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CELEBRATE PEDIATRIC RESEARCH DAY
UBC DEPARTMENT OF PEDIATRICS

Fellow Oral Competition

FRIDAY, APRIL 14TH, 2023

Dr. Leah Halpenny

Enhanced Communication with Families of Preterm Infants in the NICU: A Quality Improvement Project

Dr Leah Halpenny, Mimi Kuan, Elisa Karanjia, Dr Emily Kieran

UBC Celebrate Research Day, 14th April 2023

BC WOMEN'S HOSPITAL+ HEALTH CENTRE

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Background

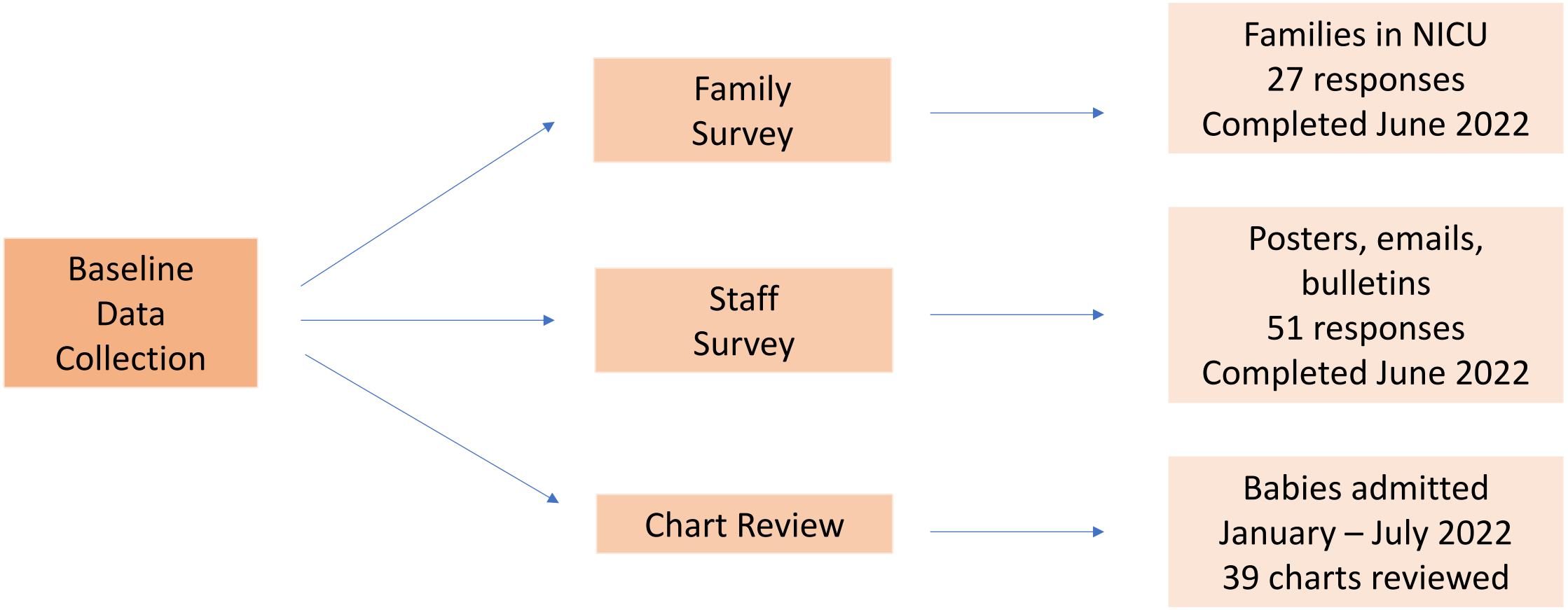
- Communication in the NICU significant impacts parental outcomes
  - Reduced stress
  - Information accuracy and parental understanding
  - Tailoring communication improves satisfaction

- Previous work at BCWH NICU identified families who would benefit from enhanced communication

Aim

- Increase documented initial family-centred communication episodes (≤96 hours) with families of infants <30 weeks to 80% by April 2022

Baseline Data



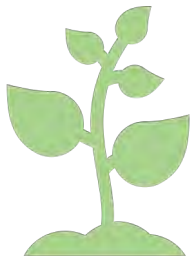
‘Early Communication Episode’

- 96.3% of families reported having a communication episode within 96 hours of admission
- 66.7% of staff reported they routinely met families within 96 hours
- 66.7% of charts had some form of documented communication

“ Family Updated”

“ Family Present on Rounds”

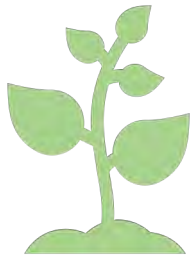
Family Centred communication



- 59.3% of families were asked about their **values/goals/wishes**
- 58.8% of staff reported they routinely ask

- 77.8% of families were asked about **concerns/worries/fears**
- 58.8% of staff reported routinely asking

Values/Goals/Wishes



Yes No

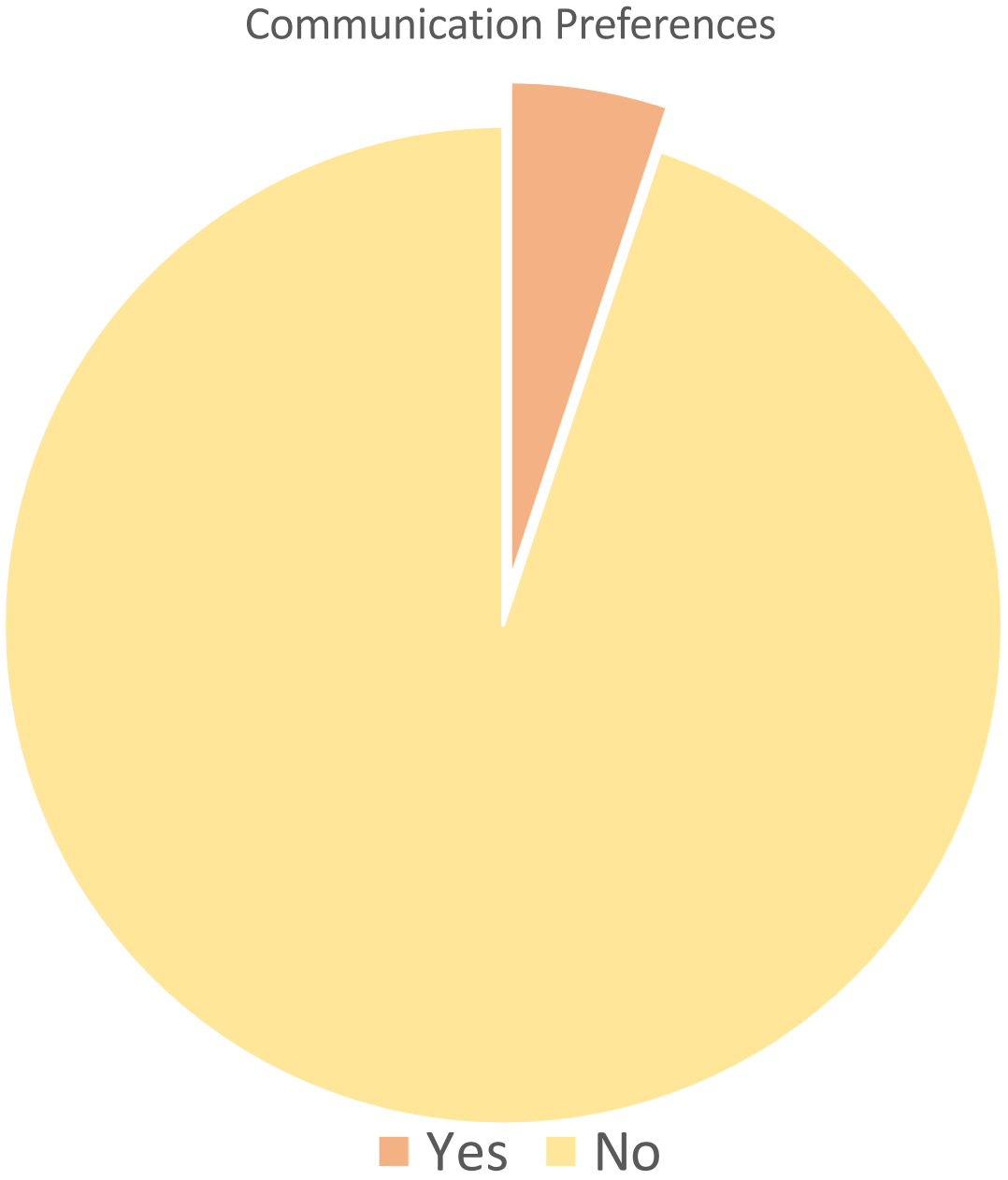
Concerns/Fears/Worries

Yes No

Communication Preferences

- 59.3% of families reported being asked how they would like to receive information

- 23.5% of staff routinely ask how families would like to receive information


Communication Preferences
Yes
No

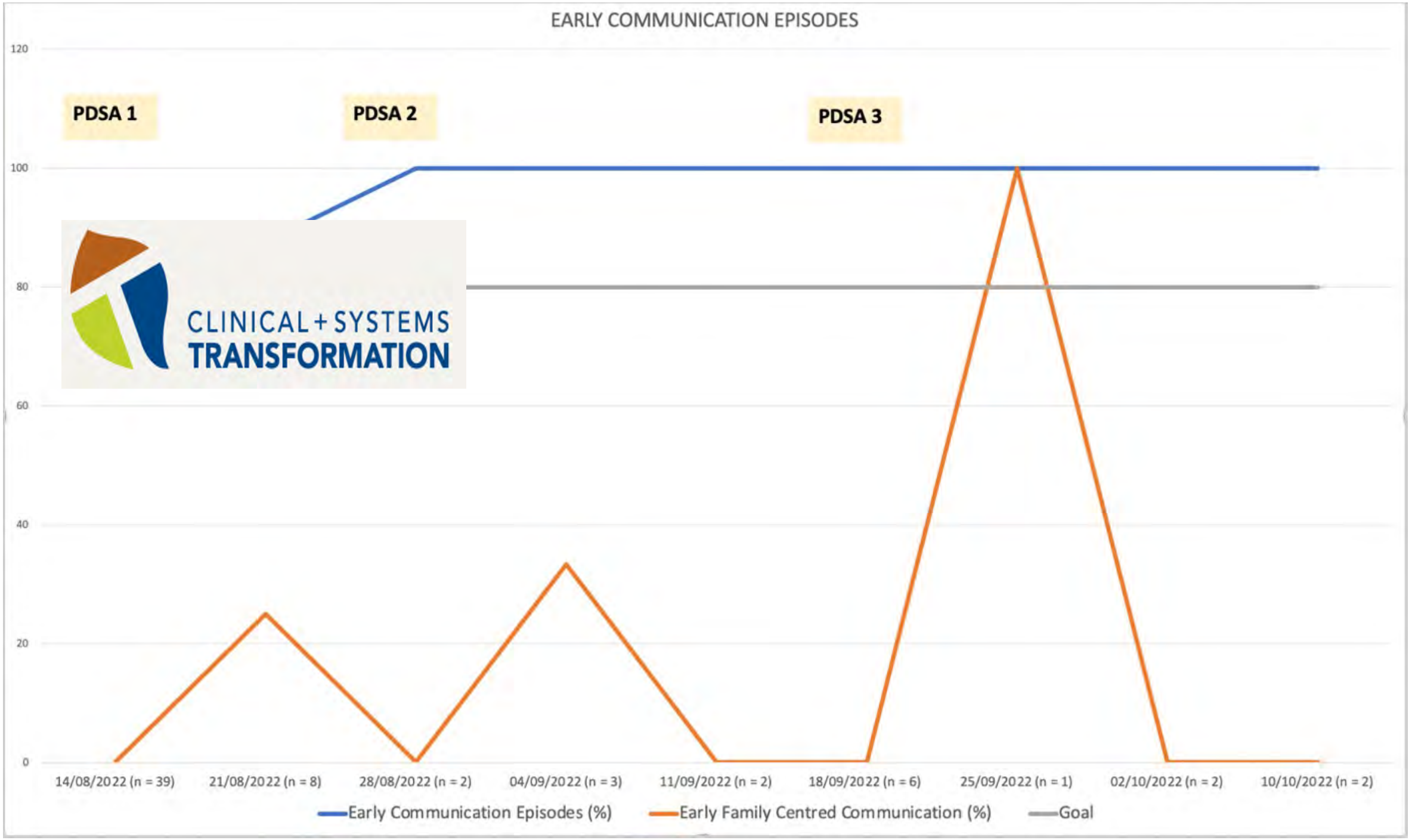
Consistency

”We had multiple doctors/surgeons coming in to talk to us in the same day giving conflicting information

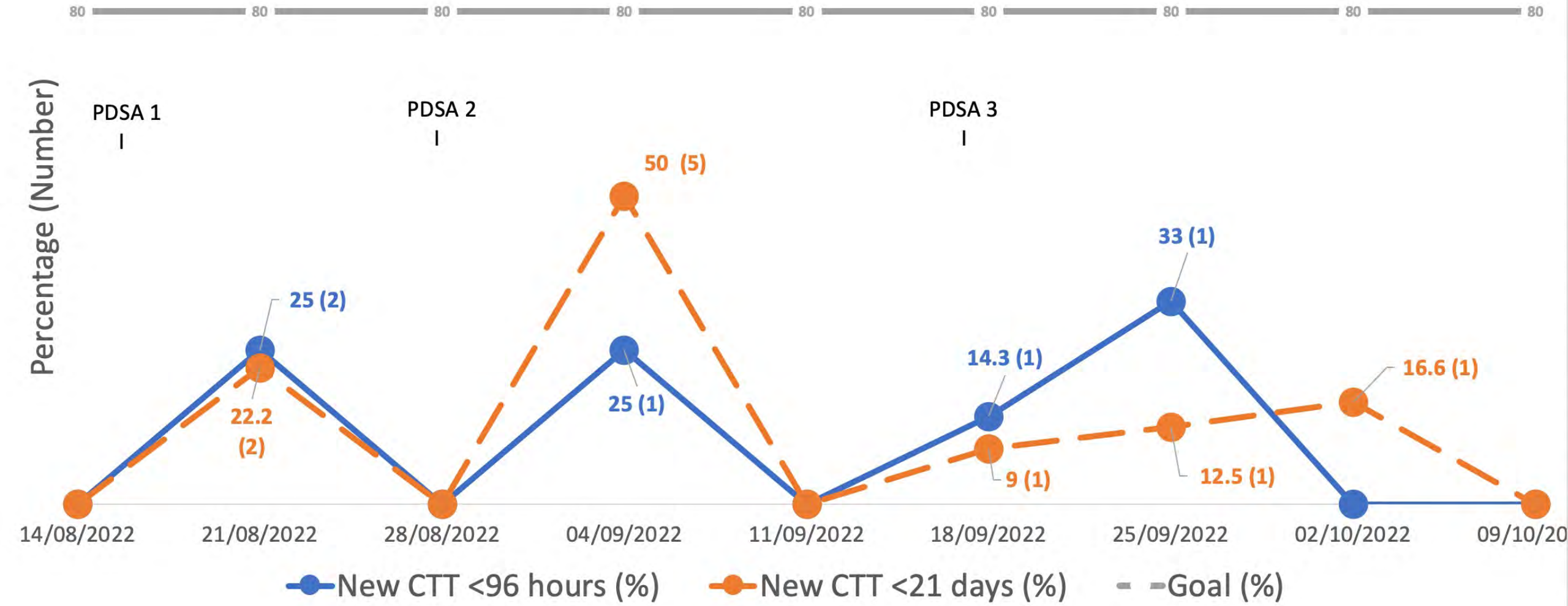
“Nurse consistency makes a huge difference on the care received”

“I wonder if it would be helpful to have someone who is a designated person who explains the treatment plan in detail, what the day-to-day will look like for the baby”

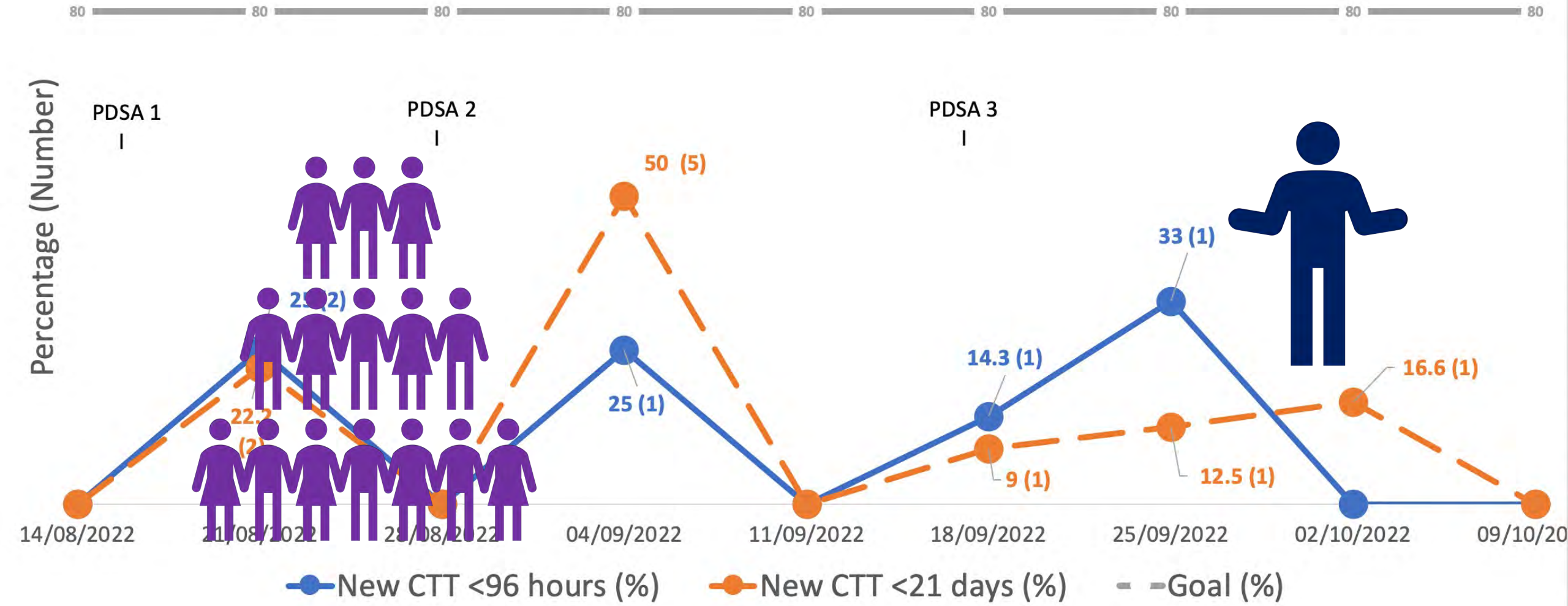
PDSA 1	August 15 – 28 2022	CTT introduced Project team present on NICU Knowledge translation (KT) rounds
PDSA 2	Aug 29 – Sept 18 2022	CTT placed at bedside of eligible babies. Email including KT rounds presentation and educational video circulated. Presentation to Continuous Professional Development Committee
PDSA 3	Sept 19 – Oct 10 2022	Targeted email to on-service neonatologist at beginning of service to highlight use of tool

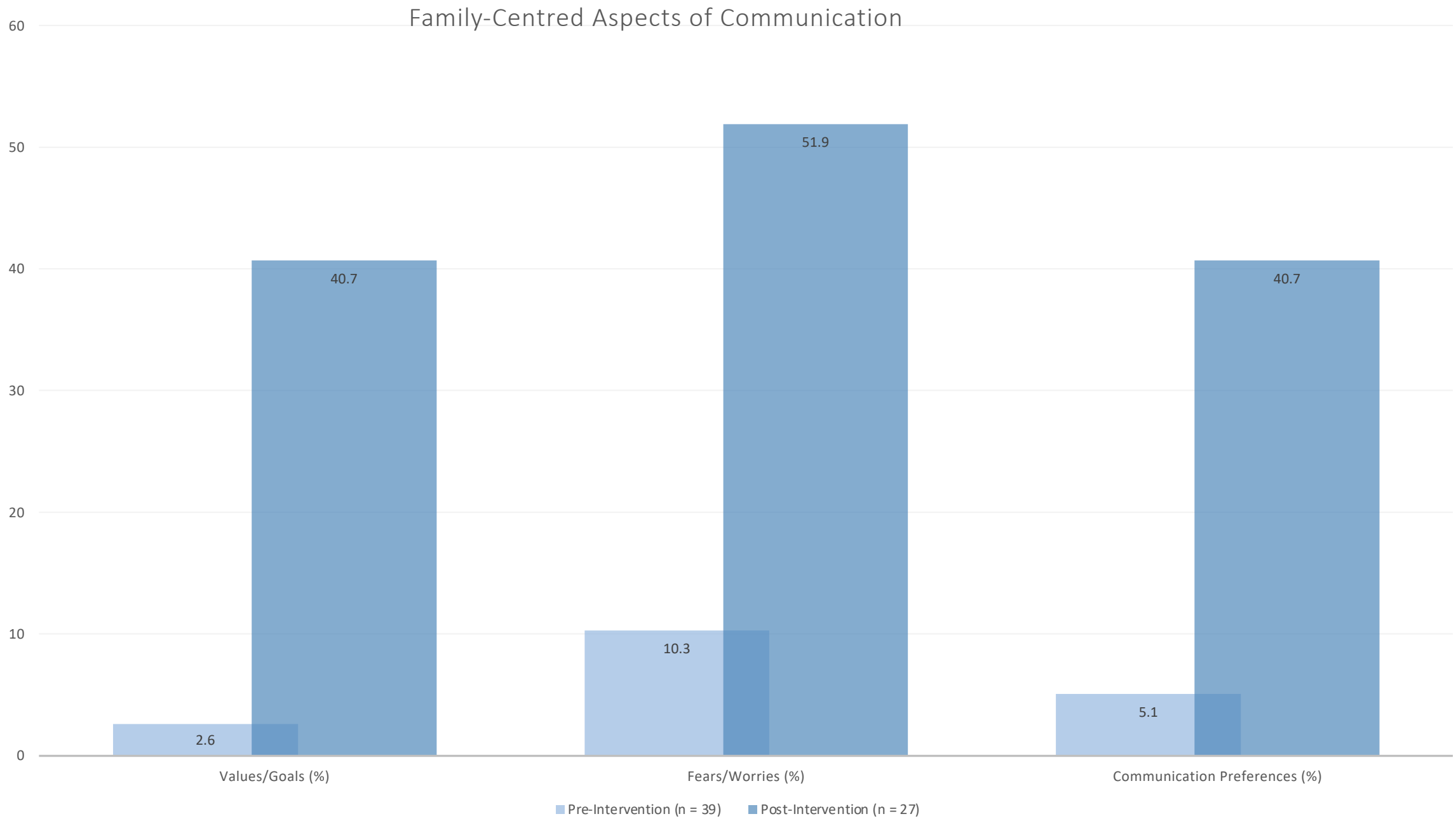

EARLY COMMUNICATION EPISODES
120
100
80
60
40
20
0
PDSA 1
PDSA 2
PDSA 3
CLINICAL + SYSTEMS
TRANSFORMATION
14/08/2022 (n = 39)
21/08/2022 (n = 8)
28/08/2022 (n = 2)
04/09/2022 (n = 3)
11/09/2022 (n = 2)
18/09/2022 (n = 6)
25/09/2022 (n = 1)
02/10/2022 (n = 2)
10/10/2022 (n = 2)
Early Communication Episodes (%)
Early Family Centred Communication (%)
Goal

NEW CTT INTERACTIONS



NEW CTT INTERACTIONS




Family-Centred Aspects of Communication
60
50
40
30
20
10
0
40.7
51.9
40.7
10.3
2.6
5.1
Values/Goals (%)
Fears/Worries (%)
Communication Preferences (%)
Pre-Intervention (n = 39)
Post-Intervention (n = 27)

Version 2.5
Updated: December 24, 2021

COMMUNICATION TRACKING TOOL

Name of baby: _____ **Primary Tracker(s):** _____

Name of parents: _____

_____

Preferred language: _____

Indicators for increased need for communication (check all that apply):

[ ] Predicted/expected duration in NICU >6 weeks
[ ] Uncertain diagnosis/ prognosis
[ ] Not following predicted trajectory
[ ] Multiple teams
[ ] Parents unfamiliar with health care system
[ ] Cultural aspects: _____
[ ] Parents* and clinical team's goals are different
[ ] Parents differ about care plan/goals of care
[ ] Parents cannot talk about the "what ifs"
[ ] Financial/social stressors
[ ] English not a primary language
[ ] Other reason _____

Significant Communication (ie. Family team meeting, review of tests…):

Name	Discipline	Date	Disclosure

What is the parents' understanding of their baby's illness/condition?

[ ] Emerging understanding
[ ] Underestimating prognosis/wellness
[ ] Overestimating prognosis/wellness
[ ] Appropriate understanding

Notes:

Date Updated: _____

How much information would parents like to receive about what is likely to be ahead with baby's illness/condition?

[ ] Want to be fully informed
[ ] Want some information but no "bad news" – *explore approaches to sharing information*
[ ] Want to be informed of a big picture, but not details
[ ] Parent does not want information

Designated surrogate decisions maker/support: _____

Notes: _____

What has the team communicated thus far regarding prognosis?

Life Expectancy (if predicted/disclosed)

[ ] Days to weeks
[ ] Several weeks to months
[ ] More than a year
[ ] Childhood/adolescence
[ ] Will likely live into adulthood
[ ] Very uncertain (fragility may affect longevity)

Notes:

Discharge Plan

[ ] Discharge NICU stable by (date) _____
[ ] Discharge NICU fragile - needs ACCP by (date) _____
[ ] Transfer to another facility _____
[ ] Uncertainty when baby will be discharged
[ ] Not expecting discharge/ baby deteriorating

Family Values

If your baby becomes sicker, what are your most important goals?

[ ] Spend time with people that love him/her
[ ] Be in less medicalized environment (less interventions/tests, hospice, or home)
[ ] Be physically comfortable
[ ] Live as long as possible

Notes: _____

What are your biggest fears or worries about the future with your baby's condition/illness?

[ ] Suffering
[ ] Neuro-disability
[ ] Physical disability
[ ] Financial difficulties
[ ] Family stress
[ ] Extent/burden of care
[ ] Going home
[ ] Preparing for death
[ ] The unknown

What gives you strength as you think about your baby's illness/condition and the future?

[ ] Family
[ ] Friends
[ ] Social Work
[ ] In-ward psychologist
[ ] Spirituality: _____
[ ] Culture: _____
[ ] Other: _____
[ ] Limited support
[ ] Described no support

Notes: _____

How much have you shared with your other children and your extended family/supports about your baby's condition/illness and what might be ahead?

[ ] Does not want family informed
[ ] Some discussion, wants help talking to other children/family
[ ] Some discussion but incomplete
[ ] Extensive discussion – ongoing
[ ] Wants clinician to talk to children/family

Notes: _____

If your baby becomes sicker, what are you willing to explore for the possibility of gaining more time?

[ ] Be on maximum medical support
[ ] Undergo tests and procedures
[ ] Be uncomfortable
[ ] Remain in hospital

Notes:

Date Updated: _____

Referral for Canuck Place consultation

[ ] Yes
[ ] No

Date: _____

Notes: _____

Plan and next steps in communication support:

Conclusions & Next Steps

- Increased documented family-centred communication
- Need for education and awareness
- Feedback from staff and families
- Integration into online systems / CST
- Expansion to other patient groups


Thank You!

References

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Dr. Uthaya Kumaran

Trends, practice patterns, and opportunities for improvement in postnatal steroids use for bronchopulmonary dysplasia (BPD) or chronic lung disease (CLD) in preterm infants- eleven years observational study

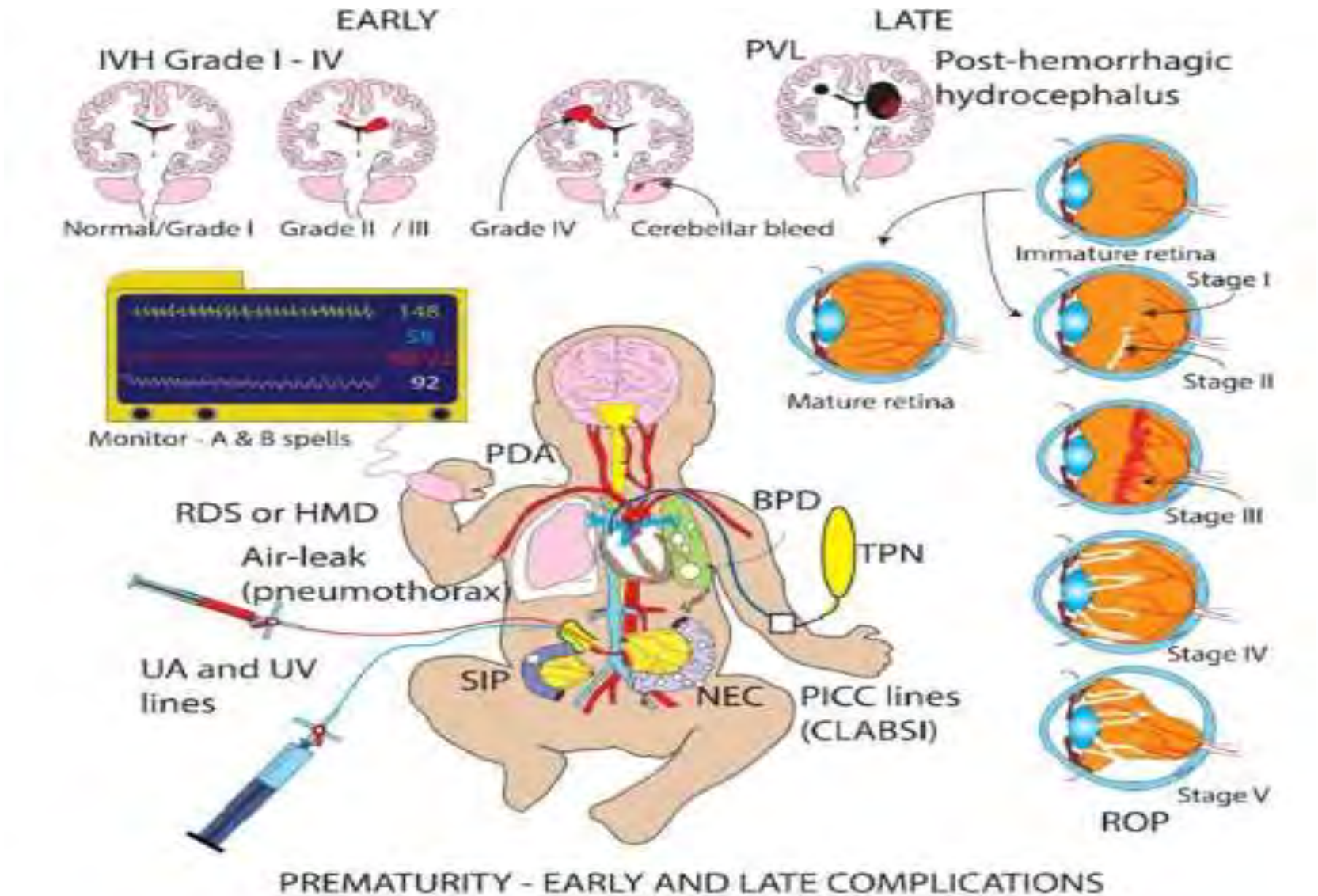
Uthaya Kumaran, MD, Fellow in Neonatal-Perinatal Medicine

Jason Tan, PharmD, Clinical Pharmacy Specialist

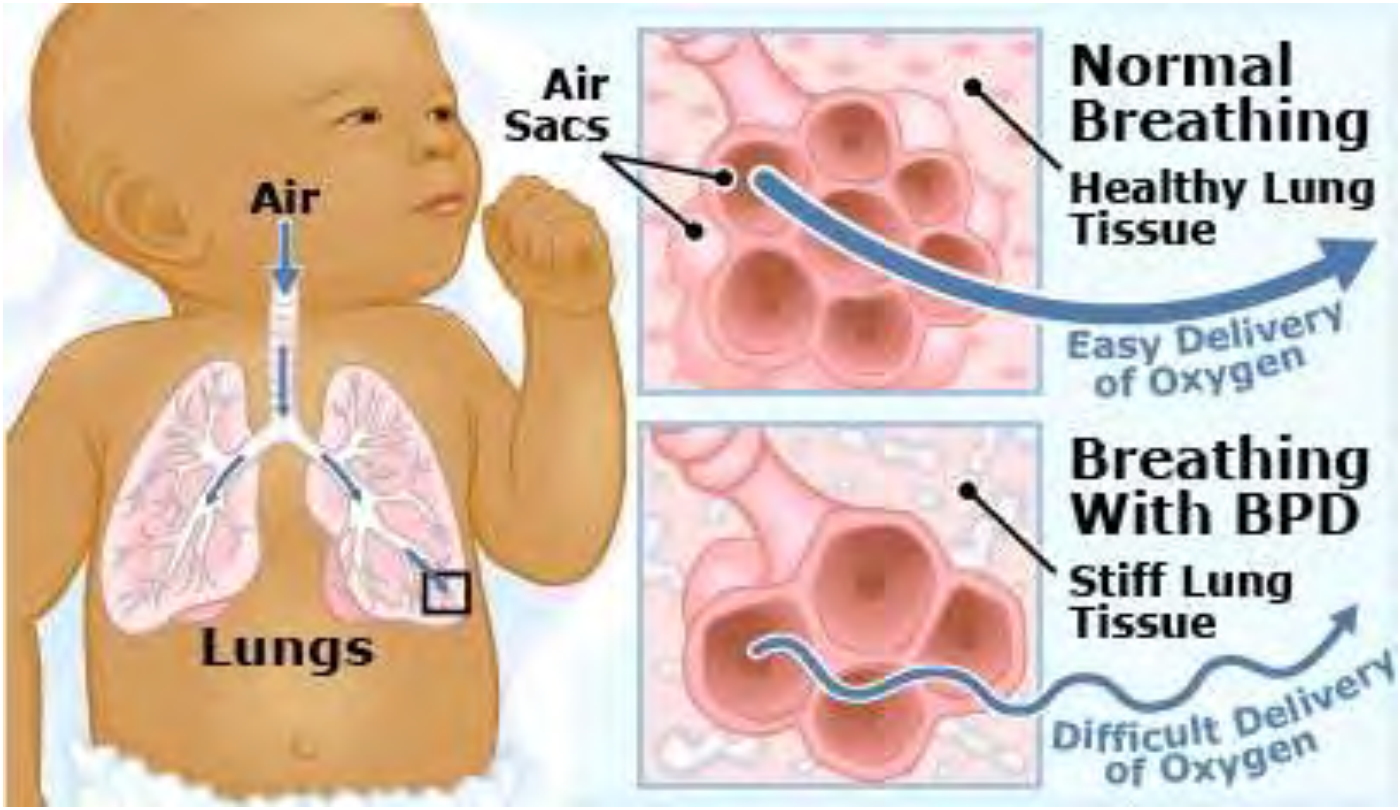
Sandesh Shivananda, Associate Professor and Neonatologist

Celebrate Research Day, April 14, 2023

Prematurity complications



Inflammation plays a major role in the pathophysiology CLD



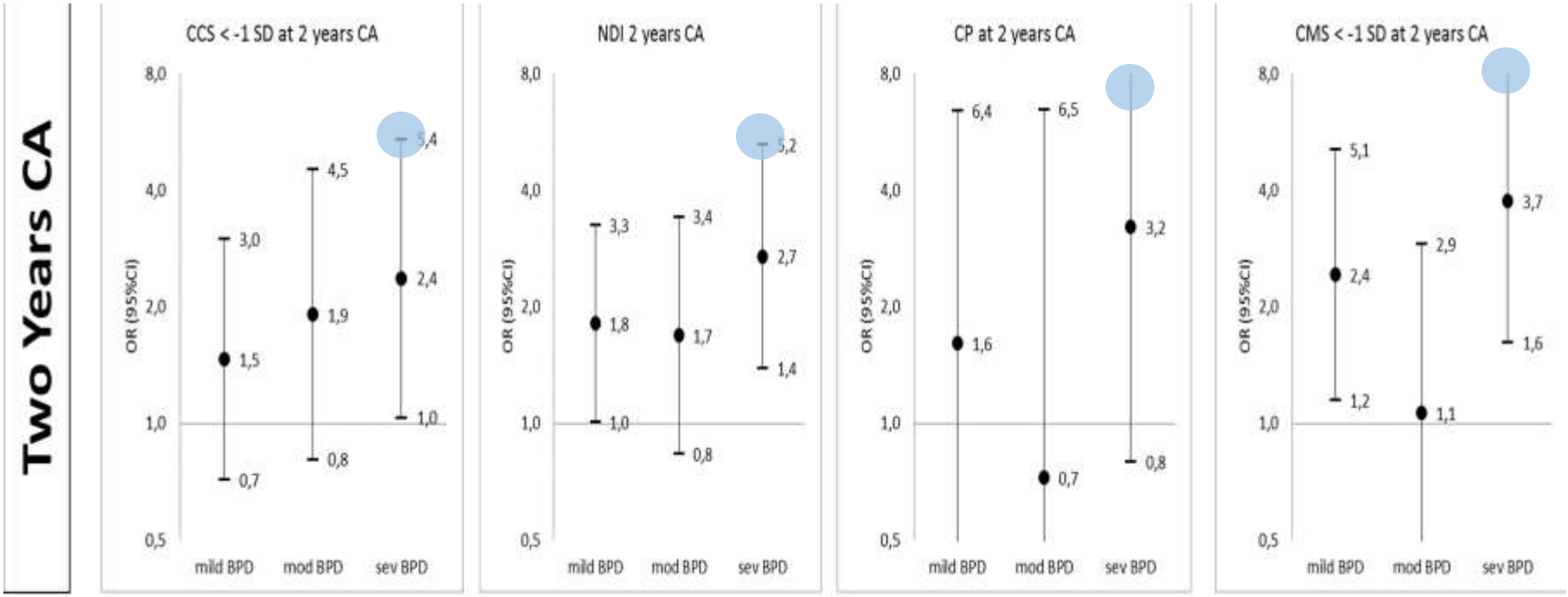
CNN classifies CLD based on oxygen and respiratory support

- CLD rate is defined as need for oxygen, flow rate, respiratory support (CPAP or ventilation) in < 33 weeks infants at 36 weeks or discharge

Severity	Respiratory support at 36 weeks PMA or at discharge	Oxygen	Flow
No CLD	None	21%	None
Mild CLD	Headbox or incubator	>21%	Any
	Nasal cannula	100%	<0.1 l/min
	Nasal cannula blended air/oxygen	21-99%	<1.5l/min
Moderate CLD	Nasal cannula	100%	>100cc/min
	Nasal cannula blended air/oxygen	21-29%	>1.5L/min
	CPAP, SIPAP, NIPPV, NIHFV	21-29%	
Severe CLD	Nasal cannula blended air/oxygen	>30%	>1.5L/min
	CPAP, SIPAP, NIPPV, NIHFV	>30%	
	Mechanical ventilation	21-100%	

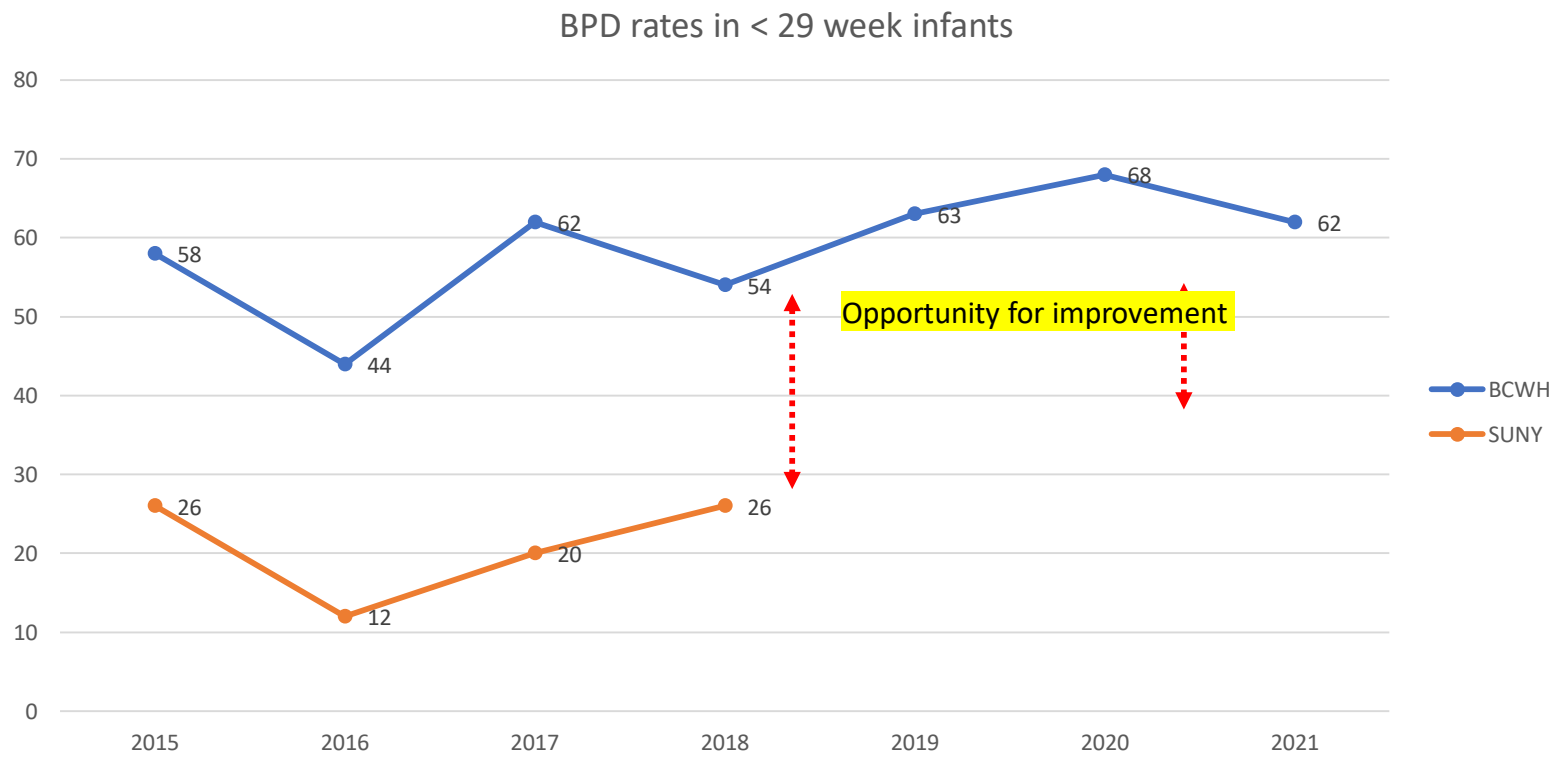
http://www.canadianneonatalnetwork.org/portal/Portals/0/2020%20CNN%20report_Oct%201%20Final.pdf

CLD at 36 w PMA increases risk of intellectual or physical disability, hearing, vision, high resource use, & care burden



The Journal of Pediatrics 2022 24340-46.e2DOI: (10.1016/j.jpeds.2021.12.018)

CLD rate at BCWH is higher in comparison with best ranked Centre in Canada



Postnatal steroids is a key intervention for CLD

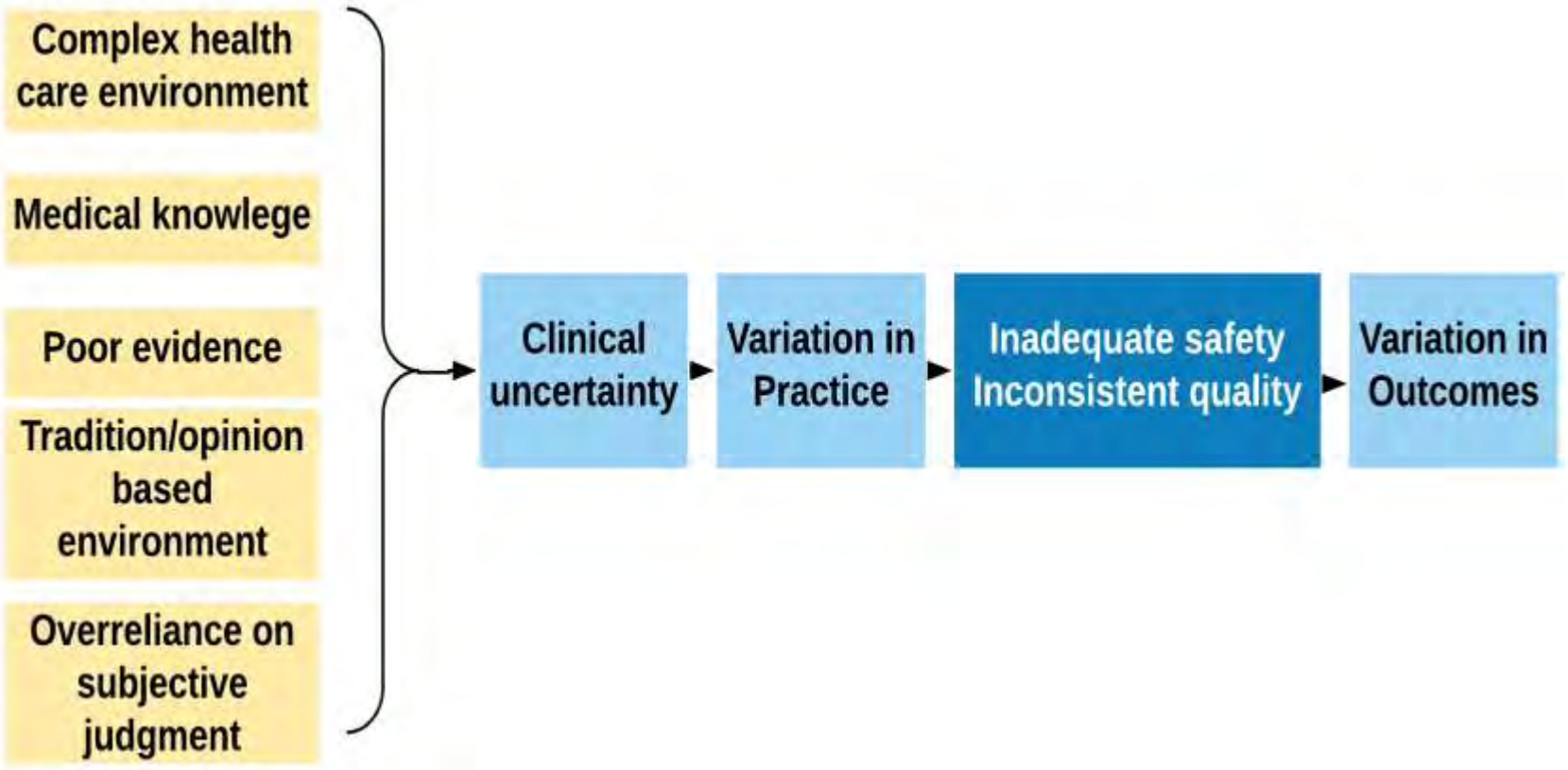
Pros

- Reduced Pulmonary Inflammatory response
- Break the vicious cycle of ongoing lung injury with invasive ventilation

Cons

- Short term
  - SIP
  - Infection
  - Hyperglycemia
  - Poor growth
  - Adrenal insufficiency
- Long Term
  - Intellectual or physical disability, hearing, vision

Perceived variation in use of steroids in BCWH NICU



Methods

- Design – retrospective observational study
- Inclusion – infants <33 weeks received steroids for CLD
- Exclusion – Major cardiac/respiratory anomalies
- Site - BCWH

Methods

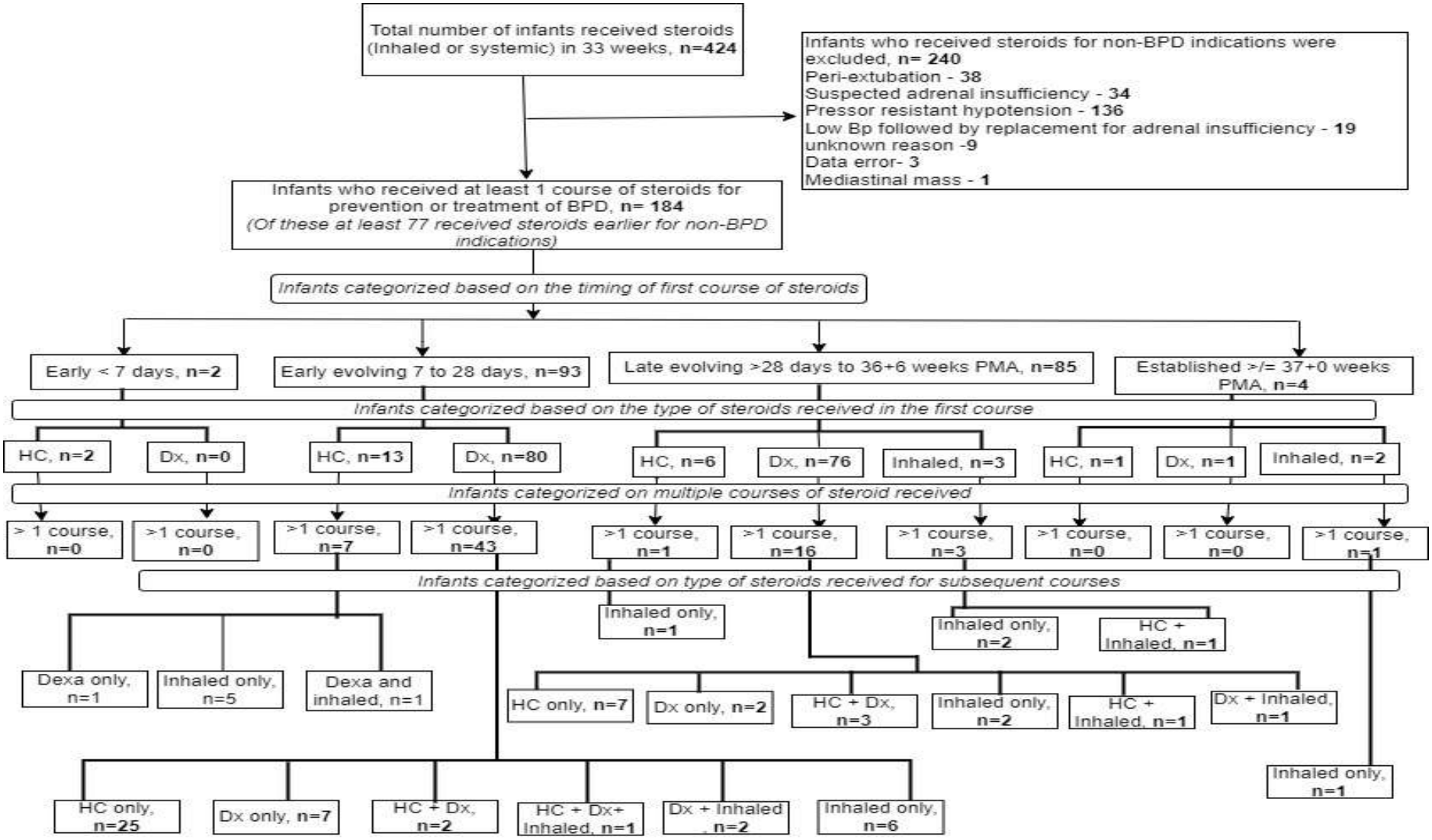
- Period – 11 years from Jan 2011 – Dec 2021
- REB approved - H21-03933, approved on 9/3/2022
- Data sources – Pharmacy, CNN, Chart review
- Analysis-Descriptively
- Subgroup: Dx vs. HC; Single vs. Multiple courses, survivors vs non-survivors

Documentation for indications for steroids when not recorded, was inferred by review of charts

Objectives

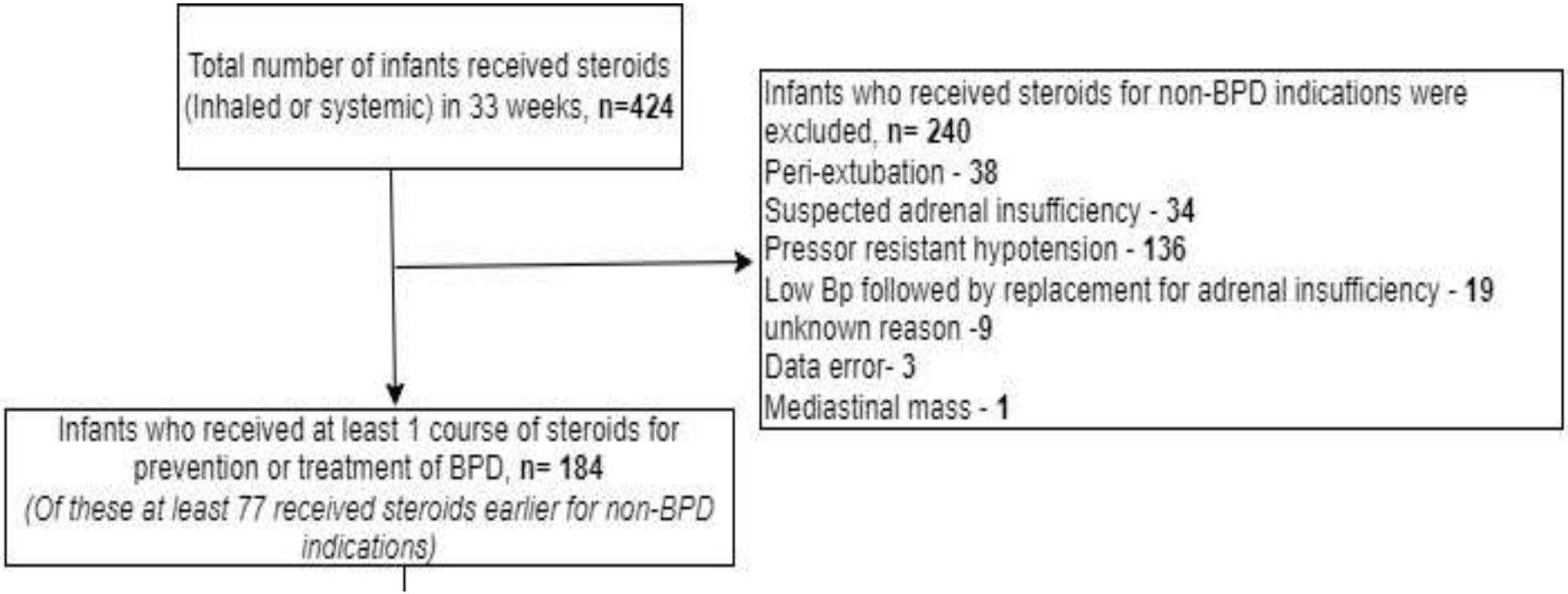
- Primary
  - Determine time of initiation, steroid type, regimen, use over time for prevention or treatment of BPD
- Secondary
  - Describe protocol deviations, resource utilization & outcomes
  - Identify opportunities for improving practices

Flow diagram

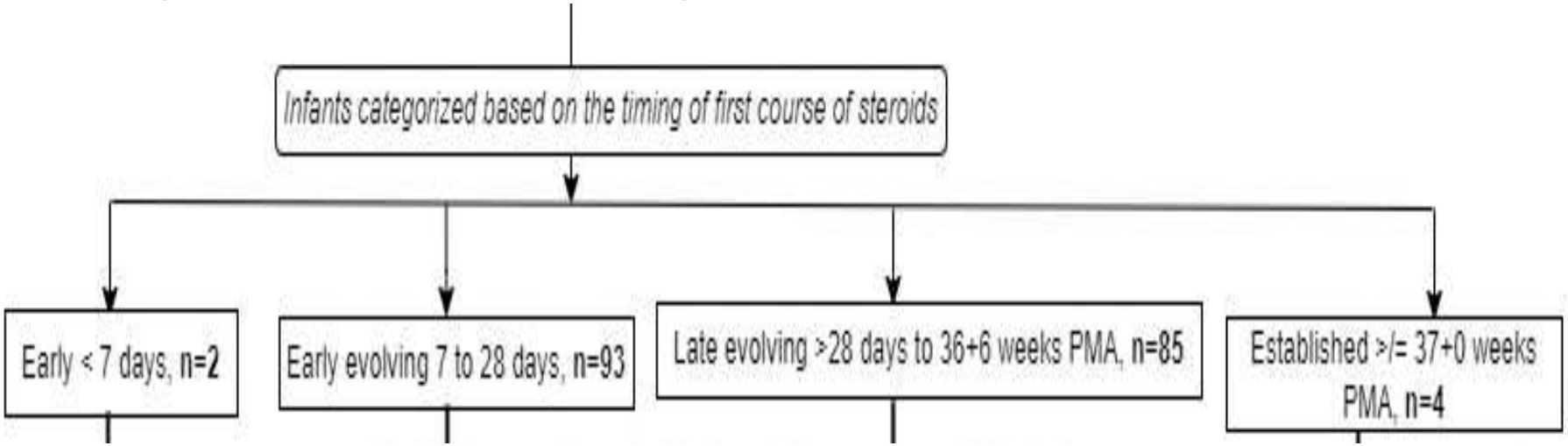


HC - Hydrocortisone, Dx-dexamethasone, BPD - Broncho pulmonary dysplasia, PMA - post menstrual age

RESULTS

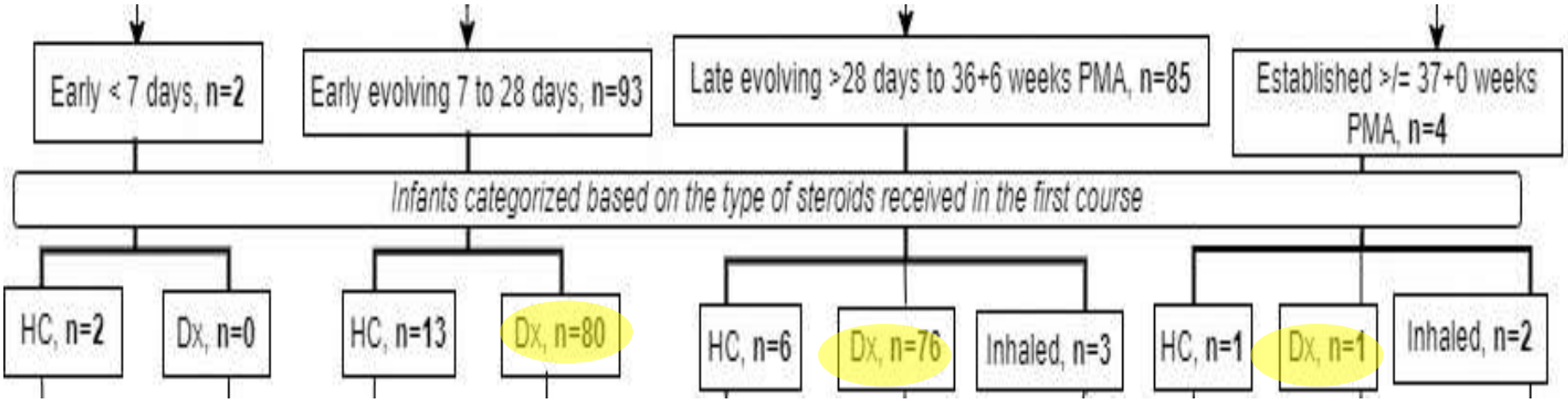

Total number of infants received steroids (Inhaled or systemic) in 33 weeks, n=424
Infants who received steroids for non-BPD indications were excluded, n= 240
Peri-extubation - 38
Suspected adrenal insufficiency - 34
Pressor resistant hypotension - 136
Low Bp followed by replacement for adrenal insufficiency - 19
unknown reason -9
Data error- 3
Mediastinal mass - 1
Infants who received at least 1 course of steroids for prevention or treatment of BPD, n= 184
(Of these at least 77 received steroids earlier for non-BPD indications)

Most infants received steroids in EE 7 -28 days and LE 28 days – 36 w



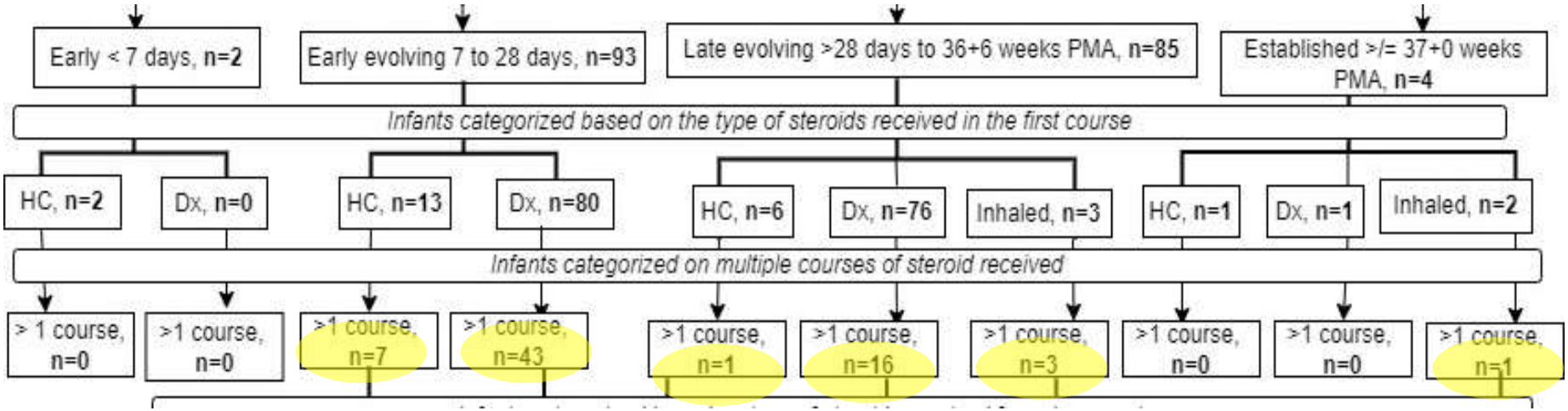
	1%	**50%**	**46%**	**2%**
Median age	2 days	19 days	38 days	75

85% and 12% infants received Dexa and Hydrocortisone (HC) as the first course of steroids



DART and STOP BPD were the only two regimen used in the unit

39% infants received more than one course of steroids, & HC was the most common steroid used (48%)



DEXA 20%, HC 48%, DEXA & HC 8%

Infants have a lengthy stay & receive prolonged ventilation, & medications

Baseline characteristics	Total
Gest age wks, Med (IQR)	25 (24-26)
Birth wt in grams, Med (IQR)	720 (625-841)
Surfactant, n (%)	184 (100.0)
Antibiotics, n (%)	184 (100.0)
Length of stay, Med (IQR)	127 (102-164)
Ventilator support days (invasive + non-invasive), Med (IQR)	105 (83-141)
Intubated and ventilated days, Med (IQR)	45 (32-65)
Oxygen days, Med (IQR)	81 (60-114)
Narcotic infusion, n (%)	181 (98.4)
Sedatives, n (%)	155 (84.2)
Muscle relaxants, n (%)	40 (21.7)
Inhaled nitric oxide, n (%)	43 (23.4)

Infants receive higher cumulative dose of steroids than those received for CLD

	Early < 7 days N=2	Early evolving 7-28 days, n=93	Late evolving 28 days-36 w PMA, n=85	Established >36 w PMA, n=4	Total	p-value
Cumulative steroid dose exposure (in Hydrocortisone equivalents mg/kg) – only for BPD, Med (IQR) *#	86 (70-92)	24 (24-60)	24 (24-25)	24 (5-26)	24 (24-48)	0.01
Cumulative steroid exposure (in Hydrocortisone equivalents mg/kg)- for any reason*#	86 (70-96)	43 (24-66)	34 (24-57)	24 (5-26)	38 (24-65)	0.3
Repeat course used, n (%)	0	50 (53.8)	20 (23.5)	1 (25)	71 (38.6)	<0.001

Protocol deviation with STOP-BPD was higher (66%) than for DART (33%)

Day of initiation of steroid course, Med (IQR)	29 (19-38)
Protocol deviation in at least 1 course* from published protocols (Total, n (%))	84 (45.7)
Based on duration, n (%)	52 (28.3)
Based on dosing, n (%)	16 (8.7)
Based on timing, n (%)	12 (6.5)
Unclear indication, n (%)	4 (2.2)

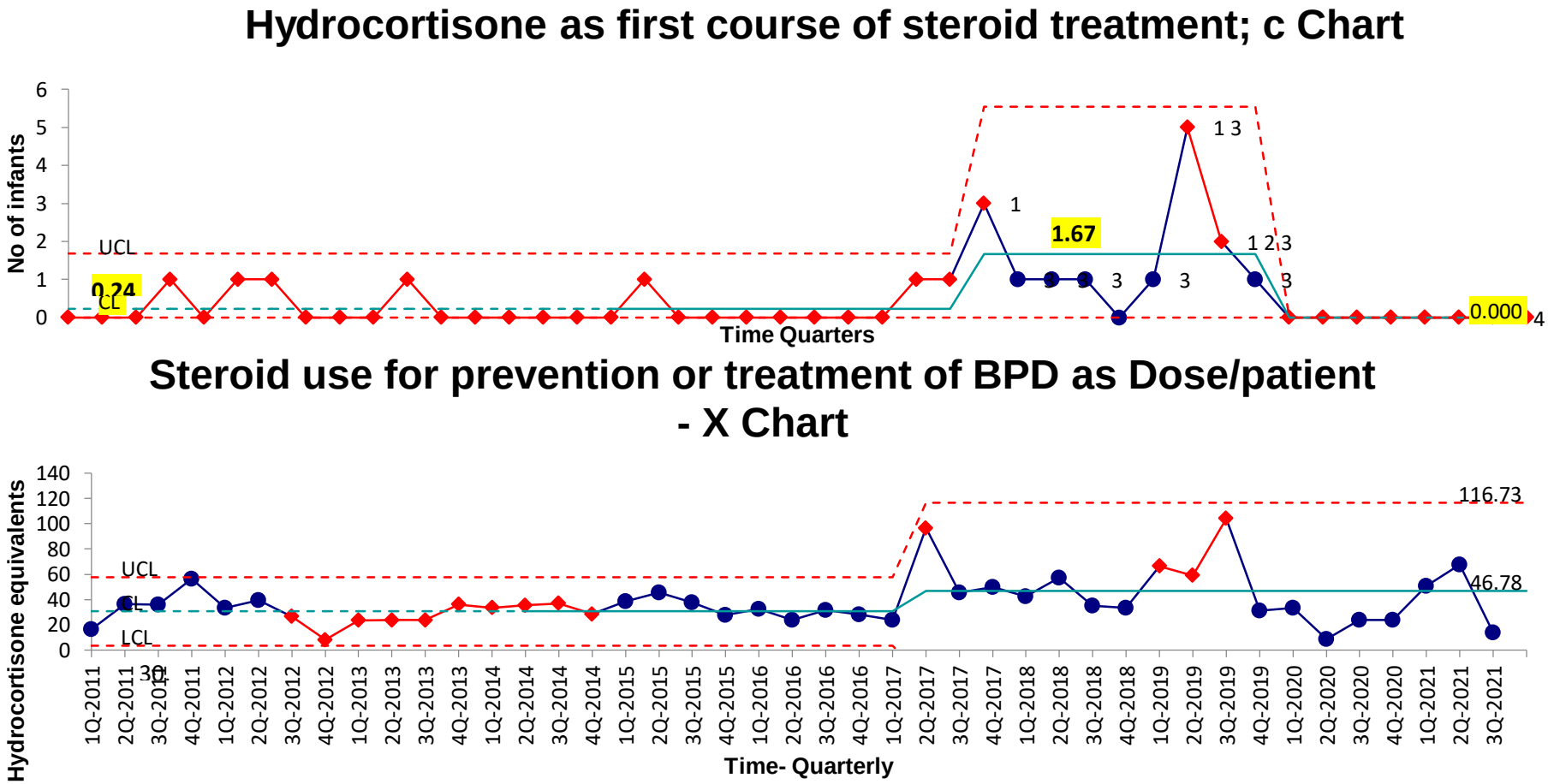
Protocol deviation was defined as 20% for duration and 10% for dose for this study

https://www.lsuhsc.edu/administration/academic/ors/docs/HRP-2660_Examples%20of%20non-compliance%20&%20serious%20non-compliance_v1.1_5.30.20.pdf
Doyle et al 2006, Neoreviews
Onland 2018 STOP-BPD. Statisticsal analysis plan, JAMA

Mortality is 13%, Disease-free survival is 1.5%, & Tech dependency is 67% at discharge

Mortality, n (%)	24 (13.0)
BPD at 36 weeks PMA, n (%)	167 (90.8)
• Moderate[#], n (%)	101 (54.9)
• Severe[$], n (%)	66 (35.9)
ROP treated, right or left, n (%)[!]	42 (22.8)
PDA treated, n (%) (Medical or surgical)	123 (66.8)
NEC Stage ≥ 2, n (%)	14 (7.6)
IVH Grade ≥ 3 n (%)	44 (23.9)
PVL grade >2, n (%)	17 (9.2)
Culture positive sepsis, n (%)	93 (50.5)
Spontaneous intestinal perforation, n (%)	11 (6)
Survival without major morbidity among survivors**, n (%)	3 (1.6)
Technology dependency (any of the following Oxygen, Monitor, Gavage, tracheostomy, Gastrostomy, Ventilation or CPAP) at discharge among survivors, n (%)!	107 (66.9)

Use of HC ↑ between 2017-19, and steroid dose received / patient for BPD has ↑ from 2017



Comment: Use of DX, multiple courses, or dose from non-BPD use has not increased over time

Conclusion on use of steroids for BPD at BCWH NICU

- Most commonly initiated in two time periods (7-28d) & (28d -36W PMA)
- DEXA is the most common steroid used (85%) - type
- DART & STOP-BPD are the two regimen used
- HC use increased between 2017-2019, and cumulative steroid received in infants has increased from 2017 - trends
- Protocol deviation occurs on 45% occasions
- Identified areas of improvement

Implications - Potential areas for improvement

- Aim for risk assessment based steroid use – BPD risk estimator

- Promote BPD prevention care bundle
    - e.g. Non-invasive surfactant administration & others to reduce the need for initiating steroids

- Creating a BPD task group to systematically plan and implement change ideas

BC WOMEN'S HOSPITAL+ HEALTH CENTRE

An agency of the Provincial Health Services Authority

thank you!

UBC

Department of Pediatrics

Dr. Sarah Riedlinger

Gonadal failure in childhood cancer survivors treated with high dose alkylating agents

Sarah Riedlinger

UBC Pediatric Celebrate Research Day

April 14, 2023

Disclosures

- I have no financial disclosures or conflicts of interest

Objectives

Review mechanism of gonadal failure in childhood cancer survivors (CCS)

Primary aim: Describe the incidence of primary gonadal failure (PGF) in children treated for intracranial brain tumors

Secondary aim: Describe additional endocrinopathies in this population

Mechanisms of gonadal damage in childhood cancer survivors

Cranial RT ≥ 30 Gy

Pelvic RT ≥ 18 Gy

CED dose (AA) ≥ 8 g/m2 in pre-pubertal patients

Rate of PGF after combined AA + RT = 50 – 75%[1,2]

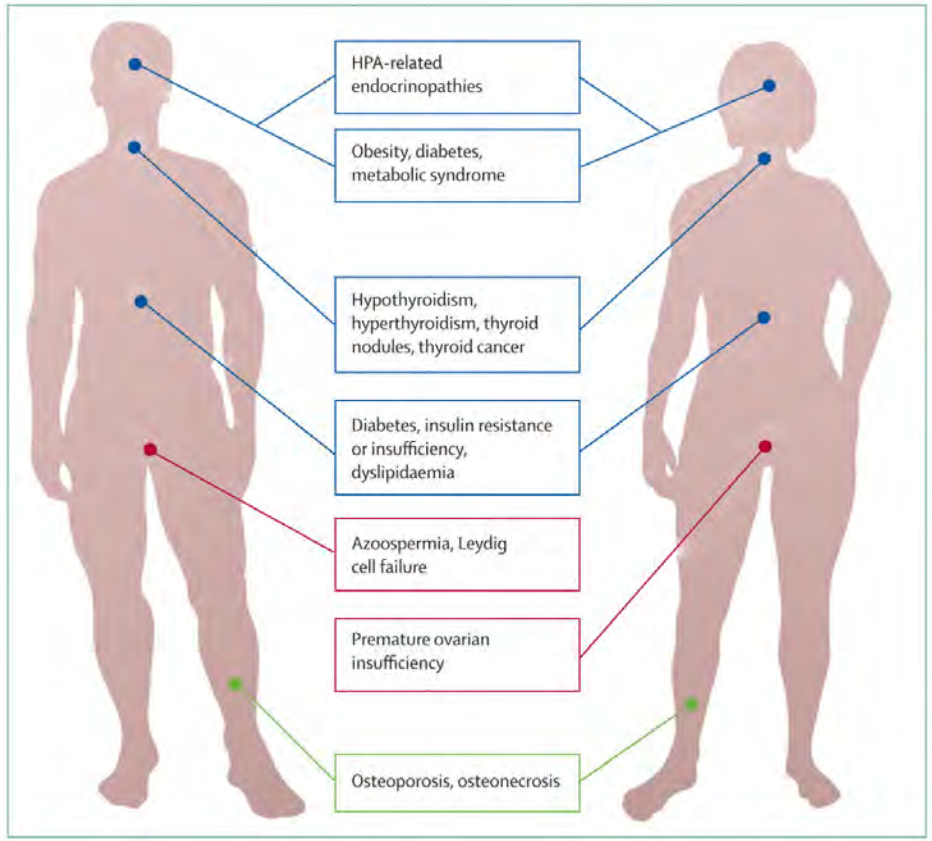
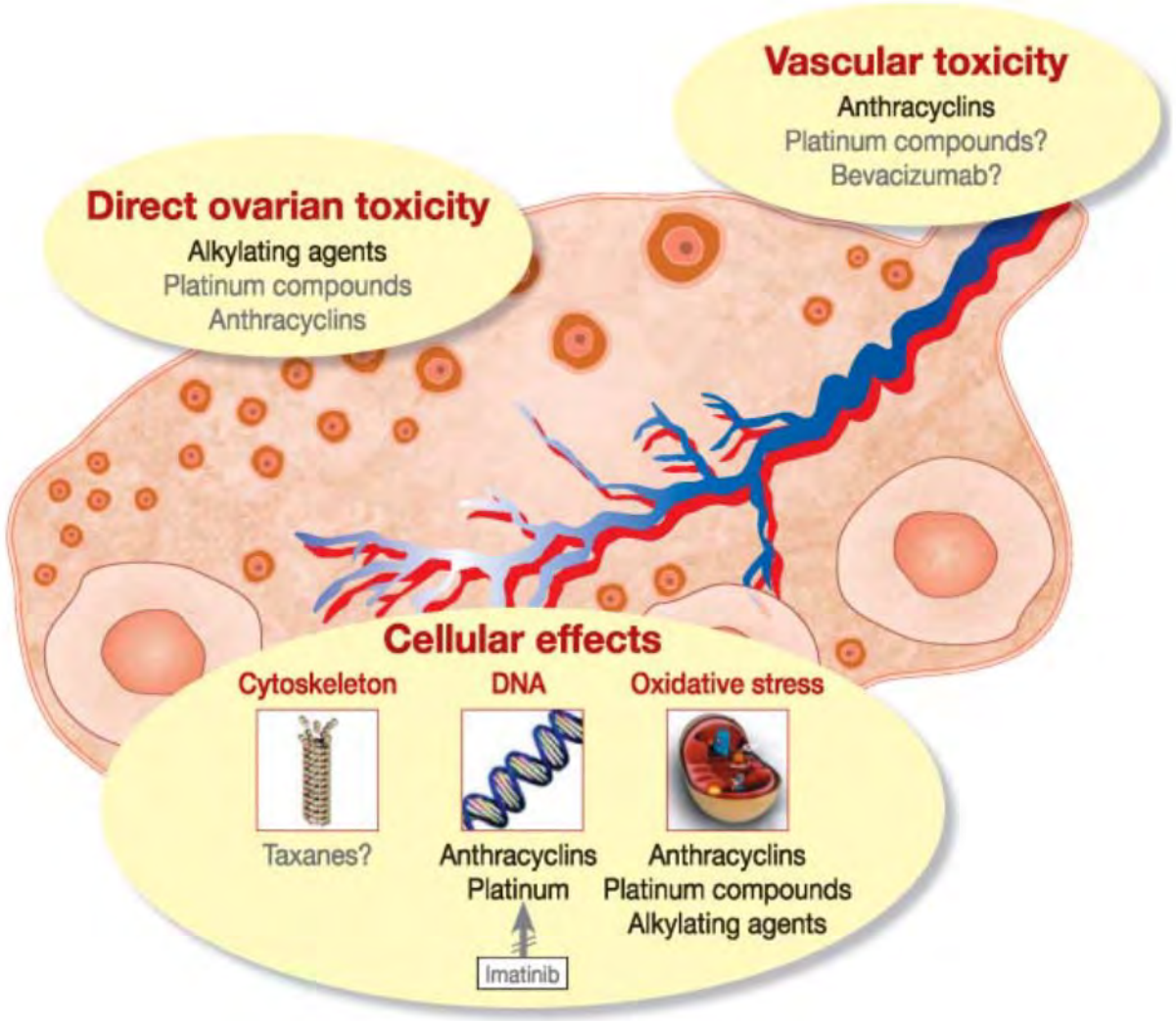


Figure 1. Endocrine outcomes after treatment for childhood cancer
HPA=hypothalamic—pituitary axis.

Mechanisms of gonadal damage with chemotherapy agents



- busulfan
- chlorambucil
- cyclophosphamide
- ifosfamide
- theotepa
- carboplatin
- cisplatin

The Headstart protocol

Cranial RT results in neurocognitive impairment[5]

Newer protocols avoid cranial RT by utilizing high dose alkylating agents[6]

BC Children's Hospital (BCCH) has been a pioneer in RT sparing approaches in children with intracranial tumors

Young children with intracranial tumors treated at BCCH represent an ideal population to assess the effects of exclusive AA on PGF

Study overview

Retrospective chart review 1998 - 2018

Inclusion criteria: diagnosis of intracranial tumor 0 – 8 years, initial regimen RT-sparing, minimum 3-year follow-up, age at data collection girls ≥ 8 and boys ≥ 9 years old

Exclusion criteria: incomplete medical records, additional risk factors for PGF

Data analysis: R statistical software (Kaplan Meier survival curves), Microsoft Excel (regression analysis, and T-tests were used in data analysis)

Data collection

Diagnosis

Treatment regimen

Doses of AA, Cyclophosphamide Equivalent Dose

Relapse

Endocrine biochemistries

Endocrine diagnoses

Growth velocities

Follow up time

Status (living/ deceased) at time of study

Results

Patient Characteristics (N = 18)

Age at diagnosis in years: median (range)	2.3 (0.2 - 6.8)
Follow up time in years: median (range)	12.0 (6.4 - 20.5)
Age at time of data collection in years: median (range)	14.6 (8.0 - 21.6)
Female N (%)	11 (61.1 %)
CED in g/m^2: median (range)	48.9 (9.0 - 83.0)
Relapse N (%)	7 (38.9 %)
Status at time of study N (%) **Alive, disease free** **Alive, stable disease** **Deceased**	 14 (77.8 %) 3 (16.7 %) 1 (5.6 %)

Incidence of PGF

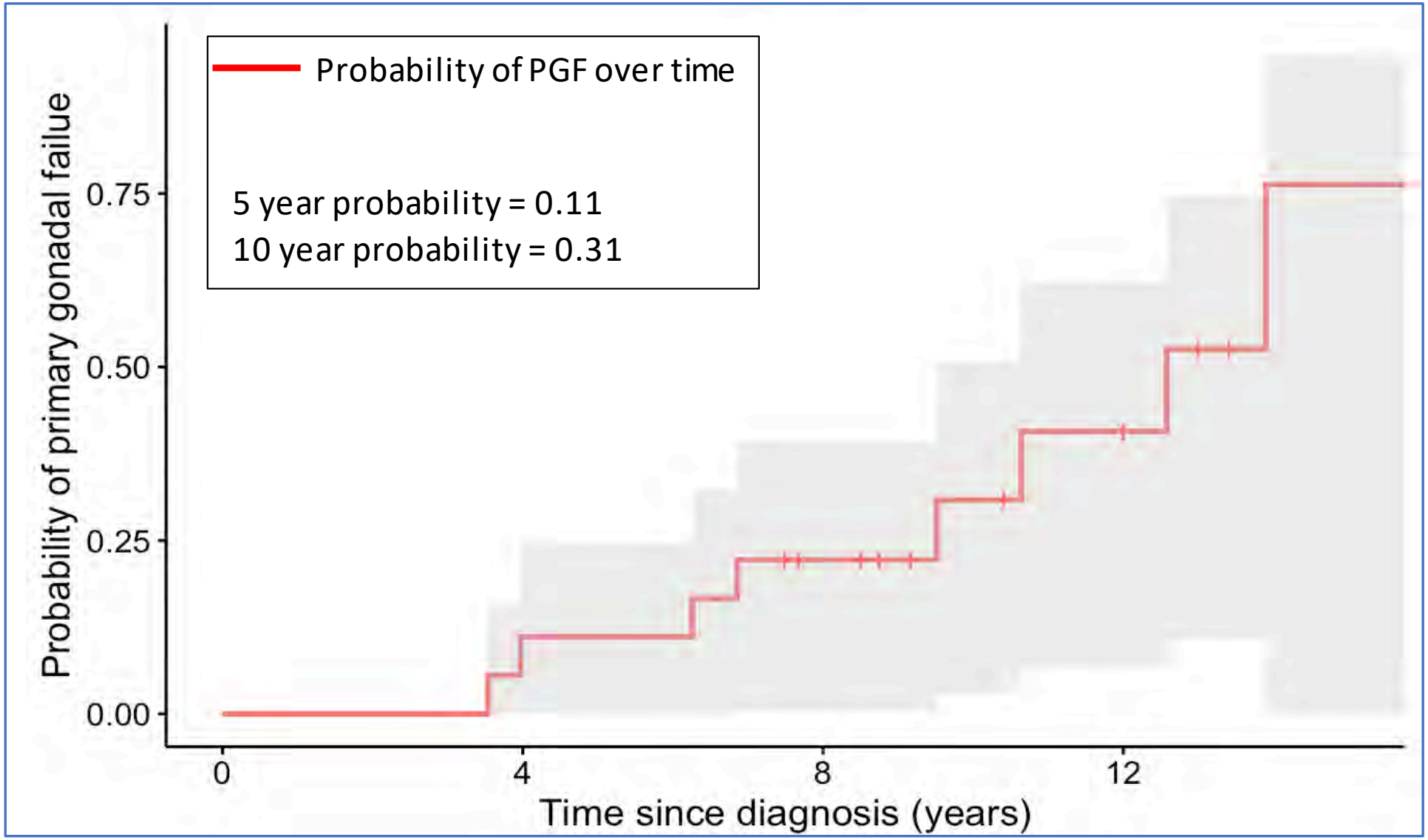
Total cohort 8/18 (44%)

In RT-naive patients 5/14 (36%)

In RT-exposed patients 3/4 (75%)

- median cranial RT 54.9 Gy

Figure 1: Probability of developing gonadal failure from time of diagnosis



Comparison of variables between those with and without PGF

Similarities

- Age at diagnosis
- Sex (M vs F)
- Use of specific alkylators
- Relapse
- Cranial RT exposure
- Age at data collection
- Pubertal status (pre vs. post pubertal at data collection)

Differences

- Higher CED (g/m2): 56.1 vs. 45.2, p = 0.02
- More endocrinopathies, p = 0.02
- Follow up time (years): 16.1 vs. 9.8, p = 0.01

Review of other endocrinopathies

PGF patients (n = 8)

- Additional endocrinopathies: 5/8 (63%)
- 3 cranial RT (median 54.9 Gy), 1 autoimmune PT, 1 mass effect

Non PGF patients (n = 10)

- Additional endocrinopathies: 0
- 1 cranial RT (54 Gy)

Children treated with high dose chemotherapy do not require pituitary monitoring (Childhood Oncology Group 2018 guidelines[9])

Discussion

Our main findings

1. Overall incidence of PGF 8/18 (44%) – highlights importance of fertility counselling
   - RT-naïve 5/14 (36%)
   - RT-exposed 3/4 (75%)
2. Probability of developing PGF was higher in those who had additional endocrinopathies
3. Mean CED higher in those with PGF (vs. non-PGF)
   - But no linear relationship between CED dose and time to PGF was established

Strengths and limitations

- The only study to date to assess PGF in CCS treated exclusively with high dose AA!
- Long follow-up time
- Gonadal function assessed with biochemical data
- Male and females included

- Retrospective cohort
- Small sample size
- Not all patients were post-pubertal at the time of data analysis (i.e. 13 years in girls, 14 years in boys)

Ideas for future studies

Larger cohorts and prospective studies may better assess PGF and high dose AA

Establish additional risk factors

Thank you

- Acknowledgements:
  - Supervisors: Dr. Carol Lam
  - Co-supervisor: Dr. Sylvia Cheng
  - Collaborators: Dr. Rebecca Ronsley, Dr. Laura Stewart, Dr. Juliette Hukin

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2) Utriainen P, Suominen A, Mäkitie O, Jahnukainen K. Gonadal Failure Is Common in Long-Term Survivors of Childhood High-Risk Neuroblastoma Treated With High-Dose Chemotherapy and Autologous Stem Cell Rescue. *Frontiers in Endocrinology*. 2019;10:2016-10. doi:10.3389/fendo.2019.00555

3) Group. children's O. Long-Term Follow-up Guidelines for Survivors of Childhood Adolescent, and Young Adult Cancers, Version 5.0. Published October 1, 2018. www.survivorshipguidelines.org. Accessed August 26, 2022

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5) Danoff BF, Cowchock FS, Marquette C, Mulgrew L, Kramer S. Assessment of the long-term effects of primary radiation therapy for brain tumors in children. *Cancer*. 1982;49(8):1580-1586. doi:10.1002/1097-0142(19820415)49:8<1580::aid-cncr2820490810>3.0.co;2-7

6) Dhall G, Grodman H, Ji L, Sands S, Gardner S, Dunkel IJ, et al. Outcome of children less than three years old at diagnosis with non-metastatic medulloblastoma treated with chemotherapy on the "Head Start" I and II protocols. *Pediatric Blood & Cancer*. 2008;50(6):1169-1175. doi:10.1002/pbc.21525

7) Green DM, Nolan VG, Goodman PJ, Whitton JA, Srivastava D, Leisenring WM, et al. The cyclophosphamide equivalent dose as an approach for quantifying alkylating agent exposure: A report from the childhood cancer survivor study. Pediatric Blood & Cancer. 2014;61(1):53-67. doi:10.1002/pbc.24679

8) Balachandar S, Dunkel IJ, Khakoo Y, Wolden S, Allen J, Sklar CA. Ovarian function in survivors of childhood medulloblastoma: Impact of reduced dose craniospinal irradiation and high-dose chemotherapy with autologous stem cell rescue. *Pediatric Blood & Cancer*. 2014;62(2):317-321. doi:10.1002/pbc.25291

Dr. Matthew Smyth

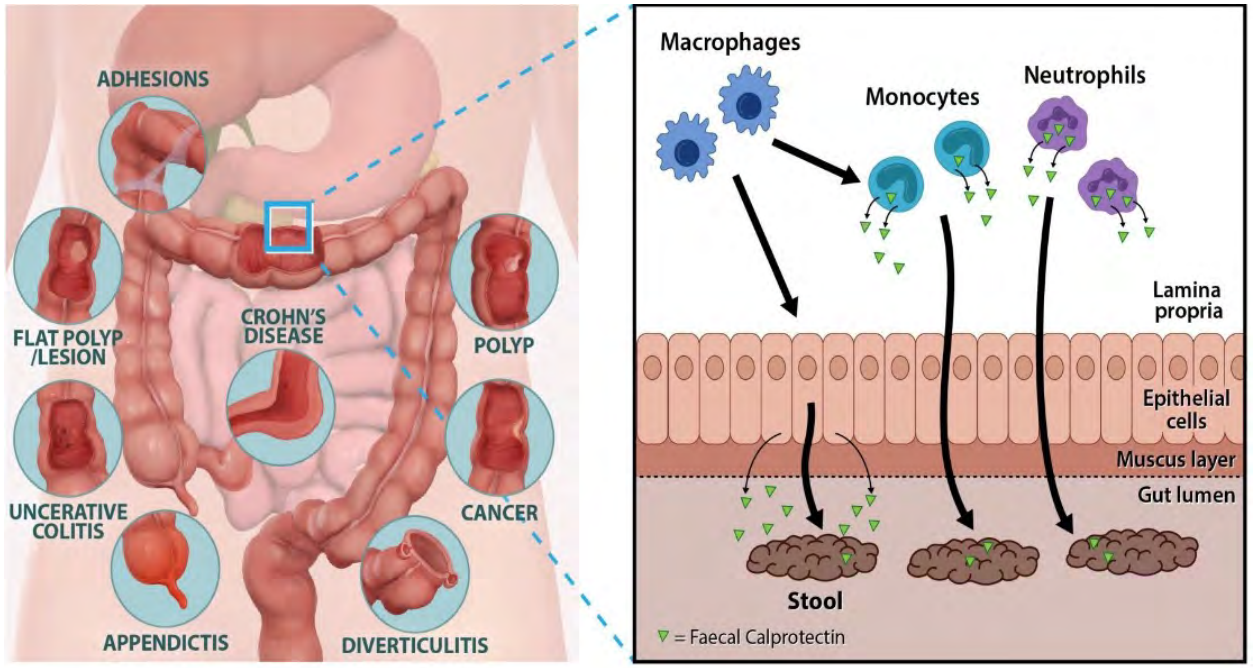
Fecal Calprotectin in a pediatric, population-based study: utility in diagnosis and monitoring of Inflammatory Bowel Disease

Matthew Smyth, MD FRCPC
PGY-5, Pediatric Gastroenterology
Supervisor: Dr. Kevan Jacobson

BCCH Celebrate Research Day, April 2023

Fecal Calprotectin in Pediatrics Background

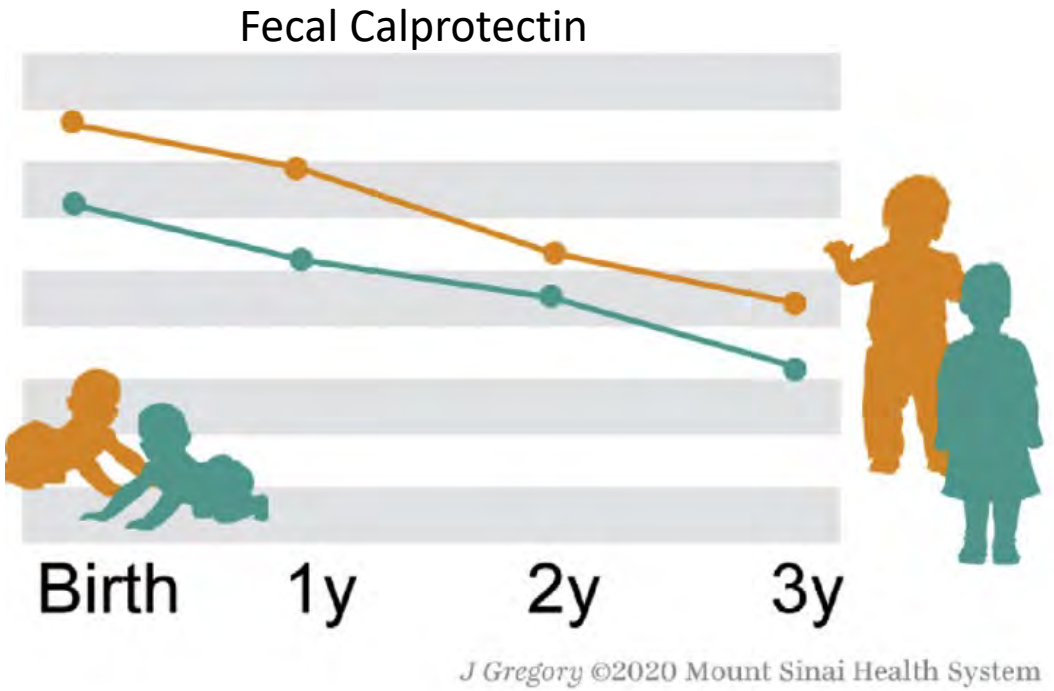
- 36 kDa protein
- Predominantly found in neutrophils
  - monocytes and macrophages
- Presence in feces proportional to neutrophil migration to intestinal tract



The role of fecal calprotectin in pediatric disease.
Jeung. Clin Exp Pediatr. 2019

Fecal Calprotectin in Pediatrics Background

- Normal values well established in adults
  - 50ug/g
- Debate ongoing for pediatric normal values
  - Age dependent
  - Younger children reported to have higher levels
  - However, existing evidence limited due to small sample size



Kim et al. *Gastroenterology*. 2021

Fecal Calprotectin in Pediatrics

Aims

1. Evaluate Fecal Calprotectin in differentiating IBD from non-IBD pediatric patients
2. Understand what factors impact Fecal Calprotectin in patients with known IBD

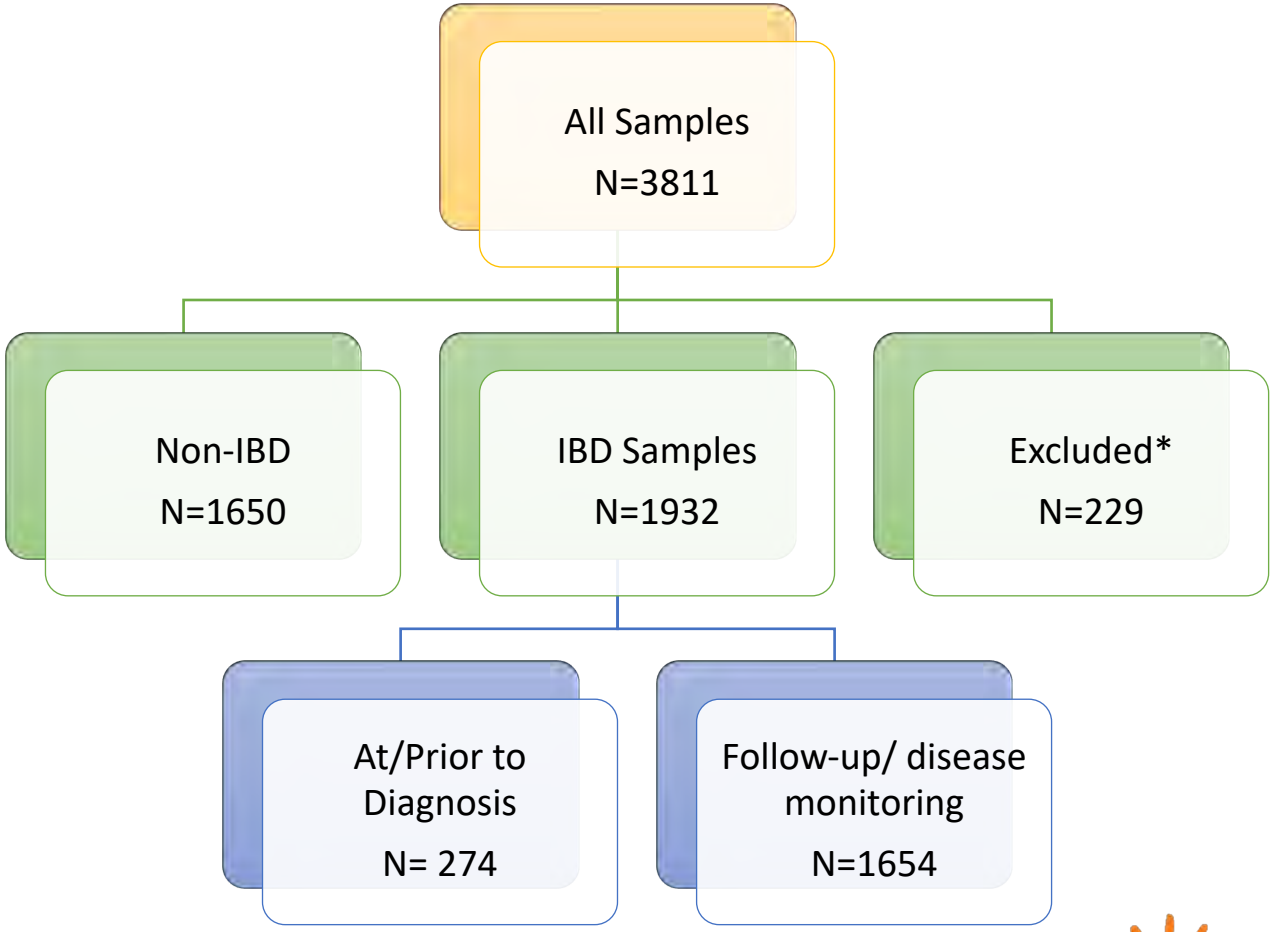
Fecal Calprotectin in Pediatrics
Methods

- All FC samples for patients ≤17yo in British Columbia prospectively collected from May 2020 to August 2022
- Standardized collection protocol was used
- All samples analyzed at central lab (Buhlmann ELISA® at BCCH) using previously validated protocols

Fecal Calprotectin in Pediatrics

Methods

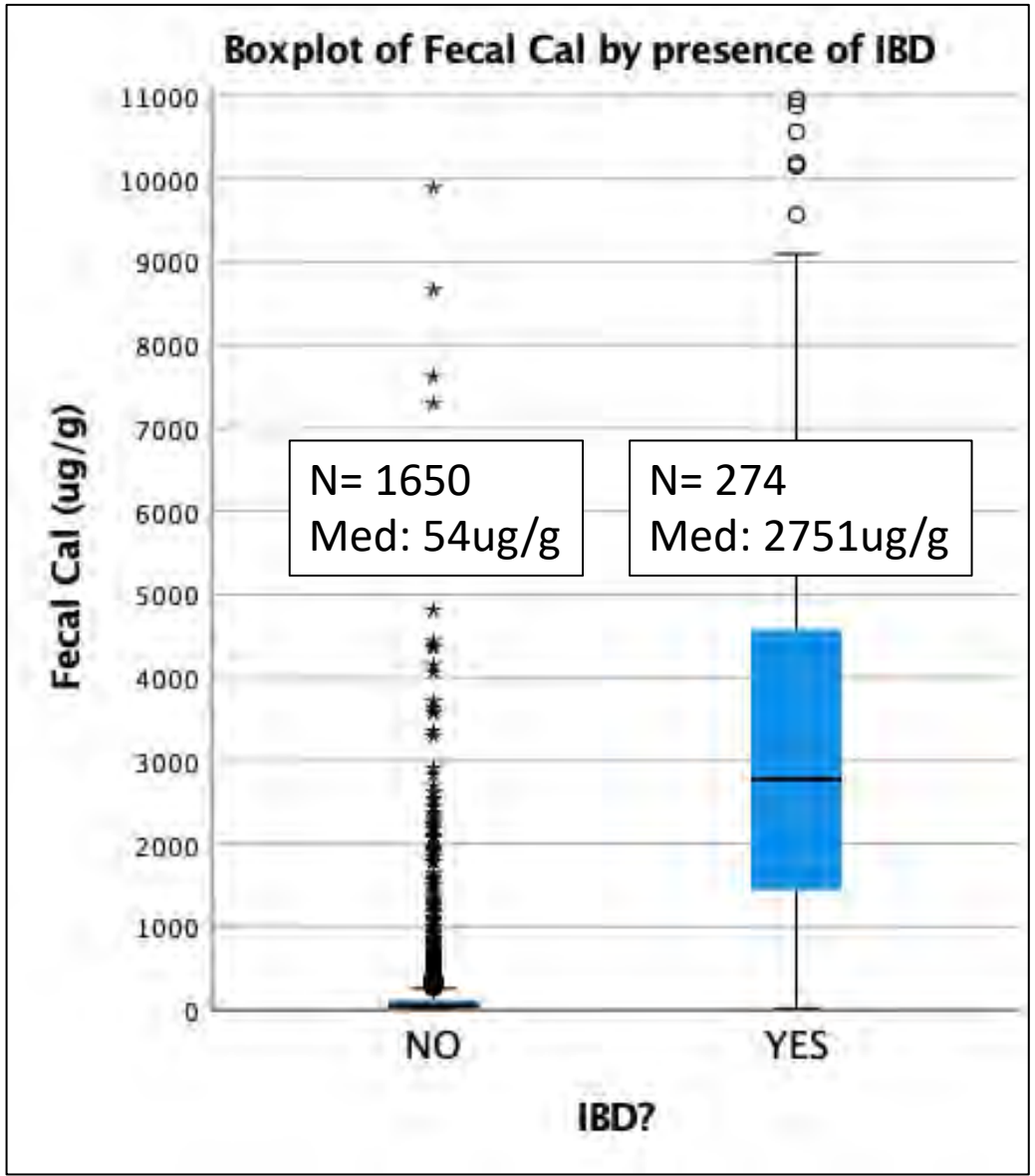
- BCCH IBD database identified patients with IBD (up to end of 2022)
  - Diagnosis, and date of diagnosis collected
- *excluded samples:
  - FC's ordered by adult GI
  - FC's on patients awaiting endoscopy as of end of 2022
- 2 sets of analysis:
  - Non-IBD + Diagnostic samples
  - Samples from IBD patients analyzed over time



BC Children's Hospital

Results Part 1: IBD vs Non-IBD

Fecal Calprotectin in Pediatrics
Results Part 1: IBD vs Non-IBD



*p<0.001

Fecal Calprotectin in Pediatrics
Results Part 1: IBD vs Non-IBD

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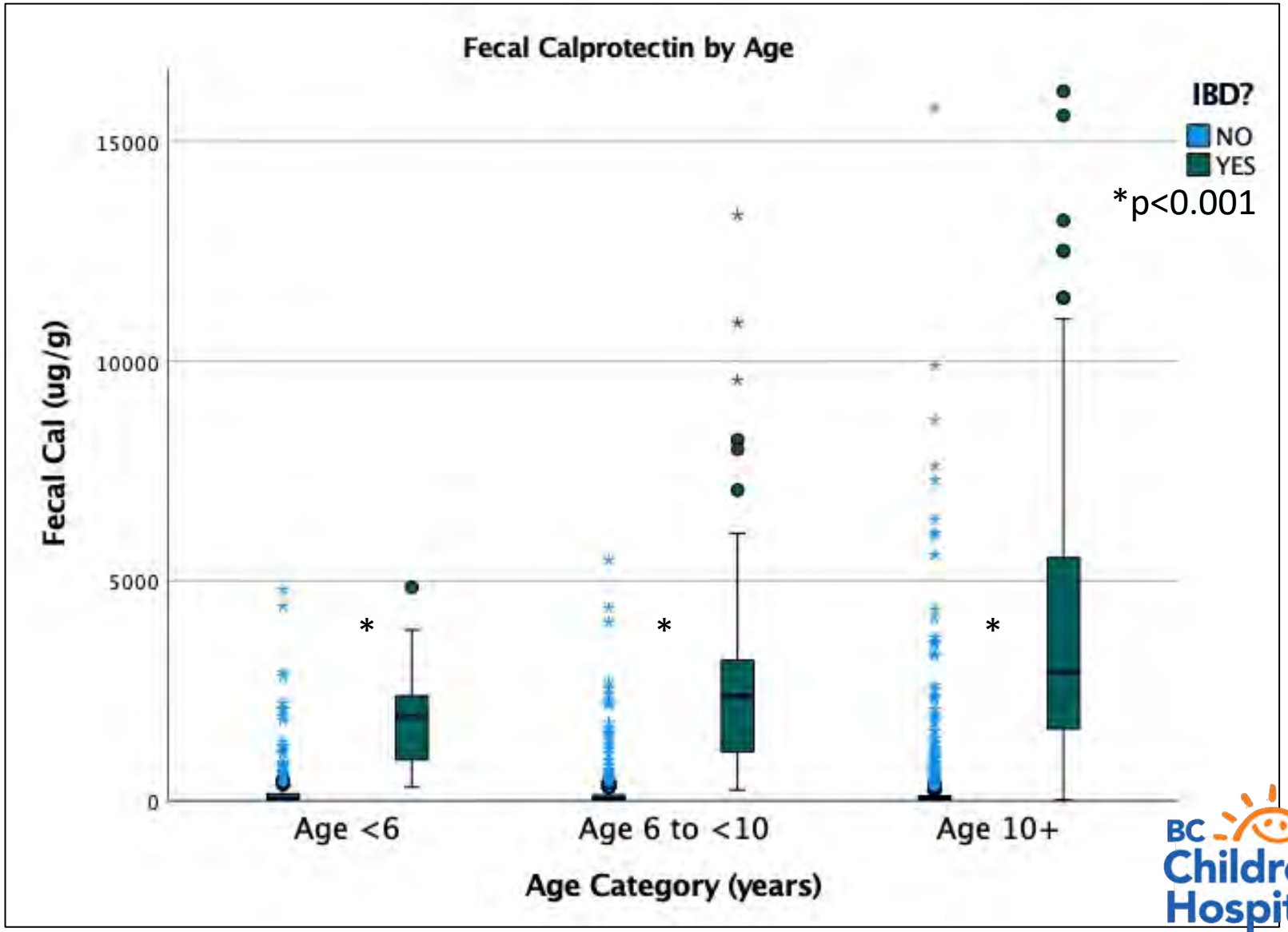
University of British Columbia

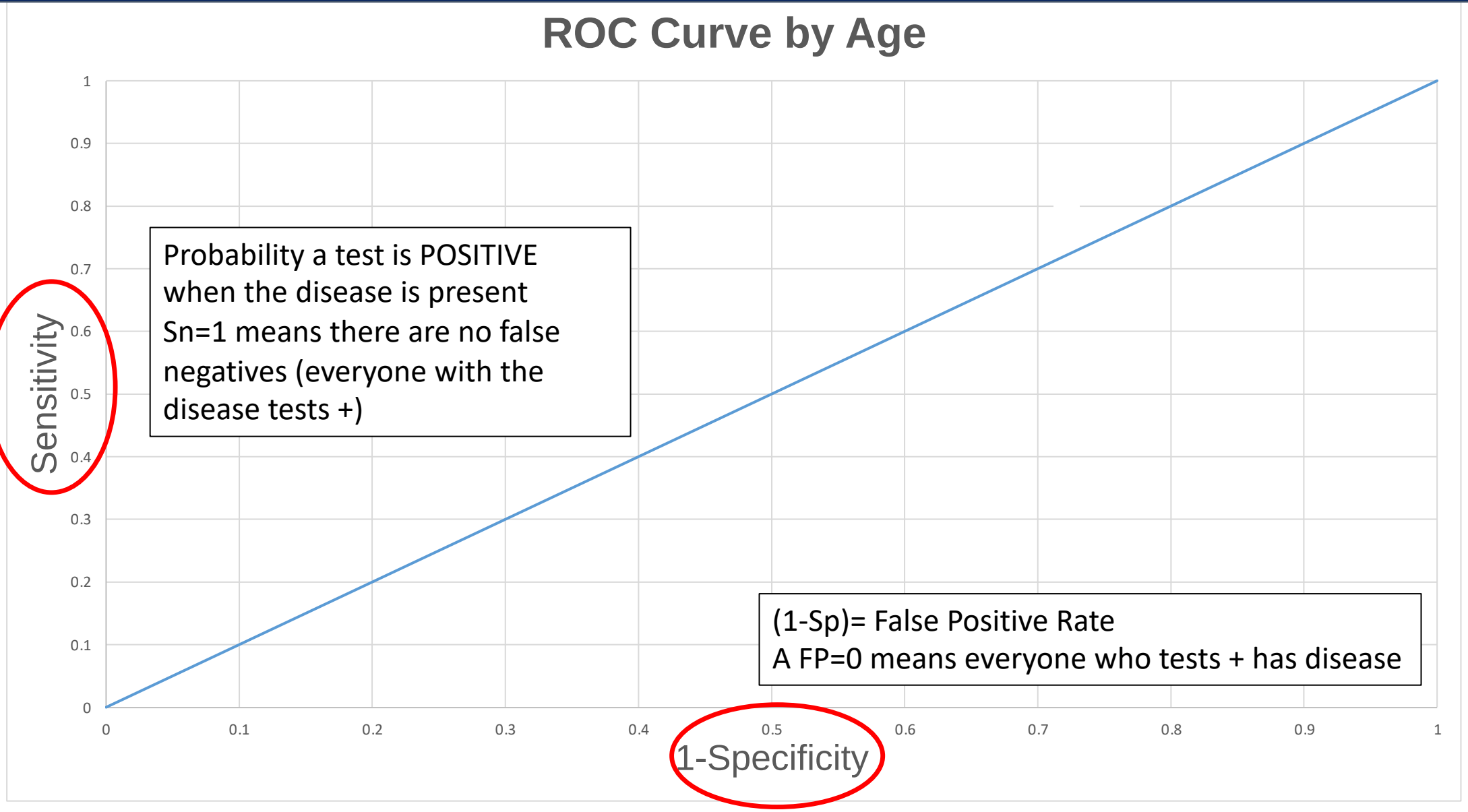
Age	Total N	N IBD (prev)
All	1924	274 (0.142)
<6yrs	246	15 (0.061)
6-10yrs	310	54 (0.174)
≥10yrs	1314	205 (0.156)

FC effective across age groups

Age cutoffs by established:
- Paris classification A1a (<10)
- Very Early Onset IBD (5 and under)

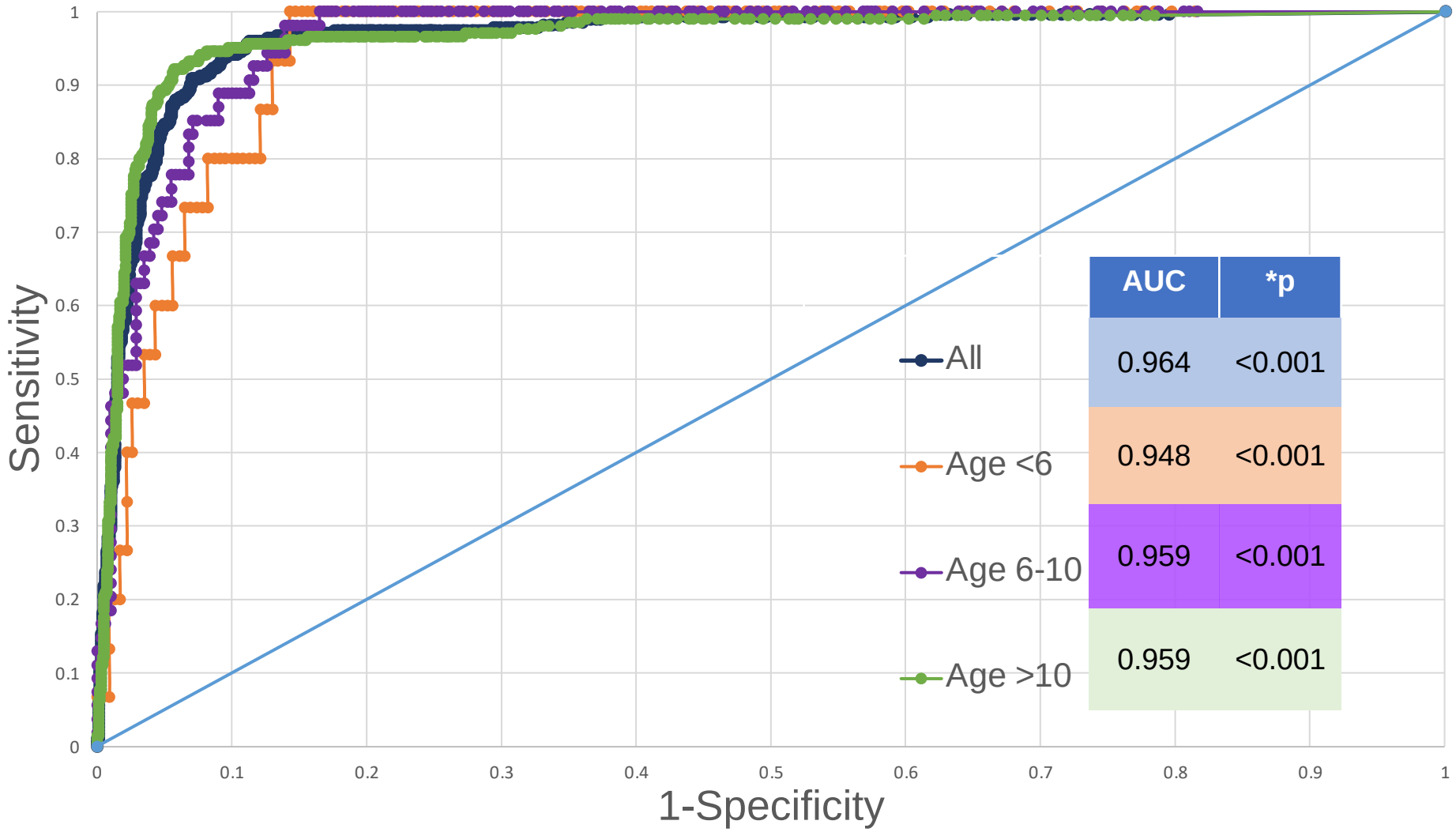


Fecal Calprotectin in Pediatrics



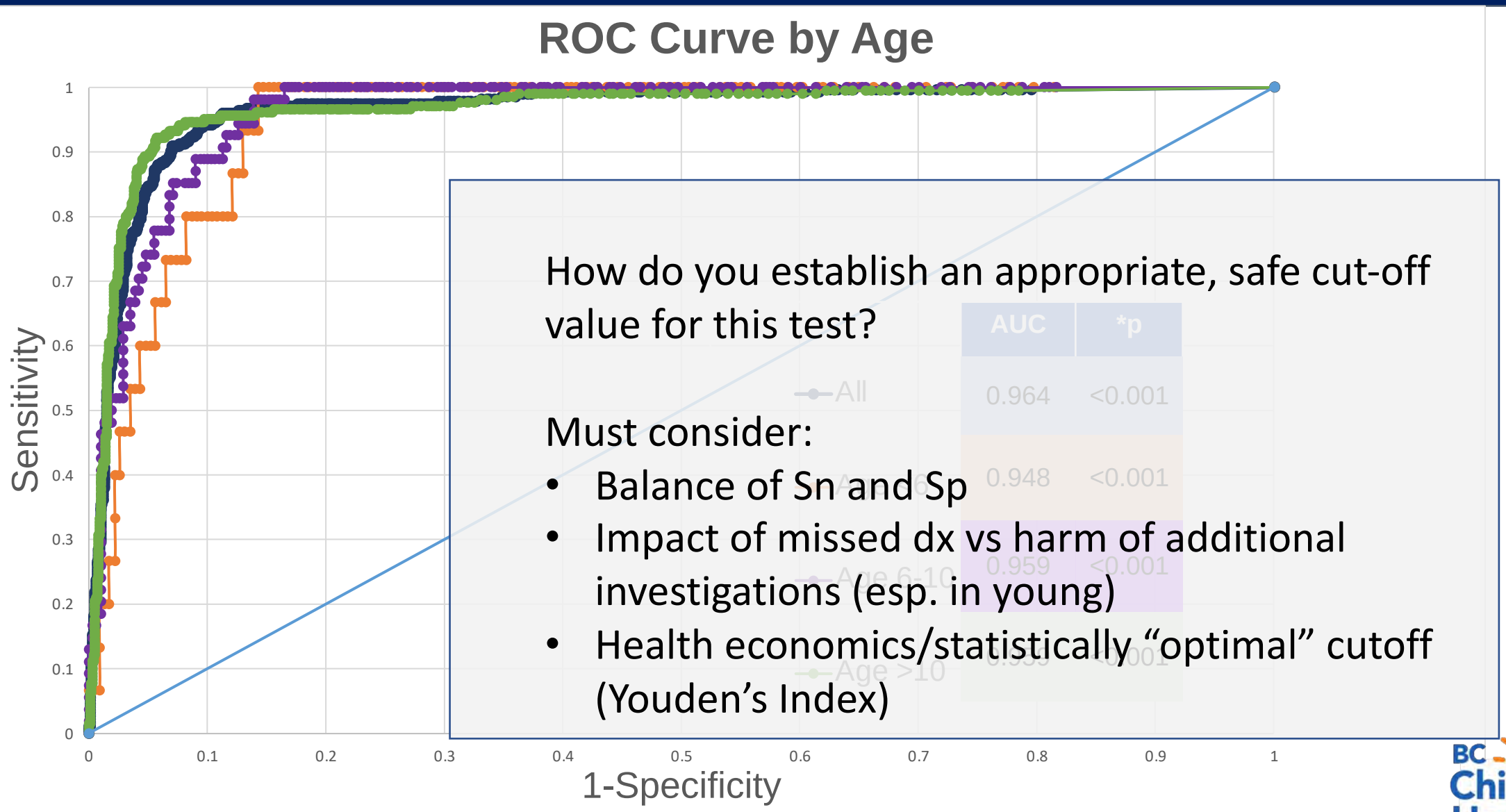
BC Children's Hospital

Fecal Calprotectin in Pediatrics



BC Children's Hospital

Fecal Calprotectin in Pediatrics



How do you establish an appropriate, safe cut-off value for this test?

Must consider:

- Balance of Sn and Sp
- Impact of missed dx vs harm of additional investigations (esp. in young)
- Health economics/statistically "optimal" cutoff (Youden's Index)

BC Children's Hospital

Fecal Calprotectin in Pediatrics
FC Cut-offs by Age

Age	Total N	N IBD (prev)	Sensitivity 99%		Sensitivity 95%	
			Fcal	LR	Fcal	LR
<6yrs	246	15 (0.061)	**306**	6.99	**335**	7.18
6 - 10	364	54 (0.174)	**245**	6.06	**309**	7.06
≥10yrs	1314	205 (0.156)	**77**	2.73	**304**	9.8
All	1924	274 (0.142)	**77**	2.63	**309**	8.66

$$LR = \frac{True\ Positive\ (Sn)}{False\ Positive\ (1-Sp)}$$

- To achieve same degree of certainty, FC changes by age
- A false negative rate <1% occurs with a cut-off of 306 vs 77 in young vs older children
- LR improves drastically for children ≥10yo with a cut-off of 304 (vs 77), reflective of the large false positive rate at lower cut-off
- At a threshold of 300, BOTH Sensitivity and LR are optimized for children, particularly those <10 (both a good screening test and diagnostic test)

BC Children's Hospital

Results Part 2:
FC in IBD monitoring

Fecal Calprotectin in Pediatrics
Results Part 2: FC in IBD Monitoring

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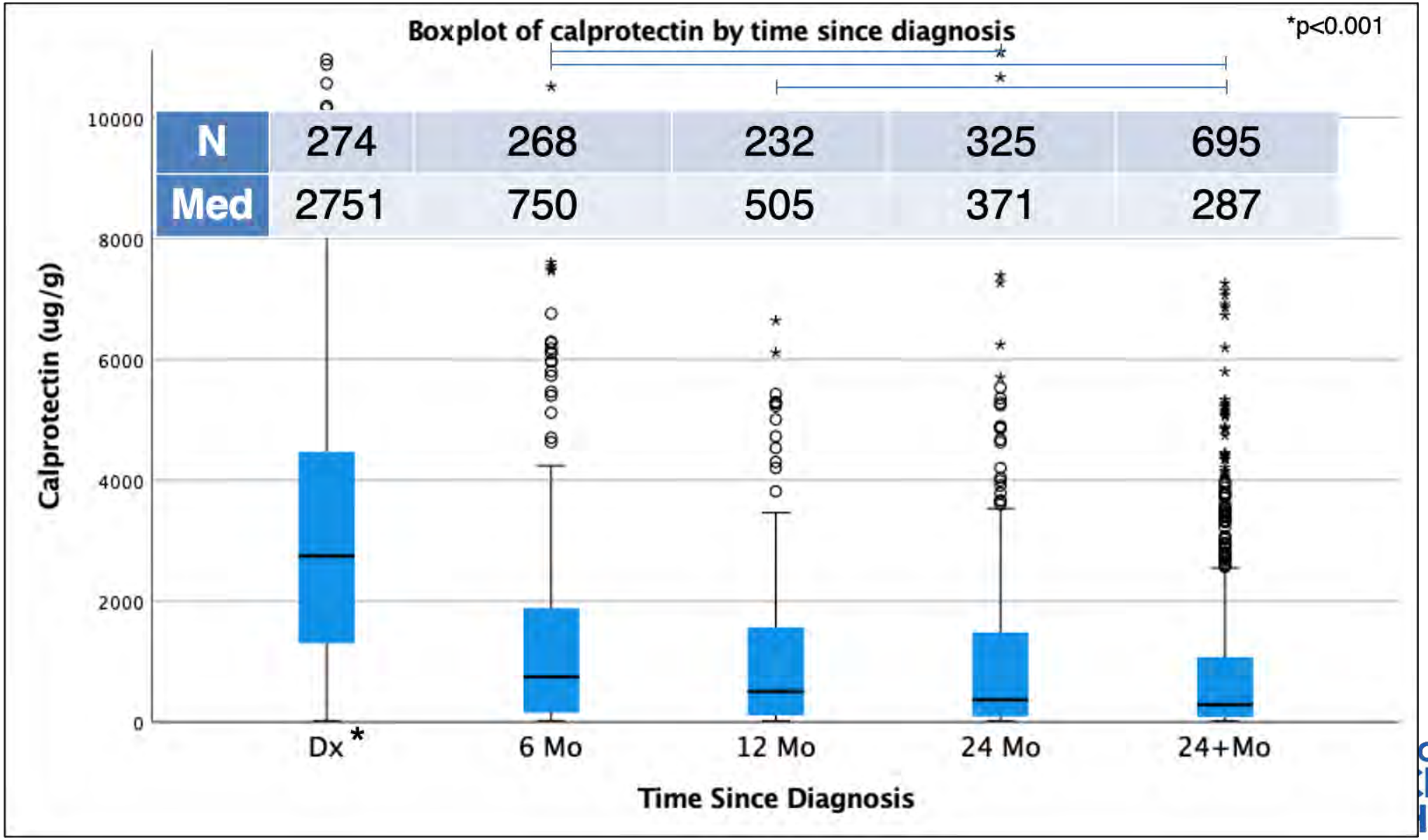
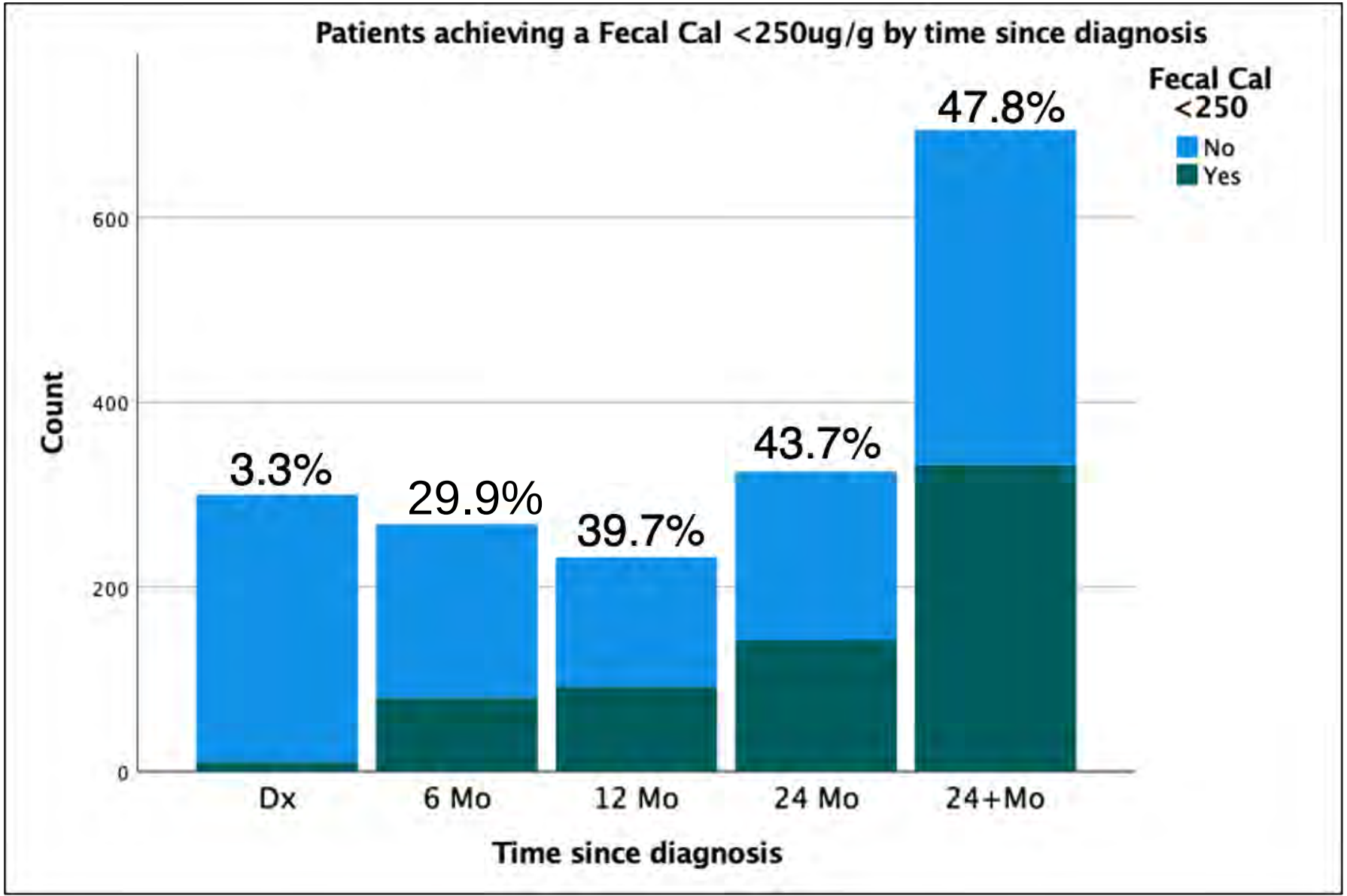
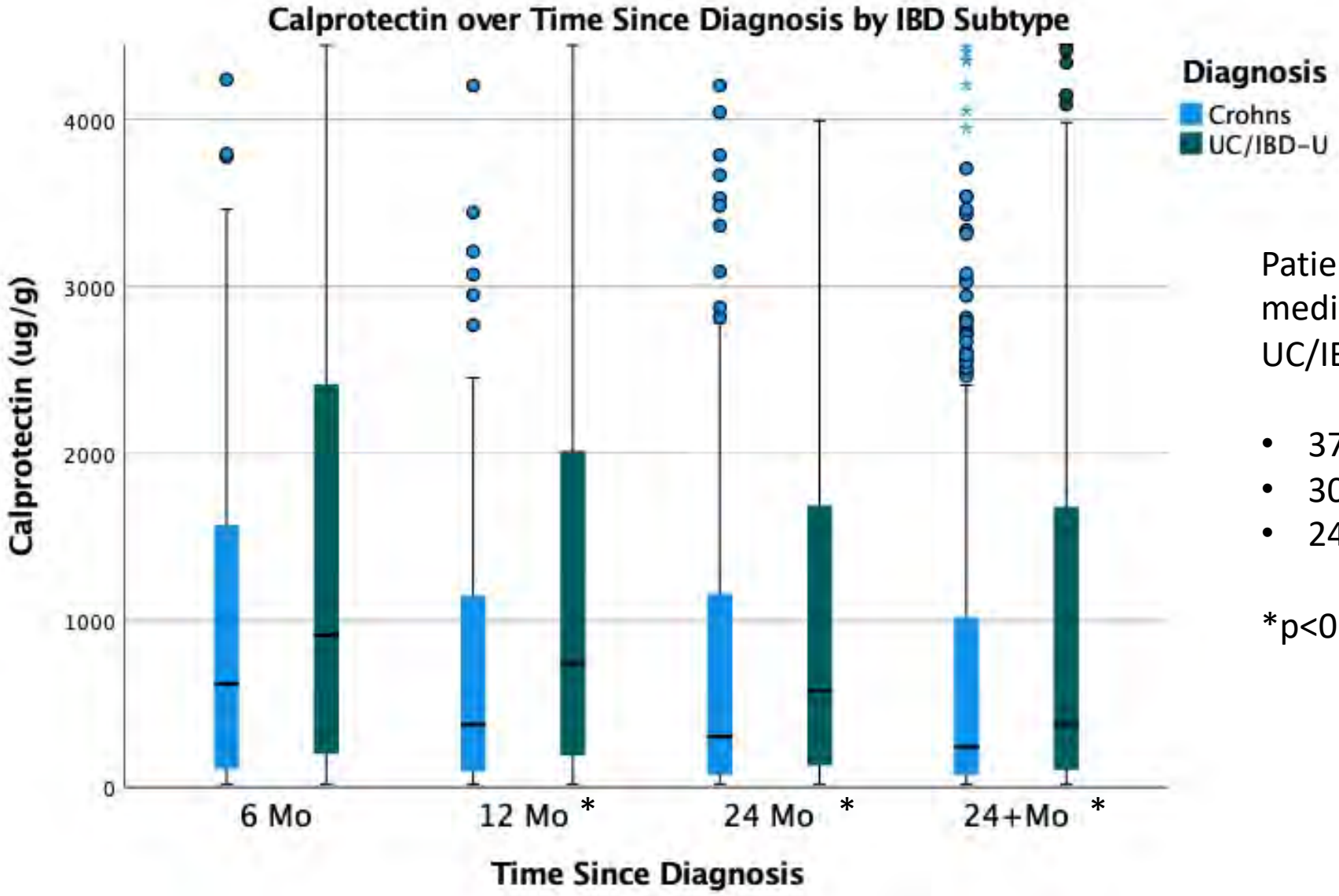


Fecal Calprotectin in Pediatrics



Fecal Calprotectin in Pediatrics



Patients with CD have lower median FC levels on follow-up vs UC/IBD-U patients

- 374 vs 745 at 12 months*
- 303 vs 577 at 24 months*
- 242 vs 378 at >24 months*

*p<0.05

BC Children's Hospital

Fecal Calprotectin in Pediatrics Summary

- Fecal calprotectin is an exceptional test for differentiating IBD from non-IBD across the Pediatric population (AUC=0.964)
- Younger children have higher FC at baseline, and a higher threshold should be applied for children before additional investigations are undertake
  - A cutoff of 300ug/g has a >99% sensitivity in patients <10 years old (LR 6.94)
- After diagnosis FC improves with time, however in this centre, only 48% achieve FC<250 on longterm follow
- Time since diagnosis and diagnosis subtype influence FC levels in IBD patients.

Conclusions

Children have higher fecal calprotectin levels, and in patients <10yo, a cut-off of 300 should be used

FC levels decrease over time from diagnosis, however only 48% of FC's were <250ug/g at long-term follow-up

Dr. Rana Swed-Tobia

Dr. Rana Swed Tobia
PEM fellow

Feb 2023

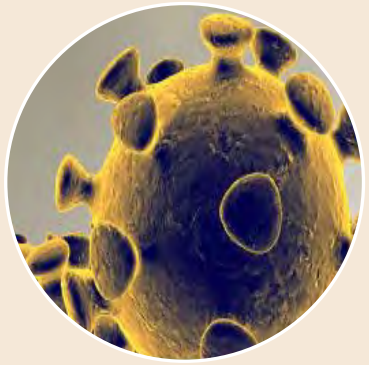
E2i EVIDENCE TO INNOVATION

BC Children's Hospital Research Institute

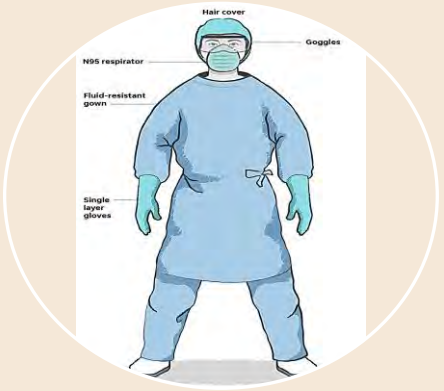
Evaluation of Endotracheal Intubation Success under Personal Protective Equipment during COVID-19 Pandemic: A Randomized Crossover Simulation Study

Challenge Accepted

Background

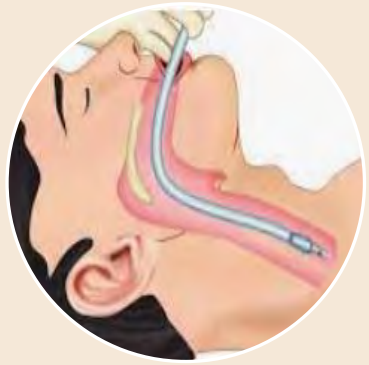


COVID-19 transferred by Respiratory droplets



PPE is mandated during procedures

Simulations influences clinical practice



Improves skills such as intubation

Rational

PPE is mandated for medical procedures

Skills training without PPE may not be sufficient

PPE's effect on intubation

Objective

Primary objective

To examine the effect of PPE on intubation length of time and completion rate

Methods

Study design

Prospective randomized crossover simulation study

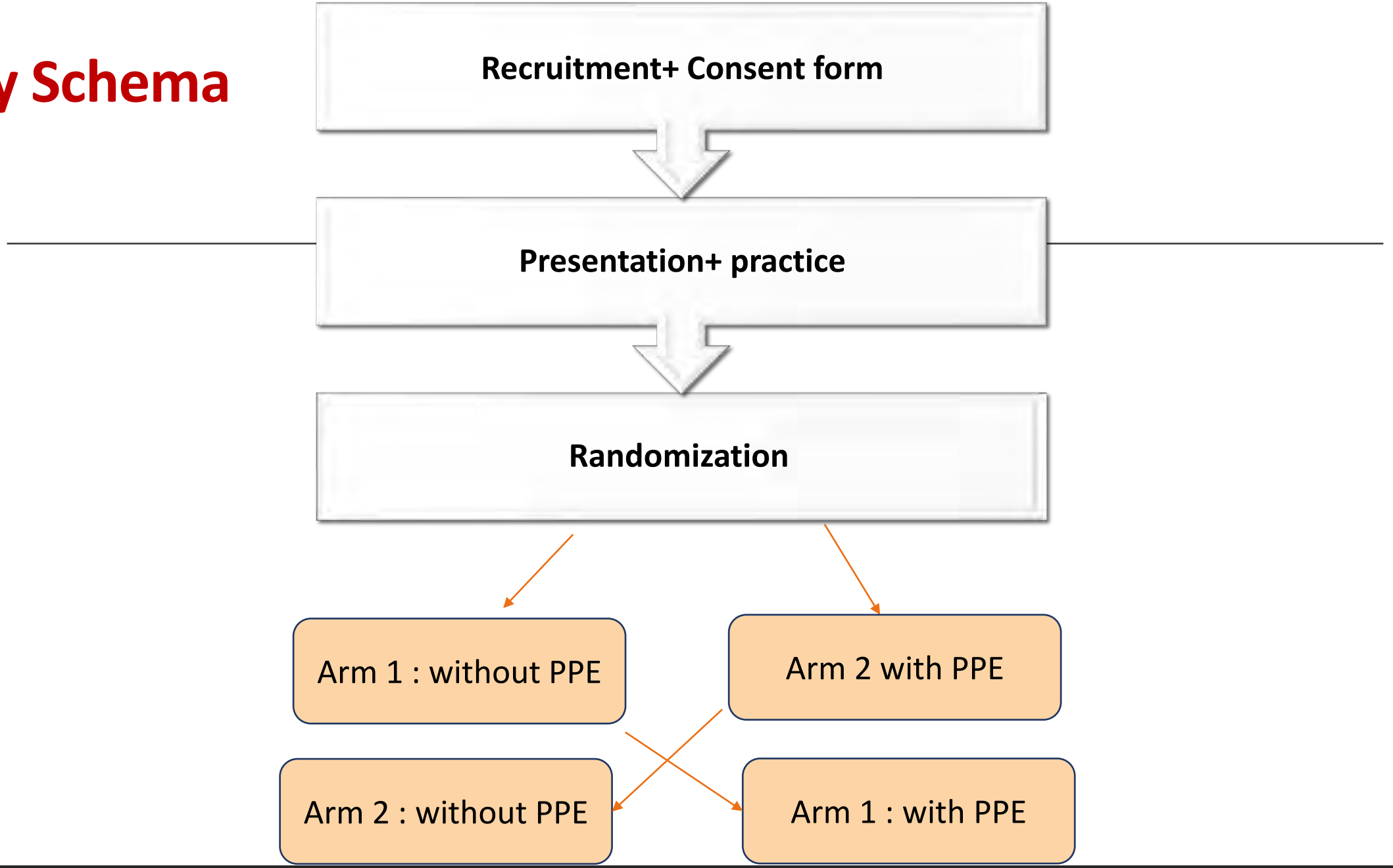
Setting

Simulation Centre, BCCH

Study population

Medical students

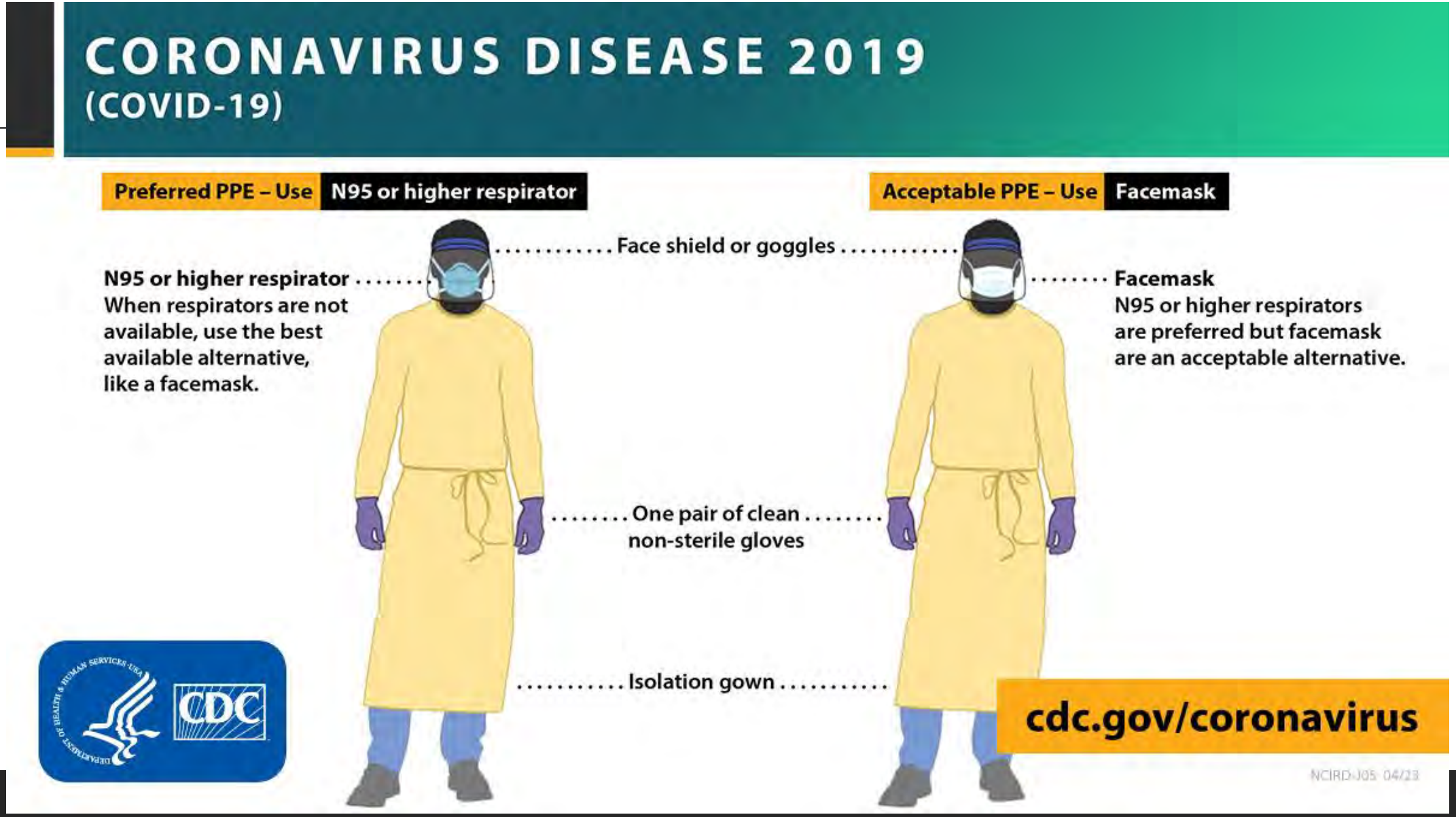
Study Schema



Questionnaires

- Level of difficulty and self-confidence using a 5-point Likert scale
- Questions related to PPE

Equipment


CORONAVIRUS DISEASE 2019
(COVID-19)
Preferred PPE – Use
N95 or higher respirator
Acceptable PPE – Use
Facemask
Face shield or goggles
N95 or higher respirator
When respirators are not available, use the best available alternative, like a facemask.
Facemask
N95 or higher respirators are preferred but facemask are an acceptable alternative.
One pair of clean non-sterile gloves
Isolation gown
cdc.gov/coronavirus
NCIRD-J05 04/23

Definitions

Intubation time:

1. Start time = laryngoscope click

2. Stop time = first inflation of lungs

Intubation failure: > 3 attempts

Outcome measures

Primary outcome measure

- The median time to intubation with and without PPE (in seconds)

Secondary outcomes

- Success rates
- Self-reported difficulty and self- confidence scores

Results

Table 1: Demographic characteristics of the study participants (n=28)

IQR=Interquartile range

Gender	
Female, n (%)	15 (53.6%)
Male, n (%)	13 (46.4%)
Age, median (IQR) years	25.5 [23.0;27.2]
Vision Aids	
NO, n (%)	12 (42.9%)
Using glasses n (%)	10 (35.7%)
Using contact lenses n (%)	6 (21.4%)
Education level	
1ST year, n (%)	7 (25.0%)
2nd year, n (%)	10 (35.7%)
3rd year, n (%)	10 (35.7%)
4th year, n (%)	1 (3.57%)
Prior experience with medical simulation:	
NO	23 (82.1%)
YES	5 (17.9%)
Self-reported level of preparation, median	1.00 [1.00;2.00]

Results

	Without PPE	With PPE	P Value
Time to intubation in seconds, median [95% CI]			
Overall	50 (42, 79)	66 (35, 98)	0.71
First attempt	46 (40, NA)*	66 (35, 83)	0.67
Success rate, n (%)			
Overall	96.4%	85.7%	0.14
Successful intubation on first attempt	20 (71.4%)	18 (64.3%)	#
Failed intubation	1 (3.6%)	4 (14.3%)	#

Results

Post intubation questionnaires:

	Without PPE	With PPE	P value
level of difficulty, mean ± SD	3 [2.75-4.0]	3 [2.0-4.0]	0.41
level of self-confidence, mean ± SD	3 [3.0-4.0]	3 [2.0-3.5]	0.46

Limitations

Simulation study

Normal anatomic airway structure.
No assessing of difficult airway

Single center study.
Small sample size

Conclusions

- PPE did not add significant time or lower success rate
- Possible additional factors account for intubation success
- Ongoing simulation-training is important with and without PPE
- Further studies are needed

Acknowledgements

Prof Ran Goldman

Simulation Center – BCCH and Ms. Debbie Cain

Medical Students

Co-authors

Thank You

Dr. Khalid Taha

THE UNIVERSITY OF BRITISH COLUMBIA

BC Children's Hospital

HYPERTENSION IN CHILDREN WITH CONGENITAL ANOMALIES OF THE KIDNEY AND URINARY TRACT (CAKUT)

Khalid Taha, M.D.

Pediatric Nephrology Fellow

University of British Columbia

UBC Celebrate Pediatric Research Day

April 14th, 2023

DISCLOSURE STATEMENT

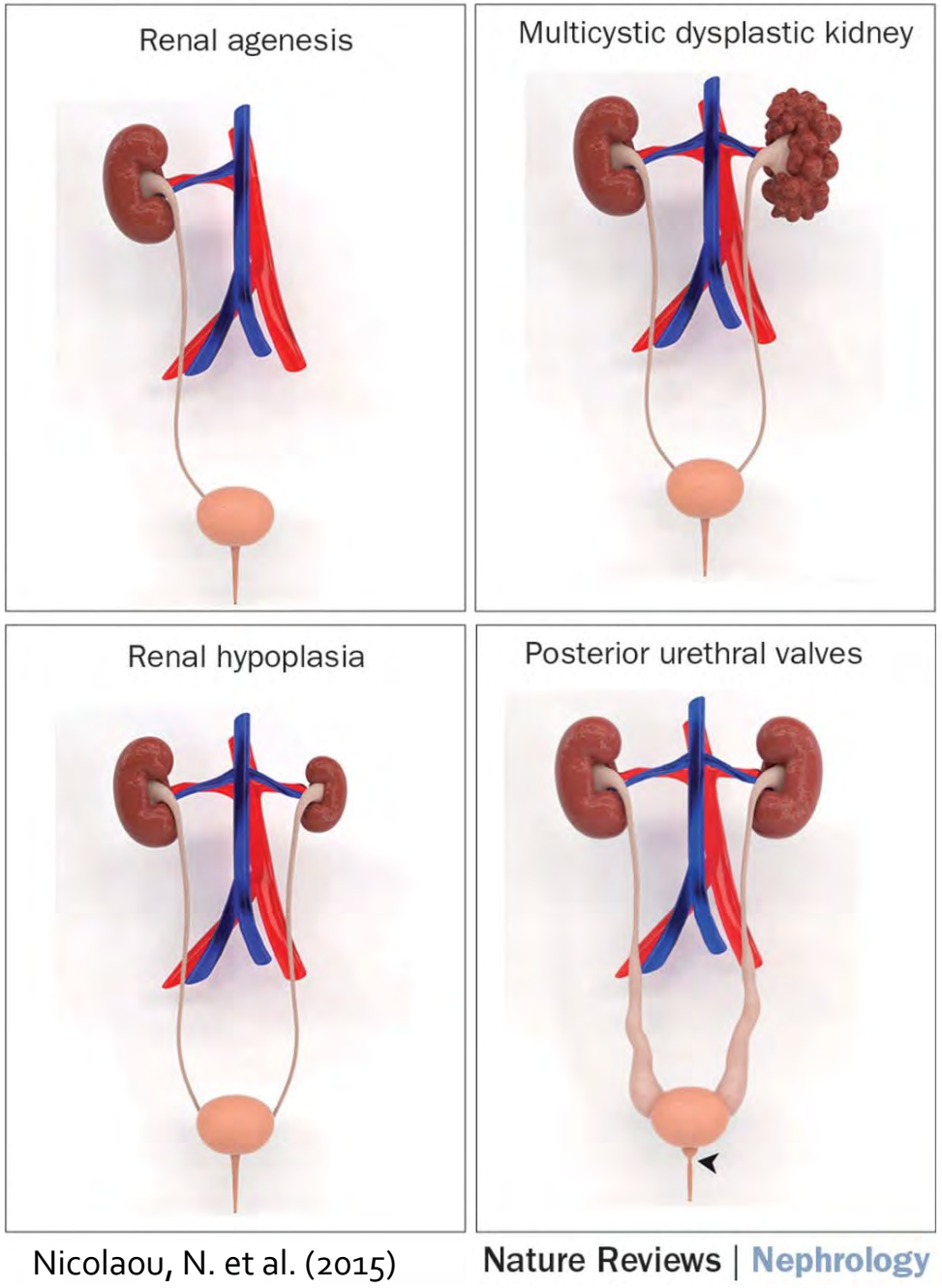
- No conflicts of interest to disclose.

Land Acknowledgment

- I acknowledge that I live and work on the traditional and unceded territory of the xʷməθkʷəy̓əm (Musqueam), Sḵwx̱wú7mesh Úxwumixw (Squamish), and səl̓ilw̓ətaʔɬ (Tsleil-Waututh).

Background

- 60% of children with chronic kidney disease (CKD) have CAKUT.
- CAKUT is heterogenous
- Hypertension is common and a modifiable risk factor for CKD progression.
- Current knowledge gap in prevalence of hypertension in CAKUT.



Aims

- Define the prevalence of hypertension in children with the various forms of CAKUT.
- Identify the shared clinical characteristics associated with the development of hypertension.
- Study the influence of hypertension on the progression of CKD.

Methods

- Retrospective cohort quality improvement study.
- Cases from BCCH with kidney malformations (2008-2018).
- Inclusion:
  - Diagnosis of one of four main type of CAKUT: MCDK, URA, RHD, and PUV
  - Blood pressure measurements
  - Age between 0 and 18 years
- Exclusion
  - Cannot confirm primary diagnosis
  - Insufficient clinical data (e.g., blood pressure measurements)

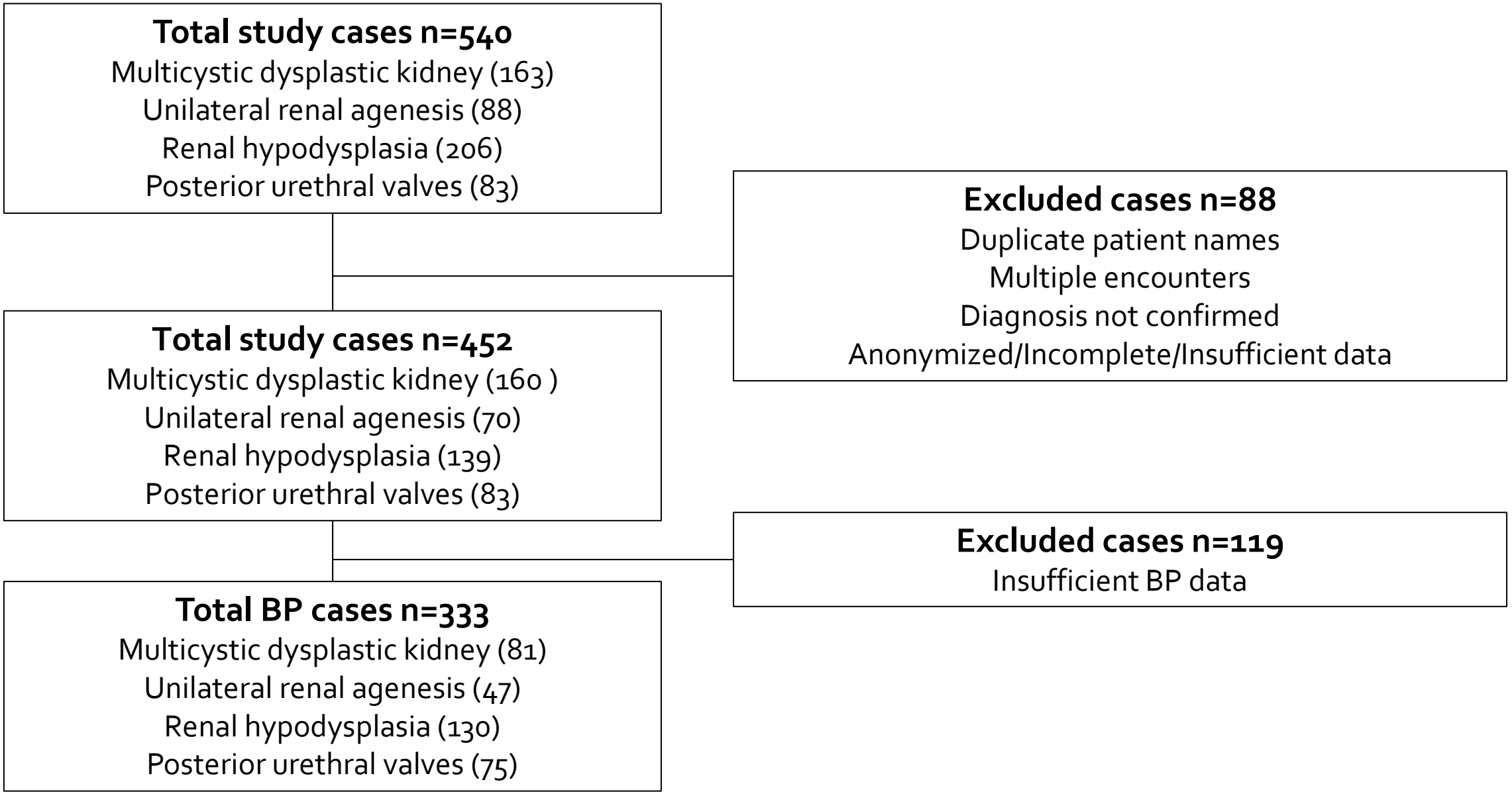
Clinical Outcomes

- **Hypertension**: sBP or dBP ≥95th %ile for age, sex, and height on two consecutive visits at least 3 months apart or on medications.
- **CKD**: eGFR <60 mL/min/1.73 m^2 on two consecutive visits at least 3 months apart.

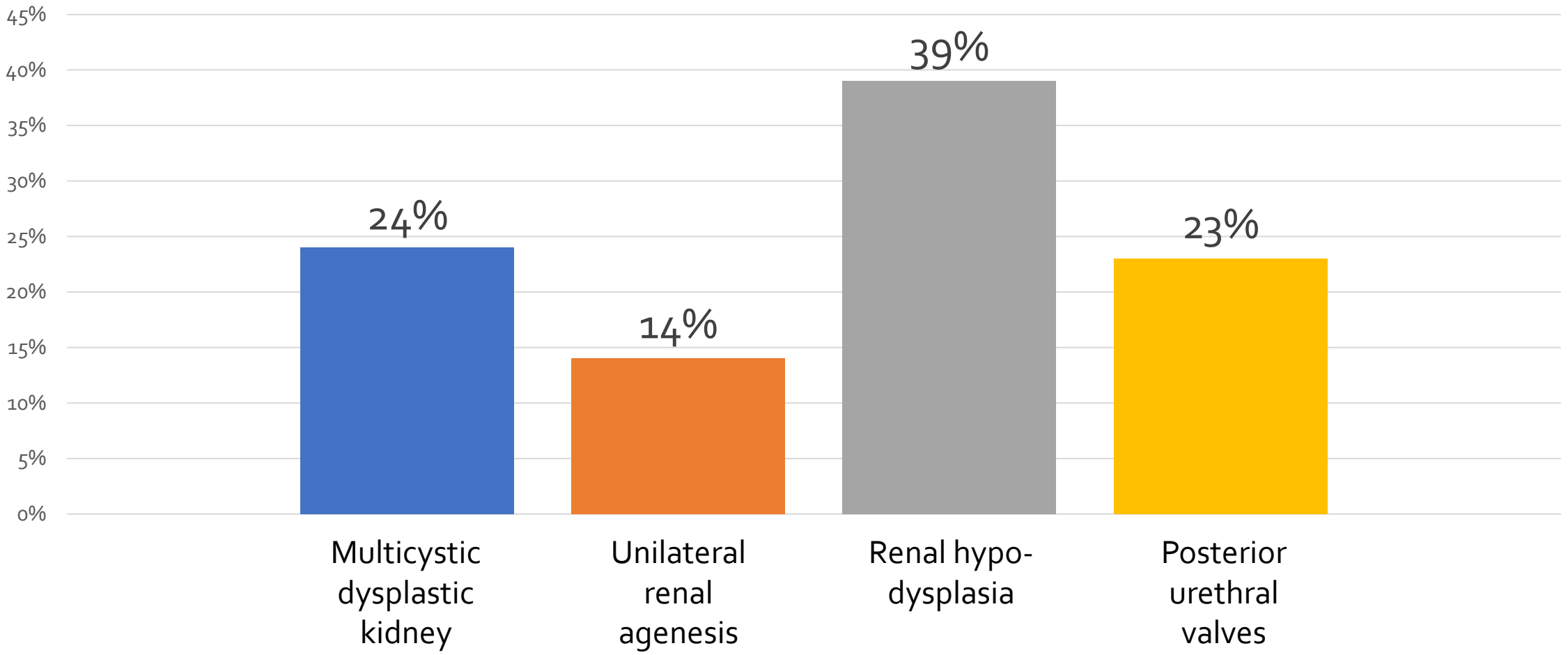
Statistical analyses

- SPSS statistical software
- Proportions, mean (± SEM), and median (IQR)
- Comparisons by Student's *t test*, Mann–Whitney U test, and Pearson's chi square test
- Outcome-free survival: Kaplan-Meier analysis
- Multivariate Binary logistic regression

RESULTS


Total study cases n=540
Multicystic dysplastic kidney (163)
Unilateral renal agenesis (88)
Renal hypodysplasia (206)
Posterior urethral valves (83)
Excluded cases n=88
Duplicate patient names
Multiple encounters
Diagnosis not confirmed
Anonymized/Incomplete/Insufficient data
Total study cases n=452
Multicystic dysplastic kidney (160)
Unilateral renal agenesis (70)
Renal hypodysplasia (139)
Posterior urethral valves (83)
Excluded cases n=119
Insufficient BP data
Total BP cases n=333
Multicystic dysplastic kidney (81)
Unilateral renal agenesis (47)
Renal hypodysplasia (130)
Posterior urethral valves (75)

Types of CAKUT



Prevalence of hypertension by CAKUT

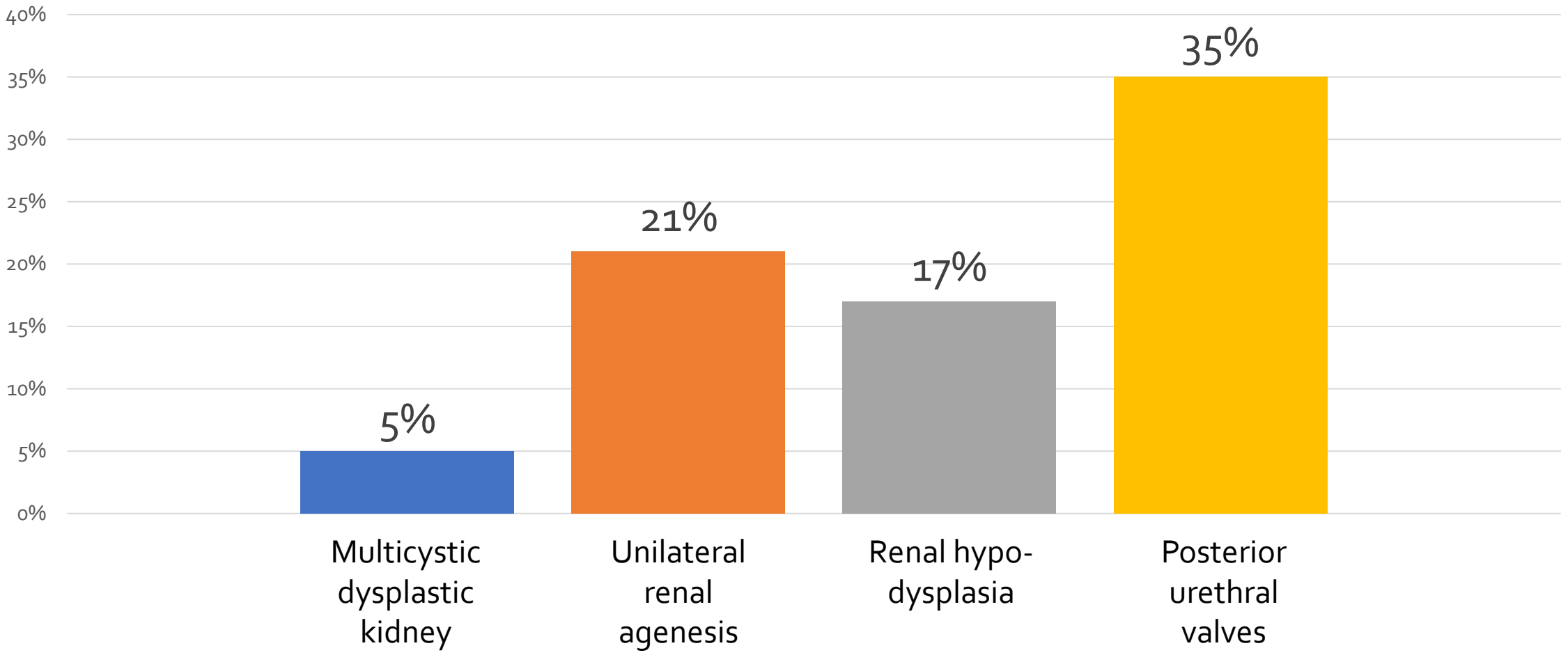
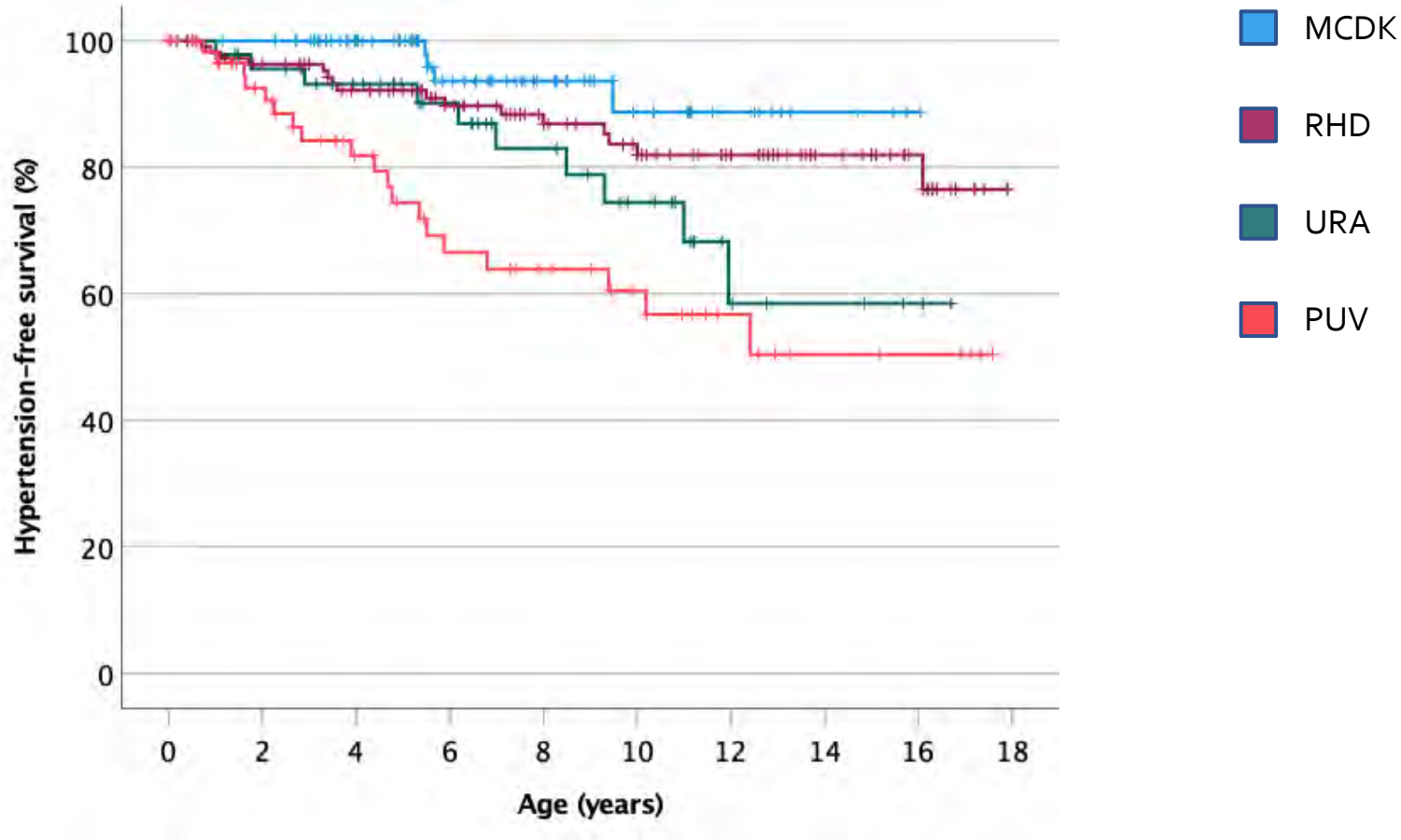


Table 1. Clinical characteristics of the CAKUT cohort

	No hypertension	Hypertension	p
Number	271/333 (81)	62/333 (19)	
Multicystic dysplastic kidney (%)	77/81 (95)	4/81 (5)	
Unilateral renal agenesis (%)	37/47 (79)	10/47 (21)	<0.001[a]
Renal hypodysplasia (%)	108/130 (83)	22/130 (17)	
Posterior urethral valve (%)	49/75 (65)	26/75 (35)	
Gestational age in wks	36.0 (2.14)	36.4 (3.86)	0.13[b]
Birth weight in kg	3.20 (0.86)	3.20 (1.22)	0.77[b]
Genetic syndrome (%)	42/271 (16)	9/62 (15)	1.00[a]
Non-renal anomalies (%)	70/271 (26)	20/62 (32)	0.34[a]
First eGFR	81 (3)	70 (5)	0.07[c]
Age at first eGFR	2.02 (6.70)	1.60 (5.63)	0.68[b]
Kidney length: body length	8.3 (0.1)	7.7 (0.2)	0.045[c]
Age at KL:BL in yrs	0.95 (5.54)	1.60 (5.45)	0.38[b]
aCAKUT (%)	102/271 (38)	33/62 (53)	0.03[a]
Proteinuria (%)	30/258 (12)	27/59 (46)	<0.001[a]

Hypertension-free survival by CAKUT category



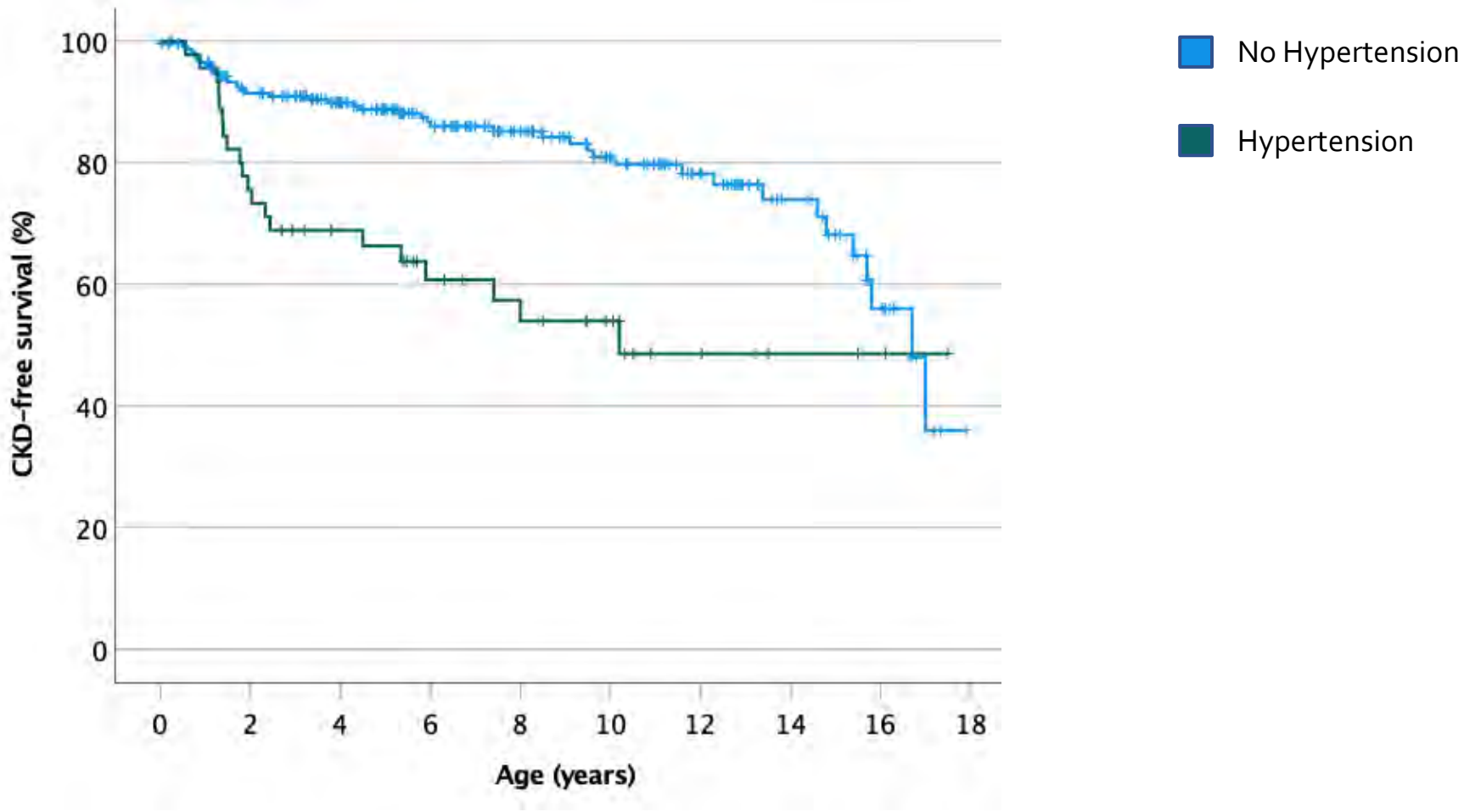
Independent predictors of hypertension

Table 3A. Independent predictors of hypertension. Multivariate analysis.

	B	Wald	P	OR (95% CI)
CAKUT diagnosis		16.2	<0.001	
Unilateral renal agenesis	1.85	7.0	<0.01	6.4 (1.6-24.9)
Renal hypodysplasia	1.44	4.4	0.04	4.2 (1.1-16.1)
Posterior urethral valve	2.39	12.9	<0.001	10.9 (3.0-40.5)
KL:BL<7.9	0.32	0.7	0.39	1.4 (0.7-2.9)
aCAKUT	0.76	5.9	0.02	2.1 (1.2-3.9)
Constant	-2.29	45.3	<0.001	0.10

B=beta coefficient, OR= odds ratio, CI=confidence interval, CAKUT= congenital anomaly of the kidney and urinary tract, KL:BL= kidney lengths:body height*100, aCAKUT = structural or anatomical anomalies in addition to primary diagnosis (see Methods)., CKD= chronic kidney disease.

Development of CKD over time



Summary

- Hypertension in approximately 19% of CAKUT cases.
- Type of CAKUT affects rate of development of hypertension (PUV > URA > RHD > MCKD).
- Additional structural kidney anomalies increase risk of hypertension.
- Hypertension increases risk and rate of developing chronic kidney disease.

Future Research

- Multicenter and prospective studies
- Larger sample size
- Effect of proteinuria and chronic kidney disease (adjusted models).
- Incorporation of results into clinical pathway

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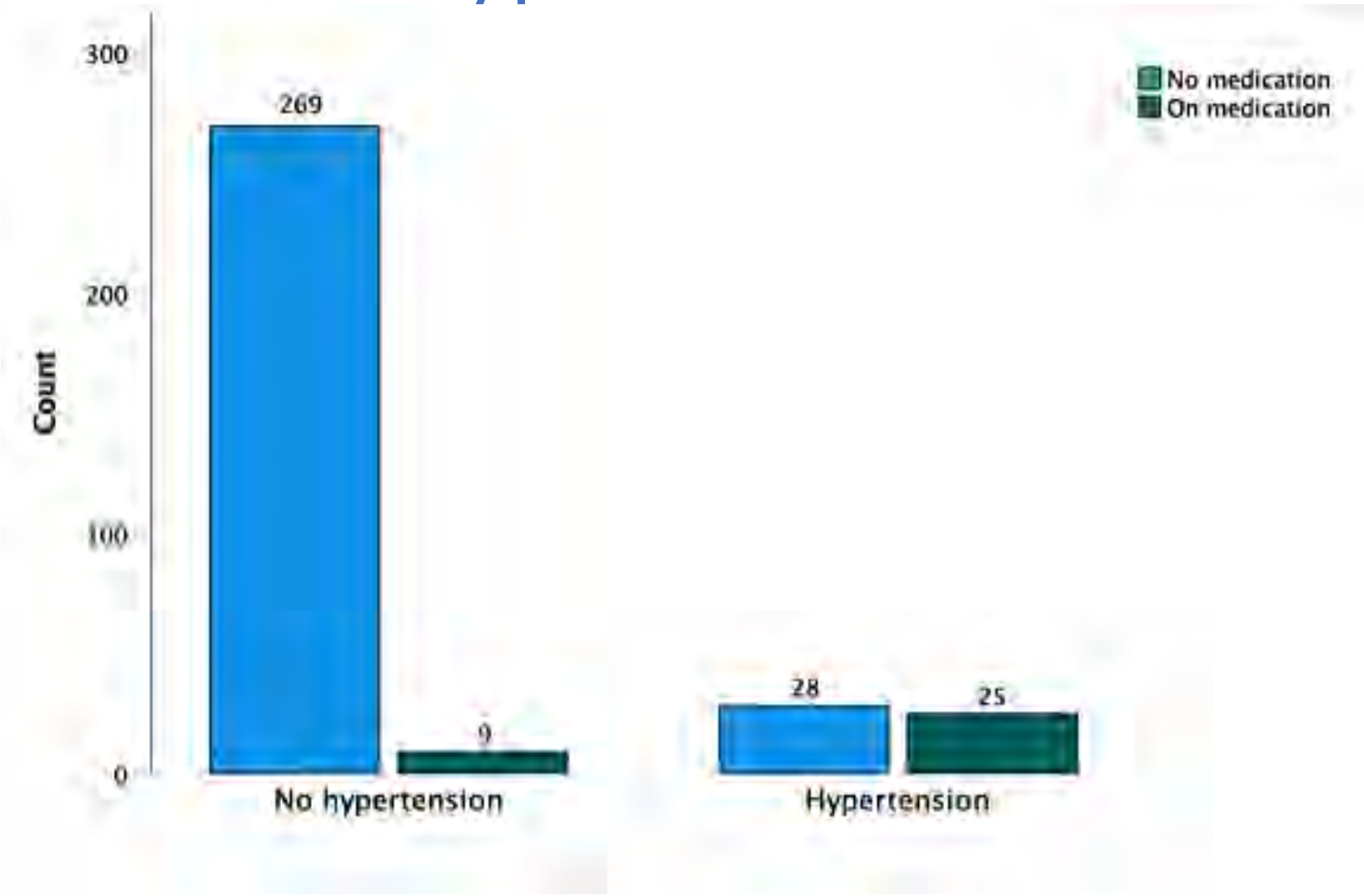
Questions

Prevalence of Hypertension



Dr. Namrata Todurkar

Early onset hyponatremia: Epidemiology and management in extremely preterm infants

CELEBRATE RESEARCH DAY - 14 April 2023

Presenter: Dr. Namrata Todurkar
Supervisors: Dr. Rajavel Elango, Dr. Susan Albersheim

Background

- Early onset hyponatremia is commonly reported in extremely preterm infants(EPI) admitted to Neonatal Intensive Care Units
- Early onset hyponatremia is associated with long and short term adverse neonatal outcomes especially poor neurodevelopment
- Numerous factors influence serum sodium (Na) concentrations in a preterm, including Na and fluid intake
- Epidemiological studies in this population are lacking, and there are no clear guidelines for how to investigate or treat hyponatremia in EPI

Study Objectives

1. To study the prevalence of early onset hyponatremia in EPI

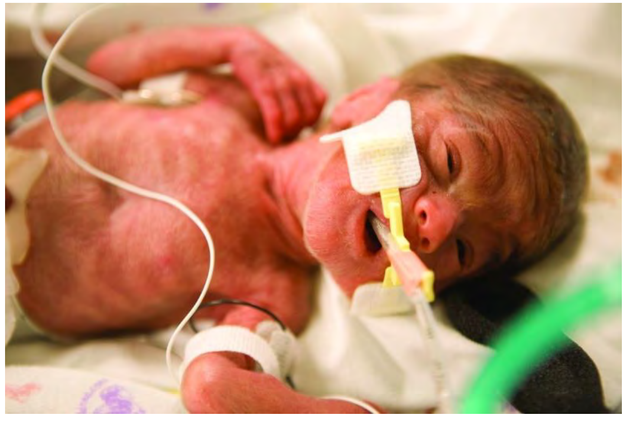
2. To determine association of early onset hyponatremia with sodium and total fluid intake (TFI)

3. To explore the investigations and interventions undertaken for hyponatremia

Hypothesis

1. Early onset hyponatremia is observed commonly in EPI

2. Early onset hyponatremia in EPI admitted to the NICU is associated with changes in i) fluid intake ii)sodium intake



Study Design

Inclusion Criteria: All EPI (<28 weeks gestation at birth), admitted to BCWH NICU in the first 2 weeks after birth

Exclusion Criteria: EPI who spent > 1 week of the first 2 weeks after birth in another hospital, EPI with major congenital anomalies.

Data Collection:

Detailed patient information extracted from medical records(fluid balance, sodium, wt) and Citrix software (demographics, lab data, morbidity/mortality)
n= 100

Definitions

- Hyponatremia days (HD)= one or multiple hyponatremia episodes in a day
- Mild hyponatremia: Na 130-134 mmol/L
- Moderate hyponatremia: Na 126-129 mmol/L
- Severe hyponatremia: Na < 125 mmol/L

Data analysis

- **Sample size:** With an estimate of hyponatremia between 35 and 55%, and a sample size of 100 charts, obtained a **precision of ±10%, ~80% power** to detect an Odds Ratio = 1.85 per SD increase in predictor variable

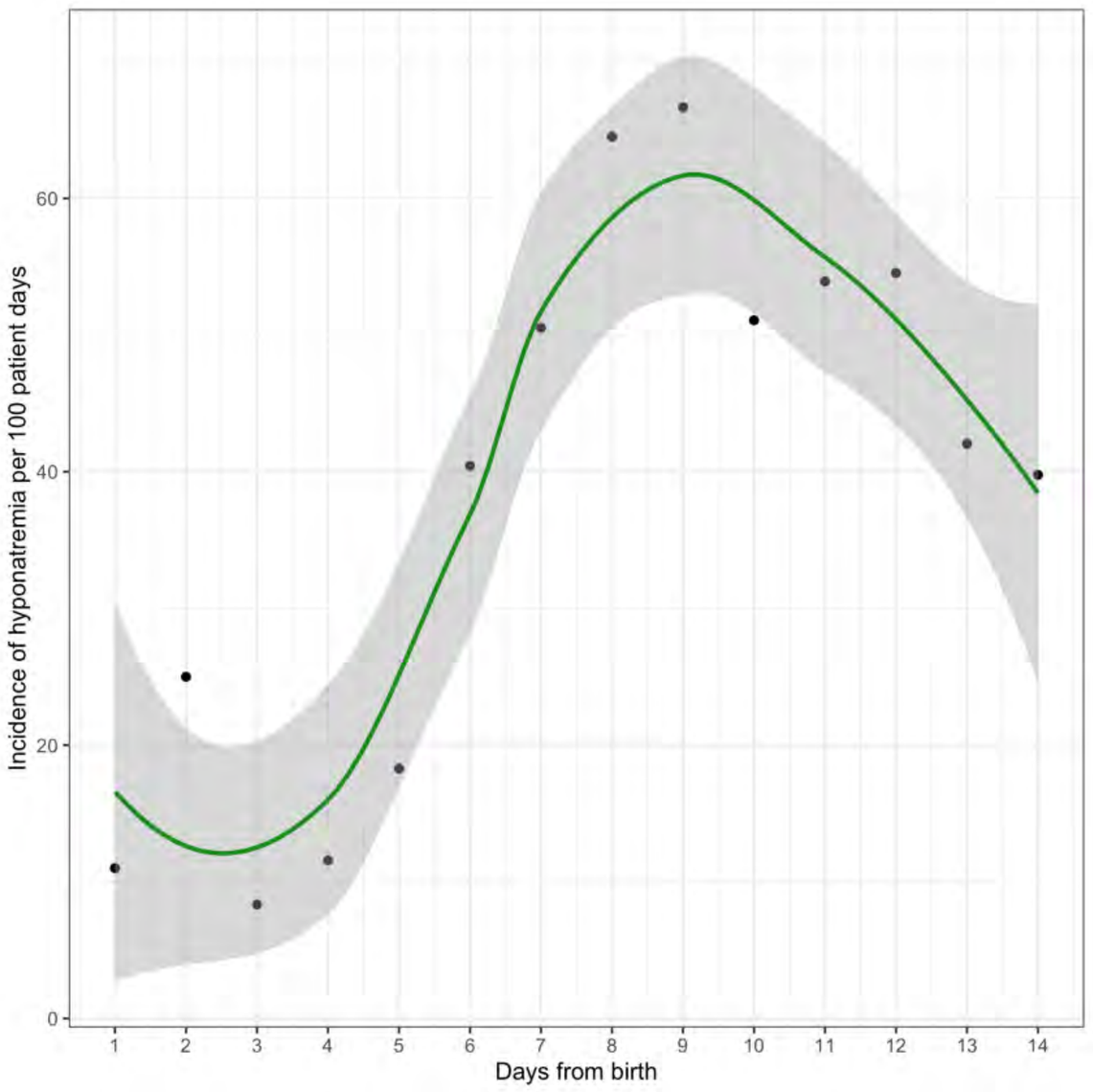
- **Statistical analyses** done using SPSS Version 21 (IBM Corporation, Armonk, NY)

- **Mixed-effects logistic regression** was used to investigate relationship between TFI and Na intake and probability of hyponatremia, with multivariate analysis for statistically significant (**p< 0.05**) results

Baseline Characteristics

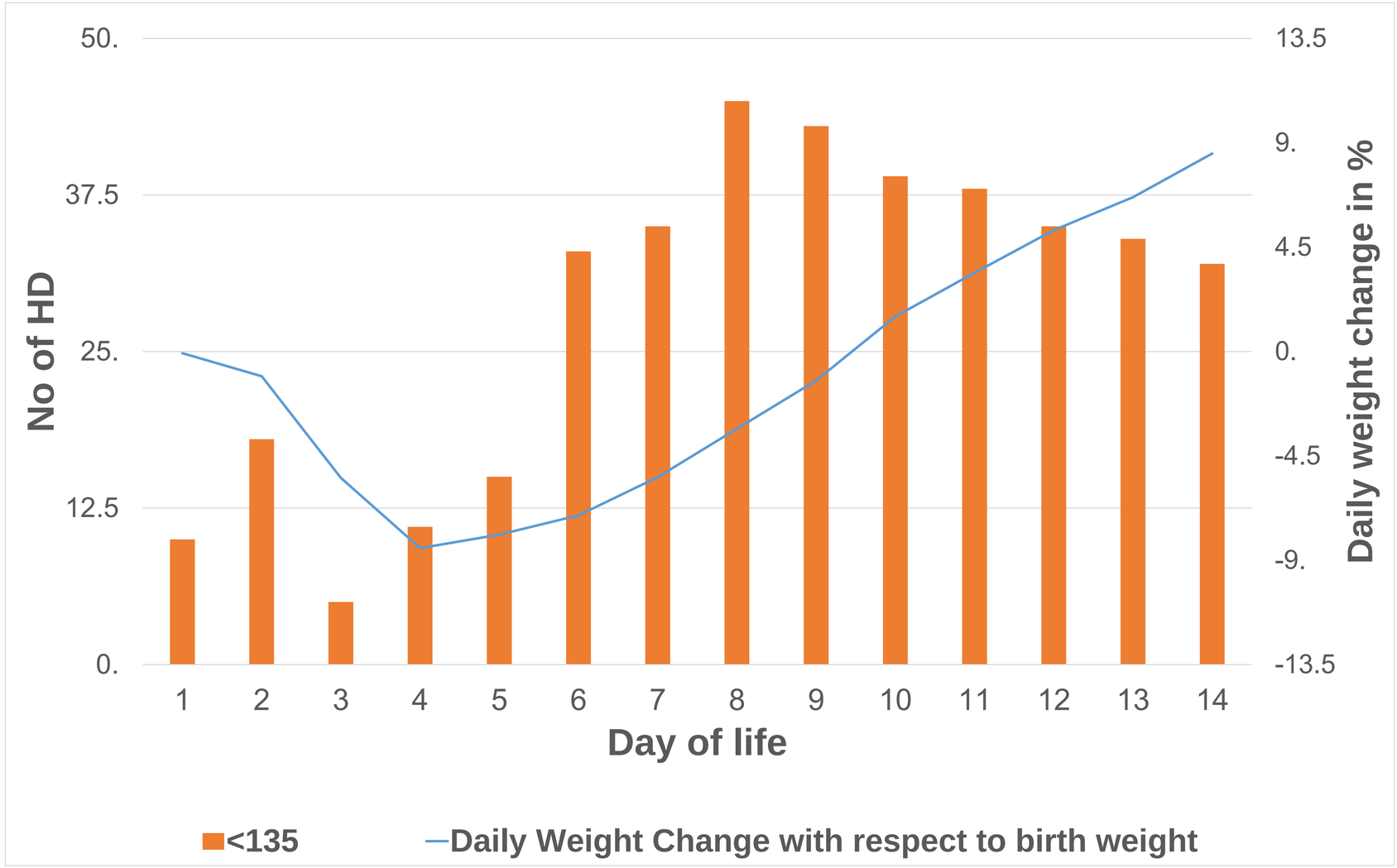
Demographic feature	No hyponatremia episode in 14-day period (N=15)	At least one hyponatremia episode in 14-day period (N = 85)
Birthweight	897 gram	842 gram
Sex	53.3% boys; 46.7% girls	60% boys; 40% girls
SNAPPE-II score	35.0	37
Type of delivery	53.3% C-section; 46.7% SVD	81.2% C-section; 18.8% SVD
Presence of maternal kidney disease	0%	8.24%

Incidence rate (per 100 patient days) of hyponatremia by day since birth



Day	Number of patients	Total hyponatremia episodes	Number of patients with hyponatremic episode
Overall	**1302 (patient days)**	**494**	**85**
1	100	11	11
2	100	25	17
3	96	8	4
4	95	11	10
5	93	17	14
6	94	38	32
7	93	47	34
8	93	60	46
9	93	62	42
10	92	47	37
11	89	48	37
12	88	48	35

Hyponatremia and cumulative fluid overload



Distribution of hyponatremia based on severity

Serum Na in mmol/L	Patients in n and %	Percentage of patients who progressed to moderate hyponatremia	Percentage of patients who progressed to severe hyponatremia
130-134 (mild hyponatremia)	77 (77%)	35 (45%)	17 (22%)
126-129 (moderate hyponatremia)	37 (37%)	-	18 (48.6%)
<125 (severe hyponatremia)	18 (18%)	-	-

Distribution of patients based on worst experienced hyponatremia:

- Mild hyponatremia: n= 42 (42%)
- Moderate hyponatremia: n= 19 (19%)
- Severe hyponatremia: n= 18 (18%)

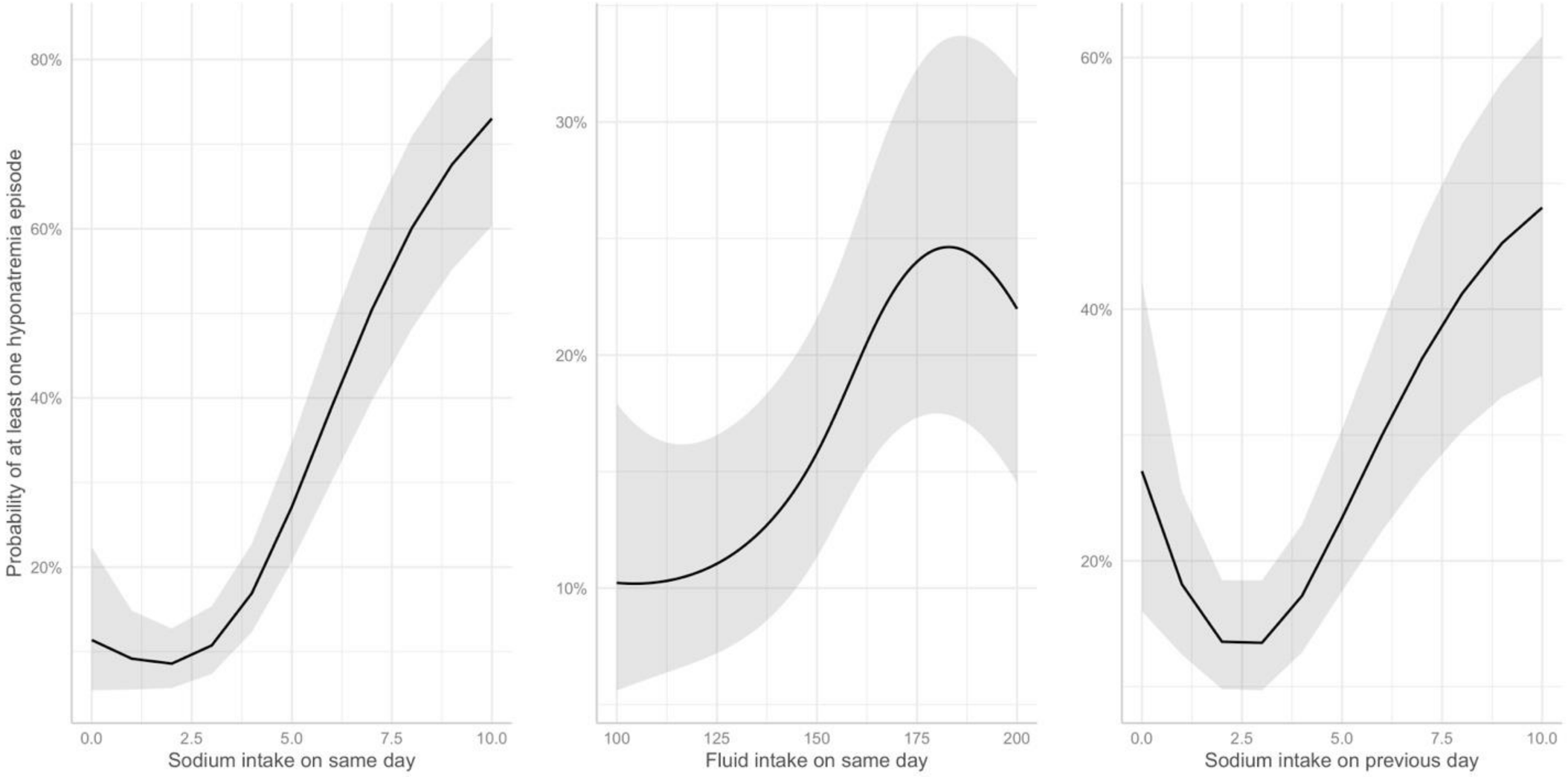
Investigations and interventions done for hyponatremia during the first two weeks of life

Investigations	Repeat Na check	Creatinine check	Urine investigations	No investigations
Hyponatremia days (n=393)	323 (82.1%)	132 (33.5%)	21 (5.3%)	42 (10.6%)
Interventions	**Increased Na intake**	**Increased prescribed TFI**	**Decreased prescribed TFI**	**No interventions**
Hyponatremia days (n=393)	219 (55.7%)	60 (15.2%)	27 (6.8%)	92 (23.4%)

Regression models assessing relationship between current and prior day sodium and fluid levels and hyponatremia

	Any hyponatremic episode			Number of hyponatremic episodes		
	Odds Ratio	95% CI	p-value	Incidence Rate Ratio	95% CI	p-value
Sodium on same day (per unit)	1.43	1.32 – 1.56	**<0.001**	1.17	1.13 – 1.20	**<0.001**
fluid (per 10 units)	1.08	1.00 – 1.16	**0.049**	1.06	1.02 – 1.11	**0.005**
Sodium intake on previous day (per unit)	1.21	1.13 – 1.29	**<0.001**	1.10	1.06 – 1.13	**<0.001**

Probability of hyponatremia by sodium intake on current day, sodium intake on previous day and fluid intake



Summary

- Early onset hyponatremia is very common in extremely preterm infants, but *under-investigated*
- Recognition of mild hyponatremia is key as *nearly half progress to moderate and severe hyponatremia*
- The most common response to hyponatremia was to *repeat Na* without investigating etiology (AKI, sodium loss, SIADH, etc.), and *supplement Na* which likely resulted in fluid overload
- Prospective studies looking at hyponatremia with planned investigations may help better *understand the cause* of this key electrolyte abnormality in EPI

Clinical implications

- These findings are concerning given the increased risk of adverse short and long term neonatal outcomes in extremely preterm infants developing early onset hyponatremia

- These data suggest that a management algorithm for hyponatremia is warranted in extremely preterm infants who are at a high risk of hyponatremia

- If mild hyponatremia is observed, should be flagged, so that they can be followed with more Na assessments

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