Give Love With Lovenox: Improving Nurse Education on Lovenox Prophylaxis to Reduce Pulmonary Embolism Risk on the Postpartum Unit

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Give Love With Lovenox:

Improving Nurse Education on Lovenox Prophylaxis to Reduce Pulmonary Embolism Risk

on the Postpartum Unit

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NURS 653: Quality Improvement Internship

Dr. Nicole Beamish, RN, DNP, FNP-C

December 13, 2023
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Abstract

**Problem:** This quality improvement project aims to improve nurse education about Lovenox prophylaxis to reduce the risk of pulmonary emboli – post-discharge – amongst high-risk postpartum women who underwent vaginal and cesarean deliveries on the family baby unit.

**Context:** This project took place in a Family Baby/ Postpartum Unit at Hospital SC in Santa Clara, California. This unit has a total of 25 beds with an increased prevalence of pulmonary embolism following cesarean delivery, post-discharge.

**Intervention:** 25 Nurses were given anonymous pre-survey questionnaires. Educational handouts were created and distributed to the registered nurses on the unit and were later given anonymous post-surveys.

**Measures:** Unit needs assessment was conducted based on the data collected by the unit director and nurse educator using the 5 P’s (Appendix A). Out of the 72 nurses on the staff roster, 25 nurses participated in the study (n = 34.7% response rate). All 25 nurses participated throughout the study, allowing greater insight into the nurses’ perspectives (Appendix M). Nurses were given edible incentives after completion of the pre-and post-surveys and education to encourage active participation. We assessed the nurses’ comfort levels and knowledge about the unit’s Lovenox Prophylaxis policy (Appendix I).

**Results:** Our results were mostly quantitative with some qualitative data. The surveys revealed a need for an annual Lovenox refresher course. Results showed that most nurses (n= 60%) knew why Lovenox was used in their unit, and (n= 76%) were comfortable administering and monitoring Lovenox but stated they had not had a refresher course since nursing school (Appendix L). Most nurses were open to a Lovenox refresher course. After the education intervention, results improved to (n= 72%) knowing why Lovenox was used, and (n= 68%)
knowing the signs and symptoms of pulmonary embolism (Appendix O).

**Conclusion:** Results showed an improvement in nurse knowledge about the unit’s Lovenox Prophylaxis policy and use. Nurses reported benefitting from re-education and disclosed being more inclined to witness patient self-administration more than once before discharge. Improvements in patient medication adherence and reduced risk of PE are to follow. This project helps support the hospital’s initiative to implement Lovenox prevention for not only cesarean deliveries but vaginal as well. Sustainability is dependent on the nurses’ willingness to participate in annual reeducation and training in the Family Baby Unit. Future recommendations should be considered.
The rate of pulmonary embolism in pregnant and postpartum (PP) women is increasing (Lao, 2022). Pregnancy-associated venous thromboembolism (VTE) and pulmonary embolism (PE) remains the leading cause of maternal death. VTE is a serious and life-threatening complication in pregnant and PP women, but the two main components of VTE appear to be deep vein thrombosis (DVT) and PE. Literature shows VTE is twice as common after C-section in comparison to vaginal deliveries (Friedman et al., 2015). For patients who are at higher risk for VTE, low molecular weight heparin (Lovenox/Enoxaparin) is recommended because of its greater reliability and fewer adverse effects in pregnancy (Lao, 2022). However, even with protocols in place for VTE prophylaxis, 46% of nurses were still unaware of the “increasing rates of maternal mortality in the United States” (Suplee & Bingham, 2019). In the same study, nurses reported being less likely to educate their patients on pulmonary embolism, other cardiac events, and venous thrombosis as opposed to providing routine education such as, postpartum depression, hemorrhage, and infection. This project aimed to improve nurse education about Lovenox prophylaxis to reduce the risk of pulmonary embolism post-discharge amongst high-risk postpartum women who underwent vaginal and cesarean deliveries in the Family Baby Unit.

Hospital SC is a county hospital that encounters many diverse patients from different socioeconomic backgrounds. Therefore, education, resources, and access to interpreters are extremely important in providing optimal care in this area. There are financial, cultural, and language barriers that may contribute to patient outcomes. According to this hospital’s assessment data, there have been two major sentinel events of pulmonary embolism prior to the initiation of the VTE prophylaxis protocol, and a few more events following thereafter. The unit director and nurse educator on the Family Baby Unit approached the Student Clinical Nurse
Leader group to conduct a quality improvement project to research evidence-based practices and to reinforce the Lovenox Prophylaxis Protocol on their unit.

**Problem Description**

Beginning January 4, 2022, Hospital SC initiated a new venous thromboembolism (VTE) prophylaxis initiative. This protocol was placed to increase patient outcomes in the labor and delivery and postpartum units to help reduce the risk of VTE, DVT, and PE in women who underwent a cesarean delivery. According to the hospital’s assessment data, there have been two sentinel events where patients received inadequate VTE prophylaxis. Other reports noted patients returning to the emergency room due to a pulmonary embolism, post-discharge from the Family Baby Unit. According to Hospital SC’s VTE Prophylaxis Protocol, patients with an increased risk of VTE and PE include those who have a personal or familial history of VTE, BMI >40, thrombophilia, or prolonged immobility. They would have been ordered a six-week medication regimen of at-home, self-administered Lovenox/enoxaparin. However, the success and adherence to this medication are intended to be used in conjunction with updated sequential compression device orders, increased pharmacological interventions, and additional patient education.

The process of this project began with an initial microsystem needs assessment in consideration of the current VTE prophylaxis policy, literature review and investigation of evidence-based practices, and the actual utilization of the policy in nursing practice on the unit. The process ends with identifying informational gaps in the microsystem concerning the nurses’ knowledge about anticoagulant therapies, patient teaching methods, and Lovenox medication use and policies based on feedback from collected nurse surveys. Through this needs assessment, this student CNL group expects to reduce the incidence of pulmonary embolism and increase patient outcomes by improving nurse and patient education.
**Rationale**

With this need for change, we utilized the Kurt Lewin change theory. This theory follows three major steps: unfreezing, changing, and refreezing (Amina et al., 2022). Although the Lovenox Prophylaxis Protocol has already been established, the need for change within this microsystem pertained to nursing practice. Therefore, the unfreezing step of this project was identifying and creating awareness of the major pain points of care and assessing the readiness for change. This data was derived from major stakeholders and conducted surveys completed by the nurses. The data showed a great need for re-education for both nurses and patients. The change or moving portion of this project was the implementation of our Lovenox refresher course in which the nurses learn about the unit’s Lovenox Prophylaxis Protocol, administration of the medication, and teach-back methods, using evidence-based practices. The nurses were given a post-survey to assess their understanding and willingness to implement these practices long-term. Lastly, the refreezing step would be nursing compliance and adherence to practices after making the necessary changes. The hope for this improvement project would be for nursing leadership to adopt these practices by requiring an annual refresher course as well as updating the current VTE/Lovenox Prophylaxis Protocol.

**Search Strategy**

A literature review was conducted for the entirety of September 2023, to gather evidence-based research. Cumulative Index to Nursing and Allied Health (CINAHL) and PubMed were used to gather peer-reviewed journals/articles between 2019 and 2023. Keywords and inclusion criteria used to research this topic included: “Lovenox”, “Prophylaxis”, “Cesarean Section and Vaginal deliveries”, “pulmonary embolism”, “VTE”, “nurse education”, and “patient education”. The literature was evaluated using the Johns Hopkins Research Evidence Appraisal Tool using
Available Knowledge & Literature Review

We defined the population, intervention, comparison, outcome, and time frame and created the PICOT question. Does Lovenox prophylaxis education provided to Registered Nurses (RN) on the postpartum unit increase patient compliance to reduce PE, DVT, and VTE occurrence amongst vaginal and cesarean deliveries post-discharge, in comparison to nurses who did not receive Lovenox prophylaxis education in three months? The PICOT question and keywords were used to guide and assist in gathering evidence-based research.

The research findings to support the need for this quality improvement project were organized and critiqued in a comprehensive literature review, with each graded amongst levels I-V based on the Johns Hopkins Research Appraisal Tool (Dang, et al., 2022). The studies represented a need for prophylactic care for high-risk mothers during and after pregnancy to reduce the risks of VTE, DVT, and PE. According to the research, pregnancy-associated PEs occur in 1 of 1000 pregnancies and is noted as one of the leading causes of maternal mortality at 3% (Lao, 2022). The risks of VTE and PE are amplified four to five times higher in pregnancy, and even more at 100 times higher in the first week, postpartum (Conti et al. 2013). This is all because pregnancy alters the coagulation factors in the body to prepare for delivery. This over-compensation can lead to adverse events such as VTE and PE (Simcox et al., 2015).

To mitigate these events, a low molecular weight heparin should be used as prophylaxis. Lovenox/enoxaparin is recommended because it can be safely used during pregnancy without crossing the placenta (Conti et al., 2013; James, 2017; Lao, 2022). In the United States, cases of VTE and PE are mostly seen after cesarean deliveries; however, it must be noted that this may occur after any type of delivery. The criteria for Lovenox prophylaxis are determined by having
at least two of the following: at least three other pregnancies, varicose veins, BMI >30, and >35 years of age (Testa et al., 2014). Current Lovenox prophylaxis protocols in retrospective and observational studies recommend Lovenox be given twice-daily a few weeks before delivery, stopped 36 hours before delivery, then resumed at six and twelve hours postpartum, and up until six weeks postpartum – minimum of three months total (Cox, 2019; Blondon et al., 202; Lao, 2022; Testa et al., 2014; Wiegers & Middeldorp, 2020). The dosage should be specific by weight. In a randomized controlled trial, they compared the effects of fixed dosages and weight-based dosages of Lovenox. The results revealed that a weight-based dosage of Lovenox was more effective at reaching peak prophylaxis at an outpatient follow-up postpartum (Bruno et al., 2022).

The catalyst for this improvement project is the two sentinel events of PEs postpartum while under the Lovenox Prophylaxis Protocol. Therefore, it was important to research possible discrepancies, such as education for nurses and patients. In a cross-sectional study, postpartum nurses were examined for their knowledge of maternal mortality and morbidity as well as the education they provide to patients about the signs and symptoms of adverse events they may experience post-discharge. The results showed that 46% of nurses were unaware of the increasing rates of maternal mortality and were less likely to be educated about PE, VTE, and other life-threatening events apart from postpartum hemorrhage, depression, and infection (Suplee & Bingham, 2019). Continuing education is recommended to improve clinical knowledge and patient outcomes. Proper patient education with the nurse’s guidance will reduce the potential risks of PE and VTE. In a study done with a multidisciplinary approach, they found that two out of four high-risk patients were experiencing VTE episodes after early stoppage of low molecular weight heparin therapy (Ernst et al., 2021). The results of this study showed that
there is a greater need for nurses to educate patients and close informational gaps.

This literature review further supports the need for quality improvement to reduce the risks of maternal mortality due to postpartum pulmonary embolism. Using evidence-based practices, we can prevent these adverse events and make immediate changes to the established Lovenox Prophylaxis Protocol. Without making these changes, maternal mortality will continue to increase, putting more lives at risk.

**Specific Aim Statement**

This quality improvement project aims to improve nurse education about Lovenox prophylaxis to reduce the risk of pulmonary embolism post-discharge amongst postpartum women who underwent vaginal and cesarean deliveries by providing an annual nurse re-education course about the Lovenox prophylaxis policy and implementing a system that requires the nurse to witness patient medication administration at least two times before discharge. Postpartum nurses will report an 80% increase in patient medication adherence in 3 months. Employee knowledge and efficiency will increase due to an improvement in their understanding of the policy and proper patient teaching methods as a result of the education and implementation of the witnessing system for high-risk patients before discharge.

**Methods**

**Project Overview**

As student Clinical Nurse Leaders, we were tasked with creating a quality improvement plan that would be not only useful, but also meaningful to the unit. The unit leadership, which included the unit director and nurse educator, prefaced the unit’s needs. This data propelled our search for reputable research and organized a literature review. Using the current evidenced-based research, a PDSA Cycle (Plan - Do - Study -Act) was created to help guide the change
To reinforce the proposed need for change, a microsystem assessment was conducted, following the 5 P’s, identifying the root-cause analysis and SWOT analysis to note the prevalent barriers affecting nursing practice and patient outcomes (Appendix A & E). It was made clear to our group members that the major needs pertained to nonadherence to the Lovenox Prophylaxis Protocol. Further, a cost-benefit analysis was done to understand the financial implications of implementing our interventions. We took into consideration the many stakeholders affected by this change.

**Microsystem Assessment**

The 5 P’s include purpose, patients, professionals, process, and patterns. The purpose of this quality improvement project is to reduce the risks of postpartum pulmonary embolism using Lovenox Prophylaxis. Hospital SC found that the prevalence of PE occurred in mostly patients who underwent cesarean section deliveries and were under the criteria of having at least two of the following risk factors: varicose veins, at least three previous pregnancies, age over 35 years, BMI >30 kg/m2, and have a family/personal history of VTE, DVT, or PE. Some patients may have comprehension difficulties due to speaking English as a second language (ESL). The professionals who reduce patient risk are the postpartum registered nurses in the Family Baby Unit. The process of changing the outcomes of these risks is providing re-education about Lovenox prophylaxis, administration, and patient education. Patterns found in this assessment include patients who do not adhere to postpartum Lovenox medication regimen post-discharge, which puts them at higher risk for PE, DVT, and, VTE due to the lack of teaching and/or poor comprehension of the self-administration education given by the nurses.

**PDSA Cycle**

We followed a Plan, Do, Study, Act Cycle (PDSA). A PDSA cycle is a change model
designed to problem-solve in four stages. The initial phase of the PDSA cycle was collaborating with the unit leadership team regarding the occurrences of PE, DVT, and VTE in vaginal and cesarean deliveries, post-discharge. Our “Plan” in this phase was to develop an aim statement, PICOT question, and generate a proposal for change. Additionally, we planned to design data collection methods, such as questionnaires and surveys. Using the data, we planned to create an educational plan and a handout for the nurses to learn about the Lovenox Prophylaxis Protocol.

The second phase was the “Do” portion, which was to conduct the microsystem assessment using the 5 P’s. This phase was where we set our plan into motion. We ran a SWOT analysis and root-cause analysis and began data collecting by assessing the nurses’ knowledge using pre- and post-surveys before and after the education. We collected meaningful data and moved on to phase three – the “Study” portion of the PDSA cycle. Here, we analyzed the data and reviewed the results from the surveys. We looked for discrepancies in the current system of the Lovenox Prophylaxis protocol and informational gaps.

The final phase, “Act” is where we developed and presented evidenced-based research and practice recommendations to the unit leadership team, which took place on October 31, 2023. It is up to the leadership team and nurse educator to decide whether or not to adopt our intervention for change. Since we had time constraints, it is recommended that leadership make necessary adjustments to the change project as new evidence-based practices evolve to fit the needs of the unit. Utilizing a PDSA Cycle was beneficial to this project because it served as a guideline to follow during the three-month process to stay on track with the expectations. PDSA cycles allow us to make refined changes to our project intervention with minimal risks or costs.

**Root Cause Analysis (RCA)**

The root-cause analysis was run and organized into a fishbone diagram. The root-cause
analysis for Lovenox prophylaxis nonadherence and compliance were identified by four components: (1) documentation, (2) people, (3) policies, procedures, and education, and (4) environment (Appendix E).

With the implementation of the Lovenox Prophylaxis Protocol, extra documentation is often seen as time-consuming and adding to nurse's workload. Short staffing could account for a lack of time for documentation and education. Some nurses are not confident in their knowledge of the signs and symptoms of PE and the prevalence of PE postpartum. They may also be unfamiliar with the unit’s Lovenox Prophylaxis Protocol. According to the analysis, most nurses have not had a refresher course on the uses of Lovenox on their unit. Procedures are not taught on the unit, but the nurses are expected to have prior knowledge. Hospital SC policy does not provide education about the medication and how to teach patient self-administration. There is a lack of medication adherence post-discharge due to a lack of education and poor patient comprehension. Additionally, nurses are required to witness patient self-administration at least one time before discharge. All reported PEs occur post-discharge and at the patients’ homes, so the main focus is education to support medication adherence. Running a root-cause analysis helped us understand the major factors that contribute to the problem of possible pulmonary embolism. With this information, we were able to think of ways to intervene to prevent the risks of PE.

**SWOT Analysis**

A SWOT analysis was done to understand the strengths, weaknesses, opportunities, and threats that would pose some kind of effect on the outcome (Appendix G). Major strengths include the possibility for re-education provided by the nurse educator, effective nursing assessments for patients receiving Lovenox, and accessibility to information regarding the
connection between Lovenox, PE, DVT, and VTE. Weaknesses include staff needing to receive initial or annual education on Lovenox administration, PE/DVT/VTE, ineffective patient teaching at discharge, and resistance to change among staff nurses. The opportunities available would decrease rates of PE, DVT, and VTE post-discharge, increase compliance with the policy, effective patient teaching at discharge, increase the accuracy of patient assessments, and increase the quality of care. Lastly, threats posed in this analysis show time and cost allocated for re-education, staff resistance to policy adherence, and documentation burden. The SWOT analysis was beneficial in understanding the possible barriers and opportunities we could potentially encounter during the implementation of our project. This information allows us to prepare for adjustments and create alternative plans.

**Cost Benefit Analysis (CBA)**

Hospital SC has an advantage by already having the Lovenox Prophylaxis Protocol set in place before the change and a nurse educator on the unit. When doing the analysis, the major stakeholders include the nurses, leadership team, nurse educators, and patients. Although it would not be an additional cost, keeping staff such as Staff Developers/educators would be an annual salary of ~$188,244 per year. Education materials are already included in the policy. However, if badge reference cards “Badge Buddies” were adopted and given to each nurse (72 nurses from all shifts), it would cost, roughly, $288 per year. Therefore, the estimated cost, annually, would be $188,532 per year (Appendix H).

**Timeline**

To track our timeliness, a Gantt chart was created (Appendix D). This chart followed the aforementioned PDSA cycle, which followed from the first week of September 2023 to the third week of November 2023.
**Intervention**

The nurse educator tasked us with creating an educational plan to help support the unit’s newly implemented Lovenox Prophylaxis policy for the nurses on the family baby unit. A survey was conducted among 25 nurses from each shift – morning, evening, and nocturnal. The questionnaire was available via QR code and paper copy. The data showed that many of the nurses had not had a refresher course about Lovenox and its proper usage and administration since nursing school. Therefore, we created two versions of an educational handout, both with evidence-based research and practices. The first version was a complete and comprehensive handout that included five main sections: “What, Why, How, Signs and Symptoms/ Monitoring, and Recommendations” (Appendix J, version I). The second version was much more condensed (Appendix J, version II). It included the “5 P’s, What, Administration, Signs and Symptoms/ Monitoring, and Recommendations”. We used this version to do in-person educational sessions. The first version was sent out via email for future reference. We decided to have the handout sent to each staff member because according to a study, mobile access helps to foster enhanced learning and accessibility to information and increases the chances of information exchange (Chu et al., 2019).

**Study of Intervention**

After implementing our intervention, we provided the nurses with both paper surveys to take with them as well as a QR code with the link to the online version of the survey to take later. This was the post-survey to collect data on how effective the handout and educational session were to their learning. Additionally, we left the handout in each nursing pod for the nurses who were unable to attend the teaching session and for future reference. The nurse educator and unit director will determine if the unit staff’s knowledge of the Lovenox Prophylaxis Protocol has
increased, if the frequency of witnessing patient self-administration has increased, and if the rates of pulmonary embolism post-discharge have decreased. This evaluation should continue on a quarterly basis.

**Measures**

The initial pre-survey included both qualitative and quantitative questions using the Likert Scale, yes-no-maybe closed-answers, and free responses. The survey inquired about the nurses’ knowledge of their Lovenox Pophylaxis Protocol, their ability to use that knowledge to educate their patients, and their utilization of patient teach-back methods for medication self-administration (Appendix I). After the Lovenox refresher course and education, provided by the CNL students, a post-survey was conducted to reassess the nurses’ confidence and knowledge about the unit’s Lovenox Prophylaxis policy (Appendix K). This post-survey only used questions in the form of the Likert scale and yes-no-maybe closed-answers. Nurses were given edible incentives after the completion of each survey and educational session.

**Ethical Considerations**

This project abides by the Quality Improvement review guidelines. This quality improvement project is approved by the University of San Francisco and does not require IRB approval. To maintain anonymity, all participants of this study, including the hospital name were excluded from the data of our project. The main purpose of this project is to ethically implement a quality improvement project using evidence-based practices as student Clinical Nurse Leaders at the University of San Francisco.

**Results**

Of the 72 nurses on the staff roster, only 25 participated (n = 34.7% response rate). After the initial survey, we decided that to have meaningful qualitative and quantitative data, we
capped our pool of participants to 25 nurses. For the pre-survey, education, and post-survey, we had a 100% response rate, allowing us to have greater insight into the nurses’ perspectives (Appendix M). The results of the initial survey showed that most nurses (n = 60%) knew why Lovenox was used in their unit, and (n = 76%) were comfortable administering and monitoring Lovenox but had not had a refresher course about Lovenox since nursing school (Appendix L). The nurses expressed that they were open to a Lovenox refresher course and the surveys further revealed a need for an annual Lovenox refresher course. The post-survey results showed improvement in their overall knowledge of pulmonary embolism, Lovenox use, and the Lovenox Prophylaxis Protocol.

<table>
<thead>
<tr>
<th>Questions from Lovenox Survey</th>
<th>Pre</th>
<th>Post</th>
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<tbody>
<tr>
<td>I know what Lovenox is and why it is used in our unit.</td>
<td>4% scored 3</td>
<td>4% scored 3</td>
</tr>
<tr>
<td></td>
<td>36% scored 4</td>
<td>24% scored 4</td>
</tr>
<tr>
<td></td>
<td>60% scored 5</td>
<td>72% scored 5</td>
</tr>
<tr>
<td>I feel comfortable administering Lovenox prophylactically and monitoring post-administration.</td>
<td>4% scored 3</td>
<td>4% scored 3</td>
</tr>
<tr>
<td></td>
<td>20% scored 4</td>
<td>20% scored 4</td>
</tr>
<tr>
<td></td>
<td>76% scored 5</td>
<td>76% scored 5</td>
</tr>
<tr>
<td>I know the signs and symptoms of pulmonary embolism (PE).</td>
<td>4% scored 2</td>
<td>32% scored 4</td>
</tr>
<tr>
<td></td>
<td>4% scored 3</td>
<td>68% scored 5</td>
</tr>
<tr>
<td></td>
<td>52% scored 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>40% scored 5</td>
<td></td>
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</tbody>
</table>

The results exceeded our initial expectations. A response rate of (n = 100%) of the 25 nurses reported benefitting from the re-education about Lovenox (Appendix N). However, we were surprised to see that only (n = 88%) were willing to watch their patients administer
Lovenox more than once. This result may be due to the issue of time and staffing shortages. Additionally, we did not expect the results of the nurses’ comfort levels of Lovenox administration and monitoring to be the same on both the pre-and post-survey. On the Likert scale, the data showed that (n = 4%) scored a three, (n = 20%) scored a four, and (n = 76%) scored a five. These results go to show that annual skills and refresher courses should be given annually to build staff confidence. After this project, I expect the nurse educator and leadership team to implement some type of refresher course training and review of the current Lovenox Prophylaxis Protocol to update their policy. Nurses should witness patient medication self-administration at least two times before discharge, as recommended in evidence-based research.

**Discussion**

The rate of maternal mortality due to pulmonary embolism is increasing (Lao, 2022). There are many studies in support of a prophylactic protocol for high-risk cases of venous thromboembolism, deep vein thrombosis, and pulmonary embolism after cesarean deliveries. Some hospitals such as Hospital SC have already set in place a VTE Prophylaxis Protocol that utilizes Lovenox. However, since the initiation of this policy, there are still cases of pulmonary embolism occurring post-discharge. Our quality improvement project was done to mitigate the issue by identifying the need for nurse education and creating a refresher course to improve nurses’ knowledge so they can better educate their patients on the Lovenox medication regimen during and after admission.

A better understanding of Lovenox allows the nurses to provide accurate and helpful education for patients. Patient compliance and medication adherence are only as successful as their level of confidence to carry out themselves without healthcare staff supervision. Studies have found that patients who self-administered two or three times prior to discharge were more
compliant with the medication regimen after discharge, as opposed to those who were given their medication by healthcare staff (Elmaghraby et al., 2022). The nursing staff must be more willing to take the time to educate their patients and witness self-administration at least two times before discharge, especially for patients who speak English as a second language. Our project identified informational gaps within the unit and informed the best way to fill the gaps, which hopefully decrease the rates of PE, VTE, and DVT in their patient population.

Limitations

Limitations for this quality improvement project included two major hindrances. The first is time constraints. Our group only had three months to implement, educate, and survey for effectiveness of our project. Additionally, there were time constraints with the staff. Often, the staff were too busy to participate in the hours our group was on the unit. Because of this, we had a very small pool of participants who were willing to participate. This was the biggest limitation. Some nurses were unwilling to participate for several reasons: resistance to change, lack of time, or feeling it was not a requirement.

Summary

Hospital SC established a VTE/Lovenox Prophylaxis Protocol in January 2022. Since the initiation of the protocol, there have been two major sentinel events that have raised concerns about the effectiveness of the protocol on the Family Baby Unit. After an initial microsystem assessment, pre-surveys were conducted anonymously amongst the staff nurses on the unit. The results of that survey showed a need for re-education about Lovenox. We created two educational handouts using evidence-based research and recommendations regarding Lovenox prophylaxis. After the education intervention, a post-survey was given to the participating nurses to gauge their understanding and knowledge after the fact. We had a 100% response rate
showing that the education was beneficial, but that there was still room for improvement. The data reveals a need for annual refresher courses about Lovenox as well as an update to increase patient witnessing for medication self-administration to at least two times before discharge on the current protocol. Due to time constraints, we cannot see the full effects of our quality improvement project.

**Conclusion**

Working with the nurse educator and leadership team, we were able to identify major pain points in this unit about Lovenox prophylaxis and pulmonary embolism. We learned that education for both nurse and patient is imperative for proper medication adherence. These changes to the protocol are minor; however, the effects, if changed, would be great. Nurses would benefit from continuing their education and knowledge and patients would lower their risk of maternal mortality. As a future Clinical Nurse Leader, I hope to emphasize the value of education, the need for change, and the importance of team collaboration. This project gave great insight into how to go about an evidence-based practice project and the importance of these projects to improve nursing practice. These interventions, as recommended by evidenced-based research, are doable and realistic; however, it is up to the nurse educators and leadership team to continue to carry out the practices of annual refresher courses and proper training that are in line with evidence-based practices and the hospital’s Lovenox Prophylaxis Protocol. I hope that in doing so, they find that this project was both useful and meaningful.
References


Appendices

Appendix A: The 5 P’s

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Reduce risks of postpartum pulmonary embolism using Lovenox!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>Mothers who underwent cesarean and high-risk vaginal deliveries at Hospital SC</td>
</tr>
<tr>
<td>Professionals</td>
<td>Postpartum (FBU) Registered Nurses</td>
</tr>
<tr>
<td>Process</td>
<td>Re-educate about Lovenox prophylaxis, administration, and patient education</td>
</tr>
<tr>
<td>Patterns</td>
<td>Patients who do not adhere to the postpartum Lovenox regimen post-discharge are at higher risk for PE/DVT/VTE because of a lack of teaching and/or poor comprehension of the self-admin education</td>
</tr>
</tbody>
</table>

Appendix B: The PICOT Question

<table>
<thead>
<tr>
<th>POPULATION</th>
<th>Nurses on the Family Baby/Postpartum Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERVENTION</td>
<td>Lovenox Prophylaxis education for PE/DVT/VTE risk</td>
</tr>
<tr>
<td>COMPARISON</td>
<td>Nurses who are not educated about Lovenox prophylaxis for PE/DVT/VTE risk</td>
</tr>
<tr>
<td>OUTCOME</td>
<td>Decreased rates of PP PE post-discharge</td>
</tr>
<tr>
<td>TIME</td>
<td>In three months</td>
</tr>
</tbody>
</table>

Appendix C: Plan, Do, Study, Act (PDSA)

1. **PLAN**
   - Collaborated w/ SCVMC Leadership team regarding PE/DVT/VTE occurrences in vaginal & cesarean deliveries post-discharge
   - Developed an aim statement
   - Created a PICOT question
   - Generated a proposal
   - Designed data collection questionnaires
   - Educated nurses about Lovenox prophylaxis
   - Created brochures for nurses to learn about Lovenox prophylaxis

2. **DO**
   - Microsystem assessment using 5 Ps
   - Conducted a SWOT analysis
   - Ran a root cause analysis
   - Collected data on the Family Baby Unit - Pre-survey to assess RN’s knowledge
   - Post-survey to assess RN’s understanding post education

3. **ACT**
   - Developed and presented evidence-based research recommendations to the SCVMC leadership team on October 31, 2023.

4. **STUDY**
   - Analyzed data gathered data from pre & post-surveys
   - Reviewed results from surveys
Appendix D: Gantt Chart

<table>
<thead>
<tr>
<th>QI PROCESS</th>
<th>SEPTEMBER</th>
<th>OCTOBER</th>
<th>NOVEMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WEEK</td>
<td>WEEK</td>
<td>WEEK</td>
</tr>
<tr>
<td></td>
<td>1 2 3 4</td>
<td>1 2 3 4</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>Project Initiation</td>
<td>Literature Review</td>
<td>Meeting with Leadership</td>
<td>Project Planning</td>
</tr>
</tbody>
</table>

Appendix E: Root-Cause Analysis (Fishbone)

Root Cause Analysis

Fishbone Diagram

- **Documentation**
  - Frequent documentation is time consuming and adds to nurse workload.
  - Most nurses have not had a refresher course on the use of Lovenox on their unit.
  - Procedures are not taught on unit, but RNs are expected to have prior knowledge.

- **People**
  - Some nurses are not confident in their knowledge of the 8/3 of PE.
  - Some nurses are unfamiliar with the prevalence of PE’s postpartum.
  - SCVMC policy does not provide education about the medication and how to teach patient self-administration.
  - RNs required to only witness patient self-administration 1x prior to discharge.

- **Environment**
  - Lack of medication adherence post-discharge due to a lack of education and poor patient comprehension.

- **Policies, Procedures, & Education**
  - All reported PE occurrences happened post-discharge and at the patient’s homes.
APPENDIX F
Student Project Approval: Statement of Determination

Title of Project
Give Love With Lovenox:
Improving Nurse Education on Lovenox Prophylaxis to Reduce Pulmonary Embolism Risk on the Postpartum Unit

Brief Description of Project:
The aim of this quality improvement project is to improve nurse education about Lovenox prophylaxis to reduce the risk of pulmonary emboli post-discharge amongst postpartum women who underwent vaginal and cesarean deliveries by providing an annual nurse re-education course about the Lovenox prophylaxis policy and implementing a system that requires the nurse to witness patient medication administration at least two times prior to discharge. Postpartum nurses will report an 80% increase in patient medication adherence in 3 months. Employee knowledge and efficiency will increase due to an improvement in their understanding of the policy and proper patient teaching methods as a result of the education and implementation of the witnessing system for high-risk patients prior to discharge.

To qualify as an Evidence-based Change in Practice Project, rather than a Research Project, the criteria outlined in federal guidelines will be used: (http://answers.hhs.gov/ohrp/categories/1569)

This project meets the guidelines for an Evidence-based Change in Practice Project as outlined in the Project Checklist (attached). Students may proceed with implementation.

Comments:

Signature of Supervising Faculty: ___________________________ (date): ____________

Signature of Student: ___________________________ (date): ____________

Domingo 27
Appendix G: SWOT Analysis

**SWOT Analysis**

**STRENGTHS**
- Lovenox re-education available as a resource annually on the unit
- Effective nursing assessment for patients receiving Lovenox
- Accessible information regarding Lovenox and PE/DVT/VTE

**WEAKNESSES**
- Staff have not received education on Lovenox administration
- Staff have not received education on PE/DVT/VTE
- Lack of annual Lovenox and PE re-education
- Ineffective patient teaching at discharge
- Resistance to change among staff nurses

**OPPORTUNITIES**
- Decreased rates of PE/DVT/VTE post-discharge
- Increased compliance with the policy
- Effective patient teaching at discharge
- Increased accuracy of patient assessments
- Increased quality of care

**THREATS**
- Time and cost allocated for re-education
- Staff resistance to policy adherence
- Documentation burden

Appendix H: Cost-Benefit Analysis (CBA)

Estimated Cost: Badge Buddies
- $288 per year

Estimated Cost: Staff Developer/Educator for Lovenox Refresher Course
- $188,244 per year

**Total Estimated Cost: $188,532 per year**
Appendix I: Pre-Survey

<table>
<thead>
<tr>
<th>Question</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>I know what Lovenox is and why it is used on our unit.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Not at all</td>
<td>0</td>
</tr>
<tr>
<td>I know it like the back of my hand</td>
<td>0</td>
</tr>
<tr>
<td>I feel comfortable administering Lovenox prophylactically and monitoring post-administration.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I am not</td>
<td>0</td>
</tr>
<tr>
<td>Totally!</td>
<td>0</td>
</tr>
<tr>
<td>I know the signs and symptoms of pulmonary embolism (PE).</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I can't remember.</td>
<td>0</td>
</tr>
<tr>
<td>Absolutely.</td>
<td>0</td>
</tr>
<tr>
<td>Based on your experience, have you seen a higher prevalence of Pulmonary Embolism (PE) in either C-Section or Vaginal deliveries?</td>
<td>C-Section</td>
</tr>
<tr>
<td>Vaginal</td>
<td></td>
</tr>
<tr>
<td>Not sure.</td>
<td></td>
</tr>
<tr>
<td>When was the last time you were educated or had a class about anticoagulant therapy (Lovenox)?</td>
<td>Your answer</td>
</tr>
<tr>
<td>Do you think you would benefit from a refresher course about anticoagulant therapy (Lovenox)?</td>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Maybe</td>
<td></td>
</tr>
<tr>
<td>Would you benefit from an anticoagulant (Lovenox) therapy flowsheet on EPIC?</td>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Maybe</td>
<td></td>
</tr>
</tbody>
</table>
Appendix J: Education Handouts (First and Second Versions)

Version I:

**GIVE LOVE WITH LOVENOX**
The rate of pulmonary embolus in pregnant and postpartum women is increasing. Pregnancy-associated VTE & PE remains the leading cause of maternal death. VTE is a serious and life-threatening complication in pregnant and PP women, but the two main components are DVT and PE. In a UK study where c-sections are rarely done, they found that 70.9% of PP VTE events occurred after vaginal delivery and that 29.1% of events occurred after C-Section (Friedman et al., 2015). However, in the US, thromboprophylaxis is used on women with the highest risk of VTE. VTE is twice as common after c-section compared with vaginal deliveries. The primary treatment is anticoagulation therapy with low molecular weight heparin (Lovenox/Enoxaparin), which has greater reliability and fewer adverse effects (Lao, 2022).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lovenox</strong> is a low molecular weight heparin</td>
<td><strong>“Virchow’s Triad</strong>” of venous stasis, hypercoagulability, and vascular damage occur in the course of pregnancy and delivery.</td>
<td><strong>LMWH is given subcutaneously into the lower abdomen (Love Handles) or IV - NEVER PO</strong></td>
<td></td>
</tr>
<tr>
<td>Works as an anticoagulant that inhibits formation of fibrin clots, that could potentially lead to DVT &amp; PE.</td>
<td>Pregnancy increases levels of coagulation factors in preparation for hemostatic challenge of delivery, whether it be vaginal or c-section, causing a degree of injury to pelvic vessels.</td>
<td><strong>Disinfect</strong> the area with an alcohol swab and let dry</td>
<td></td>
</tr>
<tr>
<td><strong>Fast acting, short-term therapy</strong></td>
<td>Women with a history of VTE are at risk for recurrence during pregnancy.</td>
<td><strong>Remove the cap and hold the syringe like a pencil.</strong></td>
<td></td>
</tr>
<tr>
<td>It’s safe because it does not cross the placenta or enter the circulation of the baby in utero.</td>
<td>Without thromboprophylaxis, the risk of recurrent VTE is estimated b/w 2-10%.</td>
<td><strong>With the other hand, pinch an inch of the cleansed area to make a fold in the skin.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Recommended:</strong> Given 6 &amp; 12 hrs PP after Vaginal &amp; Cesarean Delivery Than for at least 6 weeks PP</td>
<td><strong>PE caused 3% of maternal deaths</strong></td>
<td><strong>Insert the needle straight down at a 90 degree angle and plunge the syringe.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Total Duration: 3 mo</strong></td>
<td>LMWH Prophylaxis is recommended to women with at least two of the following risk factors:</td>
<td><strong>Release the needle from the skin and properly dispose in a sharps container</strong></td>
<td></td>
</tr>
<tr>
<td>Prevalence is around 1-2/1000 pregnancies</td>
<td>- Varicose veins</td>
<td><strong>After SQ injection, common to have bruising, irritation, &amp; pain</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- At least three previous pregnancies</td>
<td><strong>DO NOT MASSAGE SITE AFTER</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Age over 35 yrs</td>
<td><strong>Antidote: Protamine sulfate</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- BMI &gt; 30 kg/m²</td>
<td><strong>S/NOTES:</strong></td>
<td></td>
</tr>
</tbody>
</table>

The PE's that occur postpartum are often occurring post-discharge. This may be due to ineffective teaching prior to discharge and lack of medication adherence at home. Maybe we can fix this!

Per SCVMC policy, nurses are required to witness patient self-administration at least 1x prior to discharge. According to a study done in 2022, patients who were witnessed self-administering three times compared to twice before discharge had increased medication compliance and decreased risk of complications (Elmaghraby et al., 2022). Possibly, increasing teach-back will reduce the risks of VTE, DVT, & PE post-discharge!
**GIVE LOVE WITH LOVENOX**

**Purpose:** Reduce risks of postpartum pulmonary embolism using Lovenox!

**Patients:** Mothers who underwent cesarean and high risk vaginal deliveries at SCVMC

**Professionals:** Postpartum (FBU) Registered Nurses

**Process:** Re-educate about Lovenox prophylaxis, administration, and patient education

**Patterns:** Patients who do not adhere to postpartum Lovenox regimen post-discharge are at higher risk for PE/DVT/VTE because of a lack of teaching and/or poor comprehension of the self-administration.

**What?**

Lovenox is a low molecular weight heparin

Inhibits formation of fibrin clots, that could potentially lead to DVT & PE.

**Recommended:**

- Given 6 & 12 hrs PP after Vaginal & Cesarean Delivery
- Then for at least 6 weeks PP

**Total Duration:** 3 mo

**Administration**

- SQ injection into the lower abdomen (Love Handles) or IV- NEVER PO
- Pinch an inch of the disinfected area to make a fold in the skin.
- Insert the needle at a 90 degree angle and plunge the syringe, properly dispose in a sharps container
- It’s common to have bruising, irritation, & pain

**DO NOT MASSAGE SITE AFTER**

**Antidote:** Protamine sulfate

Recommended for women with at least two risk factors:

- Varicose veins
- At least three previous pregnancies
- Age over 35 yrs
- BMI >30 kg/m2

**S&S & Monitoring**

Monitor platelet count:

- **Normal PLT count = 150,000-450,000**
  - Per SCVMC: Hold/Notify HCP if PLT <100,000
  - Measured with aPTT: 47-70 seconds
  - Therapeutic range: 1.5-2 times the normal value
- **Interpretation**
  - Too high = patient will die (inc bleed)
  - Too low = clots will grow

**S/S of PE:**

- Shortness of breath
- Tachycardia
- Low blood pressure

**Educate your patient on how to identify S/S**

- Patient will self-administer Lovenox at home

The risk of VTE, DVT, & PE attribute to proper and effective teaching from the RNs.

- **PE’s that occur postpartum are often occurring post-discharge**
  - This may be due to ineffective teaching prior to discharge and lack of medication adherence at home
  - **Increasing teach-back will reduce the risks of VTE, DVT, & PE post-discharge!**

---

**Let’s work together!**

Here are our resources:
Appendix K: Post-Survey

I know what Lovenox is and why it is used on our unit.

1 2 3 4 5
Not at all ☐ ☐ ☐ ☐ ☐ I know it like the back of my hand

I feel comfortable administering Lovenox prophylactically and monitoring post-administration.

1 2 3 4 5
I am not ☐ ☐ ☐ ☐ ☐ Totally

I know the signs and symptoms of pulmonary embolism (PE).

1 2 3 4 5
I can’t remember ☐ ☐ ☐ ☐ ☐ Absolutely

Do you plan on watching your patient administer Lovenox more than once, if possible?

☐ Yes
☐ No
☐ Maybe

Did you benefit from this re-education about Lovenox?

☐ Yes
☐ No
☐ Maybe

Appendix L: Nurse Comments

NURSE COMMENTS

“When I was hired I never received education on anticoagulant therapy.”

“The last time I was educated on Lovenox Prophylaxis was in nursing school, that was years ago.”

“I’m busy and don’t want more charting.”
Appendix M: Pre-Survey Results

I know what Lovenox is and why it is used on our unit.
25 responses

I feel comfortable administering Lovenox prophylactically and monitoring post-administration.
25 responses

I know the signs and symptoms of pulmonary embolism (PE).
25 responses
Based on your experience, have you seen a higher prevalence of Pulmonary Embolism (PE) in either C-Section or Vaginal deliveries?
25 responses

- C-Section: 52%
- Vaginal: 48%

When was the last time you were educated or had a class about anticoagulant therapy (Lovenox)?
25 responses

- 1 yr: 1 (4%)
- 5 years ago: 1 (4%)
- Haven't had one: 1 (4%)
- 9/2023: 1 (4%)
- Never: 1 (4%)
- Nursing school: 1 (4%)
- Unsure: 1 (4%)
- A year ago: 2 (8%)
- Couple months ago: 2 (8%)
- None: 1 (4%)
- Pro...: 1 (4%)

Do you think you would benefit from a refresher course about anticoagulant therapy (Lovenox)?
25 responses

- Yes: 72%
- No: 20%
- Maybe: 8% 

Would you benefit from an anticoagulant (Lovenox) therapy flowsheet on EPIC?
25 responses

- Yes: 56%
- No: 28%
- Maybe: 16%
Appendix N: Post-Survey Results

I know what Lovenox is and why it is used on our unit.
25 responses

I feel comfortable administering Lovenox prophylactically and monitoring post-administration.
25 responses

I know the signs and symptoms of pulmonary embolism (PE).
25 responses

Do you plan on watching your patient administer Lovenox more than once, if possible?
25 responses
Appendix O: Comparative Results Table

<table>
<thead>
<tr>
<th>Questions from Lovenox Survey</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>I know what Lovenox is and why it is used in our unit.</td>
<td>● 4% scored 3</td>
<td>● 4% scored 3</td>
</tr>
<tr>
<td></td>
<td>● 36% scored 4</td>
<td>● 24% scored 4</td>
</tr>
<tr>
<td></td>
<td>● 60% scored 5</td>
<td>● 72% scored 5</td>
</tr>
<tr>
<td>I feel comfortable administering Lovenox prophylactically and monitoring post-administration.</td>
<td>● 4% scored 3</td>
<td>● 4% scored 3</td>
</tr>
<tr>
<td></td>
<td>● 20% scored 4</td>
<td>● 20% scored 4</td>
</tr>
<tr>
<td></td>
<td>● 76% scored 5</td>
<td>● 76% scored 5</td>
</tr>
<tr>
<td>I know the signs and symptoms of pulmonary embolism (PE).</td>
<td>● 4% scored 2</td>
<td>● 32% scored 4</td>
</tr>
<tr>
<td></td>
<td>● 4% scored 3</td>
<td>● 68% scored 5</td>
</tr>
<tr>
<td></td>
<td>● 52% scored 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>● 40% scored 5</td>
<td></td>
</tr>
</tbody>
</table>
Appendix P: Evidence-Based Change of Practice Project Checklist

**STUDENT NAME:** Jennifer Domingo  
**DATE:** December 9, 2023  
**SUPERVISING FACULTY:** Nicole Beamish

<table>
<thead>
<tr>
<th>Project Title: Give Love With Lovenox: Improving Nurse Education on Lovenox Prophylaxis to Reduce Pulmonary Embolism Risk on the Postpartum Unit</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The aim of the project is to improve the process or delivery of care with established/accepted standards, or to implement evidence-based change. There is no intention of using the data for research purposes.</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>The specific aim is to improve performance on a specific service or program and is a part of usual care. ALL participants will receive standard of care.</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>The project is NOT designed to follow a research design, e.g., hypothesis testing or group comparison, randomization, control groups, prospective comparison groups, cross-sectional, case control). The project does NOT follow a protocol that overrides clinical decision-making. The project involves implementation of established and tested quality standards and/or systematic monitoring, assessment or evaluation of the organization to ensure that existing quality standards are being met. The project does NOT develop paradigms or untested methods or new untested standards. The project involves implementation of care practices and interventions that are consensus-based or evidence-based. The project does NOT seek to test an intervention that is beyond current science and experience. The project is conducted by staff where the project will take place and involves staff who are working at an agency that has an agreement with USF SONHP. The project has NO funding from federal agencies or research-focused organizations and is not receiving funding for implementation research.</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>The agency or clinical practice unit agrees that this is a project that will be implemented to improve the process or delivery of care, i.e., not a personal research project that is dependent upon the voluntary participation of colleagues, students and/or patients.</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>If there is an intent to, or possibility of publishing your work, you and supervising faculty and agency oversight committee are comfortable with the following statement in your methods section.</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

*Adapted with permission of Elizabeth L. Hohmann, MD, Director and Chair, Partners Human Research Committee, Partners Health System, Boston, MA.*