

Development of a Group B Streptococcus Self-Learning Module
for Registered Nurses in Intrapartum and Postpartum Care

By

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Abstract

Background: The birth of a new baby is usually a time of joy and excitement. However, there exists the potential for complications, such as the exposure of the newborn to a variety of bacteria during the labour and delivery process. Group B Streptococcus (GBS) is one such infection, which can cause severe or fatal outcomes for newborns. Nurses working in this area need to be knowledgeable about this infection to provide optimal care and ensure newborn safety and wellbeing. The Northwest Health Center (NWHC) is a small isolated health facility. Currently, there is a no learning module on the topic of GBS available at the NWHC. **Purpose:** The purpose of this practicum project was to develop a learning module for Registered Nurses at the NWHC. **Methods:** This practicum project consisted of an integrated literature review, an environmental scan and consultations with key informants. **Results:** Resulting from these processes, the need for a learning module on GBS was clearly identified and substantiated. Knowles' Adult Learning Theory was used to guide development of the module. **Conclusion:** This final report will include the results of the literature review, the environmental scan and consultations and summary of self-learning module. Advanced nursing practice competencies such as clinical, research, leadership, and consultation and collaboration competencies were utilized throughout the process.

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Introduction

Upon completion of my orientation at the North West Health Center (NWHC) in northern Alberta, I recognized through an informal needs assessment that many nursing staff on the inpatient unit were unfamiliar with policies and procedures regarding appropriate treatment for Group B Streptococcus (GBS) during labour and follow up in the post-partum period. GBS is a bacterial infection that is found in the vagina of approximately 15-40% of pregnant women (SOGC, n.d.). This bacterium can be passed on to the baby during labour with potentially severe complications such as brain, lung, spinal issues or even death (SOGC, n.d.).

Through discussion with staff I identified that there was no clear policy on what was considered recommended treatment for GBS. As well, some Registered Nurses were unclear as to what would be appropriate follow up and management of an infant following incomplete treatment of the mother during labour. Since the NWHC is in a remote and isolated part of the province, supports and resources found in larger centers are not readily available. Physicians may not always be in house which means increased accountability of the nursing staff. As well, there is no neonatal unit at the NWHC, so the responsibility of monitoring newborns falls on the Registered Nurses of the inpatient unit. This highlights the importance of staff being knowledgeable regarding this topic.

Therefore, based on these learning needs, I identified that since GBS is a potentially fatal disease to newborns, a learning module for Registered Nurses should be developed to increase knowledge and awareness about the importance of appropriate

treatment. Additionally, signs and symptoms of possible infection in the newborn and appropriate management of the disease should also be included in the module.

My desire to complete a comprehensive learning module for other nursing professionals was due to having professional experience with the tragedy that can be associated with newborn GBS infections. No parent should lose their newborn baby to an infection that could have been easily managed with simple antibiotics. Since there is some inconsistency between health care providers regarding prophylactic treatment of GBS, increasing nurses' awareness of the risks associated with this infection allows them to share this knowledge with patients. Parents can then make informed health care decisions regarding consenting to treatment and have awareness of possible signs of GBS infection in their newborn.

Practicum Goals and Objectives

The overall goal of the practicum project was to develop an effective learning tool for Registered Nurses that will enhance their understanding of the management and treatment of GBS infections in the intrapartum and post-partum period. This will provide clear guidelines for Registered Nurses to use resulting in improved patient care outcomes. The key objectives of this practicum were to:

- Complete an in-depth literature review, consultations and environmental scan to assess the learning needs of the inpatient unit nursing staff and to inform the development of the resource.
- Provide an educational resource for nursing staff on the treatment and management of GBS on the inpatient unit.

- Demonstrate advanced practice nursing competencies through research and development of educational resource.

Methods

A variety of methods were completed to ensure a successful practicum project was accomplished. A thorough integrated literature review was completed to identify current, evidence-based information on GBS to include into the learning module (see Appendix A). An environmental scan was conducted to look for existing resources available to the staff at the NWHC, as well as resources in current use at other similar serviced health care facilities (see Appendix B). Consultations were completed with the obstetrics educator, Registered Nurses and medical staff at the NWHC to gather rationale and input into the learning module (see Appendix B). In addition, other educators at health care facilities were contacted to identify appropriate resources to include. Once all the information from these methods were compiled, work began on the learning module. An in-depth learning tool was developed which Registered Nurses at the NWHC can use to increase knowledge and guide nursing practice (see Appendix C).

Summary of Literature Review

Labour and delivery is generally a time of joy, however newborns are susceptible to complications such as Group B Streptococcus during this process and also in the post-partum period. GBS is a bacterial infection that is found in birth canal and/or rectum of approximately 15-40% of women (SOGC, n.d.). This infection can be passed down to newborns during childbirth. There are two forms of GBS infections: early onset and late onset (SOGC, n.d.). Early onset develops within 7 days of birth and late onset develops

after this period and up to 6 weeks follow birth. Early onset is typically responsible for more deaths and causes complications such as lung, blood, or spinal infections, while late onset more often causes meningitis (SOGC, n.d.). Both forms of GBS can have severe lifelong complications that can negatively affect a child's quality of life.

A review of the literature was completed to provide support for the development of an educational resource on the topic of GBS for the nursing staff on the inpatient unit at the Northwest Health Center (NWHC) in High Level, Alberta. This hospital is a small rural health care facility in a remote location of northern Alberta. Since there is limited access to supports and resources and there is no neonatal unit at the facility, the Registered Nurses on the inpatient unit are responsible for most of the care of pregnant and labouring women. Physicians are not in house on a 24-hour basis, and as a result nurses are the main health care providers responsible for monitoring newborns during labour and in the post-partum period. Therefore, it is imperative that there be consistent guidelines regarding treatment and management of GBS.

This literature review explored the rationale for creating the resource and the content of the literature was examined to gather evidence-based information to incorporate into the learning module. An examination of various instructional designs and learning methods helped to identify frameworks to support development of the resource.

Literature Review Methods

A variety of databases, such as CINAHL, PubMed, and Cochrane, were searched to explore relevant literature, and gather evidence based information and studies to

include into the module. Key search terms included words such as: GBS, group B strep, GBS infection, signs of GBS infection, GBS labour, GBS infants, GBS newborns, GBS Canada, and GBS studies. Search terms in the databases were limited to include articles no older than 2000, with the majority of articles utilized being less than 10 years old. The Society of Obstetricians and Gynecologists of Canada's (SOGC) website was used as a resource. The SOGC is a leader in obstetrical health for Canadian women and their families.

Fourteen relevant studies were analyzed using the Public Health Agency of Canada critical appraisal toolkit and literature summary tables are compiled in the appendix (PHAC, 2014). This garnered support for the educational resource as the strength of relevant studies have been examined. Various study designs were included in the literature review such as cohort studies, prospective studies, retrospective observation, systemic reviews, randomized control studies, time trend studies, and non-randomized population studies. Canadian research, along with studies from countries such as Northern Ireland, London, Italy, Australia, France, USA and India, were examined with an emphasis and priority placed on data gathered from Canadian studies. Incorporating a wide variety of research expands the depth of information and knowledge to be utilized.

Summary

Rates of GBS infection among pregnant women can vary from country to country and between races and cultures as well. Approximately 15-40% of pregnant women in Canada are GBS positive. Of the 40-70% of colonized women that pass down GBS

infection, 1-2% of those newborns will develop the infection (Manitoba Public Health, 2015; Ontario Midwives, 2010; Public Health Agency of Canada, 2012; SOGC, n.d).

Several factors place an infant at risk of contracting GBS infection. Certain races, such as African Americans and Asians, are at an increased risk and women from certain geographical areas are also susceptible (Bryan, Cheng, & Caughey, 2011; Eastwood et al., 2015). Other factors include prolonged rupture of membranes, maternal fever, previous newborn with GBS infection, and GBS bacteria in urine in current pregnancy can also increase the threat of infection (Eastwood et al., 2015).

Screening, via anal and vaginal swabbing, at 35-37 weeks of pregnancy has been identified as the optimal time to identify infections (De Luca et al., 2016; SOGC, n.d.; Taminato et al., 2011). Because infection may be transient, it is prudent to identify the status close to term delivery date.

Universal screening and treatment with antibiotics during labour has been proven effective in the combat against infant acquired GBS infections (Taminato et al., 2011). The use of antibiotics such as penicillin has been identified as the gold standard of treatment for GBS (Chen, Puopolo, Eichenwald, Onderdonk, & Lieberman, 2005; De Luca et al., 2016; Taminato et al., 2011). De Luca et al. (2016) also state that penicillin with an initial dose of 5 million international units (IU) and 2.5-3.0 million IU for subsequent doses, every 4 hours until delivery is the optimal choice for treatment. De Luca et al. (2016) also identified that ampicillin is considered a safe alternative, and cefazolin is also an option if there is a penicillin allergy that is not an anaphylaxis risk. Lastly, clindamycin and vancomycin should be used as a last resort for women with

anaphylaxis to penicillin. The infection is generally considered treated once the first dose of antibiotics has been in the maternal bloodstream for four hours (De Luca et al., 2016). Infants born before the four-hour mark should be monitored more closely for signs of GBS infection.

A study completed by Baecher and Grobman, (2007) explored the possibility of treating GBS infections with oral antibiotics on an outpatient unit in the prenatal period. Despite the high quality of this study, the results found that this method is not as effective as treating with intravenous antibiotics during labour and thus cannot be relied on as a sole method to treat GBS infection and prevent transmission to newborns. However, future research involving a large sample size may provide strength for the theory.

Studies have also identified that obstetricians were more likely than family physicians to follow SOGC guidelines on the management and treatment of GBS (Konrad, Hauch, & Pylypjuk, 2007). Differences in patient care management were explored and it was discovered that family physicians tended to include patients in health care decisions more. Evidence-based information was provided by family physicians, allowing patients to then make informed health care decisions.

Ineffective treatment and management places a newborn at an increased risk and a newborn infected with GBS can present with a wide variety of possible complications. Mild and life threatening complications, or even death are all possibilities. Tests used to diagnose GBS infection in newborns include blood work, cerebrospinal fluid cultures, examination of risk factors, and physical exam to look for signs of clinical sepsis (Eastwood et al., 2015). Aside from the physical and mental anguish caused by GBS

infection in newborns, increased health care costs may also result. Treating and managing GBS infections can be costly and cause a drain on the health care system (Schroeder, Petrou, Balfour, Edamma, & Heath, 2008).

Evidence-based information should guide nursing practice. Therefore, it is important to recognize relevant information provided by studies on the topic of GBS. Advances in treatment and management options have led to a significant decrease in mortality and morbidity of infants exposed to GBS infection (Taminato et al. 2011). It has also been proven that antepartum screening along with the use of antibiotics to manage GBS is safe and effective (Taminato et al. 2011). This relatively simple method of treatment is easily accessible in most health care facilities in Canada. As a result, this should be employed as the gold standard of care by all health care facilities and health care practitioners. This will ensure improved fetal outcomes and optimal health for newborns.

While there is a great deal of literature available on the topic of GBS, there is always room for increased information and more studies. Cutland et al. (2015) identified that more research is needed into the effect of GBS infection on stillbirth rates. Perhaps the most extreme outcome imaginable, but one of the most devastating as well, requiring researchers to gather more evidence on the link between the two.

Chen, Puopolo, Eichenwald, Onderdonk, and Lieberman, (2005) completed a study and examined whether antibiotic resistant strains of GBS exist due to widespread antibiotic use to treat this infection during labour. Despite the potential for antibiotic resistant strains to develop, it appears that is not a concern at the moment. Their study

found that there was no increase in antibiotic resistant strains of early onset GBS infection in newborns despite the regular use of antibiotics to treat this infection during labour.

However, Konrad and Katz (2007) found that since transmission of GBS to newborns is so rare and so many women are treated with antibiotics there is the potential to develop antibiotic resistance or complications resulting from overuse of antibiotics. The point could be argued that without proper treatment of all colonized women the rates of GBS transmission to newborns would dramatically increase. Therefore, there should be more studies completed on the risks associated with the over use of antibiotics.

Additionally, with the prophylactic use of antibiotics, bacterial organisms have the potential to modify strain patterns and become resistant to commonly used antibiotics. Therefore, it is important to ensure proper surveillance of trends of bacterial organisms, such as GBS, which commonly affect newborns (Sgro et al., 2011).

Identifying areas for future research provides health care practitioners, such as nurses, insight into other potential issues that could affect management and treatment of GBS infection in newborns. Raising awareness about all issues that impact the nurse's ability to manage and treat this disease is vital to ensure best nursing practice and patient care.

Instructional Design

Adult learning principles must be considered when developing learning modules geared towards nurses. Bloom's Taxonomy is one such instructional design that can be utilized when composing adult education learning modules (Adams, 2015; Su, & Osisek,

2011). The steps of Bloom's Taxonomy include: providing knowledge that staff can utilize on their own terms, ensuring they can comprehend the information and apply it to practice, examining available information and situation to develop a plan, and making decisions based on findings (Su, & Osisek, 2011).

Learning Theories

Learning theories can help guide nursing practice and can assist when developing educational programs for nurses. Malcom Knowles proposed a theory called Knowles' Adult Learning Theory, which shifts towards self-directed learning and allows the learner to guide their own learning (Mitchell, & Courtney, 2005). When working with adult learners, such as Registered Nurses in a remote setting, it is necessary to utilize a theory that allows learners to guide their own learning (Mitchell, & Courtney, 2005). Knowles' Theory states that in order for effective learning to happen there must be a desire to learn, a need for knowledge, ability to transfer to own practice, accountability for one's learning, and past experience must be able to be incorporated (Mitchell, & Courtney, 2005). Adults learn best when they recognize that they can utilize the material they are covering (Mitchell, & Courtney, 2005).

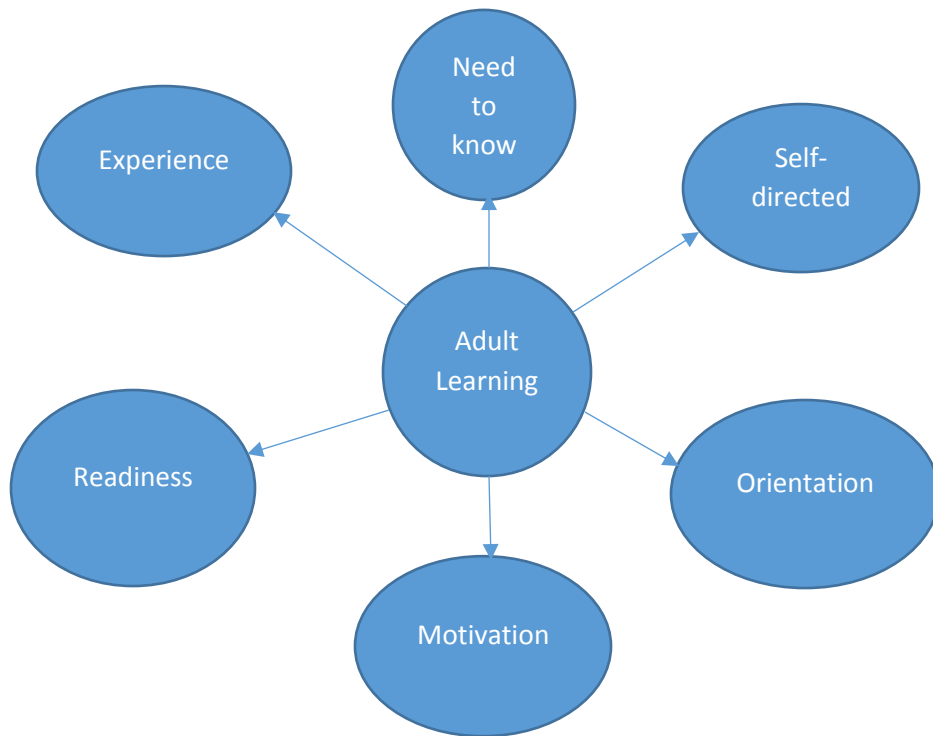


Figure 1. Knowles' Learning Theory. Figure created by author from information presented in Mitchell & Courtney (2005).

Summary of Consultations and Environmental Scan

A thorough consultation process was completed with several staff members at the NWHC. Three Registered Nurses at the NWHC were interviewed and agreed to complete a questionnaire related to GBS infections during labour and in the post-partum period. Two medical staff who deliver newborns at the NWHC were interviewed to collect input on the management of GBS infections. The obstetrical educator was consulted to gather information on supports utilized for the development of policies and procedures, and educational programs for the nursing staff. In addition, information was collected regarding existing policies and procedures surrounding the management and treatment of GBS infections during labour and in the post-partum period. An educator at my previous

place of employment, a larger health care facility in New Brunswick, was also contacted to identify how their health care facility manages GBS infections.

An in depth environmental scan was completed to explore existing resources and modules that are available. The NWHC uses the Managing Obstetrical Risk Efficiently (MORE OB) program to guide aspects of nursing practice (Salus Global, 2014). MORE OB is a program which incorporates professional standards and guidelines with current tools and resources to focus on providing safe patient environments for obstetrical programs (Salus Global, 2014). Other obstetrical educators at similar serviced health care facilities in Alberta were contacted to identify resources in use and their ability to manage GBS infections.

Common themes arose between information provided by the educators. One theme was that all stated that since the MORE OB program is widely used in Alberta, any learning modules their health care facility uses is based on the information provided in the MORE OB program and learning modules. Another common theme was that all participating educators stated that information provided by the SOGC website is also often included in learning modules and aids in the development of policies and procedures so learning tools should utilize information collected from this resource.

The educator at the NWHC recognized a gap in the knowledge as well due to lack of an existing learning module. The Registered Nurses interviewed identified that GBS is a significant health condition that requires proper management and all stated that the NWHC is effective at managing treatment of GBS. A common theme arose among the

nurses in that they all identified they could use more education on the topic in order to increase their knowledge and better manage the illness in the post-partum period.

The two participating physicians were interviewed regarding rates of GBS infections at the NWHC, screening methods, treatment, and incidences of GBS infections in newborns. They identified that while GBS transmission to newborns is rare, proper treatment and management of GBS infections in the labouring period is key to decreasing rates of transmission and improving patient outcomes.

The educator in New Brunswick shared information regarding their facility's management of GBS. Their policies, procedures and self-learning package are based on information from MORE OB, SOGC, and the Canadian Pediatric Society. This was helpful in identifying information that would be necessary to include in a learning module for nursing staff as well as identifying how larger centers manage GBS infections.

The Society of Obstetricians and Gynecologists of Canada's website was also examined to gather data. Websites of other Canadian health care organizations, such as the Canadian Pediatric Society website, were explored to identify useful information that could assist in the development of the module. As well, through internet searches, resources such as pamphlets from the University of Toronto School of Graduate Studies and Ontario Midwives were discovered that could be useful to assist nurses with providing patient education on the topic.

Summary of GBS Learning Module

Through completion of an in depth literature review, consultations and an environmental scan it was clear that the need for a learning module on the topic of GBS infections during the intrapartum and post-partum period was needed at the NWHC. The self-study module that was subsequently developed covers a variety of topics such as: what is GBS, risk factors, treatment methods, implications, complications and parent education. At the end of the module there is a short quiz to test knowledge of the learner. The purpose of this module is to:

- Provide an educational resource for Registered Nurses on the treatment and management of GBS on the inpatient unit.
- Aid Registered Nurses to enhance their own practice and increase their knowledge surrounding the assessment and management of GBS.
- Contribute to improving patient care and outcomes through the formulation of clear guidelines for all health care staff to use.

Module Summary

What is GBS?

Group B Streptococcus or GBS is a gram negative bacterium that is present in the birth canal, vagina, or rectum of approximately 15-40% of women (SOGC, n.d). The main reservoir for GBS infections that can be passed along to newborns is the gastrointestinal tract of women. The infection can be intermittent, transient or persistent and may be vertically transmitted to a newborn during the labour and delivery process.

GBS is the most significant cause of sepsis in infants with 40-70% of GBS positive women passing the infection to their newborns (SOGC, n.d). Since the infection is typically treated effectively, most infants exposed to GBS during the labour and delivery process are unaffected by it, however about 1-2% of these newborns will develop an infection from GBS (SOGC, n.d). There are two forms of GBS infections: early onset and late onset. Early onset develops within 7 days of birth and late onset develops after this period and up to 6 weeks following birth.

Screening

The Society of Gynecologists and Obstetricians of Canada recommend that all pregnant women be screen for GBS infections during pregnancy. Typically, women are swabbed for GBS via anal and vaginal swabbing, between 35-37 weeks of pregnancy to test for this infection. This time frame, close to the due date, has been identified as the best time to screen due to the transient nature of the infection.

Risk Factors

Certain risk factors place a woman at increased risk of having a baby with a GBS infection. Risk factors include:

- Prolonged rupture of membranes (> 18 hours).
- Maternal fever (> 38 °C) or illness such as chorioamnionitis during labour.
- Preterm birth (< 37 weeks).
- Endotracheal intubation or assisted ventilation at delivery.

- Previous newborn with GBS infection.
- GBS bacteria in urine in current pregnancy.

Newborn Complications

A newborn infected with GBS can present with a wide variety of possible complications. Mild or life threatening complications may result and even death is a possibility. Sepsis, meningitis and respiratory failure are all examples of issues newborns may experience. Without proper treatment, newborns that are exposed to a GBS infection during labour are at an increased risk of contracting the infection (De Luca et al., 2016).

It is important to be aware of signs and symptoms that a newborn may exhibit if exposed and affected by GBS. Physical manifestations of early onset infection in newborns can include symptoms such as lethargy or difficulty to wake, or disinterest or inability to feed. As well, newborns can experience impaired thermoregulation, tachycardia, respiratory issues or central cyanosis.

In late onset GBS infection, similar symptoms may be present but newborns may also experience vomiting or unable to tolerate feeding, hypotonia, altered level of consciousness, or a bulging fontanelle.

Treatment and Management of GBS

Universal screening and treatment with antibiotics during labour has been proven effective in combating infant acquired GBS infections (Taminato et al., 2011). The use of antibiotics such as penicillin has been identified as the gold standard of treatment for GBS (Chen, Puopolo, Eichenwald, Onderdonk, & Lieberman, 2005; De Luca et al., 2016;

Taminato et al., 2011). A positive GBS swab indicates that treatment must be promptly initiated.

Some women do not receive adequate prenatal care, therefore it is important to know what to do if a woman presents with unknown GBS status. MORE OB has developed a decision pathway for women who present in labour or with rupture of membranes with unknown GBS status. If the women had a previous GBS affected newborn or had GBS bacteriuria in current pregnancy then she should receive intrapartum antibiotics. If she does not have those risk factors, but has additional risk factors of rupture of membranes ≥ 18 hours, maternal temperature ≥ 38 degrees Celsius, or is < 37 weeks, then she should also receive intrapartum antibiotics. For all other women prophylactic antibiotics are not required (Salus Global, 2016).

Diagnostic Measures

If a GBS positive mother receives adequate antibiotic treatment prior to delivery, no follow up is required for infants unless symptoms are displayed. If suspected there must be consideration of risk factors. Tests used to diagnose the GBS infection in newborns include blood work such as CBC, cerebrospinal fluid cultures, chest x-ray, and physical exam to look for signs of clinical sepsis (Eastwood et al., 2015). Since GBS infection is a major cause of chorioamnionitis, infants born to women with chorioamnionitis should also have an evaluation for sepsis (Eastwood et al., 2015; MORE OB, 2016). In infected newborns findings may include white blood counts higher than normal ($< 5.0 \times 10^9/L$), abnormal white spots on chest x-ray with findings consistent to

pneumonia, and the presence of gram positive or negative cocci or rods in cerebrospinal fluid cultures (CPS, 2007).

Parent Education

Since late onset GBS infections can affect infants, it is important that parents are aware of signs and symptoms so they can appropriately monitor their baby once at home. Patient education should take place prior to discharge and Registered Nurses should ensure parents know how to access appropriate follow up. Patient education should focus on the signs and symptoms of GBS infections, explained in easy to understand language. Remind parents that newborns who may have contracted GBS can have trouble breathing, trouble feeding, be difficult to wake up, have a raised bump on the soft spot on their head, or have low muscle tone. These symptoms are concerning and should be addressed by a health care provider.

Link to Theoretical Framework

Instructional designs that have clear learning objectives, visually appealing learning styles, and are highly interactive are most favorable to adult learners so this format was included into the learning module (Foster, Shurtz, & Pepper, 2014). It is important to consider adult learning principles when developing resources for nurses, therefore Bloom's Taxonomy is one such instructional design that was useful to integrate into the learning module (Adams, 2015; Su, & Osisek, 2011). The six educational components of Bloom's Taxonomy were integrated by ensuring the staff can use the information provided on their own terms, making sure Registered Nurses can understand

the information and apply it into practice. As well, the module allows Registered Nurses to examine the available information and situation to develop a plan, and make clinical decisions based on findings (Su, & Osisek, 2011). This allows the user ease in comprehending the difference between subject content and the cognitive process related to it. The Revised Bloom's Taxonomy also incorporates four levels of knowledge: factual, procedural, conceptual, and metacognitive, with a focus on student knowledge (Su, & Osisek, 2011). These four levels of knowledge will assist in identifying what is intended for the target audience to learn, thereby aiding in the development of a learning module for Registered Nurses at the NWHC.

Additionally, Knowles' Adult Learning Theory, which considers self-directed learning, was a key factor in the development of the learning module (Mitchell, & Courtney, 2005). Creating a resource that Registered Nurses can access and complete themselves will allow them to be independent learners and guide their own learning (Mitchell, & Courtney, 2005). The staff are then accountable for their own learning and can translate the information learned into practice (Mitchell, & Courtney, 2005). It was necessary to engage staff in discussion and allow them to provide input on material covered. Including them in the development of the content ensured the target audience was reached and resulted in improved receptiveness to the educational resource. Through various consultations with Registered Nurses and the obstetrical educator, information was collected regarding necessary inclusions into the module. This allowed for a strong foundation for the module to be developed.

Advanced Practice Nursing Competencies

Numerous advance nursing practice competencies were demonstrated throughout completion of the two practicum courses. Clinical, research, leadership, and consultation and collaboration competencies were demonstrated during the progress of these two courses. Providing a learning module on GBS will help guide nurses to be more advanced in their own clinical skills.

Clinical competencies

The Canadian Nurses Association identifies that advance practice nurses must create new knowledge, thereby impacting standards of care and policies (CNA, 2008). The development of a new learning tool for the nursing staff at the NWHC created a new set of knowledge regarding GBS which will hopefully influence future policies and procedures. The creation of clear guidelines can result in improved standards of care and patient outcomes. Additionally, advanced practice nurses should plan and develop educational resources based on needs of the organization, (CNA, 2008). This competency was demonstrated by creating a learning tool on GBS, which will influence standards of care and fulfill a need within the organization.

Research competencies

An advanced practice nurse must be able to develop and utilize research in order to be effective in practice (CNA, 2008). Nursing research competencies were used in various aspects of the practicum courses. I was able to identify innovations to improve client care on the inpatient unit at NWHC and identify and support research to improve nursing care provided by staff at the NWHC. I was also able to contribute to nursing practice by

providing knowledge and evidence-based information by developing a learning module on GBS. As well, I collaborated with other members of the health care team to support research which improves nursing care. Ensuring confidentiality, collecting data, and analyzing findings ensured that ethical research conduct took place throughout the two courses.

Leadership competencies

The advanced practice nurse must be able to be a catalyst for change, positively influence new practice methods, improve care and impact policies of their organization (CNA, 2008). During this practicum I had the opportunity to advocate for clients and families to ensure proper policies and procedures exist to allow for achievement of positive health outcomes for newborns and their families. I was also able to identify learning needs of Registered Nurses at the NWHC and develop programs to address those needs, such as a learning module on the topic of GBS. In addition, I identified and addressed challenges, and initiated change that allowed Registered Nurses to improve practice, resulting in improved patient outcomes.

Consultation and collaboration competencies

The advanced practice nurse must have the ability to collaborate with various members of the health care team to positively impact nursing practice (CNA, 2008). During this practicum course I was fortunate to be able to consult with other health care providers to gather support and rationale for the educational resource and develop risk management strategies. I collaborated with my supervisor at MUN School of Nursing to develop an educational resource for nursing staff at the NWHC. Finally, I was able to

identify the contribution and ability of an advanced practice nurse by collaborating with other health care providers to develop an educational resource.

Next Steps

While the majority of the work has been completed there is still more to be done. Consultation took place and feedback on the learning module was requested from the educator at the NWHC to ensure the module meets the learning needs of the targeted audience. The educator stated that the module is professionally laid out and easy to read, and the risk factors and signs and symptoms of infection were presented clearly. As well, she stated that the inclusion of pictures was engaging and sound resources were used. Finally, the educator felt the quiz at the end was a great review and test of knowledge. Productive consultations resulted in an effective resource being developed and it is now up to the health center to decide how to utilize and implement the module.

While the module focuses on the scope of practice of Registered Nurses, it can be adapted to the skill set of Licensed Practical Nurses if the NWHC wishes to do so. As well, the Group B Strep Support group in UK have stated that they would like to consider using the module. The information in the self-learning module is much needed since GBS is not prophylactically treated within their geographical area.

There is hope that this module will aid in the development of future policies and procedures regarding GBS at the NWHC. As well, a pamphlet for parents on the topic of GBS is being developed with this project with useful and easy to read information. The completed pamphlet will be presented to management, and if adopted will further address learning needs and achieve improved patient outcomes.

The impact of the module may also be evaluated by including it in future orientation sessions and gathering feedback from participating nurses. Having the module available and regularly used as a reference by all current staff will also identify its value.

Conclusion

This practicum project identified a learning need at the NWHC and created a resource to fill that gap. Through completion of a literature review, consultations and environmental scan, a thorough learning module was developed which will aid Registered Nurses in the management of GBS infections in the intrapartum and post-partum period. This learning module will be an asset to the NWHC and allow Registered Nurses to be comfortable in managing and treating GBS infections. With the potential for serious complications resulting from transmission of GBS, it is important to raise awareness and increase knowledge surrounding this topic. I am optimistic that this module will lay the foundation for improved patient care and outcomes. Hopefully this will influence the development of future policies and procedures to support increased clarity and consistency in obstetrical and newborn care.

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Appendix A

Integrated Literature Review

Development of a GBS Learning Module for Nursing Staff

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Labour and delivery is generally a joyful time for parents and families. However, it is not a time free from risk and many complications can arise. Labour can be a traumatic event and newborns are susceptible to complications during both the labouring and post-partum period. Infections can be transmitted from mother to baby during the labouring process which poses an increased risk to newborns. Group B streptococcus or GBS is one such infection. GBS is a bacterial infection which is found in birth canal and/or rectum of approximately 15-40% of women (SOGC, n.d.). This infection can then be passed down to newborns during the labour process, potentially causing a wide variety of complications ranging from lung, spinal issues or even death (SOGC, n.d.).

A review of the literature will be completed to provide support for the development of an educational resource on the topic of GBS for the nursing staff on the inpatient unit at the Northwest Health Center (NWHC) in High Level, Alberta. This hospital is a small rural health care facility in a remote location of northern Alberta. Since there is limited access to supports and resources and there is no neonatal unit at the facility, the Registered Nurses on the inpatient unit are responsible for most of the care of pregnant and labouring women. Physicians are not in house on a 24-hour basis, and as a result nurses are the main health care providers responsible for monitoring newborns during labour and in the post-partum period.

Since there is only one acute inpatient unit in the entire hospital, the patient population consists of a variety of patients ranging from pediatric, cardiac, surgery, or labouring patients. With a wide variety of patients, limited supports, and the potential for newborn complications resulting from GBS, it is necessary for the staff to be

knowledgeable regarding this infection. Nursing staff especially, must be aware of potential side effects, symptoms, or complications that newborns may face in the post-partum period since they are the primary health care provider for them while in hospital. Medical and nursing staff completing locums at the hospital may differ in their approach, leading to inconsistent treatment and management of GBS infection. Clarity of existing policies and creation of a universal policy that all health care providers follow for the management and treatment of GBS will create improved care and better patient outcomes.

This literature review will explore the rationale for creating such a resource. The content of the literature will be examined to gather evidence based information to incorporate into the learning module. Various instructional designs and learning methods will be examined to identify frameworks to support development of the resource.

Methods

Various databases were searched to gather evidence based information and studies. CINAHL, PubMed, and Cochrane databases were all explored to identify relevant literature. Key search terms included words such as: GBS, group B strep, GBS infection, signs of GBS infection, GBS labour, GBS infants, GBS newborns, GBS Canada, and GBS studies. Search terms in the databases were limited to include articles no older than 2000, with the majority of articles utilized being less than 10 years old. The Society of Obstetricians and Gynecologists of Canada's (SOGC) website was used as a resource. The SOGC is a leader in obstetrical health for Canadian women and their families. An environmental scan of other health care facilities will be completed during the practicum

to identify further information regarding existing learning modules, along with examination of policies and procedures surrounding GBS management.

Fourteen relevant studies were analyzed using the Public Health Agency of Canada critical appraisal toolkit and literature summary tables are compiled in the appendix. This will garner support for the educational resource as the strength of relevant studies have been examined. Various study designs were included in the literature review such as cohort studies, prospective studies, retrospective observation, systemic reviews, randomized control studies, time trend studies, and non-randomized population studies. Canadian research, along with studies from countries such as Northern Ireland, London, Italy, Australia, France, USA and India, were examined with an emphasis and priority placed on utilizing data gathered from Canada studies. Incorporating a wide variety of research expands the depth of information and knowledge to be utilized.

Rationale

The development of a learning module for Registered Nurses at the inpatient unit at the NWHC arose from informal discussions with nursing staff on the unit. Since this hospital is the main delivery site for low risk women in this area of the province, it is important for Registered Nurses to be knowledgeable about the management of GBS. GBS is a bacterial infection that is present in the birth canal of approximately 15-40% of women, with 40-70% of these women passing the infection along to their newborns. About 1-2% of these newborns will develop an infection from GBS (SOGC, n.d.). Typically, women are swabbed between 35-37 weeks of pregnancy to test for this infection. If they are positive or colonized, they are then treated with antibiotics during

labour or once their membranes rupture to prevent transmission to their newborns during the labour process (SOGC, n.d.).

There are two forms of GBS infections: early onset and late onset (SOGC, n.d.). Early onset develops within 7 days of birth and late onset develops after this time frame and up to 6 weeks following birth. Early onset is typically responsible for more deaths and causes complications such as lung, blood, or spinal infections, while late onset more often causes meningitis (SOGC, n.d.). Both forms of GBS can have severe lifelong complications that can negatively affect a child's quality of life. Side effects of early onset GBS infection in newborns include lethargy, impaired thermoregulation, respiratory issues and poor feeding (Atherton, 2002). In late onset GBS infection, similar side effects may be present but may also include vomiting, floppiness, altered level of consciousness, and a bulging fontanelle (Atherton, 2002). Therefore, it is vital for nursing staff to be cognisant of possible symptoms newborns can exhibit in the post-partum period that could indicate a possible infection with GBS.

Treatment for GBS colonization includes the use of intravenous antibiotics such as penicillin during labour (Atherton, 2002). Guidelines and appropriate policies are necessary to ensure proper management of GBS during labour and in the post-partum period (Eastwood et al., 2015).

Having personal experience with the tragedy that can be associated with GBS infection in newborns further amplified my desire to complete a comprehensive learning module for other nursing professionals. No parent should lose their newborn baby to an infection which could have been easily managed with simple antibiotics. Since there is

some inconsistency between health care providers regarding prophylactic treatment of GBS, increasing Registered Nurses' awareness of the risks associated with GBS infections permits them to share this knowledge with patients, thereby allowing patients to make informed health care decisions regarding treatment of GBS and management of possible GBS infections in newborns.

The literature will be explored to identify rates of GBS infection in pregnant women and transmission rates to infants. Various screening and treatments methods will be examined to identify an optimal modality to manage this infection. Potential outcomes of newborns that are exposed to GBS infection, including costs and implications will also be explored.

Objectives

The objectives of this learning module are to:

- Provide an educational resource on the treatment and management of GBS for nursing staff on the inpatient unit.
- Assist Registered Nurses to enhance their own practice and increase their knowledge surrounding the assessment and management of GBS.
- Improve patient care and outcomes through the formulation of clear guidelines for all health care staff to use.

Ineffective management of GBS by staff places newborns at an increased risk unnecessarily and could potentially cause severe negative newborn outcomes. Creating appropriate guidelines and ensuring nursing staff are aware of how to manage GBS is

important to maintain health and prevent illness (Mahlmeister, 1996). The development of an educational resource with clear standards will allow for enhanced clarity and consistency in the care provided, allow for improved nursing practice, and ultimately optimal patient outcomes.

Literature Review

Rates of GBS Infection

Rates of GBS infection among pregnant women can vary from country to country and also between races and cultures as well. Approximately 15-40% of pregnant women in Canada are GBS positive. Of the 40-70% of those colonized women that pass down GBS infection, 1-2% of those newborns will develop the infection (Manitoba Public Health, 2015; Ontario Midwives, 2010; Public Health Agency of Canada, 2012; SOGC, n.d;). While it may seem that a small portion of newborns actually contract GBS the potential complications can be severe. Since GBS infection is the main cause of sepsis and meningitis in infants, the significance of its impact on newborn mortality and morbidity is quite astounding (CDC, 2014).

Risk Factors

Various risk factors can place a newborn at an increased risk of contracting GBS infection. Bryan, Cheng, and Caughey (2011) completed a study which explored the impact of race on GBS screening and rates. They found that African American women are less often screened for GBS infection, typically experience higher rates of infection, and thus being African American puts infants at an increased risk of developing a GBS

infection. As well they also identified that Asian women and other racial minority groups are all less likely to be screened for GBS infection during pregnancy. Having completed the study in one facility and only including patients who delivered at term and were not transferred to the facility garners strength for the study and results. In addition, Tandon, Parillo, and Keefer (2005) had similar findings in identifying that Hispanic women were at a disadvantage when receiving health care services and that it is important to provide culturally competence care during the prenatal period. Ensuring equal and adequate culturally competent care to all people is a vital component of nursing care (Servonsky, & Gibbons, 2005).

Certain geographical regions also appear to experience an increase in rates of GBS infection (Eastwood et al., 2015; Pulver et al., 2009; Rivera, et al., 2015) A study by Eastwood et al., (2015) found that Northern Ireland had higher rates of GBS infection among pregnant women than the UK as a whole. Over half the mothers had risk factors for GBS infections. Risk factors include prolonged rupture of membranes, maternal fever, previous newborn with GBS infection, or GBS bacteria in urine in current pregnancy (Eastwood et al., 2015). Therefore, native geographical region could be an important point to consider in areas of Canada with high immigrant rates. As well, this identifies the importance of being aware of current rates in local health care facilities and regions.

A study by Shah, Saxena, Randhawa, Nangia, and Dutta (2014) found that similar risk factors associated with GBS infection can include prolonged rupture of membranes or prolonged labour, maternal fever or illness during labour, preterm birth, or respiratory issues at delivery (see Appendix D; Government of Alberta, 2011; SOGC, n.d.;). These

are significant risk factors and Registered Nurses must be aware of them when providing nursing care to laboring women in order to prevent incidences of GBS infection in newborns.

Screening Methods

Screening, via anal and vaginal swabbing, at 35-37 weeks of pregnancy has been identified as the optimal time to identify infections (De Luca et al., 2016; SOGC, n.d.; Taminato et al., 2011). Because infection may be transient it is prudent to identify the status close to term delivery date. As well, since some women do not test positive for both anal or vaginal swabs, and only test positive for one, it is essential that health care providers complete both swabs every time (De Luca et al., 2016). Despite great advances in the decrease of GBS transmission to infants more work is needed regarding clearer guidelines on screening, prophylactic options, and monitoring infants in the post-partum period (Taminato et al., 2011). Since some health care facilities have various health care providers and disciplines that that provide care it is important that clear guidelines are in place to ensure consistent care to patients regardless of health care provider.

A study by Angstetra, Ferguson, and Giles, (2007) examined rates of early onset GBS in newborns following implementation of a universal screening policy. This study provided possible areas for future research by recognizing that more randomized controlled trials on the topic of GBS are needed. Angstetra et al. (2007) found that incidences of GBS decreased by 84% following implementation of a policy. They also identified that it is vital to ensure compliance with antibiotics treatment during labour to ensure effective treatment and thus lower infection rates. Without proper treatment of

GBS during labour, rates of GBS infections in newborns have the potential to climb resulting in decreases in newborn health (Angstetra, Ferguson, & Giles, 2007; Eastwood et al., 2015; Taminato, 2011).

Despite best efforts GBS is not always able to be effectively managed. Cases exist where mothers have tested negative for GBS, yet have an infant who develops a GBS infection (Puopolo, Madoff, & Eichenwald, 2005; Shah et al., 2014). Therefore, other options for treatment methods must be considered. Risk factors of infants must be examined and sensitivity of screening tools must be analyzed to ensure they are effective in accurate diagnosis (Puopolo, Madoff, & Eichenwald, 2005). While it is not always possible to evaluate the effect of poor obstetrical technique, it is something that must be considered (Puopolo et al., 2005)

The possibility of a maternal vaccine to combat GBS infection is another option that is on the horizon but more research is needed to ensure its safety and efficacy (Law et al. 2005). Initial trials have showed the vaccine is safe and effective at providing protection up to 3 months of age for newborns (Law et al., 2005). Until the time that vaccination against GBS infection is an option in Canada, it is important to consider screening tools that can be utilized at delivery as GBS rates have the potential to fluctuate (Puopolo, Madoff, & Eichenwald, 2005).

Treatment Methods

Universal screening and treatment with antibiotics during labour has been proven to be effective in the combat against infant acquired GBS infections (Taminato et al.,

2011). The use of antibiotics such as penicillin has been identified as the gold standard of treatment for GBS (Chen, Puopolo, Eichenwald, Onderdonk, and Lieberman, 2005; De Luca et al., 2016; Taminato et al., 2011). De Luca et al. (2016) also state that penicillin with an initial dose of 5 million international units (IU) and 2.5-3.0 million IU for subsequent doses, every 4 hours until delivery is the optimal choice for treatment. De Luca et al. (2016) also identified that ampicillin is considered a safe alternative, and cefazolin is also an option if there is a penicillin allergy which is not an anaphylaxis risk. Lastly clindamycin and vancomycin should be used as a last resort for women with anaphylaxis to penicillin. Once the first dose of antibiotics has been in the maternal bloodstream for four hours the infection is generally considered treated (De Luca et al., 2016). Infants born before the four-hour mark should be monitored more closely for signs of GBS infection.

Studies have also identified that obstetricians were more likely than family physicians to follow SOGC guidelines on the management and treatment of GBS (Konrad, Hauch, & Pylypjuk, 2007). Differences in patient care management were explored and it was discovered that family physicians tended to include patients in health care decisions more. Evidence based information was provided by family physicians, allowing patients to then make informed health care decisions. As well, another plausible explanation for differences among the two groups is that family physicians mostly deal with low risk women and obstetricians deal with high risk women so are more likely to follow SOGC guidelines (Konrad, Hauch, & Pylypjuk, 2007).

Another important aspect to consider is the current wide spread use of antibiotics in health care resulting in antibiotic resistance. Therefore, it is vital to consider alternative methods to treatment of GBS, as there is the potential for strains of GBS to develop antibiotic resistance to standard antibiotics used to treat this infection during labour (CDC, 2010). Consequently, strains of GBS must be tested for antibiotic susceptibility to ensure adequate treatment.

Chen, Puopolo, Eichenwald, Onderdonk, and Lieberman, (2005) completed a study and examined whether antibiotic resistant strains of GBS exist due to widespread antibiotic use to treat this infection during labour. Despite the potential for antibiotic resistant strains to develop, it appears that is not a concern at the moment. Their study found that there was no increase in antibiotic resistant strains of early onset GBS infection in newborns despite the regular use of antibiotics to treat this infection during labour. Three time frames or periods were covered for this study: a period when there was no screening for GBS (1009-1992), a period when risk based screening for GBS was completed (1993-1996) and a period when universal screening for GBS was completed (1997-2002). The results found that incidences of GBS fell dramatically over the three periods. Of all the antibiotics examined in the study, erythromycin was the one antibiotic that did experience antibiotic resistant strains of GBS. However, the rate was extremely low at 4 incidences out of 28,803 births during the period of no screening, 1 incidence out of 34,262 during the period of risk based screening, and 5 incidences of 57,887 during the period of universal screening (Chen et al., 2005). Despite limitations in the study regarding health care provider compliance with the use of antibiotics, it was identified

that treatment with antibiotics is an effective method of treating GBS infections during labour to prevent transmission to newborns.

It is also important to consider which method of antibiotics is most effective at preventing GBS infection in newborns. A study completed by Baecher and Grobman, (2007) explored the possibility of treating GBS infections with oral antibiotics on an outpatient unit in the prenatal period. Despite the high quality of this study, the results found that this method is not as effective as treating with intravenous antibiotics during labour and thus cannot be relied on as a sole method to treat GBS infection and prevent transmission to newborns. However, future research involving a large sample size may provide strength for the theory. This study also found that despite the advances in care and even with treatment with IV antibiotics during the intrapartum period, cases of GBS sepsis in newborns still exist.

Diagnostic Tests

Tests used to diagnose GBS infection in newborns include bloodwork, cerebrospinal fluid cultures, examination of risk factors, and physical exam to look for signs of clinical sepsis (Eastwood et al., 2015). Another method to diagnosis GBS infection may also include the use of an Xpert GBS Assay (Jost et al., 2014). This test has been proven effective at diagnosing GBS in a timely manner (Jost at al., 2014). While it normally involves collection of vaginal and rectal specimens, a study by Jost at al. (2014) examined its use for diagnosing GBS infection in newborns by collection of newborns gastric fluid. This test was found to have 80% sensitivity and 100% specificity, and was able to diagnosis GBS infection in newborns in less than one hour, therefore dramatically

reducing wait time for diagnosis and leading to a decrease in delay of treatment. While this study may be considered weaker as it is the first study testing this aspect and has a small sample size, it is still useful to identify another potential method of diagnosis, as well as an area in treatment and management that could be further explored.

Outcomes

A newborn infected with GBS can present with a wide variety of possible complications. Mild complications, life threatening complications, or even death are all possibilities for a newborn with GBS infection. De Luca et al. (2016) found that without proper treatment of GBS, infants who are exposed to a GBS infection during labour are at risk of contracting the infection. For example, GBS positive women who experience a precipitous delivery may not receive adequate treatment in time for delivery. These babies are then at risk and should be monitored more closely for signs of sepsis and other possible complications.

A systemic literature review was completed by Cutland, Edwards, Madhi, and Cunnington (2015) which examined the impacts of GBS infection on stillbirth rates. Canada was identified as having one of the lowest stillbirth rates associated with GBS. However, cases of stillbirths associated with GBS infection still exist. Potentially, under developed countries could have an increase in stillbirth rates since treatment for infection and illness is not as readily available. Well developed countries, such as Canada, typically have the resources to manage and treat infections such as GBS, so stillbirths attributed to these infections should be at a significant low. While systemic reviews may be considered weak, they often assist in providing depth and improving quality of research (Mallet,

Hagen-Zanker, Slater, & Duvendack, 2012). Therefore, relevant information can still be utilized from these types of studies.

Schroeder, Petrou, Balfour, Edamma, and Heath (2008) examined the cost of treating GBS infections in infants younger than 90 days and also found that GBS can be attributed to infant deaths. There were 242 cases of GBS infection in infants reported during their study period. Of those 242 infants, 13 died within the first year. Losing 13 infants to an infection which could have been easily managed is quite significant and devastating for the families involved. As a result, it is important to ensure proper screening and treatment is completed in a timely manner.

Implications

Aside from the physical and mental anguish caused by GBS infection in newborns, increased health care costs may also result. Treating and managing GBS infections can be costly and cause a drain on the health care system (Schroeder, Petrou, Balfour, Edamma, & Heath, 2008). A debate exists in the UK surrounding the cost effectiveness of screening for GBS infection in pregnancy. A study examining health care costs associated with GBS infection in infants was completed by Schroeder et al. (2008) and found that health care costs were doubled for infants with GBS infection compared those without. With the inclusion of universal screening, rates of GBS infections in infants has dropped thus reducing associated health care costs. Infants who contract GBS infection also utilize more community health care services and supports such as pediatricians, occupational therapists, social workers, and physiotherapists (Schroeder et al., 2008). This study identified that the overall costs of treating GBS infections in infants

cost the UK 1.6 million dollars. This number includes any financial hardships experienced by families as a result of managing a child with health concerns. Additionally, the lifelong implications of GBS can cause further financial strain. Disabilities attributed to GBS infection can cause increased potential future costs resulting from factors such as the need for special education. Completing a high quality, ethical study such as this which obtains parental consent and provides full disclosure contributes to the body of quality of research on this topic.

Taminato et al. (2011) also found that that universal screening and antibiotic treatment decreases rates of GBS. This is a strong study that is clear in identifying the benefits of consistent screening and use of antibiotics. As well, newborn outcomes were improved with the implementation of these two standards (Taminato et al., 2011). Decreases in health issues, length of hospital stay, and long term follow up needs are a result of improved health status of newborns, leading to decreases in health care costs associated with GBS infections.

Evidence based information should guide nursing practice. Therefore, it is important to recognize relevant information provided by studies on the topic of GBS. Advances in treatment and management options have led to a significant decrease in mortality and morbidity of infants exposed to GBS infection (Taminato et al. 2011). It has also been proven that the antepartum screening along with the use of antibiotic to manage GBS is safe and effective (Taminato et al. 2011). This relatively simple method of treatment is easily accessible in most health care facilities in Canada. As a result, this should be employed as the gold standard of care by all health care facilities and health

care practitioners. This will ensure improved fetal outcomes and optimal health for newborns.

Future Research

While there is a great deal of literature available on the topic of GBS, there is always room for increased information and more studies. Cutland et al. (2015) identified that more research is needed into the effect of GBS infection on stillbirth rates. Perhaps the most extreme outcome imaginable, but one of the most devastating as well, requiring researchers to gather more evidence on the link between the two.

Konrad and Katz (2007) found that since transmission of GBS to newborns is so rare and so many women are treated with antibiotics there is the potential to develop antibiotic resistance or complications resulting from overuse of antibiotics. However, the point could be argued that without proper treatment of all colonized women the rates of GBS transmission to newborns would dramatically increase. Therefore, there should be more studies completed on the risks associated with the over use of antibiotics. Patients should also be informed about potential risks and benefits to treatment to allow them to make informed health care decisions (Konrad & Katz, 2007).

Additionally, with the prophylactic use of antibiotics, bacterial organisms have the potential to modify strain patterns and become resistant to commonly used antibiotics. Therefore, it is important to ensure proper surveillance of trends of bacterial organisms, such as GBS, which commonly affect newborns (Sgro et al., 2011). This will confirm proper treatment with correct antibiotics and decrease the overuse of improper antibiotics.

Identifying areas for future research provides health care practitioners, such as nurses, insight into other potential issues that could affect management and treatment of GBS infection in newborns. Raising awareness about all issues that impact the nurse's ability to manage and treat this disease is vital to ensure best nursing practice and patient care.

Learning Methods

The goal of providing nurses with education modules is to advance nursing knowledge and practice, thereby improving patient care and outcomes (Su, & Osisek, 2011). The literature has provided a wide variety of information regarding the topic of GBS. This information can be used to formulate an educational resource for nursing staff. Various instructional designs and educational models can be utilized when providing education to Registered Nurses.

Fitzgerald and Townsend (2012) completed a study which examined rural nurses' thoughts on various learning methods available. Since the NWHC is a rural health care facility it is imperative to remember that all the supports and resources available to other health care facilities may not be accessible. There are no neonatal units, no obstetricians or pediatricians at the facility. As well, there are limited health care staff and educators at the facility so the opportunity for seminars may be limited. Fitzgerald and Townsend (2012) and Govranos and Newton (2014) identified that rural and ward nurses prefer in person seminars, or self-study learning modules the most. Modules that include case studies and instructive content are effective in providing continuing education to nurses (Fitzgerald & Townsend, 2012; Raurell-Torredà et al., 2015). Since rural nurses live far

away from major cities travelling to continuing education may be challenging. Therefore, having individuals come to a health care facility or being able to complete self-study continuing education modules is cost effective and allows the majority of nurses to participate (Fitzgerald & Townsend, 2012). The educational resource developed for this practicum will be in the form of a written self-study module that Registered Nurses can use to support their awareness and management of GBS infection in newborns.

Instructional Designs

Learning modules that have instructional designs with clear learning objectives, appealing visual learning styles, and are highly interactive are most favorable to adult learners (Foster, Shurtz, & Pepper, 2014). Adult learning principles must be considered when developing learning modules geared towards Registered Nurses. Bloom's Taxonomy is one such instructional design which can be utilized when composing adult education learning modules (Adams, 2015; Su, & Osisek, 2011). Bloom's Taxonomy consists of six education components: knowledge, comprehension, application, analysis, synthesis and evaluation (Su, & Osisek, 2011). The steps of Bloom's Taxonomy include: providing knowledge that staff can utilize on their own terms, ensuring they can comprehend the information and apply it to practice, examining available information and situation to develop a plan, and making decisions based on findings (Su, & Osisek, 2011). This allows the user ease in comprehending the difference between subject content and cognitive process related to it. The Revised Bloom's Taxonomy also incorporates four levels of knowledge: factual, procedural, conceptual, and metacognitive, with a focus on student knowledge (Su, & Osisek, 2011). These four levels of knowledge will assist in

identifying what is intended for the target audience to learn, thereby aiding in the development of a learning module for Registered Nurses at the NWHC.

Knowles Adult Learning Theory

Learning theories can help guide nursing practice and can assist when developing educational programs for nurses. Malcom Knowles proposed a theory called Knowles Adult Learning Theory which has shifted towards self-directed learning and allows the learner to guide their own learning (Mitchell, & Courtney, 2005). When working with adult learners, such as Registered Nurses, in a remote setting it is necessary to utilize a theory that allows learners to guide their own learning (Mitchell, & Courtney, 2005). Knowles Theory states that in order for effective learning to happen there must be a desire to learn, a need for knowledge, ability to transfer to own practice, accountability for one's learning, and past experience must be able to be incorporated (Mitchell, & Courtney, 2005). Adults learn best when they recognize what they are learning is able to be utilized by themselves (Mitchell, & Courtney, 2005). Therefore, when developing a learning module on GBS for Registered Nurses of the inpatient unit of the NWHC it is important to include information they can learn from, that builds upon their past experience, and is able to be incorporated into their current practice setting. It is necessary to engage staff in discussion and allow them to provide input on material covered. Including them in the development of the content ensures it is targeting its focus audience and results in improved receptiveness to the educational resource.

Conclusion

In conclusion, group B streptococcus infection in newborns is a very real and serious health concern. There is ample literature to support the finding that this infection in newborns is a costly and significant health issue (CDC, 2014; Schroeder et al., 2008). The impact of multiple health complications, as well as the increased use of health services has a substantial bearing on population health. Therefore, it is vital that health care practitioners be cognisant of the infection and be able to effectively diagnosis, treat and manage GBS infections in newborns and mothers. Increased knowledge and management will decrease the impact of this potentially deadly infection and allow improve patient outcomes. The development of a learning module will create consistency in the management of GBS infection at the NWHC. It will also allow Registered Nurses to further their knowledge, thereby improving nursing practice and patient care.

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Literature Review Appendix

Name, Author, Date, Study Objective	Sample/Groups (Size, Setting, Characteristics)	Design and Methodology	Key Results/Findings	Strengths/Limitations	Conclusion and Rating
<p><i>Equality in Obstetrical Care: Racial/Ethnic Variation in Group B Streptococcus Screening.</i></p> <p>Bryant, Cheng, & Caughey, (2011).</p> <p>To examine whether race impacts GBS screening and rates among pregnant women.</p>	<p>16, 333 women of various races who delivered at 37 weeks and beyond.</p> <p>University of California hospital in San Francisco between 1996 and 2008.</p>	<p>Retrospective cohort study design.</p> <p>Utilized chi-squared tests, t-tests, bivariate analyses, and logistic regression.</p> <p>Data was analyzed using Stata 9 Statistical package.</p>	<p>Black and Asian women were less likely than white women, to be screened for GBS.</p> <p>Older women were more likely to be screened.</p> <p>Minority race groups more likely to be GBS positive.</p> <p>Once universal policies implemented, no difference in races found.</p>	<p>Approval obtained from the Committee on Human Rights at the University of California.</p> <p>Information retrieved from medical records, not laboratory data.</p>	<p>Universal policies help ensure equitable health care treatment and outcomes among all races.</p> <p>Encourages health care providers to be aware of other possible obstetrical disparities among races.</p> <p>Appraisal using Analytic Critical Appraisal Tool. Study design: Moderate Quality of study: High</p>
<p><i>Hispanic women's perceptions of</i></p>	<p>Stratified random sample, 359</p>	<p>A mixed-methods study.</p>	<p>Hispanic women felt less respect</p>	<p>Study included mothers that recently</p>	<p>Culturally competent prenatal</p>

<p><i>patient-centeredness during prenatal care: a mixed-method study</i></p> <p>Tandon, Parillo, & Keefer, (2005).</p> <p>To explore the experiences of Hispanic women during prenatal care.</p>	<p>women in their first trimester and 68 in their third trimester.</p> <p>10 maternity hospitals in Palm Beach, Florida.</p> <p>Between May and December 2003.</p>	<p>Semi-structured interviews.</p> <p>Qualitative analyses, chi-square and one way variance to compare mothers.</p> <p>Logistic regression to assess perceptions.</p> <p>Atlas.ti 4.1 used to analyze data.</p>	<p>from doctors and nurses. Adjusted OR 0.29%, 95% CI, 0.10-0.86.</p> <p>Hispanic women experienced communication barriers more than non-Hispanic women. Adjusted OR 3.30, 95% CI, 1.40-7.76.</p>	<p>delivered. May not be generalized to all Hispanics.</p> <p>Source of funding was identified.</p> <p>No mention of ethical approval.</p>	<p>care is more beneficial to Hispanic women.</p> <p>Appraisal using Analytic Critical Appraisal Tool.</p> <p>Study design: Moderate</p> <p>Quality of study: Medium</p>
<p><i>Prevention of early-onset Group B Streptococcal disease – the Northern Ireland experience.</i></p> <p>Eastwood et al., (2015)</p> <p>To examine adherence to guidelines, prevalence, and outcomes</p>	<p>Maternity hospital in Northern Ireland.</p> <p>574 charts audited</p> <p>3 streams of work: antenatal, neonatal, and pathology.</p>	<p>Retrospective observation study.</p> <p>Audit working group formed from various health care organizations and groups in NI.</p> <p>Data managed using Excel.</p>	<p>65 infants with GBS infection, most term and most delivered vaginally.</p> <p>Majority presented with symptoms with 12 hours of birth.</p> <p>Direct mortality 7%.</p>	<p>Audit provides real clinical experiences.</p> <p>Some data on charts was incomplete.</p> <p>No ethical approval was required due to type of study, no conflicts of interest identified, and source of funding was disclosed.</p>	<p>Northern Ireland has a higher rate of GBS infection than all of the UK combined.</p> <p>Policies regarding management need to be clear.</p> <p>Appraisal using Analytic Critical Appraisal Tool.</p> <p>Study Design: Moderate</p> <p>Quality of study:</p>

associated with GBS infection.					Medium
<p><i>Prospective analysis of risk factors associated with group B streptococcal colonisation in neonates born at a tertiary care center in India.</i></p> <p>Shah, et al. (2014).</p> <p>To examine risk factors associated with GBS.</p>	<p>1050 newborns born at a tertiary care hospital in India were swabbed at 5 different body sites.</p> <p>Study conducted between Nov 2010 to March 2012.</p>	<p>A prospective cross-section analysis.</p> <p>Meritec Strep test used to confirm GBS.</p> <p>Pearson's X2 or Fishers Exact test were used. <i>t</i>-test used to compare quantitative data.</p> <p>SPSS used to analyze data</p>	<p>3.23 % infected with GBS. Only 2.9% of those infected tested positive at all body sites. Most common site to be colonised is umbilicus.</p> <p>Risk factors include prolonged rupture of membranes, lengthy labour, maternal fever, respiratory distress at birth, etc.</p> <p>Lower birth weight and lower apgar scores had higher rates.</p>	<p>Ethical approval obtained from Institutional Review and Ethics Board.</p> <p>Limited sample size for GBS positive infants. Not able to follow newborns long term.</p>	<p>Important to swab multiple sites when testing for GBS and other infections.</p> <p>Screening in the antepartum period is important.</p> <p>Appraisal using Descriptive Critical Appraisal Tool.</p> <p>Strength of study design: weak</p> <p>Quality of study: high</p>
<p><i>Screening for group B Streptococcus in pregnant women:</i></p>	<p>Studies examined risk factors, screening, and intervention and</p>	<p>5 different databases were searched to identify studies</p>	<p>Universal screening decreases rates of sepsis caused by</p>	<p>Study quality assessed using STROBE.</p> <p>Review followed</p>	<p>Advanced in care, universal screening, and prophylaxis</p>

<p><i>A systematic review and meta-analysis.</i></p> <p>Taminato et al. (2011).</p> <p>To review the available literature on GBS screening.</p>	<p>must include incidence of neonatal sepsis.</p> <p>8 studies included (4 prospective cohort and 4 retrospective cohort), 104, 930 participants.</p>	<p>from 5 different countries which were published from 1994 to 2006. Grey literature was also searched.</p> <p>OR and CI calculated. X2 and I2 statistics used.</p>	<p>GBS.</p> <p>More patients benefit from universal screening.</p> <p>Prophylactic antibiotics are safe and effective and have improved newborn outcomes</p>	<p>Cochrane Collaboration.</p> <p>No ethical approval necessary since it is a systemic review and meta-analysis</p>	<p>decreases rates.</p> <p>Appraisal using Literature Critical Appraisal Tool. Quality of study: High</p>
<p><i>Screening and management of maternal colonization with Streptococcus agalactiae: an Italian cohort study.</i></p> <p>De Luca et al. (2016)</p> <p>To study rates of GBS in women, treatment during labour, and neonatal outcomes.</p>	<p>Obstetrics unit and neonatal ICU at the Cardarelli Hospital in Italy.</p> <p>468 women with 475 live births. 243 had vaginal delivery while 225 had a c-section. Age range from 18-50 years old.</p>	<p>Cohort study, took place between July-Dec 2013.</p> <p>Evaluated indications for treatment, proper treatment and neonatal outcomes</p>	<p>1/3 women did not have GBS screening. GBS screening is not free for women despite recommendations to have them.</p> <p>30.2% screened were GBS positive.</p> <p>Only half of the group who had indication for antibiotics received them.</p>	<p>No conflict of interest was declared.</p> <p>Ethics or ethical approval was not mentioned.</p>	<p>Important that all women be tested for GBS. More education is needed for clinicians regarding proper screening and treatment.</p> <p>Treatment with antibiotics should be started promptly during labour. Despite recommendations some women are not properly being</p>

					<p>treated.</p> <p>Appraisal using Analytic Critical Appraisal Tool. Study design: Moderate Quality of study: Weak</p>
<p><i>Institution of universal screening for Group B streptococcus (GBS) from a risk management protocol results in reduction of early-onset GBS disease in a tertiary obstetric unit.</i></p> <p>Angstetra, Ferguson, & Giles (2007).</p> <p>To identify if universal screening reduces</p>	<p>42, 471 women at John Hunter Hospital in Australia. Majority of women were term and delivered vaginally.</p> <p>Offered GBS screening at 34-37 weeks.</p>	<p>Prospective study with historical control data.</p> <p>Live birth rates and other data from Jan 1994 to Jun 2006 examined. Looked for GBS positive infants less than 7 days old.</p> <p>Reviewed effect of policy change and data prior to change implemented.</p>	<p>8303 live births to GBS positive mothers, no cases of transmission to infant.</p> <p>84% reduction in early onset GBS in newborns following implementation of universal screening policy. P=0.016</p>	<p>Ethics followed standards by National Health and Medical Research Council</p> <p>Future areas for research, RCT's, were identified.</p>	<p>Despite low incidence of early onset GBS, rates were dramatically decreased after policy implementation.</p> <p>Appropriate sampling, culturing, and antibiotic compliance are necessary.</p> <p>Appraisal using Analytic Critical Appraisal Tool. Study design: Moderate Quality of study:</p>

rates of GBS infection.		X2 test with Yates correction was utilized with Statistical Calculator StatPac.			high
<p><i>Early-onset group B streptococcal disease in the era of maternal screening.</i></p> <p>Puopolo, Madoff, & Eichenwald, (2005).</p> <p>To determine factors that influence early onset GBS (EOGBS) after implementation of a prophylactic antibiotic policy</p>	<p>25 cases of EOGBS at a hospital in Boston, MA from 1997 to 2003.</p> <p>17 infants were term and 8 were preterm.</p>	<p>Retrospective review of all cases of positive early onset GBS infection.</p> <p>Microbiology laboratory database and medical records were reviewed.</p> <p>Mantel-Haenszel test was used to analyze incidence of disease.</p>	<p>82% (14) of mothers of term infants were GBS negative on screening. More than half had intrapartum risk factors. Of mothers of preterm infants, 2 were GBS negative, 3 had unknown status.</p> <p>Only 1/25 women received proper prophylactic antibiotic treatment.</p>	<p>Ethical approval obtained from Brigham and Women's Hospital Human Research Committee.</p> <p>Unable to assess the effect of poor obstetrical technique on screening results.</p>	<p>Most of infants with EOGBS were born to GBS negative mothers.</p> <p>It is important to monitor intrapartum risk factors, develop good screening tools and ensure antibiotic susceptibility.</p> <p>Appraisal using Descriptive Critical Appraisal Tool.</p> <p>Strength of study design: weak</p> <p>Quality of study: high</p>
<i>Prevention of neonatal group B streptococcal</i>	85 physicians and residents with labour privileges	Non randomized population based survey.	66% of family doctors and residents follow	University of Manitoba Research Ethics Board provided	Family physicians want patients to be involved in care

<p><i>infection: Approaches of physicians in Winnipeg, Man</i></p> <p>Konrad, Hauch, & Pylypjuk, (2007).</p> <p>To determine how family physicians manage GBS and whether their methods differ from obstetricians.</p>	<p>in Winnipeg hospitals.</p> <p>Family physician, obstetrician offices and labour units at 3 hospitals in Winnipeg, MB.</p> <p>Conducted between June 2004 and June 2005.</p>	<p>SPSS was used to analyze data. X2 used to analyze differences among groups.</p>	<p>SOGC guidelines, while 87% of obstetricians follow them.</p> <p>Obstetricians were more likely to use evidence based information, while physicians more likely to allow colleague and peer influence to affect method of care.</p> <p>Majority of both groups thought that benefits of screening outweighed the risks.</p>	<p>ethical approval.</p> <p>Informed consent was obtained.</p> <p>Only half of qualified respondents were interviewed.</p> <p>No conflict of interest declared.</p>	<p>and make informed decisions.</p> <p>Both groups willing to expose women, perhaps unnecessarily, to antibiotics to prevent infants' deaths from GBS.</p> <p>Possible explanation for differences is that physicians deal with low risk women and obstetricians generally deal with high risk women.</p> <p>Appraisal using Analytic Critical Appraisal Tool.</p> <p>Study design: Moderate</p> <p>Quality of study: Medium</p>
<p><i>No increase in rates of early-</i></p>	<p>120, 952 infants born at the</p>	<p>Time trend study covering three</p>	<p>No cases of GBS EONS resistant to</p>	<p>Approved by the hospital institution</p>	<p>Clindamycin and erythromycin</p>

<p><i>onset neonatal sepsis by antibiotic-resistant group B Streptococcus in the era of intrapartum antibiotic prophylaxis.</i></p> <p>Chen, Puopolo, Eichenwald, Onderdonk, & Lieberman, (2005).</p> <p>To explore incidences early-onset GBS sepsis from antibiotic resistant strains.</p>	<p>Brigham and Women's Hospital, a tertiary care center.</p>	<p>time periods from 1990-2002.</p> <p>X2 test used to analyze linear trends.</p>	<p>penicillin, ampicillin, cefazolin, or vancomycin.</p> <p>No change in rates of erythromycin resistant strains. P=.6</p> <p>3 cases of clindamycin resistant strains which were also resistant to erythromycin.</p>	<p>review board.</p> <p>Information regarding compliance of health care providers and use of antibiotics during pregnancy was limited.</p>	<p>should only be used when anaphylaxis to penicillin occurs.</p> <p>Appraisal using Analytic Critical Appraisal Tool. Study design: Moderate Quality of study: High</p>
<p><i>Prenatal antibiotic treatment does not decrease group B streptococcus colonization at delivery.</i></p> <p>Baecher, &</p>	<p>32 participants randomized into two groups, treatment and placebo groups. 15 in placebo group and 14 in amoxicillin group.</p> <p>Similar qualities</p>	<p>Randomized control study.</p> <p>One group given oral antibiotics and other given placebo in prenatal period, and repeat cultures taken at</p>	<p>No significant difference in colonization rates at delivery among two groups.</p> <p>Potential to be significant if a larger group was studied.</p>	<p>Approval obtained from the Northwest Institutional Review Board.</p> <p>Source of funding for study was identified.</p>	<p>Oral antibiotic given in the prenatal period are not significantly effective at reducing rates of colonization with GBS.</p> <p>Appraisal using</p>

<p>Grobman, (2007). To examine the effect of oral prenatal antibiotics in combating GBS infections.</p>	<p>such as maternal and gestational age, ethnicity, and parity in both groups. Took place at a tertiary care center.</p>	<p>admission for delivery. <i>t</i> test, Fisher exact test, χ^2 analysis was used to analysis data</p>			<p>Analytic Critical Appraisal Tool. Study design: Strong Quality of study: High</p>
<p><i>Xpert GBS assay for rapid detection of Group B Streptococcus in gastric fluid samples from newborns.</i> Jost, et al. (2014). To examine the effectiveness of the Xpert GBS assay in diagnosing GBS infection in newborns.</p>	<p>143 newborns (between 31-41 weeks gestation) included over a 3 month period. Lariboisiere University Hospital in Paris, France.</p>	<p>Prospective study. Swab soaked in gastric fluid, then analyzed using GeneXpert system and GBS specific real time PCR.</p>	<p>11.2% samples tested positive using Xpert GBS assay. Results obtained in roughly 30 minutes. Low quality of bacteria or treatment with antibiotics during labour can influence results.</p>	<p>No conflict of interest identified. No mention of ethical approval.</p>	<p>Sensitivity of 80%, specificity of 100%. Identified a potentially useful and new diagnostic tool. Appraisal using Descriptive Critical Appraisal Tool. Strength of study design: weak Quality of study: low</p>
<p><i>Maternal group B Streptococcus-related stillbirth: a systematic</i></p>	<p>Studies from 1961-2013. 17 in total from 9 different countries</p>	<p>Systemically reviewed 4 databases and analyzed using</p>	<p>Rates of GBS attributed stillbirths range from 0 to 12.1%</p>	<p>Conflicts of interest, ethics and funding all addressed.</p>	<p>Up to 12.1% of still births can be attributed to GBS.</p>

<p><i>review.</i></p> <p>Cutland, Edwards, Madhi, & Cunnington, (2015).</p> <p>To review the literature on the link between GBS and stillbirths.</p>	<p>included.</p> <p>Studies which examined GBS stillbirths greater than 20 weeks.</p> <p>Studies must provide investigate rates of GBS associated stillbirths.</p> <p>GBS must be identified as cause of stillbirth though autopsy or cultures.</p>	<p>descriptive analysis.</p> <p>Unable to complete meta-analysis but calculates rates of GBS associated stillbirths in each study.</p>	<p>Stillbirths related to GBS range from 0.04-0.9% for every 1000 births.</p> <p>Stillbirths still happen in high income countries.</p>	<p>Examined studies from several different countries and several study designs. However, some older studies were included.</p> <p>Small sample sizes within studies.</p> <p>Important to consider specificity and sensitivity of diagnostic tools.</p>	<p>More research is needed on this link.</p> <p>Important to have clear definitions on what is considered a stillbirth as this impacts rates.</p> <p>Appraisal using Literature Critical Appraisal Tool. Quality of study: Medium</p>
<p><i>The economic costs of Group B Streptococcus (GBS) disease: prospective cohort study of infants with GBS disease in England.</i></p> <p>Schroeder et al. (2008).</p>	<p>Infants less than 90 days old who were hospitalized with GBS infection. Study took place in hospitals in London, Oxford, Portsmouth and Bristol between Feb 2000-Feb 2003.</p>	<p>Prospective cohort, χ^2 test was used.</p> <p>Comparison between infants with GBS and without. Estimates between costs of two groups using multiple linear</p>	<p>GBS group spent more time in neonatal unit ($p = 0.66$), had increased hospital and community resource costs, used more supports and resources.</p>	<p>Written permission was obtained from parents.</p> <p>Source of funding was declared and ensured there was no conflict or bias.</p> <p>Approval was obtained from the ethics committee of Scotland.</p>	<p>GBS infection greatly increases health care costs, by two fold.</p> <p>Associated health care costs outweigh universal screening costs.</p> <p>Appraisal using Analytic Critical</p>

<p>To examine the costs associated with GBS disease in infants.</p>	<p>138 infants with GBS and 305 in control group.</p>	<p>regression. Data Analyzed using SPSS and Excel.</p>			<p>Appraisal Tool. Study design: Moderate Quality of study: Strong</p>
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Appendix B

Consultation and Environmental Scan Report

Environmental Scan and Consultation Report

Nurse 6660

Cindy Clancey

Memorial University of Newfoundland

Introduction

The Northwest Health Center (NHC) is a small rural health care facility in northern Alberta. It is one of the main labour and delivery sites for the area. Due to its isolation, the facility has limited supports and resources compared to major urban centers. The nursing staff of the inpatient unit provide the majority of the care for patients on the unit. Physicians are not in house on a 24-hour basis, and as a result Registered Nurses are the main health care providers responsible for monitoring newborns during labour and in the post-partum period.

Since there is only one acute inpatient unit in the entire hospital, the patient population consists of a variety of patients ranging from pediatric, cardiac, surgery, or labouring patients. With a wide variety of patients, limited supports, and the potential for newborn complications resulting from GBS, it is necessary for the staff to be knowledgeable regarding this infection. Registered Nursing especially, must be aware of potential side effects, symptoms, or complications that newborns may face in the post-partum period since they are the primary health care provider for them while in hospital. Medical and nursing staff completing locums at the hospital may differ in their approach, leading to inconsistent treatment and management of GBS infection. Clarity of existing policies and creation of a universal policy that all health care providers follow for the management and treatment of GBS will create improved care and better patient outcomes.

This project will consist of the development of an education resource, in the format of a learning module, for Registered Nurses of the inpatient unit at the NHC. The focus of this learning module will be on the topic of Group B Streptococcus (GBS)

infections in labouring women and the impact of potential transmissions to newborns. GBS is a bacterial infection which is found in birth canal and/or rectum of approximately 15-40% of women (SOGC, n.d.). This infection can then be passed down to newborns during the labour process, potentially causing a wide variety of complications ranging from lung, spinal issues or even death (SOGC, n.d.). There are two forms of GBS infections: early onset and late onset (SOGC, n.d.). Early onset develops within 7 days of birth and late onset develops after this time frame and up to 6 weeks following birth. Early onset is typically responsible for more deaths and causes complications such as lung, blood, or spinal infections, while late onset more often causes meningitis (SOGC, n.d.). Both forms of GBS can result in severe lifelong complications that can negatively affect a child's quality of life. Since GBS infection is the main cause of sepsis and meningitis in infants, the significance of its impact on newborn mortality and morbidity is quite astounding (CDC, 2014).

Management and treatment options for this infection during labour will be identified, discussed and explored in the learning module. As well, information on potential newborn complications, signs and symptoms of exposure, and possible treatment options, if a GBS infection in the post-partum period is suspected, will be included.

The module will consist of a self-study educational component on the topic to further increase learning of the target audience. This resource will increase knowledge and skill of the Registered Nurses in managing GBS infections, resulting in improved patient care and outcomes.

Methods

Various methods were used to gather input for the development of the learning module. Both an environmental scan and consultations were completed to ensure a wider depth of coverage and increased access to beneficial information.

Environmental Scan

An in depth environmental scan was completed to explore existing resources and modules that are available. The NWHC uses the Managing Obstetrical Risk Efficiently (MORE OB) program to guide nursing practice (Salus Global, 2014). MORE OB is a program which incorporates professional standards and guidelines with current tools and resources to focus on providing safe patient environments for obstetrical programs. (Salus Global, 2014). Other obstetrical educators at similar serviced health care facilities were contacted to identify resources in use and their ability to manage GBS infections. The rationale behind choosing other rural settings is that they too will be limited in available supports and services, and therefore would experience the same challenges that the NHWC would experience. However, several educators contacted did not respond after several contact attempts and input was gathered from only one other educator.

The Society of Obstetricians and Gynecologists of Canada's website was examined to gather data. Since this organization is an important leader in obstetrics, they provide information that many health authorities can use in developing guidelines and education tools (SOGC, n.d.). Websites of Canadian health care organizations, such as the

Canadian Pediatric website, were also explored to identify useful information that can assist in the development of the module. As well, through internet searches, pamphlets from the University of Toronto School of Graduate Studies and Ontario Midwives were discovered that could be useful to assist nurses with providing patient education on the topic. They provide clear and appropriate information in non-medical terms which can be easily understood by the general population.

Consultation

A thorough consultation process was completed with several staff members at the NWHC. Three Registered Nurses at the NWHC were interviewed and agreed to complete a questionnaire related to GBS infections during labour and in the post-partum period. Ideally more staff would have been targeted but because of rotations and staffing levels, only a small number of Registered Nurses work on the acute unit each day. Two medical staff who do deliveries at the NWHC were interviewed to collect input on the management of GBS infections. The educator at the NWHC was consulted to gather information on supports utilized for the development of policies and procedures, and educational programs for the nursing staff. In addition, information was collected regarding existing policies and procedures surrounding the management and treatment of GBS infections during labour and in the post-partum period. An educator at my previous place of employment, a larger health care facility in New Brunswick, and with whom I have an established relationship with, was also contacted to identify how their health care facility manages GBS infections.

Rationale

Environmental Scan

- To identify resources available at the NHWC, such as a related learning module or current policies and procedures surrounding the management of GBS infection during labour and in the post-partum period, which will inform the content and aid in the development of the learning module.
- To review existing learning modules that may be available from other rural health care settings which will identify relevant data to include in the learning module.
- To explore the SOGC website to identify best practice guidelines to incorporate into the learning module.

Consultation Scan

- To gather support for the need for a learning module on the topic of GBS through consultations with Registered Nurses, medical staff, and the obstetrics educator.
- To gather information on necessary components to be included in the learning module from consultation with Registered Nurses and medical staff.
- To seek Registered Nurses support for the use of a self-study module as the learning tool.
- To review policies and procedures, and existing learning modules on the management of GBS infection during labour, at a larger health center in New Brunswick.

Recruitment

Participants for the environmental and consultation scan were recruited through a variety of methods. Recruitment for the environmental scan consisted of a letter sent via email which was sent to select nurse educators at other health care facilities in rural Alberta settings (see Appendix A). Several educators were contacted and educators at the Northwest Health Center and the Peace River Community Health Center responded and provided feedback. Registered Nurses at the NWHC were recruited based on availability and willingness to participate. Since there are a limited number of physicians that deliver newborns at the NWHC, two of the main General Practitioners were verbally recruited, willing to participate, and provided feedback and information on GBS infections.

Data Collection, Management and Analyses

Data was collected through various methods such as interviews with medical staff, and interviews and questionnaires with the nursing staff (see Appendix B). Information from interviews was transcribed onto a word document and data collected from questionnaires was collected, reviewed, and analyzed. Information provided from discussion through email with various educators was collected and examined to look for common themes and ideas to inform the content of the learning module. Specific opinions of individuals will not be included in the module, however common themes and information that is supported by evidence will be included.

All data was managed in a confidential manner using word documents and excel spreadsheets. Content analysis was used to examine and reduce the data. Coding of

groups of information derived from interviews and questionnaires was completed to identify the focus of data and compile it into more manageable information. Descriptive data was used when common themes or trends regarding learning needs or input on learning tools were identified among the data. Information collected was included in the scan summary of the final practicum report.

Ethical Conduct

All information collected was kept confidential and in a secure location on a password protected computer which was not utilized by anyone else. Participation was voluntary and contact was limited to two attempts. Several educators chose not to respond to contact requests and if after two contact attempts were made, no response was received then no further attempts were made. Respecting privacy laws regarding disclosure of information of health care organizations is an important part of conducting ethical work, therefore it is important to remember that health care facilities may not be willing to disclose information regarding policies and procedures to outside individuals. Registered Nurses and medical staff were not pressured to be included in the consultation and participation was voluntary. As well, the Health Ethics Research Screening Tool was analyzed and it was identified that ethical approval was not needed for this study (see Appendix C).

Results

Educators

Limited, but useful, data was discovered through the environmental scan. Three educators in Alberta provided feedback on possible inclusions into the learning module. Two educators provided feedback directly to myself and another provided feedback to the NWHC educator. Common themes arose in that all three stated that since the MORE OB program is widely used in Alberta, any learning modules their health care facility uses is based on the information provided in the MORE OB program and learning modules. Another common theme was that all three participating educators stated that information provided by the SOGC website is also often included in learning modules and aids in the development of policies and procedures so learning tools should utilize information collected from this resource. One educator provided information on the Strategies for Teaching Obstetrics to Rural and Urban Caregivers (STORC) learning tool that her health care facility utilized. The STORC program was developed by the Alberta Perinatal Health Program and consists of 32 learning modules which focus on obstetrics (Alberta Perinatal Health Program, n.d.) One educator did say that Alberta Health Services does not have a clear policy on management of GBS in isolated settings so learning modules with information included from MORE OB and SOGC will help provide clarity for the nursing staff. The educator at the NWHC also recognized a gap in the knowledge as well due to lack of an existing learning module. Since there is currently no learning module for Registered Nurses at the NWHC, one of her goals was to compile information and develop a module regarding GBS infections for the nursing staff.

Nurses

The Registered Nurses interviewed identified that GBS is a significant health condition that bears proper management and all stated that the NWHC does a good job at managing treatment. A questionnaire was completed by them using a 0-10 rating scale with zero being the low end of the scale and 10 being the high. With a low response rate of 3 Registered Nurses, statistical analysis was not feasible, however valuable information was provided and will be summarized. They all rated the significance of GBS infections and its impact on infants similarly at 7 and 8-9 on the scale. Wide variations on the scale were identified when questioned about rates of GBS at the NWHC, with scores ranging from 2-7. All identified that it is important to treat GBS during labour with scores of 9 and 10. All felt that it is important to monitor GBS exposed infants in the post-partum period with ratings on the higher end of the scale, 8-9. However, a common theme arose and all identified they could use more education on the topic in order to increase their knowledge and better manage the illness in the post-partum period. One Registered Nurse specifically said she was unsure of signs and symptoms to look for in an infant in the post-partum period that could suggest a possible GBS infection and another also identified it would be important to include signs and symptoms in the learning module. This exemplifies the educators concern and need for a learning module.

Medical Staff

The two participating physicians were interviewed and asked questions regarding rates of GBS infections at the NWHC, screening methods, treatment options, incidences of GBS infections in newborns. They identified that while GBS transmission to newborns

is rare, proper treatment and management of GBS infections in the labouring period is key to decreasing rates of transmission and improving patient outcomes. One physician said he had only seen one case of GBS sepsis in his twenty years of practice and identified that it is imperative that all women be screened for GBS infection. He also identified that women who are scheduled for a caesarean section typically are not screened unless they are at risk of premature membrane rupture. The other physician identified that treatment of GBS at the NWHC is aggressive and therefore aids in decreasing incidences of GBS transmissions and sepsis in babies. The medical staff were supportive of the learning module as any education that aids in improving patient care is valuable.

Out of Province Educator

The educator in New Brunswick shared information regarding their facility's management of GBS. An existing self-learning package which staff complete on orientation to the unit was shared. This module includes evidence-based information along with multiple choice and short answer questions for the Registered Nurses to complete. Current policies and procedures that this health care facility utilizes were also shared. Their policies, procedures and self-learning package are based on information from MORE OB, SOGC, and the Canadian Pediatric Society. This information is helpful in identifying information that is necessary to include in a learning module for Registered Nurses as well as identifying how larger centers manage GBS infections. While the same supports and resources are not available in rural and isolated settings, the resources

identified and information collected can be utilized to inform the content of the learning module.

Internet Search

A scan of seven reputable Canadian government and health agency websites was completed and two useful pamphlets on GBS infection were identified. Pamphlets are often used for patient education and two patient pamphlets were from the University of Toronto and Ontario Midwives. These were chosen because they are an appropriate learning tool for use with the general public. Since GBS has two formats, early onset and late onset, it is important that parents are educated by the nursing staff about the signs and symptoms of the disease so they can be aware of what to look for should their infant develop the disease once they are at home.

- University of Toronto

http://bmc1.utm.utoronto.ca/~amanda/visualtoolssite/media/pamphlets/GBS_pamphlet.pdf

- Ontario Midwives

<http://www.ontariomidwives.ca/care/birth/gbs>

The Canadian Pediatric Society (2007) also utilizes an algorithm which can be used as a guide for nursing staff when working with infants at risk for sepsis. Having a step by step guide with instruction is key to ensure consistent and equitable health care to all infants. This algorithm can be used in any health care setting, regardless of location, and is helpful in allowing Registered Nurses to have a workable tool that is clear for managing GBS and identifying effective treatment. One of the educators also identified a

MORE OB algorithm that is helpful when managing GBS infections. Both algorithms are helpful as they target different aspects of GBS management and these can be included in the module as resources for Registered Nurses to utilize.

Conclusion

Overall, the majority of health care providers identify GBS infection as a serious, yet manageable infection. The environmental scan identified that use of resources such as the SOGC website and MORE OB program assist health care agencies in developing appropriate learning resources for nursing staff. Therefore, these programs will guide the development and inform the content of a learning module for Registered Nurses at the NWHC. Registered Nurses at the NWHC identified the need for increasing learning on the topic, and the educator recognized that development of a learning module for the nursing staff would be a beneficial resource. Based on information identified through the environmental and consultation scan the resource will consist of a general overview on what GBS is, how it is screened and treated, possible signs and symptoms a newborn could experience in the post-partum period, appropriate steps to manage a newborn with possible sepsis, patient education methods and multiple choice questions on the topic. Through consultation the need and rationale for a learning module was strongly identified. The development of this learning module will fill that gap and support nursing knowledge resulting in improved patient outcomes.

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Consultation and Environmental Scan Appendix A

February 25, 2016

Cindy Clancey BNRN

Memorial University of Newfoundland

Master of Nursing student

Dear participants:

My name is Cindy Clancey and I am a Master of Nursing student with Memorial University of Newfoundland. In partial fulfillment of my MN degree I am completing a practicum project on the development of a Group B Streptococcus learning module. This learning module will focus on the management and treatment of GBS infections during labour, and potential implications and management of the newborn in the post-partum period. This module will be utilized as a learning tool for staff at a rural hospital in northern Alberta.

I am completing an environmental scan to collect data on this topic and I am writing to request information that your health care facility utilizes regarding this topic. Relevant policies and procedures, statistics or existing learning modules will all assist with the development of this resource. All information collected will be kept confidential and participation and sharing of information is voluntary. You are free to contact myself at s72cmh@mun.ca or my practicum supervisor Lynn Cooze at lcooze@mun.ca with any comments, questions or concerns. I thank you in advance for your time and consideration.

Sincerely,

Cindy Clancey

Consultation and Environmental Scan Appendix B

GBS Questionnaire

Scale

Please use a 0-10 scale to rate the following, with 0 being of low and 10 being high.

1. How significant of a health concern would you consider GBS infections?
2. Do you think rates of GBS infections are high or low at the NWHC?
3. How important is it that GBS positive individuals are treated prophylactically during labour?
4. How significant is the impact of GBS infections on health outcomes of infants?
5. How important is it to monitor GBS exposed infants more closely in the post-partum period?

Questions

Do you think GBS during labour is managed effectively?

What information would be beneficial to help you manage GBS infections?

What types of learning tools or methods would help you learn about GBS?

Appendix C

Health Research Ethics Authority Screening Tool

	Question	Yes	No
1.	Is the project funded by, or being submitted to, a research funding agency for a research grant or award that requires research ethics review	<input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/>
2.	Are there any local policies which require this project to undergo review by a Research Ethics Board?	<input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/>
	IF YES to either of the above, the project should be submitted to a Research Ethics Board. IF NO to both questions, continue to complete the checklist.	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
3.	Is the primary purpose of the project to contribute to the growing body of knowledge regarding health and/or health systems that are generally accessible through academic literature?	<input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
4.	Is the project designed to answer a specific research question or to test an explicit hypothesis?	<input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/>
5.	Does the project involve a comparison of multiple sites, control sites, and/or control groups?	<input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/>
6.	Is the project design and methodology adequate to support generalizations that go beyond the particular population the sample is being drawn from?	<input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
7.	Does the project impose any additional burdens on participants beyond what would be expected through a typically expected course of care or role expectations?	<input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/>
LINE A: SUBTOTAL Questions 3 through 7 = (Count the # of Yes responses)		2	5
8.	Are many of the participants in the project also likely to be among those who	<input checked="" type="checkbox"/>	<input type="checkbox"/>

	might potentially benefit from the result of the project as it proceeds?		
9.	Is the project intended to define a best practice within your organization or practice?	X	<input type="checkbox"/>
10.	Would the project still be done at your site, even if there were no opportunity to publish the results or if the results might not be applicable anywhere else?	X	<input type="checkbox"/>
11.	Does the statement of purpose of the project refer explicitly to the features of a particular program, Organization, or region, rather than using more general terminology such as rural vs. urban populations?	<input type="checkbox"/> <input type="checkbox"/>	X
12.	Is the current project part of a continuous process of gathering or monitoring data within an organization?		X
LINE B: SUBTOTAL Questions 8 through 12 = (Count the # of Yes responses)		3	2
SUMMARY See Interpretation Below		5	7

Interpretation:

- If the sum of Line A is greater than Line B, the most probable purpose is **research**. The project should be submitted to an REB.
- If the sum of Line B is greater than Line A, the most probable purpose is **quality/evaluation**. Proceed with locally relevant process for ethics review (may not necessarily involve an REB).
- If the sums are equal, seek a second opinion to further explore whether the project should be classified as Research or as Quality and Evaluation.

These guidelines are used at Memorial University of Newfoundland and were adapted from ALBERTA RESEARCH ETHICS COMMUNITY CONSENSUS INITIATIVE (ARECCI). Further information can be found at:

<http://www.hrea.ca/Ethics-Review-Required.aspx>.

Appendix C

Learning Module

**Management of Group B Streptococcus
Infections for the Intrapartum and Post-Partum
Patient:
A Self-Learning Module for Registered Nurses**

Developed by: Cindy Clancey

Introduction

This is a self-study module on the topic of Group B Streptococcus (GBS) infections during labour and in the post-partum period. This module will cover a variety of topics such as: what is GBS, risk factors, treatment methods, implications, complications and parent education. If mothers are not effectively treated for GBS the potential impact on newborns may be serious or even fatal. Therefore, it is important to have clear guidelines, treatment and monitoring methods, as this will help to prevent possible transmission to newborns in the post-partum period. This will result in reduced incidences and complications from transmission of GBS, allowing for improved patient outcomes. After the module there will be a short quiz to test the knowledge you have learned. The purpose of this module is to:

- Provide an educational resource for Registered Nurses on the treatment and management of GBS on the inpatient unit.
- Aid Registered Nurses to enhance their own practice and increase their knowledge surrounding the assessment and management of GBS.
- Contribute to improving patient care and outcomes through the formulation of clear guidelines for all health care staff to use.

It is important to remember this module covers information on GBS only. Any information that is unclear should be addressed with your educator or manager.

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Learning Objectives

Upon completion of this module the learner will be able to:

- Describe GBS and the screening methods for determining presence of the infection.
- Identify maternal risk factors that places a newborn at risk of contracting GBS.
- Recognize newborn complications, signs and symptoms if they should acquire a GBS infection.
- Explain appropriate ways to treat, manage, and diagnosis GBS infections.
- Be able to effectively teach parents about GBS infections and how it can affect their newborn.
- Discuss with parents how to access appropriate follow up care for their newborn.
- Successfully complete the post module quiz.

What is Group B Strep?

Group B Streptococcus or GBS is a gram negative bacterium that is present in the birth canal, vagina, or rectum of approximately 15-40% of women. The main reservoir for GBS infections that can be passed along to newborns is the gastrointestinal tract of women. The infection can be intermittent, transient or persistent and can be vertically transmitted to a newborn during the labour and delivery process. GBS is the most significant cause of sepsis in infants with 40-70% of GBS positive women passing the infection along to their newborns (SOGC, n.d). Since the infection is typically treated effectively, most infants exposed to GBS during the labour and delivery process are

unaffected by it, however about 1-2% of these newborns will develop an infection from GBS (SOGC, n.d). While there is no one clear distinguishing factor that determines which infants will develop GBS there are certain factors that place infants at risk (SOGC, n.d).

There are two forms of GBS infections: early onset and late onset. Early onset develops within 7 days of birth and late onset develops after this time period and up to 6 weeks following birth. Early onset GBS is transmitted from mother to baby as the baby passes through the birth canal during the labour process. Late onset GBS may come from the mother or another source. GBS transmitted to a newborn can lead to a wide variety of health complications ranging from meningitis, sepsis, or even death. Mortality rates of infants who become unwell with GBS infection range from 5-12%. Therefore, it is important to be prompt with treatment and monitoring (Society of Obstetricians and Gynecologist of Canada, n.d; MORE OB, 2016).



(Group B Strep Support, 2015, <http://gbss.org.uk/>)

Screening for Group B Strep

The Society of Gynecologists and Obstetricians of Canada recommend that all pregnant women be screen for GBS infections during pregnancy. Typically, women are swabbed for GBS between 35-37 weeks of pregnancy to test for this infection. This time frame, close to the due date, has been identified as the best time to screen due to the transient nature of the infection. Screening is done by anal and vaginal swabbing and can be completed in their health care provider's office. Since some women do not test positive for both anal or vaginal swabs, and only test positive for one, it is essential that health care providers complete both swabs every time. If they are positive or colonized, they are then treated with antibiotics once labour starts or their membranes rupture to prevent transmission to their newborns during the labour process (De Luca et al., 2016; SOGC, n.d.; Taminato et al., 2011)

Maternal Risk Factors

Certain risk factors place a woman at increased risk of having a baby with a GBS infection. Risk factors include:

- **Prolonged rupture of membranes (> 18 hours).** If a woman's membranes have been ruptured for longer than 18 hours, the risk of GBS transmission to newborn is increased. Therefore, this must be determined upon admission with proper clinical assessment.
- **Maternal fever (> 38 °C) or illness such as chorioamnionitis during labour.** It is important to monitor maternal temperature as per your

facility's guidelines and more frequently if needed. If chorioamnionitis is suspected due to maternal temperature, foul smelling amniotic fluid, high maternal (>120bpm) or fetal heart (>160bpm) rate, uterine tenderness, it is important that the attending physician be notified immediately.

- **Preterm birth (< 37 weeks).** Any newborn born before 37 weeks gestation is at an increased risk of contracting GBS, therefore these infants should be more closely monitored in the post-partum period.
- **Endotracheal intubation or assisted ventilation at delivery.** Some newborns may experience respiratory distress at birth and may need assisted ventilation. Endotracheal intubation can damage the trachea making it more susceptible to infections so infants who had intubation at delivery are at an increased risk of developing GBS.
- **Previous newborn with GBS infection.** Having an infant develop a GBS infection places all future newborns of that mother at an increased risk. Therefore, it is important to be aware of this information which can normally be obtained during the maternal history taking.
- **GBS bacteria in urine in current pregnancy.** It is important to review prenatal records to identify if the woman has experienced GBS bacteria in her urine during this pregnancy as this places the newborn at an increased risk.

(Eastwood et al., 2015; Government of Alberta, 2011; Salus Global, 2016; SOGC, n.d.)



(Love to Know, 2015)

Geographical areas and race can also play a factor in rates of GBS infections. African American and Asian women are less likely to be screened and therefore, experience higher rates of GBS infections (Bryan, Cheng, & Caughey, 2011). Studies have shown that geographical areas can impact rates of GBS as well, so this is an important aspect to consider in areas that have high immigration rates. As well, it is important to be aware of rates and incidences of GBS infections in both mothers and newborns at your health care facility (Bryan, Cheng, & Caughey, 2011; Eastwood et al., 2015).

MORE OB has developed a chart which demonstrates the risk of contraction of GBS based on risk factors and swabbing results.

	Risk Factors* Present	Risk Factors* Absent
Culture Positive	1:25	1:200
Culture Negative	1:1100	1:3200
Culture Unknown (or not done)	1:120	1:800

(Salus Global, 2016. Reproduced with permission.)

*In this study the “Risk Factors” were defined as preterm labour (< 37 weeks), prolonged membrane rupture (> 12 hours), or intrapartum fever (>37.5°C/99.5° F). These factors are slightly different from those used in the current recommendations (Salus Global, 2016). Current guidelines include prolonged rupture of membranes if > 18 hours, versus 12 and intrapartum fever if > 38 °C versus 37.5 °C. This is significant because rates of incidences may change based on utilizing current recommendations. It is also important to remember that even with any changes in standards, nursing judgement should always prevail and any concerns with a newborn regardless should be promptly addressed.

Newborn Complications

A newborn infected with GBS can present with a wide variety of possible complications. Mild or life threatening complications, or even death are all possibilities for a newborn with GBS infection. Sepsis, meningitis and respiratory failure are all

examples of issues newborns may experience. Without proper treatment, newborns that are exposed to a GBS infection during labour are at an increased risk of contracting the infection. For example, GBS positive women who experience a precipitous delivery may not receive adequate treatment in time for delivery. These babies are then at risk and should be monitored more closely for signs of sepsis and other possible complications (De Luca et al., 2016).

Signs and Symptoms of Infection

Newborns exposed to GBS are at risk of contracting the infection themselves. Therefore, it is important to be aware of signs and symptoms that a newborn may present with if exposed and affected by GBS. Physical manifestations of early onset GBS infection in newborns include:

- **Lethargy such as difficult to wake or disinterest in feeds.** Newborns born to GBS positive mothers whom display these symptoms should be investigated for a possible cause.
- **Impaired thermoregulation such as high or low temperature.** Normal newborn auxiliary temperature ranges from 36.5-37.5 °C. A temperature outside this range should be considered abnormal and investigated. It is important to assess how the baby is dressed, if the baby is skin to skin, and ensure the temperature is taken accurately.
- **Tachycardia (higher than normal heart rate).** Normal fetal heart rate is typically between 120-160bpm, so a heart rate above 160bpm would be concerning. It is also important to consider the baseline fetal heart rate and

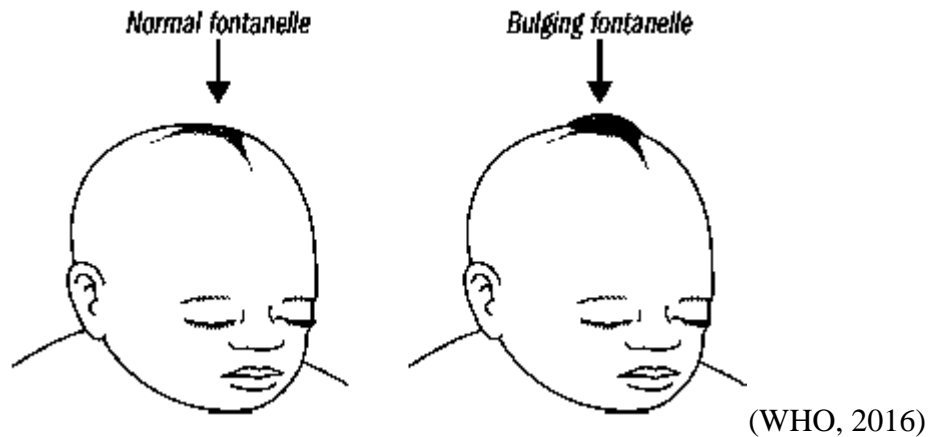
any medications the mother has been given which may affect the fetal heart rate.

- **Respiratory issues such as apnea, high respiratory rate, retractions, shallow or irregular breathing patterns.** Normal newborn respiratory rates are 30-60 breaths/min and respiratory rates above 60 breaths/min are concerning and may indicate infection and would warrant investigation.
- **Central cyanosis due to respiratory issues.** Central cyanosis is bluish colouring to the central body of a newborn and is an abnormal finding that is related to impaired perfusion.
- **Poor feeding such as inability to feed or disinterest in feeding.** A newborn born to a GBS positive mother who displays these symptoms should be investigated to identify if the cause is related to infection or other issues. During the establishment of breastfeeding newborns may have breastfeeding difficulties, so it is important to do a thorough assessment and consider all factors relating to feeding challenges.

In late onset GBS infection, similar symptoms may be present but may also include:

- **Vomiting or unable to keep feeds down.** A normal newborn should feed every 3-4 hours and one who is unable to feed well must be investigated to assess if the cause is related to GBS or other factors such as oral or gastrointestinal abnormalities.
- **Hypotonia which is floppiness or poor muscle tone.** Normal newborns' tone is flexed and it is abnormal for newborns to be limp or floppy.

- **Altered level of consciousness or difficult to wake.** Newborns have rest and wake periods throughout the day, however a newborn who is difficult to wake or is not alert at all throughout the day should be examined immediately.
- **A bulging fontanelle (soft spot).** It is important to assess fontanelles regularly. A fontanelle which is bulging or raised is abnormal and should be investigated for a cause.



If you have a newborn who displays any of these symptoms, it must be promptly investigated by the appropriate health care provider and the physician on call must immediately be called. Most infants, 89-95%, who develop complications from early onset GBS infections will display symptoms within 24 hours, therefore it is important that babies of GBS positive mothers remain in hospital and be closely monitored for at least 24 hours (Atherton, 2002; CPS, 2016; Government of Alberta, 2016; Salus Global, 2016).

Should a mother not receive adequate treatment for GBS infections and the newborn displays symptoms, it is important to increase the frequency of assessments including vital signs; temperature, O₂ saturation, heart and respiratory rate as needed

based on symptoms. Use the steps found in Acute Care of the Newborn (ACORN) learning tool found in the nursery to ensure all potential management issues have been addressed (CPS, 2015). Ensure resuscitation equipment is available such as oxygen, pulse oximetry, intubation equipment, etc. Stay with the newborn if they are sick, reassure parents and keep them informed. Keep your charge nurse and physician up to date on patient progress, accurately document your nursing care, and seek guidance and support from staff as needed.

Treatment and Management of GBS



(WorldsArtsMe, n.d)

Universal screening and treatment with antibiotics during labour has been proven to be effective in combating infant acquired GBS infections. The use of antibiotics such as penicillin has been identified as the gold standard of treatment for GBS. A positive GBS swab indicates that treatment must be initiated promptly.

- Penicillin G IV with an initial dose of 5 million international units (IU) and 2.5 million IU for subsequent doses, every 4 hours until delivery is the optimal choice for treatment.

- Ampicillin IV, 2 grams followed by 1 gram every 4 hours, is considered a safe alternative.
- Cefazolin IV, 2 grams followed by 1 gram every 8 hours, is also an option if there is a penicillin allergy which is not an anaphylaxis risk.
- Clindamycin IV 900 mg and vancomycin 1gram IV every 12 hours should be used as a last resort for women with anaphylaxis to penicillin.

(Salus Global, 2016)

It is important to always consider the implications of administering medications to patients, especially those with allergies to medications. Have anaphylaxis kits available and ensure it is not expired. Educate patient and support persons regarding the reason you are starting an IV, the medication you are giving, and any restrictions this may place on their ability to ambulate or be mobile.

Once the first dose of antibiotics has been in the maternal bloodstream for four hours the infection is generally considered treated and the newborn may be managed with routine measurement of vital signs and assessments. Infants born before the four-hour mark should be monitored more closely for signs of GBS infection as previously described (Chen, Puopolo, Eichenwald, Onderdonk, and Lieberman, 2005; De Luca et al., 2016; Taminato et al., 2011).

How to Manage Unknown GBS Status

Some women do not receive adequate prenatal care, therefore it is important to know what to do if a woman presents with unknown GBS status. MORE OB has developed a decision pathway for women who present in labour or with rupture of

membranes with unknown GBS status. If the woman had a previous GBS affected newborn or has GBS bacteriuria in current pregnancy, then she should receive intrapartum antibiotics. If she does not have those risk factors, but has additional risk factors of rupture of membranes ≥ 18 hours, maternal temperature ≥ 38 degrees Celsius, or is < 37 weeks, then she should also receive intrapartum antibiotics. For all other women prophylactic antibiotics are not required (Salus Global, 2016).

Diagnostic Measures

If a GBS positive mother receives adequate antibiotic treatment prior to delivery, no follow up workup is required for infants unless symptoms are displayed. If suspected there must be consideration of risk factors. Tests used to diagnose GBS infection in newborns include bloodwork such as CBC, cerebrospinal fluid cultures, chest x-ray, and physical exam to look for signs of clinical sepsis. Since GBS infection is a major cause of chorioamnionitis, infants born to women with chorioamnionitis should also have an evaluation for sepsis. In GBS infected newborns findings may include white blood counts higher than normal ($< 5.0 \times 10^9/L$), abnormal white spots on chest x-ray with findings consistent to pneumonia, and the presence of gram positive or negative cocci or rods in cerebrospinal fluid cultures (CPS, 2007; Eastwood et al., 2015; MORE OB, 2016).

The Canadian Pediatric Society has developed an algorithm for the management of newborns at risk for sepsis. This algorithm provides a step by step guide to monitoring and managing possible GBS infections in newborns. First it is important to consider if the newborn is unwell, if the mother is GBS positive or not, and if there are any maternal risk factors which places a newborn at increased risk. If the newborn is unwell then a full

diagnostic evaluation must be initiated. If not, then consider if the mother is GBS positive and whether she received prophylactic antibiotics. It is recommended that infants whose mothers did not receive adequate antibiotic treatment have a CBC and remain in hospital for at least 24 hours. Infants displaying symptoms of sepsis should be managed in a facility with an intensive care unit (CPS, 2007).

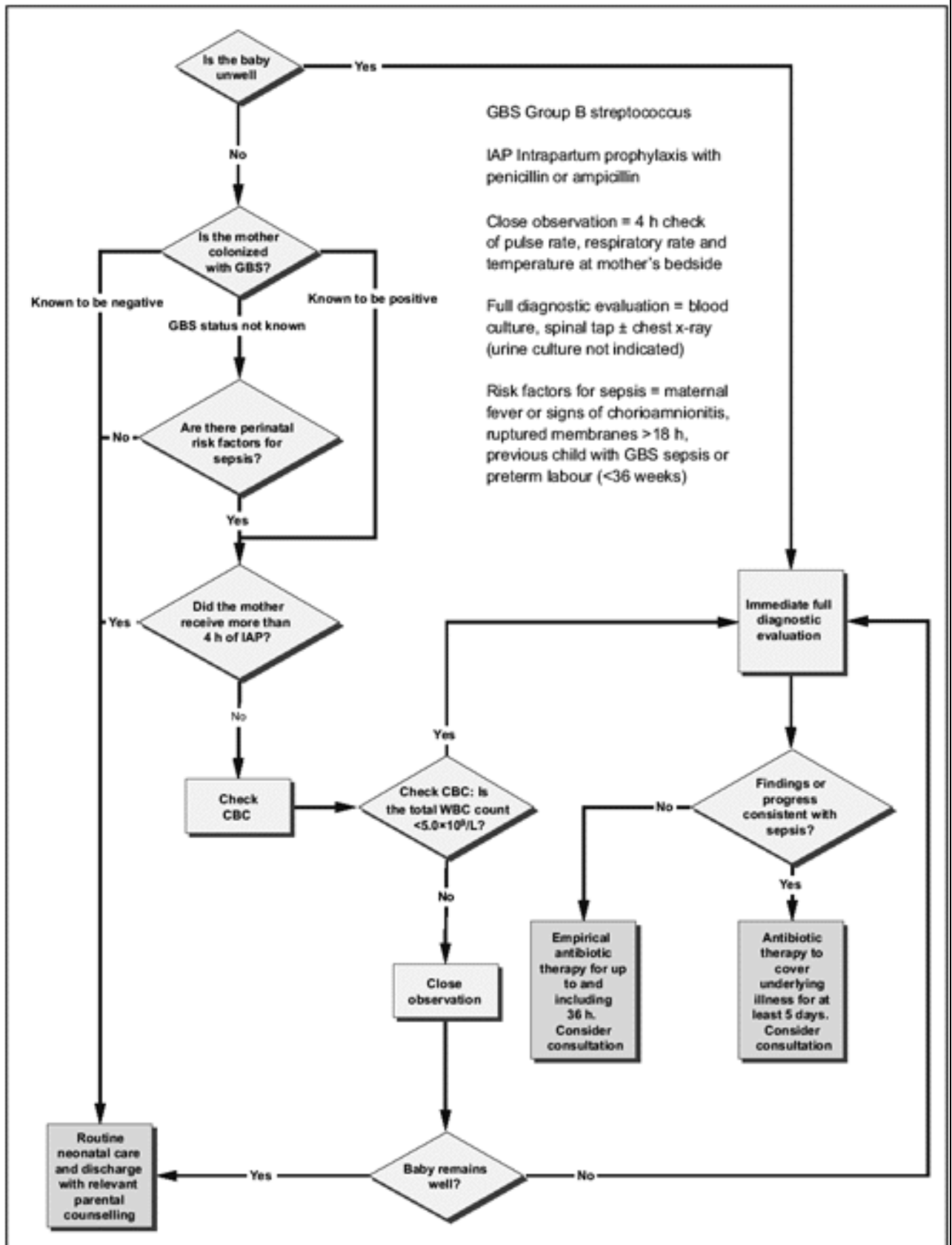
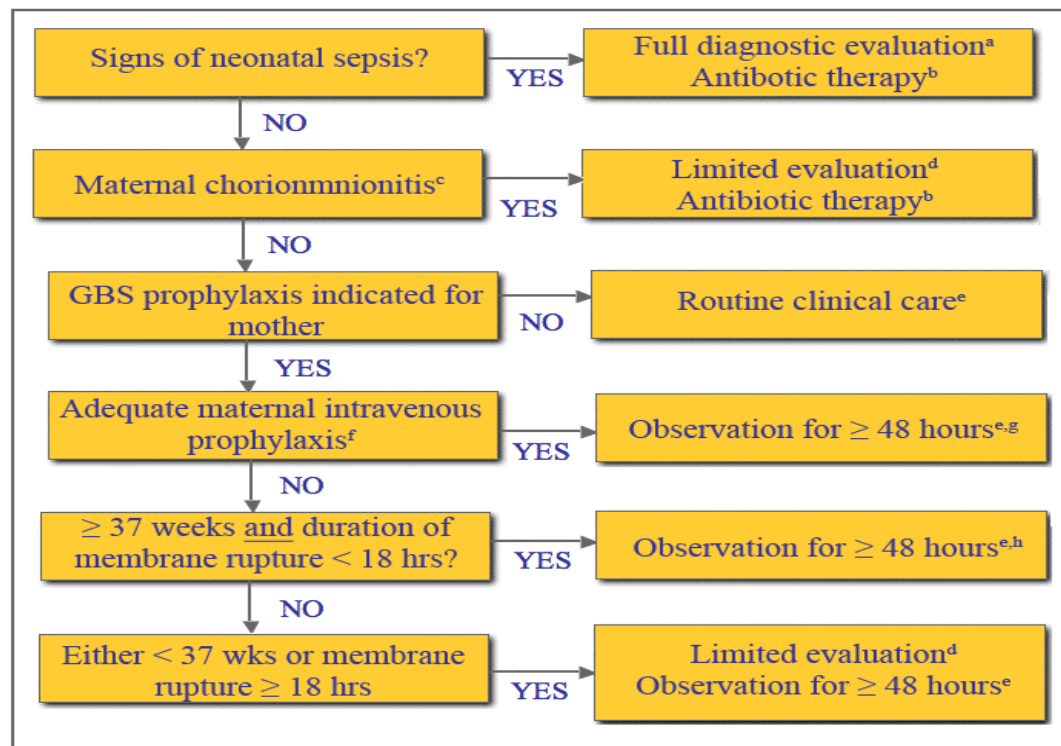


Figure 1) Algorithm for the management of newborn babies who may be at risk for neonatal sepsis. Source: Canadian Paediatric Society, 2007

Source: Barrington KJ, Canadian Paediatric Society, Fetus and Newborn Committee.

Management of the infant at increased risk for sepsis. *Paediatrics & Child Health* 2007;12(10):893-8. With permission.

As well, MORE OB has developed a working tool which can assist with managing possible GBS infections.



(Salus Global, 2016, reproduced with permission)

- a. **CBC, blood culture, Chest x-ray (if they have respiratory symptoms), +/- LP.**

Ensure that the physician and parents are up to date on patient progress, and appropriate tests are ordered and completed in a timely manner. It is important to be knowledgeable about testing the newborn is receiving and be aware of potential complications so the newborn can be appropriately monitored.

- b. **Antibiotics: ampicillin and coverage for other potential organisms.** Nursing care includes explaining the reason for starting an IV, the medications that are being given, and how often the newborn will receive them.
- c. **Diagnosed with symptoms of: fever, tender uterus, purulent/foul amniotic fluid, etc.** It is important the nurses monitor patients closely during labour and report any abnormal findings promptly to the physician.
- d. **CBC (WBC, diff., plat.) and blood culture.** This should be completed if chorionmnionitis is identified in the mother. Inform the family of patient progress, reasoning for treatment and possible complications that can result. Ensure procedures are completed in a timely manner and results are promptly identified to physician and family.
- e. **If signs of sepsis, then full diagnostic evaluation and antibiotic therapy.** It is important for Registered Nurses to be aware of signs of sepsis, ensure symptoms are quickly relayed to physician, parents are kept up to date, subsequent diagnostic procedures are completed, newborn is monitored closely for possible complications, and results are relayed as soon as they are available.
- f. **Penicillin, ampicillin, or cefazolin for ≥ 4 hrs before delivery.** Ensure IV is promptly started once labour starts or membranes rupture, and patient receives appropriate treatment in a timely manner.
- g. **May be discharged @ 24 hrs if criteria met and access to care.** Ensure patient has been closely monitored and parents know how and where to access follow up care for their newborn. Advise parents of any possible future signs and symptoms and know when to seek treatment. (see Patient Education section)

- h. **Canadian Paediatric Society recommends: CBC (WBC, diff., plat.).** Well infants may be discharged @ 24 hrs if criteria met and immediate access to care. Ensure results of CBC are normal and physician is aware. Ensure parents know how and where to access follow up care and provide patient teaching regarding signs and symptoms of GBS infection that the newborn may experience once discharged.

Parent Education

Since late onset GBS infections can affect infants, it is important that parents are aware of signs and symptoms so they can appropriately monitor their baby once at home. Patient education about the topic of GBS infections should take place prior to discharge. Patient education should focus on the signs and symptoms of GBS infections, explained in easy to understand language, such as:

- trouble breathing, breathing too fast or too slow
- having trouble feeding
- difficult to wake up or sleepy all the time
- raised bump on the soft spot on their head
- floppiness or low muscle tone

Discussions should take place regarding access to follow up care and parents should also be given contact information for a health care facility near them. It is important to remember that no treatment is 100% effective in eliminating GBS infections, thus the potential for transmission is always there and parent should not feel guilty if their child does acquire GBS. However, parents should be reminded to seek prompt medical

care if their infant displays any of the symptoms of late onset GBS in the first 6 weeks of life.

Self-Study Questionnaire

1. What percentage of women are infected with GBS?
 - a. > 10%
 - b. 15-40%
 - c. 60-85%
 - d. > 90%

2. When should screening for GBS be done for pregnant women?
 - a. In labour
 - b. >20 weeks
 - c. 25-27 weeks
 - d. 35-37 weeks

3. What are signs of a possible GBS infection in a newborn?
 - a. High temperature
 - b. Poor feeding
 - c. Respiratory issues
 - d. All of the above

4. If a woman is GBS +, how long before delivery should she receive antibiotics?
 - a. 1 hour
 - b. 2 hours

c. 4 hours

d. 5 hours

5. What antibiotic is the gold standard of treatment used to treat GBS infections in labour?

6. What are two maternal factors that may increase the risk for a baby to develop a GBS infection?

7. During what time period would an infection be considered early onset and what time period would an infection be considered late onset?

8. If a woman presents in labour with unknown GBS status, name two risk factors which would indicate the need for intrapartum antibiotics?

9. Diagnostic measures for GBS infection in newborns can include CBC, MRI, cerebrospinal fluid cultures, or chest x-ray.

TRUE or FALSE

10. Case study:

A woman with limited prenatal care who is 39 weeks gestation is admitted to the labour unit and experiences a precipitous delivery. Her GBS status is unknown.

The newborn has an apgar score of 9 and 10. What are your next steps?

Answers

1. B
2. D
3. D
4. C
5. Penicillin
6. Previous baby with GBS infection, maternal temperature or infection during labour, prolonged rupture of membranes, prolonged labour, respiratory issues at delivery, preterm birth, GBS bacteria in urine during this pregnancy.
7. Early: within 7 days of birth, Late: after 7 days
8. Previous infant with GBS, GBS bacteriuria in current pregnancy, rupture of membranes ≥ 18 hours, maternal temperature ≥ 38 degrees Celsius, or is < 37 weeks.
9. False, not MRI.
10. Determine if there are risk factors for sepsis: maternal fever, illness, previous newborn with GBS infection, etc . If none have been identified then provide routine postnatal and newborn care, and parental counselling regarding GBS. If risk factors are present, then a CBC should be performed and follow up care based on results.

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