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Implemented Nurse Education to Improve the Effective Use of The Sapphire PCA Pump: Achievement of Quality Pain Control

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Author Note

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Abstract

The Sapphire ™ Infusion System Patient-Controlled-Analgesia (PCA) pump is a device that is used to administer high pain medication to manage a patient's pain level after an invasive procedure such as surgery. In order to achieve this goal, nurses must be able to use the sapphire equipment efficiently to prevent medication overdose and underdose, as well as to preserve safety for both the patients and the nurses themselves. In addition, nurses must be able to document accurately on EPIC. The purpose of this project, led by the team of Clinical Nurse Leader (CNL) students from the University of San Francisco, was to educate the nurses in various units at Suburban Medical Center A and B with regard to the correct and effective use of the Sapphire PCA pump; also, to manage a patient's pain level. Throughout our initial implementation (9 questions survey metric) we surveyed 286 nurses in both medical centers to discover if they had used, or been exposed to, the Sapphire PCA pump. We found out that (n=171) nurses had used the pump before, and (n=115) nurses had never used the Sapphire PCA Pump. After the in-service training the post survey data showed there was a 58.5% increase level of confidence in the application of the pump. At the same time, some nurses expressed having difficulties using it. Unfortunately, due to limitations related to the coronavirus pandemic, our project was terminated and the team was unable to finish the in-service education and the post-survey phase, but a video recorded by our team was provided to the medical centers with step-by step instructions on how to use the Sapphire PCA pump along with some clarification of nurses' concerns. With regard to this project, upcoming CNL students will continue the in-service education.

Keywords: Sapphire PCA pump, nursing staff education, safety, pain management

Introduction and Background

Implemented Nurse Education to Improve the Effective Use of The Sapphire PCA Pump Achievement of Quality Pain Control

As early as the 1980s, the Patient-Controlled Analgesia (PCA) pump had been utilized for clinical practice (Ferguson, Williams, Beard, 2010). According to King and Gerard (2016) "The quality improvement project allows the CNL's to recognize opportunities for quality improvement and leads to improvement activities by applying evidence-based models." The objective of this quality improvement project was to educate nurses in three medical surgical units, two neuro/trauma units, one ICU, one PCU, oncology pulmonary inpatient unit, telemetry unit, endocrinology and metabolism unit, CVSU and CVPCU with regard to the correct and effective use of the Sapphire PCA pump, as well to determine its effectiveness with regard to pain management and safety purposes. The Sapphire PCA pump is a device that is used to deliver high alert pain medication in order to control a patient's discomfort (Institute of Medicine, 2000). As many patients go through invasive procedures such as surgery, they often experience a great deal of pain; therefore, the Sapphire PCA pump is used to deliver medication such as Morphine to control their pain level (Jahansouz, Rafie, Chu, Lamott, and Atayee, 2013). Also, many patients have expressed receiving insufficient pain relief medication by other routes (Jahansouz et al., 2013).

The Sapphire PCA pump equipment permits the delivery of analgesic drugs such as Morphine and Dilaudid (Ferguson et al., 2010). The devise provides a basal infusion rate, a bolus dosage and a patient's bolus, which is initiated by the patient every time they push a button on the handle; therefore, patients must be educated in how to self-administer the medication (Ferguson et al., 2010). Regarding the usage of this pump, the nurses must be able to follow the

steps in order to preserve safety for both the patients and the nurses themselves, as the pump has several steps to follow.

In this pump, there is also a lockout period in which no bolus dose can be delivered even when the patient pushes the button (Ferguson et al., 2010). This lockout period preserves safety and avoids accidental overdose of the medication (Ferguson et al., 2010). Also, this system locks automatically, and the nurse must always use the password to unlock the pump before changing any parameters (Ferguson et al., 2010). One of the most important and consistent features of the Sapphire PCA system is that it provides patient control with regard to their pain management as well as giving them the autonomy to be part of their own care (Imantalab, Mirmansouri, Mohammadzadeh Jouryabi, Naderi Nabe, Kanani, Nassiri Sheikhani, Atrkarroushan, Ghazanfar Tehran, and Samadpour, 2017). This autonomy is important because it links the patient with their own medical care.

With regard to this project, after being briefed with regard to the problems related to the use of Sapphire PCA pump, our team performed and conducted a pre-assessment, which included an initial survey and interviews with the nurses (See Appendix B). This interview phase allowed us to determine the percentage of nurses who used the Sapphires PCA pump and the nurses who never used the pump before (Nelson, Batalden, and Godfrey, 2007). The survey also provided answers to other questions that were pertinent in compiling our data. According to Lockhart (2006) and Bluestone, Johnson, Fullerton, Carr, Alderman, Bontempo (2013), the need assessment is the first step necessary in order to plan for the education.

After the pre-assessment phase, we proceeded with the in-service training along with the collection of post-assessment surveys after each training session (See Appendix D). According to Lockhart (2006) and Bluestone et al. (2013) the educational training promotes staff development

roles and is also effective in assembling the knowledge needs of nurses to improve their nursing practices (Imantalab et al., 2017). This in-service education allowed us to know the nurses' confidence level while programming the pump and what to document. It also allowed us to identify the major concerns the nurses had while using the Sapphire PCA pump. As a result, a root cause analysis chart (See Appendix C) was created so that the appropriate interventions could be delivered in relation to the Sapphire PCA pump procedure (Nelson et al., 2007).

Literature Review

I conducted a literature review to compile evidence-based practice articles regarding the effective use of the Sapphire PCA pump, effective patient pain management, and other safety concerns. The University of San Francisco library databases, Pub-Med, Google Scholar, Cochrand database, and CINAHL were used to find a multitude of review journals and articles to write this paper.

There was some commonality in the literature which showed that in-service training of the nurses provides the focus on competence assessment and development (Imantalab et al., 2017). In this sense, it imperative to provide nurses with training on the new introduced equipment so that they will provide quality and safe care to a patient. In addition, the staff development is described as "the process of assessment, development, and evaluation that enhances the performance or professional development of healthcare providers and their continuing competence" (Bluestone et al., 2013). Educating nurses on how to use the Sapphire PCA pump contributes to the development of nurses, as well as their core competencies.

Moreover, Ferguson et al. (2010), pointed out that when a new equipment or tool is to be introduced into a hospital, the representatives from the company and the educators from that hospital will conduct an education to confirm initial staff competency.

Subsequently, the multidisciplinary team at the medical centers designates the units that will be frequently using the pump so that nurses receive training to improve their proficiency in programming the PCA pump (Ferguson et al., 2010). When nurses master the Sapphire Infusion PCA pump application they will be able to provide quality and safe care to patients (Institute of Medicine, 2000). Ferguson et al. (2010), also stated that some of the adverse effects with regard to the PCA pump use could be due to insufficient monitoring of the patients, improper programming of the pump, as well as lacking patient education.

Studies by Ferguson et al. (2010), Bluestone et al. (2013) and Institute of Medicine (2000) show that the most important safety concerns regarding the pump are medication errors such as under-sedation, in which the patient will experience pain, and over-sedation that could result in respiratory arrest and death. As patient safety is the number one priority for healthcare professionals, nurses must follow procedures and be competent in using the pump (Institute of Medicine, 2000). This could be accomplished if nurses are thoroughly trained on the correct usage of the pump. Recent studies by Ferguson et al. (2010) indicated that there is the incidence of PCA errors that ranges from 1% to 8%, which is moderately low and often these errors have insignificant injurious outcomes.

In addition, Ratrout, Hamdan-Mansour, Seder, and Salim (2014) pointed out that the PCA utilization had helped decrease the levels of a patient's pain after an invasive procedure. It has led to greater patient satisfaction, decreased the quantity of sedation requirement, and avoided more pronounced complications. According to Jahansouz et al. (2013) the Sapphire PCA pump device provides, and ensures, one convenient way to meet the goals of patient outcomes. Furthermore, Imantalab et al. (2017) affirmed that when patients are educated with regard to how to use the PCA handle they can self-administrate a medication bolus already programed to

manage their pain level. The author pointed out that when patients' pain is not managed, it could lead to negative consequences such as hyperglycemia, insulin resistance, infections, and increased patient discomfort (Morlion, Schäfer, Betteridge and Kalso, 2018). According to Morlion et al. (2018) pain control is a vital and substantial contributor of a patient's physiological and psychological healing, as well as improving the patient's quality of life, diminishing longer-term costs of care, and, in general, leads to the best clinical practice. If pain is uncontrolled, it may lead to the decline of a patient's condition.

Problem Statement

The medical centers targeted for the quality improvement project previously used the Lifecare PCA syringe pumps which will be replaced by the Sapphire ™ Infusion System PCA pump. This pump was temporarily utilized at this hospital to control and manage a patient's pain; therefore, all of the nurses didn't receive training; some have not been exposed to the pump and other nurses have used the pump only sporadically. As the Sapphire PCA pump is going to be used permanently, the nurses need more education with regard to its application so as to prevent medication errors and for the effective control of patients' pain. As MSN/CNL students, our quality improvement project was to educate nurses using the previous educational resources as guidelines and then create new guidelines for implementation.

Methodology

Lippitt Change Theory

With regard to this quality improvement project, Lippitt's change theory was utilized for educational purposes. This model of change entailed seven stages, which included diagnosis of the problem, review reason and competency for change, evaluate the change agent's inspiration and resources, select gradual change purposes, describe the role of the change agent, preserve

change by enabling response, and progressively conclude the helping relationship of the change agent (Lippitt, Watson, and Wesley, 1958). With regard to the above, we were able to conduct a microsystem assessment and a root cause analysis to clarify the problem. The change with regard to this project was to provide in-service training to nurses in this unit regarding the Sapphire PCA pump. After each training session a post-survey was given to nurses for evaluation.

Microsystem Assessment

It was noted that even though this quality improvement project was conducted in various units at this hospital, the microsystem that was chosen for the assessment was the oncology pulmonary acute care inpatient unit. This unit assessment involved examining the "5Ps" of the unit which included the purpose, patients, professionals, processes, and patterns, all of which allowed us to recognize this milieu so that an efficient implementation could take place (Nelson et al., 2007).

Purpose:

The Sapphire PCA pump is used in the oncology pulmonary acute care inpatient unit to provide high alert medication such as Morphine and Dilaudid to patients to control their pain, especially after an invasive procedure or when the patient's pain cannot be managed by other measures. When this pump is being used on the patients, nurses should closely observe them to prevent any adverse effects, with the purpose of maintaining patient safety and comfort.

Patients:

In this hospital microsystem unit, there are 30 beds total with 8 private and 22 semi-private beds. The nurse to patient ratio is one nurse to four patients, and sometime one to five when there is no patient under telemetry monitoring. Patients who are usually

admitted to this unit are the ones who are diagnosed with oncology diseases, pulmonary (pneumonia, COPD, asthma), cellulitis, and diabetic/wounds.

Professionals:

This oncology pulmonary acute care inpatient unit included the physicians and nurse practitioners that are the primary doctors who prescribe medications on behalf of the patients. The nurse managers oversee the nursing staffs' work in the unit and also make sure the patients are receiving the care they need. Nurses provide daily assessment, intervention with regard to medication administration, and continue to evaluate the patients. Additional professionals include LVN's, CNA's, unit secretaries, physical therapists, occupational therapists, speech therapists, respiratory therapists, nutritionists, spiritual services, case managers, social workers, lift team, phlebotomy, SWAT, and line's team.

Processes:

As the Sapphire PCA pump will be a permanent tool in this hospital to deliver high alert pain medication, the nurses were provided educational training to give them the opportunity to practice using the pump and ask questions during the training. The PDS supports the use of PCA pump and unit-based in-services training which is included in the departmental orientation process.

Patterns:

This hospital metric measurement uses nurses' sensitive metrics such as falls, HAPI, CLABSI, CAUTI, C-Diff, hand hygiene, opioid pre/post assessment, mislabeled specimen, RN communication, patient experience, length of stay, and readmissions for overall evaluations.

Root Cause Analysis

The implementation of a root cause analysis afforded the opportunity to establish the cause and effect factors with regard to the use of the Sapphire PCA pump. This root cause analysis provided several illuminating factors (Nelson et al., 2007 and King et al., 2016). First, the Sapphire PCA pump is different from the previous PCA pump; it is a newly introduced pump that is unfamiliar to some nurses; it is complicated to use; has unclear charting in Epic; and several nurses were uncomfortable with regard to setting up the pump. As a result, this created some effects, as follows: potential impact regarding patient safety, incorrect documentation, incorrect shift change reports concerning pain medication, patient pain management delayed, and lack of confidence on the nurses' part with regard to the general usage of the pump (See Appendix C, for root cause analysis). With this in mind we examined the findings of the root cause analysis with the pre-survey data with the purpose of providing proper education to the nurses.

Implementation

Before we proceeded to implement training on the units, we met with the educators and our clinical instructor to discuss how this educational session was going to be conducted. Then we received resources regarding the Sapphire PCA pump training from the educators and our clinical instructor and utilized this information to set up our plan. The survey questions were generalized from Nelson's et al. (2007) book. We started with a pre-survey assessment to find out the percentage of nurses who had this educational training before and who didn't, and how they felt about having training with regard to utilizing this pump. We, as a team, received training so that we could successfully implement this project. A flier was created, designating which units would be receiving this in-service education.

The most important elements to determine during the initial implementation was to find out who had used the pump before and who did not. Another factor was to completely answer the questions given on the pre-survey**.** In both campuses, nurses (n= 286) were pre-surveyed to determine their knowledge regarding the usage of the Sapphire PCA pump and (n=99) nurses were post-surveyed. From both campuses, data from the oncology pulmonary acute care unit at this hospital was selected for microsystem purposes. Throughout the process of this quality improvement project a timeline was utilized (See Appendix A).

Cost Analysis

The implementation process of educating nurses on how to use the Sapphire PCA pump effectively should not have accrued a cost for the hospital since CNL students organized and implemented this education. If nurses who received the education with regard to the Sapphire PCA pump are able to use it effectively it will control patients pain and help prevent other health complications. In this sense, there will be better outcomes for patients, as well as for the hospital in general because it will decrease patient readmissions (Nelson et al., 2007)

Results

The results from the data were adapted from Nelson's book (Nelson's et al., 2007). With regard to the initial assessment for both medical centers, we surveyed (n=286) nurses in which 40.2% expressed not having had exposure and 59.8% had exposure to the Sapphire Infusion. pump; also, 65% didn't receive training; 62% had difficulty operating the pump (See Appendix E and G). Also, when the nurses were surveyed on questions 4 and 5 the results showed that 44% were at 80-100% confident (See Appendix E). With regard to the post survey, (n=99) nurses were surveyed in both medical centers. Of the 80% who received the training, 80-100% expressed definitive confidence in being able to effectively use the Sapphire Infusion PCA Pump

and included in the data, 98% of nurses found the in-service helpful. There was a 36% increase in nurses who were 80-100% confident they had learned how to effectively use the pump as a result of the in-service training.

Also, the results showed that in both medical centers there was a considerable gain in understanding of how to use the PCA pump from the pre-survey to the post survey responses when the nurses were asked to scale from 1 to 5 how comfortable they now were with regard to using the pump (See Appendix F). From the nurses' responses to these questions, a greater gain was reflected in questions 1 to 5. All of these reflected a gain of 90% or higher. The lowest gain was reflected in questions 6 (67.63%), 8 (31.49%), 9 (15.82%) and 7 (12.31%) (See Appendix F). The overall average of all the questions was 58.5% which still reflects a considerable amount of improvement, understanding, and competency with regard to the Sapphire PCA pump in the nine-question survey metric.

Finally, with regard to the guidelines of the quality improvement project, we selected a microsystem Oncology Pulmonary Acute Care Inpatient for assessment. With regard to the initial assessment, 46.2% of nurses expressed not having had exposure, and 53.8% had exposure to the Sapphire Infusion pump (See Appendix I). Afterwards, the data from the unit oncology pulmonary acute care inpatient unit at this medical center B was collected and the results showed that nurses were at an 80% to 100% confidence rate in answering questions 4 or 5 of the survey (See Appendix H).

For the educational training, nurses were provided in-service training and it was followed up with post-survey questions. After the nurses received the training, we compared the pre-survey assessment to the post-survey assessment, which showed that the in-service training was going well. The results reflected a considerably higher gain of more than 100% from the pre-

survey to the post-survey questions (nine-question metric) with the exception of questions 6 and 9 (See Appendix F). These results are significant and show definitive improvement, understanding, and reflect the growing comfort level of the nurses with regard to operating the Sapphire PCA pump.

The post-survey results lead to the conclusion that patients will have a better outcome when receiving their pain medication using the Sapphire PCA pump. According to Bluestone et al. (2013), providing an educational program for nurses is paramount and significant for nurses' development and competency. Unfortunately, the results from the data collected from this oncology pulmonary acute care unit educational training are incomplete because several nurses did not receive the in-service training due to a sudden termination of the project. Overall, though, the project seems to be running successfully.

Clinical Nurse Leader Relevant

This quality improvement project gave the CNL students the opportunity to perform the role of a CNL. According to Jukkala, Greenwood, Ladner, and Hopkins (2010) a CNL is "a clinician, an advanced generalist, an outcomes manager, an interdisciplinary care team manager, a patient advocate, information manager, and an educator." This means that the CNL has the opportunity to work at the microsystem level by utilizing evidence-based-practice on every intervention.

Discussion/Limitations

This quality improvement project was to educate nurses in the proper use of the Sapphire PCA pump. During the training, most nurses showed genuine interest in learning how to use the pump. Graphs showed that nurses were applying information effectively. Unfortunately, the project showed some limitations. Some nurses needed more instruction and help than others and

some nurses didn't receive enough information at one time, and reteaching was necessary. Other nurses were not available when we were ready for the training sessions. Also, periodically it was a challenge to get nurses to complete the pre-surveys and post-surveys. Another weakness was the inconsistency with regard to the documentation requirement on epic using information from the Sapphire PCA pump. Also, nurses had concerns as to whether the shift total would be calculated every 8 hours and every 12 hours. It was also challenging to provide training to float nurses due to their variable schedules.

In addition, the project was terminated at the in-service phase before its completion due to the coronavirus pandemic, which has devasted the world as a whole. However, the project phase that was accomplished suggested that this educational project was significant for the nurses. As the project was left unfinished during the in-service phase, our team made a video with instruction on how to use the Sapphire PCA pump and has been made available to the nurses for educational purposes. The video includes some answers to questions related to a certain phase of programing the pump. Hopefully, this video will be used by nurses who haven't yet become competent in the application of the PCA pump. With reference to the graphs, it is obvious that educating the nurses in the proper use of the Sapphire PCA pump is a worthy enterprise and leads one to believe that if we had finished the educational process the percentage increases would had been even higher.

Future recommendations

We recommend that the upcoming CNL students continue with the in-service for units in which we were not able to complete this educational training. Then they can evaluate the project for the effectiveness of the training and provide any necessary interventions that are needed. The Sapphire pump in-service should be standardized and be conducted every 2 years so that the

nurses develop their skills and maintain competency using it. It is also important to provide online assessment surveys that the nurses will use to continue to keep track of their progress, and a Sapphire pump competency checkoff should be created for the units who frequently receive patients with the PCA. Finally, we recommend that the CNL students do an evaluation to find out if there are improved patient outcomes, including decreased medication errors, improved pain management, and increased patient satisfaction.

Conclusion

This quality improvement project on educating nurses at the hospital, in how to use the Sapphire PCA pump, was very beneficial for both the nurses and the educators (nursing students). First, it was important for nurses to acquire this skill so that the patients' pain level could be managed. In addition, nurses mastering the application of the pump will help prevent medication errors, leading to diminished suffering of the patients. The overall project was a great learning experience for both students and nurses. Also, the knowledge that I acquired with regard to the application of the Sapphire PCA pump will benefit me in my future career as a nurse. Again, even though the project was terminated, the data showed increased knowledge with regard to the proper use of the Sapphire PCA pump.

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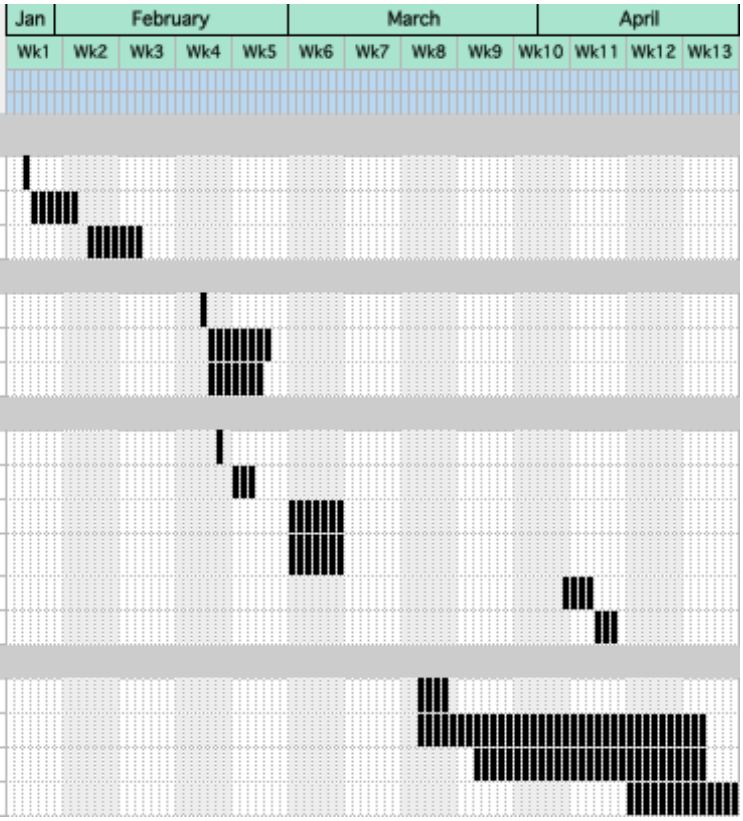
Appendix A

Timeline

Project Implementation Timeline Completion from January to April

TASK TITLE	START	END	DURATION
Identification of Problem			
Initial Meeting with Stakeholders	1/29	1/29	1
Development of Pre-Survey	1/30	2/3	3
Staff Pre-Surveys	2/5	2/12	7
Project Definition and Planning			
Follow-up Meeting with Stakehol	2/19	2/19	1
Review of Literature	2/20	2/27	7
Education Plan	2/20	2/26	6
Project Conception and Initiation			
Sapphire Pump Education Trainir	2/21	2/21	1
Script	2/23	2/25	3
Sapphire Pump Inservice	3/1	3/7	7
Sappire Pump Post-Survey	3/1	3/7	7
Updates to Video Script	4/4	4/7	4
Film and Edit Educational Video	4/8	4/10	3
Project Performance / Monitoring			
Data Analysis	3/17	3/20	4
Sapphire Team Collaboration	3/17	4/21	35
Meetings with Project Advisor	3/24	4/21	28
Project Presentation Developme	4/12	4/25	14



Appendix B

Nurses Pre-Surveys Interview Sample

1.Have you used the Sapphire Infusion Pump before?

- ❑ Yes
- ❑ No

If no, have you heard anything about it?

_____

_____

1. Have you ever attended a Sapphire PCA Pump training session?
   - ❑ Yes
   - ❑ No

2. On a scale from 1-5, how comfortable are you with:
   a) Priming the Sapphire Infusion Pump? Least **1 2 3 4 5** Most
   Which method of priming do you most often use?
      - ❑ Manual
      - ❑ With the device
   b) Loading the cassette? Least **1 2 3 4 5** Most
   c) Programming an infusion? Least **1 2 3 4 5** Most
   d) Updating infusion parameters? Least **1 2 3 4 5** Most
   e) Administering clinician bolus? Least **1 2 3 4 5** Most
   f) Documenting/clearing shift totals? Least **1 2 3 4 5** Most

3. Have you had any difficulties operating the Sapphire Infusion Pump?
   - ❑ Yes
   - ❑ No

   If yes, please explain: _____
4. What safety issues or concerns have you noticed while using the Sapphire Infusion Pump?

   Please explain:

_____

5. Where/how do you chart your shift totals for the Sapphire Infusion Pump?
   Please specify:
   _____
   _____

6. Have you found any workarounds related to any of these reasons while using the Sapphire Infusion Pump?
   - ❑ Securing the pump to a pole
   - ❑ Opening the side compartment
   - ❑ Programming the pump
   - ❑ Switching to continuous infusion
   - ❑ Pausing the pump
   - ❑ Calculating shift totals
   - ❑ Clearing shift totals
   - ❑ Administrating clinician bolus
   - ❑ Other: _____

7. How confident are you in performing manual medication calculations and calculating a dosage given in milliliters if need be?

   Least **1** **2** **3** **4** **5** Most

8. How user-friendly do you find the tip sheet layout attached to the Sapphire Infusion Pump?

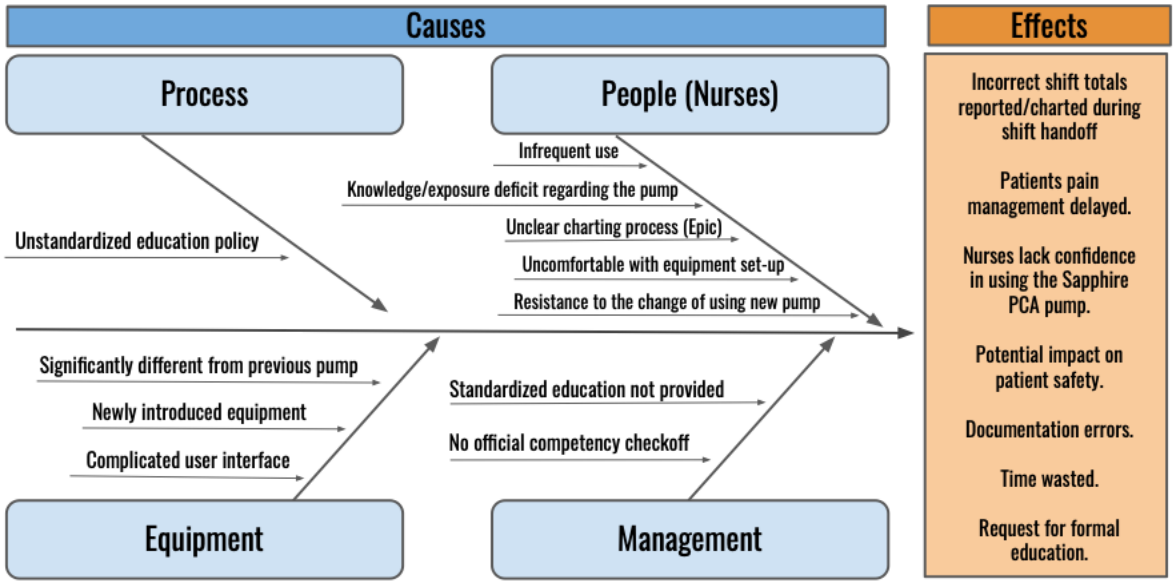
   Least **1** **2** **3** **4** **5** Most

9. On a scale from 1-5, in your opinion, how effective is the Sapphire Infusion Pump in general?

   Least **1** **2** **3** **4** **5** Most

Appendix C

Root Cause Analysis Fishbone



Appendix D

In-service Post-Survey

Interviewer: _____Campus: _____Unit: _____RN Name: __

1. Have you used the Sapphire Infusion Pump prior to this inservice?

❑ Yes

❑ No

2. Have you had any difficulties operating the Sapphire Infusion Pump during this inservice?

❑ Yes

❑ No

3. Now that you have been introduced to the steps to using the pump, do you feel comfortable using it on your own?

❑ Yes

❑ No

If no, please explain: _____

4. On a scale from 1-5, how comfortable are you with:

a) Priming the Sapphire Infusion Pump? Least 1 2 3 4 5 Most

After the in-service, which method of priming are you more likely to use?

❑ Manual

❑ With the device

b) Loading the cassette? Least 1 2 3 4 5 Most

c) Programming an infusion? Least 1 2 3 4 5 Most

d) Updating infusion parameters? Least 1 2 3 4 5 Most

e) Administering clinician bolus? Least 1 2 3 4 5 Most

f) Documenting/clearing shift totals? Least 1 2 3 4 5 Most

PLEASE SEE OTHER SIDE →

5. What safety issues or concerns are you still having post in-service?

Please explain:

_____

6. Following in-service, is the hospital policy on when/where to document PCA shift totals clear?

❑ Yes

❑ No

If no, please specify:

_____

7. How confident are you in performing manual medication calculations and calculating a dosage given in milliliters if need be?

Least 1 2 3 4 5 Most

8. How user-friendly do you find the tip sheet layout attached to the Sapphire Infusion Pump?

Least 1 2 3 4 5 Most

9. On a scale from 1-5, in your opinion, how effective is the Sapphire Infusion Pump in general?

Least 1 2 3 4 5 Most

10. Do you think the in-service provided was helpful towards your understanding of the Sapphire pump?

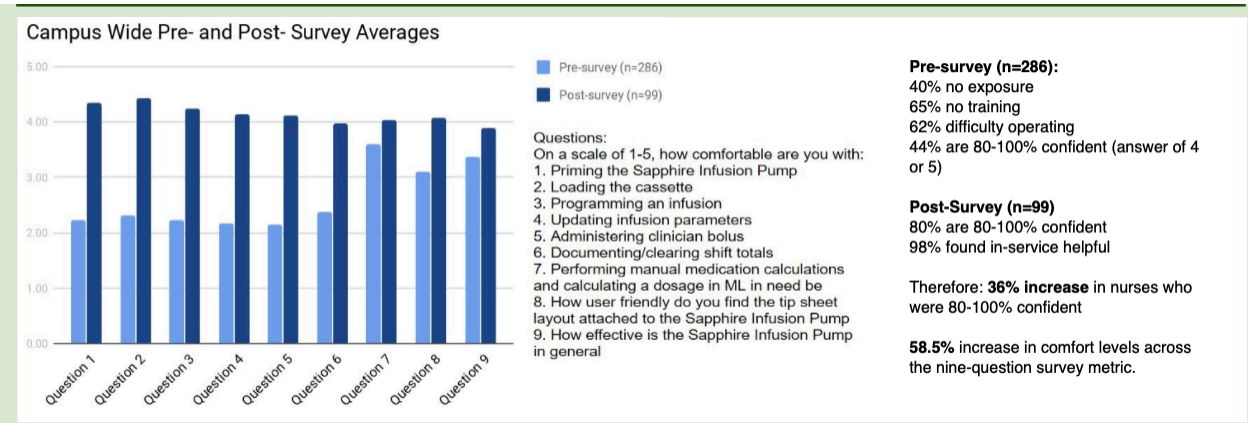
❑ Yes

❑ No

11. Please specify any additional questions/concerns regarding the use of the Sapphire pump: (include official John Muir Health email)

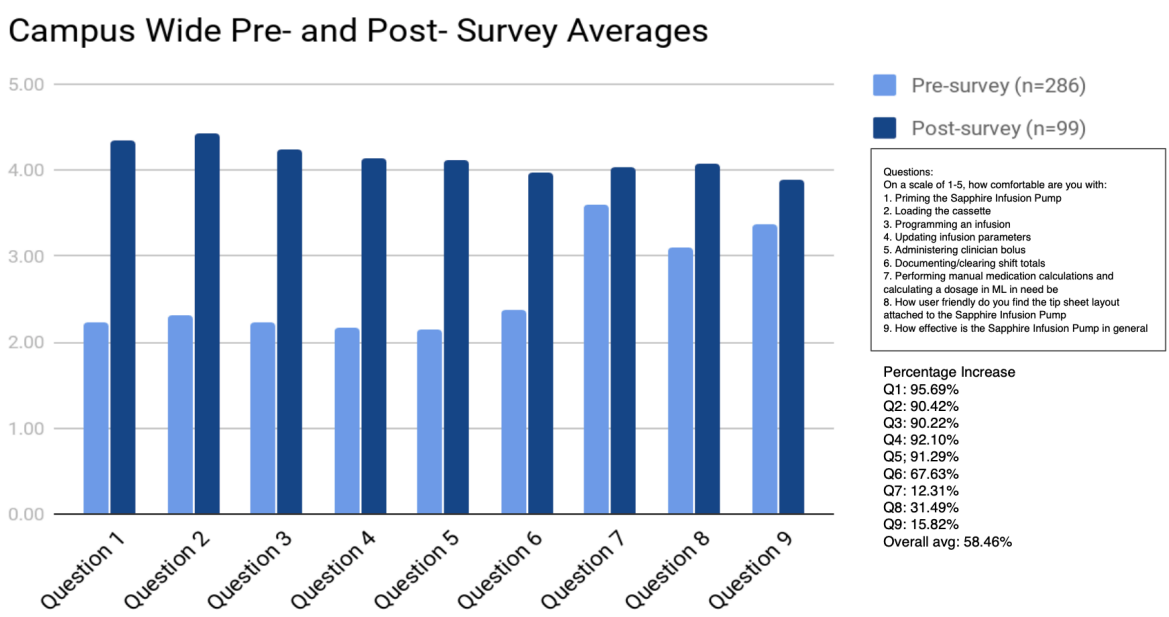
Appendix E

Both Campuses Pre and Post-Survey Graph Averages

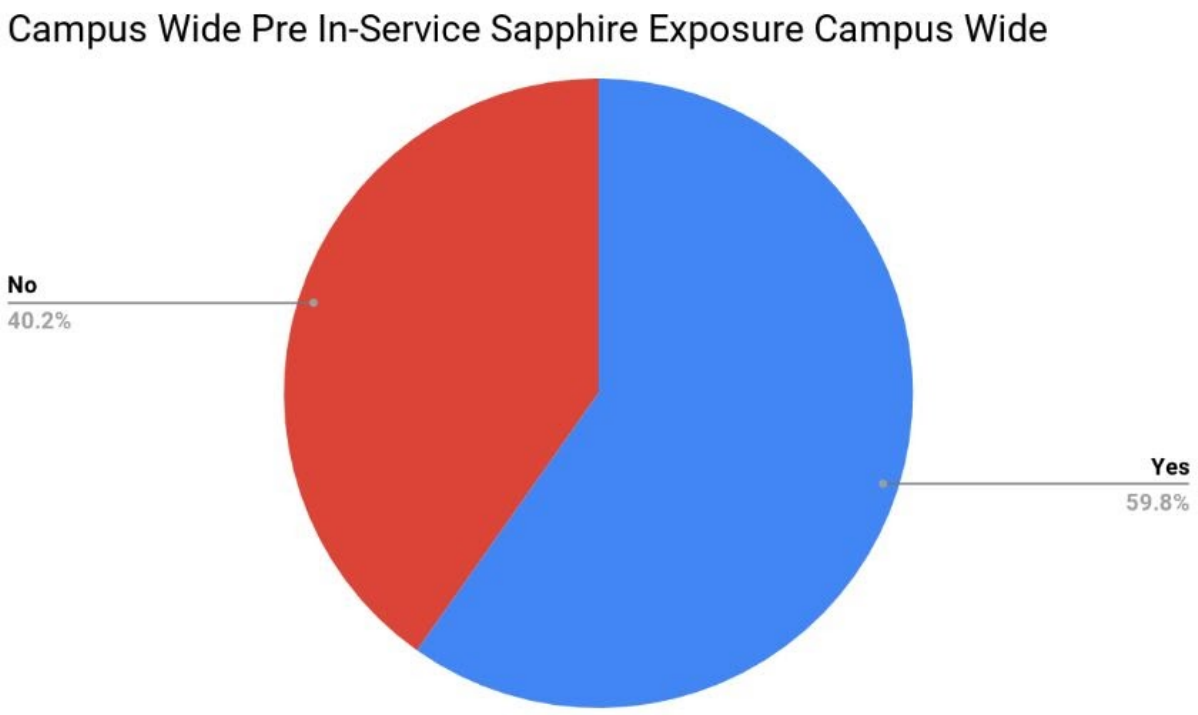


Appendix F

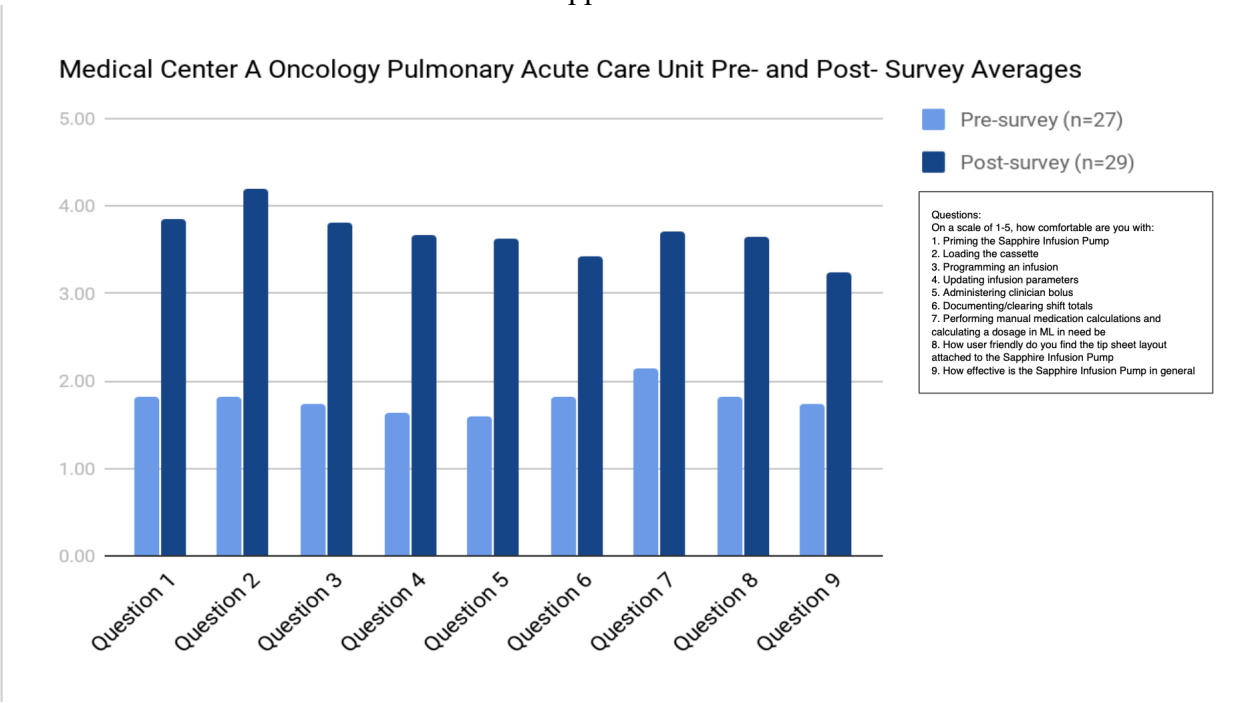
Both Campuses Pre and Post-Survey Graph Averages



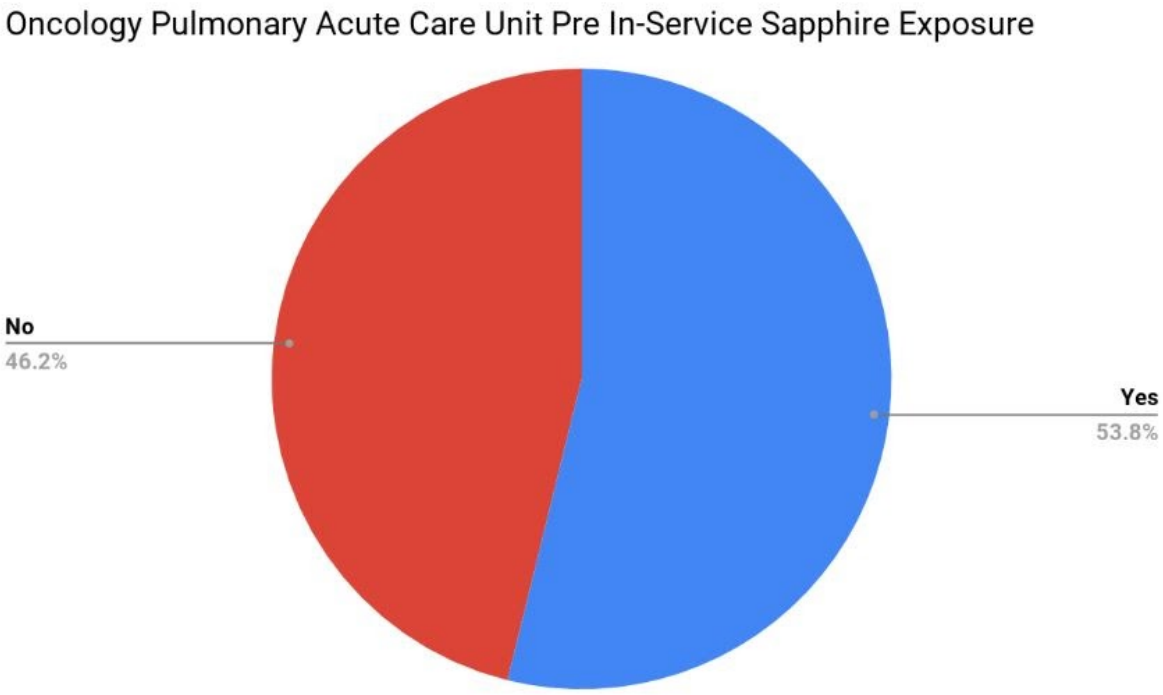
Appendix G


Campus Wide Pre In-Service Sapphire Exposure Campus Wide
No
40.2%
Yes
59.8%

Appendix H


Medical Center A Oncology Pulmonary Acute Care Unit Pre- and Post- Survey Averages
5.00
4.00
3.00
2.00
1.00
0.00
Question 1
Question 2
Question 3
Question 4
Question 5
Question 6
Question 7
Question 8
Question 9
Pre-survey (n=27)
Post-survey (n=29)
Questions:
On a scale of 1-5, how comfortable are you with:
1. Priming the Sapphire Infusion Pump
2. Loading the cassette
3. Programming an infusion
4. Updating infusion parameters
5. Administering clinician bolus
6. Documenting/clearing shift totals
7. Performing manual medication calculations and calculating a dosage in ML in need be
8. How user friendly do you find the tip sheet layout attached to the Sapphire Infusion Pump
9. How effective is the Sapphire Infusion Pump in general

Appendix I


Oncology Pulmonary Acute Care Unit Pre In-Service Sapphire Exposure
No
46.2%
Yes
53.8%