2017 VON ABSTRACT

TITLE/HEADING:

"A Quality Improvement Project Aimed at Reducing Unnecessary Sepsis Evaluations and Antibiotic Exposure by Standardizing Care and Hardwiring Automated DC Orders for Antibiotics – YEAR 2"

Institution Name: Inova Fair Oaks Hospital, Fairfax, VA, USA

Authors: Stephen G Spurr MD

Alan Silk MD

VON Project: iNICQ 2017: Choosing Antibiotics Wisely

SETTING:

Our Hospital's Women's and Children's Division delivers about 4000 babies a year. The Staff involved in the decision making, prescribing and delivery of antibiotics includes 3 Neonatologists in the NICU, 4 Full-Time Pediatricians and 10 moonlighters in Family Centered Care (FCC) and NICU, more than 25 Obstetricians in L&D, and more than 80 RNs in all these departments. We do not have specific Neonatal pharmacists. These are the more than 120 people that we need to influence to effect changes in our practice. As our current policy stands, any baby requiring antibiotics needs to be admitted to our NICU. The baby needs to be off antibiotics to go to FCC. We admit about 350 babies to our level IIIa NICU. More than 65% of our admissions are >= 2500 grams and >=35 weeks Gestation (Late preterm/Near Term and Term babies). More than 37% of our admissions (about 136 /year) are started on antibiotics. Our rate of proven Early Onset Sepsis in that age group (positive Blood culture) however is very low at 0.6%.

BACKGROUND

The overuse/misuse of antibiotics in NICUs has been shown to have significant deleterious effects to include in our case unnecessary NICU stays. This can create parental anxiety and separation of mother from baby. The financial cost of such admissions is also high. Our goal is to minimize the use of antibiotics overall in our NICU, especially in Term/Late preterm/Early Term asymptomatic babies by reducing "screening CBCs", reducing admissions for "r/o sepsis" and minimizing treatment duration and "extra doses" of antibiotics in babies with negative blood cultures. This will reduce the deleterious effects of antibiotic overuse and decrease the overall time our babies spend in the NICU solely for the purpose of receiving antibiotics.

PROBLEM DESCRIPTION/RATIONALE

A review of antibiotics use in our NICU over the last 5 years shows a very low Early Onset Sepsis rate of 0.6% and virtually 0% late infections or NEC. More than one third (37%) of our admissions are started empirically on antibiotics. Of the total number of babies treated with antibiotics on admission (~136 babies/year), 30% are Term/Late Preterm asymptomatic babies admitted due to an OB diagnosis of Maternal "Chorioamnionitis" and 16% are admitted for "suspected" Early Onset Sepsis based on our GBS screening criteria/CBC results. Adding those 2 numbers shows that 46% of all the babies we start on antibiotics on admission are bigger asymptomatic babies admitted to our NICU solely for antibiotics.

Our data shows that 64% of babies admitted for antibiotics have their antibiotics discontinued after 2 days of negative blood culture. Of those babies, 2/3 get "extra" antibiotic doses beyond the strict 48 hours, adding a significant number of unnecessary antibiotic doses. The majority of the remaining 36% of babies started on antibiotics end up with a 7-day "clinical sepsis" treatment with a negative blood culture. This is due to a variety of reasons including maternal risk factors, mild symptoms on admission, abnormal CBCs or CRPs. In 2014- 2015 our data shows an average 527 Total Antibiotic Days per year in our NICU resulting in an Antibiotic Usage Rate (CDC AUR = antibiotic days/100 patient days) of 12.8%. In contrast, from 2011 to 2015 we averaged only 0.6 % of all admissions with a positive blood culture (1-3 per year)

Our NiCQ 2106 project which focused on a strict adherence to a"48-hour antibiotic stop-order" policy and on refining and narrowing /standardizing criteria for the diagnosis of "clinical or suspected maternal chorioamnionitis" resulted in a decrease in our NICU AUR from 12.8% to 9.4%. (27% decrease in AUR).

AIMS:

SMART AIM: We will decrease our NICU Antibiotic Usage Rate (AUR) by December 31, 2017 from 9.4% to 8.4% to achieve a further 10% reduction in overall use of antibiotics. Our target population in this second year will be asymptomatic Term/late Term Newborns.

DRIVERS OF CHANGE

Our drivers included a series of small changes in our practices in order to achieve our Aim of reducing our AUR by 27% in 2016 based on our current practices, and now will help us reduce our AUR by another 10% based on more changes to our new practices. (See Driver Diagram (Appendix A) for details.)

1. *Strict adherence by all prescribing physicians to a "strict 48 hour initial stop order" for* antibiotics; then expanding the "stop order" protocol to any antibiotic orders - babies will always have the exact number of antibiotic doses ordered. Goal achieved 2016.
2. Decrease admissions for "Maternal Chorioamnionitis" by:

a. Narrowing / standardizing criteria for the diagnosis of "clinical or suspected chorioamnionitis- done 2016.
b. Based on new evidence (Pediatrics 6-2017) change our "maternal chorioamnionitis " policy : We plan NOT to start antibiotics routinely on asymptomatic babies.

3. Decrease admissions for "rule-out sepsis" following routine CBCs from GBS+ mothers by changing our EOS policy to adhere more closely to CDC criteria.
4. "Longer term" plans include changing our policy to let babies in NICU solely on antibiotics to go back to Family Centered Care (FCC) with their mothers and to develop criteria to minimize the number of asymptomatic, blood culture-negative babies that are treated for 7 days for "clinical sepsis".

INTERVENTIONS/TESTS OF CHANGE

Plan:

In order to achieve our AIM we joined the iNICQ 2016 and now the iNICQ 2017 "Choosing Antibiotics Wisely" collaboratives. We established an interdisciplinary team made up of NICU physicians including our NICU Director, Nursing staff including the Clinical Director of the NICU, a Pharmacist, Clinical Educator, and Quality Improvement Facilitator. Despite our efforts, we continue to be unable to find a parent willing to join the team. We collected and reviewed baseline data, including VON Day Audit, VON annual reports, and our own database going back 5 years. Based on the collected and analyzed data we confirmed the rationale for our improvement project. We established a hierarchy of aims. In order to focus improvement on achieving our created Smart Aim we reviewed the Potentially Better Practices (PBPs) in the "Choosing Antibiotics Wisely" collaborative and chose to develop, test, implement and continually refine policies and protocols for appropriate antibiotic use in the Late Preterm/Term newborn; We also chose to work on reporting regularly on antibiotic use in our NICU and to promote awareness and an organizational commitment to appropriate antibiotic use.

We created a Driver Diagram, modified in 2017 (see Key Driver Document - Appendix A) and a Quality Improvement Project Charter, modified in 2017 (see Appendix B) which was shared with Senior Leaders in our institution. We mapped the current processes we wished to improve (number of extra antibiotic dosages, narrowing and clarification of the "Maternal Chorioamnionitis" diagnosis, decreasing the number of CBCs on asymptomatic newborns with regard to maternal GBS status). We identified and defined measurements to know whether a test of change would result in improvement (see Measurement section below). We designed new processes or practices to test on a small scale (writing "stop orders" on all antibiotic orders, designed a new "Chorioamnionitis" algorithm with the Obstetricians, and we are currently working on modifying our current practice of starting antibiotics on every asymptomatic baby of mothers with "clinical chorioamnionitis" and on developing a new GBS

screening process that is closer to CDC guidelines and will decrease the number of CBCs drawn after birth). We selected the population (Term, Early Term, Late preterm) and designated time frames (see Charter – Appendix B) for measuring Outcome, Process and Balancing measures starting in March 2016 and continuing now through December 2017, with weekly monitoring and analyzing of data and PDSA cycles to improve process and watch for any negative outcomes.

Do: (Process changes)

1. Writing "Stop Orders" on all antibiotics orders , starting with initial "48h stop" orders

- PDSA 1: 3/1/2016: Neonatologists agree to new policy.
- PDSA 2: 3/14/2016: Pediatricians notified by email of the new policy.
- PDSA 3: 3/21/2016: NICU staff (RNs) informed of new policy.
- PDSA 4: 3/27/2016: New policy and graphs of outcome and process measurements posted weekly on NICU info board and reminders placed on all NICU workstations.
- PDSA 5: 4/8/2016: Reminder emails sent to all staff about importance of adhering to new "stop order" policy. Reminder posted in PEDS office.
- PDSA 6: 5/25/16, 7/18/2016: After stop orders missed by any physician, a reminder email is sent to reinforce the new policy.
- PDSA 7: 11/16/2016 and 2/17/2017: VON Day Audits
- PDSA 8: 3/27/2017 and 5/1/2027: Reminder emails to all MDs after "stop order" missed.
- PDSA 9: 7/1/2017: Daily "Trio rounds" initiated to include official "time out" before 48 hours' deadline with parents and RN to review patient's status and discuss reasons for stopping or continuing antibiotics. Also developed a standard "Smartphrase" that neonatologists will use in the ID or Social section of the EPIC notes.

2. Decreasing admissions due to maternal "Chorioamnionitis"

In April 2016, we developed a new "Chorioamnionitis" Algorithm based on CDC guidelines, ACOG recommendations and the recent NICHD workshop executive summary on "Chorioamnionitis (or newly defined as Triple I: "Intrauterine Inflammation, Infection or Both"). This new Algorithm (Appendix C) clearly defines the criteria for a diagnosis of "Chorioamnionitis" for the Obstetricians, and guides the L&D staff through the process of managing newborns under various scenarios. Currently (July 2017) we are working at revising our "chorioamnionitis" policy so that we will NO LONGER routinely admit asymptomatic babies for antibiotics. Planned official start with new guidelines is 9/30/2017.

- PDSA 1: 4/1/2016: We developed a new "Chorioamnionitis" algorithm.
- PDSA 2: 4/6/2016: Algorithm presented to OB care Committee and further refined.
- PDSA 3: 4/13/2016: We presented "Chorioamnionitis" algorithm to the OB department
- PDSA 4: 5/4/2016: Medical Staff Office emailed all Obstetricians informing them.

- PDSA 5: 5/14/2016: Algorithm posted in L&D OB work stations, OB Sleeping quarters.
- PDSA 6: 11/16/2016 and 2/17/2017: VON Day Audits
- PDSA 7: 5/31/2017: "small surge" in "chorio" admits, start random review of charts
- PDSA 8: 7/1/2017: start work on new policy to avoid routine antibiotic use on asymptomatic babies of mothers with OB diagnosis of "chorioamnionitis". Developing.

3. Decrease admissions for "rule-out sepsis" following routine CBCs from GBS+ mothers

On 5/17/2016 the we started work on new "maternal GBS" guidelines/Algorithm for babies born to mother with different GBS statuses. The focus is to follow the CDC/AAP guidelines more closely and decrease the number of CBCs drawn on asymptomatic newborns. After some delays the planned official start with new guidelines is now 9/30/2017.

- PDSA 1: 5/17/2016: Guidelines submitted to iNICQ Core committee. Decision made to coordinate with Sister institutions (ICH, ILH) and to develop an algorithm for L&D.
- PDSA 2: 5/21/2017: obtained and reviewed ICH "Early Onset Suspected Sepsis" policy and CDC guidelines regarding newborns of GBS carrier mothers
- PDSA 3: 6/1/2017: Developed algorithm for "Newborn EOS Screening" (Appendix D)
- PDSA 4: 7/7/2017: email guidelines/algorithm and guidelines to iNICQ 2017 Core Team.
- PDSA 5: 7/10/2017: approved by Q&I/safety committee, awaiting discussion at NICU Collaborative

MEASUREMENT

The following measures will allow us to know whether our tests of change would result in an improvement, and whether our Project Aim will be achieved, while monitoring for potential harm:

1. AUR: (Outcome measure)
    a. Weekly VON AUR: Number of babies on antibiotics/ NICU census.
    b. New Goal AUR 8.4%.
2. Percentage of admitted babies with Antibiotic "stop orders": (Process measure)
    a. Weekly – Number of babies with "48h stop orders on admission" / total number of babies started on antibiotics x100 .
    b. Goal 100%.
3. Percent of babies treated for "48h r/o sepsis" who get extra doses of antibiotics: (Process measure)
    a. Weekly – number of babies who are given extra antibiotic doses after 48 hours / total number of babies whose antibiotics are stopped with a 48h negative blood culture x100.
    b. Goal 0% . (achieved)

4. Tally of missed antibiotics doses when Blood culture turns positive or who we decide to treat 7 days for clinical sepsis: (Balancing measure)
    a. Continuous monitoring and recorded in log - Number of babies with missed antibiotic doses (+BC or "clinical sepsis" decision at "Time Out" / total number of babies started on antibiotics x100.
    b. Goal is 0%.
5. Number of admissions solely for antibiotics for maternal Chorioamnionitis: (Process measure)
    a. Weekly – Total Number of asymptomatic babies admitted to NICU and treated with antibiotics .
    b. Goal further 50% reduction of admissions for antibiotics due to "maternal Chorioamnionitis".
6. Future Process measures to include a) Official documented "time outs" before 48 hours with parents, and b) Number of asymptomatic babies admitted for antibiotics with new GBS/CBC and "chorioamnionitis" guidelines both to be started around September 2017.

RESULTS (see Annotated Charts 1-4)

1. *Chart 1* shows AUR baseline, Goal line, and changes.. There is a lot a variability from week to week but most of the data points are below our Goal Line and our AUR for the last 6 months is down to 9.4% , a reduction in AUR of 27%. More Process changes due.
2. *Chart 2* shows the percentage of babies with "48h stop orders" written on admission. By PDSA cycle 5 and ever since we have consistently achieved 95% compliance. There are still occasional missed "stop-orders" and we continue to reinforce the new policy by email and posting our progress frequently for all to see.
3. *Chart 3* shows the percentage of "48h rule-out sepsis" babies who get extra doses of antibiotics. Our Goal of 0% was achieved by the 3rd PDSA cycle. Even though we have not achieved 100% consistent compliance with written "stop orders", the physicians are more "aware" of the need to stop the antibiotics and so far have consistently made sure to discontinue antibiotics on time. This success has persisted well into 2017.
4. Tally/Log of missed antibiotics orders since starting the "48h stop orders: Babies' Blood Cultures are followed by the lab for 5 days. There is no Chart to show as NO antibiotic doses have been missed since we started the Process changes.
5. *Chart 4* shows our admissions for antibiotics in asymptomatic babies of mothers with "Chorioamnionitis". We have surpassed our goal of reducing our admissions by 10%. We currently admit about one baby every 13 days (from a baseline of 1 baby every 8 days, a decrease of 37%). We are working on reducing that number even more (see below)

DISCUSSION

1. Key findings:
    - We reduced our NICU AUR in 2016 by 27% .
    - We have seen a definite "shift" in the culture in our Units (NICU/L&D)
    - *Stop Orders:* We rapidly achieved our Goal of NO "extra" antibiotic doses by writing "antibiotic stop orders" on all babies on admission.
    - *"Chorioamnionitis" Guidelines/*Algorithm did result in more consistency in our OBs labeling a mother as having "chorioamnionitis". This has reduced by 40% the number of asymptomatic babies admitted to our NICU for antibiotics.
    - No cases of Early Onset Sepsis have been missed since implementing our new "chorioamnionitis" protocol. (Balancing measure).
2. Lessons Learned:
    - We achieved the process goal of Zero "extra doses" before we achieved the process goal of all babies having "stop orders" written, suggesting that physician awareness ("current culture" change) is very important to achieve results.
    - A recent "surge" of "chorioamnionitis" admissions shows that more PDSA cycles are always needed to maintain improvement, such as random reviews of OB charts and reinforcing new criteria.
3. Barriers/Challenges:
    - We continue to have occasional missed "stop orders". Success rate is > 95%. Our process is dependent on physicians remembering to write the stop orders.
    - We operate within a Hospital System with 4 NICUs who do not necessarily wish to implement the same changes we do.
    - A further challenge will be when new doctors (NICU, L&D) or NNPs are hired.
    - We have tried and been unable to find a parent willing to join our Committee.
4. Next Steps:
    - We may need to include a Pharmacy "forced" "stop order" in EPIC. However other NICUs in our "System" do not wish to have "stop orders" and are focusing on the "time out" process instead
    - New Process Change: We plan to no longer "treat with antibiotics" asymptomatic babies of mothers with an OB Diagnosis of "chorioamnionitis". We will monitor these babies in NICU for 24 hours. Goal: Further reduce antibiotic use in this target group by 50%.
    - Other Process Change to be implemented: Reduce the number of CBCs drawn on asymptomatic babies of GBS+ mothers. Abnormal CBCs are responsible for 16% of our babies started on antibiotics in NICU. New guidelines / algorithm have been developed/approved and will be presented at NICU Collaborative..
    - Continue to promote awareness and an organizational commitment to appropriate antibiotic use. We routinely post our Outcome and Process

measures in the NICU. Also the Charter and Key Driver Diagram are posted. Continue to promote change with education and information.

- We will start to engage families more in our PDSA cycles and in our decisions to continue or discontinue antibiotics at 48 hours. (Trio Rounding)

5. Our new Goal is for a further reduction of AUR by 10% by December 31, 2017. The impact of such changes on our NICU census and any financial implications would be interesting to analyze and discuss.

KEYWORDS:

AUR, CDC, VON, NICU, STOP ORDER, ANTIBIOTICS, CHORIOAMNIONITIS, GBS, ALGORITHM

TEAM ACKNOWLEDGMENT

Team members/ Core Team:

-Stephen Spurr MD, Neonatologist, Logistical Leader and VON Champion/Primary Contact

-Alan Silk MD, Chairman Pediatrics/Director Neonatology, VON Team Leader

-Jennifer McCaughey MSN, RNC-MNN, CCE, Clinical Educator, VON Day Data Collector / Liaison / Coordinator

-Penny Fuller MSN, RNC-NIC, CPNP/SNP, Clinical Director, NICU/Pediatrics, Core Team member

-Wendy Soto RN, BSN, Quality Consultant, Performance Improvement & Outcomes, Core Team member

-Jin Hong PharmD, Clinical Pharmacy Specialist, Core Team member

-Jeanne Hargrave BSN, RNC-NIC, NICU, Core Team member

-Remy Ann Jornales RN, BSN, NICU, VON Web Services Administrator and Data Collector, Core Team member

-Cyndi Miles BSN, RNC-LRN, NICU, Core Team member

-Cindy Patrello , BSN, RNC-NIC, NICU, Core Team member

Senior Leaders who signed charter and support our improvement collaborative:

-Marla Booker, Women's and Children's Division Director

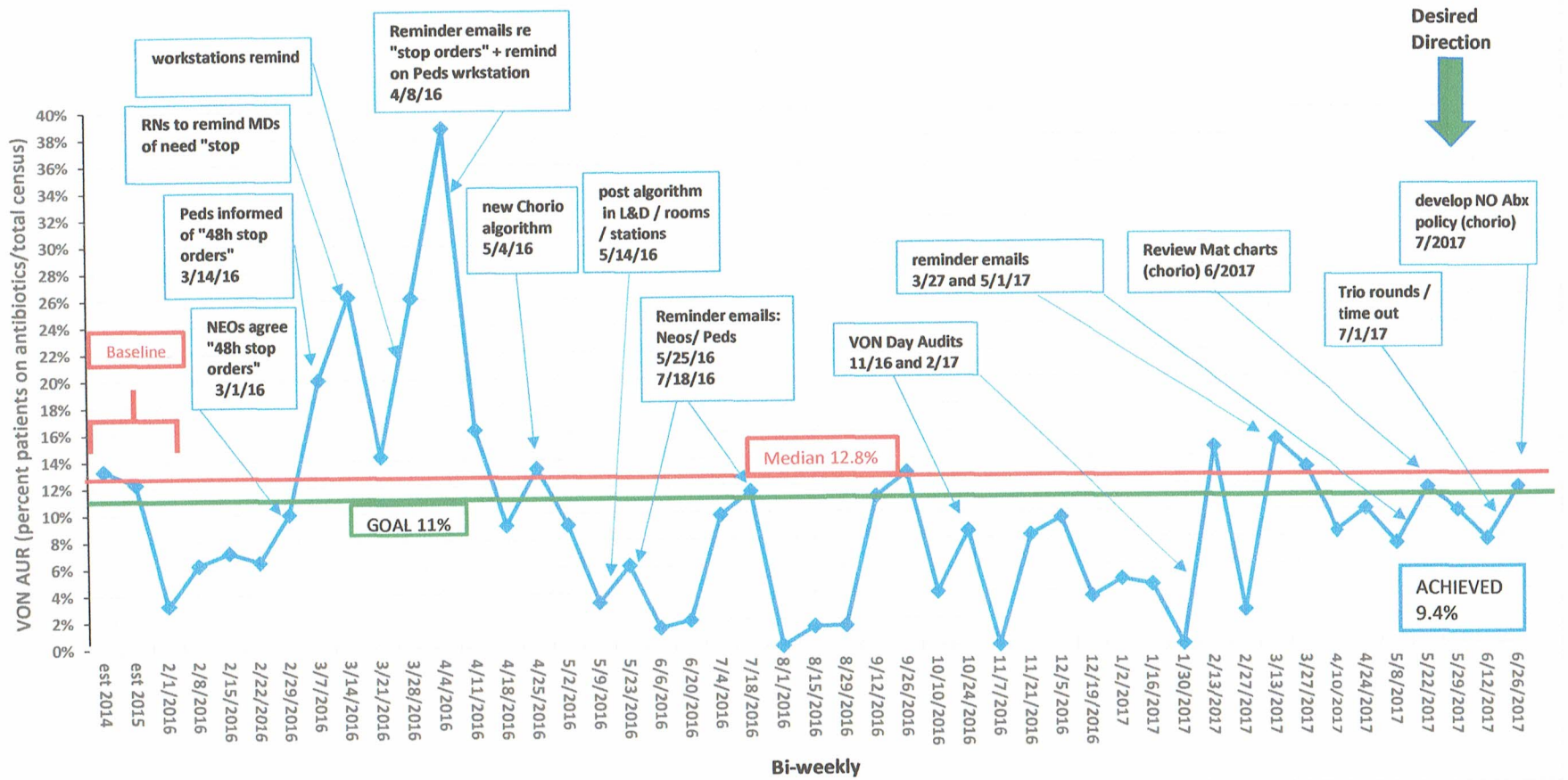
-G Michael Lynch, Senior Leader, Chief Medical Officer, Inova Fair Oaks Hospital

ABP MOC PART 4

It is the intent of the physician Team members to present ths abstract for MOC part 4 credit:

Dr. Stephen Spurr Dr. Alan Silk

CHART 1: NICU Weekly Antibiotic Utilization Rate (AUR) February 2016 - June 2017



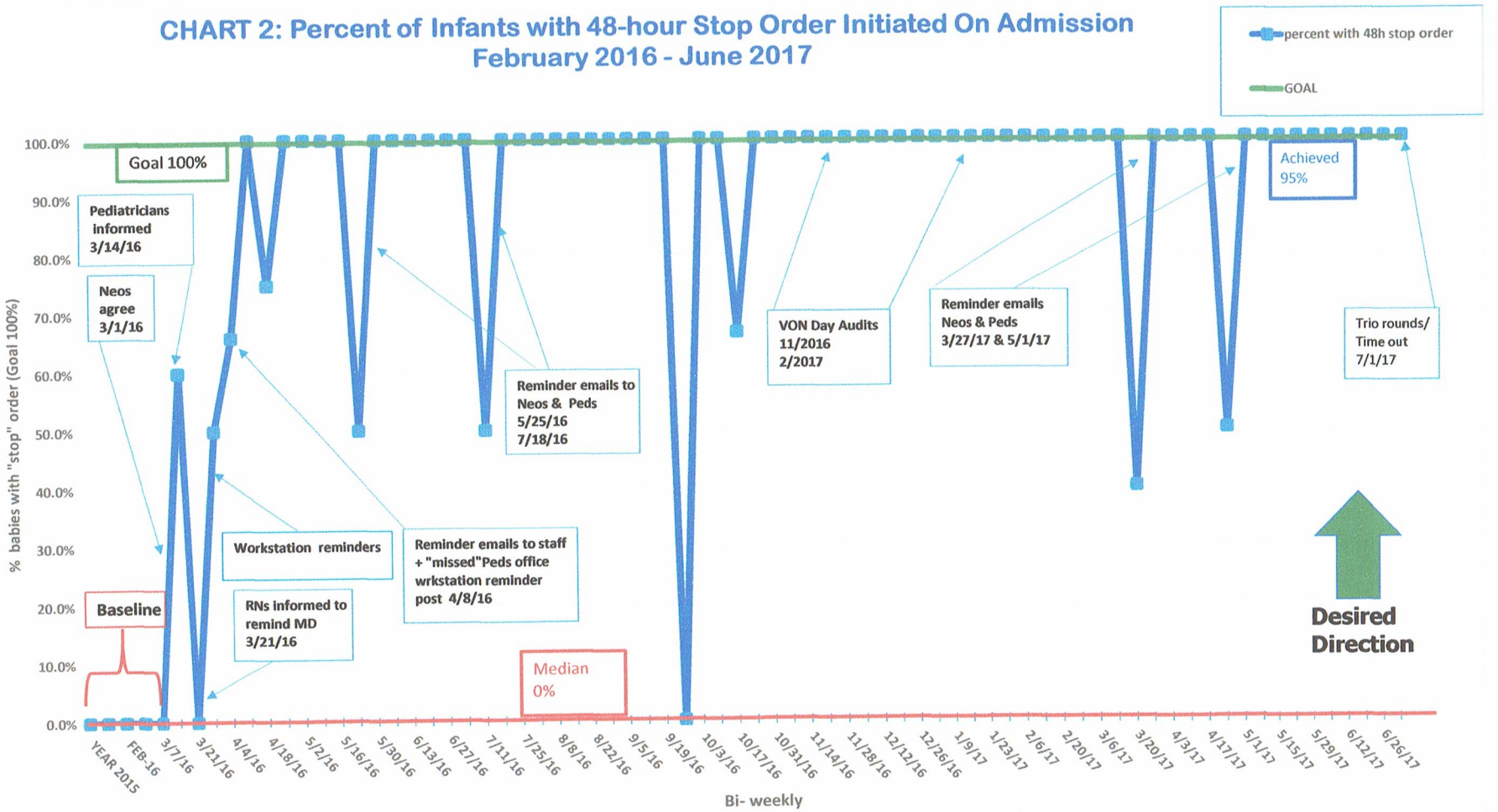


CHART 2: Percent of Infants with 48-hour Stop Order Initiated On Admission
February 2016 - June 2017
percent with 48h stop order
GOAL
% babies with "stop" order (Goal 100%)
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Goal 100%
Achieved 95%
Pediatricians informed 3/14/16
Neos agree 3/1/16
Baseline
Workstation reminders
RNs informed to remind MD 3/21/16
Reminder emails to staff + "missed"Peds office wrkstation reminder post 4/8/16
Reminder emails to Neos & Peds 5/25/16 7/18/16
Median 0%
VON Day Audits 11/2016 2/2017
Reminder emails Neos & Peds 3/27/17 & 5/1/17
Trio rounds/ Time out 7/1/17
Desired Direction
YEAR 2015
FEB-16
3/7/16
3/21/16
4/4/16
4/18/16
5/2/16
5/16/16
5/30/16
6/13/16
6/27/16
7/11/16
7/25/16
8/8/16
8/22/16
9/5/16
9/19/16
10/3/16
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10/31/16
11/14/16
11/28/16
12/12/16
12/26/16
1/9/17
1/23/17
2/6/17
2/20/17
3/6/17
3/20/17
4/3/17
4/17/17
5/1/17
5/15/17
5/29/17
6/12/17
6/26/17
Bi- weekly

CHART 3: Percent of Infants Who Received Additional AB Dose Beyond Intended 48-hour "Rule Out" February 2016 - June 2017

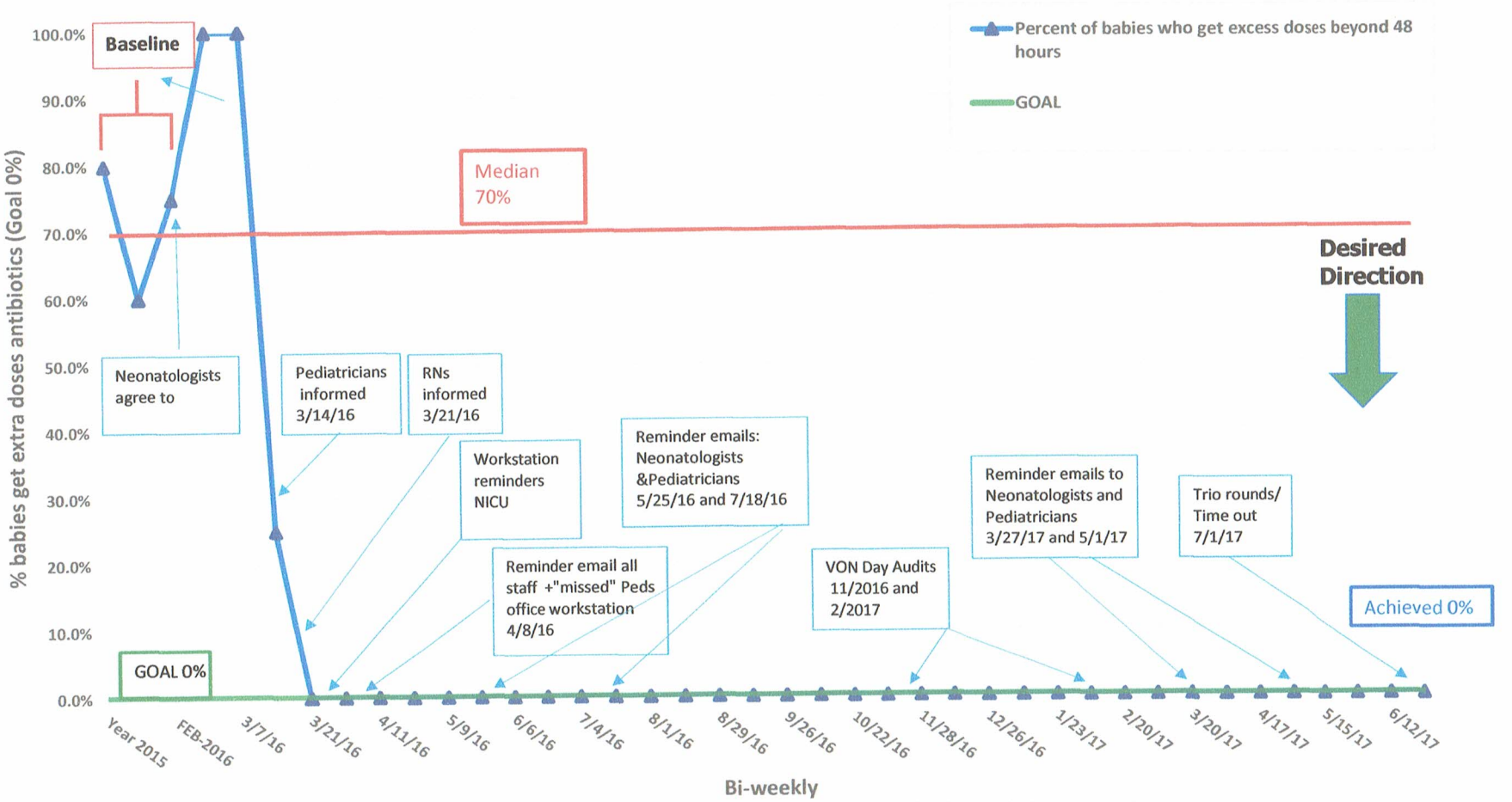
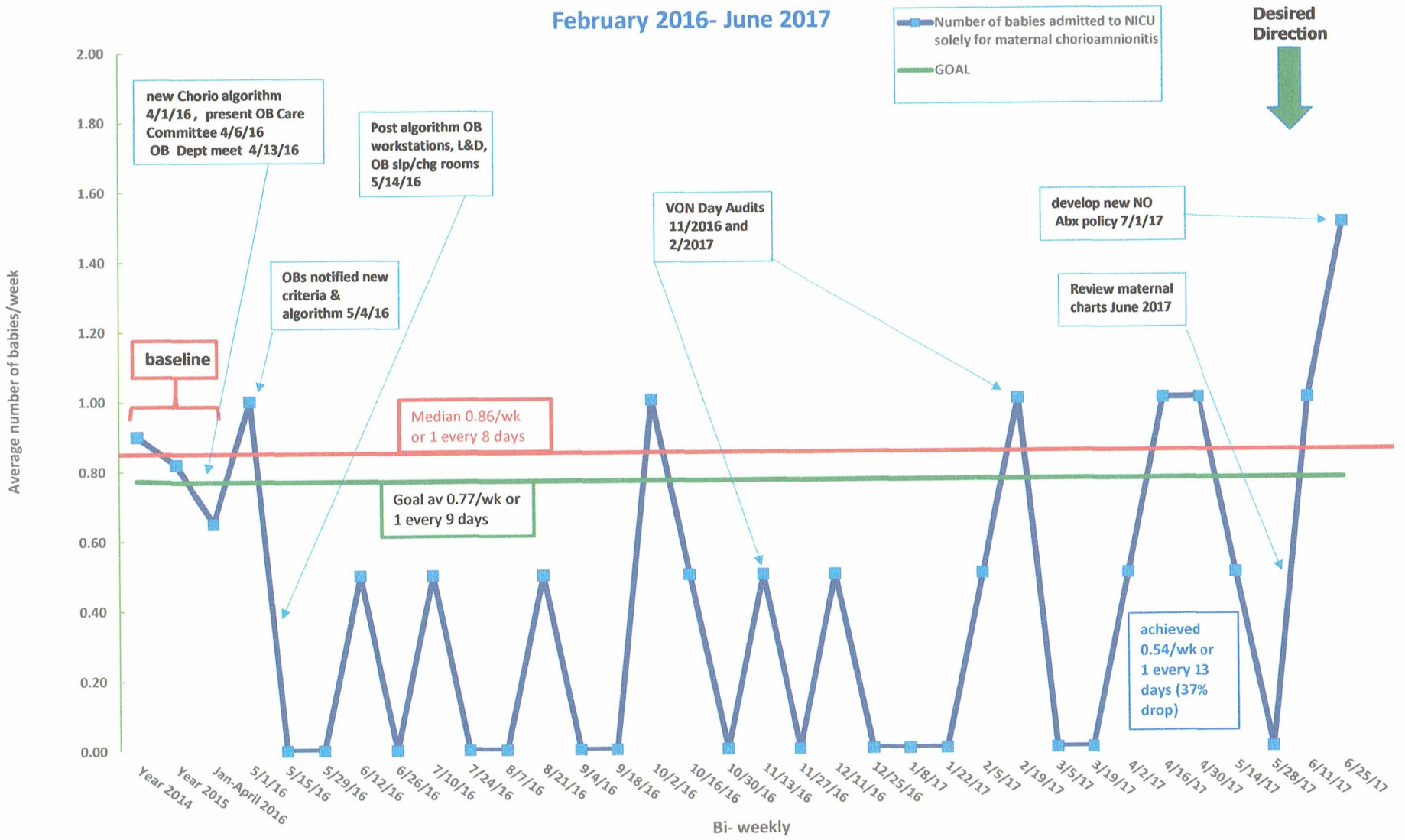


CHART 4: Number of Asymptomatic Newborns Admitted to the NICU Per Week Solely For "Maternal ChorioAmnionitis" February 2016- June 2017



APPENDIX A

"Using Antibiotics Wisely" Driver Diagram (updated 7-2017)

Primary Drivers

Secondary Drivers

SMART AIM
By 12/31/2017 Decrease the (over)use of antibiotics in the NICU by another 10%

1) Strict adherence on all new antibiotics orders to 48 hours (first priority). Also for babies treated 7 days (negative BC) strict adherence to 7 days treatment

- Physician to enter exact number of doses of antibiotics or 48h stop order.
- RN to notify Physician if no time or antibiotic dose limits ordered
- "Time out" at 48 hours with active decision taken if antibiotics to be continued. Discussion with parent and RN and documentation in chart as to "why", especially with negative BC
- Monitoring compliance/progress: weekly "plot the dot" data/charts posted in NICU
- Balancing measures: Monitoring of Blood cultures and "missed doses if BC turns positive"
- Staff training/awareness: all physicians and RNs to be told of new guidelines and kept informed of progress ("Culture change")
- If decision to "treat " 7 days, physician will write appropriate number of doses of antibiotics

2) Decrease number of asymptomatic babies admitted to NICU and treated with antibiotics due to maternal diagnosis of "Chorioamnionitis"

- Reinforce/"redefine" with OB department definition of Chorioamnionitis (Go to meeting)
- Produce new Guidelines -Algorithm based on recent criteria/ACOG Guidelines
- Post new Algorithm/guidelines in delivery rooms /OB workstations, Sleeping quarters
- IF needed, physician to discuss with OB prior to admitting baby to NICU (case by case basis?)
- in 2017 implement new Policy (Pediatrics 6-2017) of NOT Treating asymptomatic newborns.
- Balancing measures: observe in NICU 24 hours (as a transitional period)
  Monitor for any baby that subsequently gets sick/NICU/antibiotics

3) Decrease number of asymptomatic babies of GBS+ mothers admitted to NICU for antibiotics due to abnormal CBCs

-Follow CDC criteria or redefine criteria closer to CDC guidelines for GBS maternal status
-Initial focus on asymptomatic infants with no risk factors, born by scheduled CS with no ROM and asymptomatic infants (with no risk factors) of fully treatedGBS+ mothers: NO CBCs to be drawn
- Develop a new "Newborn EOS Screening guidelines/Algorithm " and post in L&D/NRNs education
- Balancing measures: these babies to remain in FCC 48h with more frequent VS.
  Monitor for any baby that subsequently gets sick/NICU/antibiotics

4) Decrease number of babies in NICU <u>solely</u> for antibiotics

-work on (1) and (2) and (3) above
- transfer asymptomatic/BC neg babies to Pediatric unit at 48h (mother can room in and BF)
- Long them plan: transfer babies to FCC if mother still in house (FCC RN training/education)

5) Longer term plan: Decrease number of (asymptomatic) babies treated for 7 days with negative blood cultures

-redefine criteria for continuation of antibiotics in asymptomatic babies with negative BC
- "Time out" at 48h with active decision to continue – involve parents, RN?
- ?based on maternal history, CBCs, CRPs, Other labs
- Obtain 1 mL for BC to decrease chance of false negative? – downside is delay in obtaining BC and starting antibiotics promptly
- Monitoring compliance/progress: weekly data and charts (AUR)
-Balancing measures: monitoring for positive BC, missed antibiotic dosages, period of observation ? At least initially

APPENDIX B

Project Charter
Updated (07/10/2017)

Project Name	Using Antibiotics Wisely: Decreasing the use of antibiotics in Asymptomatic Newborns
Project Dates:	02/01/2016 to 12/31/2017
Team Leader	Stephen G Spurr
Physician Leader	Stephen G Spurr

Project Description / Statement of Work

A review of antibiotic use in our NICU over the last few years shows a very low Sepsis rate with 0.6% Early bacterial Sepsis and virtually 0% of any Late Infections or NEC. Yet about one third of our admissions are exposed to antibiotics, mostly Term or Near Term asymptomatic or mildly symptomatic babies admitted for maternal chorioamnionitis or r/o Early Onset Sepsis. Any reduction in antibiotic use in this population would greatly reduce the overall exposure to antibiotics in our NICU. IN 2016 we reduced our AUR from 12.8% to 9.4% and we continue to work on reducing it even further.

Statement of Need

The Overuse/misuse of antibiotics in NICUs has been shown to have significant deleterious effects. These include antibiotic resistance, alteration of patients' microbiome and unnecessary NICU stays. This can create parental anxiety and separation of mother from baby with negative effects on bonding and breastfeeding. The financial cost of such admissions is also high. Our goal is to minimize the use of antibiotics overall in our NICU, especially in Term/Near Term asymptomatic babies and reduce the deleterious effects of such use and decrease the overall time our babies spend in the NICU solely for the purpose of receiving antibiotics.

Project Definition

Global Aim	Continue to decrease of the overall Use of antibiotics in our NICU
Project Aim	SMART AIM (revised): By December 31, 2017, we will decrease our NICU Antibiotic Use Rate (AUR) from the already improved 9.4% to to 8.4% to achieve a further reduction of ~10% in overall use of antibiotics.
Project Scope	The project started in February 2016 with the collection of data and review of our antibiotic use. The first phase of our project "ended" in December 2016. This new phase (iNICQ2017) will end in December 2017. Service Lines affected: Women's and Children's Division. Units impacted: NICU, FCC, L&D and Pediatric Unit. Population affected: Term and Near Term newborns considered at risk for sepsis prior to potential admission to NICU (decreasing admission rates) and any newborns admitted to our NICU who are on antibiotics with negative Blood Cultures. Excluded from this project will be newborns transferred out of our NICU on day 1 and babies with positive blood cultures
Change Ideas	Please refer to our Key Drivers diagram. Our initial focus/change consisted on limiting initial antibiotic orders strictly to 48 hours (with a stop order) followed by a "Time Out" to decide whether to continue antibiotics and why (specific reasons to be documented clearly in chart).

Performance Measures	**Baseline**	**Goal/Target**	**Time Frame**
AUR: number babies on antibiotics/Census (outcome)	**9.4%**	**8.4%**	**December 2017**
Percentage of Antibiotic orders with "Stop" order (process)	**95%**	**100%**	**December 2017**
Number of admissions solely for antibiotics due to maternal Chorio (process)	**0.77/week**	**0.38/week**	**October 2017**
Number babies given extra doses antibiotics/Number ordered for 48h (outcome)	**80%**	**0%**	**June 2016**
Tally of missed Antibiotic Doses when BC positive or decide to treat 7 days (balancing)	**0%**	**Stays 0%**	**December 2017**

Major Milestones	**Due Date**
Physicians trained and entering correct number of antibiotics doses for "48h" rule-outs	**April 30, 2016-done**
"Time out" at or before 48h instituted to include parents/RN and documented clearly in chart	**June 30, 2016-done**
If 7-day Treatment decided after "Time Out"- exact number doses antibiotics ordered- physicians trained	**June 30, 2016-done**
Reinforce Chorioamnionitis Criteria to Obstetricians-also post criteria in L&D	**May 30, 2016-done**
Implement new "Chorioamnionitis" newborn protocol- no antibiotics, NICU observation only	**August 31,2017**
Review and adopt CDC criteria limiting use of screening CBCs in babies of GBS+ mothers	**September 30,2017**

1. Compliance with changes by multiple MDs. 2. Resistance to change. 3. Unanticipated delay in education and training. 4. Resource intensive manual data collection initially. 5. Trying to develop automatic reports functions. 6. Forced functions in EHR require System-Wide approval.

APPENDIX B

VON Vermont Oxford NETWORK

Project Charter

Updated (07/10/2017)

Resources Needed
1. Senior leadership support. 2. IT support. 3. EPIC support

Communication Plan
Updating Senior Leaders about project Team meetings twice a month and as needed Keeping NICU staff updated with emails and charts to include plans and Process and Outcome progress Emails and meeting with all MDs who will be involved in writing orders and complying with any new /redefined guidelines
Stakeholders
All Women's and Children's Staff, Pediatric Hospitalists, Parents and patients

Project Team Roles and Responsibilities

Team members	Roles	Responsibilities	% Time Required
Stephen Spurr	Team Leader, Physician Lead	Logistical leader	
Alan Silk	NICU Director/ Pediatrics Chairman		
Jennifer McCaughey	Clinical Educator	VON data collector	
Penny Fuller	Clinical Director NICU		
Wendy Soto	Quality Improvement Facilitator		
Jeanne Hargrave	RN NICU		
Jin Hong	Pharmacist		
Remy Ann Jornales	RN NICU		
Cyndy Miles	RN NICU		
Cindy Patrello	RN NICU		
Sign Off			

Team Leader: Stephen Spurr Date: 7/12/17

Medical Director: Alan Silk, MD Date: 7/12/17

Nursing Director: Penny Fuller Date: 7/11/17

Division Director: Marla Booker Date: 7/12/17

Senior Leader: G Michael Lynch Date: 7/11/17

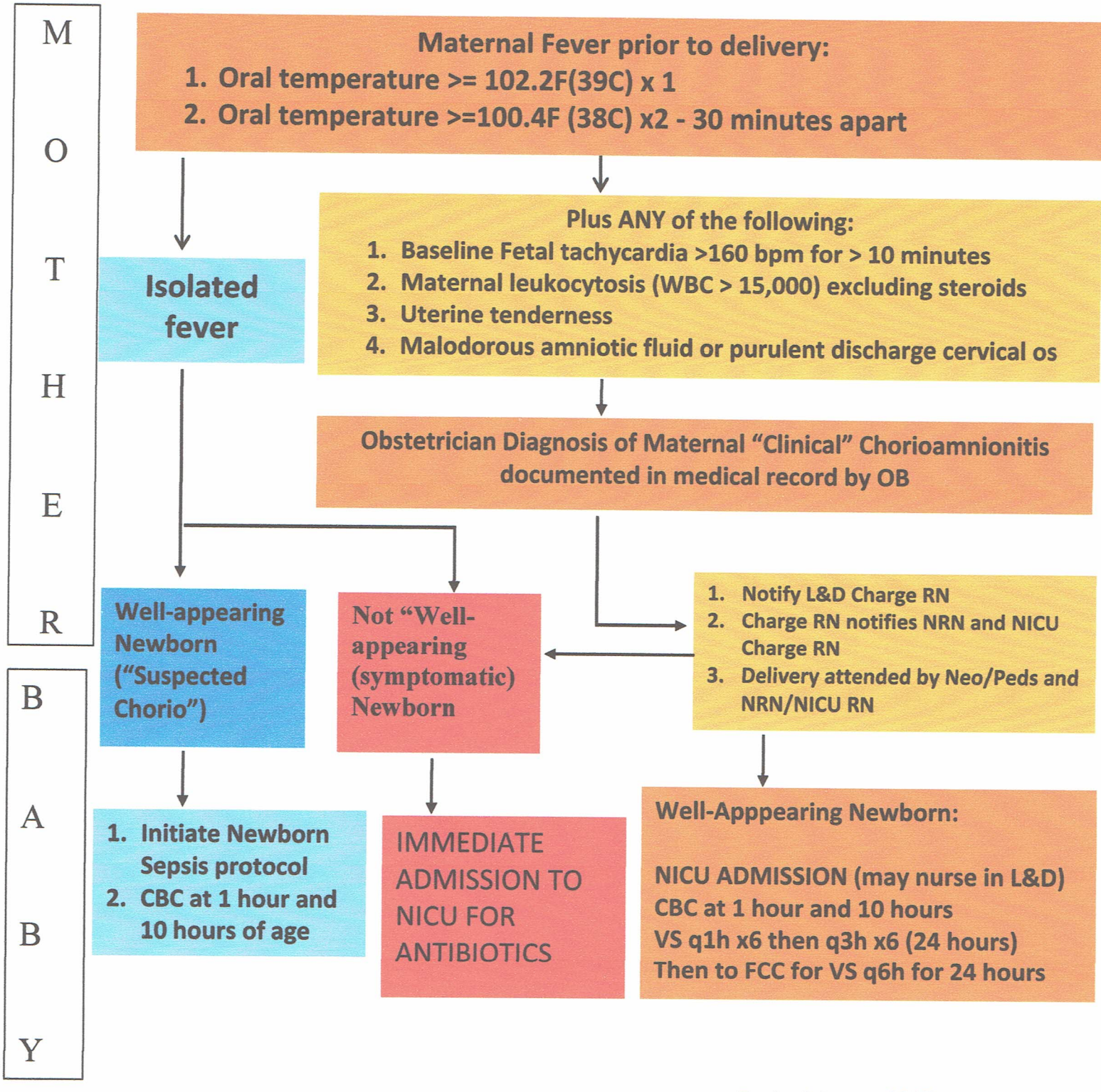
APPENDIX C

Guidelines for Clinical Chorioamnionitis*

(Intrauterine Infection or Inflammation or both)

And Prevention of Newborn Early Onset Sepsis

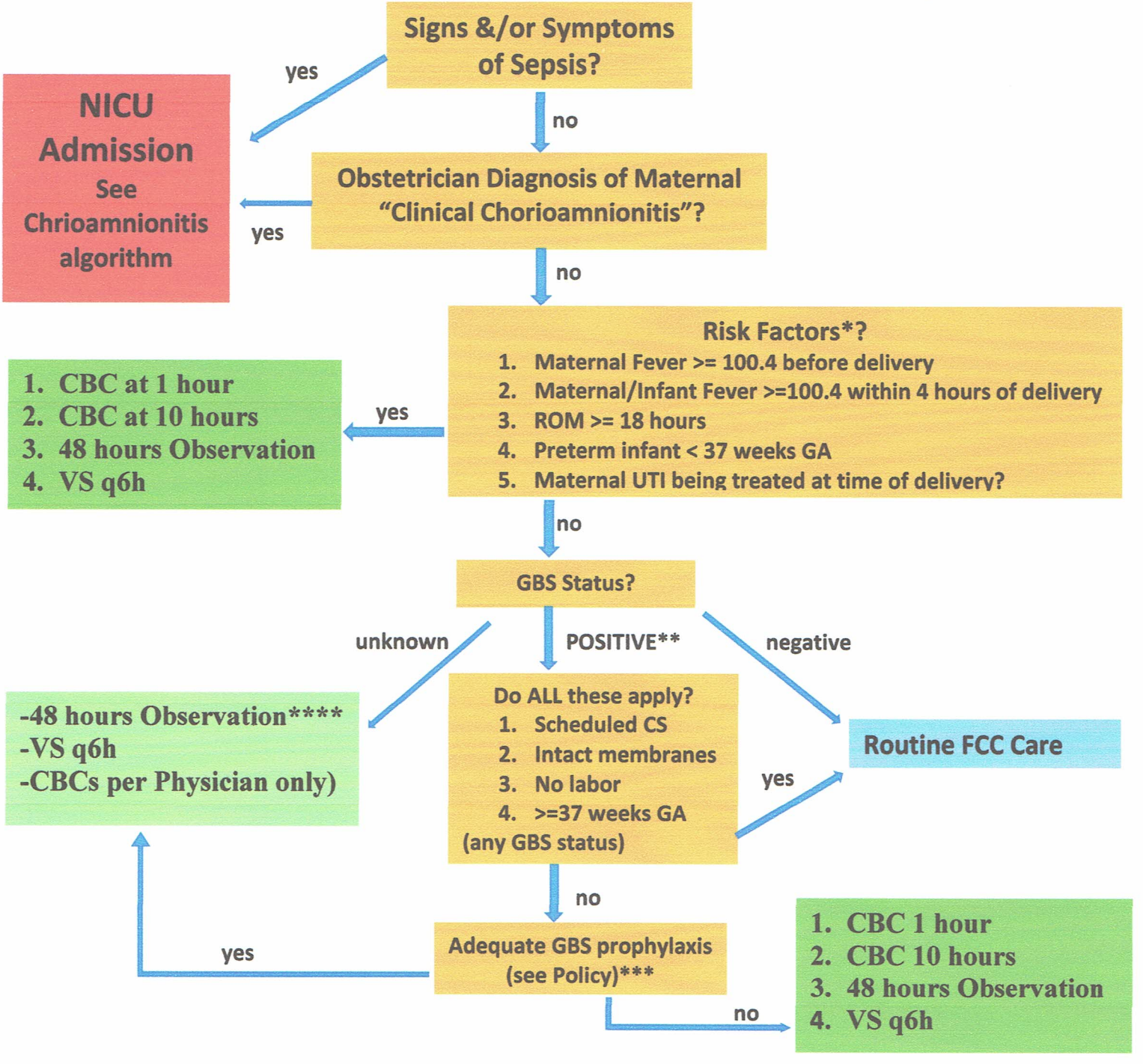
Maternal/Newborn Algorithm for Labor and Delivery



Revised August 2017

APPENDIX D

Guidelines for Newborn Early Onset Sepsis Screening
Maternal/Newborn Algorithm for Labor and Delivery



**GBS+ = +GBS screen, GBS bacteruria this ptegnancy, previous baby with GBS sepsis

***Adequate Prophylaxis: Penicillin or ampicillin, if Penicillin allergy then Cefazolin/Vancomycin. Clindamycin alone not adequate

****Observation time : may be decreased to 24 hours if NO risk factors AND adequate prophylaxis AND adequate home AND access to medical care

Revised August 10, 2017