Predictors of Less Invasive Surfactant Administration Failure

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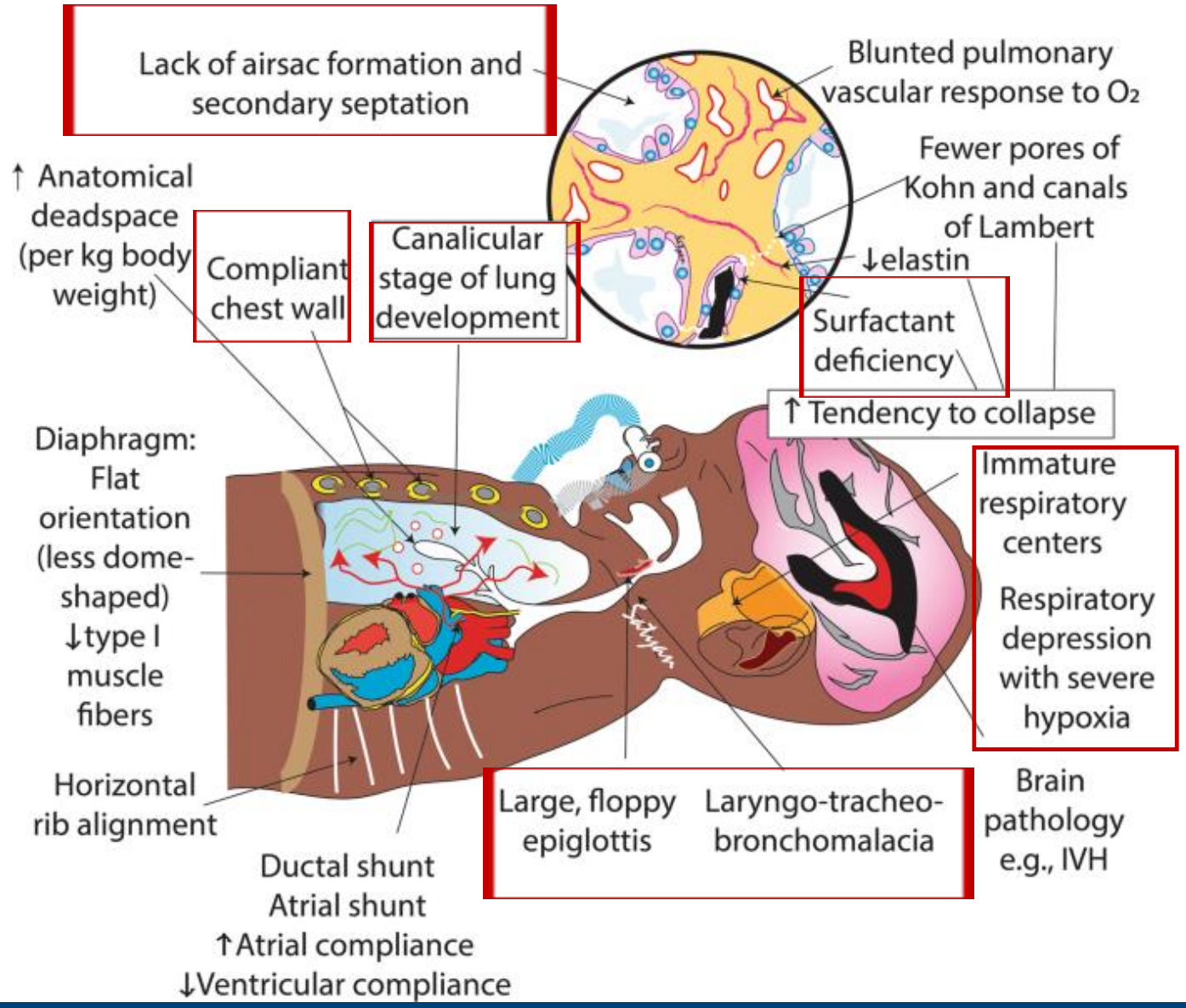
Disclosures

- I have following disclosures:
  - I have received grant support from Chiesi Pharmaceuticals for an ongoing investigator initiated randomized control trial
  - I am a Co-PI of a study on Neonatal Opioid Withdrawal Syndrome conducted by SPARK Biomedical Inc (NIH funded study)
  - I ***have no actual or potential conflict of interest in relation to this presentation***
  - This presentation ***will involve*** a discussion of an unapproved or off-label use of catheters for less invasive surfactant administration.

Postnatal Transition of Extremely Preterm Infant



Sehgal, Ruoss, Stanford, Lakshminrusimha, & McNamara,

Effects of mechanical ventilation on preterm infants

- Brief exposure to large tidal volume ventilation can induce
  - Widespread lung injury and alveolar protein extravasation making subsequent administration of surfactant less effective [1]
  - Pulmonary and systemic inflammatory response [2]
  - Cerebral hemodynamic instability and increased brain inflammation [3]

1. Bjorklund *et al*., Ped Res, 1997
2. Hillman *et al*., Am J Respir Crit Care Med, 2007
3. Polglase *et al*., PloS one, 2012
4. Hillman *et al*., Am J Respir Crit Care Med, 2011

Early CPAP Vs Prophylactic MV

	Study design	Results
COIN trial, 2008 GA 25-28 wks (Morley et al., 2008)	CPAP group: Started with CPAP 8 cm H_2O Intubation & surfactant criteria: FiO_2 0.6, pCO_2 >60 mm Hg	N=610 ↔ Death or BPD [RR 0.80 (95% CI 0.58-1.12)] CPAP arm: ↓ Need for MV, ↓ MV days, ↑ Air leak
SUPPORT trial, 2010 GA 24-27 wks (Finer & Carlo, 2010)	CPAP group: CPAP 5-7 cm H_2O Intubation & surfactant criteria: FiO_2 >0.5 pCO_2 >65	N=1316 ↔ Death or BPD [RR 0.95 (CI 0.85-1.05)] CPAP arm: 66 % infants stabilized on CPAP in the DR ↓ Epinephrine in DR (2% vs 4%) ↓ Need for MV (83% required MV during NICU stay) ↓ MV days ↓ Mortality in the 24-25 week subgroup (24% vs 32 %, P <0.03)

GA: gestational age, MAP: mean airway pressure, MV: mechanical ventilation, RR: relative risk, PNS: Post natal steroid

Early CPAP vs Prophylactic INSURE*

	Results
CURPAP trial, 2010, GA 25-28 weeks (Sandri et al., 2010)	n= 208 No difference in the need for MV w/in 5 days (RR 0.95 (95% CI 0.64-1.41) **INSURE group:** 10% infants could not be extubated after INSURE 30% required reintubation within 5 days after INSURE in DR **CPAP group:** 50% infants required no intubation/MV (within 5 days)
DRM trial, 2011 GA 26-29 weeks (Dunn et al., 2011)	n=439 No difference in death/BPD (RR 0.83 (95% CI 0.64-1.09) **INSURE group:** 41% required reintubation within first week **CPAP group** 48% required no intubation/MV within first week

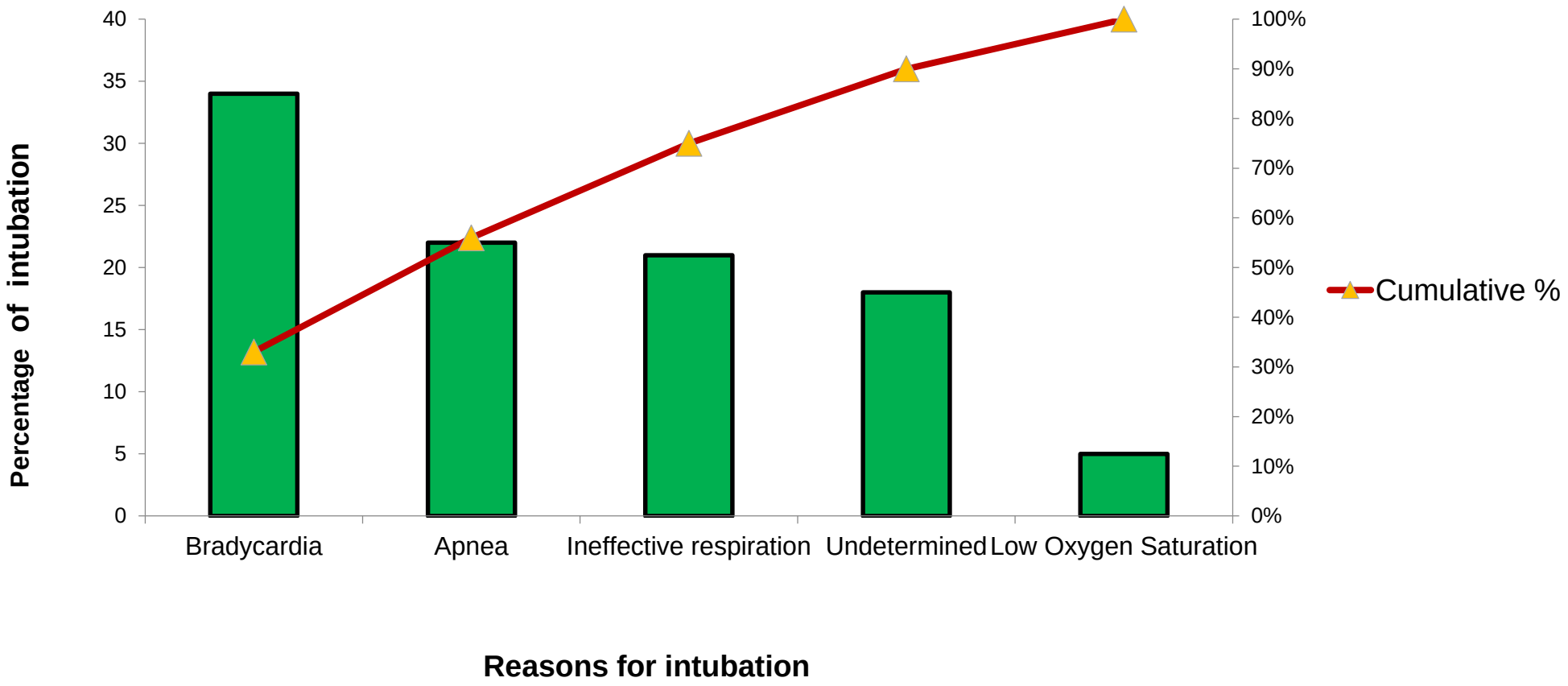
*INSURE: Intubate-Surf-Extubate

Early CPAP Compared to Mechanical Ventilation: Early CPAP Improves Outcome

Author	Result	RR/NNB (95% Conf Int)
Subramanian et al; Cochrane Database of Systematic Reviews 2016 RCTS : 3 N= 2364	↓ BPD in DR-CPAP group	RR 0.89, (0.8 to 0.99) NNB 25 (13-100)
	↓ Death or BPD in CPAP group	RR 0.89, (0.81-0.97) NNB 20 (11-100)
	↔ Mortality	RR 0.82, (0.66 to 1.03)

RR: relative risk, NNB: number needed for treatment benefit

Evaluation of reasons for intubation



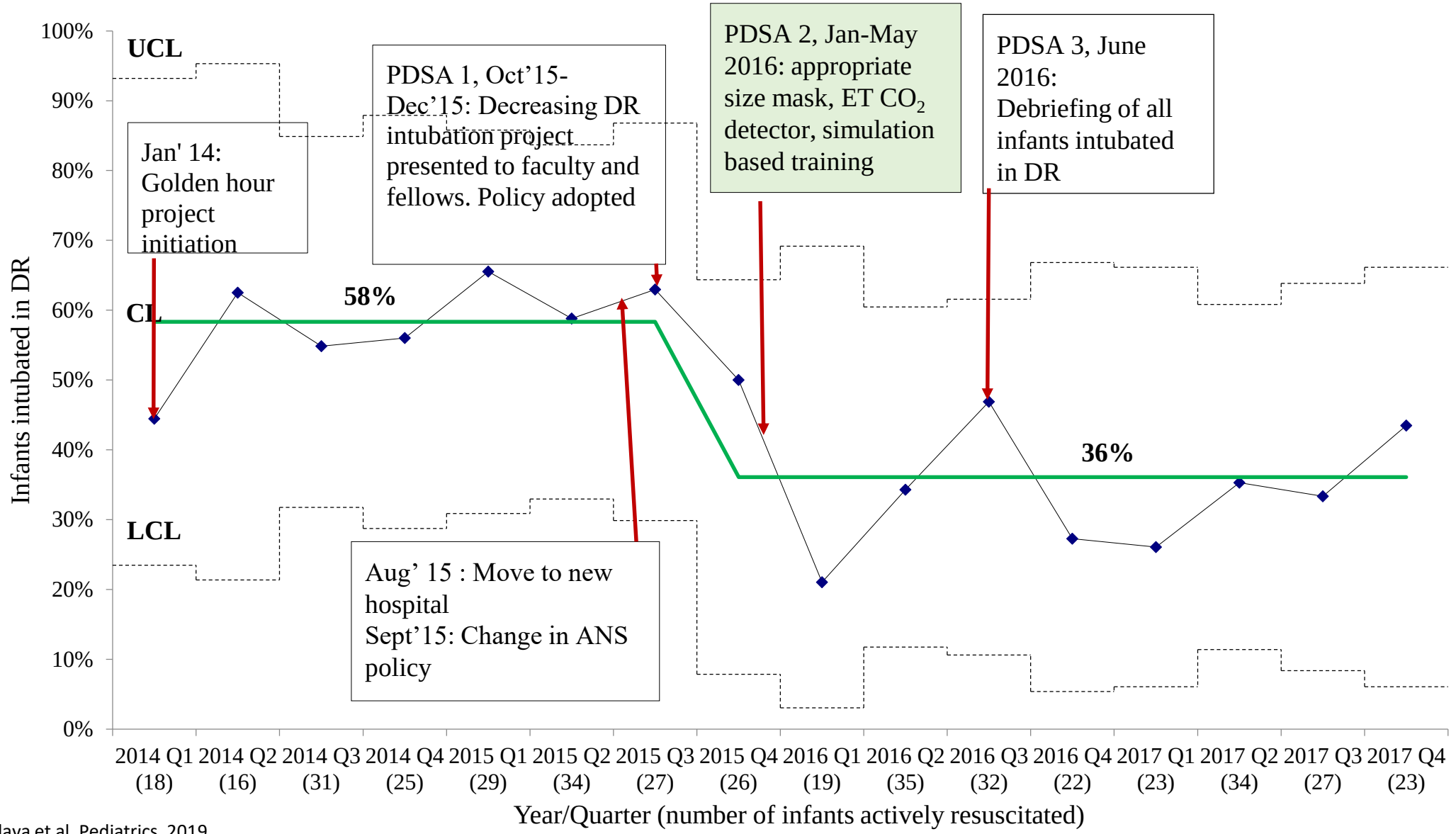
Kakkilaya et al, 2019

Interventions to Decrease Delivery Room Intubation

- ✓ Reemphasize importance of ventilation corrective measures; MRSOPA, especially increase PIP to 30 and I Time to 1s
- ✓ Use of round mask and appropriate size
- ✓ RT training in decreasing mask leak + obstruction using simulation
- ✓ Use $ETCO_2$ during bagging to assist adequate ventilation
- ✓ Debriefing after every intubation in the NICU
- ✓ Document reason for intubation

Kakkilaya et al, 2019

Decreasing Delivery room intubation rate with resuscitation bundle to improve face mask positive p



Kakkilaya et al, Pediatrics, 2019

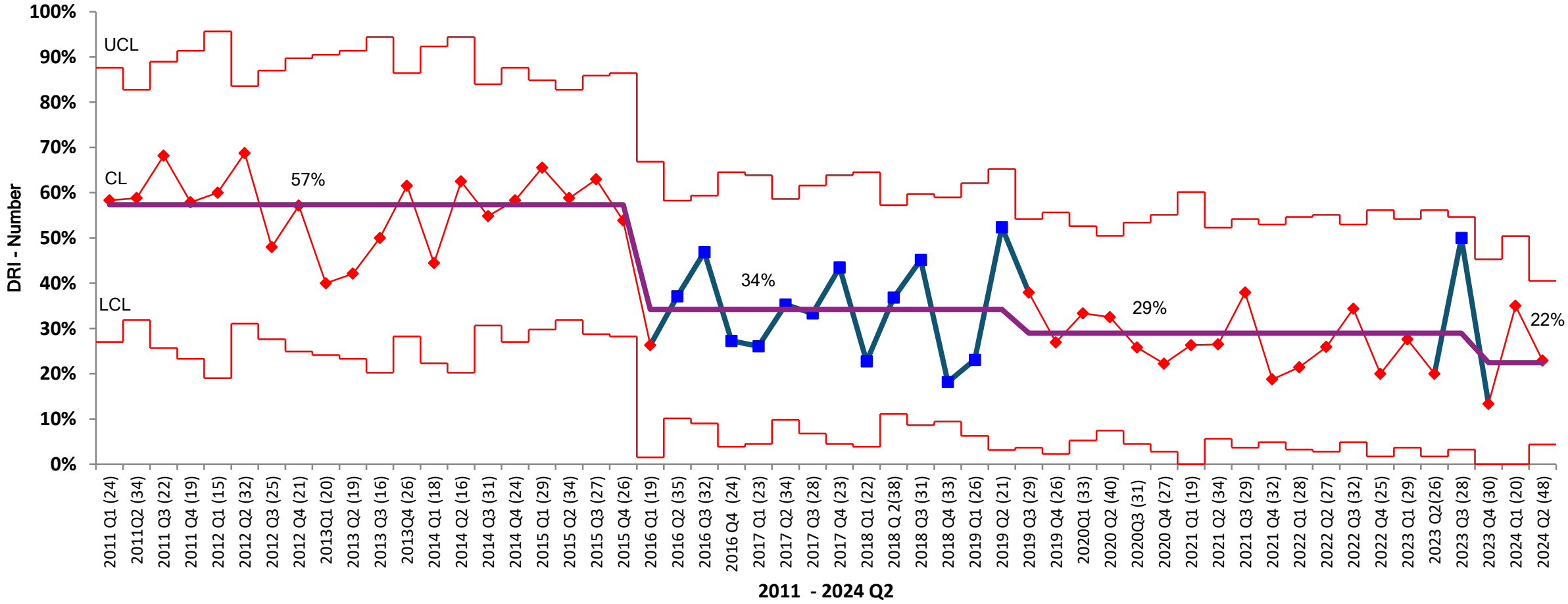
Decreasing DR Intubation Rates Improve Outcomes

	Pre QI N=180	Post-QI N=134	P-value
BPD (%)*	47 (26)	17 (13)	<0.01
Severe ROP (%)	25 (14)	7 (5)	0.01
Severe IVH (%)	21 (12)	10 (8)	NS
Death (%)	19 (11)	16 (12)	NS
Death or BPD (%)	66 (37)	33 (25)	0.02

*Walsh et al, 2006

Kakkilaya V et al, Pediatrics, 2019

Delivery Room Intubation Rate 22-29 weeks GA



CPAP Failure*

Need for Mechanical ventilation within 72 hours in the CPAP arm of randomized control trials			
	GA (weeks)	Criteria for surfactant therapy	CPAP failure**
Morley et al., 2008	25-28	FiO_2 >0.6, CPAP 8	46 %
Finer et al., 2010	24-27	FiO_2 >0.5, CPAP 5-7	52%
Sandri et al., 2010	25-28	FiO_2 >0.4, CPAP 5-7	48%
Dunn et al, 2011	26-29	FiO_2 0.4-0.6, CPAP 5-7	46%

*Need for mechanical ventilation within 72 hours of life

Predicting CPAP Failure in ≤ 29 weeks GA infants

	FiO_2 threshold
Fuchs et al, 2011	$FiO_2 \geq 0.3$ on admission
Dargaville et al, 2013	$FiO_2 \geq 0.3$ within 2 hours of life
Kakkilaya et al, 2019	$FiO_2 > 0.3$ at 2 hours of life
Gulczynska et al, 2019	$FiO_2 \geq 0.29$ at 2 hours of life

CPAP failure is associated with higher odds of

- Pneumothorax
- BPD
- Severe IVH
- Mortality

*Need for mechanical ventilation within 72 hours of life

Ammari et al, 2005, Fuchs et al, 2011, Dargaville et al , 2016, Kakkilaya et al, 2019,

Optimizing CPAP therapy

- Bubble CPAP improves oxygenation[1]
- Appropriate size nasal prongs ↓ resistance to flow and pressure drop [2]
- Proper positioning of the infant [3]
- Higher CPAP level increase functional residual capacity [4, 5, 6]
- Mouth closure improves CPAP transmission [7]
- Avoid gastric distension with venting [6]
- Frequent monitoring/checks [8]

1. Courtney SE et al, 2011
2. Green EA et al, 2019
3. Wright, CJ et al, 2018
4,5,6: Gregory GA, 1969, Bonta et al 1977, Bhatia et al 2017
7. De Paoli et al, 2005
8. Sahni & Wung 1998

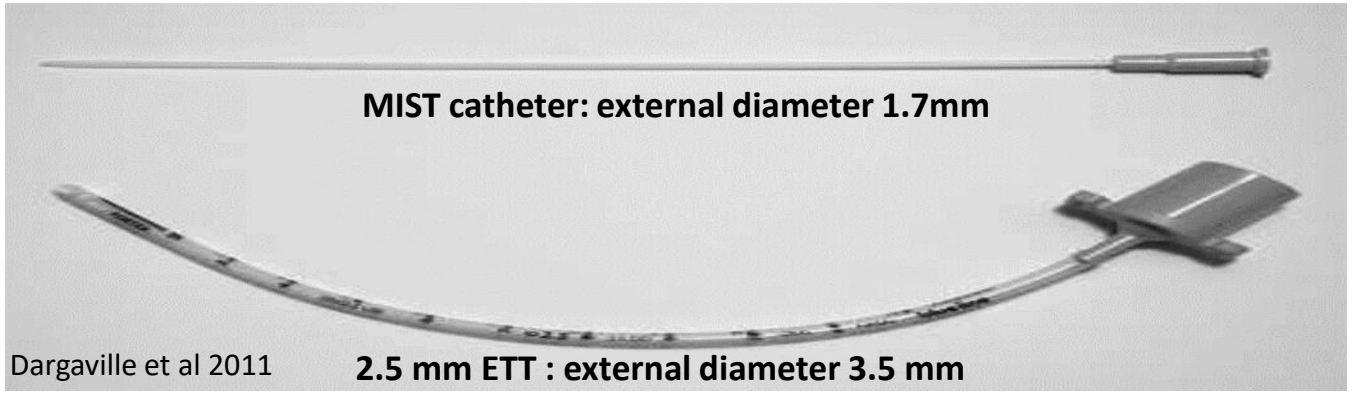
Higher Resistance Nasal Interface = Greater Drop in Delivered Pressure

Interface	Outer Diameter (mm)	Expiratory Limb Pressure (cm H_2O) @ 8L/min flow
Hudson 0 3	 3.6 5.1	 7.8 0.94
F&P prong Small Medium	 2.8 3.9	 12.2 1.9
F&P Mask small	4	0
RAM Premie Newborn	 3.1 4.5	 10.9 9.4

Green EA et al, 2018

Surfactant Administration Without Invasive Positive Pressure Ventilation

- Aerosolized surfactant
- Surfactant Through Laryngeal or Supraglottic Airway (SALSA)
- Thin catheters using direct laryngoscope or video-laryngoscope
  - Cologne method: 4 Fr feeding tube with using Magill forceps [1]
  - Minimally Invasive Surfactant Therapy technique using 16 G, 5.5” vascular catheter [2]



1. Kribs et al, 2007
2. Dargaville et al 2011

Clinical Trials

20 trials compared LISA vs surfactant administration using ETT

Strategies in the control group	# RCT(s)
Intubation, surfactant administration followed by continued MV	1
Selective intubation and continued MV. Surfactant per the discretion of clinician	4
INSURE using similar threshold as LISA group	15

LISA: Less Invasive Surfactant Administration,
MV: mechanical ventilation,
ETT: endotracheal tube,
RCT: randomized control trials

Kakkilaya V, Gautham KS, Ped Res. 2022

LISA vs Intubation, Surfactant and Continued MV

Author/Year/ Design	LISA Group	Control group	Results
Kribs et al, JAMA Pediatr, 2015, 13 centers 23 -26 weeks GA Enrolled ≤ 2 hours of life Poractant alfa, 100 mg/kg	Threshold for surf: FiO_2 >0.3, Silverman score ≥5 Procedure: Cologne method, Premedication: None Intubation criteria: FiO_2 ≥0.45, $PaCO_2$ >60, persistent apnea.	Threshold for surf: FiO_2 >0.3 Silverman score ≥5 Continued MV after surfactant	n=211 ↔ Survival without BPD * ↑ Survival without major complications ↓ Need for MV ↓ Pneumothorax ↓ Grade 3-4 IVH

*Primary outcome; aRR: absolute risk reduction

LISA vs CPAP, Selective intubation ± Surfactant via ETT

Author/Year/ Design	LISA Threshold	Control Group	Result
Dargaville et al, JAMA, 2021 33 centers, 25-28 weeks GA Enrolled within 6 HOL Treatment team blinded to group allocation Study period: Dec 2011- March 2020 Enrollment stopped due to slow recruitment Surf: Poractant alfa 200 mg/kg	$FiO_2 \geq 0.3$, CPAP 5-8 cm H_2O MIST method Intubation criteria: $FiO_2 \geq 0.45$, persistent apnea If intubated, surfactant per clinician's discretion	Sham Treatment CPAP 5-8 cm H2O Intubation criteria: $FiO_2 \geq 0.45$, persistent apnea. If intubated, surfactant per clinician's discretion	n=485 (of the desired 606) ↔ Death or BPD (43.6 % v s 49.6)* RR 0.87 (95% CI 0.74 to 1.03) ↓ BPD, pneumothorax, need for MV ≤ 72 hours, PDA treatment, ↔ mortality (10% vs 7.8%) RR 1.27 (95% CI 0.63 to 2.57)

* Primary outcome

LISA vs CPAP Selective Surfactant via ETT*

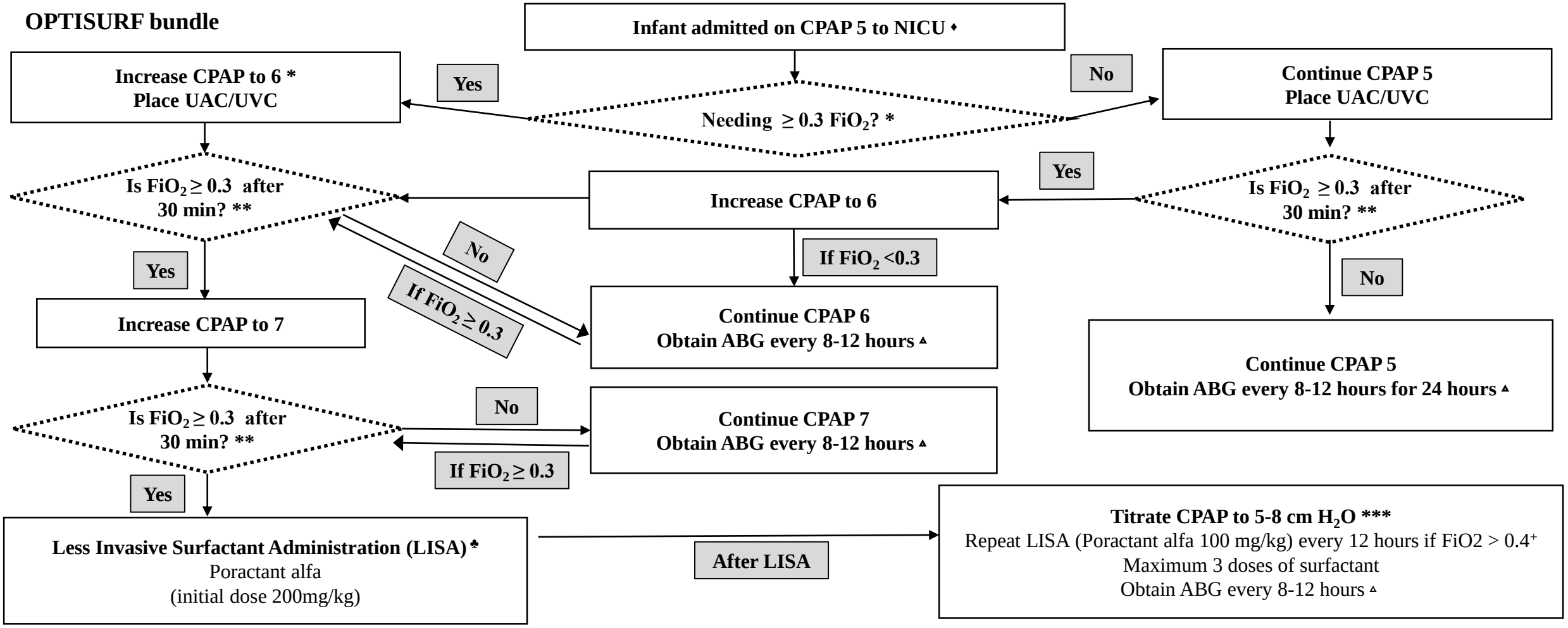
Author/Year/ Design	LISA Group	Control Group	Result
Katheria, A NEJM evidence, 2023 24-29 weeks GA Multicenter study Enrolled within one hour. 2 centers in US	Caffeine + LISA given within 2 hours of life	CPAP 5-8, Caffiene Surfactant via ETT for CPAP 6-8cm H_2O, FiO_2 0.4	N= 180 LISA group: ↓ Need for MV within 72 HOL (23% vs 53%) ↓ BPD (26 % vs 39%)

*INSURE or Continued MV

Meta-analysis

Author, # RCTs, n	Results, Risk Ratio (95% CI), NNB (95% CI)
Abdel-Latif et al, 2021 16 RCTs	**LISA vs ETT surfactant (all studies)** LISA associated with: ↓ Death or BPD 0.59 (95% CI 0.48 to 0.73) NNB 9 (7-16) ↓ BPD 0.57 (0.45, 0.74) NNB 13 (9-24) ↓ MV within 72 hours, 0.63 (0.54 to 0.74) NNB 8 (6-12) ↓ Severe IVH, 0.63 (95% CI 0.42 to 0.96), NNB 22 (12-193) ↓ Mortality 0.63 (95% CI 0.47,0.84), NNB 20 (12-58) **LISA vs INSURE** ↓ Death or BPD, RR 0.66 (95% CI 0.46 to 0.93), NNB 11 (6-15) ↓ MV within 72 hours, (RR 0.52, 95% CI 0.4, 0.68), NNB 9 (6-12)

MV: Mechanical ventilation, NNB: number needed for treatment benefit, RR: Risk Ratio



♦ Place head of the infant at the foot end of the incubator on admission to allow for LISA during line placement

▲ If no UAC, obtain CBG

***** Intubate if requiring $FiO_2 \geq 0.7$ or having frequent apnea (≥ 3 in one hour needing stimulation or any needing PPV)

****** If requiring $FiO_2 \geq 0.5$, intervene at 20-minute intervals

******* Wean CPAP to 6 if $FiO_2 < 0.25$ after surfactant and obtain CXR within 2 hours s/p LISA and wean for hyper-expansion
Avoid rapid wean of pressure in <26 weeks' GA infants and those without antenatal steroids

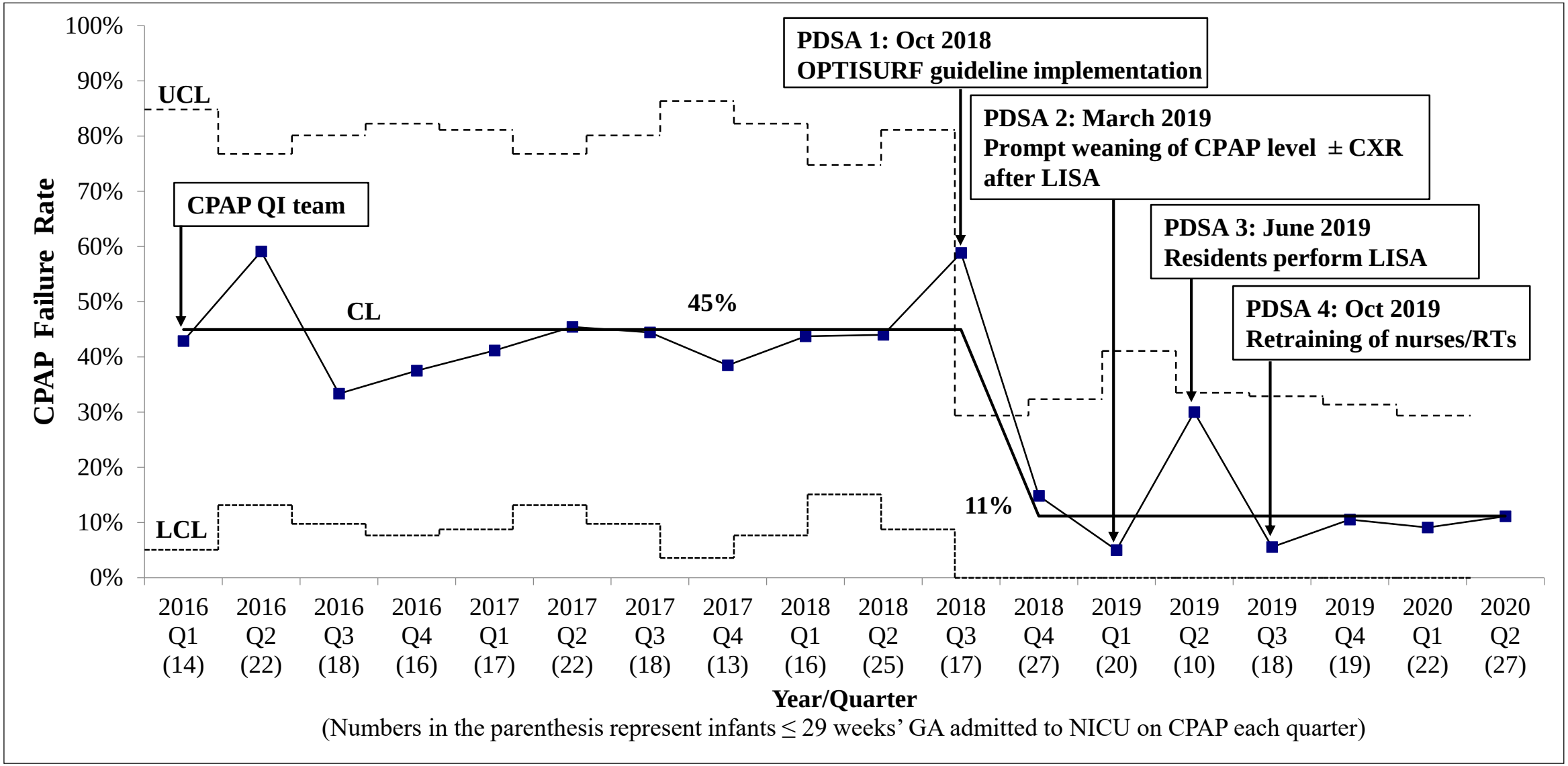
+ Intubate if needing $FiO_2 > 0.45$ on CPAP ≥ 7 cm H_2O for > 1 hour after LISA, or if not due for next dose

♣ Keep head midline. Do not change infant's position while administering LISA.\

Catheter insertion depth:
≤ 26 week : 1cm
27-28 week: 1.5 cm
>28 week: 2 cm

Kakkilaya et al, Pediatrics, 2021

CPAP Failure Rate



(Numbers in the parenthesis represent infants ≤ 29 weeks' GA admitted to NICU on CPAP each quarter)

Kakkilaya et al, Pediatrics, 2021

CL: Control line, UCL: Upper control limit, LCL: Lower control limit, PDSA: Plan do study act, CXR: Chest radiograph

Comparison of respiratory care of infants in pre vs post QI

	All infants		23-26 weeks' GA		27-29 weeks' GA	
Characteristics	Pre QI n=125	Post-QI n=91	Pre-QI n=33	Post-QI n=28	Pre-QI n=92	Post-QI n=63
CPAP failure n (%)	68 (54)	10 (11)*	26 (79)	8 (27)*	42 (46)	2 (3)*
MV within 7 days	70 (56)	12 (13)*	27 (82)	10 (36)*	43 (47)	2 (3)*
Any MV n (%)	72 (58)	28 (31)*	25 (76)	16 (57)	47 (51)	12 (19)*
HFV n (%)	30 (24)	5 (6)*	21 (64)	4 (14)*	9 (10)	1 (2)▲
MV days **δ**	4 (1, 11)	2 (0, 12)	10 (3, 25)	5 (2, 27)	1 (1, 7)	1 (0, 2)*
NIPPV n (%)	15 (12)	15 (17)	8 (24)	12 (43)▲	7 (8)	3 (5)

δ Median (25th, 75th), * P=<0.01, ** P= <0.05, ♣ P=0.053, ▲ P=0.06

Comparing Outcomes Between Pre and Post-QI Cohorts

	All infants		23-26 weeks GA		27-29 weeks GA	
Characteristics	Pre OSC n=125	Post-OSC n=91	Pre-OSC n=33	Post-OSC n=28	Pre-OSC n=92	Post-OSC n=63
Pneumothorax n (%)	10 (8)	1 (1)**	5 (15%)	0▲	5 (5)	1 (2)
Pulm Hemorrhage n (%)	4 (3)	4 (4)	2 (6)	4 (14)	2 (2)	0 (0)
PDA treatment n (%)	26 (21)	8 (9)**	15 (46)	6 (22)**	11 (12)	2 (3)♣
NEC n (%)	10 (8)	7 (8)	5 (15)	0	5 (5)	7 (11)
Severe IVH n (%)	5 (4)	4 (4)	2 (6)	4 (14)	3 (3)	0
Severe ROP n (%)	8 (6)	3 (3)	5 (15)	3 (11)	3 (3)	0
BPD n (%)	20 (16)	8 (9)	12 (36)	7 (25)	8 (9)	1 (2) ♠
Home oxygen n (%)	4 (3)	4 (5)	3 (9)	4 (14)	1 (1)	0
Mortality n (%)	9 (7)	8 (9)	6 (18)	7 (25)	3 (3)	1 (2)
Death or BPD n (%)	29 (23)	16 (17)	18 (55)	14 (50)	11 (12)	2 (3)♣
Length of stay **δ**	80 (62, 105)	72 (59, 96)	105 (87, 136)	96 (60, 123)	72 (59, 90)	70 (59, 85)

Kakkilaya et al, Pediatrics, 2021

δ Median (25^{th}, 75^{th}), * P=<0.01, ** P= <0.05, ♣ P=0.053, ▲ P=0.06, ♠ P=0.08

Can We Predict LISA Failure?

- LISA Failure: Need for MV within 72 hours after LISA

LISA Failure* in RCTs

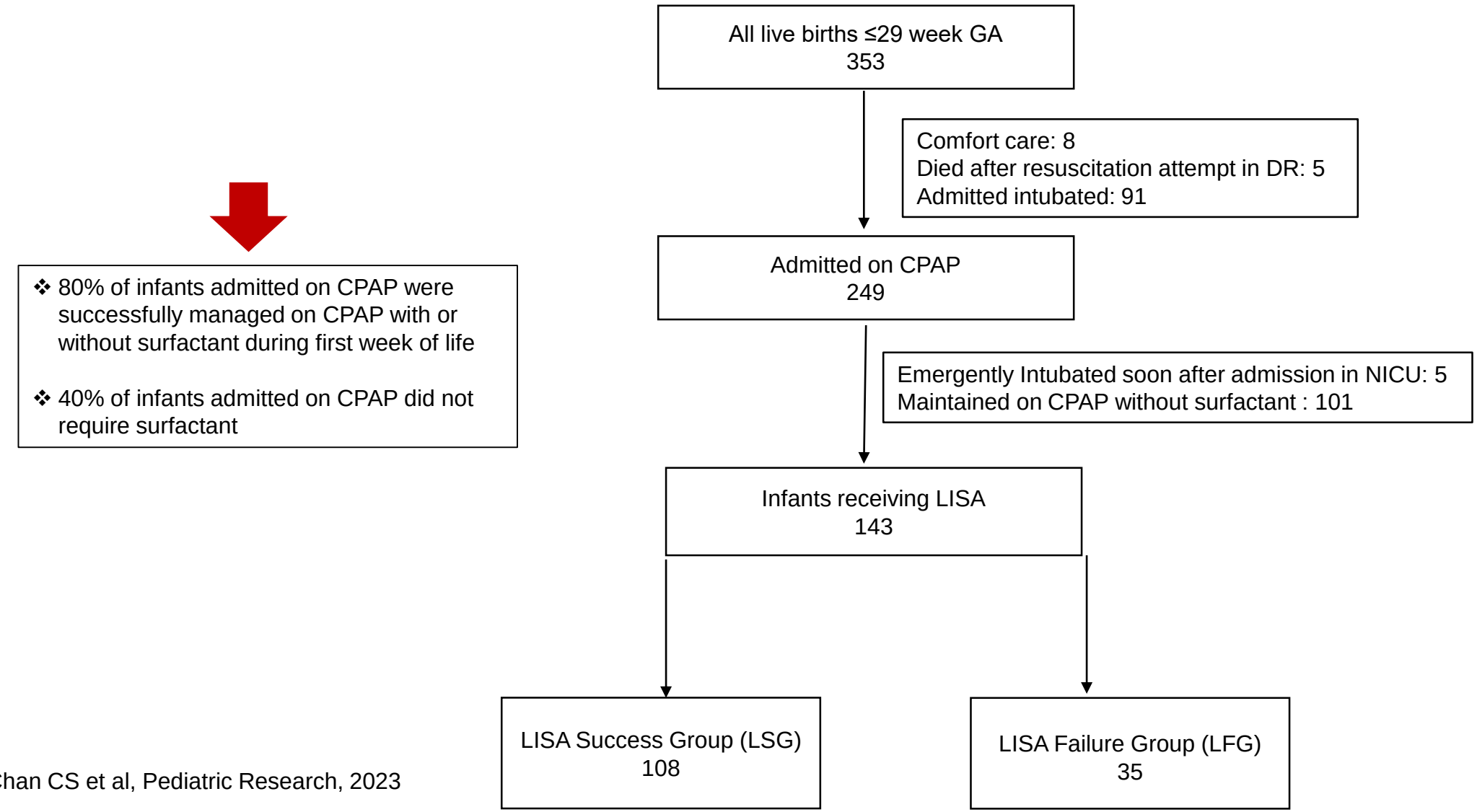
Author, year	GA	Threshold for LISA	LISA failure
Kanmaz et al. 2012	23-32 weeks GA	FiO_2 >40 %, CPAP 5-7 cm H_2O	30 %
Kribs et al. 2015	23-26 weeks	FiO_2 >30 % and/or Silverman score ≥5	47 %
Dargaville et al. 2021	25-28 weeks	FiO_2 >30 %, CPAP 5-8 cm H_2O	36 %
Katheria et al. 2023	24-29 weeks GA	Infants needing CPAP	23%

LISA Failure in Infants ≤ 26 week GA

- Retrospective cohort study of infants 22-26 week GA born in 68 NICUs in German Neonatal network between 2009-2020. LISA was administered in DR
- Results: Of the 6542 enrolled infants, 7% did not receive surf, 38% received LISA, 54% received ETT surf.
- LISA Failure: 46%
- Compared to ETT surf group, LISA was independently associated with decreased mortality and death or BPD. No difference in sIVH
- LISA Failure was associated with GA, male gender, no ANS, out born status, low Apgar score, IUGR status, and higher max FiO_2 (>0.6) in the first 12 HOL

Hartel et al, JAMA Network Open, 2022,

Flow chart of ≤ 29 week GA infants born 2018 Q4-2021



- 80% of infants admitted on CPAP were successfully managed on CPAP with or without surfactant during first week of life
- 40% of infants admitted on CPAP did not require surfactant

Chan CS et al, Pediatric Research, 2023

Comparison of LISA Success and LISA failure Groups

	LISA Success (*n* = 108)	**LISA Failure (*n* = 35)**	***P*-value**
Mother's Age, yr*	28 (24, 35)	26 (21, 30)	0.03
Hispanic, *n* (%)	69 (64)	23 (66)	0.90
Antenatal Steroids, n (%)	93 (86)	28 (80)	0.55
Complete Course (=2), *n* (%)	41/93 (44)	14/28 (48)	0.58
Prolonged ROM (>18 hours), *n* (%)	30 (28)	10 (29)	0.93
Multiple birth, *n* (%)	19 (18)	8 (23)	0.49
Cesarean section, *n* (%)	79 (73)	29 (83)	0.25

*Median (25th, 75th)

Chan CS et al, Pediatric Research, 2023

Comparison of LISA Success and LISA failure Groups

	LISA Success *n* = 108	LISA Failure *n* = 35	*P*-value
Male, *n* (%)	54 (50)	19 (54)	0.66
Estimated GA, weeks*	27 (26, 29)	25 (24, 27)	<0.01
Estimated GA ≤ 25 weeks, *n* (%)	22 (20)	18 (51)	<0.01
Apgar scores			
1 min*	4 (3, 6)	3 (2, 4)	0.02
5 min*	7 (6, 8)	7 (6, 8)	0.08
Cord Blood gas pH*	7.27 (7.22, 7.31)	7.29 (7.26, 7.34)	0.11
Cord Blood gas base deficit*	-5.3 (-8.6, -3.7)	-4.7 (-6.9, -2.5)	0.14
Hypothermia (<36◦ C) on admission, *n* (%)	18 (17)	5 (14)	0.74
Hypothermia (< 36◦C) ≤ 4 hrs of life, *n* (%)	31 (29)	20 (57)	<0.01

*Median (25th, 75th)

Chan CS et al, Pediatric Research, 2023

Comparison of DR and NICU Respiratory Support

	LISA Success *n* = 108	LISA Failure *n* = 35	*P*-value
Max FiO_2 in DR*	0.75 (0.60, 1)	1 (0.7, 1)	<0.01
Max CPAP, cm H_2O*	5 (5, 6)	6 (6, 7)	<0.01
FiO_2*	0.30 (0.23, 0.37)	0.40 (0.25, 0.5)	<0.01
CPAP*	5 (5, 6)	6 (6, 7)	<0.01
FiO_2 @ 1 hour of life *	0.30 (0.25, 0.38)	0.40 (0.25, 0.58)	0.04
CPAP @ 1 hour of life *	6 (5, 6)	7 (6, 7)	<0.01
Time of birth to LISA (hrs)*	3.93 (2.45, 11.23)	2.00 (1.20, 3.77)	<0.01
FiO_2 1 hour after LISA*	24 (21, 28)	30 (24, 45)	<0.01
CPAP 1 hour after LISA *	6 (6, 7)	7 (6, 7)	<0.01
>1 dose of LISA, *n* (%)	17 (16)	14 (40)	<0.01

*Median (25th, 75th)

Chan CS et al, Pediatric Research, 2023

Comparison of DR and NICU Respiratory Support

	LISA Success (n=108)	LISA Failure (n=35)	*P*-value
MV during first week of life, *n* (%)	4 (4)	35 (100)	<0.01
MV during hospital stay n (%)	23 (21)	35 (100)	<0.01
HFV (HFOV/HFJV), *n* (%)	6 (6)	15 (43)	<0.01
Pneumothorax, *n* (%)	2 (2)	3 (9)	0.09
Pulmonary hemorrhage, *n* (%)	2 (2)	10 (29)	<0.01
BPD, *n* (%)	16 (15)	9 (26)	0.14
NEC, *n* (%)	7 (7)	3 (9)	0.71
Severe ROP (=3 either eye), *n* (%)	9 (8)	8 (23)	0.03
Severe IVH (>3 right or left), *n* (%)	2 (2)	7 (20)	<0.01
Death or Moderate to severe BPD, *n* (%)	19 (18)	20 (57)	<0.01

Chan CS et al, Pediatric Research, 2023

LISA Failure by Gestational Age

GA	All infants n=244	CPAP success n=209	CPAP failure n=35	CPAP Success %
22-23	2	0	2	0
24	18	11	7	61
25	23	14	9	61
26	25	19	6	76
27	54	48	6	88
28	53	50	3	94
29	69	67	2	97

Chan CS et al, Pediatric Research, 2023

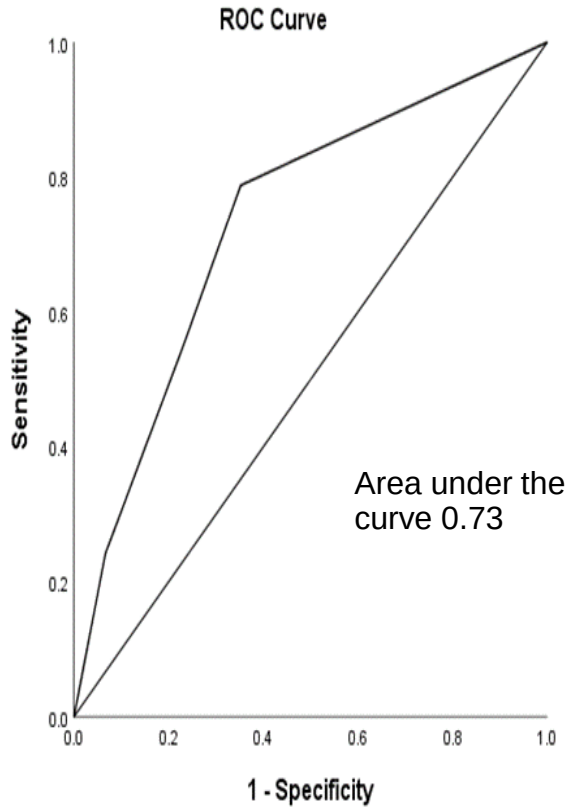
Reasons for LISA Failure

	Reasons for LISA Failure (n=35)
Apnea, *n* (%)	15 (43)
Hypoxemia, *n* (%)	12 (34)
Pneumothorax, *n* (%)	3 (9)
Hypercarbia, *n* (%)	1 (3)
IVH, *n* (%)	1 (3)
Pulmonary hemorrhage, *n* (%)	2 (6)
Hemodynamic instability, *n* (%)	1 (3)

Chan CS et al, Pediatric Research, 2023

Predictors of LISA failure

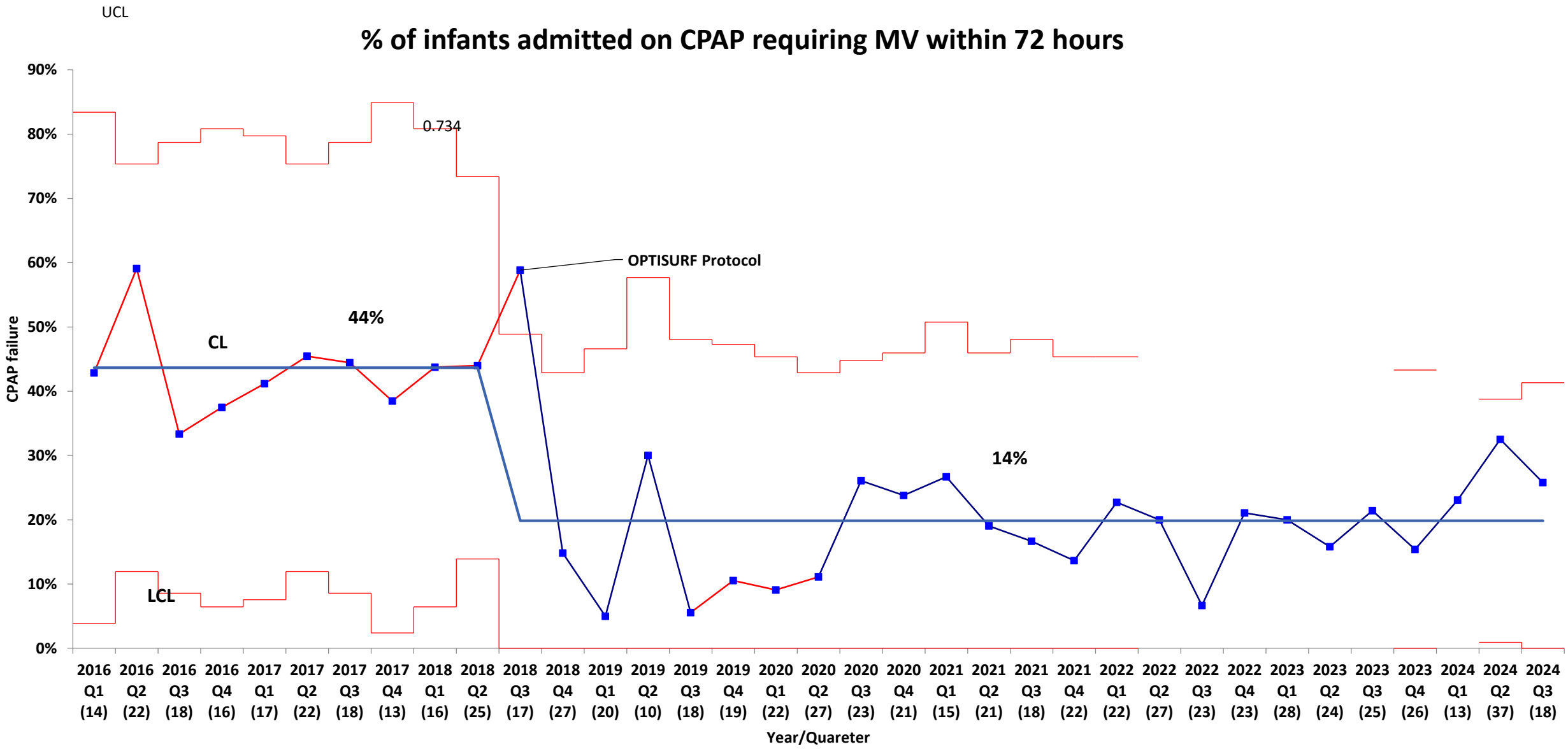
- GA ≤ 25 weeks (aOR 3.62, (95% CI) 1.51-8.68, P <0.004
- FiO_2 ≥0.30 an hour after LISA (aOR 3.69, CI 1.57-8.67, P 0.003)



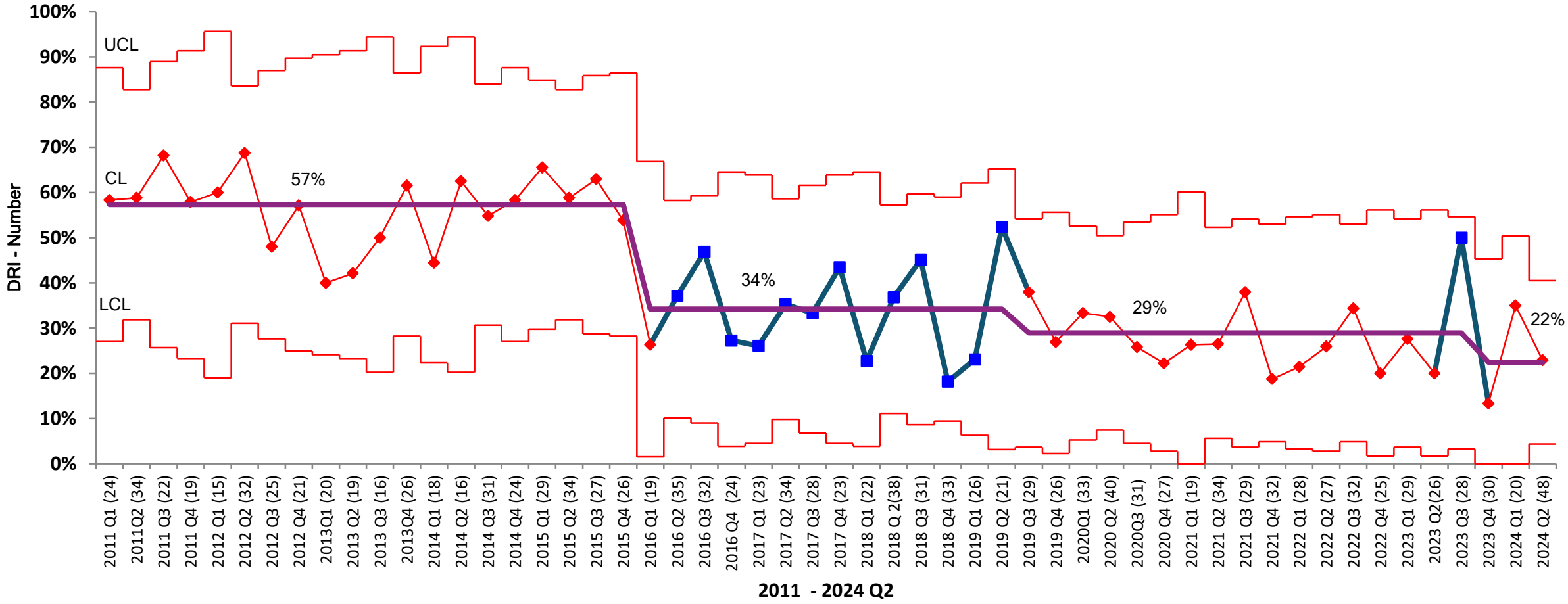
Chan CS et al, Pediatric Research, 2023

How to decrease the need for MV in ≤ 25 weeks GA infants?

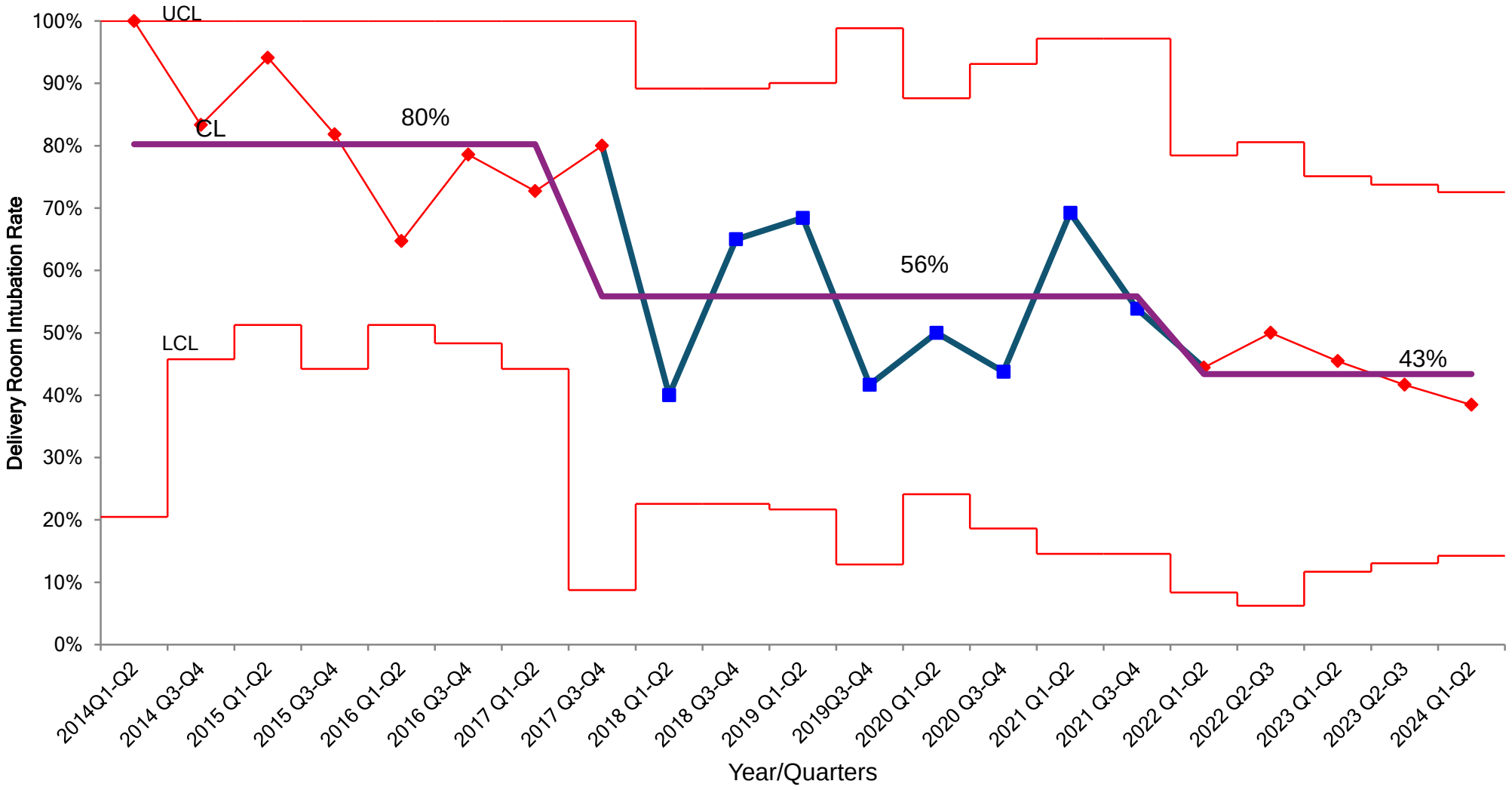
- Delayed cord clamping
- Prevent hypothermia
- Support spontaneous breathing: Early caffeine
- Maintain adequate FRC:
  - Higher CPAP level when needed
  - Non Invasive Positive Pressure Ventilation: sNIPPV, NAVA, nHFOV
  - Repeat doses of surfactant

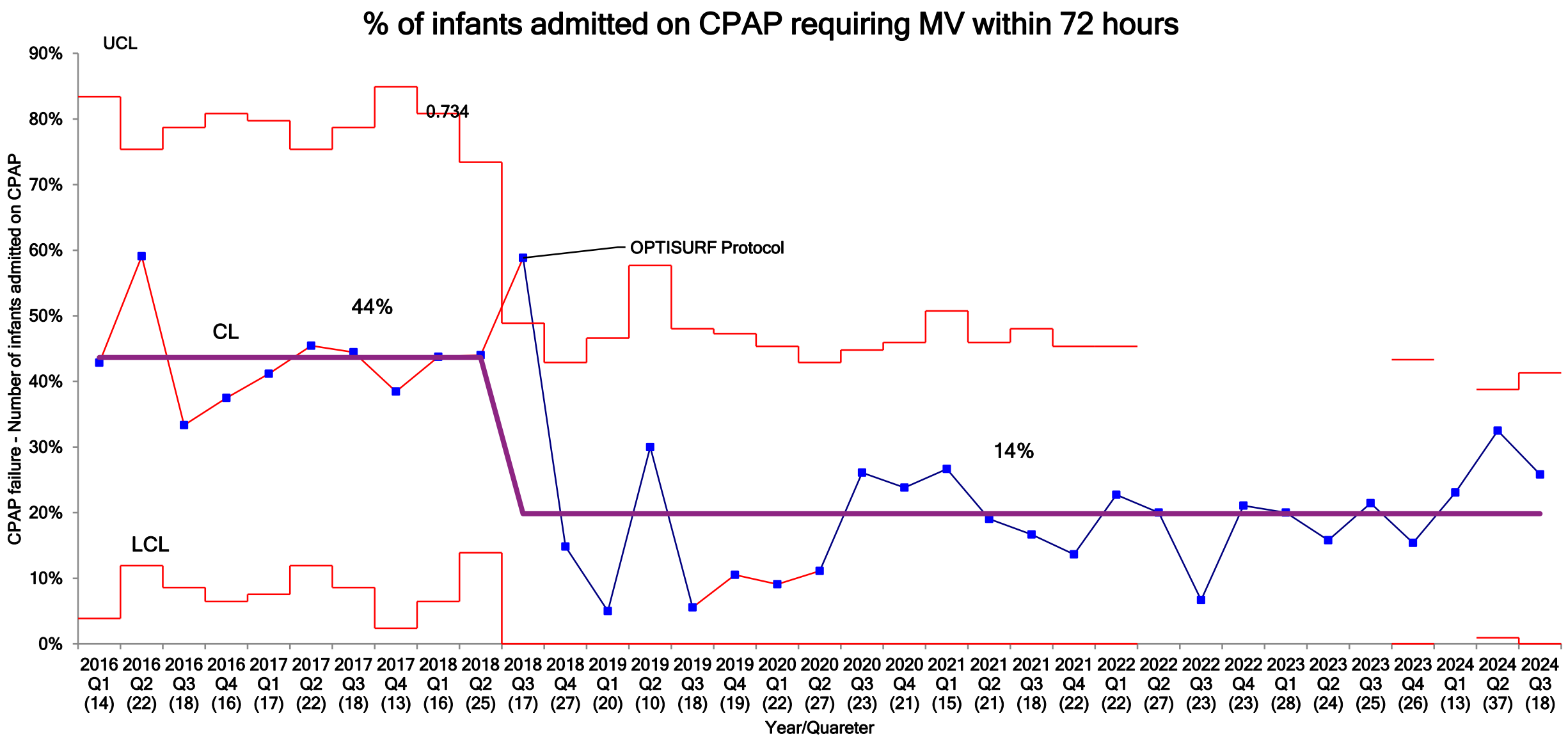

UCL
% of infants admitted on CPAP requiring MV within 72 hours
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
CPAP failure
0.734
OPTISURF Protocol
44%
CL
14%
LCL
2016 Q1 (14)
2016 Q2 (22)
2016 Q3 (18)
2016 Q4 (16)
2017 Q1 (17)
2017 Q2 (22)
2017 Q3 (18)
2017 Q4 (13)
2018 Q1 (16)
2018 Q2 (25)
2018 Q3 (17)
2018 Q4 (27)
2019 Q1 (20)
2019 Q2 (10)
2019 Q3 (18)
2019 Q4 (19)
2020 Q1 (22)
2020 Q2 (27)
2020 Q3 (23)
2020 Q4 (21)
2021 Q1 (15)
2021 Q2 (21)
2021 Q3 (18)
2021 Q4 (22)
2022 Q1 (22)
2022 Q2 (27)
2022 Q3 (23)
2022 Q4 (23)
2023 Q1 (28)
2023 Q2 (24)
2023 Q3 (25)
2023 Q4 (26)
2024 Q1 (13)
2024 Q2 (37)
2024 Q3 (18)
Year/Quareter

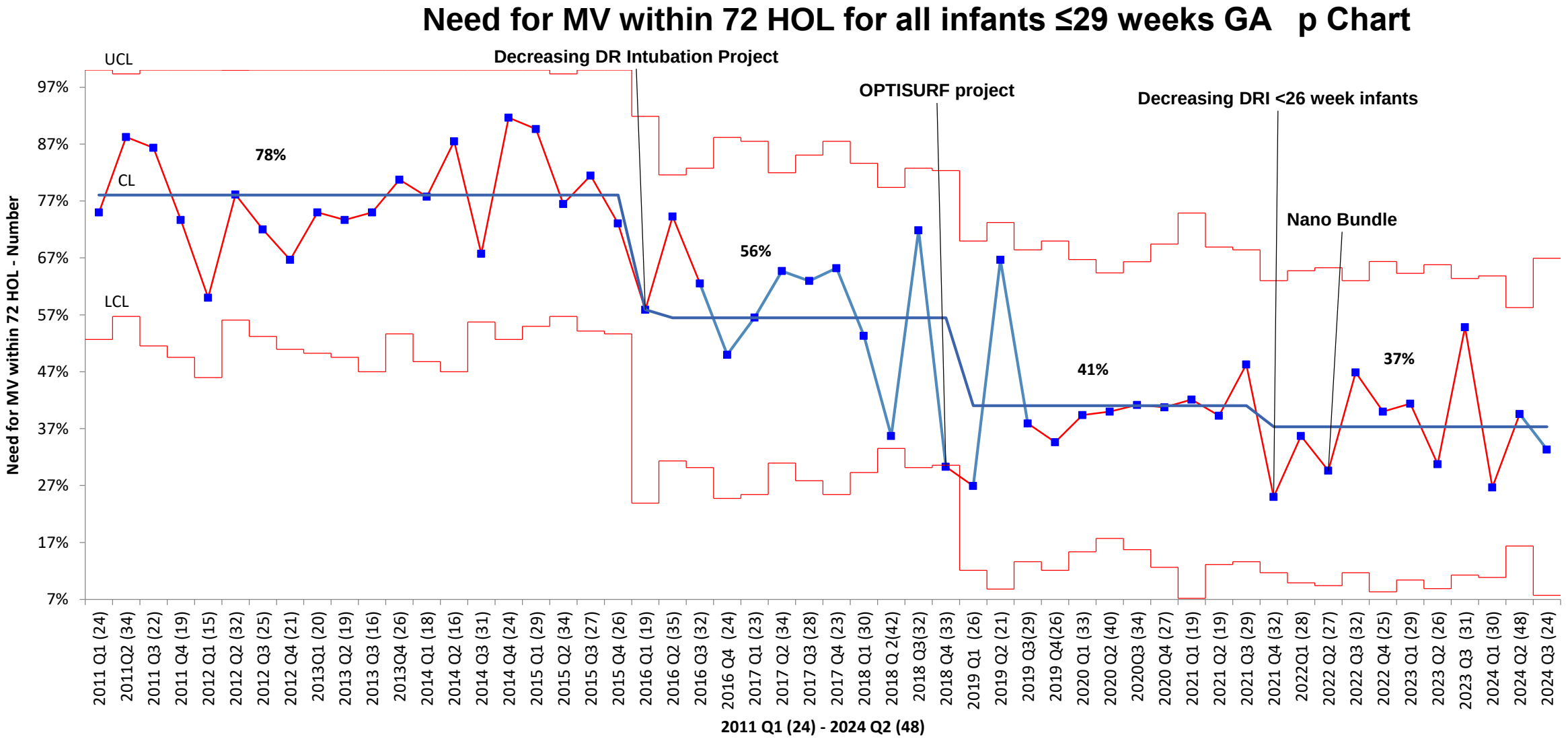
Delivery Room Intubation Rate 22-29 weeks GA



Delivery Room Intubation Rate in 22-25 weeks gestational age infants

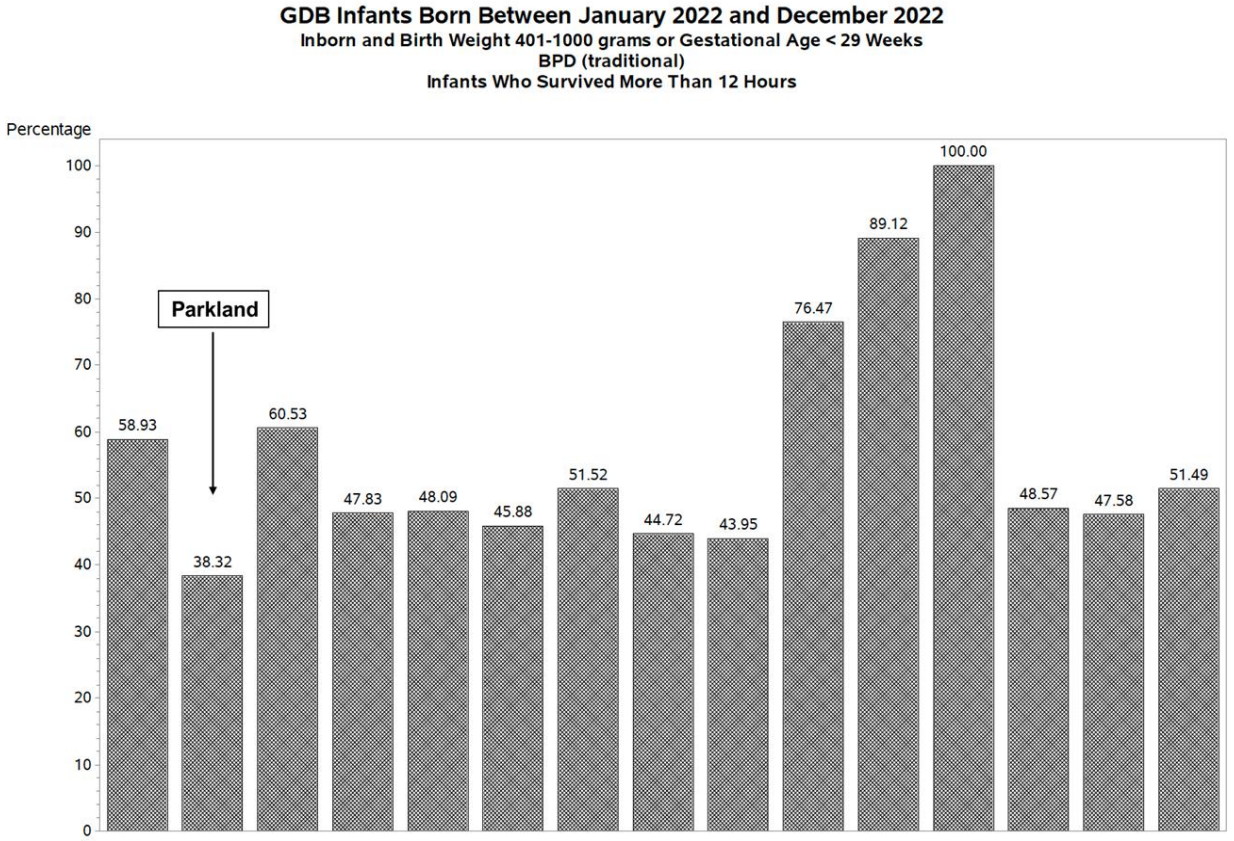


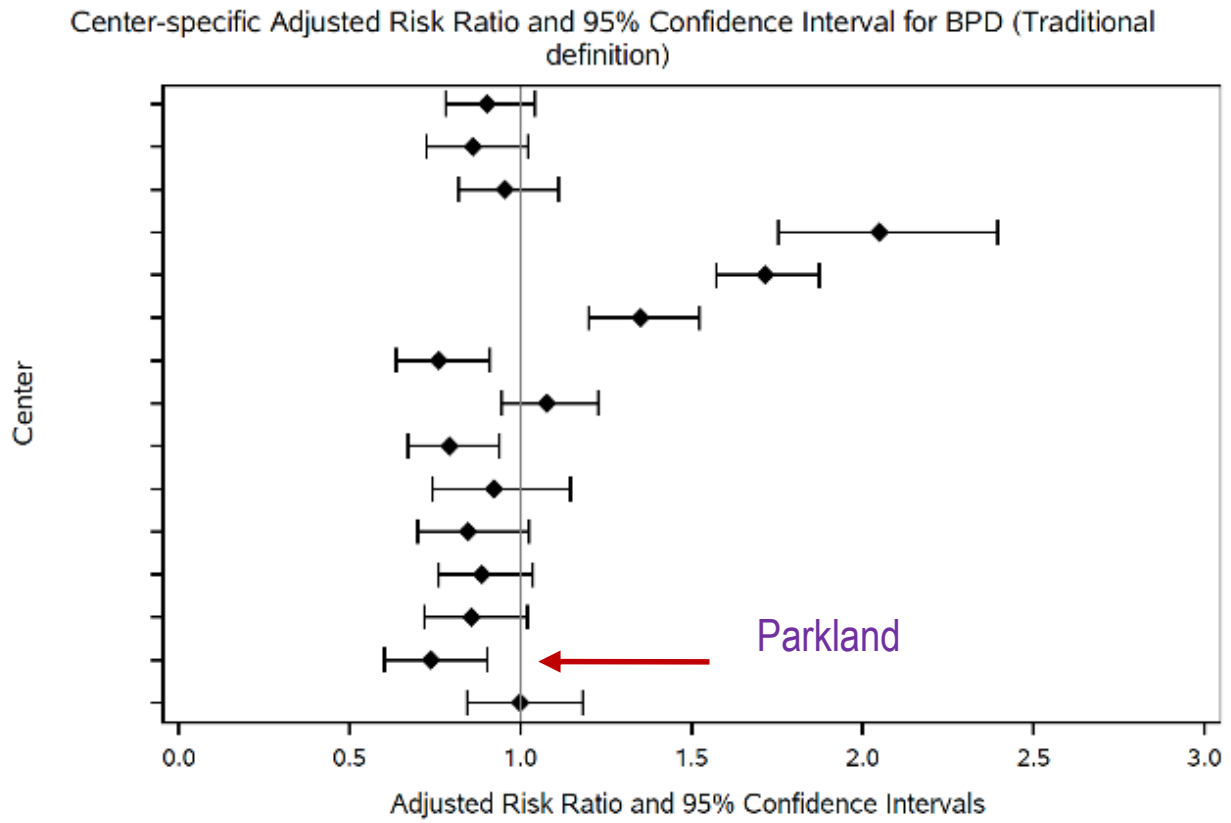

% of infants admitted on CPAP requiring MV within 72 hours
UCL
0.734
OPTISURF Protocol
44%
CL
14%
LCL
CPAP failure - Number of infants admitted on CPAP
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2016 Q1 (14)
2016 Q2 (22)
2016 Q3 (18)
2016 Q4 (16)
2017 Q1 (17)
2017 Q2 (22)
2017 Q3 (18)
2017 Q4 (13)
2018 Q1 (16)
2018 Q2 (25)
2018 Q3 (17)
2018 Q4 (27)
2019 Q1 (20)
2019 Q2 (10)
2019 Q3 (18)
2019 Q4 (19)
2020 Q1 (22)
2020 Q2 (27)
2020 Q3 (23)
2020 Q4 (21)
2021 Q1 (15)
2021 Q2 (21)
2021 Q3 (18)
2021 Q4 (22)
2022 Q1 (22)
2022 Q2 (27)
2022 Q3 (23)
2022 Q4 (23)
2023 Q1 (28)
2023 Q2 (24)
2023 Q3 (25)
2023 Q4 (26)
2024 Q1 (13)
2024 Q2 (37)
2024 Q3 (18)
Year/Quareter


Need for MV within 72 HOL for all infants ≤29 weeks GA p Chart
UCL
CL
LCL
Decreasing DR Intubation Project
OPTISURF project
Decreasing DRI <26 week infants
Nano Bundle
78%
56%
41%
37%
Need for MV within 72 HOL - Number
97%
87%
77%
67%
57%
47%
37%
27%
17%
7%
2011 Q1 (24)
2011Q2 (34)
2011 Q3 (22)
2011 Q4 (19)
2012 Q1 (15)
2012 Q2 (32)
2012 Q3 (25)
2012 Q4 (21)
2013Q1 (20)
2013 Q2 (19)
2013 Q3 (16)
2013Q4 (26)
2014 Q1 (18)
2014 Q2 (16)
2014 Q3 (31)
2014 Q4 (24)
2015 Q1 (29)
2015 Q2 (34)
2015 Q3 (27)
2015 Q4 (26)
2016 Q1 (19)
2016 Q2 (35)
2016 Q3 (32)
2016 Q4 (24)
2017 Q1 (23)
2017 Q2 (34)
2017 Q3 (28)
2017 Q4 (23)
2018 Q1 (30)
2018 Q 2(42)
2018 Q3(32)
2018 Q4 (33)
2019 Q1 (26)
2019 Q2 (21)
2019 Q3(29)
2019 Q4(26)
2020 Q1 (33)
2020 Q2 (40)
2020Q3 (34)
2020 Q4 (27)
2021 Q1 (19)
2021 Q2 (19)
2021 Q3 (29)
2021 Q4 (32)
2022Q1 (28)
2022 Q2 (27)
2022 Q3 (32)
2022 Q4 (25)
2023 Q1 (29)
2023 Q2 (26)
2023 Q3 (31)
2024 Q1 (30)
2024 Q2 (48)
2024 Q3 (24)
2011 Q1 (24) - 2024 Q2 (48)

Bronchopulmonary Dysplasia (BPD)

Comparison of Parkland NICU vs. NICHD Neonatal Research Network (NRN) Centers





**GDB = NICHD Neonatal Research Network Generic Database of 15 large academic centers in the USA*

How do we compare with VON centers?

Summary

- Avoiding MV and stabilization of preterm infants on CPAP at birth improves outcomes.
- Large body of evidence supports LISA using thin catheter in preterm infants
- Our single center experience shows that implementation of QI bundle consisting of stepwise escalation of CPAP and LISA guided by $FiO_2 \geq 0.3$ decrease the need for MV, PDA treatment and incidence of pneumothorax.
- Infants ≤25 weeks GA requiring $FiO_2 \geq 0.3$ are at risk of LISA failure
- Further studies are necessary to evaluate strategies to decrease LISA failure
- Need for MV in preterm infants can be decreased with concerted and sustained team efforts

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- Parkland Golden Hour and CPAP/LISA team members
- All faculty, fellows, advanced practice providers and residents working/worked at Parkland NICU
- Research team and database management team

APLUS Conference, Dallas, TX, Oct 2023

PAS Workshop, Denver, CO, 2022

PAS Workshop, Washington, DC, 2023

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