Inpatient & Outpatient Venous Thromboembolism: A Multifactorial Approach to Increase Mechanical and Pharmacological Prophylaxis Compliance

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A Multifactorial Approach to Increase Mechanical and Pharmacological Prophylaxis Compliance

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Abstract

Venous thromboemboli (VTEs) are a clinical and public health problem as they are commonly linked to inpatient experiences, yet frequently occur in the outpatient setting. VTEs place a significant burden on health care organizations and patients alike, as VTEs are costly, require long-term medications, and frequently reoccur. Research has identified risk factors and determined best practices for VTE prevention and prophylaxis, however little consensus exists among health care organizations and the implementation of best practices is varied. This project studied the challenges and opportunities in VTE prevention and prophylaxis at a large metropolitan hospital in California. Environmental changes were made in patient rooms across ten medical surgical units to increase nurses’ compliance with sequential compression device (SCD) orders. New machines were labeled and placed on patient beds, signs were placed on documentation stations, and education sessions were conducted with over 300 medical surgical nurses. Informal interviews with nursing staff, discharge pharmacists, and the hospital’s outpatient clinic staff were conducted to determine obstacles in compliance and gaps in anticoagulant discharge education. The subsequent audits revealed that nurses’ compliance with SCD orders and documentation remain low and that SCD machines continue to be misplaced, transferred between units, and stored incorrectly. Additional observations further indicated that discharge anticoagulation education is inconsistent and a discharge checklist was developed in response. Future work will include increased education about SCD compliance and documentation. Additional research should be conducted to identify new barriers to compliance, interdisciplinary influences, as well as to determine local, state, or national similarities. Furthermore, interdisciplinary processes must be developed to ensure the tracking and return of machines. In addition, an institutional policy, such as the standardization of the discharge
checklist, should be implemented to ensure consistent discharge patient education and optimal patient outcomes.

*Keywords: venous thromboembolism (VTE), prevention and prophylaxis, sequential compression device (SCD), anticoagulant, discharge education, checklists*
Table of Contents

Introduction .................................................................................................................. 6

Etiology & Risk Factors .......................................................................................... 6

Epidemiology ............................................................................................................ 7

Burden of VTE ......................................................................................................... 7

Background .............................................................................................................. 10

Challenges & Opportunities .................................................................................. 11

Implications for Practice ...................................................................................... 14

Scope of Work ......................................................................................................... 15

Organizational Vision, Mission & Goals ............................................................. 15

Population Served .................................................................................................. 16

VTE Project ............................................................................................................. 17

Project Results ....................................................................................................... 22

Divided Stakeholder Support .............................................................................. 22

Lack of Supportive Processes ............................................................................. 23

Persistent SCD Non-Compliance ........................................................................ 23

Lack of Systemic Discharge Education ............................................................... 24

Interdisciplinary Factors ..................................................................................... 25

Project Implications ............................................................................................... 27

Additional Research ............................................................................................. 27

Development of Interdisciplinary Processes ....................................................... 28

Institutional Discharge Education Checklist ...................................................... 29

Modification of Electronic Medical Record System .......................................... 30
Conclusion………………………………………………………………………………………………… 31
Tables……………………………………………………………………………………………………….. 37
Introduction

Venous thromboemboli (VTEs) are named one of the most preventable hospital-associated complications, however an estimated 100,000 people in the U.S. continue to die every year due to VTEs (Lavall & Costello, 2015). Venous thromboembolism is defined as a condition that includes both deep vein thrombosis (DVT) and pulmonary embolism (PE). More specifically, DVTs refer to the formation of a blood clot that can occur within a deep vein. One of the most serious complications of a DVT occurs when the clot dislodges from the deep vein and travels into the lungs, thus resulting in a potentially fatal PE (Casciano et al., 2015).

Etiology & Risk Factors

The etiology of VTEs is not fully understood, however it is clear that VTEs are a multifactorial condition. Virchow’s triad, including vascular damage, venous stasis, and hypercoagulability, has been historically used to describe the risk factors for VTEs; however, advanced research has identified multiple genetic, behavioral, biological, and environmental risk factors for VTEs (Tsai et al., 2015). Prominent genetic risk factors include family history of blood clotting, as well as inherited thrombophilia (Beckman, Hooper, Critchley, & Ortel, 2010). More commonly seen biological risk factors include chronic disease, cancer, obesity, surgery, trauma, immobilization, and infection. Findings by Tsai et al. (2015) highlight that such preexisting comorbid conditions are associated with a 4-19% increased likelihood of VTE, while having two comorbid conditions is associated with a 190-450% increased likelihood of VTE occurrence.

In addition to genetic and biological risk factors, various behavioral and environmental factors increase an individual’s risk of developing a VTE. Behavioral risk factors include smoking, as well as hormonal contraceptives and hormone replacement therapy use (Beckman,
Hooper, Critchley, & Ortel, 2010). More recently identified environmental risk factors include long-distance travel and prolonged hospital stay (Tsai et al., 2015). In the U.S. alone, an estimated 12 million individuals are at risk of VTE due to hospitalization for surgery or an illness (Schiro et al., 2011). In addition, more recent research has identified demographic risk factors, including African-American race, male sex, and women in the pregnancy and the post-partum period. Although numerous risk factors have been identified, nearly 50% of all VTE cases are considered idiopathic, with no risk factors identified (Beckman, Hooper, Critchley, & Ortel, 2010).

Epidemiology

Although numerous risk factors are known, the prevalence of VTEs is increasing nationally. According to the Centers for Disease Control and Prevention (CDC), approximately 300,000-600,000 people experience a VTE annually (Lavall & Costello, 2015). Heit et al. (2016) further explains that the prevalence of VTEs remained relatively stable between 1980 to 2000. However following 2001, the incidence of VTEs increased steadily. According to current literature, approximately two-thirds of patients who present with a VTE experience a DVT, while the remaining one-third experience a PE. Although DVTs have a greater incidence, PEs must be simultaneously addressed, as they are the leading cause of preventable hospital death and the leading cause of maternal mortality in the U.S. (Beckman, Hooper, Critchley, & Ortel, 2010). More alarmingly, due to the lack of a national VTE surveillance system, the true number of individuals affected by VTEs is likely grossly underestimated.

Burden of VTE

The occurrence of a VTE can significantly decrease quality of life and become a chronic condition. According to Beckman, Hooper, Critchley, and Ortel (2010) approximately 10-30% of
VTE cases will end in fatality within 30 days; the majority of deaths occur among patients affected by PE. Furthermore, 20-25% of all PE cases present in sudden death and approximately one-third of all VTE patients will experience a recurrent VTE within 10 years (Beckman, Hooper, Critchley, & Ortel, 2010). Additional studies suggest that 4% of VTE patients have a recurrent VTE within 12 months alone, however the period of greatest risk is during the first 6-12 months (Casciano et al., 2015). Even more alarming, all VTE patients will remain at risk for the rest of their lives. It is estimated that following a VTE, quality of life is adversely affected for four months following the initial event. For those patients who do require long-term anticoagulation therapy, quality of life is even more negatively affected, as anticoagulation therapy increases their risk for an adverse bleeding episode (Beckman, Hooper, Critchley, & Ortel, 2010).

In addition to the burden on morbidity and mortality, VTEs have a significant economic burden. Total direct costs of managing VTEs in the U.S. health care system range from $1.5-10 billion annually. However this estimate does not include the additional costs of VTE complications, including readmissions, bleeding episodes, etc. In one study, researchers found that direct and indirect costs of VTEs account for approximately $9.8-52 billion annually. Furthermore, episodes of recurrent DVT are estimated to cost 21% more than the initial event (Casciano et al., 2015). In a study by Casciano et al. (2015), the all-cause hospitalization cost for VTEs was $17,301 with no recurrent VTEs and $27,370 with recurrent VTEs. Furthermore, the Center for Medicare and Medicaid Services (CMS) discontinued reimbursement for VTEs due to their preventable nature. Similarly, the Joint Commission established standards for VTE prevention and prophylaxis use in hospitals; only hospitals with 100% compliance gain reimbursement for subsequent VTE occurrences (Spinazzi et al., 2015).
VTEs are not only a clinical health issue; they pose a growing public health concern as well, as the majority of VTEs occur within the community setting. Research shows that approximately 50% of VTE cases can be directly linked to a prior acute care hospitalization or surgery within the last three months (Nelson et al., 2015). However, approximately 70% of VTE occurrences were identified in community or outpatient setting (Tsai et al., 2015). Thus, it is evident that VTEs are both a clinical and public health concern. The following paper serves to provide a historical context of VTE prevention and prophylaxis, describe the current challenges and opportunities, as well as describe an organizational level intervention in a public metropolitan hospital.
Background

Although historically seen as a clinical health issue, VTEs have gained significant public health attention on the national, state, and local level. Beginning in 2001, the Agency for Healthcare Research and Quality named thromboprophylaxis to prevent VTEs as the number one safety practice for hospitals. Soon after, the CDC created a Thrombosis and Hemostasis Centers program to conduct research and provide services to patients with DVT. In 2003, the American Public Health Association (APHA) with the CDC held a conference on DVT to discuss the increased need of national awareness surrounding VTE.

Between 2006-2008, the National Quality Forum, the Joint Commission, and the CMS developed and implemented policies to decrease VTEs via appropriate prophylaxis (Beckman, Hooper, Critchley, & Ortel, 2010). The 2007 CDC “Stop the Clot” was a key campaign, as it aimed to develop and disseminate health information for patients affected by VTE. “Stop the Clot” continues to conduct education forums, host a resource website, and manage support groups. In addition, the CDC created an online program for non-healthcare professionals to become trained on the basics of VTE (Beckman, Hooper, Critchley, & Ortel, 2010).

In 2008, US Surgeon General released Call to Action to Prevent Deep Vein Thrombosis and Pulmonary Embolism. The plan included a call for increased awareness from providers and the public, increased use of evidence-based practices to improve screening, diagnosing, and treating VTEs, as well as increased research on DVTs (Beckman, Hooper, Critchley, & Ortel, 2010). Increased VTE prevention and prophylaxis continues to be a national goal and is included in the Healthy People 2020 goals. Healthy People 2020 aims for a 10% reduction of VTE incidence, from 54.3 to 48.9 per 10,000 by 2020 (Beckman, Hooper, Critchley, & Ortel, 2010).

Various advances have been made through public health efforts; however, decreasing the burden
of VTEs remains a challenge. Such challenges and associated opportunities can be organized around the socio-ecological model.

**Challenges & Opportunities**

**Individual Level.** Numerous studies have found that regardless of patient education and current VTE awareness campaigns, there is a lack of VTE awareness and knowledge among the general public. In a qualitative study of 31 patients identified as high risk for VTE during a recent hospitalization, researchers found that although aware of VTE risk, one-third of patients believed they would not be able to recognize a VTE if it occurred. Furthermore, only two patients were able to identify the symptoms of PE, a potentially fatal complication of VTEs. Patients reported mixed views of anticoagulant discharged education, as some patients were required to demonstrate self-administration of anticoagulants, while others were simply handed an injection set upon discharge. Patients reported that although they completed the entire course of anticoagulation therapy, increased education on VTEs was needed in order to deepen their understanding of how VTE prophylaxis works and why it is important. Furthermore, the patients desired increased information on symptoms of VTE, and more specifically PE (Apenteng et al., 2016).

In order to address these concerns, the National Institute for Health and Care Excellence guidelines recommends that patients receive verbal and written instructions on VTE prophylaxis upon discharge in order to increase patient understanding and medication adherence. Increased knowledge on VTE signs and symptoms is critical to ensure early and accurate detection of VTEs, which will nevertheless decrease preventable deaths (Beckman, Hooper, Critchley, & Ortel, 2010). Another study by Lavall & Costello (2015) found that the majority of participants preferred to receive health information from medical professionals. Nurses have a unique
opportunity to promote positive patient outcomes within the inpatient and the community setting via patient education. Nevertheless, a significant challenge still remains in disseminating VTE information from health care practitioners to the general public (Lavall & Costello, 2015). Additional research should be conducted to determine the best methods to educate patients on VTE risk and prophylaxis in both settings.

**Organizational Level.** Currently, various guidelines and recommendations for best practices surrounding VTE prevention, prophylaxis, and education exist; however, much variability exists among health care organizations. The American College of Chest Physicians guidelines is currently the most adhered to guidelines. Nevertheless, there is no consensus among practitioners and hospitals on the best approach to VTEs. Furthermore, the guidelines are not accepted by all specialties. In order to increase consensus, national standards need to be developed and agreed upon by all specialties (Beckman, Hooper, Critchley, & Ortel, 2010). In addition, the lack of proper risk assessment tools, asymptomatic presentations, misdiagnoses, and inadequate documentation increase health care organizations difficulty in diagnosing VTEs (Bilgi et al., 2016). The adapted Caprini RAM risk assessment tool can be used as an economic, efficient, and practical tool to stratify surgical patients for perioperative VTE risk (Bilgi et al., 2016). In a prospective cohort study, researchers found that high Caprini score were associated with increased risk of VTE and a moderate-low Caprini score was associated with zero VTE events (Bilgi et al., 2016).

Even with increased consensus and access to best practice guidelines, VTE prevention and prophylaxis education does not always occur. A recent study found that confusion existed among health care providers over which member of the health care team was responsible for performing the risk assessment of VTE. Furthermore, a similar study found that 90% of the health
care professionals in a single hospital acknowledged VTEs as a concern and were aware of available prevention tools; however only 52% of physicians completed VTE prophylaxis orders (Lavall & Costello, 2015). In a similar study, researchers found significant variability in how VTE risk was communicated among the health care team within units and the overall health care facility (Schiro et al., 2011). Research shows that appointing a charge nurse as the single point of contact for VTE risk assessment and prevention can increase communication between the health care team, encourage documentation, and advocate for appropriate action if VTE prophylaxis is not prescribed (Schiro et al., 2011). Furthermore, the point of contact can serve as an educational resource among the entire health care team (Schiro, et al., 2011).

Underutilization of thromboprophylaxis in hospitalized patients continues to be problematic in the U.S. (Piazza et al., 2012). In a study by Piazza et al. (2012), researches found that patient refusal accounted for 44.5% of anticoagulant orders that were not executed. Additionally only 3% of patients asked questions following VTE or the use of self-injected anticoagulants. The implementation of an individualized patient education program led by a pharmacist resulted in statistically higher medication adherence to VTE prophylaxis, with approximately one-third less patient refusal to VTE prophylaxis (Piazza et al., 2012).

Lastly, in addition to increased consensus and utilization of best practices guidelines among health care organizations, a national surveillance system is needed to better report, track, and understand VTEs. Currently, there is no national surveillance system for VTEs and thus the true occurrence of VTEs is largely unknown. A national surveillance system is needed to serve a base line to determine the true burden of VTEs in the U.S., as well to assess the true impact of public health prevention efforts (Beckman, Hooper, Critchley, & Ortel, 2010). A surveillance system would allow for population-based estimates of VTEs, longitudinal epidemiological
research on VTEs, as well as the creation of targeted awareness and prevention campaigns (Beckman, Hooper, Critchley, & Ortel, 2010).

**Implications for Practice**

Numerous challenges exist in the effort to decrease the prevalence of VTEs in the U.S. Based upon the socio-ecological model it is also evident that numerous opportunities exist on the organizational level. As the majority of VTEs occur post hospitalization or surgery, intervening on the organizational level is critical as increased VTE risk begins in the inpatient setting. Furthermore, as studies show that individuals prefer to learn about VTE prevention and prophylaxis from medical professionals, it is vital that hospital staff provide comprehensive VTE discharge education. In order to ensure consistent discharge education, microsystem changes are warranted so that VTE education is not only standardized on inpatient units, but resources are readily available for patients to access post-discharge.
Scope of Work

The following fieldwork internship takes place at a large public metropolitan hospital in California. The hospital is the priority trauma hospital in the area, but nevertheless has a wide range of clinics and departments. In addition to standard departments such as the Emergency Department, Urgent Care Center, and Pediatric Urgent Care, the hospital has a Behavioral Health Clinic, Burn and Wound Clinic, Community Wellness Center, Interpreter Services, and Patient Advocate Department. The following sections provide a detailed description of the organization, the population it serves, as well as the role of the Clinical Nurse Leader (CNL) student in the aforementioned VTE project. In order to provide anonymity to the hospital, the following data is slightly generalized, however the implications of the data remain the same.

Organizational Vision, Mission, & Goals

The overarching vision of the hospital is to exceed patient expectations and increase community wellness by providing a patient-centered healing environment. The hospital’s mission is to provide quality health care with both respect and compassion to every patient. In order to better define its vision and mission, the hospital highlights respect, improvement, teamwork, and courage as core values to the organization.

According data from the local public health department where the hospital is located, the hospital’s key goals for 2015-2018 include advancing their organizational strategies to meet “True North.” The hospital’s True North metrics include quality, safety, care experience, developing people, and financial stewardship. Quality refers to preventing mortality and reducing readmission, including reducing fatal PE’s or readmissions due to VTE reoccurrence. The Joint Commission’s National Hospital Inpatient Quality Measures includes six VTE
associated measures, VTE-1 to VTE-6, to further detail VTE prevention and performance goals for hospitals (Joint Commission, 2016). These measures will be discussed within later sections.

Safety refers to zero patient harm and zero staff injuries, including following sequential compression device (SCD) orders to decrease patients’ risk of hospital acquired VTEs. This metric is also reflected in the Joint Commission’s measures, as VTE-6 sets goals on hospital acquired potentially preventable VTEs. Data from the local health department also shows that within the last 2016 quarter, the hospital reached the Joint Commission’s goal of 0%, or zero occurrences of potentially preventable VTEs. Care experience refers to patient satisfaction and access and flow, while developing people involves staff satisfaction and developing problem solvers. Lastly, financial stewardship refers to meeting budget goals and decreasing patient length of stay, both of which are negatively affected by VTE occurrence. In order to gain reimbursement for VTEs, hospitals must achieve 100% compliance with the Joint Commissions measures. Furthermore, due to the preventable nature of VTEs, CMS discontinued reimbursement for VTEs (Spinazzi et al., 2015). Thus, hospital acquired VTEs significantly compromise the financial, quality, and safety metrics of the hospital.

Population Served

The hospital serves a unique and diverse population from a large metropolitan city in California. It provides care to vulnerable populations within the city including, the uninsured, the homeless, and immigrants. According to data from the local health department near the hospital, approximately 75% of the hospital’s patients are uninsured or covered by Medi-Cal and an estimated 75% of patients are from racial, ethnic, or minority backgrounds. The hospital treats over 100,000 patients annually, or 1 in 8 patients within the city. It has over 500,000 outpatient visits each year, over 18,000 urgent care visits each year, and is home to nearly 600 licensed
patient beds and over 4,000 full time employees. Furthermore, the local health department’s data shows that the hospital provides approximately 20% of the total inpatient care for the city, as nearly 30% of all ambulances within the city are directed to the hospital.

**VTE Project**

The overall goal of the project is to increase mechanical and pharmacological VTE prevention compliance on all medical-surgical units within the hospital. More specifically, the project aims to raise the hospital’s VTE-I score, or score on medical-surgical VTE prophylaxis, from the current 80% to the Joint Commission’s standard of 96%. The project focuses on increasing compliance by removing environmental barriers to SCD usage, increasing systematic usage/documentation, providing VTE education to nurses, and identifying areas for improvement with anticoagulant patient discharge education. There are various project objectives to meet this aim, including replacing old SCD machines with new SCD machines on every bed across all units, ensuring environmental staff cleans SCD machines every day without removing the machine from the bed, educating nurses on importance of SCD usage and compliance via 1:1 education, and observing current discharge education sessions.

**VTE Team.** Currently, the VTE team includes a Quality Improvement Nurse, three CNL students, and Nurse Managers from ten medical-surgical units within the hospital. Additional staff involved in the project includes medical-surgical registered nurses (RNs), medical-surgical personal care assistants (PCAs), the Transitional Care Team, the Discharge Pharmacist, and patients. The project spans the organizational level of the socio-ecological model, as it aims to change the organizational practices of one metropolitan hospital. However, the project also aims to bridge the organizational and community level, as VTE prevention and prophylaxis begins in the inpatient setting but continues into the community setting.
Role of CNL. The role of the CNL student in the VTE project is to assist the Quality Improvement Nurse on an ongoing hospital-wide VTE project. The CNL student is expected to participate in performing environmental changes to increase nurses’ compliance with SCD orders on all medical-surgical units. The CNL will aid in educating medical-surgical nurses on the importance of SCD usage and how to operate the new machines. Next, the CNL student is expected to conduct an audit following education to see if SCDs are being utilized and if SCD orders are being accurately followed, as well as identify challenges and unpredicted barriers to compliance. In addition, the CNL student is expected to determine if any inpatient discharge strategies can be implemented to increase pharmacological prophylaxis and improve outpatient outcomes. Lastly the CNL student is expected to present findings to the VTE team, as well Nurse Managers across all medical-surgical units, and further detail the recommended direction of the project.

CNL Goals & Objectives. In order to effectively intervene on the organizational and community level of the socio-ecological model, the CNL student will utilize various levels of intervention from the spectrum of prevention. The following goals and objectives are based around the spectrum’s framework and include interventions on strengthening individual knowledge and skills, educating providers, fostering coalitions and networks, and changing organizational policies and practices. The following section provides an overview of the CNL student’s goals, as well as the associated objectives and activities necessary to meet those goals. Additional details on the goals, objectives, activities, timeline, as well as tracking measures are further described in Table 1. In addition, the following work was organized around the Plan, Do, Study, Act Cycle, and is further detailed in Appendix A.
Changing organizational practices. In order to analyze current VTE risk assessment and prevention practices on all medical-surgical units, the CNL student learned about staff, policies, and current practices on ten medical-surgical units, as well as completed orientation training and analyzed data collected from the previous VTE team. In addition, the CNL student performed a root cause analysis of SCD non-compliance, as seen in Appendix B. Following the assessment, the CNL student revised and developed best practices guidelines to be utilized on medical-surgical units by developing and sharing a research analysis summary of VTEs with medical-surgical Nurse Managers. In addition, the CNL student encouraged standardized discharge education practices across all medical-surgical units and provided the educational materials to begin to do so.

Educating providers. In order to meet the goal of educating medical-surgical nurses on the importance of SCD use, the CNL student aided in the rollout of new SCD machines on all beds across the medical-surgical units, as well as performed 1:1 in-service teaching on SCDs for medical-surgical nurses using the Educational Flier in Appendix C. More specifically, the CNL student notified charge nurses on teaching sessions, requested nursing schedules across all units, and created a spreadsheet to track education sessions via signatures and check-offs. The CNL student then conducted an audit using the SCD placement audit tool in Table 2 to determine if SCD machine placement and associated education was effective.

Increasing individual knowledge and skills. Following nursing education, the CNL developed VTE prevention and prophylaxis discharge education materials by learning current VTE discharge education norms across medical-surgical units. The CNL observed numerous VTE discharge education sessions, interviewed over thirty medical-surgical nurses about their thoughts on current VTE discharge education practices to determine if current VTE discharge
education is effective. Next, the CNL prepared educational materials to be utilized by nurses and administered to patients during discharge, including an educational checklist to be taken home by patients (see Appendix D). In order to evaluate effectiveness of SCD teaching in-service, the CNL then tracked nursing compliance with SCD orders with the SCD usage and documentation audit tool in Table 3.

*Fostering coalitions and networks.* In order to truly bridge the organizational and community level of the socio-ecological model, the CNL collaborated efforts between medical-surgical units and the hospital’s outpatient community clinic. To do so, the CNL learned current public health programs/campaigns on the community, county, and state level by reviewing program information, efforts, and resource availability from all programs addressing VTEs. The CNL student then spoke with the Transition Care Team to determine a local clinic that seems a large number of the patients discharged on anticoagulation medications. The CNL student met with members of the clinic’s staff to identify patient gaps in knowledge surrounding VTE prevention and prophylaxis, as well as collaborated efforts between the inpatient and outpatient staff to then address those gaps.

To further understand the impact of VTEs in the community, the CNL student analyzed the current impact of VTEs in surrounding community, as well as determined the VTE prevention and prophylaxis education materials available for public health nurses. By evaluating existing VTE prevention and prophylaxis tools, guidelines, and recommendations for public health nurses, the CNL student identified additional areas of improvement between inpatient and outpatient VTE resources. Furthermore, the CNL student revised inpatient education materials in accordance with the findings from the root cause analysis and informal interviews.
**Project Deliverables.** The various project deliverables include a root cause analysis of SCD usage and documentation noncompliance, revised SCD procedures on medical-surgical units, a revised SCD educational flier, SCD poster reminders attached to nursing workstations in all 180 patient rooms, patient discharge education materials, and lastly a detailed summary of next steps for the VTE project.
**Project Results**

**Divided Stakeholder Support**

The aforementioned work aimed to implement environmental and process changes across ten medical-surgical units in order to prevent VTEs in the inpatient and outpatient setting. Throughout the work across each different and unique unit, it became evident that not all stakeholders were involved in or believed in the efficacy of the proposed change. The proposed environmental change recommended that 180 medical-surgical patient rooms were not only equipped with SCD machines, but that all machines were kept on the end of the patient bed. Such a change was thought to increase compliance with SCD provider orders by increasing availability of machines at the point of care, as well as serving as a visual reminder to utilize machines when indicated.

However, numerous informal interviews with Nurse Managers and nurses revealed that due to varying opinions of nurse managers, including beliefs that the machines posed a fall risk to patients, consumed valuable workable space, or were simply unnecessary, many machines were found stored away in patient closets, thus defeating the anticipated visual reminder. This finding suggests that if all Nurse Managers were included in the planning of the proposed SCD change or had their concerns be heard and addressed by the VTE team prior to implementation, there may have been increased compliance with the new recommendations. Out of the 180 machines placed, 66 machines were found on patient beds and a greater 77 machines were found stored in patient closets. In addition, the remaining machines were found on patient counters, under patient beds, as well as simply misplaced. Such varied findings highlight the importance of future consideration of how to work with diverse stakeholders, as well as gaining buy-in from all stakeholders prior to program implementation.
Lack of Supportive Processes

The intervention failed to develop processes to mitigate unanticipated consequences, causing additional barriers to SCD compliance. The VTE team had discussed unanticipated consequences, such as who should be notified if a SCD machine was missing from a patient room, who would be responsible to track that machine, and who would return that machine to its’ original unit if it were transferred out of the unit. Although recommendations were proposed, no processes or standardized work was created to address and mitigate these potential consequences.

Based upon numerous hours of observation on the units, as well as informal interviews with nurses, it became clear that not putting these systems in place was not only an oversight, but instead a significant flaw in the entire intervention. Numerous machines were transferred off their original units and without a designated process to ensure their return, leaving numerous units to experience a shortage of machines and once again, not comply with SCD orders. Out of the 180 machines placed, 37 machines were missing across all ten units. In addition, 13 machines were found on the wrong unit. In order to address this barrier, the VTE made labels for each machine to designate its’ appropriate unit and patient bed number, and then labeled each of the 180 machines. However, in a secondary audit, numerous machines were found on the correct unit, but were found on the incorrect bed, thus suggesting that the labeling was not entirely effective in managing the machines.

Persistent SCD Non-Compliance

Even with increased availability of SCD machines at the point of care, compliance with SCD orders remains low. Based upon hours of observation in patient rooms, it is clear that there continues to be low compliance with SCD provider orders. 74% of the over 380 medical-surgical
nursing staff received education about the new SCD process, as well as education on the importance of using SCDs as a form of mechanical prophylaxis to prevent VTEs. Due to varying schedules of nurses, as well as a limited time constraints of the CNL students, 26% of nurses could not be educated during the given time.

In an audit of 57 patients with SCD orders, only 19% of patients were wearing SCDs at the time of the audit and furthermore only 56% of SCD orders were documented by nursing staff. Even if a SCD machine was in the patient room and the patient had a SCD order, it is common that the patient will not be wearing the SCDs for the recommended time. When asked why patients with SCD orders were not currently wearing SCDs, nursing staff reported various reasons including that the patient was ambulatory, the patient refused to wear them, the patient only wears them at night, or simply that the order is just no longer needed. Nevertheless, the associated documentation or lack thereof, did not reflect these reasons.

A secondary audit of nurses’ SCD documentation was conducted and found that with increased mention on SCD documentation at daily meetings and by Nurse Managers, the average documentation had increased to 66%. Due to the comprehensiveness of the secondary audit, 66% should serve as the organization’s new baseline. Although this represents an improvement from the primary audit, these numbers remain significantly lower than the Joint Commission’s standard of 96% and thus the organization should continue to strive for higher compliance to meet those national standards.

**Lack of Systematic Discharge Education**

It is increasingly evident that patients are not receiving adequate anticoagulation discharge education in the inpatient setting, thus compromising their outpatient outcomes. Based upon informal interviews with medical staff at the hospital’s outpatient community clinic,
patients discharged with anticoagulants display numerous gaps in knowledge regarding the management of these prescribed medications. There is a high prevalence of patients who are unaware that they have to make an outpatient appointment and schedule lab work within ten days of discharge. Furthermore, many patients are unaware of why anticoagulants are different than their other medications, and why special attention needs to be taken, as the risk factors of anticoagulants are unique and potentially severe. Additional interviews with the hospital’s Discharge Pharmacist, as well as observation of anticoagulant patient education sessions, support these findings, as there is no standardization regarding VTE prophylaxis orders to ensure all patients receive equal, if any, discharge education.

**Interdisciplinary Factors**

From numerous informal interviews, it became clear that physicians played a significant role in SCD noncompliance. Physicians are the only members of the health care team who can order and then discontinue SCD orders; thus, when nurses believe than an order is no longer needed, they must request for the physician to discontinue it. This is problematic for various reasons, as nurses state they do not have the time to call and request an order be discharged and that such request may be viewed as unimportant by the physician. Thus, for the sake of time, as well as quality of relationships between nurses and physicians, many nurses opt to not bother physicians and leave the orders active.

An additional audit was conducted to gain further insight on physicians’ role in SCD noncompliance. The audit revealed that although physicians order SCD orders, they do not reassess the need for the orders at any point during the patient’s stay at the hospital. Furthermore, when called and asked if they would like to discontinue the SCD orders due to a patient’s new ambulatory status or pharmacological orders of VTE prevention, many physicians agreed to
discontinue the order. It is important to note that physicians work within specific teams at the hospital, such as orthopedics, neurology, trauma, and medicine, and although many teams were receptive to canceling orders, the trauma team refused to do so.
Project Implications

Additional Research

**Nurses.** There are various implications that can be gleaned from the project findings, most notably, the need for additional research. Additional research should be conducted on why medical-surgical nurses do not comply with SCD orders. Although the VTE project eliminated the process of having to order a SCD machine from the clean processing department (CPD), made SCD machines available at the point of care, and provided additional education on the importance of SCD use, SCD compliance among nurses continues to be low and below the Joint Commission’s standard of 96%. Comprehensive surveys, informal interviews, and additional observations should be conducted in order to determine if there are additional barriers to nursing compliance, such as frequent patient removal of SCDs or continued misplacement of SCD machines. Additional research findings could reveal new root causes and necessitate that the program becomes tailored to a new audience, such as the patient or physician population.

**Physicians.** The above findings also reveal the need for research focused primarily on physicians’ role in SCD noncompliance. In order to do so, Quality Improvement and future CNL students should work with the medical team, as they are the largest physician team, and were open to discussing their current ordering and rounding practices. The future VTE team should assess physicians’ rounding topics, as well as physicians’ emersion and orientation to the hospital to determine if SCD orders can be included in physicians’ daily rounds and patient safety assessments. Furthermore, the future VTE team should determine if physicians are willing to write SCD orders with parameters, such as SCDs should be discontinued if the patient becomes ambulatory. The rewriting of these orders would allow nurses to discontinue the order.
as the patient progresses, and would inherently increase SCD usage and documentation compliance, as the only active orders would be those orders that were truly necessary.

**Local, State, & National Level.** As the aforementioned results are from a single metropolitan hospital, the results are not generalizable to all medical-surgical nurses or units in the larger population. Additional research should be conducted across multiple hospitals on the state or national level to determine if incompliance with VTE prevention and prophylaxis orders is unique to the above hospital or is a national phenomenon.

**Development of Interdisciplinary Processes**

**CPD.** Before fully implementing future interventions, processes must be in place to address unanticipated consequences in order to ensure the future success of this project and similar projects. As the VTE project is an ongoing project at the hospital, additional changes should not only be discussed, but the VTE team should seek interdisciplinary input to develop supportive processes. Going forward, collaboration should occur between the VTE team and the environmental services team to determine who will be responsible for tracking and returning missing SCD machines. For example, a standardized work order could be created in order to ensure that CPD delivers SCD machines to their intended unit on their daily rounds.

**ICU.** Furthermore, the VTE team should analyze successful processes in other units, such as the intensive care unit (ICU), in order to inform those potential processes. The hospital’s ICU is unique in that it is achieved the highest SCD compliance within the hospital. To better determine what allowed the unit to overcome barriers and enable their 100% compliance, the future VTE team should perform a microsystem assessment, as well as work with the ICU to determine their current practices. Furthermore, the VTE team should model relevant medical-surgical practices to those of the ICU in order to ensure increased usage and documentation.
Institutional Discharge Education Checklist

Based upon the above findings, it is also clear that an organizational policy is needed to ensure that all patients discharged with an anticoagulant receive the same degree of inpatient education. In order to achieve this, a standardized set of discharge education materials, such as the discharge checklist, can be created, used by nurses, and given to all patients discharged with VTE prophylaxis orders. In “The Checklist Manifesto,” Atul Gwande (2011) describes how checklists have become an impactful, low-cost tool used by a variety of industries, including healthcare, to improve quality. Gwande argues that although checklists may seem a simple and obvious solution to complex issues, such as central line infections or hospital-acquired VTE, checklists relieve the human fallibility of memory and attention. By providing protection against these failures, as well as outlining the minimum necessary steps, the effectiveness of checklists has been seen in ICUs at the cutting-edge Johns Hopkins Hospital, the ICU at Sinai-Grace Hospital in inner city Detroit, and even in the emergency department of a community hospital in Austria. In all three settings the checklists established higher standards of performance, improved consistency of care, generated substantial hospital-savings, and overall increased patient outcomes (Gwande, 2011).

By developing a policy requiring nurses to document the use of the checklist at discharged education sessions, the hospital could then ensure all patients receive discharge anticoagulation education. Such a policy would nevertheless enforce necessary discharge teaching for patients, but also serve a take home material patients could reference in the community setting. By changing organizational practices and policies to increase individual patient knowledge and skills, one large metropolitan hospital can leverage their inpatient
practices to decrease the risk of VTEs in the outpatient setting and overall improve patient outcomes.

**Modification of Electronic Medical Record System**

Another key implication of the numerous interviews and audits is that the current electronic medical record (EMR) system should be modified to allow for increased documentation and variability. Numerous nurses stated that they would be more likely to comply with documentation in their shift assessments if the system provided additional areas where nurses could check off reasons why a patient was not wearing the SCDs. Currently, SCD documentation is located in the shift assessment’s safety and equipment section, which is commonly passed over, as it is not a priority section. It is recommended that SCD documentation be moved under the cardiovascular section, as this section is perceived as a higher priority. Furthermore, the small change of including SCDs under the cardiovascular section could nevertheless aid in reframing nurses' perception of SCD orders, from an added safety precaution to a necessary cardiovascular precaution.

In addition to expanding and moving the SCD documenting section, SCD orders should be expanded within the system. As previously mentioned, the inclusion of parameters with an SCD order would allow nurses to discontinue orders when no longer necessary. In order to encourage this change, the EMR system should be altered to provide such prompts for physicians when writing SCD orders. This additional small change would also serve as a reminder for physicians to include parameters and thus add to the goal of appropriate SCD usage and documentation compliance.
Conclusion

The VTE project aimed to decrease the prevalence of VTEs by increasing the use of mechanical and pharmacologic prophylaxis through environmental changes and the creation of a discharge checklist. VTEs are named one of the most preventable hospital-associated complications, however an estimated 100,000 people in the US continue to die every year due to VTEs (Lavall & Costello, 2015). Research has identified that VTEs are caused by numerous genetic, behavioral, biological, and environmental factors, however regardless of these known risk factors, the prevalence of VTEs is increasing within the U.S. (Tsai et al., 2015). VTEs pose not only a significant economic burden on health care organizations, but also a chronic health burden, as approximately one-third of all VTE patients will experience a recurrent VTE within 10 years (Beckman, Hooper, Critchley, & Ortel, 2010). Furthermore, as nearly 70% of all VTEs occur in the community and outpatient setting, VTEs are both a clinical and public health concern (Tsai et al., 2015).

In response to this increasing prevalence, the CDC, APHA, Joint Commission, and the CMS created numerous national and local programs within the last decade. Nevertheless, increasing inpatient VTE prevention and prophylaxis continues to be a national goal and is included in the Health People 2020 goals (Beckman, Hooper, Critchley, & Ortel, 2010). Numerous studies highlight key challenges to achieving these goals, including inadequate discharge education regarding VTE prevention and prophylaxis, the lack of consensus and inpatient compliance with VTE best practices, as well as the lack of a national surveillance system to accurately track VTE occurrence (Apenteng et al., 2016; Beckman, Hooper, Critchley, & Ortel, 2010).
In order to further investigate the challenges and opportunities in VTE prevention and prophylaxis, the CNL student worked on an SCD project at a large metropolitan hospital in California. The project aimed to increase compliance by removing environmental barriers, increasing systematic usage/documentation, providing education to nurses, and creating a discharge checklist. Project components included replacing old SCD machines with new SCD machines on every bed across ten medical-surgical units and educating nurses on importance of SCD use and compliance via 1:1 education with CNL students.

Furthermore, the CNL student conducted a series of audits following education to see if SCDs were being utilized and if SCD orders were being accurately followed. The CNL student identified challenges and unpredicted barriers to compliance, as well as presented findings to the VTE team, and Nurse Managers across medical-surgical units. Lastly, in order to span the organizational and community level, the CNL student interviewed the hospital’s outpatient clinic staff and analyzed challenges the clinic faced due to poor VTE education in the hospital’s inpatient setting. To address these challenges, the CNL student developed an inpatient discharge checklist to be utilized by inpatient nurses and taken home by patients to reference.

The public health impact gleaned from the above project spans both the organizational and community level, as the subsequent findings and implications illuminated. Numerous informal interviews revealed that not all stakeholders were involved in or believed in the efficacy of the proposed change, and thus SCD machines were not stored at the end of patients’ beds as initially intended. Numerous hours of observation on units showed that the intervention failed to develop the needed processes to mitigate unanticipated consequences, such as designating staff to track and replace machines post-implementation. The lack of such
processes resulted in a large program flaw, as SDC machines were misplaced, lost, and no system was in place to return them their intended unit and ensure SCD compliance. Lastly, informal interviews with discharge pharmacists and clinic staff revealed that patients discharged with anticoagulants display a numerous gaps in knowledge regarding the management of these prescribed medications. Additional observations of discharge teaching supported this finding, as there is no standardized system of patient discharge education at the hospital.

As SCD compliance remains less than optimal, additional research should be conducted to better understand why nurses are not complying with SCD orders, as well as analyze if any additional factors are contributing to non-compliance. Future research should focus on the role of physicians in SCD non-compliance, as well as opportunities to include SCDs orders in physicians’ daily safety assessments. Furthermore, additional research should be conducted to determine if such findings are unique to the chosen hospital or if the results are reflected on a county, state, or national level as well.

In addition, processes need to be developed in order to mitigate future unintended consequences with the VTE project, as well as all proposed programs. Collaboration between teams is vital to the success and effectiveness of an intervention and such collaboration is warranted for the continuation of the VTE project at the hospital. The future VTE team should collaborate with the ICU to determine successful practices, as well as increase inter-unit communication. Lastly, an institutionalized discharge checklist should be both utilized by the nurse and taken home by the patient to serve as a reminder to both parties and to ensure consistent education regarding VTE prevention and prophylaxis.
References


### Table 1

**CNL Student Fieldwork Learning Objectives**

#### Inpatient Setting

| Goal 1: Analyze current VTE risk assessment and prevention practices on all medical surgical (med-surg) units at a large metropolitan hospital. |
|---|---|---|---|---|
| **Objective(s)** | **Activities** | **Start/End Date** | **Who is Responsible** | **Tracking Measures** |
| Learn about staff, policies, and current practices on all med-surg units. | Complete orientation training, perform a 5 P’s microsystem assessment, and analyze previous data collected by USF VTE team. | February 13, 2017 – February 20, 2017 | Suzanne & Jignasa | Meet with Jignasa, as well as Nurse Managers and charge nurses on med-surg units. |
| Perform a root cause analysis of SCD non-compliance across units. | Review findings from previous VTE team, as well as findings from microsystem assessment and observations to create root cause analysis. | February 20, 2017 – February 22, 2017 | Suzanne & Jignasa | Meet with Jignasa and Danijela. |

#### Goal 2: Determine best practices VTE guidelines to be utilized on med-surg units at the metropolitan hospital.

<table>
<thead>
<tr>
<th>Objective(s)</th>
<th>Activities</th>
<th>Start/End Date</th>
<th>Who is Responsible</th>
<th>Tracking Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop and share a research analysis summary of VTEs in the context of med-surg or inpatient units.</td>
<td>Perform a literature search and produce an annotated bibliography of VTE practices, guidelines, and recommendations on med-surg or inpatient units.</td>
<td>February 4, 2017 – February 20, 2017</td>
<td>Suzanne</td>
<td>Meet with Jignasa.</td>
</tr>
<tr>
<td>Evaluate existing VTE guidelines, protocols, and recommendations</td>
<td>Summarize current VTE protocols on med-surg unit, as well as current VTE</td>
<td>February 13, 2017 – February 20, 2017</td>
<td>Suzanne &amp; Jignasa</td>
<td>Meet with Jignasa and discharge pharmacist.</td>
</tr>
</tbody>
</table>
and note any discrepancies between recommended practice and current practice.

| Goal 3: Educate staff nurses on all med-surg units on importance of SCD use. |
|-------------------|-----------------|-----------------|-----------------|-----------------|
| **Objective(s)**  | **Activities**   | **Start/End Date** | **Who is Responsible** | **Tracking Measures** |
| Aid in the rollout of new SCD machines on all beds across all med-surg units. | Aid SCD machine representative in removing all old machines and placing new machines on beds. | February 22, 2017 | Suzanne & Jignasa | Meet with Jignasa and if available, other stakeholders on med-surg units. |
| Perform 1:1 in-service teaching on SCDs for all med-surg nurses. | Notify charge nurses of teaching sessions, request March schedule for all med-surg nurses, create spreadsheet to track education sessions via signatures and check-offs. | February 23, 2017 - March 21, 2017 | Suzanne, Shannon, Marlene, & Jignasa | Meet with Jignasa and Nurse Managers/charge nurses on med-surg units. Completed 310 teaching sessions. |

<p>| Goal 4: Develop VTE prevention and prophylaxis discharge educational materials. |
|-------------------|-----------------|-----------------|-----------------|-----------------|
| <strong>Objective(s)</strong>  | <strong>Activities</strong>   | <strong>Start/End Date</strong> | <strong>Who is Responsible</strong> | <strong>Tracking Measures</strong> |
| Learn current VTE discharge education norms on med-surg unit. | Observe VTE discharge education sessions, interview 30 nurses about their thoughts on VTE discharge education | March 1, 2017 - March 14, 2017 | Suzanne &amp; Jignasa | Meet with Jignasa and if available, other stakeholders on med-surg units. Completed 30+ informal interviews. |</p>
<table>
<thead>
<tr>
<th>Objective</th>
<th>Activities</th>
<th>Start/End Date</th>
<th>Who is Responsible</th>
<th>Tracking Measures</th>
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</thead>
<tbody>
<tr>
<td>Prepare educational materials to be utilized by nurses and administered to patients during discharge.</td>
<td>Create educational pamphlets, laminated cards, etc. to be taken home by patients.</td>
<td>April X, 2017-April X, 2017</td>
<td>Suzanne, Shannon, Marlene, &amp; Jignasa</td>
<td>Meet with Jignasa and if available, other stakeholders on med-surg units.</td>
</tr>
<tr>
<td>Evaluate effectiveness of SCD teaching in-service.</td>
<td>Track nursing compliance with SCD orders and collaborate with Transition Care team to call patients after 1 week of intervention and interview them on adherence to VTE discharge orders.</td>
<td>April 1, 2017-April 14, 2017</td>
<td>Suzanne</td>
<td>Meet with Transition Care Team, Jignasa and if available, other stakeholders on med-surg units.</td>
</tr>
<tr>
<td>Identify additional barriers to mechanical and pharmacological VTE prophylaxis compliance if necessary.</td>
<td>Conduct informal interviews with nurses and analyze collected data to determine additional barriers.</td>
<td>April 1, 2017-April 14, 2017</td>
<td>Suzanne</td>
<td>Meet with Transition Care Team, Jignasa and if available, other stakeholders on med-surg units.</td>
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### Outpatient/Community Setting

**Goal 1: Analyze the current impact of VTEs in the community setting.**

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<thead>
<tr>
<th>Objective(s)</th>
<th>Activities</th>
<th>Start/End Date</th>
<th>Who is Responsible</th>
<th>Tracking Measures</th>
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</thead>
<tbody>
<tr>
<td>Develop and share a research analysis summary of VTEs in the context of the community.</td>
<td>Perform a literature search and produce an annotated bibliography of VTE epidemiology, awareness, and public health efforts.</td>
<td>February 4, 2017 – February 13, 2017</td>
<td>Suzanne</td>
<td>Meet with Dr. Nosek</td>
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<tr>
<td>Objective(s)</td>
<td>Activities</td>
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<td>Who is Responsible</td>
<td>Tracking Measures</td>
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<tr>
<td>Evaluate existing VTE prevention and prophylaxis tools, guidelines, and recommendations for public health nurses.</td>
<td>Summarize resources available to public health nurses, as well as the overall use and effectiveness of the resources.</td>
<td>February 20, 2017 - February 27, 2017</td>
<td>Suzanne</td>
<td>Meet with Dr. Nosek</td>
</tr>
<tr>
<td>Identify a surrounding clinic that receives patients with VTE prevention and prophylaxis orders from the metropolitan hospital.</td>
<td>Review 60+ patient records and collaborate with the transition care team to determine which clinics receive the largest number of patients.</td>
<td>March 1, 2017 - March 14, 2017</td>
<td>Suzanne</td>
<td>Meet with Jignasa and Dr. Nosek</td>
</tr>
<tr>
<td>Analyze challenges the clinic faces due to poor inpatient discharge VTE education.</td>
<td>Interview 30+ clinic staff and summarize general findings and themes.</td>
<td>March 14, 2017 - March 30, 2017</td>
<td>Suzanne</td>
<td>Meet with Dr. Nosek</td>
</tr>
<tr>
<td>If necessary, revise inpatient education materials depending on findings of root cause analysis.</td>
<td>Revise educational fliers and pamphlets to reflect current recommendations.</td>
<td>April 1, 2017 - April 14, 2017</td>
<td>Suzanne</td>
<td>Meet with Dr. Nosek</td>
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Table 2

*SCD Placement Audit Tool*

<table>
<thead>
<tr>
<th>Room #</th>
<th># SCDs in room</th>
<th>Location</th>
<th>Notes</th>
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Table 3

*SCD Usage and Documentation Audit Tool*

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*Note.* Dx=diagnosis
PDSA Cycle 1

Subject: SCD Project
Start Date: 2/23/2017
Submitted by: Marlene Mateo, Shannon Muramoto, Suzanne Scheierling
(2/23/2017)

<table>
<thead>
<tr>
<th>P L A N</th>
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<tbody>
<tr>
<td>• Problem:</td>
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<tr>
<td>o SCDs not applied to patient within 2 hrs of order.</td>
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<tr>
<td>• Potential Root cause(s):</td>
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<tr>
<td>o <em>Nursing staff</em>: believe SCDs are soft orders; SCD’s not on all beds; duplicate nursing notes from previous shift; unaware of SCD order</td>
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<tr>
<td>o <em>Patient education</em>: does not effectively convey importance of wearing SCDs; does not stress risk factors of DVTs</td>
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<tr>
<td>o <em>Patient</em>: refuse SCDs; find SCDs uncomfortable, itchy or unnecessary; do not understand how to self-apply SCDs</td>
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<tr>
<td>o <em>PCAs</em>: believe SCDs are soft orders; do not re-apply SCDs after ambulating or toileting</td>
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<tr>
<td>o <em>Auxiliary staff</em>: do not re-apply SCDs after ambulating</td>
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<tr>
<td>o <em>Miscommunication</em>: nurses non compliant with standardized charting for SCD usage; hospital staff unaware of SCD protocols; unclear SCD protocols and parameters</td>
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<tr>
<td>• Improvement idea to test:</td>
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<tr>
<td>o SCDs will be placed on all beds in all med-surg units and all medical-surgical nurses will receive SCD education and resource</td>
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<tr>
<td>• Predicted result(s) of this test:</td>
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<tr>
<td>o SDC compliance will increase due to availability of SCD machines and increased awareness of SCD protocols and importance</td>
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<tr>
<td>• Measurable targets to determine success or failure:</td>
<td></td>
</tr>
<tr>
<td>o Evaluation/audits of patient beds and interviews with nursing staff and patients</td>
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<tr>
<th>D O</th>
<th>What tasks are planned/completed to test your idea?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasks (Include population/setting)</td>
<td>Person Responsible</td>
</tr>
<tr>
<td>1. Collect old SCD machines from all med-surg units</td>
<td>Students</td>
</tr>
<tr>
<td>2. Place new SCD machines on all med-surg beds</td>
<td>Students</td>
</tr>
</tbody>
</table>
3. Education of RN’s and PCA’s on all med-surg units via revised flier
   | Students | 3/6/17 |
4. Conduct SCD audits 2-3 weeks post implementation
   | Students | 3/13-4/13 |

**Document what actually happened:**

- **STUDY**
  - **Summarize measurable results of test:**
    - All med-surg units (4th-7th floor) have an SCD on every patient bed and all old SCD machines were taken off the unit.
    - We want to evaluate nurses’ knowledge of SCD use and analyze whether nurses are using SCD more frequently.
  - **What did you learn?**
    - In order to overcome some of the resistance when implementing a new system, it is important to educate staff on the importance of this new intervention.
  - **Unintended consequences:**
    - Conflicting ideas about where SCDs should be kept if SCDs are not in use
    - Need plan of action for when SCDs are transferred between units (i.e. from PACU to med-surg)
  - **Barriers/Root Causes:**
    - Nurses: some resistant to having the new SCDs on patient beds
    - Nurse managers: argued that if the patient does not have an order for SCDs then it should go in the patient’s closest until needed.

- **ACT**
  - **Further implementation:**
    - Create small laminated reminder cards for nurses and post them on each COW in each patient room.
  - **Next tests or adjustments:**
    - Post-audits will be necessary in order to evaluate nurses’ knowledge and see if SCD machines are where they need to be i.e. bed and not placed in closet.
    - Checking if patients have SCD orders and seeing if nurses are implementing them.
    - Determining if nurses are using standardized documentation on SCD orders/usage
  - **Unresolved barriers:** Continued resistance from nursing management and staff.
**Problem:**
- SCDs are missing from patient rooms

**Potential Root cause(s):**
- **Location:** SCDs are sometimes stored in patient closet rather than staying on the end of the bed; patient belongings or extra bedding is placed on top of the SCDs in the closets;
- **Nursing staff:** Nurses are not checking patient closet for SCDs, rather they will just order another one which can lead to duplicate SCDs in one room.

**Improvement idea to test:**
- Label each SCD with corresponding zone and room number

**Predicted result(s) of this test:**
- SCDs will not go missing and if SCDs are removed from the room for whatever reason they can be easily returned; each SCD will be accounted for

**Measurable targets to determine success or failure:**
- Evaluation/audits of patient beds and interviews with nursing staff and patients
- All patient rooms will have a labeled SCD machine

### What tasks are planned/completed to test your idea?

<table>
<thead>
<tr>
<th>Tasks (Include population/setting)</th>
<th>Person Responsible</th>
<th>Due Date</th>
<th>Date Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Print labels for all med-surg rooms (5-7th floor)</td>
<td>Students</td>
<td>3/9/17</td>
<td>3/9/17</td>
</tr>
<tr>
<td>2. Place labels on SCD machines (5th-7th floor)</td>
<td>Students</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Place extra machines in storage room on each med-surg unit</td>
<td>Joel (rep)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Education of RN’s and PCA’s on all med-surg units via revised flier</td>
<td>Students</td>
<td>3/17/17</td>
<td></td>
</tr>
</tbody>
</table>

**Document what actually happened:**

- SCDs in med-surg units were labeled
- Rooms with missing machines: 5411, 5416, 5420, 5428-1, 5601-1, 5602-2, 5604, 5609, 5611, 6203-2, 6205-2, 6210, 6422, 6425, 6426-2, 6427, 6428, 6431, 6438-2
- All dirty and clean utility rooms and storage rooms were checked for SCDs -
none were found
  o SPD has 14 extra machines as of 2/10/17
  o CPD has 1 broken machine as of 2/10/17

• What did you learn?
  o Potential unintended consequences should be further analyzed before future implementations, as identifying them and taking steps to minimize them (i.e. labeling all machines pre-roll out) can save time

• Unintended consequences:
  o Conflicting ideas about where SCDs should be kept if SCDs are not in use

• Barriers/Root Causes:
  o Nurses: some resistant to having the new SCDs on patient beds
  o Nurse managers: argued that if the patient does not have an order for SCDs then it should go in the patient’s closest until needed.

• Further implementation:
  o Label storage SCD machines to ensure there are four extra machines per floor

• Next tests or adjustments:
  o Post-audits will be necessary in order to evaluate if labeling SCDs prevents misplacement
  o Checking if patients have SCD orders and seeing if nurses are implementing them.
  o Determining if nurses are using standardized documentation on SCD orders/usage

• Unresolved barriers: Continued resistance from nursing management and staff; continued misplacement of SCDs
staying on the end of the bed; patient belongings or extra bedding is placed on top of the SCDs in the closets; multiple SCD machines in patient rooms

- **SCDs Missing:** Extra SCD machines were pulled from storage so no extra machines exist on many units; nurses do not know who to inform if they are unable to find a machine

  - **Improvement idea to test:**
    - Place one SCD labeled with corresponding zone and room number on each patient bed across all med-surg units
    - Educate nursing staff regarding new SCD procedure along with a reminder to document SCD usage.
    - Share results with nurse managers and nurses and remind them to continue to document in their shift assessment

  - **Predicted result(s) of this test:**
    - SCD compliance rates for documentation and usage will increase; SCD machines will not go missing and will be contained on the intended unit
    - Nurses will aim for higher documentation compliance and documentation will increase

  - **Measurable targets to determine success or failure:**
    - Audits of each patient room and interviews with nursing staff
    - All patient rooms will have a labeled SCD machine
    - Correct documentation of SCD orders/usage in the shift assessment

<table>
<thead>
<tr>
<th>Tasks (Include population/setting)</th>
<th>Person Responsible</th>
<th>Due Date</th>
<th>Date Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Baseline audit on all med-surg floors</td>
<td>Students</td>
<td>4/10/17</td>
<td>3/27/17</td>
</tr>
<tr>
<td>2. Room audit on all med-surg floors (locate SCD machines)</td>
<td>Students</td>
<td>4/10/17</td>
<td>4/3/17</td>
</tr>
<tr>
<td>3. SCD orders audit on all med-surg floors</td>
<td>Students</td>
<td>4/10/17</td>
<td>4/3/17</td>
</tr>
<tr>
<td>4. Compile and analyze baseline and audit data</td>
<td>Students</td>
<td>4/10/17</td>
<td>4/5/2017</td>
</tr>
<tr>
<td>5. Share data with nurse managers and nursing staff</td>
<td>Students</td>
<td>4/23/17</td>
<td></td>
</tr>
</tbody>
</table>

**Document what actually happened:**

- Summarize measurable results of test:
  - Total nurses educated: 286/389 (74%)
  - Total SCD orders: 57
- Average documentation: 32/57 (56%)
- Average SCD usage: 11/57 (19%)
  - 9 missing SCD machines (6203-2, 5425, 5426-1, 5428-2, 5434, 5601-1, 4410-1, 4410-2, 4411)

**What did you learn?**
- SCDs are not used if the patient is ambulatory
- Nurses are not calling physician to d/c SCD orders when necessary, thus SCD orders are not d/c’d
- Nurses are not documenting SCD use due to numerous reasons including if patient is ambulatory, refuses, is agitated, or because they are unaware of SCD order or need to document
- It is unclear as to whether labeling all SCD machines was effective and useful for staff
- SCDs are not always reapplied after the patient uses the restroom or works with other specialties (physical therapy)

**Unintended consequences:**
- Worse documentation compliance post-education than pre-education

**Barriers/Root Causes:**
- SCD documentation or compliance is not a primary task for nurses
- Patients frequently refuse SCDs
- SCD machines, labeled or unlabeled, continue to go missing and nurses cannot always access a machine when needed

**Further implementation:**
- Conduct secondary audit on all med-surg floors, with an emphasis on units that had the lowest compliance
- Remind nurses how to correctly document SCD orders/usage in shift assessment

**Next tests or adjustments:**
- Perform secondary SCD orders audit with a focus on documentation
- Ask nurses:
  - Why SCD was not charted or not in use
  - Barriers and challenges to documenting and utilizing SCDs
  - Ask if they remember the education/in-service
  - Ask if they have any suggestions to help increase SCD documentation
- Ask approximately 10 patients with SCD orders:
  - Do you know what an SCD is?
  - Do you know why you need to use the SCD?
  - Did your nurse educate you on the SCD process?
- Attend 62/64 and 54/56 huddle to remind staff about documenting SCDs in shift assessment

**Unresolved barriers:**
- Continued resistance from nursing management and staff
- Continued misplacement of SCDs in patient rooms and on the unit
Appendix B
Root Cause Analysis

**Nurses**
- Cannot cancel SCD orders
- Higher priorities
- Copy shift assessments
- Do not document if patient refuses or if they deem SCD order no longer necessary

**Patients**
- Refuse to wear SCDs
- Take SCDs off
- Become ambulatory

**Policies & Protocols**
- Orders do not have parameters to discharge
- Orders are conflicting
- Documenting system is limited and cannot be altered to make SCD documentation more thorough
- No standardized anticoagulation discharge education materials

**Environmental Services**
- Do not clean SCD machines on the end of the bed
- SCD machines need to be ordered from Clean Processing Department
- SCD machines not delivered in a timely manner
- Do not have machines at the point of care

**Environment**

**Auxiliary Staff**
- Remove SCDs and do not replace them when patient is returned to bed

**Physicians**
- Do not reassess need for SCD order
- Do not order parameters for SCDs
- Do not want to cancel order even if no longer needed

*VTE prevention & prophylaxis non-compliance:*
SCD usage and documentation low; anticoagulation discharge education unstandardized and inconsistent
PREVENTING VTE AT HOSPITAL

Venous thromboembolism is the leading cause of preventable hospital death in the US

DID YOU KNOW?
Venous thromboembolism (VTE) refers collectively to deep vein thrombosis (DVT), a blood clot that occurs in a deep vein usually in the leg, and pulmonary embolism (PE), a clot that breaks loose and travels to the lung.

SCDs can significantly reduce patients’ risk of developing a VTE and when SCDs are combined with pharmacological prophylaxis, patients’ risks are even lower.

Reducing hospital acquired VTE aligns with the strategic plan to achieve zero patient harm and ensure financial stewardship.

In the United States, hospital acquired VTEs can cost up to $10 billion annually.

Let’s aim for greater than 100% SDC compliance!

RISK FACTORS FOR VTE INCLUDE:
- Age (70+)
- Immobility for more than 72 hours a day
- History of VTE
- Malignancy
- Major surgery or trauma
- Serious infection
- Heart Failure, MI, lung disease
- CNS Injury
- Obesity
- Hypercoagulable state
- Pregnancy
- Inflammatory bowel disease
- General anesthesia time more than 30 minutes

WHAT CAN WE DO TO PREVENT VTE?
- Assess each patient’s risk of developing VTE (the Provider does this on admission).
- Provide pharmacologic prophylaxis (for example Enoxaparin or Heparin) as ordered by the patient’s Provider.
- Provide mechanical prophylaxis (for example SCD) as ordered by the Provider.
- When ordered “except while walking”, use SCDs every time the patient is in bed until the order is discontinued or the patient is discharged.
- Encourage early and frequent ambulation.
- Teach our patients about VTE and how to prevent it (for example, teach your patient what SCDs are, why they are important, and how to apply them).

Nurses’ feedback was heard and the new SCD process will eliminate steps and stress-saving more time for patient care!

NEW SCD PROCESS
- ONE SCD Machine should be on EVERY BED/ROOM
- Keep SCD machine on end of the bed for EVS to clean
- SCD sleeves are stocked in clean utility room in each unit
- Utilize SCD machine on patients at least 18 hrs/day
- Remove old sleeves from machine when patient is discharged
- Do not store extra SCD machines in room
- If patient is transferred in or out with SCD, keep SCD in original room
**PROVIDER ORDERS/TRANSCRIPTION**

- Pharmacologic VTE prophylaxis (Enoxaparin or Heparin SQ)
- Mechanical VTE prophylaxis (SCD – calf or foot sleeves)
- If patient is not at risk for VTE or prophylaxis contraindicated, Provider documents why not (built into the CPOE order set)
- If high risk, can order both pharmacologic and mechanical VTE prophylaxis

**NURSING DOCUMENTATION**

- Pharmacologic: document in MAR
- Mechanical: in LCR – shift assessment – safety equipment – under equipment check box SCD
- NOTE: If patient refuses to wear the SCD, document the patient refused in the comment section. If the patient is consistently refusing to wear SCD despite of education, notify the Provider to discontinue SCD.

**COMMUNICATION/EDUCATION**

- SCD order verified into eKorder are an active Provider order
- CPOE order reads “SCD except while walking”, patients should have SCDs ON while in bed, even if they can ambulate, in order to follow this order.
- SCD sleeves will be stored in clean utility room
- Communicate upon shift/hand off report
- Communicate with PCA/CAN
- Educate patients/care givers on the importance of SCDs and VTE risk

Thank you all for your hard work and assistance with improving patient care!
### Leaving on an anticoagulant medication?

Here’s what you need to know:

- Anticoagulants are prescribed to prevent the formation of harmful blood clots. You may have a condition, such as atrial fibrillation, heart valve replacement, or a certain genetic disorder that makes you more likely to clot.
- When you first start taking this medication, you will need your blood checked to see if the amount of medication is right for you. The test to do this is the INR and it will tell your physician how long it takes you to clot.
- Your food and drink does have an effect on your anticoagulant, so while you take this medication, it is very important to keep your diet consistent and limit your alcohol intake to 1 drink per day at most.

#### Possible side effects that are not considered dangerous include:

- Bleeding gums when you brush your teeth
- Minor nose bleeds
- Easy bruising
- Menstrual bleeding that is heavier than usual
- Bleeding after a minor cut that takes longer to stop than usual

#### Possible side effects that are considered dangerous are:

- Changes in the color of your urine or stool
- Vomit that is red or looks like coffee grounds
- Coughing up secretions that are red-tinged
- Severe headache or stomachache
- Excessive bleeding from the gums or nose
- Excessive menstrual bleeding

### Don’t forget to...

- Take your medication exactly as prescribed
- It is very important to avoid skipping a dose or taking a double dose
- Schedule your follow-up appointment within 10 days of discharge
- Get your lab work done before your follow-up appointment
- Keep your diet consistent
- Read through the rest of your discharge education materials to gain more information on your medication
- Call your health care provider if you have any questions or concerns
To schedule your follow-up appointment call the General Medicine Clinic at (123) 456-7891
The clinic is located at Metropolitan Hospital, 100 Main Ave., Main Building 1

If you are having a medical emergency, please call 9-1-1

Appendix E
MPH Program Competency Inventory

<table>
<thead>
<tr>
<th>Competency:</th>
<th>Method of Achievement:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Select quantitative and qualitative data collection methods appropriate for a given public health context</td>
<td>I reviewed quantitative data collected from the previous VTE team and gathered additional quantitative and qualitative data via numerous documentation and usage audits, using the audit tools provided in Table 2 and Table 3. In addition, I conducted numerous informal interviews with nursing staff in the inpatient and outpatient clinic.</td>
</tr>
<tr>
<td>7. Assess population needs, assets and capacities that affect communities’ health</td>
<td>I assessed the unique needs, assets, and capacities of the diverse patient population at a large metropolitan hospital by synthesizing data from previous VTE team and data from nurse and patient interviews. In addition, I assessed the medical-surgical nurse population across ten units via similar informal interviews to determine their needs and assets in complying with VTE prevention and prophylaxis policies at the hospital.</td>
</tr>
<tr>
<td>13. Propose strategies to identify stakeholders and build coalitions and partnerships for influencing public health outcomes</td>
<td>In order to implement revised policy and protocol changes across all medical-surgical units, I met with Nurse Managers various times to increase inter-unit communication and diverse input. In addition I worked with the outpatient staff to determine gaps in patient knowledge, and then worked with inpatient staff to create a checklist that would address those gaps and increase the continuum of care from inpatient to the community setting. In addition, I created a partnership between the Discharge Pharmacist and the outpatient clinic, which will continue to collaborate to find best practices in VTE discharge education.</td>
</tr>
<tr>
<td>22. Apply systems thinking tools to a public health issue</td>
<td>I aided in revising a nursing education poster to educate over 280 nurses on VTEs, the importance of wearing SCDs, and how to do so properly. In addition, I worked with the VTE team to revise medical-surgical VTE protocols in order to increase clarity and increase usage and documentation compliance across all ten units.</td>
</tr>
<tr>
<td>21. Perform effectively on inter-professional teams</td>
<td>Throughout this project, I worked alongside a Quality Improvement nurse, ten medical-surgical Nurse Managers, and two other CNL students. I also worked with the Transition Care Team and Discharge Pharmacy</td>
</tr>
</tbody>
</table>
nurse. Lastly, I began assessing physicians’ role in VTE noncompliance and was able to interview a handful of physicians, as well as identify the need for an interdisciplinary focus as future steps for the VTE project.
### Appendix F

Fieldwork Time Log

#### UNIVERSITY OF
SAN FRANCISCO
School of Nursing and
Health Professions

**Master of Public Health Program**

**Student Time Sheet**

<table>
<thead>
<tr>
<th>Student Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student's Name: Suzanne Scheierling</td>
</tr>
<tr>
<td>Student's Phone: (650)921-3750</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preceptor Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preceptor's Name: Jignasa Panchoy</td>
</tr>
<tr>
<td>Preceptor's Phone: (415) 206-7452</td>
</tr>
<tr>
<td>Organization: ZSFGH</td>
</tr>
<tr>
<td>Student's Start Date: 2/1/2017</td>
</tr>
</tbody>
</table>

#### Time Log for (Check One):

- SPRING 2017
- Summer 2013
- Fall 2013

- SPRING 2014
- Summer 2014
- Fall 2014

<table>
<thead>
<tr>
<th>Week</th>
<th>Total # of Hours for Week</th>
<th>Preceptor Initials</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/1-2/5/2017</td>
<td>30 hours</td>
<td>J</td>
</tr>
<tr>
<td>2/6-2/12/2017</td>
<td>0 hours</td>
<td></td>
</tr>
<tr>
<td>2/13-2/19/2017</td>
<td>9 hours</td>
<td></td>
</tr>
<tr>
<td>2/20-2/26/2017</td>
<td>15 hours</td>
<td></td>
</tr>
<tr>
<td>2/27-3/5/2017</td>
<td>27 hours</td>
<td></td>
</tr>
<tr>
<td>3/6-3/12/2017</td>
<td>30 hours</td>
<td></td>
</tr>
<tr>
<td>3/13-3/19/2017</td>
<td>0 hours</td>
<td></td>
</tr>
<tr>
<td>3/20-3/26/2017</td>
<td>19 hours</td>
<td></td>
</tr>
<tr>
<td>3/27-4/2/2017</td>
<td>21 hours</td>
<td></td>
</tr>
<tr>
<td>4/3-4/9/2017</td>
<td>16 hours</td>
<td></td>
</tr>
<tr>
<td>4/10-4/16/2017</td>
<td>15 hours</td>
<td>J</td>
</tr>
<tr>
<td>4/17-4/23/2017</td>
<td>18 hours</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week</th>
<th>Total # of Hours for Week</th>
<th>Preceptor Initials</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/24-4/30/2017</td>
<td>30 hours</td>
<td></td>
</tr>
<tr>
<td>5/1-5/8/2017</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

[Signature]
# Appendix G  
Student Evaluation of Fieldwork Experience

## Student Information

<table>
<thead>
<tr>
<th>Student's Name</th>
<th>Suzanne Scheierling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student's Phone</td>
<td>(650) 921-3750</td>
</tr>
<tr>
<td>Campus ID #</td>
<td>20281654</td>
</tr>
<tr>
<td>Student's Email</td>
<td><a href="mailto:sescheierling@usfca.edu">sescheierling@usfca.edu</a></td>
</tr>
</tbody>
</table>

## Preceptor Information

<table>
<thead>
<tr>
<th>Preceptor's Name</th>
<th>Jignasa Pancholy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preceptor's Title</td>
<td>Quality Improvement Manager</td>
</tr>
<tr>
<td>Preceptor's Phone</td>
<td>(415) 206-7452</td>
</tr>
<tr>
<td>Preceptor's Email</td>
<td><a href="mailto:Jignasa.Pancholy@sfdph.org">Jignasa.Pancholy@sfdph.org</a></td>
</tr>
<tr>
<td>Organization</td>
<td>ZSFG</td>
</tr>
<tr>
<td>Student's Start Date</td>
<td>2/1/2017</td>
</tr>
<tr>
<td>Student's End Date</td>
<td>4/30/2017</td>
</tr>
<tr>
<td>Hours/week</td>
<td></td>
</tr>
</tbody>
</table>

## Please use the following key to respond to the statements listed below.

- **SA** = Strongly Agree  
- **A** = Agree  
- **D** = Disagree  
- **SD** = Strongly Disagree  
- **N/A** = Not Applicable

### My Field Experience

<table>
<thead>
<tr>
<th>Statement</th>
<th>SA</th>
<th>A</th>
<th>D</th>
<th>SD</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contributed to the development of my specific career interests</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provided me with the opportunity to carry out my field learning objectives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provided the opportunity to use skills obtained in MPH classes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required skills I did not have</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Please list: the ability to adapt stakeholder buy-in, the ability to produce an A, the ability to diplomatically work with stakeholders</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Required skills I have but did not gain in the MPH program</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Please list:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Added new information and/or skills to my graduate education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Please list: systems management, working with diverse stakeholders, applying multiple versions of the PDSA cycle, and fostering collaborations between numerous resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Challenged me to work at my highest level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Served as a valuable learning experience in public health practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would recommend this agency to others for future field experiences.</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My preceptor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was valuable in enabling me to achieve my field learning objectives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was accessible to me</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initiated communication relevant to my special assignment that he/she considered of interest to me</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initiated communication with me relevant to general functions of the agency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. Would you recommend this preceptor for future field experiences? Please explain.

   X Yes     No     Unsure

Yes, working with the Quality Improvement Department at ZSFG, and more specially with Jignasa Pancholy was a fantastic learning experience. The assigned project was challenging, frustrating, and what can only be described a raw learning experience. My preceptor was extremely knowledgeable, accessible, encouraging, and pushed me to produce my best work. She provided us with just enough direction, as well as just enough expectations and by working extremely hard to overcome unforeseen obstacles and meet those expectations, I learned an invaluable amount about making systematic changes in complex environments.

3. Please provide additional comments explaining any of your responses.

4. Summary Report: All students are required to prepare a written summary of the field work to be submitted with this evaluation form.