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Improving the Timing of Antibiotic Administration in High-Risk Neonates

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Abstract

There is limited available data on the efficacy of prompt antibiotic administration in high-risk neonate populations. Pre-mature and immunosuppressed infants are high-risk to infection; therefore, the timeliness of antibiotic administration must be considered as a standard practice in neonatal intensive care unit (NICU). This project focuses on administering an antibiotic within one hour from the time its administration is ordered by a physician. A review of 38 patient charts was done and only shows 22% of Ampicillin and 20% of Gentamicin were given within 1 hour. The rapid nurse turnover and improper use of the golden hour flowsheet are some of the factors that affects the timing of antibiotic administration. The staff were re-oriented on how to use the flow chart and how role delegation works per said flow chart. Mock codes drill on high-risk admissions were performed on skills day. A chart review of all high-risk admissions from February 2018 will be checked for the timing of ordered antibiotics. After the project was implemented, 46% of Ampicillin was given within 1 hour, and 39% of Gentamicin was delivered within one hour, an increase from 20% before the project began. Additionally, this project will support the golden hour checklist and will seek to re-educate nurses on the urgency and priority with which antibiotic administration must be treated. The stated goal of this project is to increase from its current state of 20% to 60% by July 2018.

Introduction

While there are few existing studies conducted on neonatal populations, the Surviving Sepsis Campaign recommends administration of empiric antimicrobial therapy within 1 hour of recognition of severe sepsis or septic shock in adult and pediatric patients (Seeling, Eggers, & Spies, 2008). With premature neonates, it is essential that we take into consideration the timing of

antibiotic administration. The Institute of Medicine suggests that 1 of 6 broad aims to improve delivery of healthcare is that it be "timely", which is defined as reducing waits and harmful delays for those who receive or give care (Bissinger et al., 2013). Delaying antimicrobial therapy beyond 3 hours from sepsis recognition was recognized as an independent risk factor for mortality and prolonged organ failure in severe pediatric sepsis and septic shock (Kumar et al., 2006).

Nurses must have a sense of urgency when physicians place orders for antibiotics. Given the correlation between prompt antibiotic administration and positive outcomes, promptness of administration should serve as a benchmark for quality of care. Adult studies of antibiotic timing in meningitis, pneumonia, and septic shock indicate that early treatment was associated with survival and decreased length of stay (Battleman, Callahan, & Thaler, 2002). Additionally, the timely administration of antibiotics makes sense from a broader clinical perspective, as killing infectious microorganisms and the reduction of bacterial load within a microsystem can improve infection control broadly. The foundation of this project will lie in identifying the obstacles to timely administration of antibiotics and using said obstacles to direct the design of new processes to help achieve the stated objective of 60% compliance.

Problem Description

The medical center is a general medical and surgical hospital located in San Francisco, CA. It is a Level 3 hospital, serving the city and the greater San Francisco area with 215 beds. One of the specialty units in the hospital is the neonatal intensive care (NICU). The unit has 22 beds; 2 of them are designated as isolation rooms. The NICU has an average of 900 admissions per year, of which 56% are male and 44% are female infants. 90% of the admissions are born in the hospital and the rest are transfers from both member and non-member hospitals.

In the past year, there has been an influx of newly hired nurses and travel nurses. Many nurses transferred to different shifts within the NICU when available positions arose. Still, there is a high level of collaboration and rapport between the doctors and the nurses. A pharmacist dedicated to the unit plays an important role in the team as well. The NICU pharmacist's role is significant given that when questions arise regarding medications, he or she is the person of first contact. He or she can facilitate the release of medications in emergency situations, including but not limited to those that might become vital for an admitted high-risk infant.

After interviewing doctors and nurses, the general consensus is that role delegation is often not implemented as intended, or goes undocumented. Nurses also lack the commensurate sense of urgency warranted by the importance of timely antibiotic administration in high-risk patients. The golden hour flow sheet is a time lined workflow that guides staff on what interventions should be completed from the time the baby is born to the time the bed isolette is closed. The goal of the golden hour is to ensure the completion of all tasks needed from birth to the closing of the isolette in under 1 hour. The administration of the antibiotics, if prescribed, is one of the tasks included in the golden hour flow sheet. When roles are not properly assigned and staffed, tasks - which should have been designated to a nurse - are more likely not to be completed in a timely manner. The new nurses and the rapid turnover of travel nurses likely contribute to difficulties in both role delegation and as a consequence, antibiotic administration. The majority of the travel nurses are not familiar with nor have been properly oriented on workflow processes required when admitting a high-risk infant.

Finally, a review of electronic health records was undertaken to establish baseline data regarding the timing of antibiotic administration. 38 patient medical records were reviewed. In this sample, only 22% of Ampicillin and 20% of Gentamicin was given within 1 hour after ordered by

a physician. The target goal of the project is 60% by July 2018. It is an expectation that all antibiotics are given promptly. A 20% compliance is a significant gap in quality performance. High-risk infant admissions are classified as infants younger than 32wks, below gestation, or less than or equal to 1500 gm of birth weight.

Available Knowledge

A review of available literature was conducted by answering the following PICO question: In high-risk infants (P) does administration of antibiotics within 1 hour (I) or not (C) decrease the hospital length of stay (O). An electronic search was conducted pursuant to this question in March 2017 in the Cochrane Database of Systematic Reviews, CINAHL Complete, and PubMed databases using a combination of the following search items: timing, antibacterial agents, administration, neonates, infants, antibiotics, and time factor. Limitations were as follows: include only English, research, and publication dates with no limitations. The search yielded 124 articles, some of which are included in this review (see Figure A).

Premature and immunocompromised neonates are susceptible to infection and do not necessarily present with any signs of illness. Often, high-risk infants have interventions and invasive procedures done in the delivery room or operating room before they are admitted to the neonatal intensive care unit (NICU). Many steps involved in the acute, post-delivery care of newborns are high-risk. These include but are not limited to performing resuscitative measures, securing intravascular access, and obtaining culture specimens. All such measures may forestall antibiotic administration (Weiner, Barks, Wright, & Faix, 1998). There is no published data or practice guideline that delineates antibiotics should be administered within an hour, but it is a standard of practice that antibiotics should be administered promptly in any NICU. Delay in the initiation of appropriate antibiotic therapy has been recognized as a risk factor to infant mortality

(Ferrer et al., 2014). This assumption is not new; Ehrlich's concept of "hit hard and fast" was described over a hundred years ago (Ehrlich, 1913).

The initiation of antimicrobial therapy in newborns with suspected sepsis at birth frequently takes several hours (Weiner et al., 1998). Given there are many measures of initial care taken for high-risk infants, such as IV access, fluid administration, and blood culture and other laboratory tests collection, it is important to also prioritize and cement the centrality of timely antibiotic administration. To understand the problem further, an assessment of potential causes for delay was conducted by interviewing team members. Feedback gathered from debriefing after high-risk admission also illustrated potential reasons for delays. It is recognized that some of the delays that occurred in the observed unit were due to lack of intravenous access in cases where UA/UV line placement was unsuccessful. However, absent such cases, nurses were expected to act with a sense of urgency when the physician placed an order for antibiotics and attempted to place an intravenous access without delay.

The relationship between prompt antibiotic administration and better outcomes establishes timeliness of administration as a benchmark for quality of care. A retrospective cohort study of patients with septic shock conducted in the United States and Canada found that effective antimicrobial administration within the first hour of documented hypotension was associated with a rate of 79.9% survival to hospital discharge (Kumar et al., 2006). Even modest improvements in timeliness of antibiotic administration are thought to benefit patients (Houck, Bratzler, Ma, & Bartlett, 2004). While studies in neonatal population are limited, the impact and benefits of prompt antibiotic administration almost certainly affect the infant's health outcomes.

There are no neonatal studies that focus on the timing of antibiotics ordered. High-risk infants, such as those that are premature and immunocompromised, should have improved health

outcomes with improved timing of antibiotic administration. Evidence from both the pediatric and adult group exemplifies that prompt antibiotic administration increases the rate of survival and decreases the length of a hospital stay. The benefits of timely antibiotic administration were even noted a hundred years ago (Ehrlich, 1913). Evidence-based literature from pediatric and adult studies highlights the timeliness of antibiotic administration in high-risk infants and supports the fact that this should be a standard of care.

Rationale

In this project, Lippitt's theory of change will be the guide on how to generate change and achieve goals. Lippitt and colleagues extended Lewin's three-step change theory to seven steps, placing greater emphasis on the role and responsibility of leaders as change agents rather than on the evolution of the change itself (Lippitt et al., 1958). Lippitt's seven steps of change illustrate the role the CNL plays in planning, integrating, and sustaining change. Lippitt's seven steps change theory is comparable to the nursing process. The first three steps to establish awareness of the problem and assessment of motivation and resources. Steps four and five correspond to selection of strategies and action plans, as well as evaluation of the role and responsibilities of the change agents. Lippitt's implementation and evaluation stages are steps six and seven, which include the integration of strategies to prevent a return to previous practices. Lippitt's change theory is likely to be highly useful to nurse managers because it incorporates a detailed plan on how to generate change and is supported by the four elements of nursing process: assessment, planning, implementation, and evaluation (Pearson et al., 2005). Lippitt's theory, coupled with the vision and support of unit leaders and care providers, will improve the chances of a successful outcome for this project.

With the evidence-based literature and guidance of a CNL, improving practice is achievable. One important leadership responsibility of the CNL involves knowing when to make a change. Change are actions intended to achieve specific goals. To achieve the intended goals of this project, there must be a clear understanding of the present state, in which we have identified that there are frequent delays in antibiotic administration. The desired outcome is to increase the promptness of administration. The process of change will be facilitated by a proven change theory. It is important that managers and change agents alike identify an appropriate change theory or model to provide a framework for implementing, managing, and evaluating change (Pearson et al., 2005). In this project, the admission process will be evaluated to identify barriers that prevent timeliness of antibiotic administration. Understanding deficiencies in this process will facilitate the implementation of change needed for improvement.

Specific Aims

The specific aim of this project is to improve the compliance of antibiotic administration within one hour on high-risk neonates from 20% to 60% by July 2018. This project also intends to educate nurses on the importance of prioritizing antibiotic administration to high-risk infants.

Context

The assessment of a clinical microsystem is the beginning of that system's improvement journey (Nelson, Batalden, & Godfrey, 2007). The data gathered in the NICUs microsystem assessment shows its unique components and functionality. The observed microsystem is a 22 bed, level 3 NICU unit. The average admission rate is 900 babies a year. Among babies admitted last year, 56% were male and 44% were female. The age distributions were as follows: 50% were 35wks and above, 45% were 28wks-35 wks old, and 5% were 28wks and younger. 90% of the admissions were born in this medical center. The team is composed of nurses, doctors, respiratory

therapist, and non-medical staff. There is a high level of collaboration between the doctors and the nurses. During the day, there is pharmacist on-site who is dedicated to the NICU. Once a week, a speech pathologist is on-site, and an occupational therapist comes into the NICU with referrals. An analysis of the strengths, weaknesses, opportunities, and threats (SWOT) reveals the unit's capability to be successful in this improvement project (see Figure B). All factors will be integrated into the workflow to seek areas that need more effort for improvement.

A business plan for this project was created to show the estimated costs and the return on investment (see Figure C). The budget needed for this project consists of the overtime pay needed to compensate nurses for attending additional staff meetings. The return on investment will consist of the savings delivered by shorter average hospital-wide length of stay for patients. Saving even one day of hospital stay in all admission on average could be of significant financial and reputational benefit to the organization.

The use of the shift huddle technique to disseminate information will be led by the nurse leader or charge nurse on any given shift. A more in-depth educational teaching will be held during monthly unit meeting. There will also be a skills day planned for the year that will focus on re-educating staff of the golden hour process and the prioritization of the antibiotic administration. Outcomes of all high-risk admissions will be reviewed and discussed with the staff.

Intervention

In terms of specific processes, the nurse leader will be responsible for spearheading the use of golden hour flow chart and ensuring more efficient implementation of role delegation during admission. The staff will be re-oriented on how to use the flowchart and how role delegation works per said flow chart. There will always be a specific RN assigned to administration of antibiotics. In order to ensure this is possible, staffing must be available when there are pending admissions.

The nurse leader will continue to have a situational awareness of the in-coming admission and stay in contact with the staffing office to ensure appropriate and necessary staffing levels.

Nurses will be trained on placing peripheral intravenous lines that will provide access to the administration of antibiotics. Health Connect functionality on admission order will be reviewed to ensure nurses acknowledge doctors' orders. The team leader or physician will also give periodic reminders to team member to check for the antibiotic orders and if it was given.

A high-risk admission simulation will be conducted during skills day. During the admission process, the nurse leader or the charge nurse will then monitor that any necessary interventions and the quality of care provided met standards stipulated in the golden hour flowchart. The team leader will lastly be responsible for reminding team members of the tasks specified in the flowchart. Debriefing after the admission process will be necessary to evaluate success or failure, and to identify the necessary improvements needed for better outcomes.

Before changes can successfully be implemented, the staff needs to understand why the administration of antibiotics within 1 hour is so important. Evidence-based literature is available, as previously outlined, to support this claim. The staff also will need to appreciate the current state of their performance and how it contrasts with the unit's goal.

Study of the Interventions

Data were collected from the electronic health records of 38 high-risk admissions and was used to establish a baseline. This baseline data illustrated that high-risk admissions received Ampicillin by 22% and Gentamicin by 20% within 1 hour of prescription (see Figure D). High-risk admissions in 2018 will be reviewed to discern for how many antibiotics are administered within one hour. The order of antibiotics is noted in the chart review of high-risk infants. Those who received a specific order for the antibiotics within one hour were monitored. The golden hour

flowsheet also aided in recording the timing of antibiotic administration. Data collected from the chart audit will show if the various measures taken to improve compliance with this new standard were sufficient to improve compliance to reach the goal. The measurement strategy in the project charter (see Figure E), provides the measure description and data definition that will be used in the result interpretation of the practice change. A Plan-Do-Study-Act (PDSA) cycle was started with a small change having a charge nurse from each shift requests 2 nurses needed in the golden hour workflow. This is the first PDSA cycle in the project. Then during unit's skills day, the golden hour flow sheet was reviewed. The role and responsibilities of nurses in the golden hour admission was re-emphasized. The other PDSA cycle occurred when nurses were trained on mock code for high-risk admissions. New interventions will be tested as the project was being monitored for improvements.

Measures

The outcome measure of this project is the percent of high-risk infants that receive antibiotics within 1 hour after a physician's order. The target percentage is 60%. The process measures are the percent of high-risk infant admission with antibiotic orders and the percent of antibiotic orders acknowledge by RNs within 15 min after a physician makes an order. Both measures have a target of 60%, and data will be collected by means of a chart audit. The balancing measures are the number of incorrect antibiotics administered and the number of medication overrides on infant with antibiotic orders. The targets for balancing measures are set at zero occurrence.

The family of measures chosen will reflect the outcome of each high-risk admission (see Figure F). The results will validate if the improvement project succeeds or not. The reliability of collected data points is high; data stems from patient charts which can be cross-referenced with

pharmacy records and the medication dispensing machine. The team leader and the doctors both represent collaborative stakeholders with a vested interest in this project's success and proper documentation. There will be a debriefing after each high-risk admission to assess how each step of the process contributed to the timeliness of antibiotic administration.

Timing is the key variable being measured to determine success or failure of this project. From staff interviews and observations, some factors in the delay of the antibiotic administration have already been recognized. The extent to which the effect or occurrence of such factors can be mitigated will correlate strongly with the success of this project. Considerations have and will need to be taken in regard to what the adequate staffing level is, team dynamics, and leadership. Such analyses will be especially contingent on the results of the project.

Ethical Considerations

There are no foreseeable conflicts of interest in this improvement project at current. The microsystem will incur no additional cost other than the time spent during staff meetings. The only potential burden on the staff exists in the time that will need to be taken for debriefing. Nurses are already expected to perform the task for which their compliance is being measured; poor performance if present should be a motivation for them to reach the goal as opposed to distressing them. No harm to patients will be associated with this project; rather patient safety will be enhanced. This project meets the guidelines for an Evidence-based Change in Practice Project as outlined in the Project Checklist. The project was reviewed by faculty and is determined to qualify as an Evidence-based Change in Practice Project, rather than a Research Project. Institutional review board (IRB) review is not required (see Figure G). In addition, this study involves the implementation of care practices and interventions that are evidence-based, and data collected is not intended for research purposes. An ethical principle of beneficence applies to this project which

addresses the idea that a nurse's action should promote good. The timely administration of antibiotics is the best practice and doing beneficence for high-risk infants.

Results

Before this improvement project was implemented, a chart review of 38 high-risk admissions was completed. Only 22% of Ampicillin and 20% of Gentamicin in 38 patients was given within 1 hour after the doctor ordered them. Therefore, 20% was the baseline for improvement on this project. From February to June 2018, there were fifteen high-risk admissions in NICU. Thirteen patients out of the fifteen had an antibiotic order (see Figure H). 46% of Ampicillin was given within 1 hour, and 39% of Gentamicin was delivered within one hour, an increase from 20% before the project began (see Figure I). One of the high-risk admissions that did not reach the goal had a prolonged resuscitation and umbilical line placement. There was no incidence of the wrong antibiotics given or patient override with these high-risk admissions.

Summary

The increase in nurse turnover plays a significant role in the delay of antibiotic administration in neonatal intensive care unit. It is disruptive to the workflow and a threat to quality of care and patient safety. Hiring travel nurses can help the staffing shortage but will not provide a high- quality level of care. The golden hour flowsheet was implemented last year to decrease the length of time from an infant's birth to the time the isolette bed is closed at the end of the golden hour process. Due to nursing shortage and lack of communication in role delegation, the workflow was not completed timely and correctly. Antibiotic administration was part of the golden hour flowsheet. This part of the workflow was negatively impacted. The role of a CNL helped to mitigate the problem. Designing, implementing, and evaluating the change in practice specific to the microsystem contributed to the successful transition.

While utilizing evidence-based literature and the latest care practice, the staff and team are able to confidently optimize their work after re-education on the correct use of the golden hour flowsheet. CNL is a part of an interdisciplinary team of physicians, pharmacist, social workers, and frontline nurses who all work to provide the most effective treatment and care. Success stems from teamwork and clear communication that improve the timing of antibiotic administrations. Looking at the results of the timing on antibiotic administrations, there is a difference between the Ampicillin and Gentamicin compliance given within one hour. Ampicillin is available in the unit and can be accessed immediately, whereas Gentamicin is prepared in the pharmacy and can cause a delay in the timing of administration. This issue was addressed on the unit skills day and nurses will need to diligently administer antibiotics on time. The established goal was not reached at this time, but the improvement in the percentage of antibiotics given within an hour shows that the change implemented was successful.

This project only required a sufficient budget for the nurse overtime compensation during unit meetings for re-education on the use of the golden hour flowsheet (see Figure J). Most of the information dissemination will be done on huddles and during unit rounding when nurses are at the bedside. The average length of stay for 32-week and below infants admitted to the NICU is 38.2 day. If the project can decrease the average length of stay by one days, the unit saves $11,238, which is its cost per day per admission. We established the estimated cost for this project as $11,025; given that this is comparable to the amount a one day stay in NICU costs, reducing even one patient’s stay by one day represents a breakeven point for the project (see Figure K). The return on investment will consist of the savings delivered by shorter average hospital-wide length of stay for patients. Saving even one day of hospital stay in all admission on average could be of significant financial and reputational benefit to the organization.

Conclusions

Despite the noticeable benefits of evidence-based practices, healthcare professionals often encounter challenges when implementing improvement projects or change in practice. From staff interviews and observations, it is clear that the nurses involved in the golden hour admission were not adequately assigned a specific role which resulted in a delay in administration. The nursing shortage and increased nurse turnover had a major impact on the delay of antibiotic administration as well. Unless the nurse leader uses these challenges as learning experiences to guide the implementation process, any change in practice will be difficult to sustain. Giving the antibiotic within one hour is a valuable evidence-based practice and a vital component of quality care. Sustainability in this improvement project will be achieved if the attitude of the staff which is fundamental in carrying out the process is geared toward doing what is good for the patients. In addition, it is essential for the stakeholders to invest in hiring and training the nursing staff to fully implement this proposed improvement project. The budget needed for this project consists of the overtime pay needed to compensate nurses for attending additional staff meetings. The return on investment will consist of the savings delivered by shorter average hospital-wide length of stay for patients. The established cost of this project is simply the overtime compensation for the nurses attending the staff meetings and skill training day. The return on investment will surely surpass this cost and of course bring non-monetary patient health benefits as well.

Evidence-based practice can move care to a higher level of intended outcome. Administering antibiotics within one hour is a quality standard of care. The baseline compliance measurement for antibiotics given within one hour is 22% for Ampicillin and 20% for Gentamicin. With the implementation of this project, the percentage of antibiotics given within one hour increased to 46% for Ampicillin and 39% for Gentamicin. The impact and success of

this improvement project are already evident in the results produced. This project will be continued to reach its established goal of 60% compliance if continued with appropriate staffing and training on the golden hour admission process.

References

Battleman, D. S., Callahan, M., & Thaler, H. T. (2002). Rapid Antibiotic Delivery and Appropriate Antibiotic Selection Reduce Length of Hospital Stay of Patients with Community-Acquired Pneumonia. *Archives of Internal Medicine,162*(6), 682.

Bissinger, R. L., Mueller, M., Cox, T. H., Cahill, J., Garner, S. S., Irving, M., &… Annibale, D. J. (2013). Antibiotic Timing in Neonates with Suspected Hospital-Acquired Infections. *Advances in Neonatal Care,13*(1), 22-28.

Ehrlich, P: Chemotherapeutics: Scientific principles, methods, and results. Address in pathology to 17th International Congress of Medicine (London, 1913). *Lancet* 1013; 2:445-451.

Ferrer, R., Martin-Loeches, I., Phillips, G., Osborn, T. M., Townsend, S., Dellinger, R. P., &… Levy, M. M. (2014). Empiric Antibiotic Treatment Reduces Mortality in Severe Sepsis and Septic Shock from the First Hour. *Critical Care Medicine,42*(8), 1749-1755.

Houck, P. M., Bratzler, D. W., Nsa, W., Ma, A., & Bartlett, J. G. (2004). Antibiotic Administration in Community-Acquired Pneumonia. *Chest,126*(1), 320-321.

Kumar, A., Roberts, D., Wood, K. E., Light, B., Parrillo, J. E., Sharma, S., … Cheang, M. (2006). Duration of hypotension before initiation of effective antimicrobial therapy is the critical determinant of survival in human septic shock. *Critical Care Medicine,34*(6), 1589-1596.

Lippitt, R., Watson, J., & Westley, B. (1958). *The dynamics of planned change: A comparative study and principles and techniques.* New York: Hartcourt, Brace & World.

Nelson, E. C., Batalden, P. B., & Godfrey, M. M. (2007). *Quality By Design: A Clinical Microsystems Approach*. Wiley.

Person, A., Vaughan, B., & Fitzgerald, M., (2005). *Nursing Models for Practice*. Third Edition. Butterworth-Heinenmann, Oxford.

Seeling, M., Eggers, V., & Spies, C. (2008). Surviving Sepsis Campaign: Guideline Clarification. *Critical Care Medicine,36*(8), 2490.

Weiner, G. M., Barks, J. D., Wright, E. J., & Faix, R. G. Improving the Timing of Antibiotic Administration to High-Risk Newborns. *Journal of Perinatology* Vol. 18, No. 3, 1998.

Appendices

Figure A: Evaluation Table

Study	Design	Sample	Outcome/Feasibility	Evidence rating
Ferrer, R., Martin-Loeches, I., Phillips, G., Osborn, T. M., Townsend, S., Dellinger, R. P., &… Levy, M. M. (2014). Empiric Antibiotic Treatment Reduces Mortality in Severe Sepsis and Septic Shock from the First Hour. *Critical Care Medicine,42*(8), 1749-1755.	Retrospective analysis	28,150 patients with severe sepsis and septic shock from January 2005 to February 2010.	Demonstrated that delay in antibiotic administration was associated with increased in-hospital mortality. There was a linear increase in the	L III A

			risk of mortality for each hour delay in antibiotic administration.	
Weiner, G. M., Barks, J. D., Wright, E. J., & Faix, R. G. Improving the Timing of Antibiotic Administration to High-Risk Newborns. *Journal of Perinatology* Vol. 18, No. 3, 1998.	Retrospective chart review and prospective intervention	488 infants with indications for antibiotic therapy	Improvement in antibiotic administration was attained by continued surveillance and feedbacks to caregiver. Administration of the first dose of antibiotic takes more than 1 hour after MD order.	L III B

Bissinger, R. L., Mueller, M., Cox, T. H., Cahill, J., Garner, S. S., Irving, M., &… Annibale, D. J. (2013). Antibiotic Timing in Neonates with Suspected Hospital-Acquired Infections. *Advances in Neonatal Care,13*(1), 2228.	Prospective cohort study	5-year period or 551 antibiotic orders	This analysis suggests that antibiotic delay is a common but preventable problem. Significant improvements in processes supporting medical	L II A
			interventions are possible through quality analysis and improvement techniques.	
Weiss, S. L., Fitzgerald, J. C., Balamuth, F., Alpern, E. R., Lavelle, J., Chilutti, M., . . . Thomas, N. J. (2014). Delayed Antimicrobial	Retrospective observational study	130 patients treated for severe sepsis or septic shock	Delayed antimicrobial therapy was an independent risk factor and prolonged organ	L II B

Therapy Increases Mortality and Organ Dysfunction Duration in Pediatric Sepsis*. *Critical Care Medicine,42*(11), 24092417. doi:10.1097/ccm.0000000000000509			dysfunction in pediatric sepsis. Further study is needed to define the optimal timing of antibiotic administration but delays more than 3 hours should be avoided in pediatric population.	
Rankin, V. (2015, June). Clinical Nurse Leader: A Role for the 21st Century. Retrieved October 21, 2017, from https://www.ncbi.nlm.nih.gov/pubmed/26285387.	Consensus paper	None	Provided insights on the role of a CNL in aligning quality improvement efforts in a microsystem to achieve change.	L V A

American Association of Colleges of Nursing (AACN). (2013). *Competencies and curricular expectations for clinical nurse leaders' education and practice*. Retrieved from http://www.aacn.nche.edu/publications/whitepapers/cnl.	Consensus guidelines	None	A guide to CNL competencies and curriculum. Provides the essential knowledge and skills needed to function as a CNL in a microsystem.	L V A

Figure B: SWOT

SWOT ANALYSIS

Strength	Weakness
1. Unit team's strong commitment 2. Physician cooperation and support 3. Leadership and management support	1. Staffing turnover 2. Prioritizing other life-saving interventions 3. Unavailability of intravenous access 4. Inadequate staffing for known admission
Opportunities	**Threats**
1. Cost savings with decreased hospital length of stay 2. Evidence-based literature supporting project 3. Improved patient satisfaction	1. Disruption of workflow 2. Changes in healthcare reimbursement 3. Patient re-admission due to infection

Figure C: ROI Plan

Business Plan:

Improve Antibiotic Administration in High-Risk Infants

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Executive Summary

Ensuring prompt administration of prescribed antibiotics in cases in which a high-risk infant is suspected to have sepsis is the focus of this project. This project will focus on change implementation; the necessary change is the degree to which nurses prioritize antibiotic administration in these cases. Using the Golden Hour flowsheet, requisite staff members will be guided by a time-specific workflow, which will demonstrate how to give antibiotics within one hour after an MD's order. This project introduces no new processes or steps, but rather hinges on enforcing proper delegation of responsibilities to ensure that antibiotics are given in a timely fashion. There is substantial evidence to support that prompt antibiotic administration results in shorter hospital stays and increases survival rates. Benefits to the hospital will include cost savings, especially when patients are discharged earlier on average.

Nurse education will take place during staff meetings. This will require nurses to be compensated for overtime, as additional training will have to take place before or after shifts. With 98 nurses and an average salary of $75/hr., one hour of overtime will cost $11,025, as overtime hours entail compensation for time and a half. The total time requirement is limited to a 1-time educational session during staff meetings; the rest of the education will be handled during regular work processes. Kaiser SF neonatal intensive care unit (NICU) charges $11,238 a day per Chargemaster. If patients can be discharged even 1 day ahead of time, the project could result in

significant savings. The average length of stay in the NICU for high-risk infants is 38.2 days. A 1 day difference in length of stay would represent approximately a 2.5% improvement.

Introduction

Premature and immunocompromised neonates are susceptible to infection and can present with no or only subtle signs of illness. Although definitive data to indicate improved outcomes with earlier antibiotic administration are limited, efficient antibiotic delivery should be a standard of care in any NICU (Bissenger et al., 2013). A chart audit of 32 high-risk infant admissions was completed and the subsequent results showed that in only 20 percent of cases in which antibiotics were prescribed were the antibiotics administered within one hour from the doctor's order. Prompt antibiotic administration for suspected sepsis in high-risk infants is the focus of this project. The aim of this project is to increase compliance with a stated goal of administering antibiotics within one hour after the physician orders from 20% (current state) to 80%. Adult studies of antibiotic timing in meningitis, pneumonia, and septic shock indicate that early treatment was associated with greater survival rates and decreased length of stay (Battleman, Callahan, & Thaler., 2002). The timely administration of antibiotics makes good clinical sense, as it helps eliminate the spread of infectious microorganisms and reduces the bacterial load, leading to fewer infections, thus decreasing lengths of stay broadly as well.

Market Analysis

Among all gestational ages, infants admitted to a special care unit have an average length of stay of 13.2 days, ranging from 4.9 days to 46.2 days among infants born at 39-41 weeks. Average hospital stays among infants admitted to special care nurseries were 20% longer for infants born just a few weeks early (37-38 weeks) and were twice as long for late preterm infants

(34-36 weeks) compared to infants born at 39-41 weeks or full term. On average, hospital charges for infants admitted to a special care nursery totaled $76,164 for the initial hospital stay following delivery. Infants born at or before 32 weeks had an average hospital charge of $280,811, more than 9 times as high as charges for infants born at 39-41 weeks (March of Dimes, 2017). The population for this project consists of infants born at or before this 32-week threshold that are admitted to the NICU. The average hospital length of stay in our unit for these infants is 38 days. Administering antibiotics promptly will help decrease the hospital length of stay of infants with suspected infections. A SWOT analysis was conducted to examine the strengths and weakness of this project as well (see Appendix A). This project, if conducted properly and according to the project plan, will decrease costs and improve patient care, with decreased length of stay representing the primary driver of these improvements.

Project Description

The aim of this project is to increase the percentage of patients who receive antibiotics within one hour of a physician order from a baseline level of 20% to 80% by July 2018. The Surviving Sepsis Campaign recommends administration of empiric antimicrobial therapy within one hour of recognition of severe sepsis or septic shock in adult and pediatric patients (Seeling, Eggers, & Spies., 2008). With premature neonates, it is essential to take into consideration the time factor of antibiotic administration. Evidence-based practice has emerged as a marker for healthcare quality. In this project, the staff will be educated with evidence-based literature that supports the practice of prompt antibiotic administration. Education and organizational context, including lack of time, cost, the availability of nurses with research knowledge, and leader support are key factors affecting how research can be translated into practice and evaluated for clinical effectiveness

(Koehn., 2008). Thus, a greater emphasis will be placed on evidence-based practice, which has been identified as crucial for promoting the desired change of this project.

Another goal of this project is to foster a general sense of urgency of the timeliness of these types of clinical practices. To do so, the data collected in this improvement project will be shared with the staff to emphasize whether the goal was achieved and to formulate solutions to barriers encountered like staffing inadequacy. Such barriers may represent broader organizational issues. This barrier will be addressed on shift to shift basis depending on the need of the unit. When hospital and nursing administrators listen to nurses, recognize their contributions and challenges they face, and allow them to participate in decision making about the physical work environment, the resultant increases in job satisfaction and decreases in staff stress can be profound (Applebaum et al., 2010). All of these improvements can help decrease the length of stay of infants with suspected infection, and of patients broadly, in the NICU.

Budget

The project will begin with informing the staff of the change implementation. Education will be provided during staff meetings, which will be held once a month. Staff nurses will be paid for the overtime they incur during said staff meetings. A brochure will be made available for the unit as a reference as well; the materials are to be provided at no additional cost. With 98 nurses whose average salary is $75/hr., the total amount paid for the education during staff meetings will be $11,025, as overtime is compensated at a rate of 1.5 hours to every hour (see Appendix B). The staff will be kept aware of project's progress during huddle and if necessary, during one on one meetings with the nurse leader or charge nurse. There will be no cost on huddle and one on one meetings as these will be take place during the workday, when nurses are free or at the bedside.

Financial Analysis

The average length of stay for 32 week and below infants admitted to the NICU is 38.2 day. If the project can decrease the average length of stay by 1 days, the unit saves $11,238, which is its cost per day per admission. We established the estimated cost for this project as $11,025; given that this is comparable to the amount a 1 day stay in NICU costs, reducing even one patient's stay by 1 day represents a breakeven point for the project (see Appendix C). Still, this project can only succeed if it is sufficiently staffed. Nursing management findings suggest that efforts to improve teamwork and ensure adequate staffing in acute care settings also have major impact on staff satisfaction (Kalisch., 2010). As this project should foster greater collaboration and efficiency in the NICU, improved staff satisfaction is a plausible externality of the project. We can see that the project offers the potential to also deliver non-monetary benefits.

Timeline

Educational tool and the requisite brochure will be developed and staffing plans detailing how to assign all nurses to a staff meeting will be undertaken by March 2018. The April staff meeting will be scheduled first, at which point the project rollout will also become official. After the staff meeting, one on one meetings will be conducted by the nurse leaders or charge nurses as necessary. These meetings will focus on facilitating the ongoing project. All staff will be informed and educated on the change implementation process and data collection will start as well immediately. By June 2018, all high-risk admissions will be reviewed to gauge compliance with the stated objective of timely antibiotic administration, and the results will be tabulated, evaluated, and shared with the staff. There will then be continued huddles to debrief the improvement project. Intermittent debriefing should occur after each admission to monitor performance and identify the

main barriers encountered like inadequate staffing. Unit champions and charge nurses will lead the team in devising solutions to the identified barriers.

Feasibility Statement and Conclusion

Prompt antibiotic administration for suspected sepsis in high-risk infants is the goal of this project. This improvement project will facilitate the re-familiarization of nurses with the unit's golden hour flow chart, under which the antibiotic administration process is outlined, and timeliness is stressed. The golden hour workflow is time-oriented and assigns a team member to each task. Initiating this project will refocus nurses and other NICU members on their individual roles and responsibilities in the antibiotic administration process. It will also foster a collective environment of collaboration and accountability. The budget needed for this project consists of the overtime pay needed to compensate nurses for attending additional staff meetings. The return on investment will consist of the savings delivered by shorter average hospital wide length of stay for patients. Saving even one day of hospital stay in all admission on average could be of significant financial and reputational benefit to the organization.

This project will also increase the quality of care more broadly and stresses the importance of continued process evaluation. The Institutes of Medicine report on To Err is Human (Kohn et al. 2000) study pointed out that higher teamwork is linked to safety. This improvement project will take place within pre-established existing admission process, and thus does not represent a significant imposition on workflow. The principle constraint on this project is the need for adequate staffing during admission. Assessment of staffing needs will be addressed every shift to address this need.

References

Applebaum, D., Fowler, S., Fiedler, N., Osinubi, O., & Robson, M. (2010). The Impact of Environmental Factors on Nursing Stress, Job Satisfaction, and Turnover Intention. *The Journal of Nursing Administration, 40*(0), 323–328. http://doi.org/10.1097/NNA.0b013e3181e9393b

Battleman, D. S., Callahan, M., & Thaler, H. T. (2002). Rapid Antibiotic Delivery and Appropriate Antibiotic Selection Reduce Length of Hospital Stay of Patients with Community-Acquired Pneumonia. *Archives of Internal Medicine,162*(6), 682.

Bissinger, R. L., Mueller, M., Cox, T. H., Cahill, J., Garner, S. S., Irving, M., &… Annibale, D. J. (2013). Antibiotic Timing in Neonates with Suspected Hospital-Acquired Infections. *Advances in Neonatal Care,13*(1), 22-28.

Kalisch, B. J., Lee, H., & Rochman, M. (2010). Nursing staff teamwork and job satisfaction. *Journal of Nursing Management,18*(8), 938-947.

Koehn, M. L., & Lehman, K. (2008, April 03). Nurses' perceptions of evidence-based nursing practice. Retrieved April 27, 2018, from https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1365-2648.2007.04589.x

Kohn L., Corrigan J. & Donaldson M. (2000) To Err Is Human: Building a Safer Health Care System. National Academy Press, Washington, DC.

March of Dimes. (2017). *Special Care Nursery Admissions*. Retrieved from https://www.marchofdimes.org/peristats/pdfdocs/nicu_summary_final.pdf.

Seeling, M., Eggers, V., & Spies, C. (2008). Surviving Sepsis Campaign: Guideline Clarification. *Critical Care Medicine,36*(8), 2490

Appendix A

Table 1: Improvement Project SWOT Matrix

Strength: Project will decrease hospital length of stay. Improve staff work satisfaction.	Weakness: Cost for staff education. Staffing shortage
Opportunities: Dollar savings for the hospital/organization	Threat: No threat identified.

Appendix B

Table 2: Budget of the Startup Cost

Year 1	Year 2	Interpretation	Item
$11,025.00	0	Over time paid for 98 nurses to attend staff meeting related to the project.	Personnel Expenses
0	0	Office supply and items for training.	Non-personnel Expenses
$11,025.00	0	Project will have one-time unit meeting attendance.	Total Expense

Appendix C

Table 3: Net Savings Per Day

Patient	Daily saving per patient	Total Cost of Project	Daily savings per patient after project cost
Patient 1	$11,238.00	$11,025.00	$213.00
Patient 2	$11,238.00	0	$11,238.00

Figure D: Timing of Antibiotic Administration

DOB	**Time of Birth**	Antibiotics Ordered (Y/N)	**Time Ordered**	**Time From Birth to Order**	Time Ampicillin Administered	**Time from Order to Administration, Ampicillin**	Time Gentamicin Administered	**Time from Order to Administration, Gentamicin**
6/5/2015	**5:05**	yes	**5:12**	**0:07**	8:36	**3:24**	9:15	**4:03**
6/7/2016		yes	**5:35**	**5:35**	6:45	**1:10**	8:20	**2:45**
6/8/2016	**15:23**	yes	**18:00**	**2:37**	19:04	**1:04**	19:10	**1:10**
6/11/2016	**14:37**	yes	**15:09**	**0:32**	6/11/2017 16:09	**1:00**	16:59	**1:50**
6/22/2016	**16:32**	no				**0:00**		**0:00**
6/24/2016	**21:31**	no				**0:00**		**0:00**
7/4/2016	**7:24**	yes	**10:35**	**3:11**	10:54		11:30	**0:55**
7/6/2016	**4:54**	yes	**5:32**	**0:38**	7:13	**1:41**	7:50	**2:18**
7/15/2016	**9:41**	yes	**10:01**	**0:20**	10:47	**0:46**	10:54	**0:53**
8/3/2016	**8/3/2016 22:06**	yes	**8/3/2016 22:34**	**0:28**	8/4/2016 0:57	**2:23**	8/4/2016 1:40	**3:06**
8/7/2016	**23:04**	yes	**23:46**	**0:42**	8/8/2016 1:24	**1:38**	8/8/2016 1:30	**1:44**
8/8/2016	**23:29**	yes	**23:54**	**0:25**	8/9/2016	**2:05**	8/9/2016 2:06	**2:12**
8/20/2016	**2013**	no						
8/27/2016	**23:16**	yes	**23:57**	**0:41**	8/28/2016 1:45	**1:48**	2/28/2016 2:00	**2:03**
8/27/2016	**23:16**	yes	**0:04**		1:45	**1:41**	2:00	**1:56**
8/31/2016	**6:13**	yes	**6:54**	**0:41**	11:01	**4:07**	10:45	**3:51**
9/6/2016	**22:51**	yes	**23:19**	**0:28**	9/7/2016 0:56	**1:37**	9/7/2016	**2:08**
9/6/2016	**22:47**	yes	**23:16**	**0:29**	9/7/2017 1:15	**1:59**	9/7/2016 1:30	**2:14**
9/13/2016	**2:33**	yes	**3:06**	**0:33**	5:25	**2:19**	6:06	**3:00**
9/17/2016	**23:19**	no				**0:00**		**0:00**
9/28/2016	**2:26**	yes	**3:06**	**0:40**	5:20	**2:14**	5:22	**2:16**
9/28/2016	**4:34**	no				**0:00**		**0:00**
10/27/2016	**9:53**	yes	**10:27**	**0:34**	11:19	**0:52**	11:30	**1:03**
10/31/2016	**6:10**	yes	**6:34**	**0:24**	9:00	**2:26**	9:15	**2:41**
11/7/2016	**15:47**	yes	**16:14**	**0:27**	17:45	**1:31**	20:00	**3:46**
11/10/2016	**1:00**	yes	**1:25**	**0:25**	3:30	**2:05**	3:30	**2:05**
12/1/2016	**0:46**	yes	**1:07**	**0:21**	2:30	**1:23**	3:30	**2:23**
12/8/2016	**21:22**	yes	**22:05**	**0:43**	23:38	**1:33**	0:09	**2:04**
12/15/2016	**16:38**	yes	**16:53**	**0:15**	18:03	**1:10**	18:32	**1:39**
12/27/2016	**3:55**	yes	**4:45**	**0:50**	5:24	**0:39**	5:55	**1:10**
1/4/2017	**16:12**	yes	**16:50**	**0:38**	17:29	**0:39**	19:49	**2:59**
1/18/2017	**8:25**	no				**0:00**		**0:00**
1/21/2017	**8:30**	yes	**8:51**	**0:21**	10:42	**1:51**	10:49	**1:58**
1/31/2017								
2/1/2017	**8:53**	yes	**9:27**	**0:34**	11:45	**2:18**	12:08	**2:41**
2/9/2017	**0:13**	yes	**1:27**	**1:14**	2:16	**0:49**	2:16	**0:49**
2/18/2017	**20:17**	yes	**20:51**	**0:34**	21:19	**0:28**	21:43	**0:52**
2/23/2017	**19:21**	yes	**19:53**	**0:32**	21:57	**2:04**	21:57	**2:04**

Figure E: Project Charter- Microsystem Improvement Project

Project Charter: Improving the Timing of Antibiotic Administration in High-Risk Neonates

Aim

Global Aim: To improve the timing of antibiotic administration in high-risk infants admitted to Neonatal Intensive Care Unit (NICU).

Specific Aim: NICU will increase the percentage of antibiotic administration within 1 hour after physician order to all high-risk neonates from 30% to 60% by August 31, 2018.

Background

Premature and immunocompromised neonates are susceptible to infection and can present with very subtle signs of illness. Many steps are involved in the acute, postdelivery care of newborns at high-risk. These include but not limited to performance of resuscitative measures, securing intravascular access, and obtaining culture specimens. These interventions may forestall antibiotic administration (Weiner, G., Barks, J., Wright, E., & Faix, R. 1998). Delay in the initiation of appropriate antibiotic therapy has been recognized as a risk factor to mortality (Ferrer et al. 2014). Adult studies of antibiotic timing in meningitis, pneumonia, and septic shock indicate that early treatment was associated with survival and decreased length of stay (Battleman, D. S., Callahan, M., & Thaler, H. T. (2002). Although definitive data to indicate improved outcomes with earlier antibiotic administration are few, efficient antibiotic delivery should be the standard of care in the NICU (Bissenger et al. (2013). The Surviving Sepsis Campaign recommends administration of empiric antimicrobial therapy within 1 hour of recognition of severe sepsis or septic shock in adult and pediatric patients (Seeling, M., Eggers, V., & Spies, C. 2008). With premature neonates, it is essential that we take into consideration the

time factor of antibiotic administration. The relationship of prompt antibiotic administration and better outcomes can act as a marker for the quality of care. In this project, identifying the obstacles to timely administration of antibiotics will be the foundation in designing new processes or work flow that will be instrumental in achieving the goal.

Goals

Prompt antibiotic administration for suspected sepsis in high-risk infants is the focus of this project. The aim of this project is to improve the percentage of patients who receive antibiotics within 1 hour of physician order from baseline of 30% to 60% by August 2018. This charter project will facilitate on re-educating nurses to the unit's golden hour flow chart where antibiotic administration is part of the whole process. The golden hour work flow is time lined and with a team member assigned to each task. Initiating this project will refocus on member's role and responsibilities in giving antibiotic promptly. Another goal for this project is to ignite the sense of urgency on the time factor of this intervention. The data collected in this improvement project will be shared to the staff that will help improve the unit's morale and formulate solutions to barriers encountered.

Measures

Outcome Measure		Data Source		Target
% of infants receiving antibiotic within 1 hour after physician order		Chart Audit		60%
Process Measures				

% of infants with antibiotic orders % of antibiotic orders acknowledge by RN within 15 min after physician order		Chart Audit		60%
Balancing Measures				
Number of wrong antibiotic given % of medication override on patient with antibiotic order		Chart Audit Pharmacy report		0

Sponsors

Chief of Neonatal Intensive Care Unit: Dr. Carlos Botas

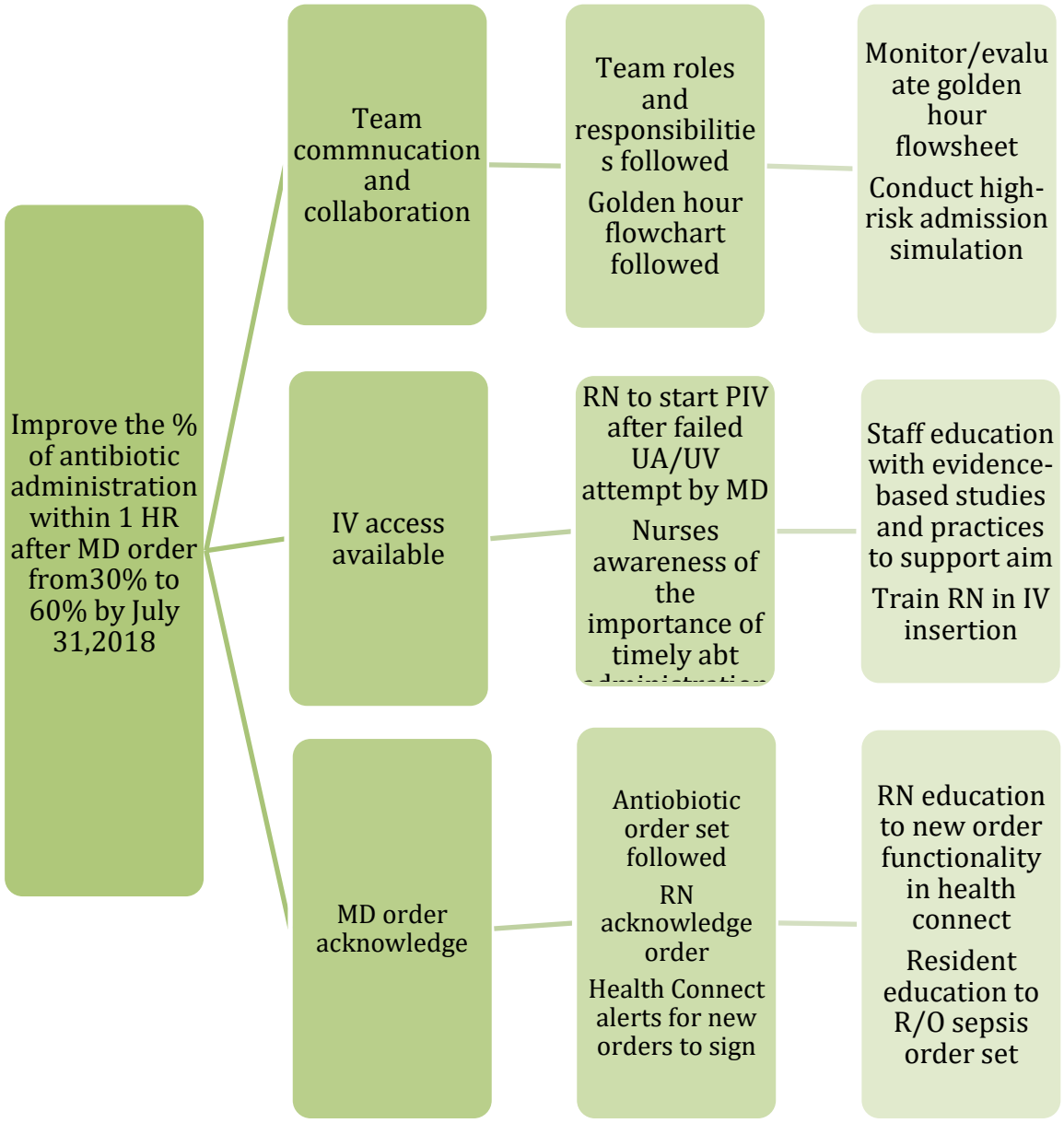
NICU Physicians: Dr. Cindy Tran, Dr. Karen Bockli, Dr. Mike Kuzniewicz

Nurse Manager: Abica Jarganauth

MCH Director: Armilla Henry

Driver Diagram

Aim	Primary Drivers:	Secondary Drivers:	Specific Ideas to Test or Change Concepts



Measurement Strategy

Background (Goal Statement)

To improve the timing of antibiotic administration in high-risk infants admitted to Neonatal Intensive Care Unit (NICU).

Population Criteria: High-risk neonates admitted to NICU

Data Collection Method: Data was collected from medication audit info view reports and chart review from a 6-month time line to establish baseline. After baseline data is collected, all high-risk infants admitted in 2018 will be reviewed for this project. Monthly chart audit to all high-risk admission.

Measure Description

Measure	Measure Definition	Data Collection Source	Goals
% of antibiotic given within 1 hour after MD orders	N= number of infants who receives antibiotic within 1 HR after MD order D= number of high-risk infants who has antibiotics order	Chart audit	60%
% of infants with antibiotic orders	N= number of infants with antibiotic orders D=high-risk infants admitted	Chart audit	60%

% of antibiotic orders acknowledge by RN within 15 min	N= number of infants with antibiotic orders D= high-risk infants admitted	Chart audit	60%

Data Definition

Data Element	Definition
High-risk infants	Infants born 32wks and below or infants that requires more than the standard monitoring and care
Golden hour flow chart	Standardized NICU admission work flowsheet
Medication override	Dispensing antibiotics without scanning to cross-reference to the patient

Changes to Test

The use of golden hour flow chart and role delegation during admission, will be the change implemented by the nurse leader. Staff will be oriented on how to use the flow chart and roles of the nurses specified in the flow chart. Nurse leader will try to provide adequate staff are available

when known pending admission is coming. During the admission process, nurse leader will monitor that interventions and care were provided as expected in the golden hour flow chart. Debriefing after the admission process will be done to evaluate the success and improvements needed for better outcomes.

Project Timeline

	0 9/01	0 9/20	0/15	1 2/01	/01	/15	4/01	5/01	0 5/15	6/10
Define Topic										
Aim Statement Background										
Measures Develop Charter										
Learning Assessment Objectives										
Collect Data Identify Changes to Test										

Review Approve Charter										
Driver Diagram										
Finalize Charter										
Prepare Presentation										

CNL Competencies

Using evidence-based practices and studies to implement quality improvement that address safety and quality is a role of a CNL as a clinician (American Association of Colleges of Nursing [AACN], 2013). In this project, health promotion and risk reduction were taken into consideration in improving the time factor of antibiotic administration. To disseminate changes in practice and communicate to the healthcare team the current quality and safety guidelines is a role of an educator. The CNL can educate the staff on the use of patient-care technologies like health connect to identify the gaps in interventions provided. The CNL also use current information and materials in the design and delivery of change strategies. As an outcome manager, the CNL will synthesize the data collected to evaluate the effectiveness of the change

implemented. Use information and evidence-base knowledge to achieve and sustain change to promote quality care.

Lessons Learned

By doing the microsystem assessment, it was discovered that NICU does not have its own mission statement that reflects the values and belief of the unit that can be the core of their practice. With a lot of travelling nurses working in the unit, it is difficult for the regular staff to develop a valuable and trusting relationships with their colleagues. This project showed me that a standard intervention like giving antibiotic can be affected by the many aspects of health care delivery. The complexity of the work processes, staff involvement, and systems in place will make a simple task results to a poor outcome.

Understanding the steps of model for improvement project helps the readiness for a nurse leader to implement change. From developing an aim goal to establishing measures, the change agent can select what changes need to happen to see improvements. Learning these fundamental components for improvement project gives the nurse leader the confidence to achieve goals. Engaging the team to be accountable and will fully participate in the improvement process will lead to the success of this project.

Collaboration with my classmates in this class also developed our partnership in healthcare and established a sense of community for better service. Everyone advocates for a different needs and health outcomes. But at the end, we all work to promote quality, safe, and coordinated care on different microsystems.

References:

American Association of Colleges of Nursing (AACN). (2013). *Competencies and curricular expectations for clinical nurse leaders' education and practice*. Retrieved from http://www.aacn.nche.edu/publications/white-papers/cnl.

Battleman, D. S., Callahan, M., & Thaler, H. T. (2002). Rapid Antibiotic Delivery and Appropriate Antibiotic Selection Reduce Length of Hospital Stay of Patients with Community-Acquired Pneumonia. *Archives of Internal Medicine,162*(6), 682.

Bissinger, R. L., Mueller, M., Cox, T. H., Cahill, J., Garner, S. S., Irving, M., &… Annibale, D. J. (2013). Antibiotic Timing in Neonates with Suspected Hospital-Acquired Infections. *Advances in Neonatal Care,13*(1), 22-28.

Seeling, M., Eggers, V., & Spies, C. (2008). Surviving Sepsis Campaign: Guideline Clarification. *Critical Care Medicine,36*(8), 2490.

Weiner, G. M., Barks, J. D., Wright, E. J., & Faix, R. G. Improving the Timing of Antibiotic Administration to High-Risk Newborns. *Journal of Perinatology* Vol. 18, No. 3, 1998.

Figure F: Family of Measures

Outcome Measure		Data Source		Target
% of infants receiving antibiotic within 1 hour after physician order		Chart Audit		60%
Process Measures				

% of infants with antibiotic orders % of antibiotic orders acknowledged by RN within 15 min after physician order		Chart Audit		60%
Balancing Measures				
Number of wrong antibiotic given % of medication override on patient with antibiotic order		Chart Audit Pharmacy report		0

Figure G: Statement of Non-Research Determination Form

Title of Project: Improving the Timing of Antibiotic Administration in High-Risk Neonates

Brief Description of Project: This project aims to ignite the sense of urgency to nurses in giving the antibiotic promptly. Premature and immunocompromised neonates are susceptible to infection and studies shows that prompt antibiotic administration results to better health outcomes. The role and responsibilities of each team members will be followed and creating solutions to barriers encountered.

A) Aim Statement: NICU will increase the percentage of antibiotic administration within 1 hour after physician order to all high-risk neonates from 30% to 60% by August 31, 2018.

B) Description of Intervention: Improving team communication and collaboration by following each member's role and responsibilities. Prompt placement of a PIV by nurses when MD failed UA/UV attempts. With Health Connect alerts, nurses will acknowledge MD orders of antibiotics.

C) How will this intervention change practice? Team communication and collaboration will refocus team member's role and responsibilities in giving the antibiotic timely. Training nurses in placing PIV will give them more confidence in their role. By doing the process consistently, barriers encountered will have solutions as feedbacks are given. The process will be a part of the unit's practice in giving the antibiotics.

D) Outcome measurements:

Outcome Measure: 1. % of infants receiving antibiotic within 1 hour after physician order

Process Measures: 1. % of infants with antibiotic orders
2. % of antibiotic orders acknowledge by RN within 15 min after physician order

Balancing Measures: 1. Number of wrong antibiotic given
2. % of medication overrides on patient with antibiotic order

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)

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

☐ This project involves research with human subjects and must be submitted for IRB approval before project activity can commence.

Comments:

EVIDENCE-BASED CHANGE OF PRACTICE PROJECT CHECKLIST *

Instructions: Answer YES or NO to each of the following statements:

Project Title:	**YES**	**NO**
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.	**X**	
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.	**X**	
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.	**X**	
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.	**X**	
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.	**X**	

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.	**X**	
The project has **NO** funding from federal agencies or research-focused organizations and is not receiving funding for implementation research.	**X**	
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.	X	
If there is an intent to, or possibility of publishing your work, you and supervising faculty and the agency oversight committee are comfortable with the following statement in your methods section: *"This project was undertaken as an Evidence-based change of practice project at X hospital or agency and as such was not formally supervised by the Institutional Review Board."*	**X**	

ANSWER KEY: If the answer to **ALL** of these items is yes, the project can be considered an Evidence-based activity that does NOT meet the definition of research. **IRB review is not required. Keep a copy of this checklist in your files.** If the answer to ANY of these questions is **NO**, you must submit for IRB approval.

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

STUDENT NAME (Please print): Jed Comuelo

_____

Signature of Student: _____DATE 02-04-2018

SUPERVISING FACULTY MEMBER NAME (Please print):

_____

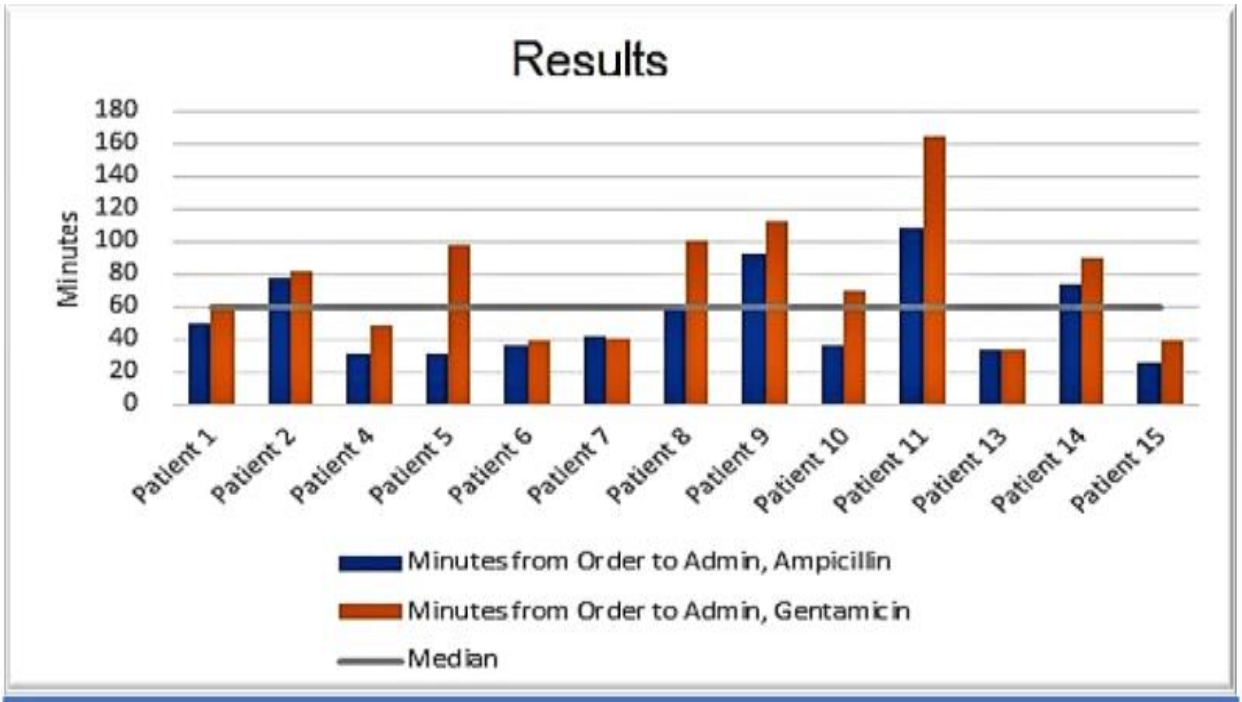
Signature of Supervising Faculty Member

_____DATE_____

Figure H: Pre-Intervention Results

DOB	Time of Birth	Antibiotics Ordered (Y/N)	Time Ordered	Time From Birth to Order	Time Ampicillin Administered	Time from Order to Administration, Ampicillin	Time Gentamicin Administered	Time from Order to Administration, Gentamicin
2/5/2018	15:14	Yes	15:46	0:32	16:35	0:49	16:45	0:59
2/10/2018	22:30	yes	22:45	0:15	0:02	1:17	0:07	1:15
3/3/2018	3:40	no		##########		0:00		0:00
3/8/2018	12:36	yes	12:57	0:21	13:28	0:31	13:45	0:48
3/21/2018	15:49	yes	16:27	0:38	16:58	0:31	18:05	1:38
3/24/2018	22:43	yes	23:26	0:43	3/24/2018 0:02	0:36	3/24/2018 0:05	0:39
4/13/2018	22:07	yes	22:19	0:12	23:00	0:41	22:59	0:40
4/14/2018	23:32	yes	23:47	0:15	4/15/2018 0:45	0:58	4/15/2018 1:28	1:41
4/14/2018	23:33	yes	23:48	0:15	4/14/2018 1:21	1:33	4/15/2018 1:40	1:52
4/18/2018	21:56	yes	22:16	0:20	22:52	0:36	23:25	1:09
5/9/2018	12:09	yes	12:29	0:20	14:17	1:48	15:14	2:45
5/11/2018	9:50	no						
5/15/2018	23:07	yes	23:25		23:58	0:33	23:58	0:33
5/28/2018	0:45	yes	1:06		2:20	1:14	2:35	1:29
6/12/2018	9:42	yes	9:57		10:22	0:25	10:36	0:39

Figure I: Post Intervention Results



Antibiotic Administration Within One-Hour		
	Pre-Intervention	Post Intervention
Ampicillin	22%	46%
Gentamicin	20%	39%

Figure J: Budget for the Improvement Project

Year 1	Year 2	Interpretation	Item
$11,025.00	0	Over time paid for 98 nurses to attend staff meeting related to the project.	Personnel Expenses
0	0	Office supply and items for training.	Non-personnel Expenses
$11,025.00	0	Project will have one-time unit meeting attendance.	Total Expense

Figure K: Daily Net Saving

Patient	Daily saving per patient	Total Cost of Project	Daily savings per patient after project cost
Patient 1	$11,238.00	$11,025.00	$213.00
Patient 2	$11,238.00	0	$11,238.00