Clinical Safety & Effectiveness

Cohort # 18

The implementation of an Oxygen Targeting protocol in the NICU

CENTER FOR PATIENT SAFETY & HEALTH POLICY

UT HEALTH SCIENCE CENTER™

SAN ANTONIO

The Team

- Division

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- Sponsor Department:

  Margarita Vasquez, M.D. – Associate Professor, Department of Neonatology

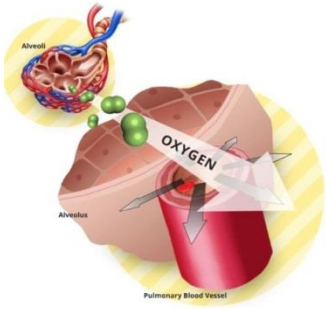
AIM Statement

The aim of this project is to implement an oxygen targeting protocol for all patients in the NICU receiving supplemental oxygen with a goal of 50% compliance within 60 days of implementation.

The process begins when a patient who requires oxygen therapy is admitted to the unit and ends when patient no longer requires oxygen therapy. It is important to implement this protocol in order to improve long-term outcomes of NICU patients, specifically retinopathy of prematurity.

Project Milestones

• Team Created	September 2015
• AIM statement created	January 2016
• Weekly Team Meetings	January 27 - present
• Background Data, Brainstorm Sessions, Workflow and Fishbone Analyses	September 2015 – February 2016
• Interventions Implemented	March 1– March 25 2016
• Data Analysis	January 8 - present
• CS&E Presentation	June 3, 2016



Background

- Retinopathy of prematurity (ROP) is a potentially blinding eye disorder that primarily affects premature infants weighing 1250 grams or less that are born before 31 weeks of gestation

- This disorder is one of the most common causes of visual loss in childhood and can lead to lifelong vision impairment and blindness. ROP was first diagnosed in 1942.

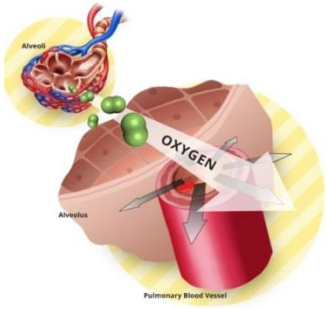
- There are approximately 3.9 million infants born in the U.S. each year; of those, about 28,000 weigh 1250 pounds or less.

- About 14,000–16,000 of these infants are affected by some degree of ROP. About 1,100–1,500 infants annually develop ROP that is severe enough to require medical treatment. About 400–600 infants each year in the US become legally blind from ROP.

- Several complex factors may be responsible for the development of ROP. The two major risk factors of ROP are the use of oxygen and a decreased gestation period.

- Excessive oxygen contributes to ROP through regulation of vascular endothelial growth factor (VEGF).

- The NICU at UH has a high rate of infants who develop severe ROP and require treatment. A protocol to maintain spO2 saturations within an specific range to prevent hyperoxia did not exist.

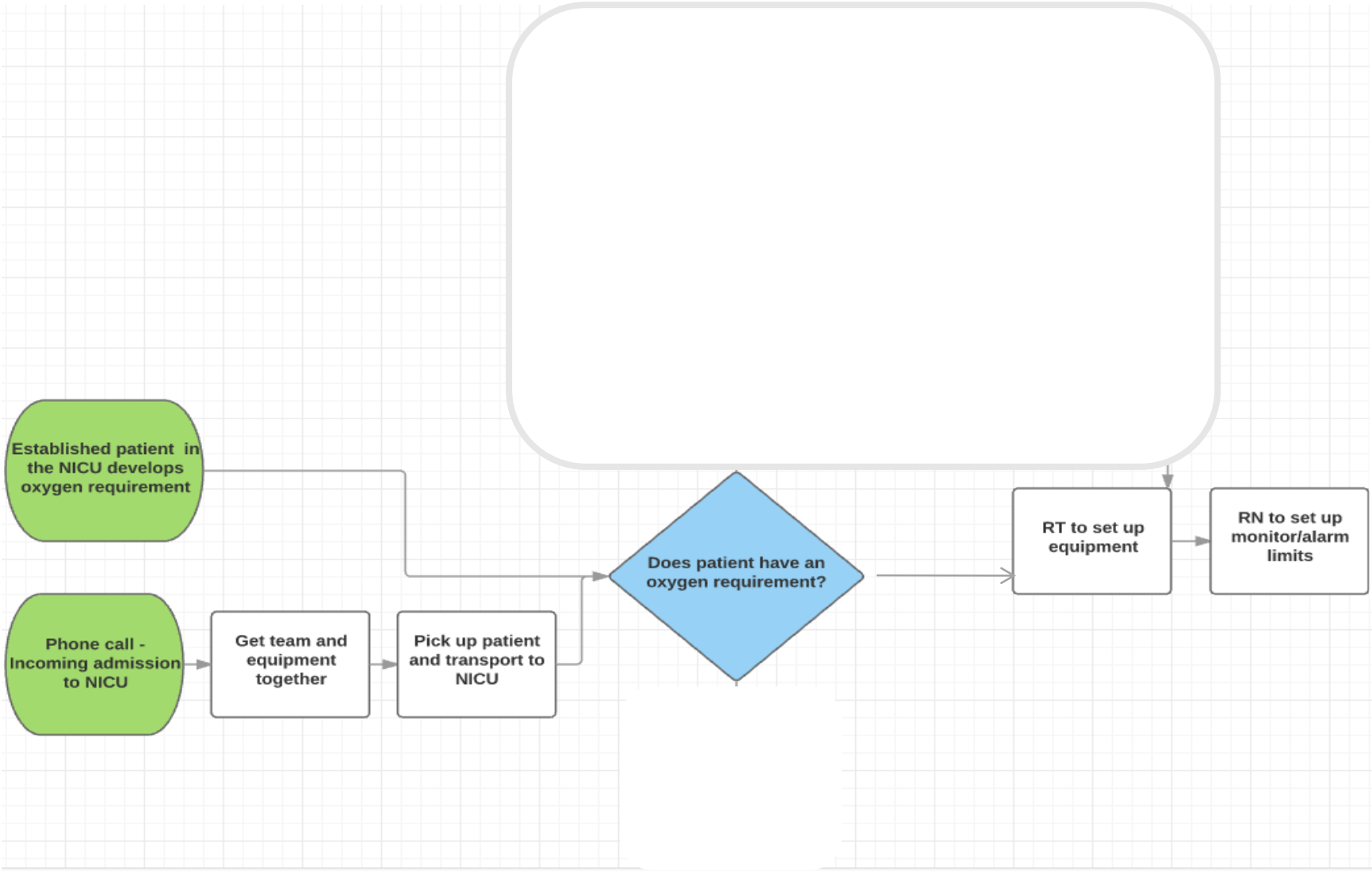


Background

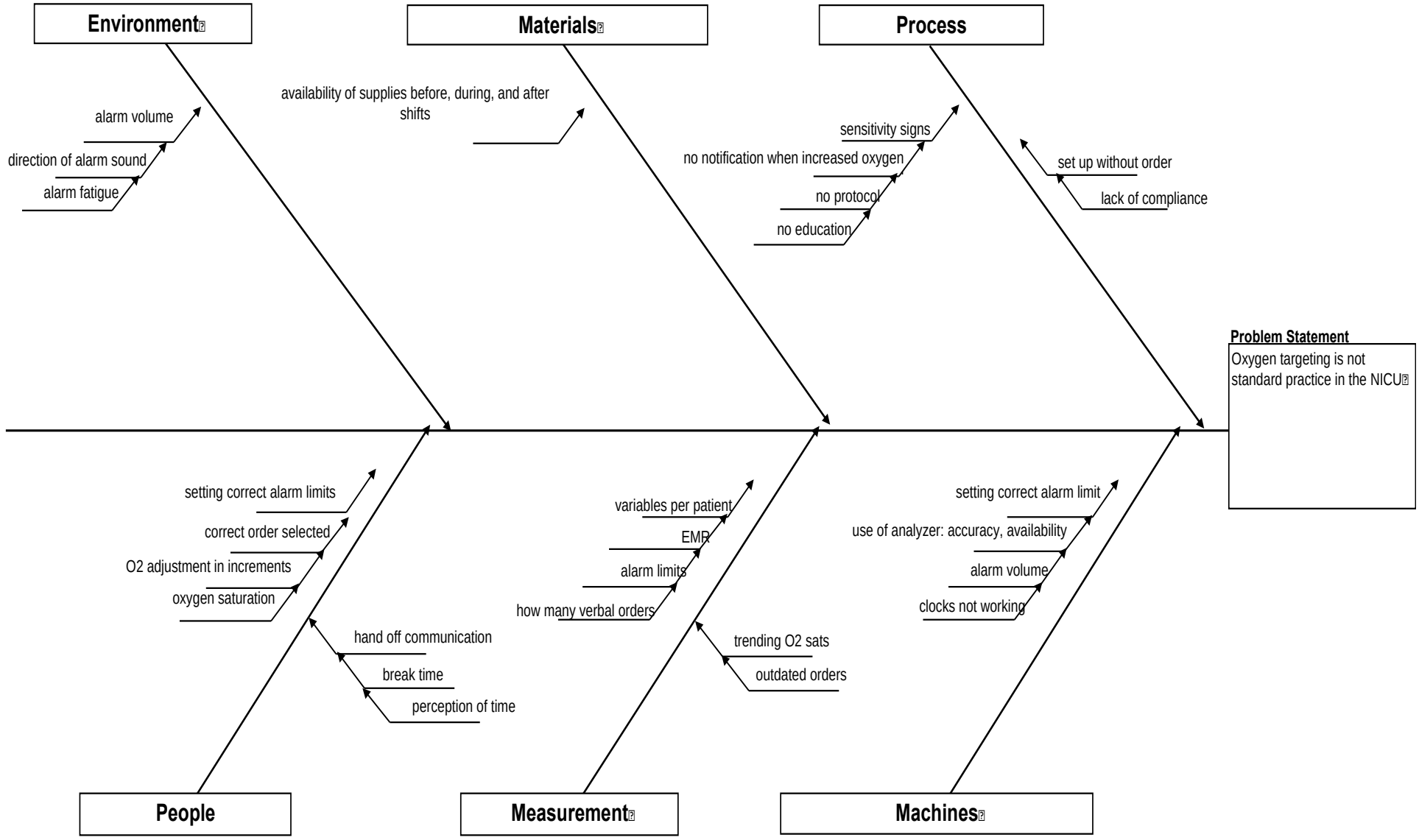
UH VON 2011-2013 ROP statistics

	UH Rate 2011-2013	Type C NICU Mean	Type C NICU Q1	TYPE C NICU Q3
Any ROP- All Eligible	32.3%	36.0%	26.2%	47.9%
Any ROP- Inborn	28.4%	33.5%	22.4%	45.4 %
Surgery- All Eligible	4.7%	3.4%	0.7	5.0%
Surgery- Inborn	3.5%	2.8%	0	4.3%
Anti-VEGF Injection	5.8%	1.4%	0	2.0%

Plan: Process Analysis



Plan: Fish Diagram



Plan: Pre-intervention Data Collection

Patient Label

SPO2 GUIDELINE DATA COLLECTION SHEET

SpO2 Goal Set Ordered: General Cardiac PPHN

Target SpO2: ____ to ____ %

Alarm Limits: ____ to ____ %

Mode: NC HFNC NIV VENT HFOV iNO DATE:

Time						
Flow Peep/MAP						
FiO2/SpO2	/	/	/	/	/	/
Alarms	-	-	-	-	-	-

Mode: NC HFNC NIV VENT HFOV iNO DATE:

Time						
Flow Peep/MAP						
FiO2/SpO2	/	/	/	/	/	/
Alarms	-	-	-	-	-	-

Mode: NC HFNC NIV VENT HFOV iNO DATE:

Time						
Flow Peep/MAP						
FiO2/SpO2	/	/	/	/	/	/
Alarms	-	-	-	-	-	-

Comments:____

Baby girl ROP
MRN 12345678

SPO2 GUIDELINE DATA COLLECTION SHEET

SpO2 Goal Set Ordered: (General) Cardiac PPHN

Target SpO2: 88 to 95 % Gen. Order: ____

Alarm Limits: 85 to 96 % GA at birth: 33 1/7

Mode: (NC) Vapo F/P NIV Vent HFOV iNO DATE: 2/26/16 DOL: 2 M

Time	0300	7	11	15	1900	2300
Flow Peep/MAP	1	1	1	1	1L	1L
FiO2/SpO2	30/93	30/94	30/92	45/97	21/96	21/94
Alarms	85-98	85-100	85-100	85-100	85-100	85-100

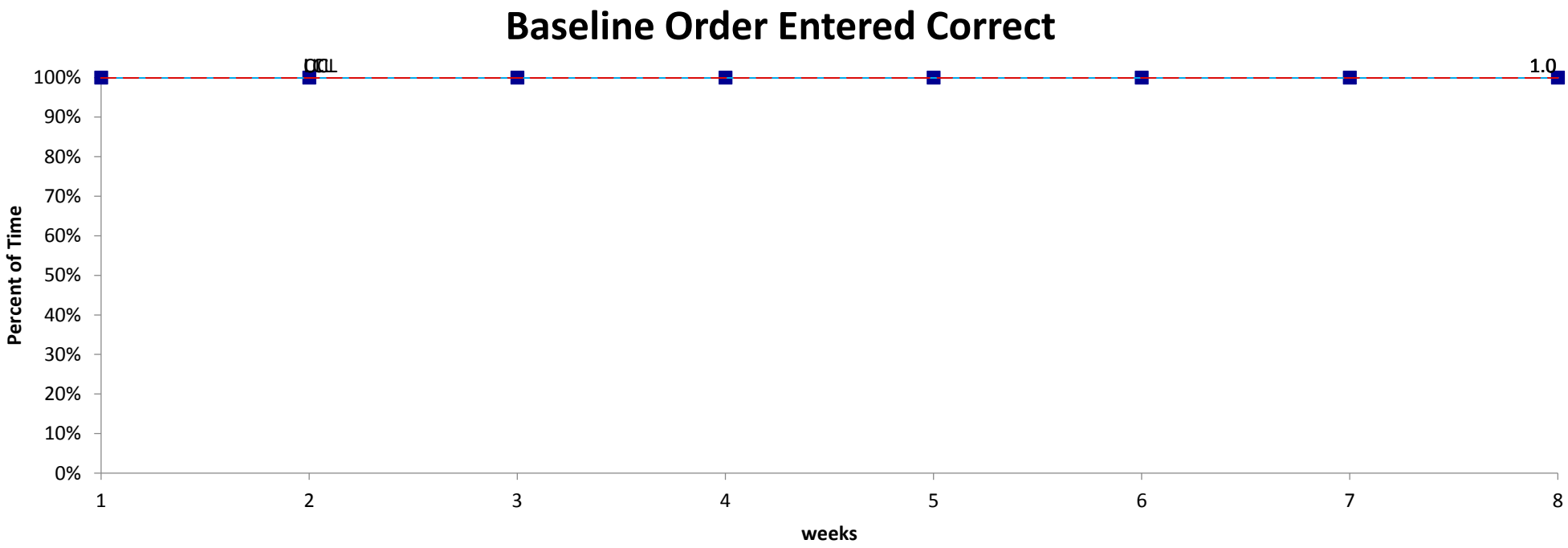
Mode: (NC) Vapo F/P NIV Vent HFOV iNO DATE: 02/27/16 DOL: 2m

Time	0300	0700	1100	1500	1900	2300
Flow Peep/MAP	1L	1	1	1	1	1
FiO2/SpO2	21/94	21/98	21/97	21/94	21/96	21/95
Alarms	85-100	88-100	88-100	88-100	88-100	85-96

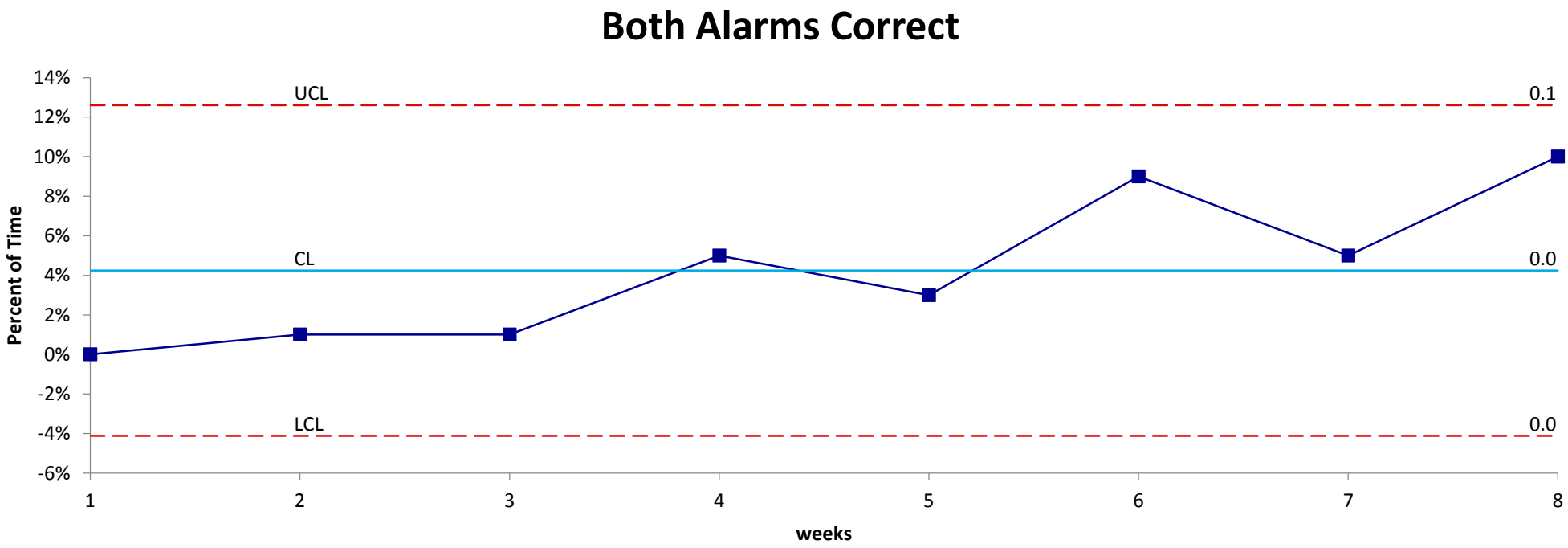
Mode: (NC) Vapo F/P NIV Vent HFOV iNO DATE: 2/28/16 DOL: 2m

Time	0300	7	11	15	1900	2300
Flow Peep/MAP	1	1	1	1	1	1
FiO2/SpO2	21/93	21/92	21/94	21/90	21/94	21/98
Alarms	85-100	85-100	85-100	85-100	88-100	88-100

Pre-intervention Data



Pre-intervention Data



DO: Implementing the Change

3 phases

1. Collect data & develop protocol - September 2015 – Feb 29 2016

Lessons learned:

- No standardized approach to oxygen targeting in place in NICU
- Vast amount of literature and none of it which came to a specific conclusion on what an appropriate target range should be
- Need to limit the data collected only to what applies to protocol

2. Education, oxygen target cards & algorithm at each bedside - March 1-25 2016

Lessons learned:

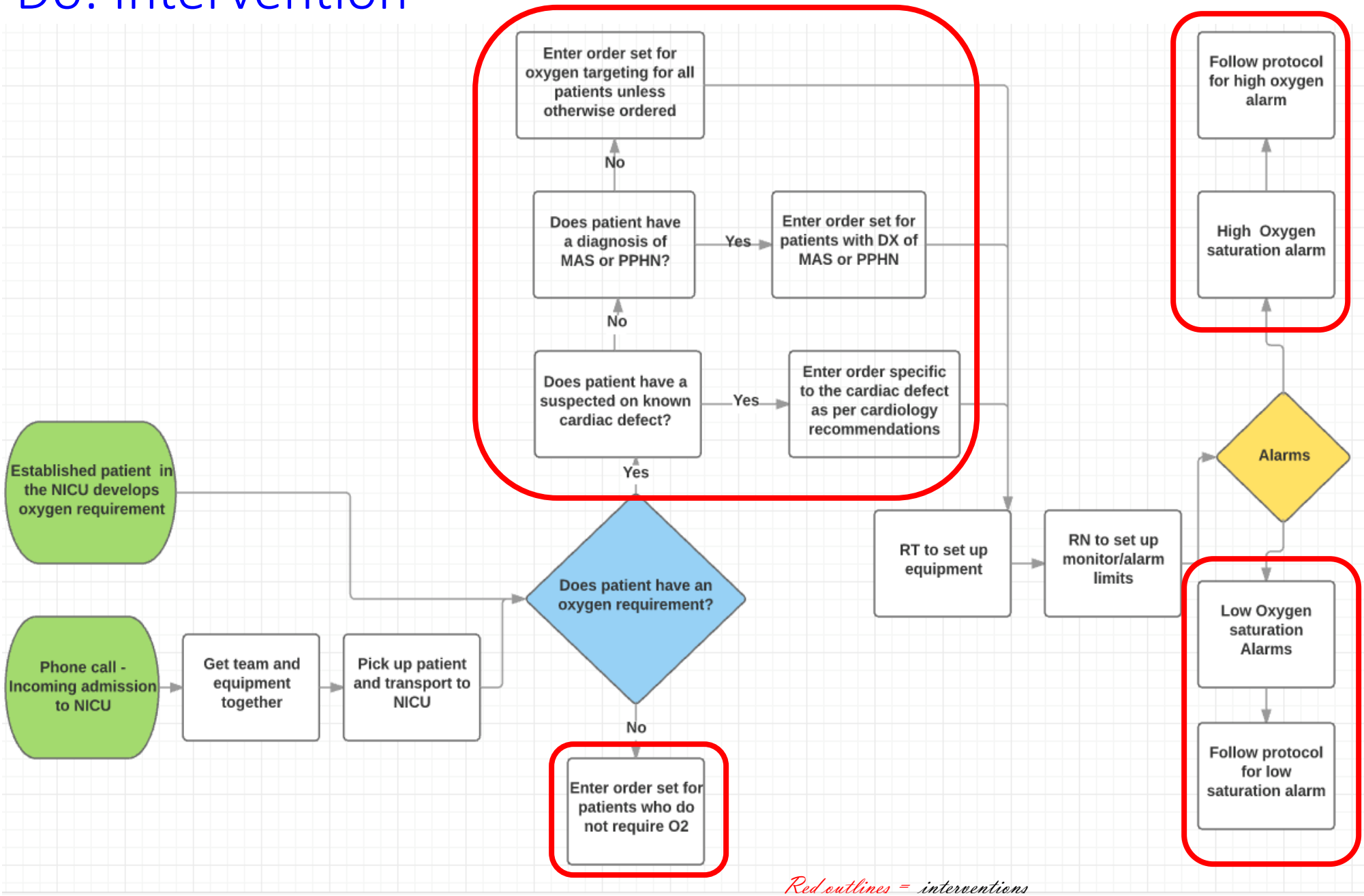
- Over 200 staff members needed to be trained, needed to be concise
- During education period, we learned that it would be beneficial to assess learners knowledge – a pre/post test was developed

3. Quality checks – March 28, 2016 to present

Lessons learned:

- Continuation of long-term data collection needed but will need to modify the team
- May need to decrease the amount of data collected and the interval

Do: Intervention



Do: Protocol Education

Mandatory In-service on

Oxygen Targeting

in X-Ray Conf. Room

Tues, Mar 1st
0630

Thurs, Mar 3rd
0630

Tues, Mar 8th
0630

Tues, Mar 10th
0630

Oxygen Targeting in the NICU

Rolando Macias, MD
Veronica Rettig, NNP-BC
Irene Sandate, NNP-BC
2016

Do- Education

Oxygen Targeting Pre & Post Test

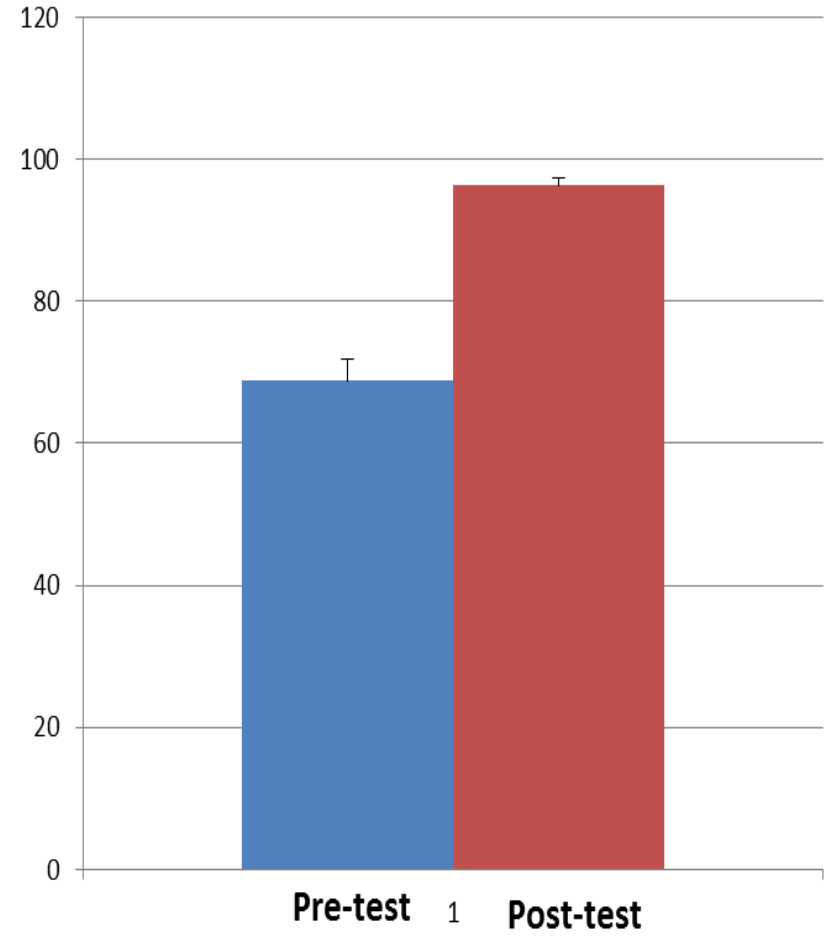
1. Hyperoxia plays a big role in which of the following disease processes?
   - A. Retinopathy of Prematurity
   - B. Chronic Lung Disease
   - C. Necrotizing Enterocolitis
   - D. All the above

2. Oxidative Stress is defined as
   - A. An imbalance between production of free radicals and antioxidant defenses.
   - B. Stress related to the implementation of a new oxygen targeting protocol
   - C. An uncharged highly reactive molecule that has unpaired electrons that can cause damage to cells

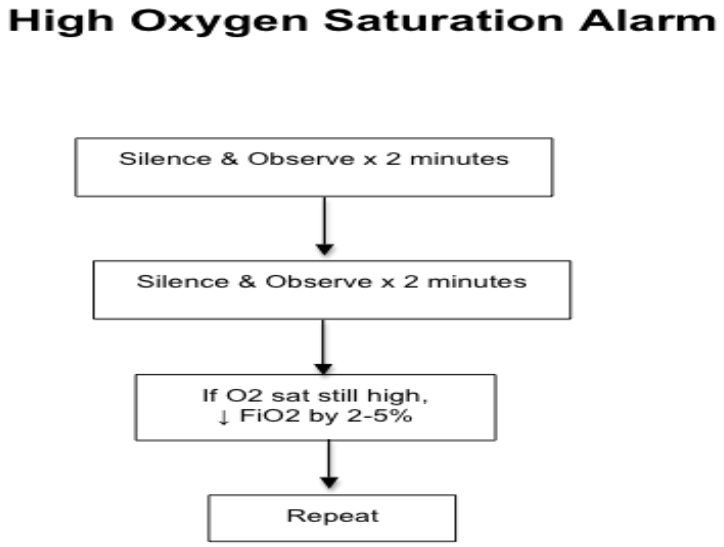
3. The area of the eye treated with laser therapy in patients with retinopathy of prematurity can eventually have normal function/vision.
   - True
   - False

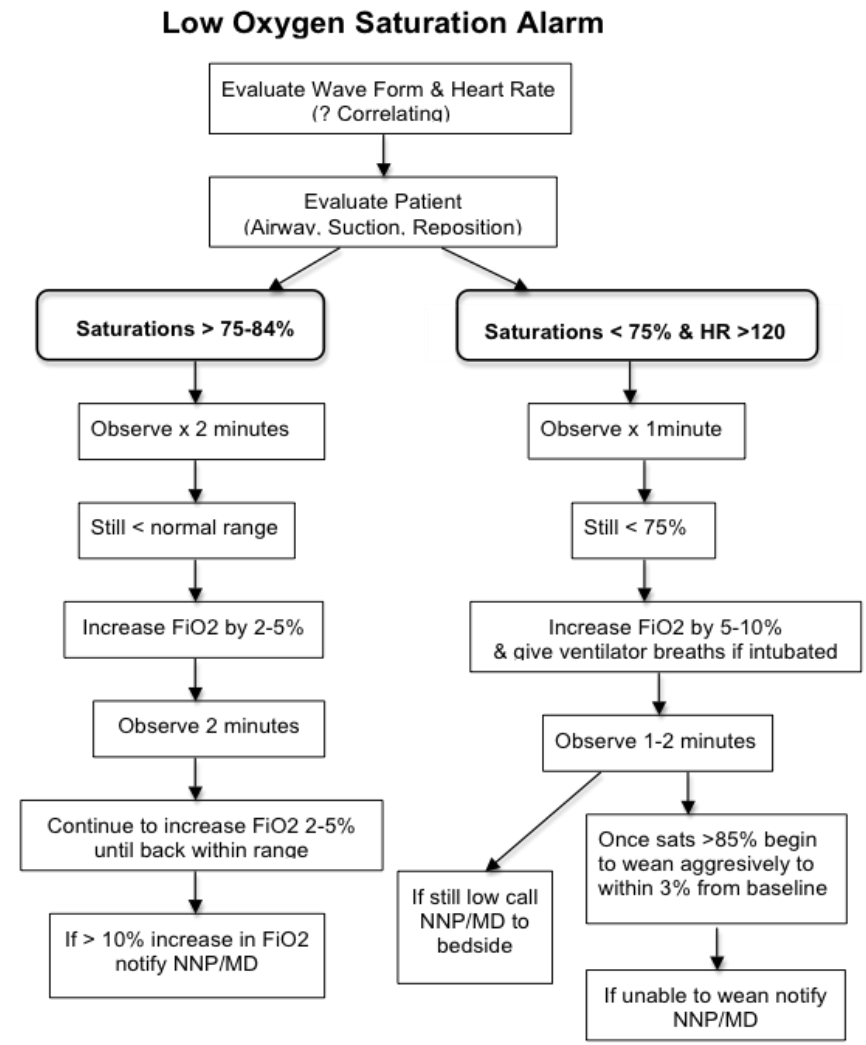
4. The current oxygen saturation alarm limit orders for patients on oxygen who do not have PPHN or a cardiac defect are:
   - A. 88-98
   - B. 85-96
   - C. 85-105

5. A term infant is not at risk for the effects of hyperoxia.
   - True
   - False



Do – protocol algorithm



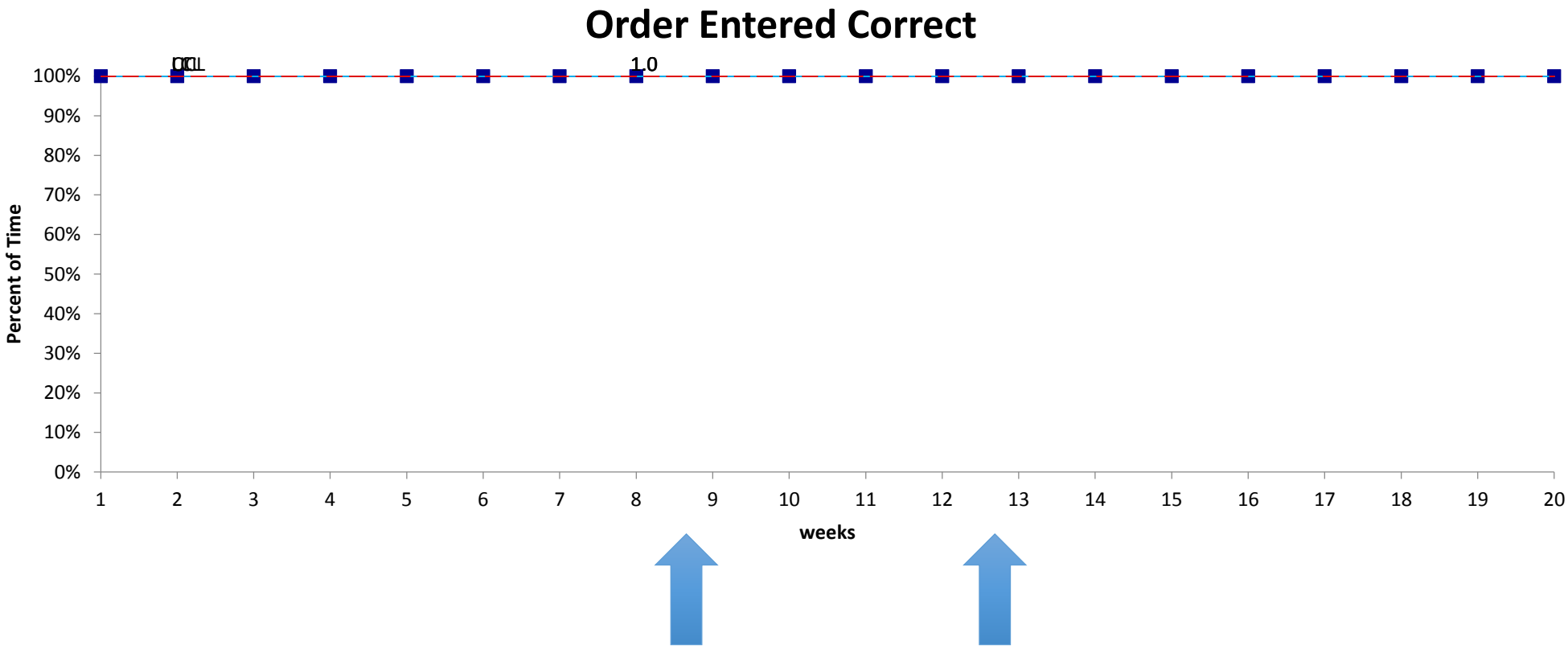


Implementation

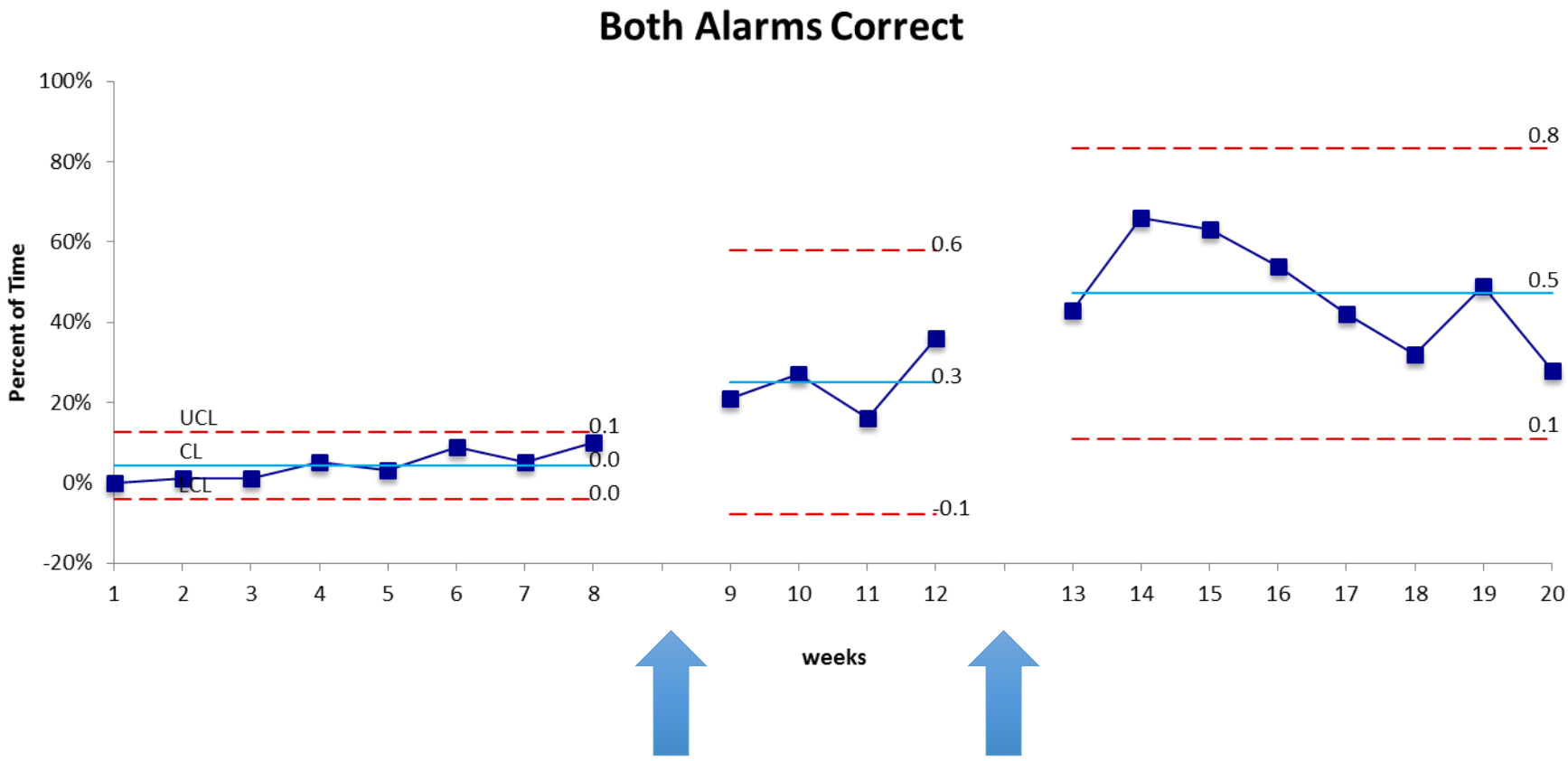
Do: Interventions based on issues/drivers from fish diagram

Environment	• Alarms project back: new monitors in the future (1/2 million dollars for 52 monitors) • Alarm fatigue: implementation of order set
People	• Protocol developed Educational in-services for nurses and respiratory therapists Daily quality checks
Measurement	• Checklist for handoff • Pre-Post test given at in-services and will repeat in 6 months • Trend O2 saturations using EMR and present at daily huddles
Machines	• Plant engineering to fix and synch all clocks in unit
Material	• O2 target cards & algorithms at each bedside • Notification of increased O2 requirement addressed in algorithm • Lack of accountability will be addressed by nurse managers as needed
Process	• New employee orientation to include presentation on O2 targeting protocol

CHECK: Results/Impact



CHECK: Results/Impact



Intervention

Post-Intervention

ACT: Sustaining the Results

Short term audits

- Daily to weekly

Long-term audits

- Quarterly review of patients who require treatment for ROP
- Vermont Oxford Network (data obtained on a yearly basis)

Education

- PRN based on compliance
- Yearly competency for nurses
- Part of new employee orientation to the NICU

Return on Investment

- UHS 2015

  7 cases severe ROP that required laser or injection with anti-VEGF

  Potential cost of one treatment of laser or anti- VEGF injection = $11,500/ case

  Anti VEGF injection = $3513 for 0.3 mg dose

  $7314 for 0.5mg dose

  Facility cost of Laser or injection = $190

  Patient exam = $100

  Cost of one day in NICU bed = $3900

Potential ROI for prevention of Reactive Oxygen Species (ROS) comorbidities (CLD, IVH, NEC) = PRICELESS

Conclusion/What's Next

Compliance

- Peaked within a few weeks of intervention to ~65%
- 8 weeks post-intervention, at ~ 30%

Barriers to sustaining the results

- Conflicting orders
- alarm fatigue
- Some programming issues with the monitors have been identifiied

Plan

- Working with IT to modify order set
- Contacting monitor manufacturer to modify alarms
- Continue audits (RT → RNs)
- Relay audit data to nursing staff at daily huddles
- Graphs showing compliance to be placed on LEAN board in unit
- One on one counseling with staff who is not compliant

Team Picture

Thank you!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