

Preterm Labor Algorithm and Maternal-Fetal Transport Data Collection Tool: Final Report

March 1, 2023

Introduction

In 2020, the Center for Quality Improvement was awarded a grant from the Betterment Fund to evaluate two new tools to reduce infant mortality in Maine. The first tool, the Maternal Risk Assessment for Preterm Labor Algorithm (“PTL Algorithm”) was designed to standardize the assessment and care of birthing people who may be in preterm labor. The second tool, the Maternal-Fetal Transport Data Collection Tool (“Transport Tool”) was designed to document conditions and factors related to maternal-fetal interfacility transport from community hospitals to tertiary care centers. While both processes have significant implications for the health of both mothers and babies and some hospitals have established internal protocols to guide these processes, no standardized tools are currently used by all Maine hospitals. This report describes the results of a year-long project to pilot the new tools in a sample of birthing and non-birthing hospitals, collect data about their acceptability and usefulness, needed modifications, and recommendations to facilitate adoption and dissemination statewide.

Background

The pilot project is a continuation of efforts to address Maine’s high infant mortality rate (IMR) which, at 6.3 deaths per 1,000 live births as of 2020, is the highest in New England.¹ In 2020, a group of partners representing health care, public health and state sectors designed and published a report titled [Understanding and Addressing the Drivers of Infant Mortality \(“IM report”\) in Maine](#).² Two priority recommendations in the report were to identify tools to ensure consistency of risk assessment and to learn more about decision making and logistics of transporting pregnant people so that all births occur in the most appropriate setting. Both tools are intended to reduce the risk of preterm births, which are a leading cause of infant mortality in Maine.

Inconsistent adoption of standardized evidence-informed guidelines among hospitals can lead to confusion and delays in care in transferring pregnant patients with potential medical problems to the appropriate maternity center for delivery. These delays can contribute to infant mortality when births do not occur in the ideal setting. Most infant deaths in Maine are due to causes related to being born too early.

In late 2020 to early 2021, two workgroups of physicians, nurses, hospital leaders, emergency medical system (EMS) personnel and others were convened to develop recommendations for clinical guidance that could be pilot tested in a small group of Maine hospitals prior to statewide dissemination. The groups met over a period of six months and produced prototypes of two clinical tools: the PTL Algorithm, for patients presenting with preterm labor signs/symptoms, and a Transport Tool, consistent with recommendations in both the Infant Mortality report² and the Maine DHHS’ Strengthening the Perinatal System of Care initiative, recommending

¹ National Center for Health Statistics. (2022). *Infant mortality rates by state*. Centers for Disease Control. https://www.cdc.gov/nchs/pressroom/sosmap/infant_mortality_rates/infant_mortality.htm

² Flaherty, K. (2020). *Understanding and addressing the drivers of infant mortality in Maine*. https://www.mekids.org/site/assets/files/1575/final_im_report_full_3_12_2020.pdf

assessment, monitoring, and evaluation of “the effectiveness of new and enhanced models and activities using quality improvement (QI) methods and data collection.”²

Description of the Pilot Project

The pilot project had two goals:

1. Engage participating hospitals in individual and group educational activities to facilitate sharing of successful implementation processes and lessons learned; and
2. Engage a sample of birthing and non-birthing hospitals in using the tools and providing feedback to facilitate their adoption and dissemination.

Recruitment

The pilot project team recruited six birthing hospitals representing diverse geographic regions of Maine.

Pilot Project Test Hospitals			
Hospital	Parent Organization	Pilot Tool	Hospital Type
Mid Coast Hospital	MaineHealth	Transport	Birthing
Inland Hospital	Northern Light	Transport	Birthing
York Hospital	Independent, Affiliation with MGH	Transport/PTL Algorithm	Birthing
Northern Maine Medical Center	Independent	Transport/PTL Algorithm	Birthing
Pen Bay Medical Center	MaineHealth	PTL Algorithm	Birthing
Waldo County General	MaineHealth	PTL Algorithm	Birthing
Millinocket Regional Hospital	Independent	PTL Algorithm	Non-birthing
CA Dean Hospital (Greenville)	Northern Light	PTL Algorithm	Non-birthing

Two selection criteria were used: 1) a minimum of 50 births annually at each participating hospital; and 2) experience implementing quality improvement initiatives. Two hospitals without an obstetrics unit, referred to as non-birthing hospitals, were also recruited to participate.

Timeline

The project spanned a period of 12 months in order to provide sufficient time for data collection and feedback from participating hospitals. The first three months were dedicated to planning and recruitment of hospital teams and refinement of data collection protocols and processes and scheduling meetings to share best practices, changes in workflow, and provider and patient engagement. The following six months served as the implementation phase, in which the tools were used routinely in clinical settings, data regarding PTL risk assessment and interfacility transport actions were collected/reported, and educational activities and meetings with individual hospitals were held. The final three months of the project were devoted to an evaluation using

² Flaherty, K. (2020). *Understanding and addressing the drivers of infant mortality in Maine*. https://www.mekids.org/site/assets/files/1575/final_im_report_full_3_12_2020.pdf

quantitative and qualitative data collected throughout the implementation phase. Hospital teams were encouraged to share lessons learned, best practices, and communication strategies with each other and project staff.

Evaluation

The pilot evaluation was conducted by an external evaluation consultant, Therese Fitzgerald, PhD, MSW, using a mixed-methods approach collecting both quantitative and qualitative data from nurse leaders from participating hospitals. The evaluation was conducted from April to September 2022. The first section of the evaluation portion of this report provides an overview and analysis of the quantitative data collected to assess each of the two tools assessed in the pilot. Quantitative data were submitted by the hospitals to the evaluator monthly and were reviewed throughout the pilot by the evaluator and the pilot project team to identify and correct issues such as missing data. The second section provides an overview and analysis of the qualitative data collected to provide context to the quantitative data analysis and findings. The qualitative data were collected during one-on-one interviews the evaluator conducted with nurse leaders from each of the hospitals that piloted the tools. Please see Appendix A for a copy of the tools and the interview guides used in the qualitative interviews.

1. Quantitative Analysis

High Level Findings from Quantitative PTL Algorithm Data:

Maternal Risk Assessment - PTL Algorithm - Quantitative Findings

Quantitative data were collected to assess utilization of the PTL Algorithm with a “checklist” form that clinicians completed each time they assessed a pregnant patient using the PTL Algorithm (see Appendix A). Twelve pregnant patients presenting with PTL symptoms were assessed using the PTL Algorithm at two of the birthing hospitals participating in the pilot. The four remaining hospitals did not have any patients present with PTL symptoms during the pilot.

Assessment - Level of Identified PTL Risk: All 12 of the patients presenting with PTL symptoms during the pilot were assessed for gestational age via ultrasound. Gestational age ranged from 24 weeks and two days to 35 weeks and five days with a mean gestational age of 31 weeks and all the women were receiving prenatal care at the time of assessment (n=12; 100%). Patients were assessed for diagnosed conditions that had occurred before or during their current pregnancy that indicated increased risk for PTL.

Examination Results: For all but one (8.3%) of the patients, the results of the physical exam showed patients were experiencing at least one of the following PTL symptoms: contractions (n=6; 50%); menstrual-like cramping/low back pain (n=50%); vaginal bleeding (n=3; 25%); ruptured membranes (n=1; 8/3%); precipitous delivery (n=1; 8/3%); and/or pressure (n=1; 8/3%).

Lab Tests and Results: Lab test results showed that 75% (n=9) of the twelve cases assessed in this pilot showed potentially serious complications of pregnancy. Forty-two percent of patients presented with PTL. Other serious conditions included Premature Prolonged Rupture Of

Membranes (their water broke prematurely), UTI (urinary tract infection), elevated blood sugar, bleeding, and precipitous delivery.

Actions Taken Based on the Exams and Test Results: More than half (n=7; 57%) of the patients in the pilot were in need of specialized care after assessment. One-third of patients (n=4) needed transport to a hospital with higher-level or more specialized care. One-third (n=4) needed to be admitted to the hospital for delivery. This was due to several reasons; labor progressing too rapidly for transfer or that transfer at that time could result in a delivery en route to the higher level of care (n=3), or to the need for labor management/observation (n=1). One in four (n=3) required Maternal-Fetal Medicine (MFM)³³ notification.

Medication Administered: All patients admitted for delivery received IV hydration.

Actions taken at or following delivery: There were three infants delivered during the study whose birthing parent was assessed with the PTL Algorithm. Two-thirds (n=2) of these infants were moved to Newborn/NICU. In one-third of deliveries (n=1) the following actions were taken: delayed cord clamping performed (recommended for all vigorous term and preterm infants for 30 - 60 seconds after delivery); cord gases obtained to assess acid base status; and postpartum care for the mother initiated.

High Level Findings from Quantitative Transport Tool Data:

Transport Tool - Quantitative Findings

There were 28 transport cases reported during the pilot across three participating birthing hospitals. The pilot project team met several times over the course of the pilot to review the data analysis presented by the evaluator. An additional partner in this work was Marc Minkler, Program Manager, EMS-C. Marc assisted with verification of data and provided input during meetings and presentations. Based on these monthly discussions of the Transport Tool wait time data, the team made the decision to exclude wait time analysis on transport cases where the patient's primary diagnosis was "postpartum to be with newborn" due to the potential for the less urgent nature of the transport to skew wait time results (n=7). The following analyses were conducted on the remaining transport 21 cases.

Length of Time to Decision to Transport: The vast majority of hospitals (90%) made the decision to transport in less than 6 hours (n=19). Only one hospital took more than 10 hours to transport the pregnant patient (See Appendix B - Chart 2).

Average Wait Times: Twenty (95%) of the hospitals submitted wait time data. On average, there was a wait time of approximately 54 minutes between MFM consultation and emergency medical system (EMS) request for transport. The average wait time for EMS arrival, the time

³ According to the Society for Maternal-Fetal Medicine, "Maternal-fetal medicine (MFM) subspecialists treat two patients at the same time. We partner with the mom-to-be, her family, and her medical team to navigate the un-routine and achieve the best possible outcome. We see families who have experienced high-risk pregnancies in the past, women with chronic health conditions, and women who develop unexpected problems during their pregnancy." Retrieved December 27, 2022 from <https://www.smfm.org/whatwedo>.

between EMS request and EMS arrival, was about 51 minutes. Overall, it took an average of 104 minutes from MFM consult to EMS arrival during the pilot transports (see Appendix B - Figure 1).

Sending Facility Staff Accompaniment: The majority of hospitals requesting transports during the pilot sent a registered nurse (RN) on the EMS transport to monitor the patient. The remaining 38% of hospitals did not send nurses or any other hospital staff with the patient during transport. Additional data are needed to determine what is driving these decisions. See qualitative findings section for context.

Primary Diagnosis: The most frequently cited primary diagnosis given as a reason for transport was fairly evenly divided between hypertensive disorders of pregnancy (n=6; 29%), preterm labor (less than 37 weeks) (n=6, 29%), and vaginal bleeding/abruption/previa (n=5; 24%). Three (n=14%) birthing people were transported due to Preterm Premature Rupture of Membranes (PPROM) and one (5%) for fetal indication (birth defect or other issue concerning the baby) (see Appendix B - Chart 3).

Gestational Age in Weeks: Gestational age in weeks for birthing people in the transport tool pilot ranged from 22 to 36 weeks. A plurality or one-third (33%) of those transported were 30-31 weeks pregnant. Average gestational age was 31 weeks (see Appendix B - Chart 4).

2. Qualitative Findings

Monthly Check-In Meetings

Monthly check in meetings were offered by CQI for each participating hospital. Each month hospitals had a choice of two date/time options to videoconference with the CQI team that included project manager and consultants. The following summarizes the discussions over the course of the 6 months of check in meetings.

Preterm Labor Algorithm:

- PTL Algorithm was presented at Department meetings, to CMO/CNO, and to the Perinatal Quality meeting.
- A paper copy of the PTL Algorithm was placed in a transport packet so nurses had it when they were readying a patient for transport. The transport packet includes EMTALA forms, consents, report forms, etc. The PTL Algorithm was also laminated and placed on infant warmers in the nursery and in the Operating Room.
- Initial findings included that the PTL Algorithm improved documentation.
- One hospital identified an increase in patients with no prenatal care; not associated with PTL.
- A suggestion was made to consider ways to integrate shared decision making into Algorithm, particularly for those situations where there are delivery hospital options for the patient and family.

- Non-birthing hospital PTL Algorithm was approved by leadership but had no opportunities to use during the pilot period and was not built into their electronic medical record or other system.

Transport Tool:

- One hospital reported that they initially used the tool as a paper copy and then realized that there are no drop-down menu options in the paper version so they transitioned to using the electronic version. Unit secretary fills out transport data collection when a maternal-fetal transfer occurs.
- Finding an available ambulance is challenging.
- After using data collection tool and assessing times, one hospital changed practice to call sooner. Depending on the situation, they now often make the call to request interfacility transport and then perform stabilization/preparation for transfer activities.

Interviews:

Additional qualitative data were collected at the end of the pilot and analyzed using a thematic analysis approach, “a method for identifying, analyzing and reporting patterns (themes) within data”.⁴ This approach was used to conduct interviews with nurse leaders and nurses piloting both the PTL Algorithm and the Transport Tool.

The evaluator conducted four open-ended interviews with nurse leaders who piloted the PTL Algorithm. Nurse leaders from four birthing and one non-birthing hospital completed the interviews. One health system had two birthing hospitals participating in the study. Therefore, one interview was conducted with two members of that health system who provided feedback about their experiences with the tool.

Due to low volume of patients presenting with PTL symptoms during the study period, only two of the five hospitals participating in the qualitative interviews had patients presenting with PTL symptoms. Therefore, only two hospitals in the pilot had the opportunity to use the PTL Algorithm - both were birthing hospitals. One of the nurse managers commented: “The tool itself is amazing. It's extremely comprehensive and has all of the information needed. It offers great guidance for anybody questioning preterm labor.”

The evaluator also conducted qualitative interviews with three of the four birthing hospitals that assessed the Transport Tool. The nurse leader from the fourth birthing hospital declined to be interviewed because they did not have an opportunity to work with the Transport Tool during the pilot period due to a lack of pregnant patients requiring transfer to a higher level of care. Nurse leaders who utilized the Transport Tool during the pilot were asked a number of questions about interfacility transports at their hospital and use and satisfaction with the transport tool and the pilot process in general (see Appendix A for copies of the interview guides used in the qualitative analysis).

⁴ Braun, V. and Clarke, V. (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3 (2). pp. 77-101. ISSN 1478-0887 Available from: <http://eprints.uwe.ac.uk/11735>

The following themes emerged from qualitative interviews regarding each of the tools.

Theme 1: The tools promote consistency and standardization.

One of the birthing hospital nurse leaders was able to provide the following positive feedback on patient impact from using the PTL Algorithm. She indicated that although the actions outlined in the PTL Algorithm are similar to the actions her hospital nurses take when presented with PTL patients, the PTL Algorithm provides nurses with the assurance that they are providing high-quality care while also giving their patients a better understanding of the process:

I think it's not much different from what we'd normally do but confirmation that we are doing the right thing. If a patient was questioning, why do you need to ship me, this is a good handout of why for the patient. They didn't need to do it, but we could use it in instances where patients question the need for interfacility transport.

When asked by the evaluator if she thought a simplified patient version of the PTL Algorithm might be helpful, the birthing hospital nurse leader responded that a visual might be helpful:

It would be good to have a visual for the patient for why they need to be transported. They're not listening to the clinical thought that their baby is at risk. Sometimes the mom panics, they have other kids, a partner, and other responsibilities so they don't want to leave the area.

One of the birthing hospital nurse leaders was able to articulate that, although they were already following the clinical guidelines outlined in the PTL Algorithm, the tool was able to provide them with validation, alignment, and consistency:

But it is nice to have alignment with all of our guidelines and have that consistency. One thing is that it validated for us that we are following it because we have strong pediatricians that we know to call neonatology, etc. This confirmed for us that these things are already part of our work process. But this is not the case at every hospital. This is validation for us that we are doing the right thing.

The birthing hospital nurse leader who was using the PTL Algorithm consistently indicated that she was “very satisfied” with the tools because it was “easy and not too much.” She also indicated that she would be “extremely likely” to recommend the tool to other hospitals. When asked why she said: “No matter where you go, women should have consistent care and get the same care in Maine no matter where they go and this tool helps make that happen.” She also said that she would be “extremely likely” to recommend that her hospital continue to use the tool on an ongoing basis for consistency and high-quality, safe care because:

It keeps things on track for new providers and new staff - this is what you would follow even if it's the middle of the night and everyone is exhausted. Making sure you are consistent makes it a valuable tool. Those tools collect valuable data for the state as well.

Standardization also drives collaboration and improves communication. Birthing hospital nurse leaders indicated that collaboration and communication were key benefits of the PTL Algorithm: “Any project when you talk to a multidisciplinary group - all of them need to communicate to go over the algorithm and follow it together which increases respect and communication and collaboration of the team. It fosters that teamwork.”

Opportunity for collaboration driven by standardized processes such as the PTL Algorithm extends beyond the hospital to ancillary services. When asked about suggestions for improving birth outcomes in Maine a birthing hospital nurse leader noted that interfacility transport is an issue as “ambulances are hard to get.” She had an innovative idea for integrating the two pilot projects, the PTL Algorithm and the Transport Tool:

Our ED is great but including the EMS team into the algorithm and working them into the workflow is one idea. If a patient is being transported, EMS doesn’t always understand the urgency, so it might be good to educate them on the importance of it and why. Making the connection between the algorithm for PTL and the interfacility transport to EMS would be a good educational tool for EMS. [EMS] need to know why we need the ambulance and understand the process and why it’s happening.

Respondents discussed the distribution and utilization of the PTL Algorithm within their hospitals. Birthing hospitals indicated that they were using paper versions and making those available to nurses in various ways. One birthing hospital laminated the PTL Algorithm and put copies in high traffic areas, near the phones, and in the birthing areas noting that, “Consistency is always key in things like that.” Another birthing hospital hung the paper version of the PTL Algorithm in their nurse’s station and instructed nurses to follow it and submit PTL data to the evaluators if a patient presented with PTL symptoms. Nurse leaders from another birthing hospital noted:

We made photocopies of the tool [PTL Algorithm] and put them with our transport packets. If you have a PTL you have to grab those packets so we put it right in the packet along with the PTL checklist tool [PTL data collection form], the EMTALA information, our documentation list, etc. You work through the Algorithm and then fill out the preterm labor checklist. If a midwife or doctor is transferring, they look at the Algorithm and then the nurse fills out the PTL data in collaboration with the doctor and/or midwife.

Theme 2: Simplify processes to promote integration of the tools into workflows.

One birthing hospital noted that they have a PTL packet used to prepare for interfacility transport that they use when patients present with PTL symptoms. They have added the PTL Algorithm to that packet and have updated their policies to include the tools to make sure they are used consistently. When asked for her advice for other hospitals or departments considering adopting these tools she suggested a simplified approach: “Don’t overcomplicate it. Work it into your existing, already-made workflows. Things get complicated when it doesn’t feel collaborative. Put it into the workflow that’s already working for you.”

One of the non-birthing hospitals made PTL tools available in physicians' offices but the tools were not available for the nurses. After the PTL pilot project period had ended, a patient with PTL symptoms presented at the hospital. Given their historically low volume of PTL patients, the hospital did not feel prepared for the preterm delivery. They subsequently added the PTL tool to workflows used when patients who are in labor arrive at the hospital.

Theme 3: EMS wait times vary and can impact clinical processes.

Pilot hospitals were asked to describe the process they use to decide when they should call EMS for maternal fetal interfacility transports. One nurse leader noted that they do not call for EMS interfacility transports until after the tertiary care facility has accepted the patient to avoid having an EMS interfacility transport waiting at their hospital while they are in the approval to transport process.

A birthing hospital nurse leader described significant wait times for EMS interfacility transport during the description of their transport process:

Our process currently is, for [EMS - name redacted], as we contract with them, we must call them first and the wait is typically 24-48 hours. So, we have difficulty getting them in a timely manner. Usually when our providers consult with maternal-fetal medicine (MFM), MFM accepts them, so there's usually some time, once they're accepted at MFM, when we can call transport to ask, what does the wait time look like for transport right now? Most of the time it is 24-48 hours and then we call 911. [EMS - name redacted] gets here in five minutes, so we don't need to call them ahead of time.

Another birthing hospital nurse leader said she used to only call EMS interfacility transport when they were ready to leave with a patient for transport. Recently, steps were added to the process that require nurses call ahead to EMS interfacility transport while they are completing forms, lab work, and medications to determine a timeframe for EMS arrival. The nurse leader noted that "90% of the time EMS has 8-10 hour wait times." She said, "when that happens, we have no choice but to call 911" after forms, labs, and medications are completed.

A third birthing hospital nurse leader indicated that there are a series of steps they take before calling EMS interfacility transport. Their birthing hospital providers first call the "transfer center" of the transport hospital to make sure the patient has been accepted for transfer; patients are either transported to Eastern Maine Medical Center or MMC. Hospital nursing staff also call the covering physician at the hospital where the patient is being transferred and present the patient's medical condition to that physician who will be overseeing the patient's care. Once the physician accepts the patient transfer, nurses check to make sure the patient will accept the transfer. Once these steps of the process are complete, EMS interfacility transport is called.

Theme 4: Most opinions on EMS are positive despite significant wait times.

Two of the hospital nurse leaders indicated that they were generally satisfied with their EMS interfacility transport system. When probed, one nurse leader said that they are not "very satisfied" because "sometimes they call and say they are running late - an hour or so before they get here. Most of the wait times are between ½-1 hour."

Similarly, another nurse leader said that getting interfacility transport in a timely fashion can be difficult and wait times can be frustrating, but once EMS arrives, the staff are great. The problem is that there just are not enough ambulances to meet the need. “We call [EMS redacted] and if they aren’t available we will call every town in the surrounding area and it is quite time consuming. For the majority of the time, we do not have immediate access to an ambulance, we have to wait.”

Another nurse leader indicated that she was dissatisfied with their EMS interfacility transport service due to limited availability. When their contracted EMS transport provider has long wait times they are forced to call 911 and tie up community emergency resources. Although the 911 EMS staff are “fantastic”, she also feels a sense of guilt tying up the 911 services when they arrive quickly and her hospital is not quite ready to transport due to required paperwork and procedures needed prior to transport.

When asked about what is going well with EMS interfacility transport in their local areas, nurse leaders expressed general satisfaction with EMS staff and the transport process after the ambulance arrives at their hospital saying:

They get the patients out. They do what they say they are going to do for the most part. We call and they usually are spot on when they are going to be here and let us know when they are going to be delayed. It’s seamless when they get here.

Another nurse leader commented:

The One Call system has been fine. The central hub for communications, rather than calling around for MFM, they call and then the MFM calls us back. One Call also has bed planning for the system as well. We have a great working relationship with MFM. For our hospital, specifically, we have it down to a science.

Hospital 3 also expressed satisfaction with EMS staff: “I think when they have the availability, it all goes very smoothly. Everybody is easy to work with and they are good with our patients but I know they are spread very thin.”

Theme 5: Interfacility Transport systems and processes need to be streamlined.

When asked about EMS improvements that needed to take place, one of the nurse leaders commented that the nursing report is an area that needs to be more efficient. She said:

I don’t know that it’s a bad thing to touch base verbally, but since we send the nurse, why can’t they look the patient up in the electronic health record and then answer the question when the patient gets there with the nurse in charge of their care. Do the orders in person rather than over the phone. Another suggestion is to increase EMS resources so we don’t need to call 911 but not sure how realistic that is. That’s a trickier problem.

Nurse leaders also wished there was a more efficient, less time-consuming way for them to contact all of the ambulances in their area at the same time rather than having to call each one individually, a sort of one-stop contact. One nurse commented: “Some transfer centers have

someone who has time to call. But for us, our nurse is away from the bedside calling for a mode of transport when they should be at the bedside caring for the patient.”

An additional challenge noted by nurse leaders that indicates a need for a streamlined process is the MFM nursing report sheet, which includes patient background, lab values, history, and a synopsis of the current situation (i.e., a one-page form). This form has to be faxed to the charge nurse and then nurses have to call after the form has been faxed. The nurses are often put on hold while the receiving hospital waits for the form. Sometimes the form has to be refaxed taking additional time. In addition to the fax, nurses must read the faxed form to the charge nurse verbally prior to transfer, although technically this information should all be in the electronic medical record already. If they call back from the receiving hospital to discuss the verbal orders over the phone, the nurse accompanying the transport patient has to get on the ambulance and leave behind a different nurse to call in the verbal report for a patient he/she does not know.

Two nurse leaders from one of the birthing hospitals further elaborated on this issue with the following information:

The difficulty is with the reporting to [the tertiary care hospital - name redacted]. For the report, when we are sending a mom to [the tertiary care hospital], we have to fill out their form, fax it, and then verbally confirm it over the phone. But often, when we call, we can't get a hold of the nurse. So, the nurse who is treating the patient often can't wait to do the verbal call, they have to get on the transport and leave the verbal report for the nurse who is staying at the hospital. We don't have phones to take with us for the ride. Since we are all connecting through EPIC, why do I need to fill out a form and fax it to you in the first place?

Theme 6: Trend data is crucial for addressing interfacility transport issues.

The evaluation included a question about the benefits of using the Transport Tool to collect data on wait times and specific patient conditions. One nurse reported that the Transport Tool pilot helped clear up confusion: “I think it helps to narrow down what the actual issues are. [There's] lots of speculation and we knew EMS was a problem.”

Another nurse observed that, even with low volume, trend data are important to collect:

I think that our numbers are so small it is difficult for us to see any real trends. We all knew about the issue about availability - but there is a benefit, on the whole, to collect the data. If we could find a way to streamline the interfacility transportation - that's the biggest roadblock as well as bed availability. If we were able to find trends, maybe we could screen for things sooner and not see these things emergently.

Others commented on opportunities to identify gaps that can reduce interfacility transport time and address roadblocks proactively: “It helps to keep track of the data to see patterns and trends, and maybe you can come up with a reason for why all of your interfacility transports are on Fridays, or specific times/days of the week.”

Conclusions

The evaluation findings suggest that both tools are user-friendly from the standpoint of hospital nurse managers and are beneficial for responding proactively to issues as they emerge. They also assist in developing contingency planning rather than simply reacting in an emergency.

Findings suggest that the PTL Algorithm and Transport Tool were used as designed. The pilot data were comprehensive and provided appropriate details for assessing risk for PTL and interfacility transport issues.

In general, the PTL Algorithm was viewed by nurse managers to effectively address serious risk factors of PTL in the majority of patients assessed. The PTL Algorithm identified key symptoms of PTL in patients presenting to birthing hospitals: 75% (n=9) of the twelve cases assessed in this pilot showed potentially serious complications of pregnancy including 42% of patients experiencing PTL and one-third in need of interfacility transport.

Nurse leaders indicated that they were satisfied with the PTL Algorithm and would recommend its use to others for assessing PTL risk. Data collection indicates that the tools were easy to use given that they were completed by staff with few missing data points in a timely fashion.

Further investigation is needed to determine if the same findings will hold true for non-birthing hospitals given the lack of data from those participating hospitals. Although the findings are limited due to low sample size, initial findings from this brief pilot highlight the importance of identifying, monitoring, and tracking data across the state in order to improve maternal and infant birth outcomes and the long-term goal of reducing infant mortality.

Positive themes emerged from the qualitative interviews with nurse leaders. They mentioned that the tools fostered teamwork, collaboration, communication including improved documentation, validation, consistency, and standardization – all important indicators of high-quality healthcare.

Several issues or challenges emerged from the qualitative interviews. Staff shortages, a lack of resources, and high turnover are challenging staff in their work to provide the best maternal-child healthcare, particularly in non-birth community hospitals. Interfacility transport issues were mentioned as being challenging in the assessment of both of the tools, indicating a potential opportunity for integration of the two tools to provide an extra layer of coordinated care to improve health outcomes. Formalized and standardized processes for developing and integrating clinical guidelines should be a focus of future assessments and research.

One interesting and unexpected finding was the potential for a patient version of the tools, perhaps a brief visual, to help with difficult conversations and improve communication with patients during the process of assessing for PTL. A patient tool could outline the steps being taken to ensure the safety and well-being of patients and their babies, potentially improving patient satisfaction while addressing confusion and worry for patients during a difficult, painful, and often frightening time in their pregnancy.

An unexpected but positive finding is that Maine EMS leadership is interested in using the Transport Tool as a template for tracking response and transport times for other conditions, such as stroke.

Recommendations

Preterm Labor Algorithm:

- Engage Maternal-Fetal Medicine (MFM) clinicians in supporting statewide dissemination and adoption of the Algorithm, place the PTL Algorithm on the MFM website, and develop a communication strategy to raise awareness about the PTL Algorithm and its use.
- Outreach to OBs, L&D teams, etc. in alignment with the Perinatal Outreach Educator. Coordinate with One Call and other referral platforms to make sure all are using the same Algorithm.
- Develop a strategy for non-birthing hospitals.
- Consider creating a patient education tool that is aligned with the Algorithm.

Transport Tool:

- Given that it takes an average of 60 minutes to get EMS Interfacility Transport/Transport Medicine on site, reinforce timing of calling EMS immediately once a decision for patient interfacility transport is made to increase safety and efficiency and reduce delays.
- Encourage local discussions between EMS and hospitals on the topic of activation and facilitation of maternal-fetal interfacility transfers, including staffing (both availability and scope of practice).
- Develop a system for follow up and QI involving both EMS Interfacility Transports/Transport Medicine and hospital teams.
- Continue to reinforce time-of-transport communications between sending provider and EMS Interfacility Transport/Transport Medicine regarding patient stability and care anticipated during transport.
- Perform risk-benefit of interfacility transports based on time of day, impact of any weather conditions, distance, air vs ground transport, and bed availability or reason for interfacility transport.
- Continue to develop a mechanism and seek funding for statewide maternal fetal transport case review conferences.
- Work with hospital systems and services such as One Call to provide a centralized command center for dispatching transport vehicles for each region so that nursing staff are able to focus their time on the patient rather than calling several transport companies for emergency transport services.

Challenges

COVID-19 has introduced many challenges to healthcare systems and affected the adoption of new initiatives by hospitals over the past three years. Workforce shortages, heavy patient loads, and increased use of temporary nurses and physicians have been key challenges for Maine hospitals. Initial outreach to hospitals in the fall of 2021 by the project team was met with requests to push the start date of the pilot to early 2022 and subsequently, a revised project timeline was approved by the Betterment Fund. After the New Year, an individualized approach to outreach was used and met with significant success. An unexpected challenge was that most of

the non-birthing hospitals contacted did not have the staff capacity to pilot the Preterm Labor Algorithm. As a result, two non-birthing hospitals, instead of three, piloted that tool. In addition, two birthing hospitals experienced turnover in nurse manager positions during the pilot causing participation by those hospitals to fluctuate. Staffing of the pilot project at the Center for Quality Improvement also met with challenges due to transitions of the original project manager and evaluation consultant. Fortunately, these changes happened early in the project period and were addressed by recruiting experienced individuals to these positions.

Successes

Hospitals reported improved awareness and greater consistency in care processes when utilizing the tools. They also reported an improvement in documentation of patient care, as individual nurses followed and documented steps outlined in the tool. For the Transport Tool, one hospital identified changes to their processes that led to expedited notifications to local EMS providers. Since time can be critical, reducing time to get the patient to a higher level of care can be life saving for both mothers and babies. In general, the experience of participating hospitals and nurse managers was positive and provided valuable insights and feedback about minor improvements in the tools themselves and the processes for implementation. The expectation is nurse managers involved in the pilot will be interested in efforts to disseminate and influence the adoption of the tools throughout Maine.

Next Steps

The Center for Quality Improvement plans to use the results of the pilot project in several ways:

- Presentations and discussions with the two advisory groups that drafted the Transport and PTL Algorithm to seek their reactions and recommendations
- Create revised versions of the tools based on suggested edits from hospitals
- Communication of the report and major findings to key audiences of clinicians, hospital leaders, EMS providers and advisory groups (Perinatal System of Care Working Partners, PQC4ME Steering Committee, Early Childhood Coordination and Systems Advisory Group, Northern New England Perinatal Quality Improvement Network (NNEPQIN) and others)
- Presentation of the report and major findings to Perinatal Leadership Coalition of Maine
- Outreach by PQC4ME to all birthing hospitals in Maine to assess how best to make the tools available statewide and support their adoption
- Distribution of the complete project report (with detailed clinical data tables and figures) to partners and collaborators

Background on the Maine Medical Education Trust (MMET) Pilot Project Staff and Consultants:

The Maine Medical Education Trust (MMET) provides a host of educational programs and materials for its provider members to help advance the quality of medicine in Maine and provides accreditation to many hospitals and other health organizations that sponsor Category One Continuing Medical Education or CME. The MMET shares the Maine Medical Association (MMA) mission of supporting Maine physicians while advancing the quality of medicine in Maine and promoting the health of all Maine citizens. The MMA also serves as home to the

Perinatal Quality Collaborative for Maine (PQC4ME) which focuses on implementing quality improvement initiatives with maternal and perinatal care teams for birthing hospitals statewide.

Kayla Cole initially served as manager of the pilot project. Her position was subsequently assumed by Mariah Pfeiffer, RN, MPH. Kelley Bowden, MS, RN, Clinical Consultant to MMET, and former Perinatal Outreach Nurse Educator for the state, served as a member of the pilot project team and led hospital outreach and engagement activities. Kelley was a member of the IM report team and co-led the work to draft the PTL Algorithm and Transport Tools. Deborah Deatrack, MPH, Public Health Consultant, also involved in the IM report, served as a member of the pilot project team and assisted in developing project strategy and hospital outreach. The project evaluation was implemented by Therese Fitzgerald, PhD, MSW.

Pilot Project In-kind Advisors

Several individuals provided significant in-kind time and expertise to the project based on their current positions within state government including Dr. Belisle, Chief Child Health Officer for the Maine Department of Health and Human Services and Maryann Harakall, Director of Maternal and Child Health in the Maine Centers for Disease Prevention and Control, Lifeflight of Maine's Medical Director, Dr. Norm Dinerman and Marc Minkler, Program Manager, EMS-C, Maine Emergency Medical Services. These individuals served with many others as volunteer advisors and provided technical assistance to the hospital teams on an as-needed basis.

Maine Betterment Fund Final Report - Appendices

Appendix A - Algorithms and Data Collection Tools

Maternal Risk Assessment Algorithms - Preterm Labor (PTL) Algorithms

- Preterm Labor Algorithm - Birthing Hospital Version
- Preterm Labor Algorithm - Non-Birthing Hospital Version

Quantitative Data Collection Tools

- *Maternal Risk Assessment - Checklists*
 - Preterm Labor Algorithm Checklist - Birthing Hospital Version
 - Preterm Labor Algorithm Checklist - Non-Birthing Hospital Version
- *Maternal-Fetal Transport*
 - Maternal-Fetal Transport Data Collection Tool

Qualitative Interview Guides

- Maternal Risk Assessment (Preterm Labor Algorithm) Qualitative Interview Guide
- Maternal-Fetal Transport Qualitative Interview Guide

Appendix B - Tables, Charts and Figure

Tables - PTL Algorithm Findings

- Table 1: PTL Algorithm - Assessment of Levels of Identified PTL Risk
- Table 2: PTL Algorithm - Examination Results for Assessment of PTL Risk
- Table 3: PTL Algorithm - Lab Testing
- Table 4: PTL Algorithm - Actions Taken Based on Exams and Testing
- Table 5: PTL Algorithm - Medications Administered
- Table 6: PTL Algorithm - Actions taken at or following delivery

Charts and Figure - Transport Tool Findings

- Chart 1: Transport Data by Month
- Chart 2: Patient Arrival at Hospital to Decision to Transport
- Chart 3: Primary Diagnosis
- Chart 4: Gestational Age in Weeks
- Figure 1: Average Wait Times

Appendix A - Data Collection Tools

Algorithm for patient presenting with pre-term labor signs/symptoms

PERFORM initial assessment upon admission

- **DETERMINE** presence/frequency of contractions (palpation and external monitor), and other signs/symptoms of PTL (a)
- **DETERMINE** whether there is uterine bleeding (suggesting placental abruption, placenta previa).
- **Check** fetal well-being with electronic fetal monitor.
- **SEND** urine for urinalysis with reflex to urine culture if positive.
- **PERFORM** sterile speculum exam: Visually inspect for PROM, umbilical cord prolapse, or fetal prolapse; if between 24 -34 weeks, *obtain and hold fetal fibronectin (fFN) (c)* and GBS culture before digital exam (if PCN-allergic, request sensitivities at time of culture); assess cervical dilation visually.

if PROM:

See addendum for **PPROM protocol link**

If evident intrauterine infection, placental abruption or fetal compromise:

DELIVERY may be warranted, consider **CONSULT MFM**

PERFORM transvaginal ultrasound (TVU)

- **TRIAGE** based on cervical length (CL).
- **DETERMINE** risk of Preterm Birth (PTB).

TVU readily available?

yes

no

PERFORM digital exam

- **TRIAGE** based on cervical dilation.

Low Risk
(CL ≥ 30 mm)

Medium Risk
(CL 20 - 29 mm)

High Risk
(CL <20 mm)

DISCARD fFN

SEND fFN (c)

DISCARD fFN

negative fFN

positive fFN

≥ 2 cm or ≥ 80% effaced

< 2cm dilated or <80% effaced

MONITOR cervical change, reassess at 2 hours, or PRN

Cervical change?

yes

no

DISCHARGE home, and **FOLLOW UP** for PTL* (b)

ADMIT for inpatient management

1. **TRANSFER** to tertiary care center as per leveling criteria and **shared-decision making** with patient/family.
2. **CONSULT/NOTIFY** MFM, neonatology, pediatrics.
3. **GIVE** IVF hydration.
4. **SEND** GBS culture and CBC.

GIVE medications for: see Medications box (d)

- **Fetal benefit** (betamethasone to lower risk of RDS; magnesium sulfate for neuroprotection).
- **Tocolysis** (for short-term pregnancy prolongation).
- **GBS prophylaxis** (per Perinatal GBS algorithm).

PERFORM key tasks at delivery

- **PERFORM** delayed cord clamping (recommended for all vigorous term and preterm infants x 30 - 60 seconds after delivery).
- **OBTAIN** cord gases.

MOVE infant to Newborn/NICU and **INTIATE** postpartum care for mother

DISCHARGE home, and **FOLLOW UP** for PTL (b)

See addendum for notes (a), (b), (c), and (d)

This document is a compilation of Maine Health MFM guidelines and does not substitute for clinical decision making or consult with MFM, OBGYN or Midwifery services. Please refer to guidelines for details and references.

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(a) Preterm Labor Signs/Symptoms and Diagnosis

- ° menstrual-like cramping, low back pain
- ° uterine contractions
- ° vaginal discharge

The diagnosis of preterm labor is based upon the presence of regular uterine contractions accompanied by a change in cervical dilation, effacement, or both, or initial presentation with regular contractions and cervical dilation of at least 2 cm. (ACOG Practice Bulletin No. 171. Management of preterm labor. October 2016.)

(b) Follow-up after Evaluation for PTL and discharge

- ° Instruct patient to call with additional signs or symptoms of PTL
- ° Schedule a Prenatal visit within 1 - 2 weeks
- ° If started, complete 48-hour steroid window as an outpatient, see Medication box (d)

(c) Fetal Fibronectin Criteria

If the fetal fibronectin enzyme immunoassay kit is to be used the following criteria should be met:

1. Amniotic membranes are intact.
2. Cervical dilation is minimal (< 3 cm).
3. Sampling is performed no earlier than 24 weeks, 0 days and no later than 34 weeks, 6 days of gestation.
 - a. The test is not recommended for routine screening of the general obstetric population.
 - b. Although a negative test appears to be useful in ruling out preterm delivery that is imminent (ie, within 2 weeks), the clinical implications of a positive result have not been evaluated fully.
4. No bleeding, intercourse, vaginal examinations for **at least 24 hours** prior to sampling.

Fetal Fibronectin Collection

1. Perform sterile speculum exam and rotate the provided Dacron swab across posterior fornix for 10 seconds to absorb cervicovaginal secretions. Subsequent attempts may invalidate the test. (Use only the Hologic Collection kit).
2. Remove swab and immerse Dacron tip into buffer solution. Break shaft at score mark.
3. Align shaft with cap and push down tightly.
4. Label specimen with patient's name, DOB, and collection date and time.
5. If not immediately sent to lab, specimen must be refrigerated after collection. It is ideal to transport the specimens refrigerated, however specimen integrity is maintained at **room temperature for 8 hours**.

Medications

(d) Preterm Labor and Preterm Birth (PTB) Medication Considerations

Use in PTL	Recommendations
<p>Fetal Benefit</p>	<p>To lower risk of respiratory distress syndrome, intraventricular hemorrhage, necrotizing enterocolitis, and neonatal death, give a corticosteroid course to all patients 24 - 34 weeks gestation:</p> <ul style="list-style-type: none"> ◦ Betamethasone: 12mg IM every 24 hours x 2 doses. <ul style="list-style-type: none"> - if betamethasone unavailable, may use: ◦ Dexamethasone: 6mg IM every 12 hours x 4 doses. <p><i>*Note: After MFM/NICU consult, timing of administration at periviability (20+0 - 25+6 wks) should be guided by the family's decision regarding neonatal resuscitation. (Perivable birth. Obstetric Care Consensus No. 6. American College of Obstetricians and Gynecologists. Obstet Gynecol 2017;130:e187-99.)</i></p> <p>Rescue Corticosteroid Course for Patients < 34 0/7 Weeks:</p> <p>If a patient has received a previous corticosteroid course > 14 days previously (though can be provided as early as 7 days from prior dose), AND at risk of delivery within the next 7 days AND < 34 0/7 weeks, give corticosteroid course.</p> <p><i>*Note: Repeat courses or serial courses (more than two) are not recommended. Whether to administer a repeat course of corticosteroids with preterm, premature rupture of membranes is controversial, and there is insufficient evidence to make a recommendation for or against.</i></p> <p><i>*Because corticosteroid treatment for < 24 hours is still associated with reduction in neonatal morbidity and mortality, the first dose of corticosteroids should be administered even if the ability to give the second dose is thought to be unlikely (e.g., PPRM with suspected early labor).</i></p> <p>Patients Between 34 0/7 and 36 6/7 Weeks</p> <p>Antenatal corticosteroids may be of benefit to infants born in the late preterm period. A steroid course is recommended for patients who are considered at high risk of delivery within 7 days and who have not received a previous course of antenatal steroids.</p> <p>For neuroprotection at < 32 weeks gestation, give:</p> <ul style="list-style-type: none"> ◦ Magnesium sulfate 4 gram bolus, followed by 1 gram/hour for up to 24 hours
<p>Tocolysis Use for short-term pregnancy prolongation (to allow time for patient transfer, medications administration for fetal benefit); give a tocolytic for up to 48 hrs.</p>	<p>First Line: ≤ 32 weeks, give ONE of the following:</p> <ul style="list-style-type: none"> ◦ Indomethacin: 50-100 mg by mouth loading dose followed by 25-50 mg by mouth every 6-8 hours, not to exceed 48 hours total treatment. ◦ Nifedipine: 20-30 mg by mouth loading dose, then 10-20 mg by mouth every 6-8 hours <p>First Line: 32 - 34 weeks, give:</p> <ul style="list-style-type: none"> ◦ Nifedipine: 20-30 mg by mouth loading dose, then 10-20 mg by mouth every 6-8 hours <p><i>*Note: Tocolysis is contraindicated when risks of use outweigh potential benefits (e.g., in case of nonreassuring fetal status, severe preeclampsia or eclampsia, maternal bleeding with hemodynamic instability, chorioamnionitis, PPRM, or agent-specific maternal contradictions).</i></p>
<p>GBS prevention</p>	<p>Follow MMC GBS Early-Onset Prevention Guideline. For all patients, as needed, give either:</p> <ul style="list-style-type: none"> ◦ Penicillin G: 5 million units IV initial dose; then, 2.5 –3.0 million units every 4 hours until delivery. ◦ Ampicillin: 2 g IV initial dose; then, 1 g every 4 hours until delivery or the threat of PTB is low. <p>If penicillin allergy, low risk (e.g., isolated maculopapular rash without urticaria or pruritus):</p> <ul style="list-style-type: none"> ◦ Cefazolin: 2 g IV initial dose; then, 1 g every 8 hours until delivery. <p>If penicillin allergy, high risk (e.g., anaphylaxis, angioedema, respiratory distress, urticaria):</p> <ul style="list-style-type: none"> ◦ Clindamycin: 900mg IV every 8 hours until delivery. ◦ If sensitivities unavailable, then give vancomycin (1 gram IV initial dose every 12 hours until delivery). If isolate susceptible to clindamycin and erythromycin, they give clindamycin (900mg IV initial dose every 8 hours until delivery).

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≥ 2 cm or ≥ 80% effaced

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Non-Birthing Hospital Addendum

Neonatal Resuscitation Program® 8th Edition Algorithm

Assessment of the Preterm OB patient

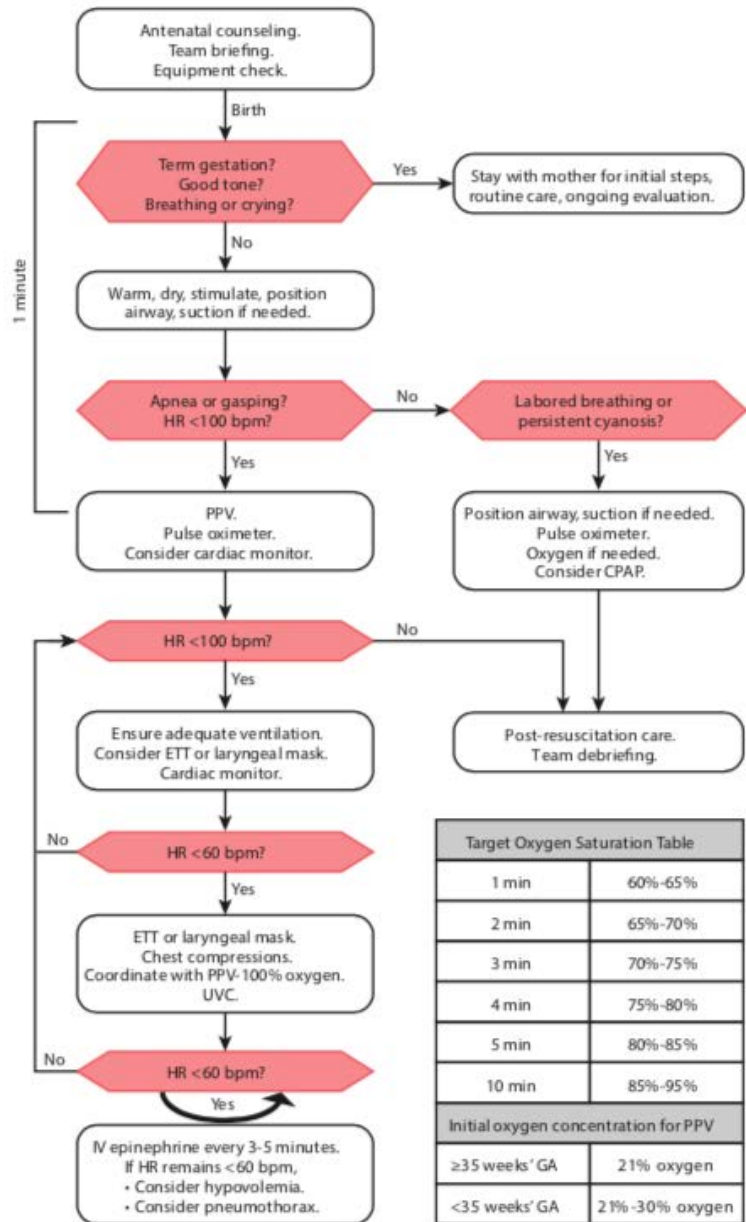
- Obtain VS and reason for presenting. Inquire about abd pain, pelvic pressure, vaginal bleeding, leaking/gush of fluid, vaginal discharge, UTI sx, recent intercourse, decreased fetal movement, etc.
- Fetal heart rate by doppler, if EFM unavailable; palpate for contractions.
- Obtain clean catch urine for cultures
- Obtain pertinent labs may include CBC, CMP, anorectal GBS, wet prep/KOH of vaginal discharge, GC/CT, etc.

Active Management of the Third Stage of Labor

- Administer pitocin following delivery of fetal shoulders:
10 unit pitocin IM
- OR -
20 units pitocin mixed in 1L LR IV @ 1000 ml/HR x 30 mins, then 125 ml/HR x 3.5 HRS
- for all vigorous infants, especially preterm, delay clamping of umbilical cord at least 30 - 60 seconds after birth;
- Gentle cord traction after signs of separation of placenta
- Fundal massage following delivery of placenta
- Inspect placenta & send w/ pt if desired by accepting OB provider
- Fundal check Q 15 - 30 mins x 2 hours following delivery, Q 4 - 8 hours thereafter; document amount/characteristics of lochia w/ each fundal check

S.T.A.B.L.E considerations

- Sugar:
- Temperature:
- Airway:
- Blood Pressure:
- Labwork:
- Emotional Support:



Preterm Labor Algorithm Checklist for Birth Hospitals

Introduction

The Risk Assessment Pilot Project is a quality improvement project led by the Perinatal Quality Collaborative for Maine (PQC4ME). The project aligns with the Perinatal System of Care work in Maine, is funded by the Betterment Fund and is being managed by the Maine Medical Association's Center for Quality Improvement. The goals of the project are to improve the systems of care for pregnant patients and their infants in Maine birthing and non-birthing hospitals, and to reduce maternal and infant morbidity and mortality. *We ask that you complete the following Preterm Labor (PTL) Algorithm Checklist as a component of this work.* As a reminder, do not include any protected health information when completing this checklist.

Identifying Information

1) Date Patient Presented in the Hospital:

2) Name of Hospital Where Patient Presented:

- CA Dean Hospital
- York Hospital
- Mid Coast Hospital

Other - Write In:

3) Hospital Contact (Name, email, phone #):

Background Information About the Presenting Patient

4) What is patient's gestational age?

of weeks confirmed via ultrasound:

of weeks estimated:

Unknown

5) Is the patient currently receiving prenatal care?

Yes

No

Unknown

6) Has the patient been diagnosed with any of the following conditions before or during the current pregnancy? CHECK ALL THAT APPLY.

- Pre-pregnancy hypertension
- Pregnancy-related hypertension
- Pre-pregnancy diabetes
- Gestational diabetes
- Obesity
- Other - Please specify:
- None of the above
- Unknown

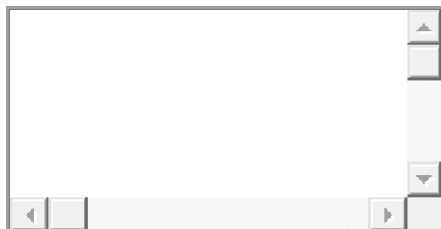
Logic: Show/hidden trigger exists.

7) Has the patient had any hospitalizations during the current pregnancy?

- Yes
- No
- Unknown

Logic: Hidden unless: #7 Question "Has the patient had any hospitalizations during the current pregnancy? " is one of the following answers ("Yes")

8) If the patient had prior hospitalizations during this pregnancy, what were the reasons for the hospitalizations if known?



9) Did the patient have any of the following outcomes for prior pregnancies? CHECK ALL THAT APPLY.

- Infant death (in the first year of life)
 - Stillbirth
 - Premature (less than 37 weeks gestation) infant
 - Low-birth weight infant
 - Other adverse birth outcome - Specify:
 - None of the above
 - Unknown
-

Initial Assessment

10) Did you identify any of the following upon physical exam? CHECK ALL THAT APPLY.

- Contractions
- Menstrual-like cramping/low back pain
- Rupture of membranes
- Vaginal bleeding
- Vaginal discharge other than bleeding
- Other - Specify:
- None of the above

11) Did you visually inspect for the following by performing a sterile speculum exam? CHECK ALL THAT APPLY.

- Premature rupture of membranes (PROM)
- Umbilical cord pro-lapse
- Fetal prolapse
- Cervical dilation
- Did not perform a sterile speculum exam

12) Did you determine the well-being of the fetus with electronic fetal monitoring (EFM) or Doppler?

- Yes
- No
- EFM and doppler tests not performed

Logic: Show/hide trigger exists.

13) Did you or someone else at your hospital perform a TVU or digital exam?

- TVU
- Digital Exam
- TVU AND Digital Exam
- Neither

Logic: Hidden unless: #13 Question "Did you or someone else at your hospital perform a TVU or digital exam?" is one of the following answers ("TVU", "TVU AND Digital Exam")

14) What were the results of the TVU?

- Low risk (CL > 30 mm)

- Medium risk (CL 20-29 mm)
- High risk (CL
- TVU not performed

Logic: Hidden unless: #13 Question "Did you or someone else at your hospital perform a TVU or digital exam?" is one of the following answers ("Digital Exam","TVU AND Digital Exam")

15) What were the results of the initial digital exam performed?

- > 2 cm or >80% effaced
- < 2cm dilated or < 80% effaced
- Digital exam not performed

Logic: Hidden unless: #13 Question "Did you or someone else at your hospital perform a TVU or digital exam?" is one of the following answers ("Digital Exam","TVU AND Digital Exam")

16) What were the results of the follow-up digital exam performed?

- > 2 cm or >80% effaced
- < 2cm dilated or < 80% effaced
- Follow-up digital exam not performed

Lab Tests

Logic: Show/hide trigger exists.

17) Did you order any of the following lab tests? CHECK ALL THAT APPLY.

- Urinalysis with reflex
- Urine culture
- Fetal fibronectin – for women between 24-34 weeks gestation
- GBS culture – for women between 24-34 weeks gestation
- Other - Specify:
- None of the above

**Logic: Hidden unless: #17 Question "Did you order any of the following lab tests? CHECK ALL THAT APPLY."
" is one of the following answers ("Urine culture")**

18) Was the urinalysis positive?

- Yes
- No

19) Through the above testing and exams, did you identify the following? CHECK ALL THAT APPLY.

- Intrauterine infection
- Placental abruption
- Premature pre-labor rupture of membranes (PPROM)
- Preterm Labor (PTL)
- Urinary tract infection (UTI)
- Fetal compromise
- Other - Specify:
- None of the above were identified

Patient Management and Outcomes

Logic: Show/hide trigger exists.

20) Following the physical exam and tests, what actions were taken? CHECK ALL THAT APPLY.

- MFM notified/consulted
- Patient admitted for management/observation
- Patient admitted for delivery
- Patient transferred to another facility as per leveling criteria and shared decision-making with patient and family
- Patient discharged home

Logic: Hidden unless: #20 Question "Following the physical exam and tests, what actions were taken? CHECK ALL THAT APPLY.

" is one of the following answers ("Patient admitted for management/observation")

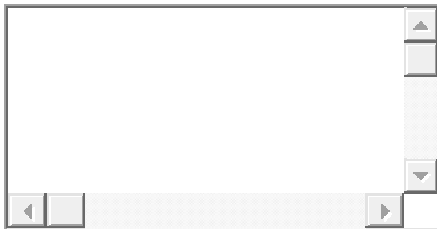
21) For those admitted for inpatient management/observation, which of the following medications were administered? CHECK ALL THAT APPLY.

- Betamethasone
- GBS prophylaxis
- IV hydration
- Magnesium sulfate for fetal benefit
- Magnesium sulfate for pre-eclampsia
- Tocolysis
- None of the above were administered

22) At or following delivery, which of the following tasks/actions were taken? CHECK ALL THAT APPLY.

- Delayed cord clamping performed (recommended for all vigorous term and preterm infants X 30- 60 seconds after delivery)
- Cord gases obtained
- Infant moved to Newborn/NICU
- Postpartum care for the mother initiated

23) Do you have any additional information you would like to add about the risk assessment and/or the risk checklist?



Thank You!

Thank you for completing the checklist. Your response is very important to us. Please contact Kelley Bowden at kellybowdenrn@gmail.com with any questions or feedback.

Preterm Labor Algorithm Checklist for Non-Birth Hospitals - copy

Introduction

The Risk Assessment Pilot Project is a quality improvement project led by the Perinatal Quality Collaborative for Maine (PQC4ME). The project aligns with the Perinatal System of Care work in Maine, is funded by the Betterment Fund and is being managed by the Maine Medical Association's Center for Quality Improvement. The goals of the project are to improve the systems of care for pregnant patients and their infants in Maine birthing and non-birthing hospitals, and to reduce maternal and infant morbidity and mortality. *We ask that you complete the following Preterm Labor (PTL) Algorithm Checklist as a component of this work.* As a reminder, do not include any protected health information when completing this checklist.

Identifying Information

1) Date Patient Presented in the Hospital:

2) Name of Hospital Where Patient Presented:

3) Hospital Contact (Name, email, phone #):

Background Information About the Presenting Patient

4) What is patient's gestational age?

() # of weeks confirmed via ultrasound:

() # of weeks estimated: _____

() Unknown

5) Is the patient currently receiving prenatal care?

() Yes

() No

() Unknown

6) Has the patient been diagnosed with any of the following conditions before or during the current pregnancy? CHECK ALL THAT APPLY.

[] Pre-pregnancy hypertension

[] Pregnancy-related hypertension

[] Pre-pregnancy diabetes

[] Gestational diabetes

[] Obesity

Other - Please specify: _____

None of the above

Unknown

Logic: Show/hide trigger exists.

7) Has the patient had any hospitalizations during the current pregnancy?

Yes

No

Unknown

Logic: Hidden unless: #7 Question "Has the patient had any hospitalizations during the current pregnancy? " is one of the following answers ("Yes")

8) If the patient had prior hospitalizations during this pregnancy, what were the reasons for the hospitalizations if known?

9) Did the patient have any of the following outcomes for prior pregnancies? CHECK ALL THAT APPLY.

Infant death (in the first year of life)

Stillbirth

Premature (less than 37 weeks gestation) infant

Low-birth weight infant

Other adverse birth outcome - Specify:

- None of the above
 - Unknown
-

Initial Assessment

10) Did you identify any of the following upon physical exam? CHECK ALL THAT APPLY.

- Contractions
- Menstrual-like cramping/low back pain
- Rupture of membranes
- Vaginal bleeding
- Vaginal discharge other than bleeding
- Other - Specify: _____
- None of the above

11) Did you visually inspect for the following by performing a sterile speculum exam? CHECK ALL THAT APPLY.

- Premature rupture of membranes (PROM)
- Umbilical cord pro-lapse
- Fetal prolapse
- Cervical dilation
- Did not perform a sterile speculum exam

12) Did you determine the well-being of the fetus with a Fetal Doppler?

- Yes

No

Logic: Show/hide trigger exists.

13) Did you or someone else at your hospital perform a digital exam?

Yes

No

Logic: Hidden unless: #13 Question "Did you or someone else at your hospital perform a digital exam?"

" is one of the following answers ("Digital Exam","Yes")

14) What were the results of the initial digital exam performed?

> 2 cm or >80% effaced

< 2cm dilated or < 80% effaced

Digital exam not performed

Logic: Hidden unless: #13 Question "Did you or someone else at your hospital perform a digital exam?"

" is one of the following answers ("Digital Exam","Yes")

15) What were the results of the follow-up digital exam performed?

> 2 cm or >80% effaced

< 2cm dilated or < 80% effaced

Follow-up digital exam not performed

Lab Tests

Logic: Show/hide trigger exists.

16) Did you order any of the following lab tests? CHECK ALL THAT APPLY.

- Urinalysis with reflex
- Urine culture
- Fetal fibronectin – for women between 24-34 weeks gestation
- GBS culture – for women between 24-34 weeks gestation
- Other - Specify: _____
- None of the above

**Logic: Hidden unless: #16 Question "Did you order any of the following lab tests? CHECK ALL THAT APPLY."
" is one of the following answers ("Urinalysis with reflex")**

17) Was the urinalysis positive?

- Yes
- No

18) Through the above testing and exams, did you identify the following? CHECK ALL THAT APPLY.

- Intrauterine infection
- Placental abruption
- Premature pre-labor rupture of membranes (PPROM)
- Preterm Labor (PTL)
- Urinary tract infection (UTI)
- Fetal compromise

Other - Specify: _____

None of the above were identified

Patient Management and Outcomes

Logic: Show/hide trigger exists.

19) Following the physical exam and tests, what actions were taken? CHECK ALL THAT APPLY.

MFM notified/consulted

Patient admitted for management/observation

Patient admitted for delivery

Patient transferred to another facility as per leveling criteria and shared decision-making with patient and family

Patient discharged home

Logic: Hidden unless: #19 Question "Following the physical exam and tests, what actions were taken? CHECK ALL THAT APPLY.

" is one of the following answers ("Patient admitted for management/observation")

20) For those admitted for inpatient management/observation, which of the following medications were administered? CHECK ALL THAT APPLY.

Betamethasone

GBS prophylaxis

IV hydration

Magnesium sulfate for fetal benefit

Magnesium sulfate for pre-eclampsia

Tocolysis

None of the above were administered

21) At or following delivery, which of the following tasks/actions were taken? CHECK ALL THAT APPLY.

Delayed cord clamping performed (recommended for all vigorous term and preterm infants X 30- 60 seconds after delivery)

Pitocin administration

Placenta delivery and inspection

NRP algorithm followed

NICU team transported infant

Postpartum care for the mother initiated

Mother transferred after delivery

Other - Write In: _____

22) Do you have any additional information you would like to add about the risk assessment and/or the risk checklist?

Thank You!

Thank you for completing the checklist. Your response is very important to us. Please contact Kelley Bowden at kellybowdenrn@gmail.com with any questions or feedback.

Maternal Risk Assessment (Preterm Labor Algorithm) - Qualitative Interview Guide

Name of Interviewee and Job Title:

Hospitals: Date of Interview:

Background questions:

QA. How are clinical algorithms and/or tools adopted by your hospital? How does the process differ for various units or departments using the tool?

QB. What is the process for adopting clinical guidelines and processes?

Assessment questions:

Q1. Process: Walk me through the process of how the PTL checklist tool has been used.

- a. Where are you getting the tool? Are you using a paper version? Or using the computer version?
- b. How did you hear about the tool?
- c. Where and how are you filling it out? That is, how are you activating its use?
- d. Are you using the tool with all pregnant women at less than 37 weeks gestation who present at your hospital? Why or why not?
- e. How much time did it take you and/or your staff to complete each PTL tool?

Q2. User Experience: What is the utility of the tool?

- a. Is the tool user-friendly?
- b. What, if any challenges, did you and your staff experience in completing the tool?
- c. What were the successes and challenges in using the tool?
- d. Do you have any suggested changes to the tool?

- e. What are the best ways to integrate the tool into ongoing routines? That is, we know that for hospitals with small numbers of births, simply remembering to use a tool like this can be challenging. Are there EMR prompts or other ways to ask clinicians to use the tool? Do they work? Any suggestions you think might work or that you've used for this project or on others?
- f. How are you and your staff keeping track of the number of patients who they've completed the form on vs number who may have qualified for its use?
- g. Were there any elements in the procedures and tools that "did not work?"
- h. Does the tool need to be revised?

Q3. Patient Impact: What impact did your use of the tool have on the pregnant patient and/or fetus?

Q4. Clinical Practice Impact: Have your practices changed since you began using the PTL tool?
Yes/No

- a. If yes, please explain how using the tool has made a difference in your practice.
- b. If no, why do you think the tool has not had an impact?

Q5. Benefits: What has been the most important use or benefit of the PTL tool at your hospital? What are some of the unexpected benefits to using this tool?

- a. I want to talk about the benefits of this project to the women you serve. What do you think women get out of this project?

Q6. Satisfaction: How satisfied are you with the PTL tool?

Very Satisfied; Satisfied; Neutral; Dissatisfied; Very Dissatisfied

Please explain:

Q7. Based on your experience, how likely are you to recommend this tool to other hospitals and other clinicians on a scale of 0 to 10?

Not at										Extremely
all likely				Neutral						Likely
0	1	2	3	4	5	6	7	8	9	10

Please explain:

Q8. Based on your experience, how likely are you to recommend that your hospital use this tool on an ongoing basis on a scale of 0 to 10?

Not at					Neutral					Extremely
all likely										Likely
0	1	2	3	4	5	6	7	8	9	10

Please explain:

Q9. What words of advice would you offer to leaders rolling out this project statewide?

Q10. What words of advice would you offer to other units or departments that are considering adopting the tool in addition to leaders (hospitals?) rolling out the project statewide?

Q11. What else do you think is needed to improve birth outcomes for mothers and babies in your community that this tool does not address but could? That is, what remains an unmet need despite this project?

Q12. I wanted to learn more about barriers (logistical, staffing, etc.) your program faced or is currently facing. To what extent do you think this project helps with those challenges?

Q13. How satisfied were you with the support your team received from the Center for Quality Improvement on implementing the pilot, from initial outreach to data collection to check in calls, etc.?

Very Satisfied; Satisfied; Neutral; Dissatisfied; Very Dissatisfied

Please Explain:

Q14. Anything else you'd like to share that we haven't covered?

Maternal Fetal Transport Qualitative Interview Guide

Name of Interviewee:

Interviewee's Job Title:

Hospital:

Date of Interview:

Q1. Is there a specific type of protocol or algorithm for making the decision on maternal transport?

Q2. What is the process for deciding when you should call EMS for pregnant people for maternal transports?

Q2a. That is, at what point in the process do you have information that you need to transport the patient?

Q2b. Do you make the call to EMS prior to calling MFM, at the same time/immediately after talking with MFM, or some later time after talking with MFM (and approximately how long)?"

Q2c. How does the MFM consult factor into this decision?

Q2d. If you wait, are there circumstances that make you delay the call?

Q2e. Why do you call when you do?

Q2f. Could you have called sooner? Why or why not?

Q2g. How does the stability of the patient come into play when making these decisions?

Q3. When you call for EMS for maternal transports, how do you decide whether or not hospital staff will travel with the patient?

Q3a. Do you ask EMS about the transport staff in order to make that decision?

Q3b. What other factors are involved in your decision on what staff to include?

Q4. We know the NICUs have been on diversion at times, how has that impacted the maternal transport system?

Q5. How are you feeling about the EMS for pregnant people transport system in your area?

Very Satisfied; Satisfied; Neutral; Dissatisfied; Very Dissatisfied

Please explain:

Q6. What do you think is working well in EMS transport for pregnant people?

Q7. What needs improvement?

Q8. What are your recommendations for making improvements?

Q9. What are the benefits at your hospital of collecting these data? Did it help clinicians get a more complete understanding of EMS transport data for their pregnant patients over time?

Q9a. If yes, will that have increased understanding lead to higher quality patient care? If so, how?

Q9b. On a scale of 0-10, how likely are you to recommend this tool to other hospitals?

Not at										Extremely
all likely				Neutral					Likely	
0	1	2	3	4	5	6	7	8	9	10

Please explain:

Q10. How satisfied were you with the support your team received from the Center for Quality Improvement on implementing the tool for this pilot, from initial outreach to data collection to check in calls, etc.?

Very Satisfied; Satisfied; Neutral; Dissatisfied; Very Dissatisfied

Please explain:

Follow-up Question: Anything else you would like to add?

Appendix B - Tables, Charts, and Figure

Tables: PTL Algorithm Findings

Table 1: PTL Algorithm Maternal Risk Assessment Pilot Results (N=12) - April to September 2022 Assessment of Levels of Identified PTL Risk	N	Percent
Baseline Assessments		
Gestational Age via Ultrasound Gestational Age Range: 24 2/7 - 35 5/7; Gestational Age Mean = 31 weeks	12	100%
Patient Currently Receiving Prenatal Care	12	100%
Total High-Risk Conditions (Prior or Current):	6	50%
Placenta previa	2	16.7%
Twins	2	16.7%
Pre-pregnancy diabetes	1	8.3%
History of preterm delivery, short cervix	1	8.3%
Total Hospitalizations during current pregnancy:	5	41.7%
Rule out preterm labor	3	25%
S/P Lap Chole, Hyperemesis	1	8.3%
Bleeding on two separate occasions	1	8.3%
Prior High-Risk Pregnancy Outcomes (Check all that apply):*	6	50%
Premature (less than 37 weeks gestation) infant	4	33.3%
Spontaneous Abortion (SAB) at six weeks	1	8.3%
Possible abruption/partial	1	8.3%
Unknown	1	8.3%

Table 1: PTL Algorithm Maternal Risk Assessment Pilot Results (N=12) - April to September 2022	N	Percent
Assessment of Levels of Identified PTL Risk		
*Some patients had more than one reported results, therefore, percentages will not total 100%		

Table 2: PTL Algorithm Maternal Risk Assessment Pilot Results (N=12) - April to September 2022	N	Percent
Examination Results for Assessment of PTL Risk		
Results of Physical Exam (Check all that apply):*	11	92%
Contractions	6	50.0%
Menstrual-like cramping/low back pain	6	50.0%
Rupture of membranes	1	8.3%
Vaginal bleeding	3	25.0%
Precipitous delivery	1	8.3%
Pressure	1	8.3%
None of the above	1	8.3%
*For some patients there was more than one result to report, therefore, percentages will not total 100%		
Results of the sterile speculum exam (Check all that apply):*	4	33.3%
Cervical dilation	4	33.3%
Fetal prolapse	1	9.1%
Umbilical cord prolapse	1	9.1%

Table 2: PTL Algorithm Maternal Risk Assessment Pilot Results (N=12) - April to September 2022	N	Percent
Examination Results for Assessment of PTL Risk		
Premature rupture of membranes (PROM)	1	9.1%
*For some patients there was more than one result to report, therefore, percentages will not total 100%		
Received Electronic Fetal Monitoring (EFM) or Doppler	12	100%
Received Digital exam	9	66.7%
Initial Digital Exam Results -	6	50%
• <2 cm dilated or < 80% effaced	3	25%
• >2 cm or > 80% effaced	5	41.7%
Follow-up Digital Exam Results (N=4; 44%)		
• <2 cm dilated or < 80% effaced	3	33.3%
• >2 cm or > 80% effaced	2	22.3%
Received TVU (Also received a Digital Exam)	1	8.3%
TVU Exam Results - High-risk (CL<20 MM)	1	8.3%
No TVU or Digital Exam Completed	3	25%

Table 3: PTL Algorithm Maternal Risk Assessment Pilot Results (N=12) - April to September 2022	N	Percent
Lab Testing		
Lab Tests Ordered (Check all that apply)*		
Urinalysis with reflex	5	41.7%
Urine culture	2	16.7%

Table 3: PTL Algorithm Maternal Risk Assessment Pilot Results (N=12) - April to September 2022		
Lab Testing	N	Percent
Fetal fibronectin – for women between 24-34 weeks gestation	4	33.3%
GBS culture – for women between 24-34 weeks gestation	1	8.3%
CBC, CMP	1	8.3%
Covid Test	1	8.3%
GC, calcium, mag, T&S, BS ROM+	1	8.3%
UDS, CBC, CMP, BC	1	8.3%
None of the above	3	25.0%
Lab Test Results (Check all that Apply)*		
Placental abruption	1	8.3%
Preterm Premature prelabor rupture of membranes (PPROM)	1	8.3%
Preterm labor (PTL)	5	41.7%
Urinary tract infection (UTI)	1	8.3%
Placenta previa	1	8.3%
Elevated BS	1	8.3%
Moderate bleeding with known complete placenta previa	1	8.3%
Precipitous delivery	1	8.3%
None of the above	3	25.0%
*For some patients there was more than one result to report, therefore, percentages will not total 100%		

Table 4: PTL Algorithm Maternal Risk Assessment Pilot Results (N=12) - April to September 2022		
Actions Taken Based on Exams and Testing (Check all that apply)*	N	Percent

Maternal-Fetal Medicine (MFM) notified/consulted	3	25.0%
Patient admitted for management/observation	1	8.3%
Patient admitted for delivery	3	25.0%
Patient transferred to another facility as per leveling criteria and shared decision-making with patient and family	4	33.3%
Patient discharged home	5	41.7%
*For some patients there was more than one result to report, therefore, percentages will not total 100%		

Table 5: PTL Algorithm Maternal Risk Assessment Pilot Results (N=12) - April to September 2022	N	Percent
Medications Administered (Check all that apply)*		
IV hydration	3	100.0%
GBS prophylaxis	2	66.7%
Betamethasone	1	33.3%
Tocolysis	1	33.3%
*For some patients there was more than one result to report, therefore, percentages will not total 100%		

Table 6: PTL Algorithm Maternal Risk Assessment Pilot Results (N=3) - April to September 2022	N	Percent
Actions taken at or following delivery (Check all that apply)*		
Infant moved to Newborn/NICU	2	66.7%
Delayed cord clamping performed (recommended for all vigorous term and preterm infants X 30- 60 seconds after delivery)	1	33.3%
Cord gases obtained	1	33.3%
Postpartum care for the mother initiated	1	33.3%

*For some patients there was more than one result to report, therefore, percentages will not total 100%

Charts and Figure: Transport Tool Findings

Chart 1

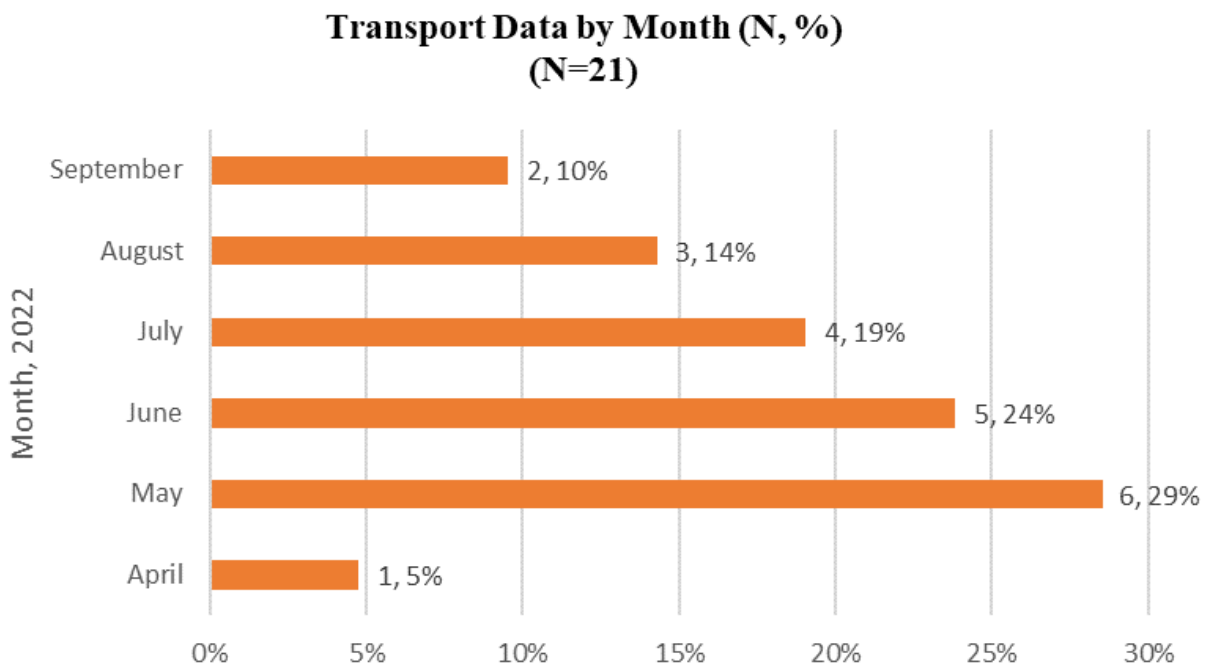


Chart 2

**Patient Arrival at Hospital to Decision to Transport
(Length of Time) (N, %)**

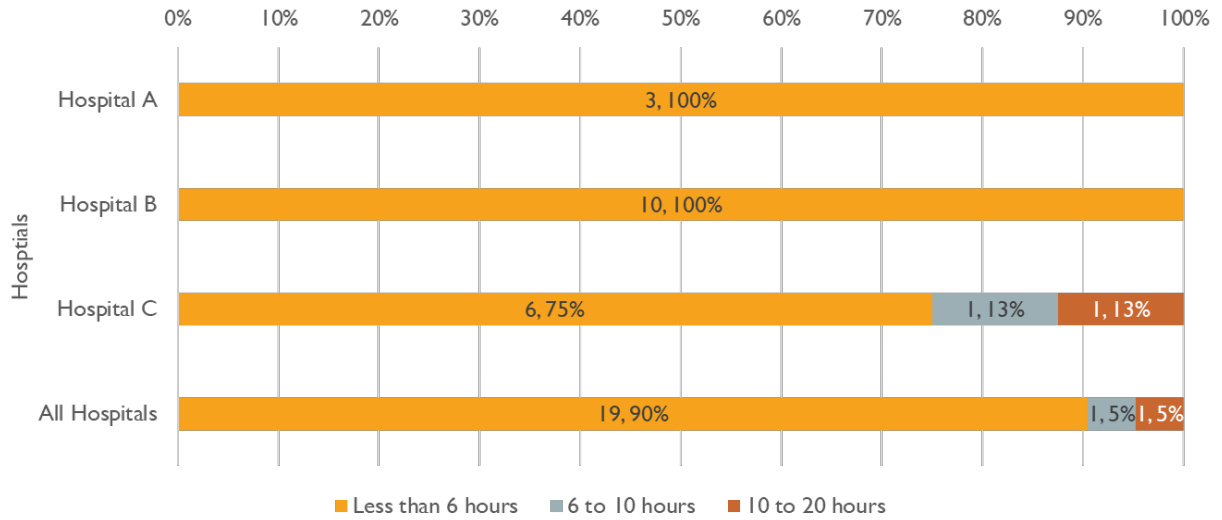


Chart 3

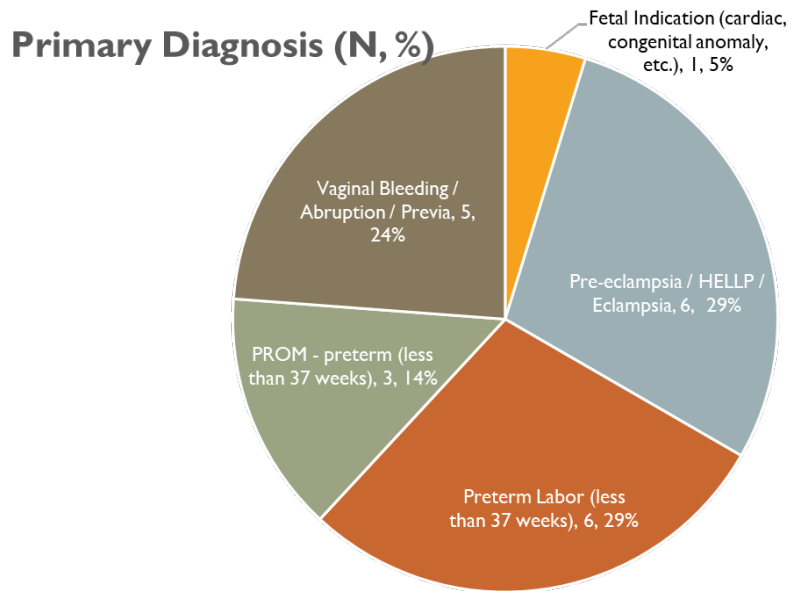


Chart 4

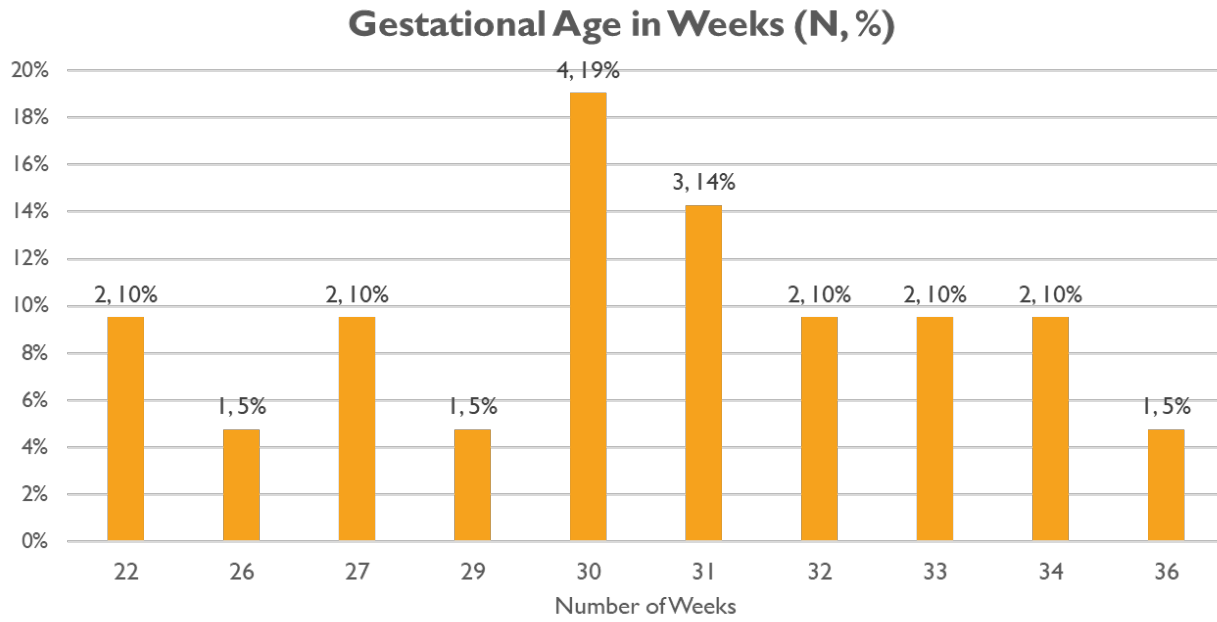


Figure 1: Average Wait Times

