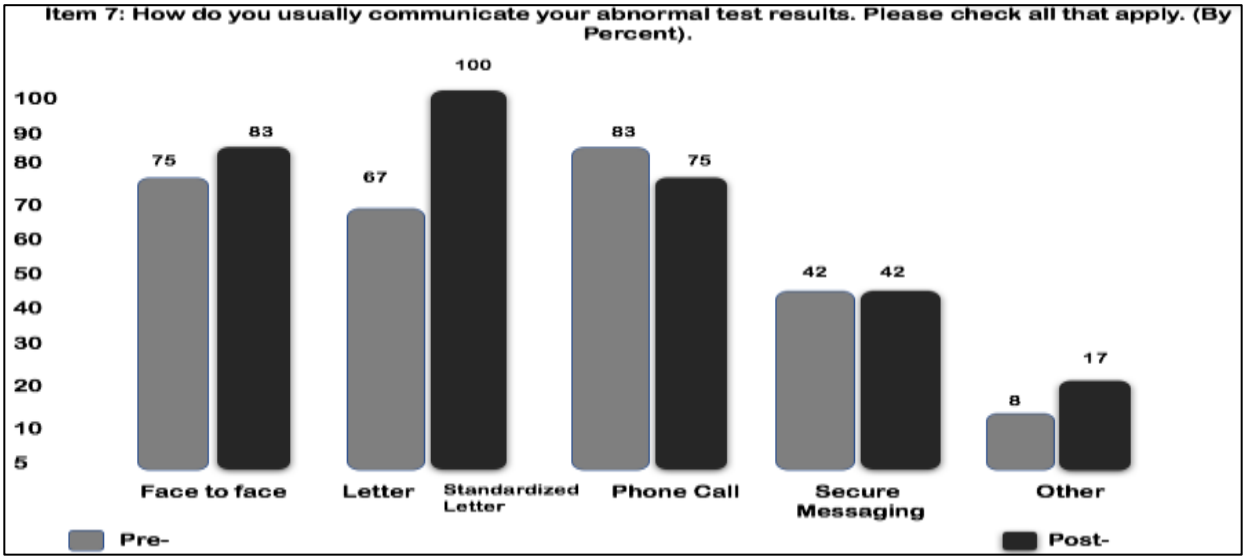
Figure 1.1. Pre-/Post Implementation Chart Review Results



Discussion

Interpretation of Results. Based on the post-implementation chart review in comparison to the pre-implementation chart review, there was evidence of an adoption of the new standardized automated test result notification process. One hundred percent of the 13 providers indicated that they use this method of communicating test results post-implementation. Compliance of timely notification also improved as evidenced by the increased percentage from a low 5 percent pre-implementation to a high of 81 percent post-implementation of abnormal test results reported. Although the target of 90 percent was not achieved, there was a remarkably increased percentage of abnormal test results communicated to patients in the months of November and December, which is suggestive of the providers' improved compliance in test reporting.

Figure 1.2. Provider Need Assessment and Satisfaction Questionnaire – Communication Method



Implications. Ongoing education is needed and warranted to assure complete compliance. It is important to continue to reach out to providers to continue to assess and implement strategies to address their challenges and barriers for safe and timely test results reporting. Leadership support is crucial and the DNP student will continue to keep leadership aware of the providers' challenges and barriers to timely reporting.

Limitations. This DNP project had several limitations. The practice change was implemented in a fluid environment where conditions were not constant and variables could not always be controlled. Small sample size of 13 providers. Another limitation was the length of time to complete this project was less than one year which was not adequate to fully engage the providers to adopt the practice change.

Chapter 2. Problem

Introduction

This chapter reviews the problem and the background of the project. The conceptual framework, literature review and synthesis, and innovations and objectives are further explored and discussed in this section. Lastly, this chapter ends with a synopsis of the problem.

Background/Problem

Primary care providers (PCPs) order tests for many patients daily and are swamped with the management of the test results (Elder, McEwen, Flack, Gallimore, & Palleria, 2010). Studies indicate that family practice providers and general internists order laboratory tests during 29% and 38% of patient visits respectively, and imaging studies in 10% and 12% of patient visits (Hickner et al., 2005). A national survey by the Institute of Medicine (IOM) indicated that each week, full-time PCPs review 800 laboratory data points, 40 radiology reports, and 12 pathology reports (Hickner et al., 2014). Failure to follow-up on laboratory or diagnostic tests is one of the most distressing safety issues of a clinical encounter, particularly when a patient is not notified of an abnormal result (Callen, Westbrook, Georgiou, & Li, 2011). Timely test results notification is one of The Joint Commission's (TJC) National Patient Safety Goals for 2015 and 2016, specifically to "improve staff communication and to get important test results to the right person on time" (TJC, 2015). Abnormal test results are indicators of poor health outcomes and lack of timely follow-up can be a source of considerable anxiety to patients, families, and providers (Veterans Health Administration [VHA] Directive 1088, 2015). Abnormal test results may not be immediately life-threatening but may represent a condition that, if not addressed in a timely manner, could have serious consequences. PCPs are

responsible for providing ongoing clinical care, including communicating with the patient by telephone, letter, or secure e-mail (Georgiou, Westbrook, & Braithwaite, 2012). However, the opportunity for important test results to be missed is great. A systematic review of outpatient test results conducted by several authors found a wide range of missed abnormal results, with 6.8% - 62% missed laboratory results and 1.0% - 35% missed radiology results (Callen et al., 2011). Failure to follow-up on abnormal tests is an important area of medical malpractice and the source of 25% of all malpractice cases (Horsky, Zhang, and Patel, 2005). Malpractice claims reveal the significance of this problem (Gale, Bisset-Siegel, Davidson, and Juran, 2011; Ghandi et al., 2006).

The Department of Veterans Affairs (VA) is committed to the timely communication of test results to ensure safe and effective health care. The VHA Directive 1088 was released in October 2015 and stated, "timely notification of test results to patients is important to the provision of safe, quality care, and facilitates patient involvement in their care" (p. 1). The purpose of this DNP project was to determine the barriers to timely abnormal test reporting and implement strategies such as a standardized and consistent notification process for safe and effective delivery of test results. The goal was that by the end of the fiscal year 2017, a standardized and consistent automated test result notification process would be implemented using clearly defined processes and guidelines.

Conceptual Framework

This DNP Project's change of practice and improvement in the reporting process of laboratory test results was guided by The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care (University of Iowa Health Clinics [UIHC], 2015). (See

Appendix A. The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care.) The Iowa Model Revised is an excellent organizational model that serves as a guide for nurses and other health care providers to use research findings for improvement of patient care" (Tietler, Kleiber, Steelman, Rakel, Budreau, & Everett et al., 2001, p. 498). According to Dontje (2007) the Iowa Model Revised "highlights the importance of considering the entire healthcare system from the provider to the patient to the infrastructure, using research within these contexts to guide practice decisions" (p. 1). This conceptual model was chosen to guide this evidence-based practice (EBP) change at VAPIHCS and to understand barriers faced by providers and potential interventions for the safe and effective delivery of abnormal test results. The Iowa Model Revised consists of seven steps to identify problems and develop solutions as they relate to incorporating evidence into practice (Titler et al., 2001):

1. Identify Triggering Issues
2. State the Question or Purpose
3. Form a Team
4. Assemble, Appraise, and Synthesize Body of Evidence
5. Design and Pilot the Practice Change
6. Integrate and Sustain the Practice Change
7. Disseminate Results

Identifying Triggering Issues. The first step in The Iowa Revised was to Identify Triggering Issues. Based on current VAPIHCS practice, the triggers for this DNP project were:

- Patient safety issue that could result in poor health outcomes and patient anxiety
- Inability to meet quarterly performance measure target

- Failed Office of the Inspector General (OIG) facility inspection in 2011 and 2015
- Lack of consistent test result notification process
- Loss of facility funding due to underperformance

Table 2.1. Pre-Implementation Chart Review Findings

Performance Measure	July FY 2015 (%)	Aug FY 2015 (%)	Oct FY 2015 (%)	Nov FY 2016 (%)	Dec FY 2016 (%)
Abnormal outpatient test results communicated to patient within 7 days	52.6	60.0	63.10	70.0	66.6
Normal outpatient test results communicated to patient within 14 days	57.4	56.8	72.8	78.9	76.6

***Data obtained from random pull of 50 VAPIHCS clinics through the External Peer Review Program (EPRP)*

Clinical Question/Purpose. The purpose of this DNP project was to determine the barriers to timely abnormal test reporting and implement strategies such as a standardized and consistent notification process for safe and effective delivery of test results. The clinical question for this DNP project was: "Will a consistent and standardized automated test result notification process have an impact on providers' adherence and are 90 percent of abnormal test results communicated within seven days?"

PICO. The PICO is used in evidence based practice to frame and answer a clinical question:

P = Problem, I = Intervention, C = Comparison, O = Outcome (Titler et al., 2001).

Table 2.2. PICO

P Problem	Lack of standardized test result notification process and primary care providers' compliance issue with test result notification
I Intervention	Standardization of test result notification delivery at VAPIHCS
C Comparison	Current practice
O Outcome	Ninety percent of abnormal test results are communicated to the patients within seven days

Form a Team. A team is responsible for development, implementation, and evaluation of EBP (Titler et al., 2001, p. 501). Assembling a team of interdisciplinary providers to look at various sources of information across disciplines (Titler et al., 2001). The team members of this DNP project consisted of:

- Deputy associate chief of primary care clinic
- Chief of clinical informatics
- Chief of laboratory services
- Patient safety manager
- Community-Based Outpatient Clinic (CBOC) nurse manager
- External advisor

Literature Review and Synthesis

Based on the PICO question, a thorough search of the literature was conducted. An electronic search was completed using PubMed, CINAHL, National Guideline Clearinghouse (NGC), Cochrane Databases, PsycINFO (via APA PsycNET), OVID, Science Direct, Google Scholar, and ELSEVIER. Search terms included: "abnormal test results," "timely notification," "electronic health record," "patient preferences," "provider test results," "result notification,"

"patient safety," "communication," "notification," "primary care," "abnormal diagnostic test results," "normal test results," "critical test results," "test result follow-up," "medical errors," "quality improvement," "guidelines," and "performance improvement." The search yielded and identified a total of 35 publications related to test result notification from 1996 to 2015, of which reduced to 32 articles found to be relevant for this project. The other three articles focused mostly on critical test results and were eliminated for insignificance. The 32 articles were then synthesized using the Mosby Research Critique Tool to grade the level of evidence and its internal validity. This tool has eight levels of evidence as shown in Table 1.3 and the 32 synthesized articles were ranked accordingly.

Table 2.3. Mosby Research Tool and Synthesized Articles

Level of Evidence	Description	Number of Articles per Level of Evidences
I	Meta-analysis	2
II	Experimental Design/Randomized Controlled Trial (RCT)	10
III	Quasi-experimental design	1
IV	Case controlled, cohort studies, longitudinal studies	3
V	Correlation studies	0
VI	Descriptive studies including surveys, cross sectional design, developmental design, and qualitative studies	12
VII	Authority opinion or expert committee reports	0
OTHER	Performance Improvement (PI); Review of Literature (ROL)	4

The major concern of the studies was patient safety when abnormal test results were not communicated appropriately. Studies about timely reporting of test results were conducted with different subjects including primary care providers (PCPs), radiologists, registered nurses, a

clerk who was assigned to communicate test results, and patients with specific medical problems. The studies relied on radiology and pathology reports, bibliographic reports, and specific laboratory alerts of abnormal values for *glycosylated hemoglobin* (HgbA1c), Hepatitis-C virus (HCV), prostate specific antigen (PSA), and thyroid stimulating hormone (TSH). Majority of the studies were Levels of Evidence II and VI, consisting of RCTs and descriptive studies.

Synthesis of Evidence by Sub-Concepts.

***Consequences of Untimely Tests Reporting*.** Callen, Westbrook, Georgiou, & Li (2011) conducted a systematic review of evidence quantifying the failure to follow-up test results and its impact on patient outcomes. Four reviewers independently screened 768 articles and 19 studies met the inclusion criteria (Callen et al., 2011). The impact of missed test results on patient outcomes was reported in 7 of the 19 studies (Callen et al., 2011) and missed cancer diagnoses were reported in 4 studies (Chen et al., 2007; Choksi et al., 2006; Singh et al., 2009; and Ghandi et al., 2006). Other reported outcomes were increased visits to the hospital because of hyperkalemia related to missed abnormal serum potassium levels (Moore, Lin, McGinn, & Halm, 2007) and adverse drug events related to insufficient supplementation with levothyroxine due to missed follow-up of abnormal TSH results (Stalfox. Ahmed, Fiskio, & Bates, 2004). Callen et al. (2011) later discussed the extent and impact on patient outcomes and concluded that "failure to follow-up test results occurs frequently in ambulatory settings and evidence of its impact demonstrates that is an important patient safety issue which needs urgent attention" (p. 1337). Level of evidence: Other, Literature of Review.

Provider Perspectives. A study conducted by Giardina et al. (2013) focused on determining physicians' perspectives about direct notification of normal and abnormal test results by conducting a cross-sectional international survey of physicians at five diverse clinical sites. Two of the sites were ambulatory clinics in large public hospitals in Sydney, Australia, both of which were in the process of transitioning to EHRs. The other three settings were in Texas. Two were large private multispecialty practices using integrated, well-established EHRs and one was a network of multispecialty private physicians at various stages of adopting an EHR system (Giardina et al., 2013). Results varied from the physicians' attitudes towards direct notification of test results, to physicians' expressing concerns about direct notification of clinically significant abnormal test results. This second group of physicians was concerned about their patients' anxiety, confusion, lack of expertise to interpret the results, seeking unreliable information to understand the results, and concerns that patients would seek care without consulting the provider (Giardina et al., 2013). Conclusions of this study indicated that physicians surveyed generally favored direct notification of normal test results but appeared to have substantial concerns about direct notification of abnormal test results (Giardina et al., 2013). Most thought the use of direct notification should be accompanied by strategies to help patients accept and manage abnormal test results. Level of evidence: Level VI.

Hysong et al. (2010) conducted a study on provider management strategies of abnormal test result alerts and randomly sampled 28 primary care providers (PCPs) from a large tertiary care Veterans Affairs Medical Center (VAMC). Via a cognitive task analysis, participants were interviewed about how and when they managed alerts. Specifically, the authors focused on certain alert management features such as completion of laboratory results or the type of clinic in which a patient was seen to filter, sort, and reduce unnecessary alerts on providers' electronic

medical record screens (Hysong et al., 2010). The results of the study found that provider knowledge of alert-management features ranged between 4% and 75% and almost half (46%) of providers did not use any of the alert-management features, and used at least one workaround strategy to manage alerts (Hysong et al., 2010). Authors concluded that standardization of alert-management strategies, including improving provider knowledge of appropriate tools in the EMR to manage alerts, could reduce the lack of timely follow-up of abnormal diagnostic test results (Hysong et al., 2010). Level of Evidence: Level II.

Patient Preferences and Satisfaction. Leekha et al. (2009) evaluated notification methods preferred by patients in a primary care internal medicine department. The study focused on determining factors that patients believed were important for their own satisfaction in test result notification, as well as how providers could assist to incorporate test results into patients' personal health decision-making. The results varied from patients preferring a telephone call from their provider (55%) and others preferring a return visit (20%) (Leekha et al., 2009). Patients were somewhat anxious to learn their test results and valued timeliness in test result notification. Some preferred a telephone call (67%) from a physician or nurse practitioner (Leekha et al., 2009). Level of evidence: Level VI.

Baldwin et al. (2005) conducted a qualitative study to identify factors that influenced the communication of normal laboratory test results to patients. Thirty-minute guided interviews were conducted with 20 adult patients at two practice-based research networks in Colorado participating in a study of medical errors. The results showed that 90% of the participants wanted to be notified of all tests results and that there were several issues related to notification including privacy, responsiveness, interactive feedback, convenience, timeliness, and detailed

information. The researchers concluded that these issues may be "critical for patient satisfaction and for improving patient safety, and are features that may be incorporated into emerging communication channels" (p. 1). Level of evidence: Level VI.

Notification Methods. Failure to follow-up on test results, particularly when a patient is not notified of an abnormal test result is an important safety issue (Callen et al., 2011). Grimes et al. (2009) conducted an anonymous survey at five ambulatory primary care clinics with patients aged 18 years or older (n=728) to assess patient preferences and physician practices for delivering laboratory test results in ambulatory care. Most the patients were satisfied with the current method of notification via the Postal Service for normal test results. Patients and providers preferred contact by phone as the method of notification for abnormal test results (Grimes et al., 2009). Level of evidence: Level VI.

Car, Gentry, van-Velthoven, & Car (2013) conducted an RCT and quasi-randomized (qRCT) on recipients (n=35) of human immunodeficiency virus (HIV) test results and post-test counseling via telephone regardless of any demographic characteristics such as age, gender, education, marital status, employment status, and income status. The study compared the efficacy of telephone HIV test results notification and post-counseling to a face-to-face notification, or other ways of HIV test result delivery such as telephone, secure messaging or emails, and letter notification. Overall, only 48% (n=168) of participants received their test results and post-counseling. Notably, more participants received their HIV test results by telephone (58%, n=106) compared to the face-to-face notification (37%, n=62) (Car et al., 2013). Level of Evidence: Level II, Level IV, and Other (ROL).

The Impact of Electronic Health Records (EHRs). Laxmisan et al. (2012) examined the effectiveness of an EHR to improve follow-up of abnormal pathology results at two VA clinics. Pathology reports were randomly selected using a standardized chart review instrument for follow-up evaluations. The results from the two VA sites varied considerably. An electronic intervention to improve test results follow-up using the same EHR was found effective only after considering certain local related factors such as the amount of "view alerts" messages daily, existing workflows or practices, concomitant QI initiatives, and other context factors (personnel) and organizational features, etc. Without controlling for "social-technical" contextual factors, the potential benefits of EHR utilization for timely follow-up of abnormal test results may have been underestimated (Laxmisan et al., 2012). Level of evidence: Level II and IV.

Lacson et al. (2014) studied the four-year impact of an alert notification system on policy adherence for the closed-loop communication of critical imaging test results to referring providers. Additionally, during the first four years after the implementation, system adoption was assessed. The authors conducted a statistical analysis of the trend at six-month intervals over four years using a chi-square trend test. Adoption of the participants was evaluated by quantifying the use of the system overall and the proportion of alerts that used non-interactive communication as a percentage of all reports generated by 320 radiologists (n=1,538,059) (Lacson et al., 2014). Manual review of a random sample of radiology reports from the first four years after the intervention (n=37,604) compared with baseline outcomes one year prior to the intervention (n=9430) (Lacson et al., 2014). An automated alert notification system for communicating critical imaging results was successfully adopted and was associated with increased adherence to institutional policy for communicating critical test results and with

reduced workflow interruption as evidenced by the nine-fold increase in the critical results communicated via the system (95% post-intervention vs 91.3% pre-intervention) (Lacson et al., 2013). Level of Evidence: Level 1.

The quality, quantity, and consistency of this DNP project's literature review were of great significance when considering an EBP change. The quality of the literature review was supported by 10 randomized controlled trials (RCTs) conducted in large organizations such as the health care facilities in Boston, and large VHA facilities throughout the country. Several of the studies were conducted in Australia and Great Britain; however, most were done in the United States. The articles reviewed covered major issues and problems; therefore, it indicated several barriers to timely notification of test results, including (Callen et al., 2011):

- The number of 'view alerts' received daily that inhibits timely notification of test result
- The lack of providers' knowledge of the EHR features
- Facility policies relating to responsibility, timing, and process

Innovation/Objectives

The objectives of this DNP project were: (a) at least 90% of abnormal test results were communicated within seven days; (b) a standardized and consistent automated test result in the notification process was established and implemented; and (c) 100% of the providers identify perceived barriers to implementation.

The literature review supports the need to improve the management of test result delivery at VAPIHCS. To meet the DNP project objectives, Callen et al. (2011) recommends: (a) assess current policies related to the responsibility, timing, and process of notification; (b)

integrate the functionality of current information technologies and actions relying on documentation in the EHR; (c) consider patient preference and the effectiveness of different methods of communicating test results; (d) identify effective methods used by the staff; and (e) ensure multidisciplinary team collaboration. Based on Laxmisan et al. (2012) study, proper training of new incoming providers to the EHR and the 'View Alerts' is essential to ensuring appropriate management of patient test results.

Summary

This chapter introduced the DNP QI project and discussed its background. The objectives and rationale for improving the process of reporting abnormal test results were outlined. The Iowa Model Revised was the conceptual model that guided this project and was utilized to identify the project's triggers. A literature review was then conducted, and relevant EB articles were selected, synthesized, and divided into sub-concepts. The results of the literature review supported the need to improve the management of test result delivery at VAPIHCS. Melnyk et al. (2014) specified that "EBP is a life-long problem-solving approach to the delivery of health care that integrates the best evidence from well-designed studies (i.e., external evidence)" (p. 5).

Chapter 3. Methods

Hundreds of laboratory and radiologic tests are generated daily by the VAPIHCS' providers. The failure to fulfill monthly goals and targets, national benchmarks and the Office of the Inspector General (OIG) safety standards resulted in failed facility inspections in 2011 and 2015. Currently, there seems to be a gap between timely delivery of test results of clinical providers' compliance with VHA Directive 1088. Communicating test results in a timely manner are one way to provide quality care and ensure patient safety (VA, 2015). VHA Directive 1088 indicated that "timely communication of test results is essential to ensuring safe and effective health care" (VHA, 2015, p. 1). In addition, the VHA also stated that "all VA medical facilities are expected to put in place appropriate systems and processes to ensure timeliness of appropriate communication and follow-up of test results" (p. 1).

The project goal was that by the end of the fiscal year 2017, a standardized and consistent automated test result notification process was implemented using clearly defined processes by focusing on clinical providers' challenges with proper test result delivery and determining their challenges and barriers with everyday workflow.

Utilizing step five of the Iowa Model Revised, which is designing and piloting the practice change, this chapter discusses the Methods by which the DNP project was implemented at VA Honolulu ACC. Specifically, the following was examined: project objectives, practice change description, operational definitions, setting and sample, data collection procedures, program evaluation plan, ethical considerations, human subjects considerations, and project limitations.

Objectives

The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care (UIHC, 2015) was the conceptual framework that guided this DNP QI project which then required the formulation of a clinical question organized in a PICO format.

- P = Lack of standardized test result notification process and primary care providers' compliance issue with test result notification
- I = Standardization of test result notification delivery at VAPIHCS
- C = Current Practice
- O = 90% of abnormal test results are communicated to the patients within seven day

The clinical question for this DNP project was: "Will a consistent and standardized automated test result notification process has an impact on providers' adherence and are 90% of abnormal test results communicated within seven days?"

Failure to communicate abnormal test results can be a major safety issue and causes patient harm and poor outcomes because of delayed diagnosis and treatment. A study conducted by Hysong et al. (2011) suggested that an electronic notification of abnormal test results via the EHR may facilitate timely follow-up, particularly in outpatient settings where many results are not immediately life-threatening and not reported to patients.

Purpose: The purpose of this DNP project was to determine the barriers to timely abnormal test reporting and implement strategies such as a standardized and consistent notification process for safe and effective delivery of test results.

Objectives: The objectives of this DNP project were: (a) at least 90% of the abnormal test results were communicated within seven days; (b) a standardized and automated test result

notification process was established and implemented; and (c) 100% of the providers identify perceived barriers to implementation.

Design

The conceptual framework that guided this DNP project was the Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care (UIHC, 2015) and it was implemented in sequential methods spanning an 11 – month period, from January 2016 to December 2016 and was conducted in five phases: (1) baseline data collection via a random pull of 100 or more laboratory and radiologic test results in which patients were not notified of their abnormal test results within a seven-day period; (2) monthly comparison of the number of test results communicated within seven days based on 100 or more randomly selected normal and abnormal laboratory and radiologic test results; (3) monthly comparison of the mean number of days taken to communicate 100 or more randomly selected normal and abnormal laboratory and radiologic test results; (4) comparison of baseline (pre-) responses of provider needs assessment and satisfaction questionnaire to the 3-month and 6-month responses post-implementation; and (5) post-implementation data collection review.

Practice Change Description

Prior to the implementation of this DNP project, there was no standardized test result notification process at the facility and based on the results of the literature review, it supported the need to improve the management of test result delivery and the following literature recommendations met the DNP project objectives: assess current policies and practices related to the responsibility, timing, and process of notification; integrate the functionality of the EHR; consideration of patient notification preferences and effectiveness of different methods of test

result notification; identify effective methods used by the staff; and ensure multidisciplinary team collaboration (Callen et al., 2011).

Previously, and during the implementation of the DNP project, a sequence of educational intervention was conducted through different methods such as face-to-face meeting with the providers, several mass emails sent to all providers, and flyers posted in different areas which addressed the importance of communicating test results in a timely manner. Also, the VHA Directive 1088, the JC, and the OIG safety standards were all discussed. After four months of collaboration between primary care leadership, clinical informatics, IT, and staff in Sacramento VA and Northern Arizona VA, a standardized and consistent automated test result notification process was implemented.

Characteristics of the Innovation. Rogers (2003) defined innovation as "an idea, practice, or object that is perceived as new by an individual or another unit of adoption" (p. 137). The rate of adoption is then defined by Rogers (2003) as "the relative speed with which an innovation is adopted by members of a social system" (p. 221). The rate of adoption of this DNP project will be dependent on different attributes such as (a) the relative advantage of the innovation; (b) compatibility; (c)complexity; (d) trialability; and (e) observability.

Relative Advantage. Relative advantage as defined by Rogers (2003) "is the degree to which an innovation is perceived as being better than the idea it supersedes" (p. 229). The focus of this DNP project was to standardize the test result delivery to assure patient safety and quality of care. However, standardizing a process can be a difficult task as it may present some, if not many obstacles and challenges. The possibility of not being successful during the innovation process can overall prevent an implementation process. Before a standardization was

reached, leadership and stakeholders involvement was significant in acquiring support and approval of this QI project. Rogers (2003) indicated that there are important specific sub-dimensions of relative advantage. This process improvement has specific attributes that can possibly affect the relative advantage and the rate of adoption of the project: (a) preventive innovations; (b) the effects of incentives; and (c) mandates for innovation. (See Appendix L. Adopter Categorization on the Basis of Innovation.)

Preventive innovations. Rogers (2003) indicated that "this innovation has a slow rate ofadoption because of the difficulty of perceiving its relative advantage" (p. 234). Given that the rate of adoption may be slow, VAPIHCS' leadership and stakeholders will have a common interest once data is presented as evidenced by (a) non-compliance with the OIG test results notification standards that resulted in facility citation; (b) loss of facility funding for not consistently meeting performance measures targets and benchmarks; and (c) continued low performance measure scores on timeliness of test result delivery. The rate of adoption of this DNP project was slow but with continued provision of meaningful data that confirms the importance of the project, it has the potential to expedite the workflow process, ensure patient safety, and improve the quality of patient care.

The effects of incentives. The Federal Government is well-known to provide incentives to its employees for performing well (positive incentive). Rogers (2003) indicated that "award incentives are used to speed up the rate of adoption of innovations" (p. 237). This is particularly an attribute to the relative advantage of this DNP project but not necessarily a positive incentive but a negative incentive. The continued concern of providers' untimely reporting of test results to patients, the facility's deputy chief of staff made mention that the evaluation of each provider will be affected for non-compliance and can affect their cash awards. Rogers (2003) specified

that “most incentives are positive in that they reward the desired behavior change but also possible to penalize an individual by imposing an unwanted penalty (p. 237).

Mandates for innovation. According to Rogers (2003) “certain types of behavior change may be desired or demanded by a government, for example, but not by the individual citizens” (p. 239). This attribute is a perfect fit with this DNP project as timeliness of test result notification has been in the VHA ‘radar’ since 2009. In 2009, the first VHA Directive pertaining to timely communication of test results was released and each VHA facility was conveyed to initiate a policy based on the Directive. In October 2015, a new Directive was released with some changes to the policy. Despite the VHA Directive on the timeliness of test result delivery, VAPIHCS continues to present non-compliance as evidenced by monthly low trended data and a citation from the OIG during a facility inspection in 2011 and 2015. Leadership at VAPIHCS had been pressured by the VA Central Office to ensure that test results are communicated to patients in a timely manner, 14 days for normal test results and seven days for abnormal test results. Currently, the target of 90% has not been reached despite continued providers’ education and the OIG finding remains ‘open’ that VAPIHCS is required to submit a quarterly report. Until the target is reached, OIG will continue to track the timeliness of test result delivery at VAPIHCS. In addition, a question included in an after-visit survey had been added if patients received their test results from their provider in a timely manner.

Compatibility. Rogers (2003) described compatibility “as the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters” (p. 240). Compatibility can also be affected by previously introduced ideas and according to Rogers (2003), “it can either speed up or delay a rate of adoption” (p. 243). This process improvement will focus on providers and address system-level issues that involve

leadership and stakeholders. Challenges for this innovation was centered on the willingness or not of the providers to comply. Compliance may be due to providers' values and beliefs, past experiences, or previously introduced ideas that may be similar to this innovation.

In 2012, the VAPIHCS' patient safety manager and other multidisciplinary team members completed a pilot project in timely communication of critical test results. Although the type of test results was more urgent and it required a very quick turnaround time for notification, a team had already worked with the providers and presented data and action plan. The outcome of this pilot project was the creation of a Situation, Background, Assessment, and Recommendation template (SBAR) note to be used by the providers at a specified amount of time following the notification of a critical test result. Providers who were part of this pilot project may or may not be receptive to the innovation, but given that the previous pilot project was well-received, this may indicate a greater chance of rate of adoption by the providers with this QI project. The SBAR pilot study was later mandated for the delivery of all critical test results to patients. A standardized and consistent automated test result notification process was implemented but it is not mandatory to use this method of test result delivery.

Complexity. As Rogers (2003) indicated "complexity is the degree to which an innovation is perceived as relatively difficult to understand and use" (p. 257). The adoption rate of this DNP project was dependent on how it was going to be perceived. VAPIHCS providers continue to utilize different test result notification methods and some providers persisted with their methods. The two methods that are most frequently used are face-to-face and telephone notification. The manual print letter notification letter was also used pre-implementation and continues to be an option for providers to use. Based on the VHA Directive 1088 (VHA, 2015) these three methods are all acceptable for test result delivery.

Trialability. Rogers (2003) defined trialability as "the degree to which an innovation may be experienced with on a limited basis" (p. 258). A standardized test result notification process can be conducted as a pilot with a smaller group of providers ascertain the response rate of the practice change. The PACT primary care providers in the Honolulu ACC will be a suitable group in which to pilot this practice change. If the pilot successfully improves providers' adherence to practice change, it can then be implemented in other CBOCs.

Observability. Rogers (2003) defined observability as "the degree to which the results of an innovation is visible to others" (p. 258). The results of this DNP project will be collected at 3-month and 6-month post-implementation and communicated to leadership and stakeholders. The post-implementation data will be a significant indicator if the practice change was successful and can be sustained.

Plan for Sustainment. Sustainment was planned and discussed at the beginning of the project where key personnel has been identified and engaged. A collection of monthly test result notification data is ongoing and initial results have been presented to leadership and stakeholders at a Quality Executive Board (QEB) Committee meeting. Ongoing education is delivered to all facility providers by using the e-mail system as means of communication. New incoming providers are assigned a 'preceptor' after going through the computerized patient record system (CPRS) training for an actual meaningful clinical involvement of the new provider. An ongoing reminder at least quarterly that goes out to all providers emphasizing the importance of timely delivery of abnormal test results is vital to the success of the DNP project. The overwhelming number of view alerts each provider receives each day is intolerable for most and with the expertise of clinical informatics department, the number and type of view alerts being sent to providers' inbox may be limited by importance and priority. The DNP

student will make this recommendation to leadership at the Project Presentation for the dissemination of information.

Operational Definitions

- **Asynchronous Communication**: is when parties involved in communication are not present at the same time, such as electronic notifications in CPRS, secure messaging, AudioCARE, FAX, or letter.
- **Ordering Provider**: is a provider authorized to enter and sign orders for diagnostic tests.
- **Patient Notification:** is communicating test results to patients or, if appropriate, to their personal representatives, including additional context and follow-up action as needed. It could occur through any synchronous or asynchronous method. For certain types of tests and certain types of patients, synchronous methods are preferred.
- **Synchronous Communication:** is when parties involved in a communication are all present at the same time, such as in person, telephone conversations, or Clinical Video Telehealth (CVT).
- **Test Results:** include the results of laboratory and pathology testing, diagnostic imaging, and diagnostic procedures. Test results are categorized as abnormal or normal as determined by a clinical provider and are further defined as follows:
    - **Abnormal Test Results:** are results that fall outside a specified normal reference range, are unexpected, or could indicate the presence of disease. An abnormal test may or may not require action and therapeutic intervention, depending on the clinical context.

- **Normal Test Results:** while the significance of a "normal" test result needs to be determined clinically, in the context of the VHA Directive 1088, it is defined as a diagnostic finding that falls within the normal reference range for the test and may or may not require immediate action or change in treatment depending on clinical circumstances.

Sampling Plan

Setting. This DNP QI project took place and was implemented at VA Honolulu ACC located on the grounds of Tripler Army Medical Center (TAMC) in Honolulu, Hawaii. The VA Pacific Islands Health Care System (VAPIHCS) is a secondary care facility with 92 beds, including a 60-bed community living center (CLC) at the Center for Aging, a 20-bed acute psychiatry ward, and 12-bed post-traumatic stress disorder residential rehabilitation program (Veterans Integrated Service Network (VISN) 21, 2015). The VA Honolulu ACC clinic is also known as the Spark Matsunaga VA Medical Center, named after the late Hawai'i Senator Spark Matsunaga. The VA Honolulu and outer Island CBOCs provide a broad range of health care services to approximately 50,000 female and male Veterans throughout Hawai'i and the Pacific Islands (VA, 2016). Approximately 28,000 Veterans are cared for through the VA Honolulu ACC (VHA Support Service Center [VSSC], 2016). The VAPIHCS provides outpatient medical, mental health, specialty care, and women's health care through the ACC in Honolulu, hospital-at-home, home-based primary care, and through seven CBOCs located in West O'ahu, Hilo, and Kona on Hawaii Island, and on Maui, Kauai, American Samoa, Saipan, and Guam (VA, 2015). There is approximately 854 full-time medical specialty-funded health care staff providing care to women and men Veterans throughout the health care system (VSSC, 2016).

Application of Social Systems. Rogers (2003) defines *social system* "as a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal" (p. 23). To determine providers' everyday workflow, their barriers and challenges, a provider needs assessment and satisfaction questionnaire was distributed during the pre-implementation of the project. The providers' rate of adoption will rely on their knowledge and readiness for the change in practice. The ACC's social system includes the ACOS and deputy ACOS who both provide overall management of the Honolulu ACC along with a secretary, a nurse manager, an administrative officer, primary care physicians, family nurse practitioners, pharmacists, registered nurses, licensed practical nurses, health technicians, and medical assistants.

Sample. The target population for this QI project was the primary care providers who have clinical privileges to provide care to VAPIHCS patients.

Sample Size. The accessible sample were the 13 providers who work in PACT teams in the Honolulu ACC.

The goal of this project was that by the end of the fiscal year 2017, a standardized and consistent automated test result notification process would be implemented using clearly defined processes and guidelines.

Inclusion Criteria. The inclusion criteria for this QI project were the 13 primary care providers who work in the Honolulu ACC PACT teams.

Exclusion Criteria. The exclusion criteria were all providers who were in the Honolulu ACC and were not necessarily in PACT teams to include the women's health, specialty care clinics, mental health clinics, hospital at home, home-based primary care, and primary care providers in the CBOCs were excluded from the study.

Recruitment/Marketing Plan. This DNP QI project involved a change in the delivery of test results. The project has gained continued support through the deputy associate chief of staff (DACOS), ongoing communication with other department chiefs, and presentations at facility 'morning reports' and Quality Executive Board (QEB) committee meetings. Gaining the providers' support and rate of adoption to this practice change involved leadership-supported communication by using flyers with eye-catching slogans (See Appendix B. Flyer), Post-implementation Education (See Appendix C) and presentations at provider meetings.

Application of Communication Processes. In addition to selecting key leaders to support the change in practice, the implementation of a standardized and consistent automated test result notification process was a strategy that could assist with the practice change diffusion process. The *communication structure*, per Rogers (2003) "is the differentiated elements (groups or cliques) that exist within a social system (p. 24). Methods of communications was held through formal and informal presentations, discussion, used 'elevator' speeches, and 'five-minute morsels sent facility-wide through mass e-mails and face-to-face meetings.

Data Collection Procedures

Chronological order of data collection procedures. The DNP QI project was conducted in five phases: 1) baseline data collection review: 2) pre-implementation provider needs assessment and satisfaction questionnaire; 3) implementation of a standardized automated test result notification process; 4) post-implementation data collection review; 5) post-implementation provider needs assessment and satisfaction questionnaire. (See Appendix K. Data Collection Procedures.)

During the first phase, a baseline data collection review was conducted during the five months prior to project implementation via a random pull of more than 100 laboratory and radiologic abnormal and normal test results ordered by the 13 PACT providers. (See Appendix D. Data Collection Tool.)

In phase two, the DNP student distributed a pre-implementation provider needs assessment and satisfaction questionnaire that assisted in determining the providers' current challenges and barriers in their workflow and reasons delays in timely communication of abnormal test results. The questionnaire also addressed their satisfaction level of the current test result notification process. (See Appendix F. Provider Needs Assessment and Satisfaction Questionnaire.)

Upon successful proposal defense of the DNP project and following approval of the project by VAPIHCS' EBP council, Phase three then was the implementation of a standardized and consistent automated test result in the notification process. (See Appendix E. Sample Automated Test Result Notification Letter.)

In phase four, three months following the implementation of the DNP project, monthly post-implementation data collection chart reviews were conducted using the same data collection tool for four months via monthly random pulls of 100 or more laboratory and radiologic abnormal and normal test results ordered by the 13 Honolulu ACC primary care providers in PACT teams. The results of the baseline chart reviews were compared with the monthly chart reviews during post-implementation. (See Appendix D. Data Collection Tool.)

Lastly, in phase five, the provider needs assessment and satisfaction questionnaire were distributed at 6-months post-implementation. The results of the baseline provider questionnaire

were compared with the post-implementation provider questionnaire. (See Appendix F. Provider Needs Assessment and Satisfaction Questionnaire.)

Required Resources. The required resources for this QI project include human, capital, physical, and budgetary elements. Human resources were the deputy associate chief of primary care, the chief and nurse coordinators of clinical informatics, the PACT team providers, CBOC nurse manager, patient safety manager, DNP student, DNP external advisor, ACC PACT team administrators, nursing and support staff. Capital resources included a printer, printing papers, laminated flyers and handouts, pre-/post-implementation questionnaire materials, Outlook Lync and VA National Telecommunication (VANTs) line used during synchronous meetings with the DNP workgroup. The physical resources included the room used during DNP meetings and a designated room where the secure printer and an employee was physically placed. The budgetary elements were the government funds used to purchase the secure printer.

Process and Outcome Variables. The project was conducted in five phases: 1) baseline data collection review; 2) pre-implementation needs assessment and satisfaction tool questionnaire; 3) implementation of a standardized and consistent automated test result notification letter; 4) post-implementation data collection review, and 5) post-implementation provider needs assessment and satisfaction questionnaire. (See Appendix K. Data Collection Procedures.)

Phase One. Baseline Data Collection Chart Review. The baseline chart review was conducted monthly for five months from January 2016 to May 2016 by random pulls of at least 100 or more normal and abnormal laboratory and radiologic test results obtained from the EHR

ordered by the 13 primary care PACT providers who worked in the acute care clinics. Facility target was 90% of normal and abnormal test results to be communicated to the patients.

Phase Two: Pre-Implementation Provider Needs Assessment and Satisfaction Questionnaire. Using a 10-item needs assessment and satisfaction questionnaire with 1 – 10 possible answers, the pre-implementation provider needs assessment and satisfaction questionnaire measured the providers' barriers to timely notification, knowledge and understanding of facility's best practices for test result notification. It also measured everyday workflow, their satisfaction of the current test result notification process, and current ability to address abnormal test results daily.

Phase Three: Implementation of a Standardized and Consistent Automated Test Result Notification Process. A standardized and more consistent automated test result notification process was implemented during phase three and since the implementation, it is hoped that the expected outcomes would be met with this intervention.

Phase Four: Post-Implementation Provider Needs and Satisfaction Questionnaire. The fifth and final phase of this project was the distribution of the provider needs and satisfaction questionnaire. In addition, items were added in the questionnaire at three months after the implementation of the DNP project.

Phase Five: Post-implementation Data Collection Chart Review. The post-implementation data collection chart reviews were conducted at 3-month post-implementation and monthly until the duration of the project for comparison with the baseline data. The DNP student conducted chart reviews from random pulled records of at least 100 or more normal and

abnormal laboratory and radiologic test results obtained from the EHR ordered by the 13 primary care PACT providers.

The expected outcomes of this DNP project were: (a) providers would be familiarized with facility's best practices for patient test result notification process; (b) a standardized and consistent automated test result notification process was planned; and (c) providers' notification timeliness of abnormal test results increased to at least 90% and the providers' barriers to implementation were identified. A Logic Model was developed for the short-, intermediate- and long-term outcomes for the project (See Appendix G. Logic Model.)

Measurements (Tools/Instruments). Two instruments were utilized for data collection during the course of this QI project. The pre-/post-implementation data collection tool was developed by the DNP student. The tool consisted of columns to log the month's chart reviews were conducted, total numbers of tests (normal and abnormal combined), total number of normal tests, total number of abnormal tests, total number of normal tests notified within 14 days, and total number of tests notified within seven days. The total number of normal and abnormal tests notified were then converted to percent. (See Appendix D. Data Collection Tools, Appendix K. Data Collection Procedures.)

The DNP student also developed a provider needs assessment and satisfaction questionnaire tool and distributed to the 13 PACT providers pre-/post-implementation for comparison. The tool measured the providers' barriers to timely communication, knowledge and understanding of facility's best practices for test result notification, everyday workflow using a 10-item questionnaire with 1-10 possible answers, and finally, satisfaction of current

test result notification process and satisfaction of their ability to address abnormal test results on a daily basis. (See Appendix F. Provider Needs Assessment and Satisfaction Questionnaire.)

Timeline. The projected timeline for this DNP project was the initiation of the QI project in January 2016 with the expected date of completion being December 2016. (See Appendix I. Timeline.)

Program Evaluation Plan

The first step to a program evaluation is engaging stakeholders. This is defined as promoting input, participation, and power-sharing among those persons who have an investment in the conduct of the evaluation and the findings (Centers for Disease Control and Prevention [CDC], 2012). The stakeholders have an exclusive role to ensure the success of a QI project. They assist to increase the chances that the evaluation will be useful. The stakeholders can also improve the evaluation's credibility, clarify roles and responsibilities, enhance cultural competencies, help protect human subjects, and avoid real or perceived conflicts of interest (CDC, 2012).

The stakeholders for this DNP project were the patients at the ACC primary care in PACT teams, PACT providers, the chief and deputy ACOS of primary care clinics, the PACT nurse manager, PACT nursing staff and support staff, and ACC primary care administrators. (See Appendix G. Logic Model.)

The Honolulu ACC primary care PACT providers' interest in the success of the project were related to the goal of improving quality patient care and positive health outcomes. Most importantly, the roles of the clinical providers were to improve their adherence of test result

notification. The VHA is committed to the timely communication of test results that ensure safe and effective health care for all the Veteran patients (VA, 2015).

Results dissemination for the stakeholders will take place via the following by the DNP student:

a. The DNP projects' findings and implications will be presented and reviewed during a QEB committee meeting by the DNP student;
b. Copies of the report and executive summary will be provided at the QEB meeting and will also be emailed to stakeholders by the DNP student;
c. Will evaluate any feedback from leadership and stakeholders and program changes will be made accordingly by the DNP student.

Data Analysis. The assumption of this DNP project was: (1) that a standardized test result notification process was to be implemented to improve patient health outcomes and quality of life; (2) the providers' adherence in abnormal test notification increased; (3) compliance with JC and OIG standards; and (4) improved monthly data and met 90% target. The project goals mirror these assumptions. The methodology applied by this project measured providers' knowledge of best practices, their challenges and barriers to timely notification of abnormal test results, and their satisfaction level of the current notification process. The results of the pre-/post-implementation chart reviews and the provider needs assessment and satisfaction questionnaire determined that a practice change had certainly occurred. The outputs and outcomes for this project are outlined in the Logic Model. (See Appendix G. Logic Model)

Human Subjects Considerations

This DNP project was a QI project and had been designed in such a way that the human rights of the PACT providers were protected. There were no randomization and different

treatment of subjects conducted. An EB standardized and consistent automated test result in the notification process was implemented during this DNP project. There was no additional risk beyond the use of a standardized process by the VAPIHCS ACC PACT providers. Additionally, there was no person-identifiable information collected in this QI project. The DNP student took the University of Hawaii required Collaborative Institutional Training Initiative (CITI) course in Human Subjects Protection. This QI project was reviewed and approved by the facility's EBP council and by a committee consisting of faculty and clinical experts to ensure there was adequate human subjects' protection.

Ethical Considerations. All 13 VAPIHCS' ACC primary care PACT providers were given the opportunity to participate in this QI project. They had a choice to complete the pre- and post-implementation provider questionnaire or not. This QI project obtained permission to develop and implement the practice change from the VAPIHCS' leadership.

Limitations. This DNP project had several limitations. The practice change was implemented in a fluid environment where conditions were not constant and variables could not be controlled. The ACC primary care PACT providers choose to participate as one provider refused to fill out the pre- and post-implementation provider questionnaire. The sample size was small as the study was limited to only 13 primary care providers. Another limitation was the time span to complete this project was less than one year which was not adequate to completely engage the providers to adopt the practice change.

The data gathering instruments were developed by the DNP student based on the literature and expert knowledge. Although the instruments were expertly reviewed by the providers, both data collection tool and the questionnaire did not have further psychometric

development and thus, these untested instruments could have influenced this project's findings. Finally, the data analysis was restricted to descriptive statistics only.

Summary

This chapter of the DNP project discussed the Methods section that focused on designing and piloting the practice change. Rogers' (2003) innovation-diffusion theory was applied to examine the ACC PACT providers' adoption process of the knowledge gained via the implementation of a standardized and consistent automated test result notification process. Pre-/post-provider needs assessment questionnaire were administered to determine the PACT providers' knowledge of best practices, their barriers and challenges that hindered their ability to timely test result notification, and their satisfaction with the current notification process. Descriptive statistics and trend analysis were then utilized to examine the data generated during this 11- month QI project.

Chapter 4. Results

Objectives

The purpose of this DNP project was to determine the barriers to timely abnormal test reporting and implement strategies such as a standardized and consistent notification process for safe and effective delivery of test results. The project's goal was that by the end of the fiscal year 2017, a standardized and consistent automated test result notification process would be implemented using clearly defined processes and guidelines.

The clinical question that guided this QI project was: "Will a standardized and consistent automated test result notification process have an impact on providers' adherence and are 90% of abnormal test results communicated to patients within seven days? "

The intended outcomes of this DNP project were at least 90% of abnormal test results were communicated to the patients within seven days and the expected implications were- providers' increased adherence to the test result delivery process and improved patient health outcomes.

Description of Sample

The target population for this QI project was the VAPIHCS' providers who have clinical privileges to provide care to VAPIHCS patients. The inclusion criteria were the 13-full-time licensed and VA-credentialed primary care providers who were in the PACT teams in the ACC.

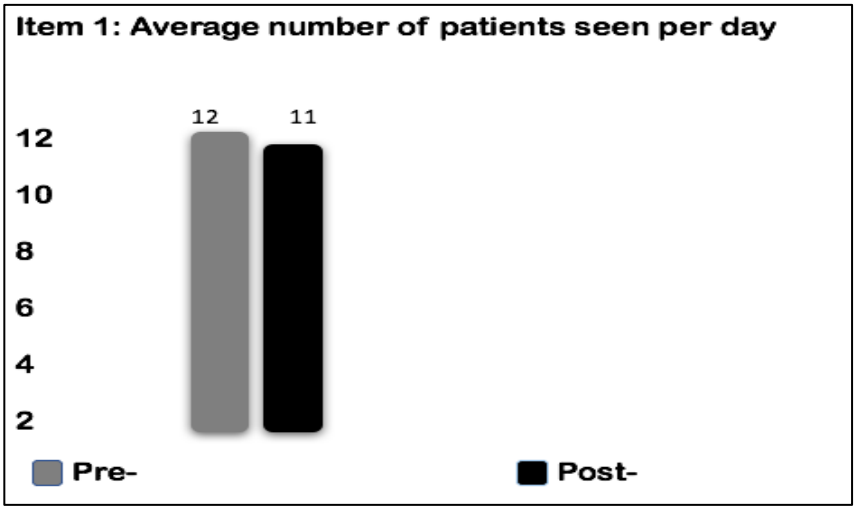
Trend Analysis for Process and Outcome Variables

An anonymous 10-item provider needs assessment and satisfaction questionnaire was

administered pre- and post-implementation.

Item 1 inquired how many patients the providers saw on an average day. The total patients seen by the 12 providers on an average day pre-implementation was 140 patients with a mean number of 12 patients seen per provider. The least number of patients a provider saw a day was five patients and the most patients a provider saw on an average day was 30. Post-implementation statistics revealed that on an average day, the 12 providers saw a total of 132 patients with a mean number of 11 patients seen per provider. The least number a provider saw was four patients a day and 20 was the most patients a provider saw on an average day. See Appendix F. Provider Needs Assessment and Satisfaction Questionnaire. See Figure 4.1 for pre- and post-implementation responses to item 1.

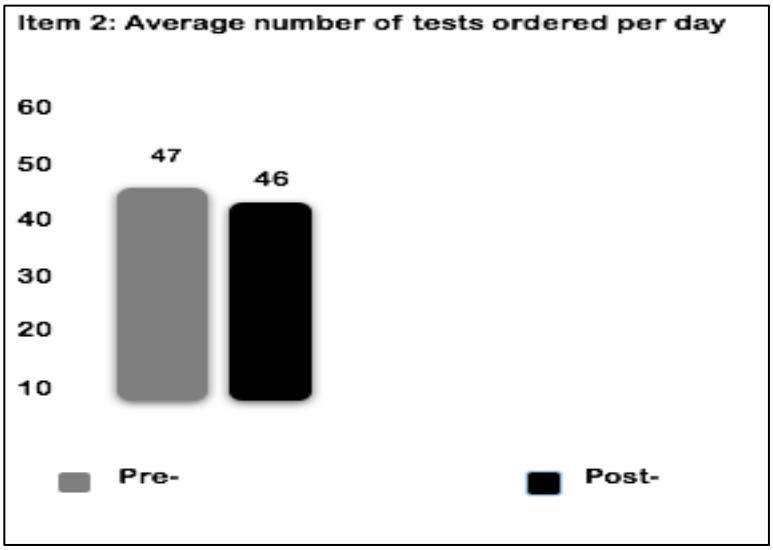
Figure 4.1. Average Number of Patients Seen Per Day



Item 2 asked about how many tests the providers normally ordered on an average day. During pre-implementation, the total tests ordered by the 12 providers on an average day were 566 with a mean number of 47 tests ordered on an average day per provider. The least number of tests ordered was 13 and the highest number of tests ordered was 88. Post-implementation

data revealed that the total tests the providers normally ordered on an average day were 552 tests with a mean number of 46 tests ordered per day per provider. The least number of tests ordered were 20 and most tests ordered were 75 on an average day. (See Figure 4.2 for pre- and post-implementation responses to item 2.

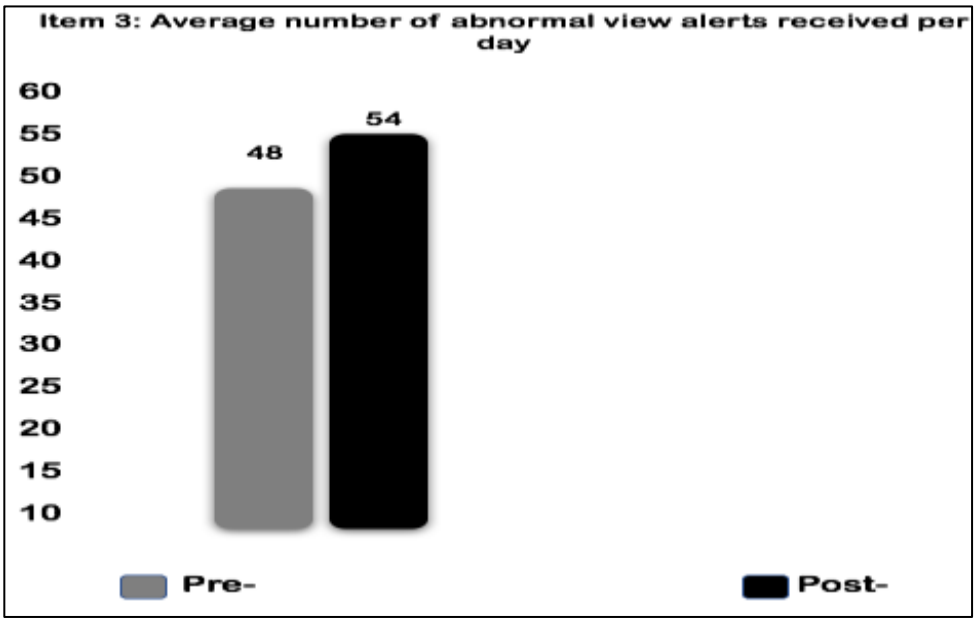
Figure 4.2. Average Number of Tests Ordered Per Day



Item 3 asked about the number of abnormal tests view alerts the providers received on an average day. The total view alerts received by the 12 providers were 573 with a mean number of 48 abnormal test result view alerts received during pre-implementation. The least abnormal test result view alerts received on an average day was 15 and the highest number of abnormal test result view alerts received was 100. Post-implementation numbers revealed that there were 653 abnormal test results view alerts received by the providers on an average day, with a mean number of 54 abnormal test results view alerts received by each provider. The least number of abnormal tests received was 10 and the highest number of abnormal tests received

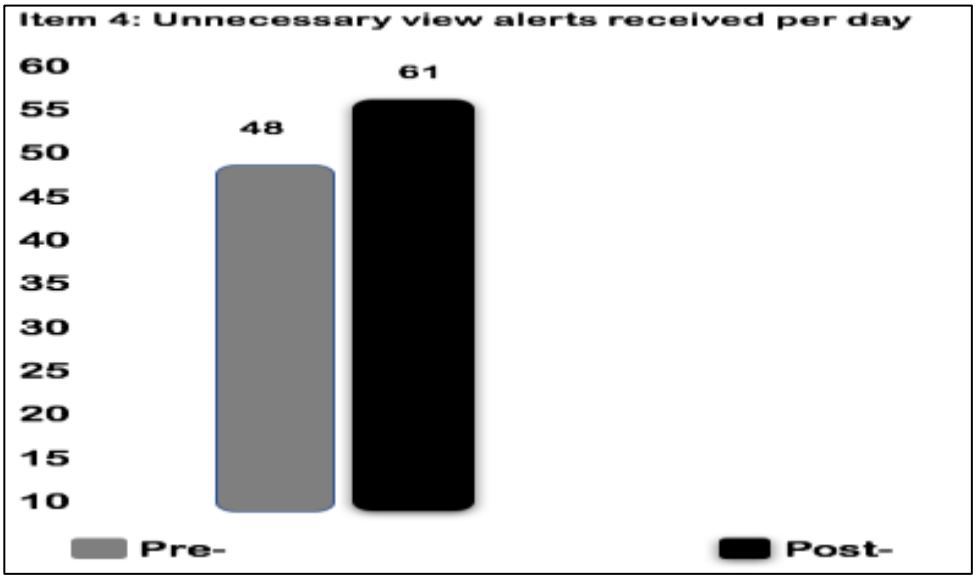
was 100 on an average day. See Figure 4.3 for pre- and post-implementation responses to item 3.

Figure 4.3. Average Number of Abnormal View Alerts Received Per Day



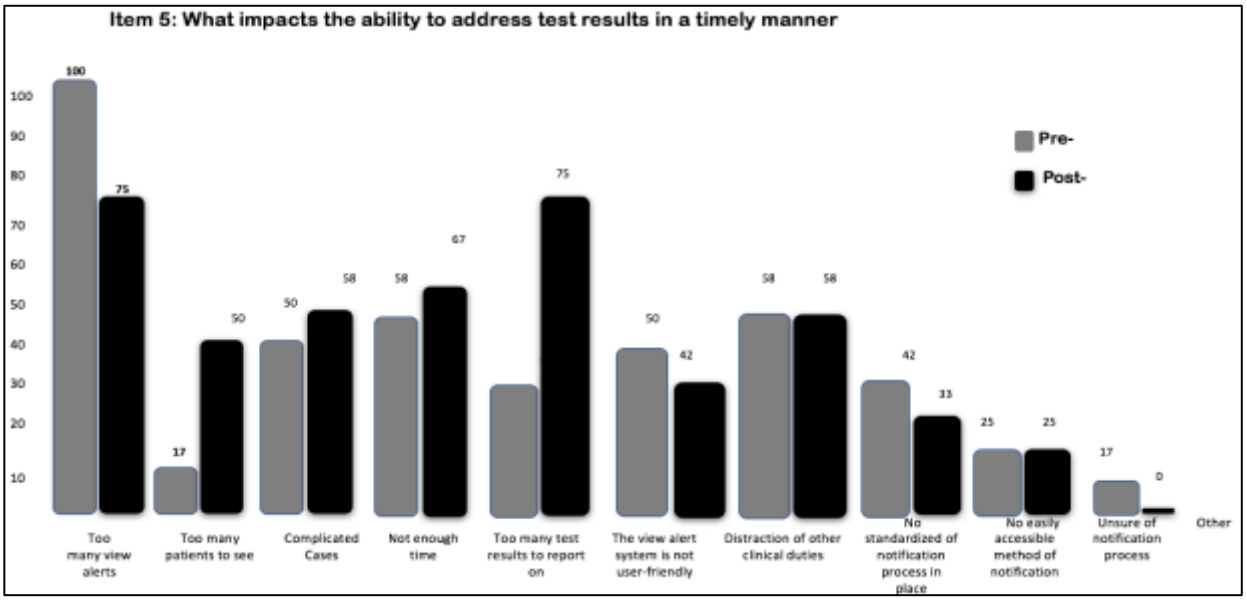
Item 4 inquired how many unnecessary view alerts the providers received on an average day. During pre-implementation, the total unnecessary view alerts received by the 12 providers on an average day were 570 with a mean number of 48 unnecessary view alerts received per provider. Post-implementation data revealed that there was a total of 727 unnecessary view alerts received by the providers with a mean number of 61 unnecessary view alerts received per provider. The least number of unnecessary view alerts received by a provider was five and the highest being 225 by a provider. See Figure 4.4 for pre- and post-implementation responses to item 4.

Figure 4.4. Unnecessary View Alerts Received Per Day



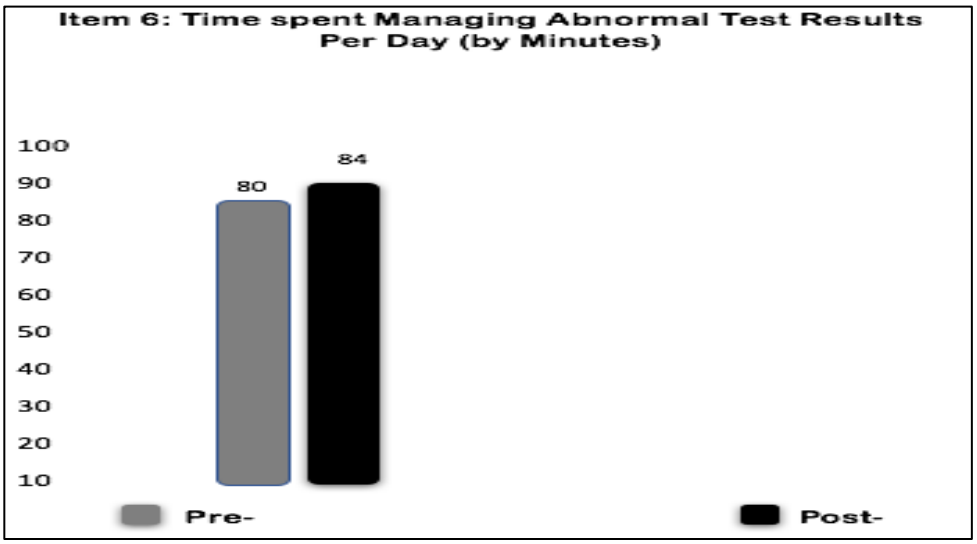
Item 5 examined the impacts of the providers' ability to address their test results in a timely manner. Providers were able to choose more than one answer hat applied to them. See Figure 4.5 for pre- and post-implementation responses to item 5.

Figure 4.5. Things That Impact the Ability to Address Test Results in a Timely Manner



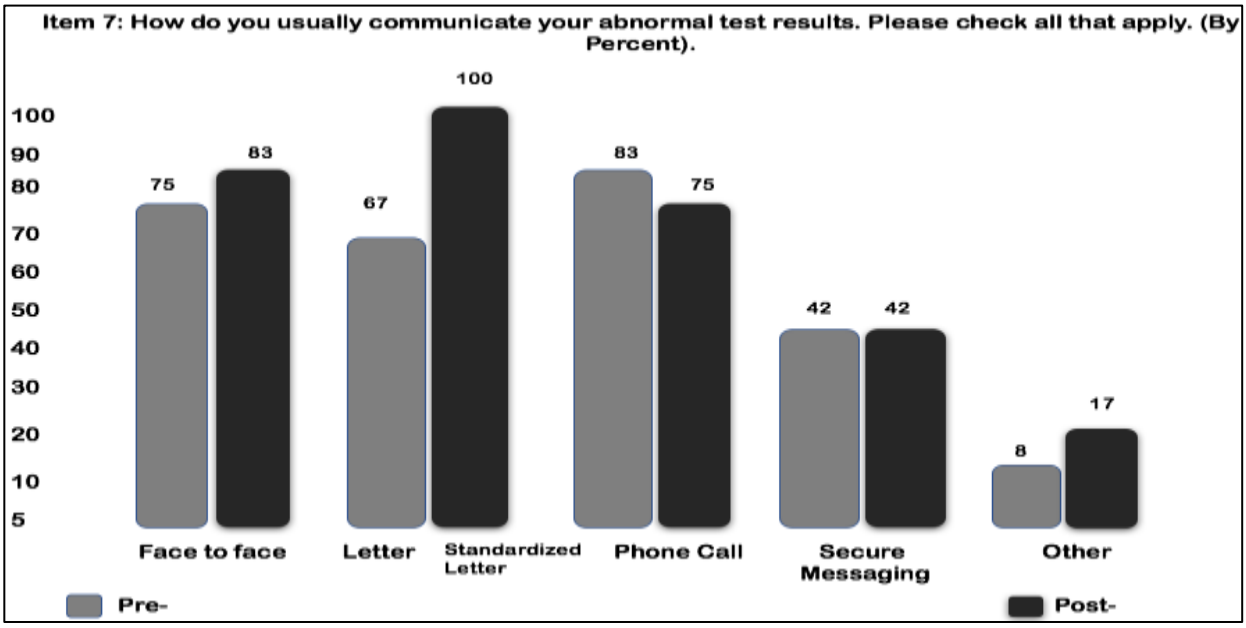
For Item 6, the question asked how much time the providers spent managing their abnormal test results on an average day. During the project pre-implementation, the total time the 12 providers spent managing their abnormal test results on an average day was 793 minutes with a mean total of 80 minutes per day for each provider. Following post-implementation, data indicated that the total time the 10 providers (two providers did not answer) spent managing their abnormal test results were 890 minutes with a mean total of 84 minutes per day spent for each provider. The least amount of time spent managing the abnormal test results by a provider was five minutes and the highest being 120 minutes per provider spent on an average day. See Figure 4.6 for pre- and post-implementation responses to item 6.

Figure 4.6. Time Spent Managing Abnormal Test Results Per Day



Item 7 inquired about the providers' method of communicating abnormal test results. See Figure 4.7 for pre- and post-implementation responses to item 7.

Figure 4.7. Communication Methods



Item 8 asked if there was anything that would be helpful in enhancing the providers' timely notification of abnormal test results. During pre-implementation, eight providers answered yes and entered their personal comments such as "automatic notification for normal results," "have lab done prior to visit, possible sent copy to patient before visit," "get rid of the unnecessary view alerts I have to sort through," "addressing everything so anything is #5 less new initial patients?, catch up time!, more staff!," "have patients do their labs or bring in outside lab reports ordered on the day of their appointment," "clarification of what must be conveyed," "FULL PACT," and "make it easier for them to complete results before visit so we don't have to do another follow-up visit." Two providers answered "No" and did not leave any comments. Two providers did not answer item 8 and left it blank. Post-implementation data revealed that there were nine providers who answered "Yes" and left comments such as: "make it easier for them to complete results before visit so we don't have to do another follow-up visit," "eliminate non-critical abnormal lab results from alerts by restricting or tighten criteria,

i.e., if not critical alert, don't leave the standard lab report to provider," "automate lab reports to send results to patient automatically – by mail or e-mail," "consider have a lab CeSar like NP or APRN to monitor critical abnormal lab as surrogate," " have more administrative support, VA have notification software," "admin time of ½ day a week to 1 day a week," "know which are truly abnormal vs only slightly off," "other people helping with the communication of results to patients when appropriate," "having appointments scheduled to review results," "administrative time," " more help with anything in #5," "open time weekly to call patients regarding abnormal tests," "stop worrying about notification of normal tests, automate print every lab and mail to patient automatically," "no duplicate view alerts for abnormal labs, no view alerts for comments that don't need to be viewed like consults." Three providers answered "No" and did not leave any comments.

Items 9 & 10 asked about the providers' satisfaction of the current test result notification process and their satisfaction with their ability to address abnormal test results on a daily basis. Providers were asked to check only one that applied. See Figures 4.8 and 4.9 for pre- and post-implementation responses to items 9 and 10.

Figure 4.8. Satisfaction of Current Notification Process

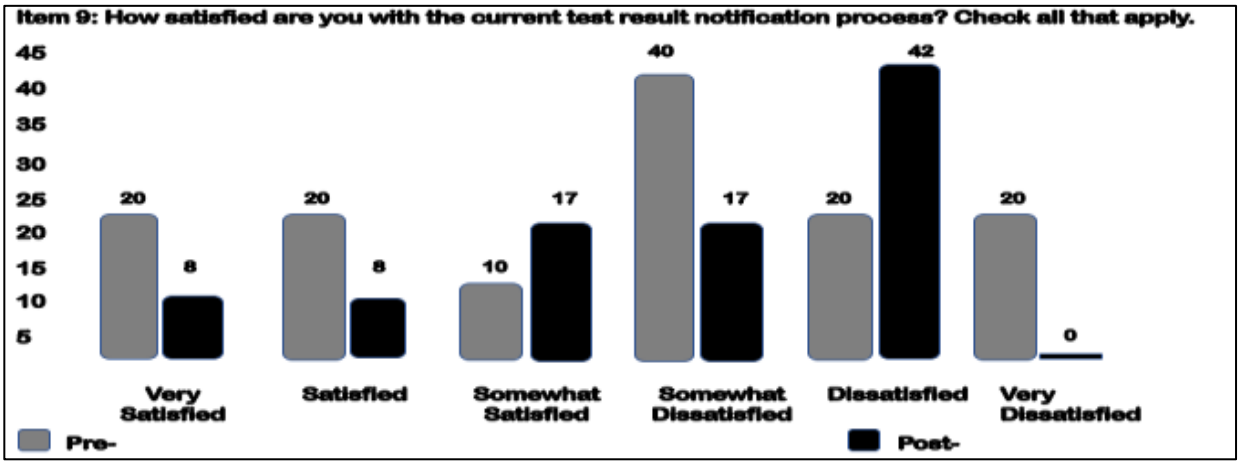
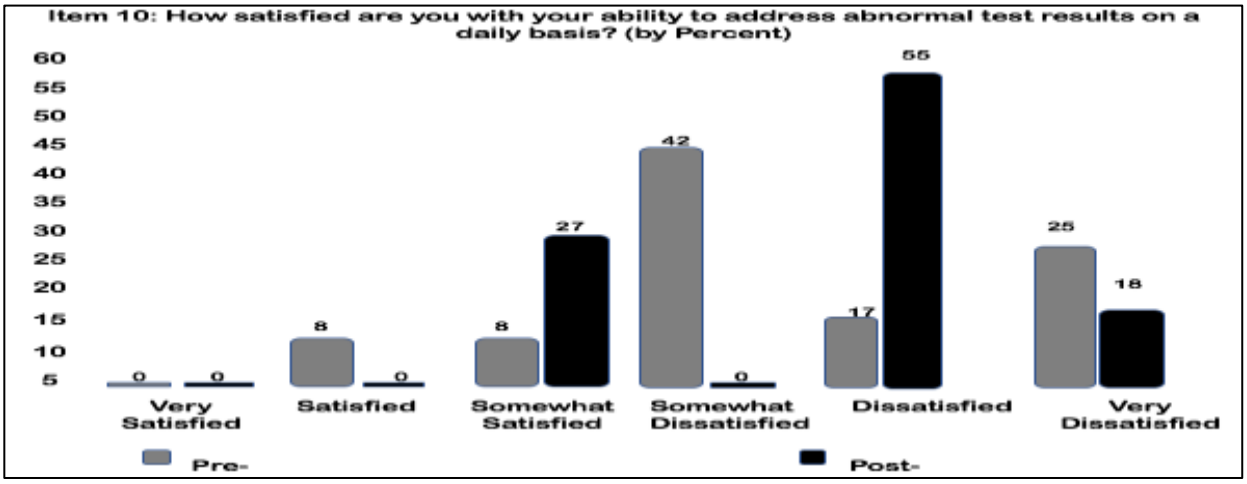


Figure 4.9. Satisfaction in Addressing Abnormal Test Results



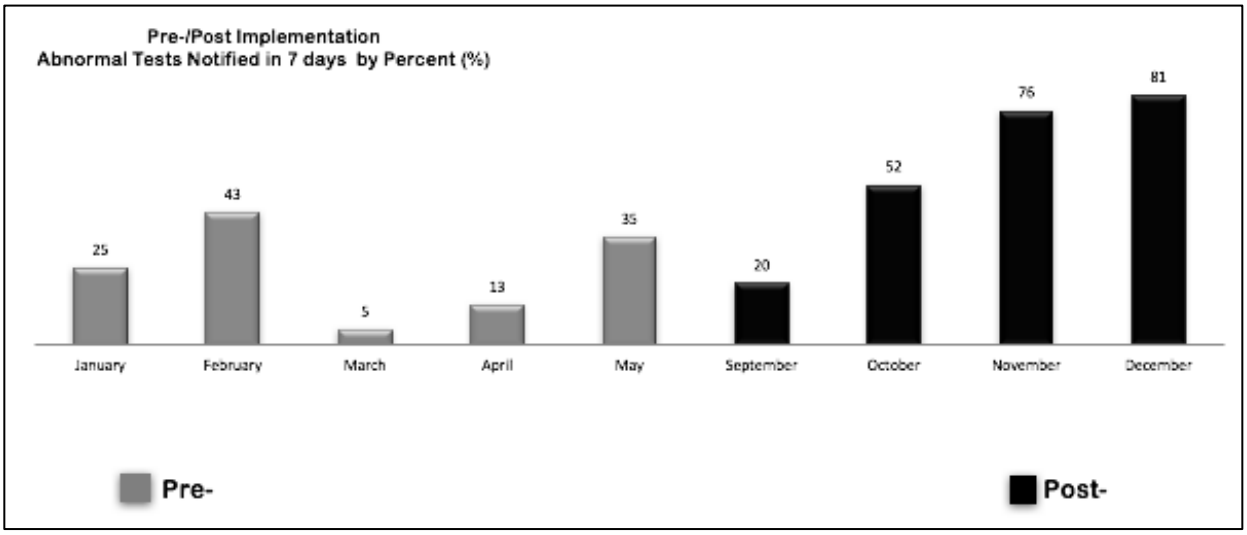
The providers were also given an opportunity to include other comments at the end of the questionnaire both pre-and post-implementation, and they are listed as follows:

- "A lot of times specialist ask us to do their labs and imaging or refer patient back to us to do labs (why, I don't know) or patient ask us to do their Choice provider labs so we have to order 10 to 20 labs for the patients, report it to them and specialists. Why can't they do their own x-ray, lab, MRI, CT, etc.,"
- "PACT physicians are used for large amount of administrative support - most all type of care rendered ends up with primary care providers (PCP) view alert, PCPs have to order labs/image studies etc. For most consultants and then f/u on results on behalf of consultant (this is similar to resident function for staff physician). NOTE: All lab results (normal and abnormal) must be reported to patients."
- "Getting non-VA consult results in a timely manner with all data needed (pathology), completed CPAP trials, etc. without the need to follow up on same patient 2-3 times is not only time-consuming but a waste of my time and my staff."

Chart Review and Pre-/Post Provider Needs Assessment and Satisfaction Questionnaire. The purpose of this DNP project was to implement a standardized and consistent test result notification process for safe and effective delivery of test results and determine the barriers to timely abnormal test reporting and if any were impacted with the implementation of the standardized notification process. The project final goal was that by the end of the fiscal year 2017, a standardized and consistent test result notification process was implemented by using clearly defined processes and guidelines, determine the provider's satisfaction with the process and the challenges and barriers with timely reporting of test results.

Chart Review Results. The baseline chart review was conducted monthly for five months from January 2016 to May 2016 prior to the project implementation by random pulls of at least 100 or more normal and abnormal laboratory and radiologic test results ordered by the 13 primary care PACT providers who worked in the ACC. Facility target was 90% of normal and abnormal test results to be communicated to the patients within 7 days. The following are the results of the pre-implementation chart review. Target: 90% of abnormal test results were communicated in seven days: January – 25%, February – 43%, March – 5%, April – 13%, and May – 35%. Following the implementation of the DNP project in June 2016, chart reviews were conducted three months' post-implementation monthly for four months. Target: 90% of abnormal test results were communicated in seven days: September – 20%, October – 52%, November – 76%, and December – 81%. See Figure 4.10 for pre- and post-implementation chart review results.

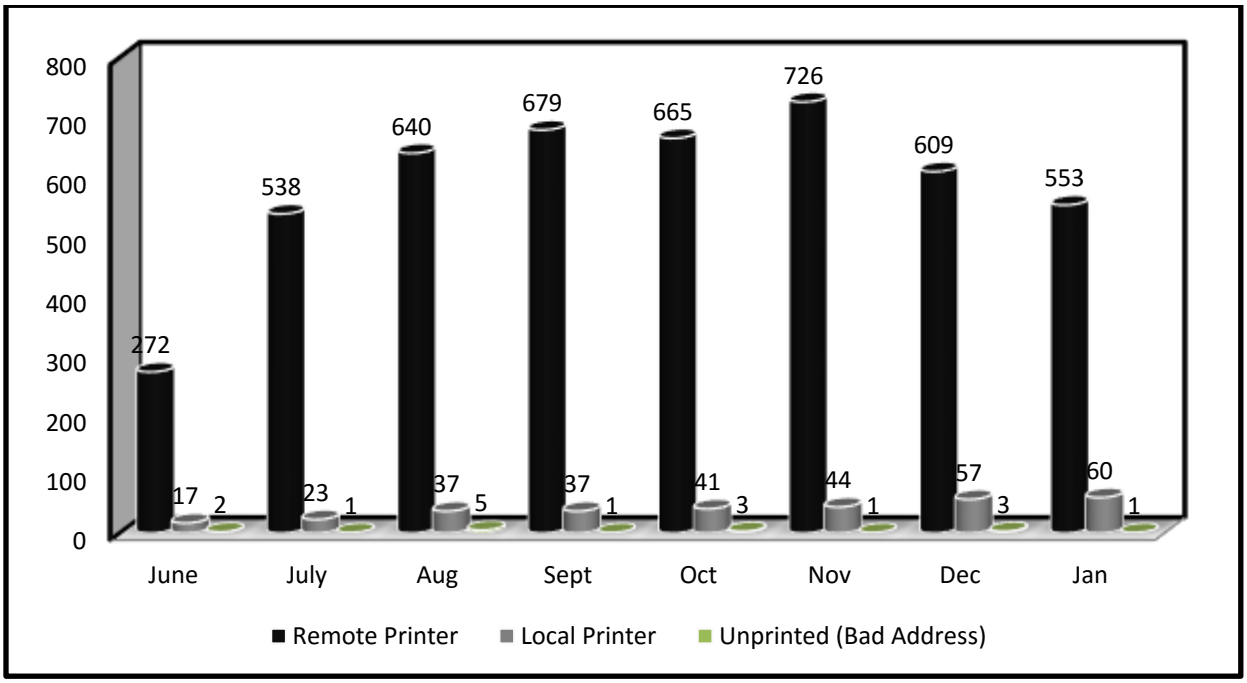
Figure 4.10. Pre-/Post-Implementation Chart Review Results



Evolution of Project

This DNP project was conducted at the VA ACC in Honolulu, Hawaii. After the implementation of the standardized and consistent automated test result notification process, the DNP student continued to meet with the 13 PACT providers and met with each one-on-one at least once a month to assess their knowledge, satisfaction, and compliance with the new process. Some of the 13 providers were hesitant to utilize the new process but eventually contributed positive feedback about the benefit of the process. Since the implementation of the project, the DNP student ran daily automated notification letter reports generated by providers from all 50 VAPIHCS clinics. Reports have shown that since the implementation of this DNP project, the number of letters sent by providers has tripled. See Figure 4.11 for post-implementation all clinics' test result notification letters report.

Figure 4.11. Post-Implementation Test Result Notification Letters Report



**Note: Letters were sent from PACT providers and other VAPIHCS providers from June 2016 – January 2017.*

Expected vs Actual Outcomes. The expected outcomes of this DNP project were:

- Providers were familiarized with VAPIHCS' best practices for patient test result notification process
- A standardized and automated test result notification was established and implemented
- Providers' notification timeliness of abnormal test results increased to at least 90%, and
- The most significant barriers to implementation experienced by the providers and the providers' satisfaction with the notification process would be identified

Based on the post-implementation chart reviews, providers gradually, although slowly,

adopted the new standardized automated test result notification process. Based on the pre-and post-provider needs assessment and satisfaction questionnaire, the providers have identified that the standardized automated test result notification process was their preferred method of communicating their test results, followed by face-to-face and phone call methods. During pre-implementation, phone calls were the providers' preferred method of communicating test results.

Facilitators. There were several important facilitators of the project. The associate chief of clinical applications of informatics expedited the flow of this innovation. His two clinical applications coordinators (CACs), both registered nurses (RNs), worked diligently to maintain contact with a consultant from another VA facility for guidance on the processes of an automated letter notification program, e.g., how to remotely print from the electronic health records. The CAC RNs also smoothed out any problems or issues during the early stages of the implementation and continue to assist with ongoing electronic and printer issues. The RNs ensured that the DNP student was kept informed of all issues and was included in e-mail chains between VAPIHCS and the other VA facility that first championed the automated test result notification process. Another important facilitator of this project was the deputy associate chief of staff (DACOS) of primary care clinics who continues to reach out to the primary care providers about the importance of timely notification of abnormal test results. The automated notification letter was set up to print at a remote VA facility if the letter remains at 82 lines. However, if the letter has 83 lines or more, the information technology center (IT) had to design a plan to print to a local printer that is in the office of the DACOS. The letters that are printed to the local printer are 'manually' stuffed in envelopes by either the DACOS or a support staff member at the primary care clinic. (See Appendix E. Automated Notification Sample Letter.)

Barriers. Some barriers that impacted the conduct of this project were:

- Lack of time. Overall, the project timeline was too short to fully integrate the new notification process into the providers' usual practices which therefore hindered the full realization of the 90% benchmark achievement. The time span to complete this project was less than one year which was not adequate to engage the providers to fully adopt the practice change.
- **Difficulty meeting with some of the PACT providers.** The providers had different schedules and once they began seeing their patients in the morning, it was difficult to find the time to meet with them one- on- one. The DNP student had to arrange meetings at ACC clinic before 0730 am or catch the providers during their lunch hour to review the educational materials and the provider needs assessment and satisfaction questionnaire during pre-implementation and again following post-implementation of the DNP project. In addition, the time it took to collect the pre-implementation questionnaires from all of the providers was close to six weeks which slowed down the progression of the project.
- **Computer glitches.** During the early phases of the implementation of the automated test result notification process, there were several computer glitches encountered by the CAC and the IT staff. The main goal for the new process was to have most, if not all, test result notification letters printed electronically to the remote printer, which meant the letters had to contain less than 82 lines. The remote printer is at the Sacramento, California VA Medical Center and the IT technicians had to set up VA Honolulu's electronic software to communicate with their software. During the 'testing' stage, the letters were not being printed at the remote site and that problem

needed to be specified between Sacramento VA IT and Honolulu VA IT. For nearly two weeks, testing was conducted daily to make sure the letters were sent electronically to the remote site. The chief of clinical informatics anticipated that some providers would generate test result notification letters with more than 82 lines by including all test results on the letter and thus a secure local printer was necessary to have as a backup - because letters containing more than 82 lines will not print to the remote site. A secure local printer was allotted and it was placed in the deputy ACOS office for privacy reasons. The local printer was not responding during the early phase of the new process and the IT had to test the local printer once again for accuracy. Another computer glitch resulted when letters that should have been printed at the remote site were being printed in the secure local printer, resulting in IT having to make additional modifications. There were many weeks of corresponding back and forth between Honolulu VA IT and Sacramento VA IT to ensure computer accuracy.

Summary

A standardized and consistent automated test result notification process was established and implemented for a group of 13 PACT providers in the Honolulu VA ACC. The expected outcomes for this DNP project were: (a) providers were familiarized with VAPIHCS' best practices for patient test result notification process; (b) a standardized and consistent automated test result notification was established and implemented; (c) providers' notification timeliness of abnormal test results increased to at least 90%; and (d) barriers to implementation were identified.

Based on the post-implementation chart review and provider needs assessment and satisfaction questionnaire, a gradual adoption of the new process was revealed, however slow, the 13 PACT providers showed increased utilization of the standardized automated notification process as evidenced by the increased number of test results communicated to patients, especially during the months of November and December, five and six months' post-implementation.

Chapter 5. Discussion

The goal of this DNP project was that by the end of the fiscal year 2017, a standardized and consistent automated test result notification process would be implemented using clearly defined processes and guidelines. With a standardized and automated test result notification process in place, the objectives were: (a) at least 90% of the abnormal test results were communicated within seven days; (b) a standardized and automated test result notification process established and implemented; and (c) 100% of the providers identify perceived barriers to implementation.

The expected outcomes of this project were: (1) providers would be familiarized with facility's best practices for test result notification process; (2) a standardized and consistent automated test result in the notification process was planned; (3) providers' notification timeliness of abnormal test results increased to at least 90%; and (4) barriers to implementation were identified. Eventually, the final implications of this practice change were improved compliance and adherence with timely test result delivery thereby potentially leading to improved patient health outcomes.

Interpretation of Findings

Chart Review Results. Following pre-implementation educational intervention and based on the post-implementation chart review in comparison to the pre-implementation chart review, there was evidence of an adoption of the new standardized automated letter notification process, over time. One hundred percent of the 13 providers indicated that they use this method of communicating test results post-implementation. See Figure 4.7 for the pre- and post-implementation results to item 7. Compliance of timely notification also improved as evidenced

by the increased percentage from a low of 5 percent pre-implementation to a high of 81% post-implementation, of abnormal test results reported. Although the target of 90 percent was not achieved, there was a remarkably increased percentage of abnormal test results communicated to patients in the months of November and December, which was 152% increase compared to pre-implementation, is suggestive of the providers' improved compliance in test reporting. In addition, the providers also utilized other methods of test result notification such as by face-to-face, phone call, and secure messaging.

The Pre-/Post-Provider Needs Assessment and Satisfaction Questionnaire. The Provider Needs Assessment and Satisfaction Questionnaire consisted of 10-items that measured the providers' workflow, barriers to timely communication of abnormal test results, and preferred communication methods as well as satisfaction with the notification process. The results indicated that providers had a similar average number of patients (12 pre- and 11 post-), a similar average number of tests ordered per day (47 pre- and 46 post-), and a similar number of abnormal view alerts received per day (48 pre- and 54 post-) pre-implementation to post-implementation of the standardized notification process. There was an increase in the average number of unnecessary view alerts received pre-implementation, 48/day, to post-implementation, 61/day. There were a staggering number of total unnecessary view alerts received by all the providers for both pre-implementation, 570/day and 727/day post-implementation. This finding is consistent with the synthesized literature review conducted by Laxmisan et al. (2012) that examined the effectiveness of an EHR to improve the follow-up of abnormal pathology results. The authors indicated that there are factors that affect timely notification of abnormal test results and one of these factors are the amount of view alerts the providers received daily. The authors concluded that these factors must be controlled to be able

to experience the potential benefits of EHR utilization to include timely follow-up of abnormal test results. Because of the extensiveness of the view alerts problem, VA recently has taken decisive action to standardize a list of mandatory view alerts within each VA facility and complete technical changes to limit the mandatory alerts at each facility to reduce daily provider view alerts and to enhance provider autonomy, without an increase in medical errors, effective May 10, 2017.

Comparing to pre-implementation data for item 5, there is an indication that providers had a perception of less view alerts received following post-implementation. This is an interesting result given that the actual number received per day was more. See Figure 4.5 for the pre-post-implementation results to item 5. With regards to the providers' perception of "too many abnormal test results," increasing post-implementation from the pre-implementation assessment, there was not a comparative increase in the actual number of abnormal test results received per day as illustrated by Figure 4.3. However, the providers' perception of the increased number of test results being reported post-implementation may be a positive indication the providers may have possibly been spending more time actually addressing their abnormal test results. Another notable finding was that by post-implementation, every provider indicated that they were sure of the notification process. The providers' perception of the other dimensions of item 5 was similar pre-implementation to post-implementation.

Item 6 asked about the amount of time the providers spent managing their abnormal test results per day. Data revealed that the time spent managing providers' abnormal test results increased slightly and may be an indication that providers are more familiarized with test result notification best practices. See Figure 4.6 for the pre- and post-implementation results to item 6.

Item 7 inquired about the providers' preferred methods of communicating abnormal test results, such as face-to-face, manual print letter notification, secure messaging, phone call, and standardized automated notification process. Pre-implementation data revealed providers' preferred method was face-to-face; however post-implementation, there was a significant switch in their preference to the standardized automated test result notification process. This could be an indication of providers' acceptance and utilization of the standardized test result notification process. Phone call method also had a decrease in utilization during post-implementation compared to pre-implementation data which could be an indication that since the providers' preferred test result in communication method changed to the standardized process, they are spending less time with the phone call method, another indication that the providers have increased their acceptance of the new standardized notification process. See Figure 4.7 for the pre- and post-implementation results to item 7.

Item 8 asked the providers what could be helpful to them to enhance their timely notification of abnormal test results. The providers' responses varied from getting rid of the overwhelming numbers of view alerts they receive each day to staffing and administrative issues. The providers voiced their frustration with the current process and the number of view alerts that have been the main hindrance to their everyday workflow.

Item 9 inquired about the providers' satisfaction of the current notification process indicates that they continue to be dissatisfied with the process both pre-/and post implementation. However, the percentage of providers dissatisfied of the current process pre-implementation was 42% and decreased to 40% post-implementation which could be indicative of providers' slow acceptance and adoption of the new standardized test result notification process. See Figure 4.8 for the pre- and post-implementation results to item 9.

Item 10 asked about providers' satisfaction in addressing abnormal test results on a daily basis. Data revealed that 55% of the providers continue to be dissatisfied on how they address their daily abnormal test results. This is also an indication that providers continue to be frustrated dealing with their workload and another reason could be because the providers are given the burden to enter tests for specialists as this is an added burden to their everyday workflow. When the providers enter tests for a patient, they now have the responsibility to make sure that the test results are communicated not just to the patient but to the specialist as well. See Figure 4.9 for the pre- and post-implementation results to item 10.

The purpose of this DNP QI project was to determine the barriers to timely abnormal test reporting and implement strategies such as a standardized and consistent notification process for safe and effective delivery of test results. A standardized and consistent test notification process was developed and implemented which greatly enhanced the percentage (from a low of 5% pre-implementation to 81% post-implementation) of providers to deliver timely abnormal test result notification within seven days. In addition, the implementation may have impacted significant barriers to timely notification in regards to the providers' perception of amount of view alerts received, the preferred method of test notification and their clarity of the notification process. However, more work needs to be done such an ongoing provider and staff education, and possibly change of policy to reduce other barriers and to reach the goal of 90% of the providers delivering timely abnormal test result notification within seven days.

Implications/Recommendations for the Essentials

The *DNP Essentials* document outlines and defines the eight foundational Essentials and address the foundational competencies that are core to all advanced nursing practice roles

(American Association of Colleges of Nursing [AACN], 2006).

Essential I: Scientific Underpinning for Practice. This QI DNP project highlights Essential #1 as it relates to the principles and laws that govern the life-process, well-being, and optimal functions of human beings and the processes by which positive changes in health status are affected (AACN, 2006). The purpose of the project was to determine the providers' barriers to timely abnormal test reporting and to implement strategies such as an EB standardized and consistent automated test result notification process for safe and effective delivery of test results. The inaccurate or untimely notification of laboratory or radiologic tests is a major safety issue and can result in delayed diagnosis and treatment that may adversely affect patient outcomes (Abjudeh et al., 2009 and WHO, 2008). The implementation of an EB standardized and consistent automated test result notification process at VAPIHCS can assist the providers with their everyday workflow, enhance health care delivery, and improve patient outcomes (DeCapua, 2016).

Essential II: Organizational and Systems Leadership for Quality Improvement & Economics. Organizational and systems leadership are both fundamental not just for the DNP graduate but for the organization as well, and the crucial goals are to improve health care delivery and patient health outcomes (AACN, 2006). This project required for an entire system to elaborate to trigger a change and to ensure the success of this QI project, the stakeholders- department chiefs, nurse scientist, nurse managers, nursing and support staff, and administrators- needed to be on board with the project to form a supportive interdepartmental and interprofessional group to improve the quality of health care delivery. In the early stages of the DNP project, the DNP student met with the chief of clinical informatics multiple times to discuss the possibility of putting in place a standardized and consistent test result notification

process at VAPIHCS as the literature revealed that it could alleviate providers' workload and assists with timely delivery of test results to patients. As a result, it could ensure accountability for the quality of care by providers and for patient safety of VAPIHCS patients (AACN, 2006).

Essential III: Evidence-Based Practice/Translation Science. Scholarship and research are the hallmarks of doctoral education (AACN, 2006). The integration of knowledge from diverse sources and across disciplines, and the application of knowledge to solve practice problems and improve health outcomes are only two of the many ways new phenomena and knowledge are generated other than through research (AACN, 1999; Diers, 1995; Palmer, 1986; Sigma ThetaTau International, 1999). A literature review was conducted, and relevant studies were synthesized which revealed five areas of significance to validate the development of the project: (1) consequences of untimely tests reporting; (2) provider perspectives of notification methods; (3) patient preferences and satisfaction; and (5) impact of EHRs. Based on these synthesized studies, this DNP project implemented an evidence-based standardized and consistent automated test result notification process using the EHR to assist providers with timely test result delivery and to help alleviate their everyday burden to enhance workflow. In addition, to the availability of the standardized test result notification process, providers can also use other preferred methods of test result communication such as face-to-face, phone call, and secure messaging as these are also proven methods.

Essential IV: Information Systems/Technology. Technology is at the center of safe, efficient, patient-centered care (DeCapua, 2016). Knowledge and skills related to information systems/technology and patient care technology prepare the DNP graduate to apply new knowledge, manage individual and aggregate level information, and assess the efficacy of patient care technology appropriate to a specialized area of practice (AACN, 2006). VAPIHCS

is 100% electronic and there is no paper trail available. This DNP project was implemented by utilizing the existing software, the computerized patient care system (CPRS). The automated letter was activated by the clinical informatics systems staff and the IT department with the supervision and direction of the chief of clinical informatics. This automated notification letter had been available in the EHR but it has remained inactive until the DNP student suggested that a standardized automated test letter notification process could be a tool that the providers can use to possibly assist with their timeliness in test result reporting and their everyday workload. The chief of clinical informatics then assigned his staff to research other VA facilities that were currently utilizing a standardized and automated test result notification letter. Through emails and phone calls, they then connected with a program manager who was knowledgeable with the initial set-up of the automated letter who was based in the Northern Arizona VA Medical Center. This program manager became a support to the clinical informatics and IT departments and she also attended most of the DNP workgroup meetings held through Veterans Affairs National Telecommunication System (VANTs) line and provided essential information about this new automated notification process. The VHA electronic software is what drove this DNP project as the standardized automated test result notification letters had to be created through the patient's EHR. Once the automated letter is signed by the provider or clinician, the notification letter becomes a permanent record in the patient's EHR.

Essential V: Health Care Policy & Ethics. Health care policy, whether created through governmental actions, institutional decision making, or organizational standards, creates a framework that can facilitate or impede the delivery of health care services or the ability of the provider to engage in the practice to address health care needs (AACN, 2006). The essential focuses on critically analyzing health policy with the goal of advocating for social justice and

the nursing profession (DeCapua, 2016). The VHA has its own health policies and directives that align with the private sectors. The VHA is committed to the timely communication of test results to ensure that safe and effective health care is delivered to the patient (VHA, 2015). The VHA realized an ongoing problem with test results not communicated back to patients in a timely manner as evidenced by two failed OIG inspections in 2011 and 2015. The VHA Directive 1088 was released in October 2015, a policy that established guidelines for the communication of test results by providers to patients. This Directive identified that, as a rule, test results are to be communicated to patients within 7 calendar days for results requiring action (abnormal) and 14 days for those that do not require any action (normal). The Directive 1088 (2015) also specified that "timely communication of test results to patients is essential for high-quality patient-centered care and lack of timely follow-up of abnormal test results has been identified as a contributor to poor outcomes and can be a source of considerable anxiety to patients and families" (p. 1). The DNP student engaged in the leadership role to assess and examine the 13 PACT providers' barriers to timely abnormal test reporting and strategies to alleviate their daily workflow. By adhering to VHA Directive 1088, a standardized and consistent automated test result notification process was implemented to assure timely notification of test results and to improve health care delivery and health outcomes.

Essential VI: Inter-professional Collaboration. The IOM defends the necessity of team-based care for the safety and well-being of all patients (IOM, 2001). This essential prepared the DNP graduate to lead inter-professional teams in the analysis of multifaceted practice and systems issues through effective communication and collaborative skills (AACN, 2006). This DNP project consisted of a multi-professional team whose members came from different disciplines. An inter-professional collaboration took place before, during, and

following the implementation of the DNP project. The DNP student was the leader and the facilitator of the DNP project and collaborated with the following members of the DNP workgroup: chief of clinical informatics, deputy chief of primary care clinics, chief of laboratory services, performance improvement coordinator, patient safety manager, an APRN, and a nurse scientist who also happened to be the DNP student's external advisor. Although these individuals were not members of the DNP project workgroup, the DNP student collaborated with the clinical informatics coordinators and the Northern Arizona VA Medical Center program manager frequently during the active phase of the DNP project. During the early stages of the DNP project, a biweekly meeting was held and post-implementation of the project, a monthly meeting was held by utilizing the VANTs line with the DNP workgroup members.

Essential VII: Clinical Prevention and Population Health for Improving the Nation's Health. This Essential evaluates care delivery models and/or strategies using concepts related to community, environmental and occupational health, and cultural and socioeconomic dimensions of health (AACN, 2006, p. 16). This DNP project supports what Essential VII by supporting health promotion and health prevention of the community. One of the intended outcomes of this DNP project was to improve the timeliness of test results delivery to patients by implementing a standardized and automated test result notification process with the goal of preventing any future poor health outcomes. The VHA Directive 1088 (2015) indicates that "timely communication of test results to patients is essential for the high-quality patient-centered care and the lack of timely follow-up of abnormal test results has been identified as a contributor to poor outcomes" (p.1). The DNP project was a systems-wide process and a quality improvement intended to promote and improve health outcomes of VAPIHCS patients.

Essential VIII: Advanced Nursing Practice. With the goal of improving patient outcomes, the DNP demonstrates advanced levels of clinical judgement, systems thinking, and delivery of evidence-based care (AACN, 2006). The goal of the project was that by the end of fiscal year 2017, a standardized and consistent automated test result notification process would be implemented using clearly defined processes and guidelines. While gaining an understanding of the providers' challenges and barriers to timely notification of test results, the DNP student developed a needs assessment and satisfaction questionnaire which was utilized during the pre-/post-implementation timeframes. A standardized and consistent automated test result notification process was implemented during quarter 3 of fiscal year 2016. Although the target goal for abnormal test results to be communicated within 7 days was 90%, the goal was nearly met at 81% during the month of December and indicated that the providers' compliance improved significantly in comparison to pre-implementation data.

Plans for Dissemination

These project findings will be presented face-to-face during the QEB Committee meeting which is held every second Tuesday each month. The projected date of presentation is to be decided subject to the approval of the project final defense. The Executive Summary will be provided for all who attend the QEB Committee meeting. The Medical Director of VAPIHCS is the governing Chair of the QEB Committee and attends the meeting frequently. The following recommendations will be made to the Medical Director and the voting members of the QEB Committee: (1) to ensure timely delivery of test results, providers' unnecessary view alerts must be removed from the important view alerts and have the view alert system more user-friendly. Aside from test results, providers also receive other view alerts such as previously generated consults that had been addressed or if a consult was canceled; (2) establish

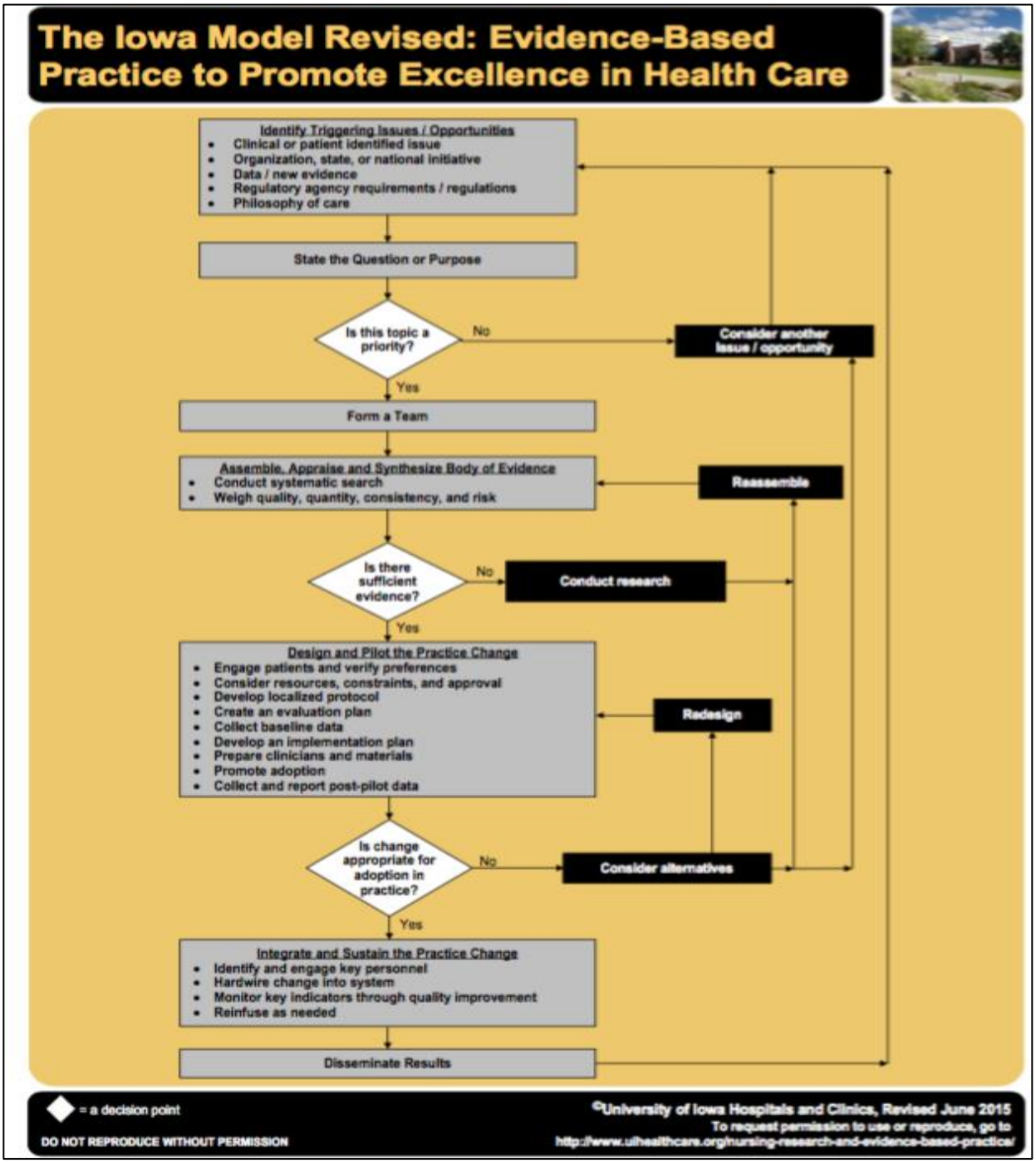
a full-functioning PACT for the providers. In addition to getting through scheduled appointments with their patients throughout the day, with the absence of support staff, or the nurse, the provider ends up doing administrative duties that can distract them from their own duties which are deterrents from having time to address their view alerts; (3) change policy that specifies specialists must order their own tests instead of sending patients to their primary care provider (PCP) which requires the PCP to do the extra work of notifying the specialist and the patient of the test results within the required timeframes, 14 days for normal and seven days for abnormal test results; and lastly (4) to meet the JC and the OIG guidelines and assure patient safety, ongoing education is needed to ensure full compliance for timely test result communication.

Summary

The goal of this project was that by the end of fiscal year 2017, a standardized and consistent automated test result notification process would be implemented using clearly defined processes and guidelines was met. The results of the post-implementation chart review and providers need assessment and satisfaction questionnaire, was suggestive that the providers' compliance with test result reporting increased. Though, the goal of 90% of the providers notifying patients of their abnormal test results in a 7- day period was not achieved, it was improved from a low of 5% pre-implementation to a high of 81% post implementation. Since the completion of the DNP project, a bi-monthly mass email has been sent out to all providers by the DNP student as an ongoing education to maintain the 'energy' to continue the upward trend and enhance the momentum. In addition, because the VA is a fluid environment, providers leave and others are hired; individual orientation to the notification process to new providers will be implemented. For example, soon after the completion of the project, one PACT provider

from ACC transferred to another VA facility and another one is due to leave the VA in the month of March and more than likely, these providers will be replaced. These newly hired providers will require training how to navigate the EHR and carry out the notification of test results expectations and process. It is important to continue to reach out to providers to continue to assess and implement strategies to address their challenges and barriers for safe and timely test results reporting. Lastly, leadership's support is crucial and the DNP student will continue to keep them aware of the providers' challenges and barriers to timely reporting and frequently present data that demonstrate providers' compliance with test result reporting.

APPENDIX A: The Iowa Model Revised



APPENDIX B: Flyer

APPENDIX C: Post-Implementation Provider Education

Dear Providers,

I am reaching out to all of you once again to provide some guidance in generating the AUTO-PRINT letters. The number of letters generated and auto-printed to the remote printer continues to rise.

However, there is a continued issue of test result letters printed to the 'local' printer (in Dr. Novak's and Dr. Kistler's office) due to long letters that are more than 82 lines, ranging from two to eight letters per day.

Our main **goal** during this process is to have most if not all letters printed to the remote printer to avoid any burden for Dr. Kistler and her staff as they are the ones receiving these letters up, stuffing them into the envelope, then brings to the post office to mail.

If there is a need to include all the test results in the letter and will have more than 82 lines, the letter can be printed MANUAL Print as this is also available for you in CPRS and you or your staff can manually mail the letter.

Please also remember to **edit** the results you import. Some of the lab results have extensive boilerplate that gives background information on the test/analyzer, tracking information, and interpretations which are usually meaningless to the patient. For example, the boilerplate template for Hepatitis C is one page long. Most of this should be edited out. The interpretation and plan should be reported clearly and succinctly. Otherwise, letters may end up being 10 pages long by simply copying and pasting all the comments from the lab and still be confusing to the patient.

Urgent/emergent results must be communicated either by phone or face-to-face within an appropriate time-frame, especially if a change of treatment, meds, or care is required as an outcome of the test results.
OIG findings during site inspection in 2011 and 2015 indicated that many of our test results were not being communicated in a timely manner and a recommendation for process improvement and compliance with the reporting standards had to be implemented.

VHA Directive 1088 (2015) indicated that test results are to be communicated within 14 days of normal test results and 7 days of abnormal, non-critical/non urgent test results.

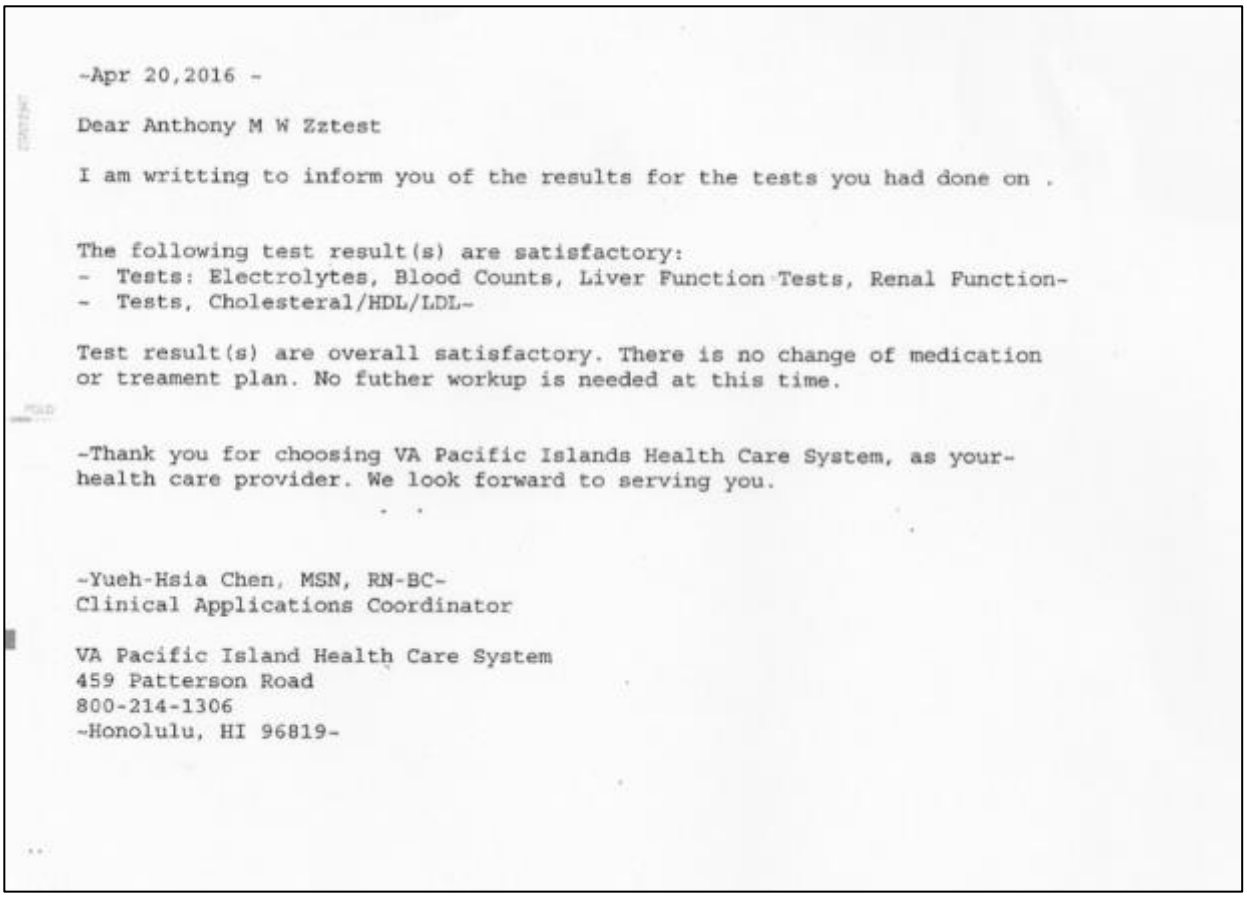
Thank you all for your time and your hard work.
Please feel free to contact me for any concerns or questions, or if you need assistance setting up your AUTO-PRINT or MANUAL PRINT templates.

APPENDIX D: Data Collection Tool – Pre-/Post Provider Needs Assessment and Satisfaction

Questionnaire

	Provider	1	2	3	4	5	6	7	8	9	10	11	12
	Question												
1	On an average day, how many patients do you see?												
2	On an average day, how many tests do you normally order?												
3	On an average day, how many view alerts do you receive regarding abnormal test results?												
4	On an average day, how many unnecessary view alerts do you receive?												
5	__Too many view alerts __Too many patients to see __Complicated cases __Not enough time __Too many test results to report on __The view alert system is not user friendly __Distraction of other clinical duties __No standardized method of test result notification __No easily accessible method of notification in place __Unsure of notification process __Other. Please specify: _____												
6	How much time do you spend managing your abnormal test results on an average day? _____minutes												
7	How do you usually communicate your abnormal test results? Please check all that apply? __Face-to-face __Letter notification __Standardized automated test result letter notification __Phone call __Secure Messaging __Telehealth __Other. Please specify: ____												
8	In notifying test results to patients, is there anything that would be helpful to enhance the timely notification of abnormal test results? Yes__ No___. If yes, please specify: _____												
9	How satisfied are you with the current test result notification process? (check only one) __Very satisfied __Satisfied __Somewhat satisfied __Somewhat dissatisfied __Somewhat dissatisfied __Dissatisfied __Very Dissatisfied												
10	How satisfied are you with your current ability to address abnormal test results on a daily basis? __Very Satisfied __Satisfied ___Somewhat satisfied __Somewhat dissatisfied __Dissatisfied __Very Dissatisfied												

APPENDIX E: Sample Automated Test Result Notification Letter



-Apr 20,2016 -

Dear Anthony M W Zztest

I am writting to inform you of the results for the tests you had done on .

The following test result(s) are satisfactory:
- Tests: Electrolytes, Blood Counts, Liver Function Tests, Renal Function-
- Tests, Cholesteral/HDL/LDL-

Test result(s) are overall satisfactory. There is no change of medication or treament plan. No futher workup is needed at this time.

-Thank you for choosing VA Pacific Islands Health Care System, as your-health care provider. We look forward to serving you.

-Yueh-Hsia Chen, MSN, RN-BC-
Clinical Applications Coordinator

VA Pacific Island Health Care System
459 Patterson Road
800-214-1306
-Honolulu, HI 96819-

APPENDIX F: Pre-/Post Provider Needs and Satisfaction Questionnaire

NEEDS ASSESSMENT and SATISFACTION QUESTIONNAIRE FOR PROVIDERS
Communication of Test Results Timeliness

All answers will be anonymous.

1. **On an average day, how many patients do you see/treat? _____**
2. **On an average day, how many tests do you normally order? _____**
   (e.g. CBC; PSA; Potassium; TSH; Chest X-ray; CT scan; CMP; Lipid; Urinalysis; etc.)
3. **On an average day, how many view alerts do you receive regarding abnormal test results? _____**
4. **On average, how many unnecessary view alerts do you receive? _____**
5. **Which of the following impacts your ability to address your Test Results in a timely manner. Please check all that apply**

   ___Too many view alerts
   ___Too many patients to see
   ___ Complicated cases
   ___ Not enough time
   ___ Too many test results to report on
   ___The view alert system is not user friendly
   ___ Distraction of other clinical duties
   ___No standardized method of test result notification
   ___No easily accessible method of notification in place
   ___Unsure of notification process
   ___ Other. Please specify: _____

6. **How much time do you spend managing your abnormal test results on an average day? _____minutes**
7. **How do you usually communicate your abnormal test results? Please check all that apply:**

   ___Face-to-face
   ___Letter notification
   ___Standardized automated test result letter notification
   ___Phone call
   ___Secure messaging
   ___Telehealth
   ___ Other (please specify)_____

8. **In notifying test results to patients, is there anything that would helpful to enhance the timely notification of abnormal test results?**

   __ Yes __ No If yes, please specify: _____

9. **How satisfied are you with the current test result notification process? (check only one)**

   ____ Very Satisfied ____ Satisfied ____Somewhat satisfied

   ____Somewhat dissatisfied ____ Dissatisfied ____ Very Dissatisfied

10. **How satisfied are you with your current ability to address abnormal test results on a daily basis?**

    ____ Very Satisfied ____ Satisfied ____Somewhat satisfied

    ____Somewhat dissatisfied ____ Dissatisfied ____ Very Dissatisfied

APPENDIX G: Logic Model

LOGIC MODEL

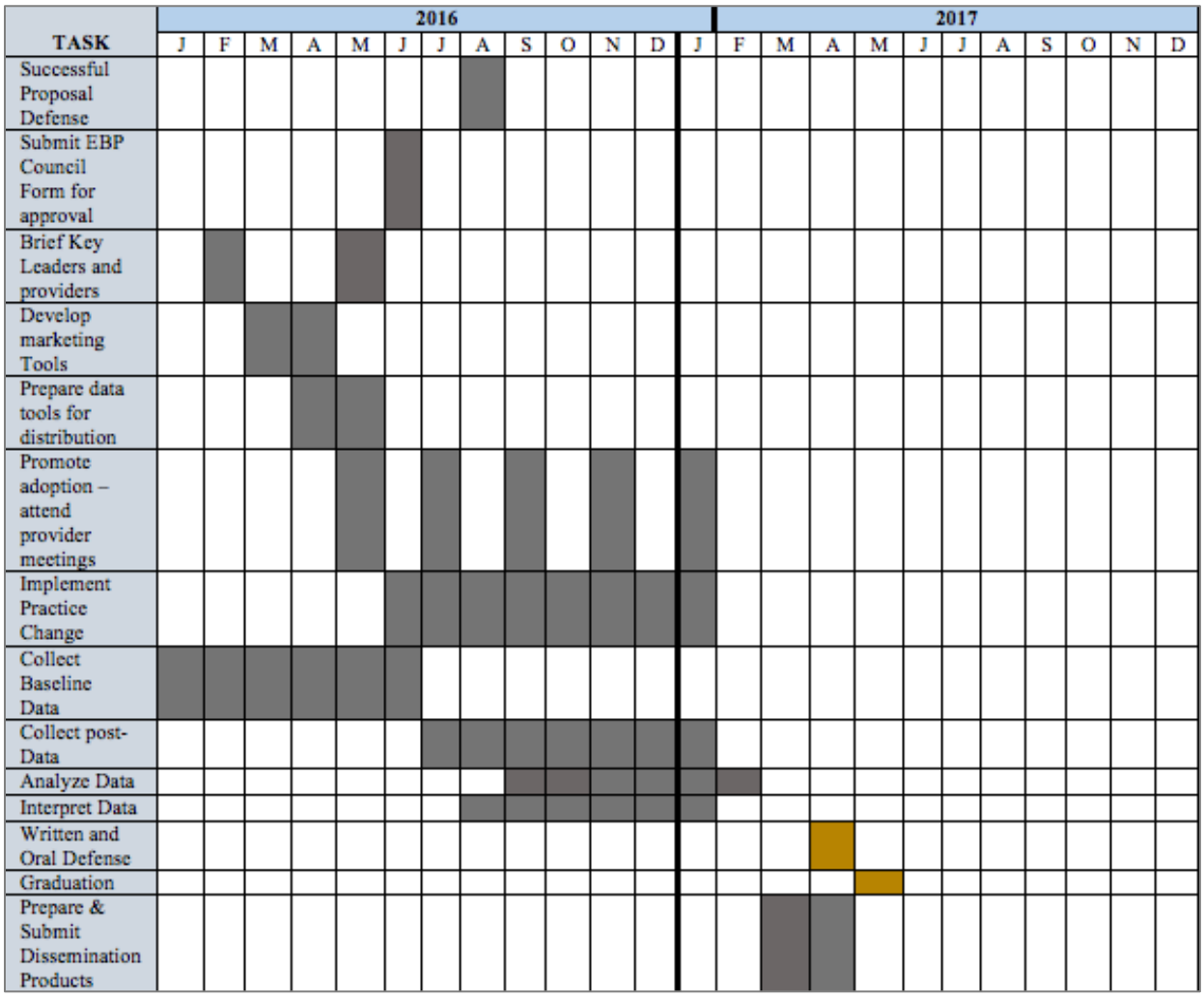
INPUTS	OUTPUTS		OUTCOMES		
RESOURCES	**ACTIVITIES**	**PARTICIPATION**	**SHORT TERM**	**INTERMEDIATE**	**LONG TERM**
• **ACC PACT Providers** • **Deputy Chief of Staff of Primary Care** • **Chief of Staff of Primary Care** • **Chief of Clinical Informatics** • **DNP Student** • **DNP External Advisor** • **Pre- and Post-Provider Needs Assessment and Satisfaction Questionnaire**	• Monthly meetings with CTR workgroup • Create flyer for marketing tools • Create a pre- and post-provider Needs Assessment and Satisfaction Questionnaire • Orient and train ACC PACT providers the proper use of the electronic health record (EHR) • Compare current VAPIHCS' policies and directives with other VA facilities relating to responsibility, timing, and process of test result notification	• ACC PACT Providers • DNP student • Deputy Chief of Staff of Primary Care Clinic • Primary Care and Community-based Outpatient clinics Nurse managers • Chief of Clinical Informat • Chief of Laboratory Services • RN, Data Analyst • External Advisor	1. Providers familiarized with best practices for patient notification process 2. Standardized test result notification process planned 3. Providers' timeliness of notification of abnormal test results increased 4. Barriers to implementation identified	• Increased compliance with the Office of Inspector General and the Joint Commission test result notification standards • Increased knowledge of providers on test result notification best practices • Standardized of an automated test result notification process • Improved monthly and quarterly test result notification data • Increased adherence to the VHA policies and directives on test result notification process	• Improved patient outcomes and quality of life • Program sustained
ASSUMPTIONS:	The implementation of a standardized test result notification process will: (1) improve patient health outcomes and quality of life; (2) increase providers' adherence in timely notification of abnormal test results; (3) compliance with OIG and JC standards; (3) improve monthly data and meet target of 90%				
External Factors:	The external factors are: (1) shifting administrative/leadership priorities at local or federal level; (2) structural, cultural, Sociological, economic changes in the region that may impact the behavior of providers				

Appendix H. Data Collection Tool - Pre-/Post Implementation Chart Review

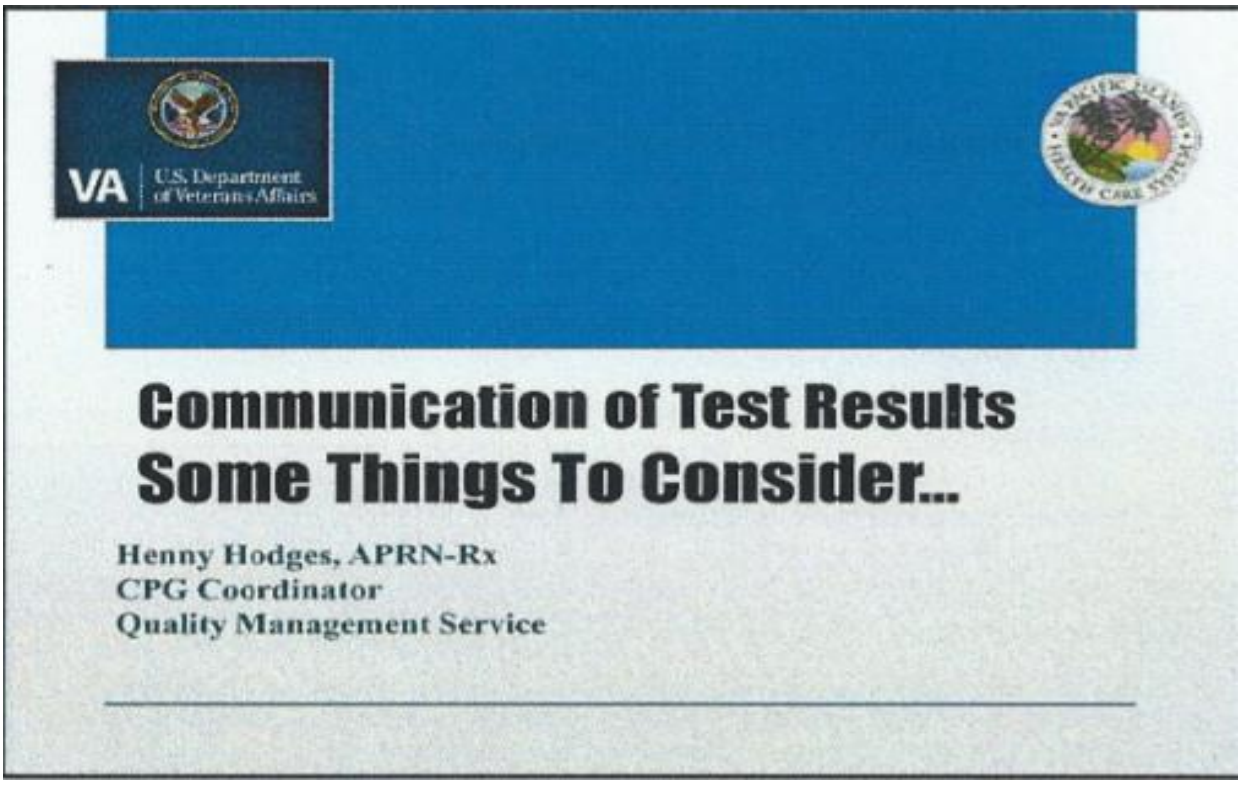
MONTH (2016)	TOTAL NUMBER OF TESTS (Normal and Abnormal)	TOTAL NUMBER OF NORMAL TESTS	NUMBER OF ABNORMAL TESTS	NUMBER OF NORMAL TEST NOTIFIED WITHIN 14 DAYS	NUMBER OF ABNORMAL TEST NOTIFIED WITHIN 7 DAYS
JANUARY					
FEBRUARY					
MARCH					
APRIL					
MAY					
SEPTEMBER					
OCTOBER					
NOVEMBER					
DECEMBER					

MONTH (2016)	TOTAL NUMBER OF TESTS (Normal and Abnormal)	TOTAL NUMBER OF NORMAL TESTS	NUMBER OF ABNORMAL TESTS	NUMBER OF NORMAL TEST NOTIFIED WITHIN 14 DAYS (%)	NUMBER OF ABNORMAL TEST NOTIFIED WITHIN 7 DAYS (%)
JANUARY					
FEBRUARY					
MARCH					
APRIL					
MAY					
SEPTEMBER					
OCTOBER					
NOVEMBER					
DECEMBER					

APPENDIX I: Timeline



APPENDIX J: PowerPoint



New Auto-Print Results Notification Letter Procedure

- Select new visit location
- Note Titles for:
  - Automatic print – Letter Results notification (Auto Print)
  - Do not edit spacing
  - Automatic print to Sacramento if letter is 82 lines or less
  - More than 82 line – print locally at a designated printer in ACC
  - Once e-signed, cannot recall the letter
- **Manual Print** – Letter Test Results (Manual Print)
  - The provider is responsible to stuff the letter in the envelope and mail
  - This option may be necessary if a certified letter is required and want to include additional information (flyer or a pamphlet)

CONFIDENTIALITY must be maintained and should not use the words HIV, AIDS, alcohol, drug, and sickle celll (U.S. Code 7332).

It is okay to say your test result was normal or abnormal but do not specifically say "Your AIDS test was positive"

What to Do If...

- Veteran has a wrong address
  - Contact Business Office to assist obtain the correct address
- Veteran has a temporary address or addressed at a shelter or Vet Center
  - Contact Veteran's case worker to make sure the letter will get delivered to the Veteran
  - Homeless Veterans – contact Homeless Program APRN or Social Workers

What to do when...

- Wrong address
  - Letter will not be automatically printed either remotely (Sacramento) or locally (PC clinic)
  - Manually print letter and mail to patient once correct address is resolved or best to attempt to call Veteran and provide test results over the phone--- document in CPRS
  - If living in shelter or Vet Center, contact case worker, social worker assigned to the Veteran

What to do when...

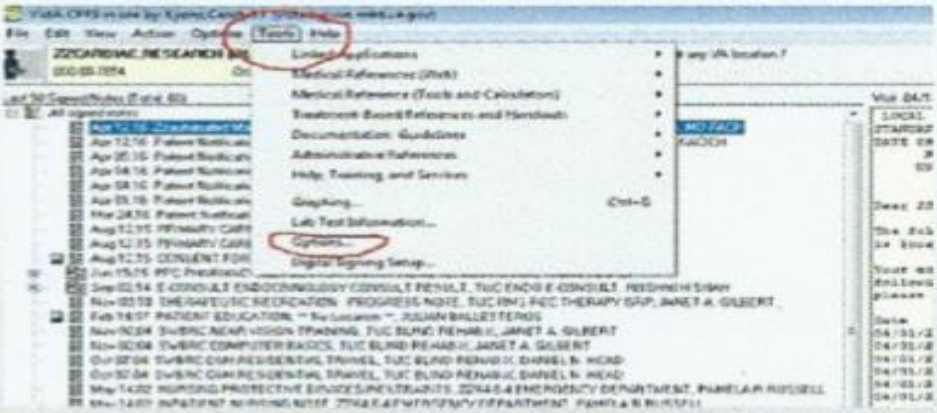
- Wrong address
  - Letter will not be automatically printed either remotely (Sacramento) or locally (PC clinic)
  - Manually print letter and mail to patient once correct address is resolved or best to attempt to call Veteran and provide test results over the phone--- document in CPRS
  - If living in shelter or Vet Center, contact case worker, social worker assigned to the Veteran

Best Practices

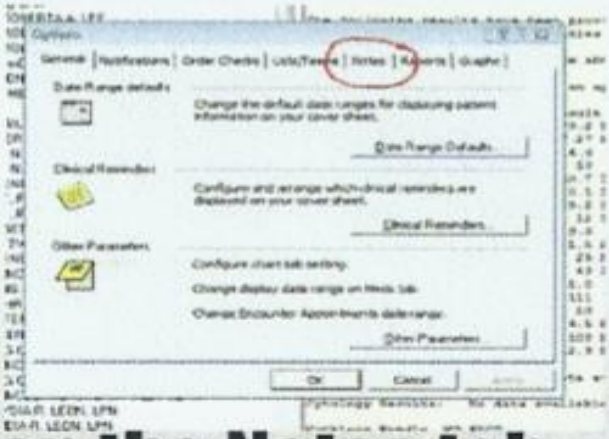
- Order tests prior to Veteran appt (preferably a week or so before)
- Veteran reminder a few days before the appt
- Discuss test results with Veteran during clinic appt
- Document in CPRS
- Veteran is assured, provided quality care, and met the performance measures criteria
  - 14 days – normal
  - 7 days - abnormal

Setting up Default Documents in CPRS

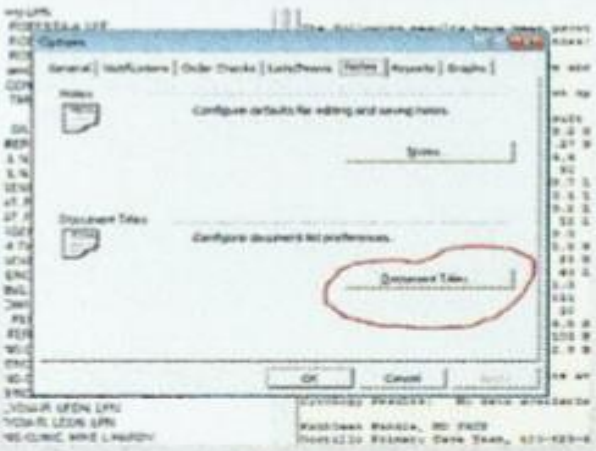
Carolyn Lyons – Northern Arizona VAMC



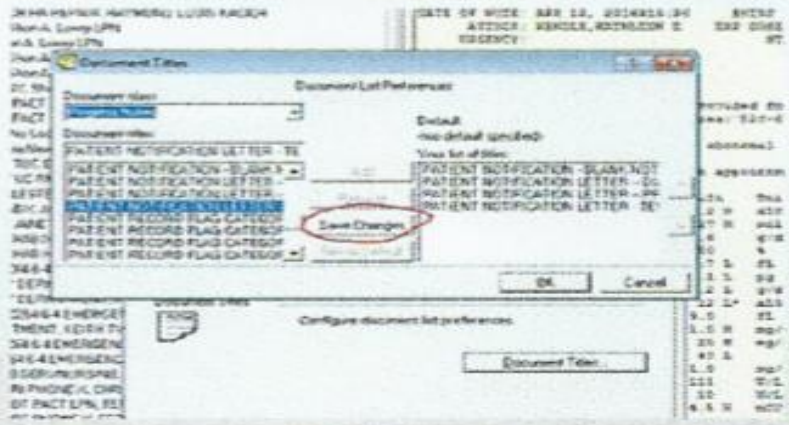
Click on Tools on the CPRS menu bar and then select Options. Lyons, Carolyn, Northern Arizona VAMC.



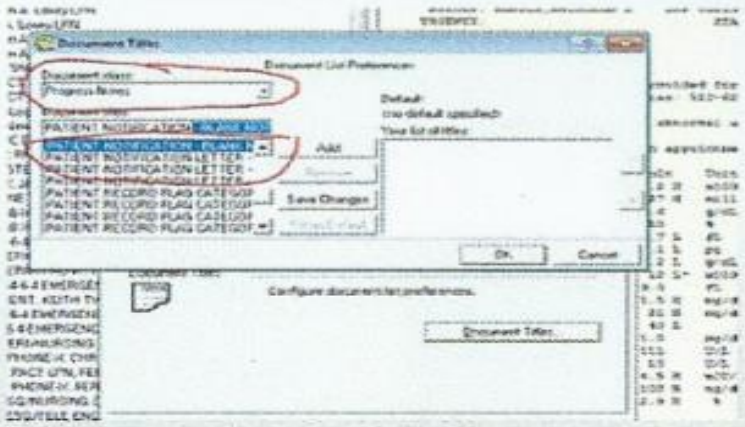
Click on the Notes tab shown in red below Lyons, Carolyn, Northern Arizona VAMC



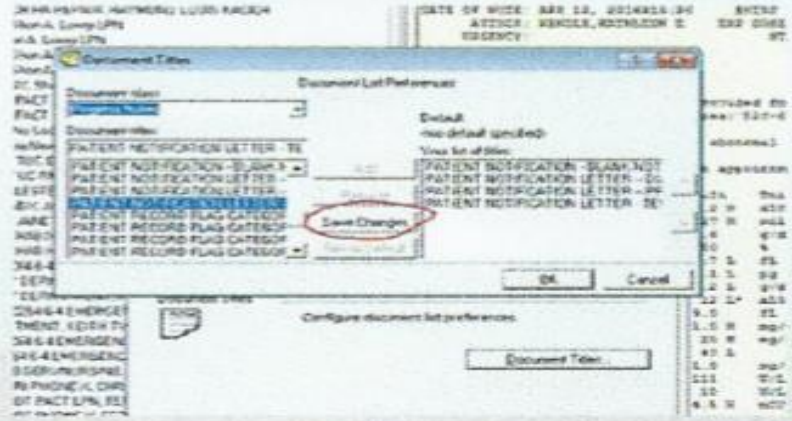
Then click on the Document Titles shown in red below. Lyons, Carolyn. Northern Arizona VAMC.



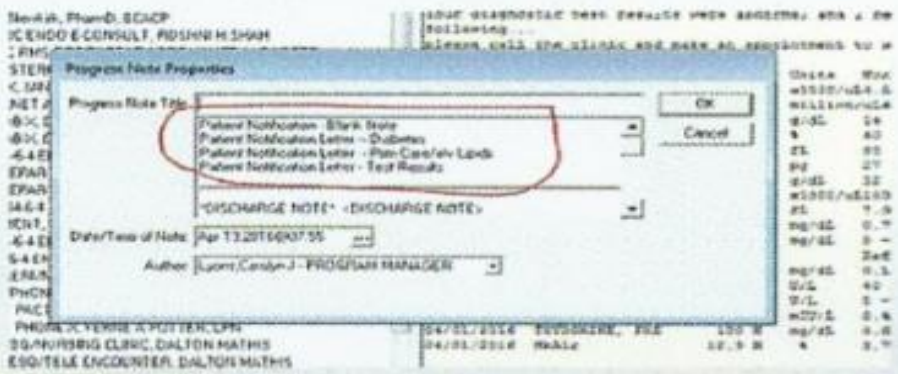
You can add the Notification Letters to your list of default titles shown to the right of the red circle and then save your changes and click OK and then OK again to close out the dialog box. Lyons, Carolyn, Northern Arizona VAMC.



Set your document class to Progress Notes Then search for the Patient Notification Letter.

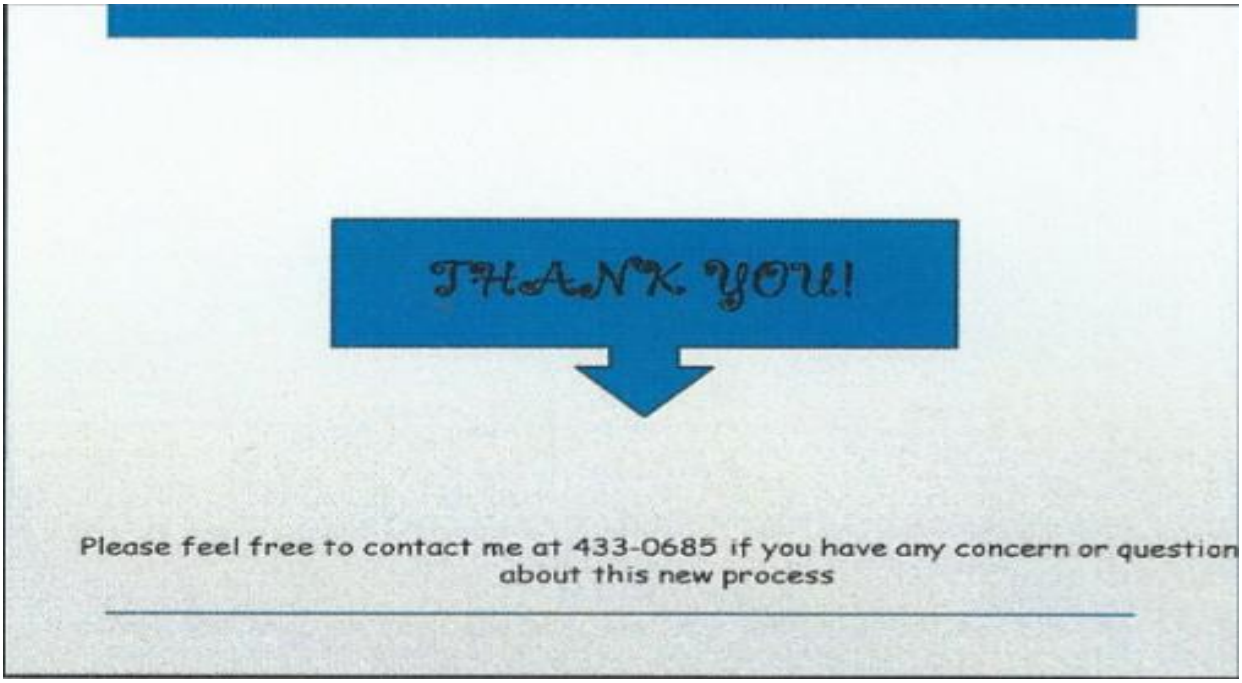


You can add the Notification Letters to your list of default titles shown to the right of the red circle and then save your changes and click OK and then OK again to close out the dialog box. Lyons, Carolyn, Northern Arizona VAMC



This diagram shows that the Notification Letters are shown at the top of the list so that I can readily use them. No more searching. Lyons, Carolyn. Northern Arizona VAMC.

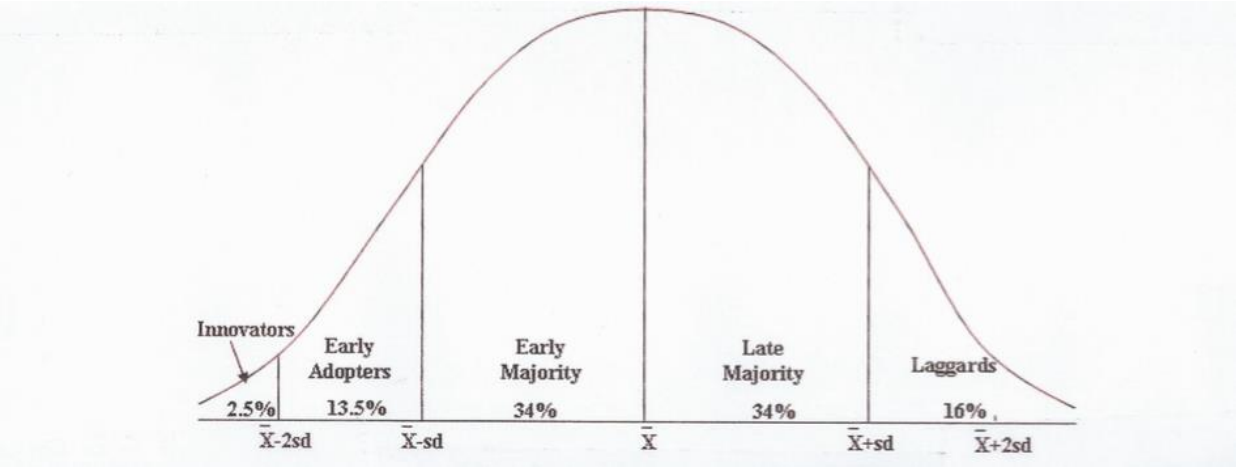
- This can be done with the different document types and document titles so that you can ease your search for documents that you use most of the time.
- I hope this has helped you
- If you have any questions, contact Carolyn Lyons (Carolyn.lyons@va.gov)


THANK YOU!
Please feel free to contact me at 433-0685 if you have any concern or question
about this new process

APPENDIX K: Data Collection Procedures

INSTRUMENTS	REFERENCES	NUMBER OF ITEMS	PSYCHOMETRICS
PROCESS MEASURES			
DNP Student-designed provider needs assessment and satisfaction questionnaire	Expert review of clinical providers, external advisor, and evidence-based literature review, reliability has not been established	10 questions/comments	Content validity through literature, and reviewed by facility nurse scientist and clinical providers, reliability has not been established
Data Audits	Random query of 100 laboratory and radiologic test results six months pre- implementation	100 or more normal and abnormal test results per month	Data is obtained from VA secure server; the type of query has been used overtime and provide accurate information, has been proven its validity and reliability
OUTCOME MEASURES			
DNP student-designed provider needs assessment and satisfaction questionnaire	Expert review of clinical providers, external advisor, and evidence-based literature review, reliability has not been established	10 questions/comments	Content validity through literature, and reviewed by facility nurse scientist and clinical providers, reliability has not been established
Data Audits	Random query of 100 laboratory and radiologic abnormal test results monthly post-implementation for six months and quarterly thereafter	100 abnormal test results every month for six months	Data is obtained from VA secure server; the type of query has been used overtime and provide accurate information, has been proven its validity and reliability

APPENDIX L: Adopter Categorization on the Basis of Innovation



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