NICU to Primary Care Transitions: Guidelines for Preterm Infants & Children

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Webinar Logistics

- Attendees are automatically muted upon entry
- The “chat” function has been disabled**. Please utilize the Q&A box if you are having technical difficulties and to submit any questions you have for the presenters.** We will answer a select number of questions relevant to the topics presented during the Q&A portion of the webinar.
- **The slides and webinar recording will be made available on the CPQCC Website** (https://www.cpqcc.org/engage/event/nicu-primary-care-transitions-guidelines-preterm-infants-children) shortly after the webinar.

Disclosures

- No financial affiliation or conflicts of interest with the material in this presentation

Learning Objectives

After completion of the session, the participant should be able to:

- Implement critical components of a NICU discharge to achieve a smooth transition to primary care
- Understand the nutritional, immunization, and special screening requirements of preterm infants and children
- Utilize appropriate reference materials to guide ongoing management of preterm infants and children

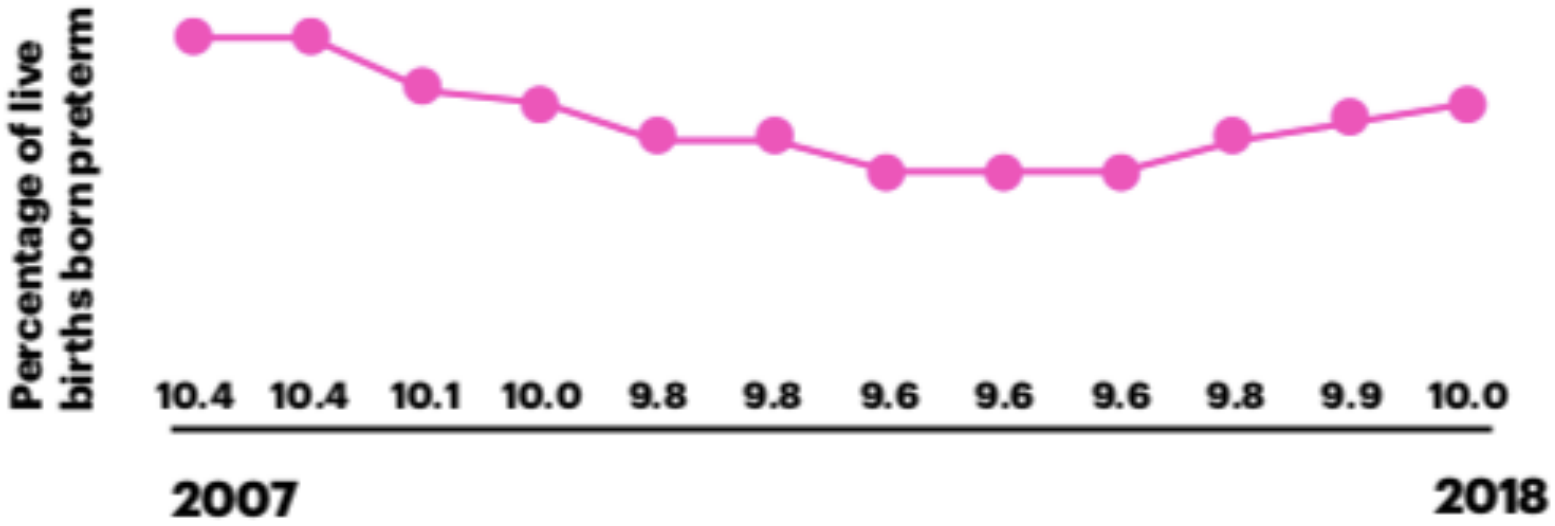
What is your usual role in the care of premature infants and children?

A. NICU Provider
B. NICU Nurse
C. NICU other
D. Hospitalist
E. Primary Care Provider
F. Primary Care other
G. Other (Please enter your role in the Q&A section)

On average, I provide medical care for an infant (newborn to 12 months of age) who was born at <37 weeks gestational age:

A. Once a day
B. Once a week
C. Once a month
D. A few times per year

US preterm birth rate 10.02% for 2018



www.marchofdimes.org/reportcard
Data from National Center for Health Statistics (NCHS)

MARCH OF DIMES

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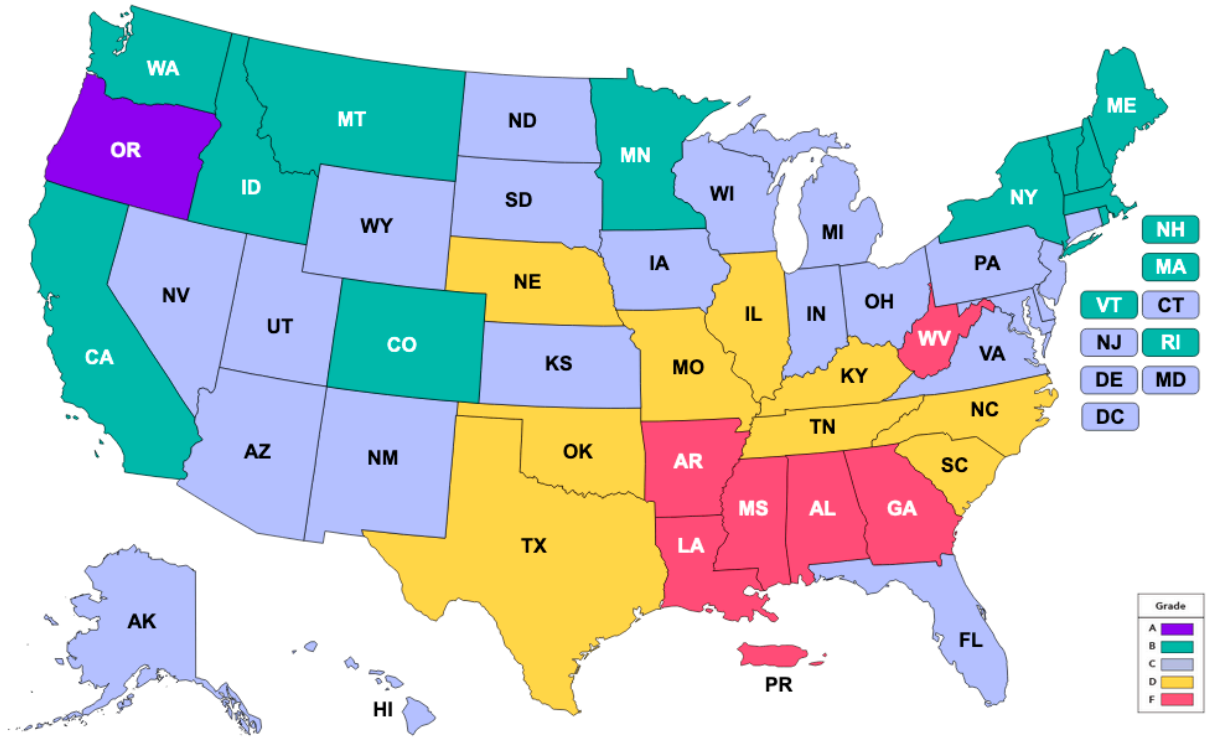
2019 MARCH OF DIMES REPORT CARD

Moms and babies face higher risks than ever before. The preterm birth rate in the United States has worsened for a fourth year, from 9.63 percent in 2015 to 10.02 percent in 2018. Premature birth and its complications are the largest contributors to infant death in this country and globally. It's not fine. But it can be. You can help March of Dimes work to solve this crisis as we fight for healthy moms and strong babies.

Choose your state to see how it ranks on this year's Report Card.



Source: Preterm birth rates are from the National Center for Health Statistics, 2018 final natality data. Grades assigned by March of Dimes Perinatal Data Center.

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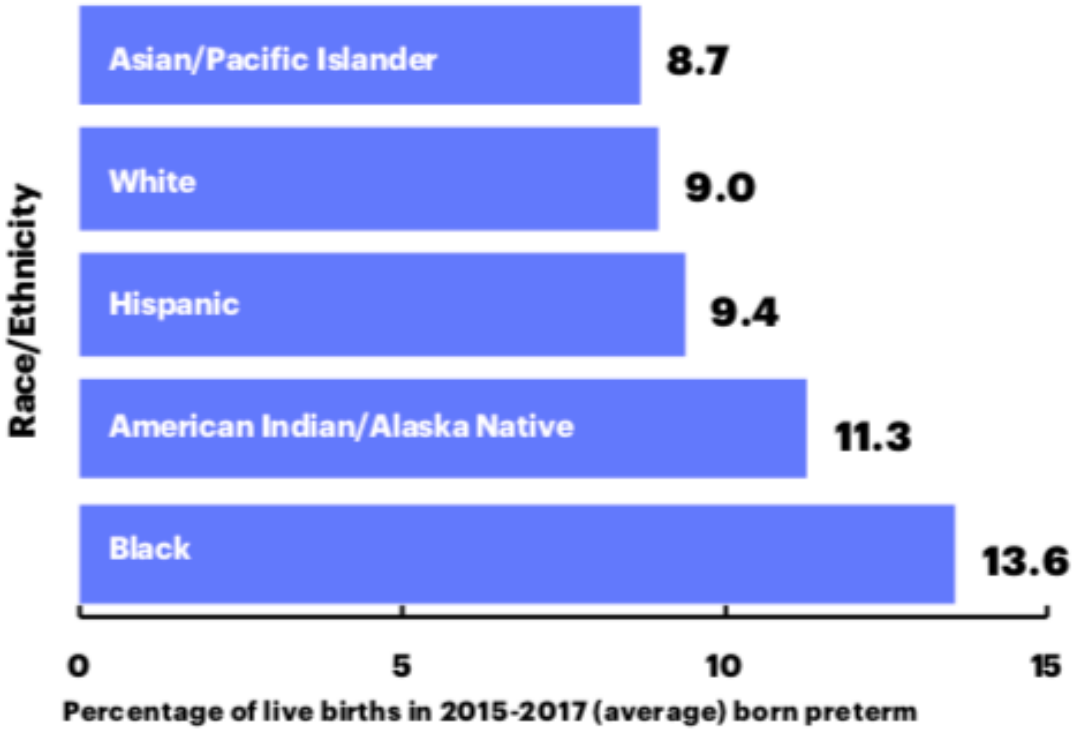
Preterm birth rate by race/ethnicity



www.marchofdimes.org/reportcard Data from National Center for Health Statistics (NCHS)

Taking care of preterm infants and children is a moving target

- Recommendations vary by gestational age
- Specific recommendations are continually updated
- Incorporate **guidelines** at the time of NICU discharge to aid in transition to primary care and subspecialty follow up

Growth and Nutrition

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Which growth chart is best to use for recently-discharged NICU grads?

A. Olsen
B. Bertino
C. Fenton growth chart
D. World Health Organization (WHO)
E. Centers for Disease Control (CDC)
F. I have no idea – whatever is in my EHR

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F. I have no idea – whatever is in my EHR

Fenton growth charts

- Used for inpatients while in NICU
- Valid for preterm infants until about 2 months of age
- Does not require age adjustment
- Plot by postmenstrual age (gestational age + chronological age)

www.ucalgary .ca/fenton

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WHO growth charts

- Recommended for infants and children 0 to 2 years
- Based on breastfed infants and children in 6 different countries

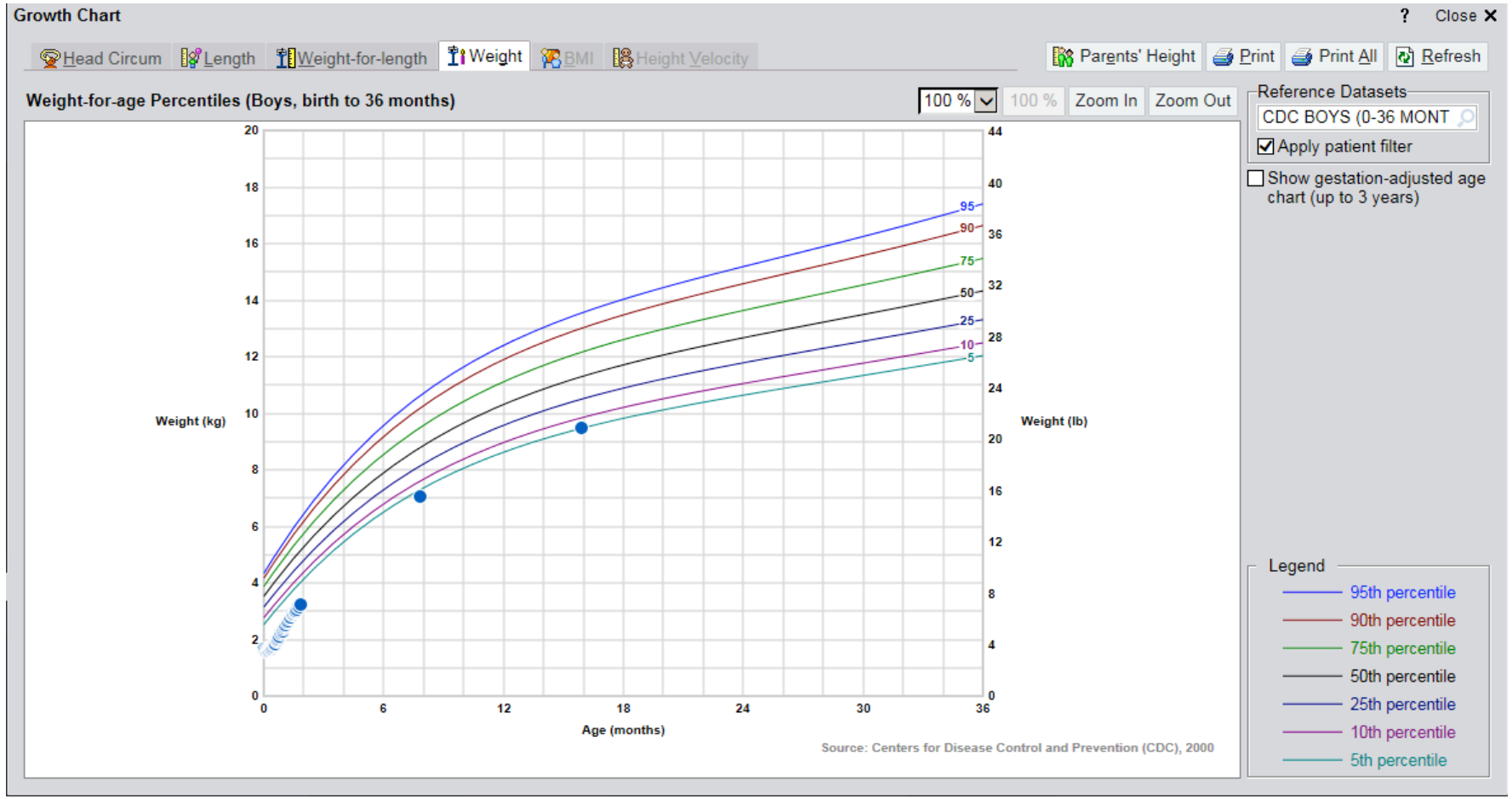
CDC growth charts

- Recommended for children 2 years and older in the United States
- Based on National Health and Nutrition Examination Survey (NHANES) data

Plotting growth

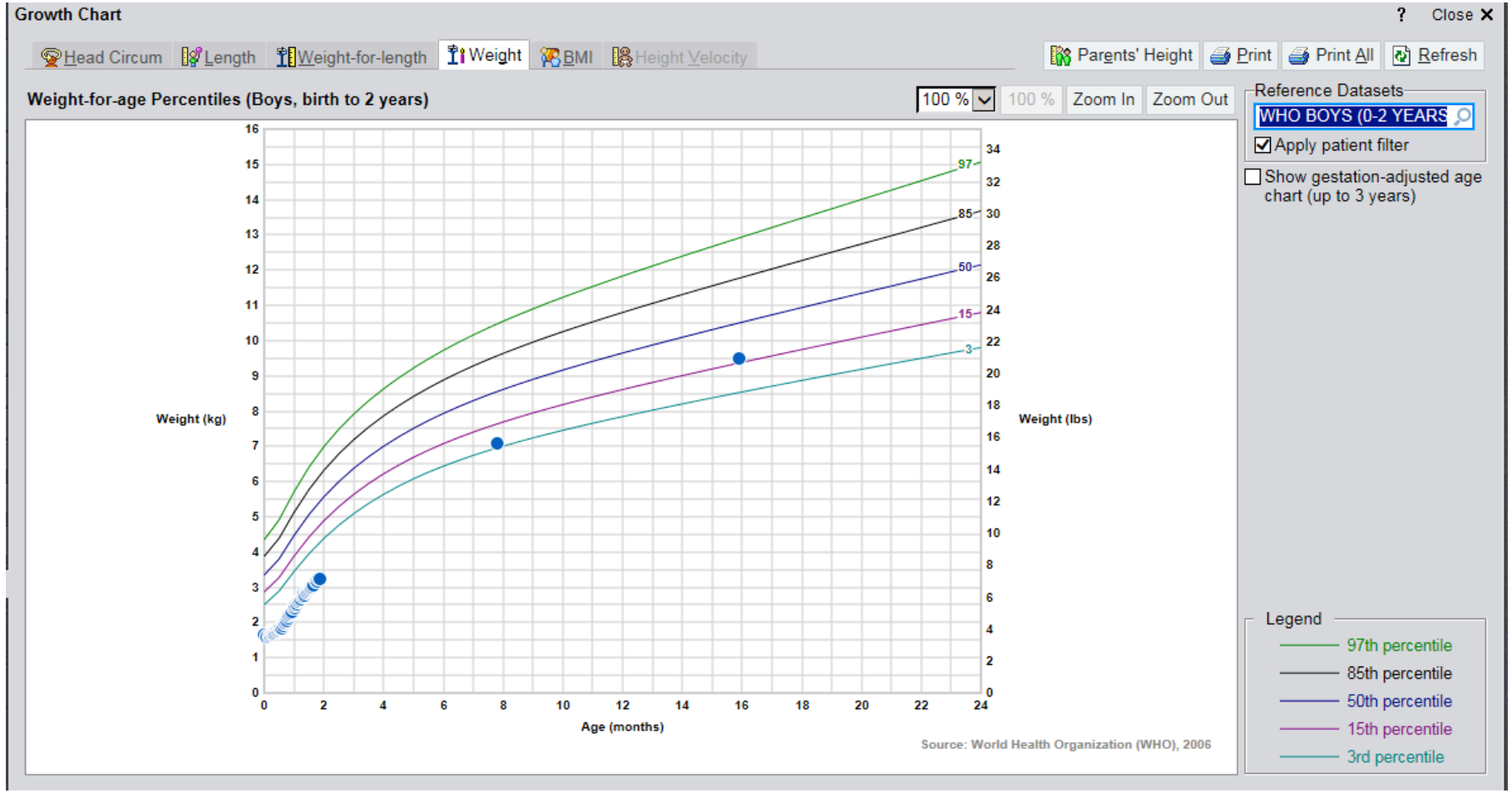
- Harry is an almost 16 month old who was born at 31+2 weeks gestational age.
- His weight today is 9.5 kg.

CDC growth chart - boys



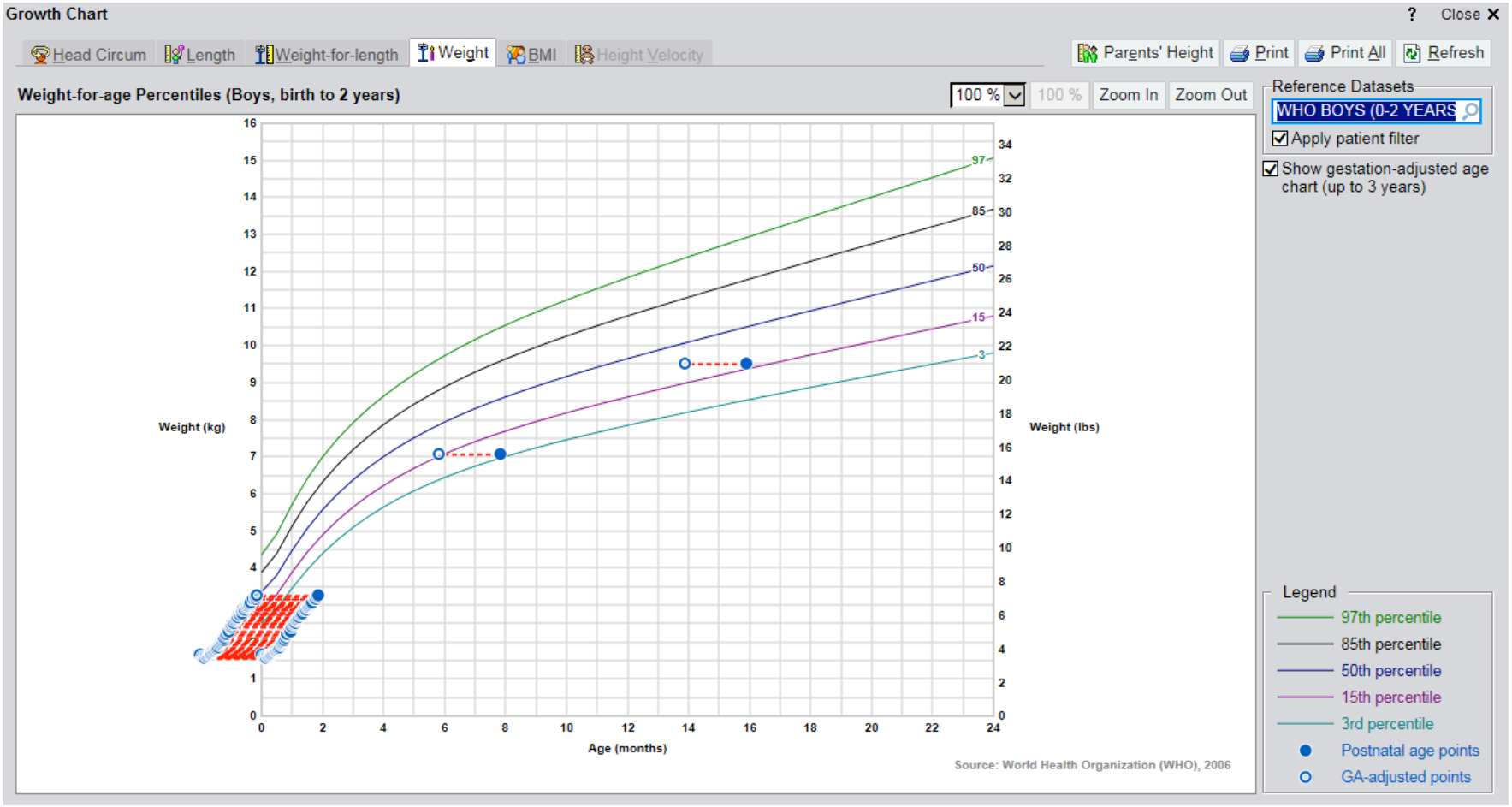
Weight 9.5 kg = 5%

WHO growth chart - boys



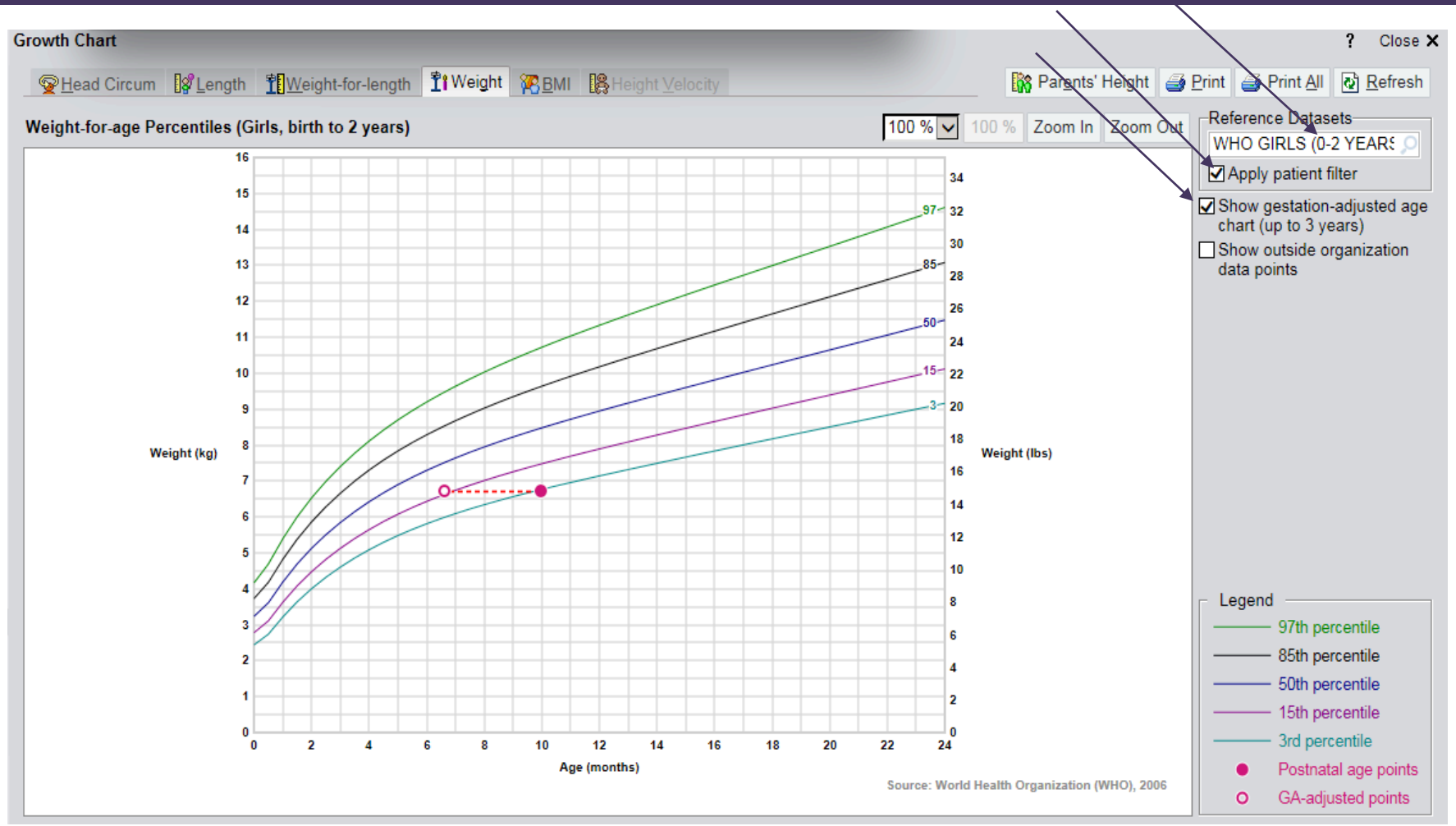
Weight 9.5 kg = 18%

WHO growth chart with corrected age



- 31+2 weeks gestational age
- Weight 9.5 kg = 18% chronological age (15 months 27 days)
- Weight 9.5 kg = 30% corrected age (13 months 27 days)

Weight for corrected age - Epic



- 25+3 week GA girl: 9 mos 29 days chronological age, 6 months 17 days corrected age
- Weight 6.73 kg = 3% chronological age, 18% corrected age

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Preterm infants are at risk for growth failure after discharge

Goals post-discharge:

- Promote breastfeeding
- Normal rate of growth for corrected age
- Avoid overfeeding

Why should post-discharge formulas be used?

- Post-discharge formula (EnfaCare®, NeoSure®) for preterm infants supplies more calories, protein, vitamins, and minerals than standard formula
- Improves growth
- Improves brain growth

Recommended macro/micronutrients for infants 0-6 months

Recommended macronutrient/micronutrient requirements (units/kg/d) for the stable preterm infant				
	Term	ELBW	VLBW	VLBW Post term
Energy, kcal	90-120	130-150	110-130	90-100
Protein, g	1.52	3.8-4.4	3.4-4.2	2.0
Carbohydrate, g	16-20[a]	9-20	7-17	6.8-14.1
Fat, g	8-10.3[a]	6.2-8.4	5.3-7.2	4.0-6.6
Vitamin A, IU	1333	700-1500	700-1500	545-1273
Vitamin D, IU	200	150-400	150-400	400
Calcium, mg	70-120	100-220	100-220	253-377
Phosphorus, mg	35-75	60-140	60-140	105-273
Iron, mg	0.09[a]	2-4	2-4	1.8-2.7
Zinc, mg	666[a]	1000-3000	1000-3000	890

Adapted from: Nzegwu NI, Ehrenkranz RA. Post-discharge nutrition and the VLBW infant: To supplement or not supplement?: a review of the current evidence. Clin Perinatol 2014;41:463-74.

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Composition of post-discharge formulas

Composition of post-discharge formulas (per 100 mL) and mature human milk						
	Mature Human Milk	Similac Neosure 22 kcal/oz[a]	Enfamil Enfacare 22 kcal/oz[b]	Similac Advance 20 kcal/oz[a]	Enfamil Lipil 20 kcal/oz[b]	Nestle Good Start 20 kcal/oz[c]
Energy, kcal	65-70	74.4	74	67.6	68	67
Protein, g	1.03	2.1	2.1	1.4	1.4	1.5
Carbohydrate, g	6.7-7.0	7.5	7.9	7.2	7.4	7.5
Fat, g	3.5	4.1	3.9	3.8	3.6	3.4
Calcium, mg	20-25	78.1	89	52.8	53	44.9
Phosphorus, mg	12-14	46.1	49	28.4	29	25.5
Sodium, mg	12-25	24.5	26	16.2	18.4	18.4
Iron, mg	0.3-0.9	1.34	1.3	1.2	1.2	1.0

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[a] Mead Johnson Nutritionals, Evansville, IN; http://www.meadjohnson.com/Brands/Pages/Products- by Need.aspx.

[b] Abbott Nutrition, Abbott Laboratories, Columbus, OH; http://abbottnutrition.com/.

[c] Gerber (Nestle) Infant Formulas, Glendale, CA; http://medical.gerber.com/products/Default.aspx.

Adapted from: Nzegwu NI, Ehrenkranz RA. Post-discharge nutrition and the VLBW infant: To supplement or not supplement?: a review of the current evidence. Clin Perinatol 2014;41:463-74.

Who needs post-discharge formula supplementation to breast milk?

- VLBW infants at highest risk
- Supplementation recommendations vary
  - Variance by geographic area and institution
  - Continual evolution as NICU nutrition knowledge improves

Approaches to using post-discharge formula (PDF)

- Substitute PDF for breast milk 2 to 3 feedings/day
- Fortification of breast milk with PDF (EnfaCare® or NeoSure® powder) to 22 or 24 cal/oz for 2 to 3 feedings per day
- PDF to 22 or 24 cal/oz with frequency determined by growth trajectory

How long to use post-discharge formula?

- BW>1800 grams: Probably not necessary
- BW 1501-1800 grams: Up to 3 months
- BW 1001-1500 grams: Up to 6 months
- BW 751-1000 grams: Up to 9 months
- BW <750 grams: Up to 12 months

Monitor growth closely

- Provide follow up within 72 hours after discharge from the NICU
- Recheck every two weeks initially until stable weight gain is established
- Follow closely while on post-discharge formula to monitor for adequate weight gain as well as too rapid weight gain
- Use clinical judgment

What about Vitamin D?

- AAP recommends Vit D 400 IU (10 mcg)/day for infants < 1 year old
- Breastfeeding infants: supplement 400 IU (10 mcg)/day
- Formulas in the US have at least 400 IU (10 mcg) of Vitamin D per liter
- Supplement partially breastfed infants and those taking less than 1 liter per day of formula

What about iron?

- Treat with iron (2 to 3 mg/kg/day) through at least the first 6 months (some recommend 12 months)
- Treat with therapeutic doses of iron (4-6 mg/kg/day) for anemia
- Consider monitoring labs

Why treat with iron?

- Iron deficit
  - Prematurity
  - Iatrogenic lab draws
- Improves developmental outcome

Rao, Raghavendra, and Michael K. Georgieff. “Iron Therapy for Preterm Infants.” Clinics in Perinatology, vol. 36, no. 1, Mar. 2009, pp. 27–42. Crossref, doi:10.1016/j.clp.2008.09.013.

Immunizations and Immunoprophylaxis

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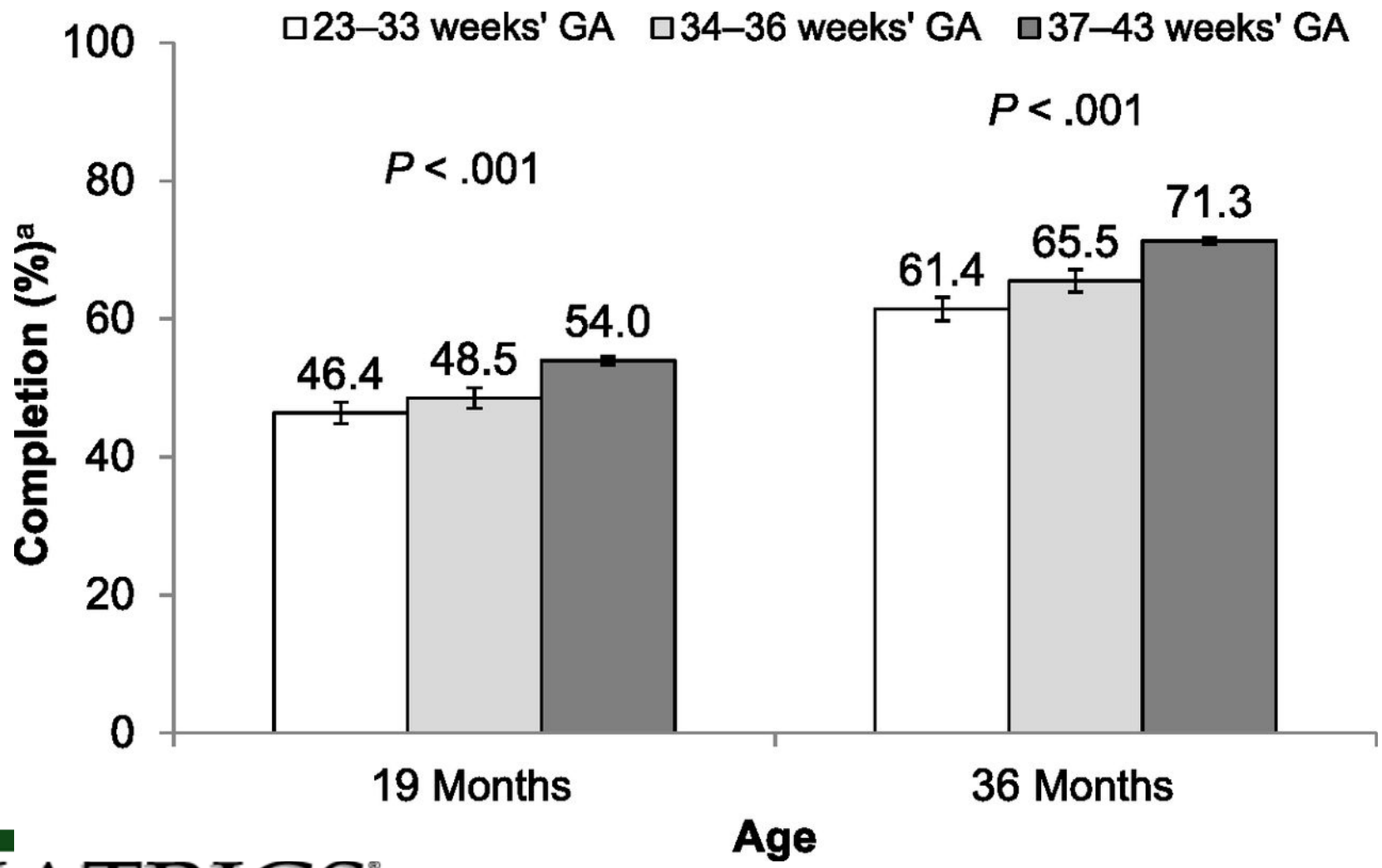
Seven-vaccine series completion by 19 and 36 months of age, by gestational age (GA). Data are presented as percentage ± SE.



PEDIATRICS®

Annika M. Hofstetter et al. Pediatrics 2019;144:e20183520

Lower immunization rates in preterm infants

- Preterm infants had lower immunization rates than term infants (7-vaccine series)
- Differences persisted through 36 months
- Possible influences:
  - parental decisions
  - provider decisions
  - provider knowledge
  - more frequent illness

Hofstetter, Annika M., et al. “Early Childhood Vaccination Status of Preterm Infants.” Pediatrics, vol. 144, no. 3, Sept. 2019,

Case example

- Tina is a former 27 week GA, 1200 gram birth weight infant who was discharged from the NICU last week. She received immunizations in the NICU when she was two months old. She is now three months old, weighs 2050 grams, and comes to your office for her first visit in December.

Which immunizations/immunoprophylaxis should she be given?

A. None are needed now
B. Rotavirus
C. Hep B, Rotavirus
D. Hep B, Rotavirus, Palivizumab
E. None of the above answers is correct

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Hepatitis B Vaccine

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Hepatitis B vaccine

- Hepatitis B vaccine is the only vaccine for which data clearly indicate a lower response in preterm infants

Hepatitis B vaccine

Mother is HBsAg-negative:

- ≥2,000 grams: 1 dose within 24 hours of birth
- <2,000 grams: 1 dose at chronological age 1 month or hospital discharge

Hepatitis B vaccine

Mother is HBsAg-positive

- Give Hep B vaccine and 0.5 mL of HBIG (at separate anatomic sites) within 12 hours of birth **regardless of birth weight**

Hepatitis B vaccine

Mother's HBsAg status is unknown:

- Give **Hep B vaccine** within 12 hours of birth, regardless of birth weight
- *<2,000 grams, give 0.5 mL of HBIG in addition to Hep B vaccine within 12 hours of birth.*

Bottom line on Hepatitis B vaccine

- Hep B vaccine given at <2000 grams and prior to 1 mo age cannot be counted as part of the primary series
- Remember to give HBIG if the mother's status is unknown and the infant is <2000 grams

Rotavirus Vaccine

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Rotavirus vaccine

- Do not start the series on or after age 15 weeks, 0 days
- Not given during most NICU admissions in the United States (a few give on discharge)
- Studies showed missed opportunities to start Rotavirus right after NICU discharge
- Always think of Rotavirus vaccine at the first visit after NICU discharge

Missed opportunities for Rotavirus vaccine

- National Immunization Survey
- 71% were fully vaccinated
- Of 14% who received no doses
  - 72% had ≥1 ACIP-defined missed opportunity
  - 60% had ≥2 ACIP-defined missed opportunity
  - 43% had ≥3 ACIP-defined missed opportunity

Sederdahl, Bethany K., et al. “Missed Opportunities for Rotavirus Vaccination.” Pediatrics, vol. 143, no. 5, May 2019

Palivizumab Prophylaxis

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Palivizumab prophylaxis

- First year of age
  - Born < 29 weeks 0 days GA
  - Born < 32 weeks 0 days GA and requirement for >21% O2 for at least 28 days after birth
  - May give for hemodynamically significant heart disease
  - Consider for pulmonary abnormality or neuromuscular disease that impairs ability to clear secretions

Palivizumab prophylaxis

- Children younger than 24 months
  - Required at least 28 days of supplemental oxygen after birth and continue to require medical intervention within 6 months of start of second RSV season
  - Consider for those profoundly immunocompromised during the RSV season

Note: Slides do not list all recommendations

General recommendations: immunization and immunoprophylaxis

- Remember Hepatitis B vaccine exceptions to the usual immunization schedule
- Do not miss the opportunity to give Rotavirus vaccine at or after NICU discharge
- Keep a list of children who need Palivizumab year-round

Screening

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Case example

Marco was born at 30 weeks gestational age and weighed 1400 grams at birth. Assuming appropriate screening in the newborn period, what additional evaluations are recommended by 30 months of age?

A. Developmental screening
B. Developmental, audiology, and ophthalmology
C. Audiology and ophthalmology

Case example

Marco was born at 30 weeks gestational age and weighed 1400 grams at birth. Assuming appropriate screening in the newborn period, what additional evaluations are recommended by 30 months of age?

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Developmental Screening

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Developmental and sensory issues

- Prematurity is associated with increased risks for developmental delay, vision problems, hearing problems, and family stress

Neurodevelopmental screening

- Multiple studies use many different outcome measures and criteria
- Two meta-analyses published in 2018

Developmental outcomes

- Meta-analysis of 30 studies included 10,293 very preterm and very low birth weight infants
- Decreasing gestational age and birth weight resulted in higher prevalence
  - Cognitive delays 16.9%
  - Motor delays 20.6%
  - Cerebral palsy 6.8%

Neurodevelopmental outcome in very preterm and very-low-birthweight infants born over the past decade: a meta-analytic review.
Pascal A, Govaert P, Oostra A, Naulaers G, Ortibus E, Van den Broeck C.
Dev Med Child Neurol. 2018 04;60(4):342-355.

Developmental outcomes

- Another meta-analysis compared 6163 very preterm and 5471 term children
- Preterm children scored lower in intelligence measures, executive functioning, and processing speed

Cognitive outcomes in children and adolescents born very preterm: a meta-analysis in Developmental Medicine & Child Neurology by Brydges, et al. Volume 60: 452-468, February 2018

Late preterm infants (34 to 36+6 weeks GA) have increased rates of:

- Developmental disability
- School failure
- Behavioral problems
- Social and medical disabilities
- Death

Woythaler, Melissa. “Neurodevelopmental Outcomes of the Late Preterm Infant.” *Seminars in Fetal and Neonatal Medicine*, vol. 24, no. 1, Feb. 2019.

Developmental screening

- AAP recommends developmental screening evidence-based tools at 9, 18, and 30 months
- Recommend general screening at each WCC visit and schedule interim visits as indicated
- Follow milestones closely
- Check for abnormalities of tone and movement at each visit

Examine

- Milestones
- Hypertonia
- Hypotonia
- Reflexes
- Abnormal movements, postures

Normal development

Altered muscle tone – hypotonic infant

Photo by Janelle Aby, MD
https://med.stanford.edu/newborns

Altered muscle tone – scissoring and muscle spasticity

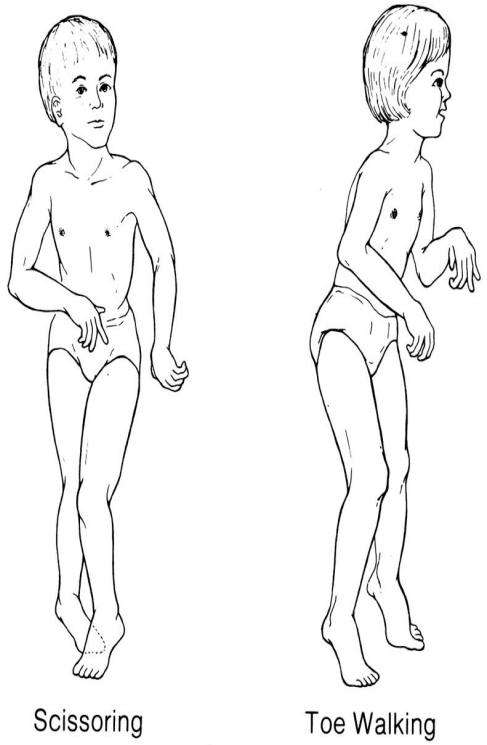

Figure 24.11. Scissoring results from increased tone in the muscles on the inner aspect of the thigh that tend to pull the legs together and turn the legs inward. Toe walking is due to tightness of the calf muscles and Achilles tendon and increased extensor tone in the legs.

Referrals for developmental concerns

- Early intervention program
- Physical therapy
- Occupational therapy
- Speech and language therapy
- Orthopedics
- Neurology
- Genetics

Hearing Screening

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Hearing screening

- Infants admitted to the NICU have a 2% risk for hearing loss, primarily due to sensorineural hearing loss (SNHL) and auditory neuropathy (AN). This is 10X the rate in the general newborn population (1.6/1000 newborns).

Risk factors for hearing loss

- Low birth weight
- Hyperbilirubinemia
- Hypoxia
- Ototoxic drugs (especially aminoglycosides)
- Infection (especially meningitis)

Early intervention makes a difference

- Hearing loss detected prior to 9 months of age improved reading and communication skills and long-term reading comprehension skills through teen years (ages 13-19 in one study)
- Amplification with hearing aids by 6 months of age was associated with better early language skills

Pimperton, Hannah, et al. “The Impact of Universal Newborn Hearing Screening on Long-Term Literacy Outcomes: A Prospective Cohort Study.” Archives of Disease in Childhood, vol. 101, no. 1, Jan. 2016, pp. 9–15. Crossref, doi:10.1136/archdischild-2014-307516.

AAP: Early Hearing Detection and Intervention (EHDI) 1-3-6

- Hearing screening by 1 month
- Diagnosis of hearing loss by 3 months
- Enrollment in intervention by 6 months

https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/PEHDIC/Pages/Early-Hearing-Detection-and-Intervention.aspx

Children who met 1, 3, 6

- Increased vocabulary
- Helped all children, regardless of their level of hearing loss or other determining factors

Yoshinaga-Itano C, Sedey AL, Wiggin M, et al. Early Hearing Detection and Vocabulary of Children with Hearing Loss. Pediatrics. 2017;140(2):e20162964

2007 AAP guidelines for Early Hearing Detection and Intervention programs

- All newborns (ABR or OAE)
- NICU admissions for > 5 days (ABR)
- Readmissions in first month of life for high risk conditions
  - Hyperbilirubinemia requiring exchange transfusion
  - Culture positive sepsis

2007 AAP guidelines for Early Hearing Detection and Intervention programs

- Referral to audiologist before 30 months for all NICU admissions > 5 days
- Close monitoring of language acquisition skills, auditory skills, middle ear status
- Refer sooner for hearing concerns, delayed language milestones

Joint Committee on Infant Hearing. “Year 2007 Position Statement: Principles and Guidelines for Early Hearing Detection and Intervention Programs.” PEDIATRICS, vol. 120, no. 4, Oct. 2007, pp. 898–921. Crossref, doi:10.1542/peds.2007-2333.

See supplement: http://pediatrics.aappublications.org/content/early/2013/03/18/peds.2013-0008.

Ophthalmologic Screening

Ophthalmologic screening

- Retinopathy of prematurity (ROP)
  - Birth weight <1500 grams
  - GA ≤30 weeks
  - Infants 1500-2000 grams and GA >30 weeks with unstable clinical course

Timing of screening

- 31 weeks postmenstrual age (PMA) for infants born 22 to 26 weeks gestational age
- 4 weeks chronological age for infants born ≥27 weeks gestational age
- Follow-up visits: every 1 to 3 weeks

TABLE 1 Timing of First Eye Examination Based on Gestational Age at Birth

Gestational Age at Birth, wk	Age at Initial Examination, wk	
	Postmenstrual	Chronologic
22[a]	31	9
23[a]	31	8
24	31	7
25	31	6
26	31	5
27	31	4
28	32	4
29	33	4
30	34	4
Older gestational age, high-risk factors[b]	—	4

Shown is a schedule for detecting prethreshold ROP with 99% confidence, usually before any required treatment. —, not applicable.

[a] This guideline should be considered tentative rather than evidence based for infants with a gestational age of 22 to 23 wk because of the small number of survivors in these postmenstrual age categories.

[b] Consider timing on the basis of the severity of comorbidities.

Fierson WM, Ophthalmology AAOPS on, Ophthalmology AAO, Strabismus AA for POA, Orthoptists AA of C. Screening Examination of Premature Infants for Retinopathy of Prematurity. *Pediatrics*. 2018;142(6):e20183061. doi:10.1542/peds.2018-3061

ROP incidence

- Population-based cohort study from New Zealand, Australia:
  - Overall incidence of severe ROP 10% of infants <32 weeks
  - Incidence 3% at 27 weeks, 34% at 24 weeks
  - ≥32 weeks: not at risk
  - ≥28 weeks: most have mild disease that does not require treatment

Tan, Zachary, et al. “Visual Impairment Due to Retinopathy of Prematurity (ROP) in New Zealand: A 22-Year Review.” British Journal of Ophthalmology, vol. 99, no. 6, June 2015, pp. 801–06. Crossref, doi:10.1136/bjophthalmol-2014-305913

Additional eye screening

- Follow specific recommendations for intervals of ophthalmologic follow up based on findings
- Additional exam generally 4-6 months after NICU or ophthalmological care discharge

American Academy of Pediatrics. Screening Examination of Premature Infants for Retinopathy of Prematurity. Volume 31 (1), 2013

Additional ophthalmologic issues

- Overall, refractive errors are four times more common in those born preterm (29.6%) than those born at term (7.8%)
- Very preterm births are more affected (<32 weeks)
- Higher rates of strabismus (5-25% in preterm)
- Presence of high refractive errors (particularly myopia (3-20%)
- Lowered stereoacuity and loss of peripheral vision

Leung, Myra PS, et al. “The Effects of Preterm Birth on Visual Development: Preterm Birth and Visual Development.” Clinical and Experimental Optometry, vol. 101, no. 1, Jan. 2018, pp. 4–12. Crossref, doi:10.1111/cxo.12578

Psychosocial Screening

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Psychosocial monitoring

- Postpartum depression
- Additional stressors because of care required for preterm infants
- Post-traumatic stress from birth and NICU experiences

Parents of preterm infants

- Increased post-traumatic stress symptoms in mothers of preterm infants compared to term infants
- Symptoms diminish over time but remain higher in mothers of preterm infants
- Referrals more likely for severe symptoms

Gondwe, Kaboni Whitney, and Diane Holditch-Davis. “Posttraumatic Stress Symptoms in Mothers of Preterm Infants.” International Journal of Africa Nursing Sciences, vol. 3, 2015, pp. 8–17. Crossref, doi:10.1016/j.ijans.2015.05.002

Screening Summary

- Neurodevelopmental screening
- Hearing screening
- Vision screening
- Psychosocial screening

Care Coordination and Transition

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NICU Discharge Guideline #1

Provide and arrange all possible care before discharge

- Update immunizations and immunoprophylaxis (Palivizumab if indicated)
- Make referrals and appointments for indicated follow up
  - Primary Care
  - Early Intervention
  - Ophthalmology
  - Audiology
  - Other subspecialties
  - Other therapeutic interventions (physical therapy, feeding therapy, occupational therapy)

NICU Discharge Guideline #2

Include primary care guidance and relevant information in the discharge summary

Modifiable Word Document for EMR

NICU DISCHARGE SUMMARY ADDENDUM

Primary Care Guidance for Preterm Infants

The following information provides general guidance, and not all recommendations are applicable to all infants. This does not indicate an exclusive course of treatment or serve as a standard of medical care. The information provided in this discharge summary is derived from the CPQCC Primary Care for Preterm Infants and Children Toolkit.

Nutrition: Use corrected age (adjusted for prematurity) on WHO growth chart until 2 years of age. Always promote breastfeeding and do not overfeed. Length of use of post-discharge formulas (usually EnfaCare® or NecSure®) is controversial and without standard recommendations but should not replace breastfeeding in an adequately growing infant. These are some informal suggestions for using premature formulas in formula-fed infants:

- *BW >1800 grams:* probably not necessary
- *BW 1501-1800 grams* – up to 3 months
- *BW 1001-1500 grams* – up to 6 months
- *BW 751-1000 grams* – up to 9 months
- *BW <750 grams* – up to 12 months

Caloric density of formulas will depend on weight gain in the NICU and other medical issues.

Vitamin D: 400 IU per day recommended < 1 year old. Formulas in US contain at least 400 IU per liter. Supplement all breastfeeding infants and all infants taking less than 1 liter of formula per day.

Iron Supplementation: 2-3 mg/kg/day for 6 to 12 months; 4-6 mg/kg/day if anemic.

Hepatitis B vaccine: A dose received by an infant <2000 grams AND <1 month of age does not count towards the primary series.

Rotavirus Vaccine: Infants usually do not receive rotavirus vaccine in the NICU. The first dose of rotavirus vaccine must be administered by age 14 weeks 6 days. Consider administering at the first outpatient visit for infants 6 weeks to 14 weeks 6 days.

Palivizumab (Synagis): Consider for infants < 12 months at start of RSV season if less than 28+6 weeks GA at birth or less than 32 weeks GA at birth and O2 requirement for at least 28 days. Consider for infants < 24 months at the start of RSV season with chronic lung disease on medical therapy within 6 months of start of RSV season. For complete recommendations, including infants with CHD and neuromuscular disease, see https://pediatrics.aappublications.org/content/134/2/415.full

Developmental Screening: Perform at every WCC visit. Use evidence-based tools at 9, 18, 30 months. Infants at high risk for developmental delays or with documented developmental delays should be referred to an Early Intervention Program. Contact information ***. Consider referrals for additional evaluations and services such as high risk infant follow-up programs and neurology.

Hearing Screening: ABR screening (such as ALGO) prior to discharge. If initial screen was not passed, repeat outpatient screening as quickly as possible and by one month of age. If initial screen was normal, repeat hearing screening by 30 months. Audiology referral advised at any time for concerns or language delays. To schedule an audiology appointment at ***, please call ***.

Ophthalmologic Screening: Monitor for ROP until mature retinae for GA<30 weeks or <1500 g or selected infants 1500-2000 g or GA >30weeks. For all, follow up at 4-6 months after NICU discharge and yearly. To schedule an ophthalmology appointment at ***, please call ***.

Psychosocial Screening: Perform at every WCC and other visits as feasible. Resources for families include ***.

For Additional Guidance

Please refer to the CPQCC Primary Care for Premature Infants & Children Toolkit available at: https://www.cpqcc.org/preterm-primary-care-toolkit.

Additional Information

[Use the space below to enter your organizational contact info, additional instructions, and information or references specific to your institution.]

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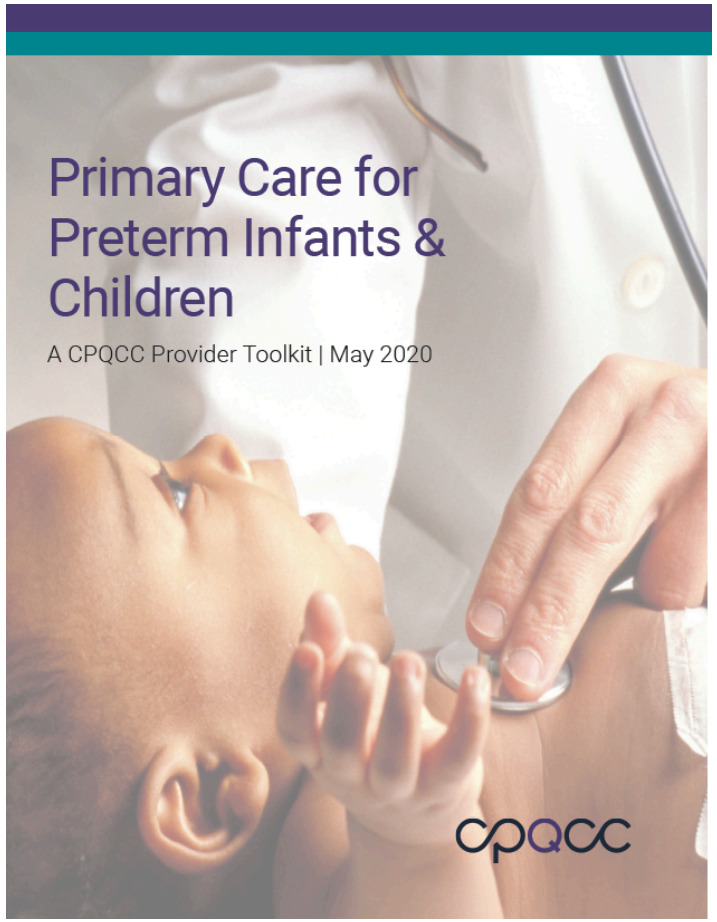
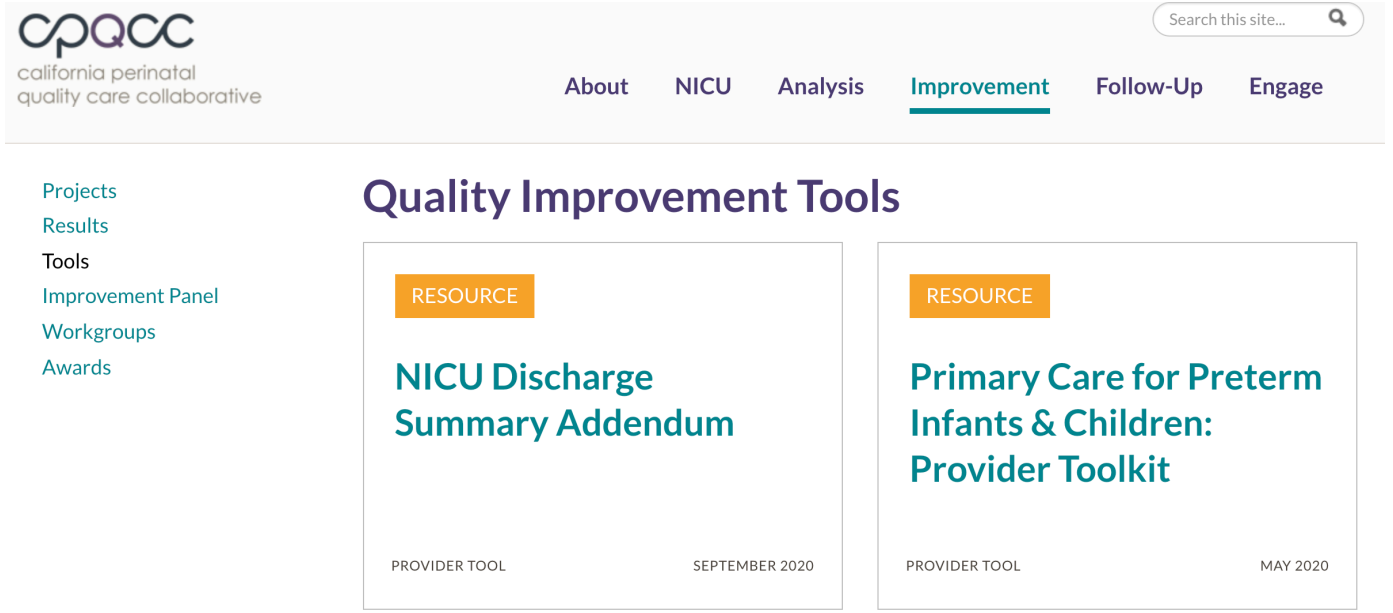
NICU Discharge Guideline #3

Provide reference material for primary care provider

Primary Care for Preterm Infants & Children Provider Toolkit



Available as a "Quality Improvement Tool" on the CPQCC website (https://www.cpqcc.org/improvement/qi-tools).



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Primary Care for Preterm Infants & Children Provider Toolkit

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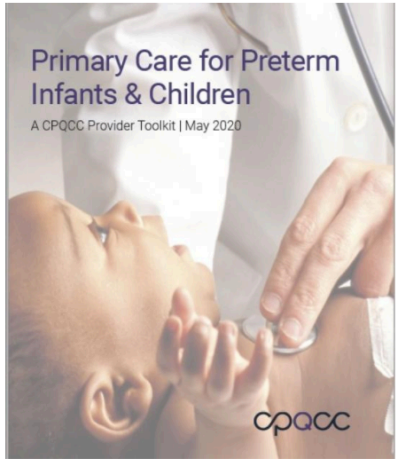

Primary Care for Preterm Infants & Children: Provider Toolkit

The Primary Care for Infants & Children Toolkit:

- Highlights nutritional, immunization, and special screening requirements for preterm infants and children
- Consolidates recommendations from national organizations such as the AAP, CDC, and ACIP
- Provides updated information in an easily-accessible reference for busy primary care pediatric providers

We have also developed a modifiable word document and recommend that NICUs edit this document for their specific needs and include this in their discharge summaries.

Resource Category:
Provider Tool

Date:
May 2020

Additional PDFs:
Primary Care Tip Sheet
Primary Care Periodicity Chart

DOWNLOAD TOOLKIT »

https://www.cpqcc.org/preterm-primary-care-toolkit

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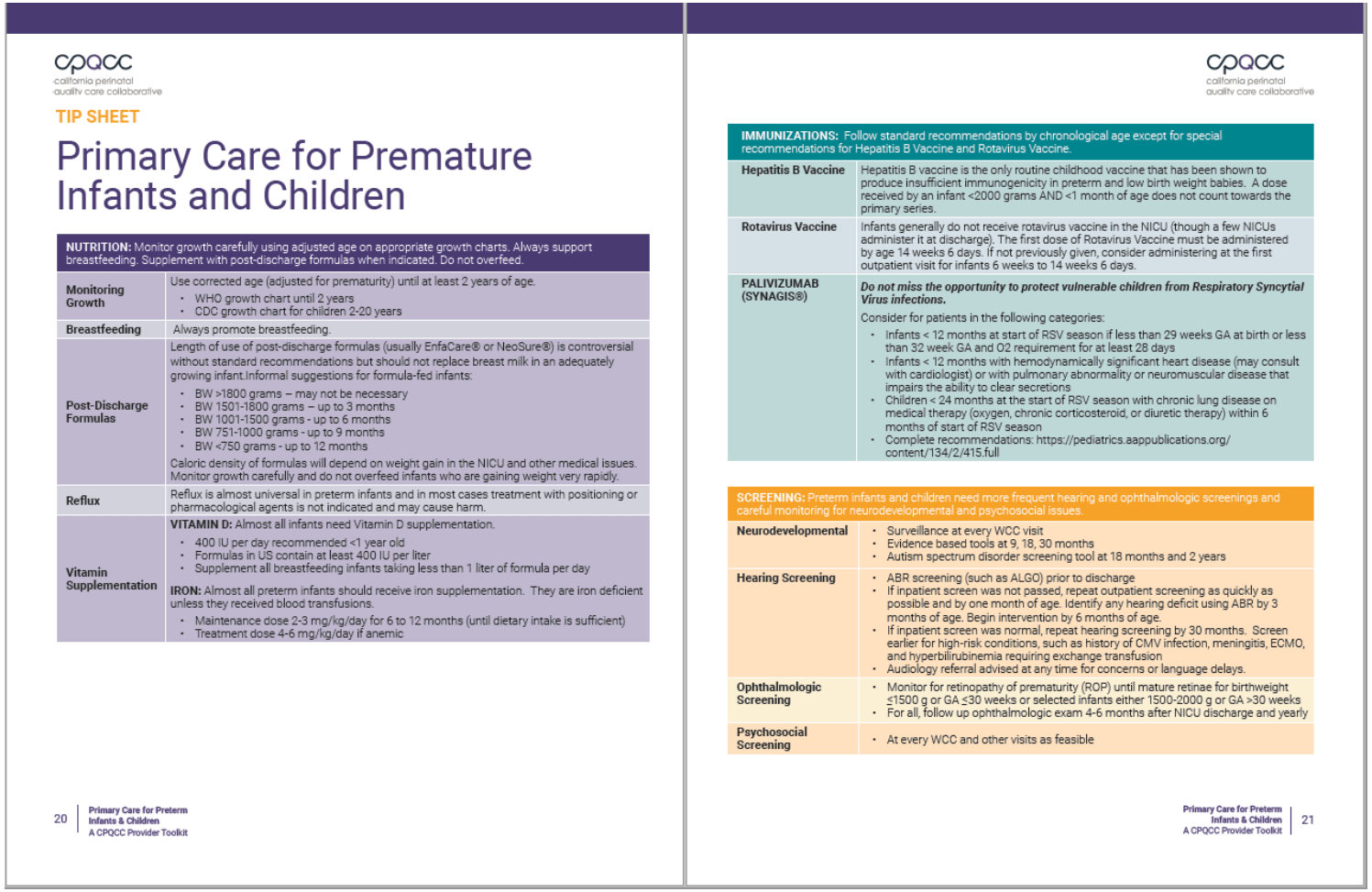
TIPS
HELPFUL

Tip Sheet



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TIP SHEET

Primary Care for Premature Infants and Children

NUTRITION: Monitor growth carefully using adjusted age on appropriate growth charts. Always support breastfeeding. Supplement with post-discharge formulas when indicated. Do not overfeed.	
Monitoring Growth	Use corrected age (adjusted for prematurity) until at least 2 years of age. • WHO growth chart until 2 years • CDC growth chart for children 2-20 years
Breastfeeding	Always promote breastfeeding.
Post-Discharge Formulas	Length of use of post-discharge formulas (usually EnfaCare® or NeoSure®) is controversial without standard recommendations but should not replace breast milk in an adequately growing infant.Informal suggestions for formula-fed infants: • BW >1800 grams – may not be necessary • BW 1501-1800 grams – up to 3 months • BW 1001-1500 grams - up to 6 months • BW 751-1000 grams - up to 9 months • BW <750 grams - up to 12 months Caloric density of formulas will depend on weight gain in the NICU and other medical issues. Monitor growth carefully and do not overfeed infants who are gaining weight very rapidly.
Reflux	Reflux is almost universal in preterm infants and in most cases treatment with positioning or pharmacological agents is not indicated and may cause harm.
Vitamin Supplementation	**VITAMIN D:** Almost all infants need Vitamin D supplementation. • 400 IU per day recommended <1 year old • Formulas in US contain at least 400 IU per liter • Supplement all breastfeeding infants taking less than 1 liter of formula per day **IRON:** Almost all preterm infants should receive iron supplementation. They are iron deficient unless they received blood transfusions. • Maintenance dose 2-3 mg/kg/day for 6 to 12 months (until dietary intake is sufficient) • Treatment dose 4-6 mg/kg/day if anemic

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IMMUNIZATIONS: Follow standard recommendations by chronological age except for special recommendations for Hepatitis B Vaccine and Rotavirus Vaccine.	
Hepatitis B Vaccine	Hepatitis B vaccine is the only routine childhood vaccine that has been shown to produce insufficient immunogenicity in preterm and low birth weight babies. A dose received by an infant <2000 grams AND <1 month of age does not count towards the primary series.
Rotavirus Vaccine	Infants generally do not receive rotavirus vaccine in the NICU (though a few NICUs administer it at discharge). The first dose of Rotavirus Vaccine must be administered by age 14 weeks 6 days. If not previously given, consider administering at the first outpatient visit for infants 6 weeks to 14 weeks 6 days.
PALIVIZUMAB (SYNAGIS®)	***Do not miss the opportunity to protect vulnerable children from Respiratory Syncytial Virus infections.*** Consider for patients in the following categories: • Infants < 12 months at start of RSV season if less than 29 weeks GA at birth or less than 32 week GA and O2 requirement for at least 28 days • Infants < 12 months with hemodynamically significant heart disease (may consult with cardiologist) or with pulmonary abnormality or neuromuscular disease that impairs the ability to clear secretions • Children < 24 months at the start of RSV season with chronic lung disease on medical therapy (oxygen, chronic corticosteroid, or diuretic therapy) within 6 months of start of RSV season • Complete recommendations: https://pediatrics.aappublications.org/content/134/2/415.full

SCREENING: Preterm infants and children need more frequent hearing and ophthalmologic screenings and careful monitoring for neurodevelopmental and psychosocial issues.	
Neurodevelopmental	• Surveillance at every WCC visit • Evidence based tools at 9, 18, 30 months • Autism spectrum disorder screening tool at 18 months and 2 years
Hearing Screening	• ABR screening (such as ALGO) prior to discharge • If inpatient screen was not passed, repeat outpatient screening as quickly as possible and by one month of age. Identify any hearing deficit using ABR by 3 months of age. Begin intervention by 6 months of age. • If inpatient screen was normal, repeat hearing screening by 30 months. Screen earlier for high-risk conditions, such as history of CMV infection, meningitis, ECMO, and hyperbilirubinemia requiring exchange transfusion • Audiology referral advised at any time for concerns or language delays.
Ophthalmologic Screening	• Monitor for retinopathy of prematurity (ROP) until mature retinae for birthweight ≤1500 g or GA ≤30 weeks or selected infants either 1500-2000 g or GA >30 weeks • For all, follow up ophthalmologic exam 4-6 months after NICU discharge and yearly
Psychosocial Screening	• At every WCC and other visits as feasible

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Periodicity Chart

PERIODICITY CHART

Primary Care for Preterm Infants & Children

	Post-discharge visit	1 mo	2 mo	4 mo	6 mo	9 mo	12 mo	15 mo	18 mo	2 yr	2½ yr	3 yr	4 yr	5 yr
Nutrition: Monitor growth carefully using adjusted age on appropriate growth charts. Always support breastfeeding. Supplement with post-discharge formulas when indicated. Do not overfeed.														
Monitoring growth/growth charts	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC
Post-discharge formulas	PF	PF	PF	PF	PF	PF	PF							
Vitamin D	D	D	D	D	D	D	D							
Iron supplementation	IS	IS	IS	IS	IS	IS	IS							
Immunizations: Follow standard recommendations by chronological age except for special recommendations for Hepatitis B Vaccine and Rotavirus Vaccine.														
Hepatitis B vaccine	H	H	H	H	H	H								
Rotavirus vaccine			R	R	R									
Palivizumab		P	P	P	P	P	P	P	P					
Screening: Preterm infants and children need more frequent hearing and ophthalmologic screenings and careful monitoring for neurodevelopmental and psychosocial issues.														
Developmental surveillance		DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS
Developmental screening						DSc			DSc		DSc			
Autism screening									ASD	ASD				
Hearing screening	HS	HS	HS	HS	HS2	HS2	HS2	HS2	HS2	HS2	HS2	HS2	HS2	HS2
Ophthalmologic screening	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS
Psychosocial screening	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS

Nutrition

- GC: ***Monitoring growth/Growth charts*** - Use WHO growth chart until 2 years. Use corrected age until at least 2 years. Use CDC growth chart for children 2-20 years.
- PF: ***Post-discharge formula*** - Length of use of post-discharge formulas (usually EnfaCare® or NeoSure®) is controversial without standard recommendations but should not replace breastfeeding in an adequately growing infant. These are some informal suggestions if using a post-discharge formula: BW >1800 grams – may not be necessary; BW 1501-1800 grams – up to 3 months; BW 1001-1500 grams - up to 6 months; BW 751-1000 grams - up to 9 months; BW <750 grams - up to 12 months. Caloric density of formula will depend on weight gain in the NICU and other medical issues. Always support breastfeeding. Do not overfeed.
- D: ***Vitamin D*** - Almost all infants need Vitamin D supplementation. 400 IU per day recommended < 1 year old. Formulas in US contain at least 400 IU per liter. Supplement all breastfeeding infants and all infants taking less than 1 liter of formula per day.
- IS: ***Iron supplementation*** - Almost all preterm infants should receive iron supplementation. Supplement with 2-3 mg/kg/day for 6 to 12 months (until dietary intake is sufficient); 4-6 mg/kg/day if anemic. Almost all preterm infants are iron deficient unless they received blood transfusions.

DISCLAIMER: The recommendations in this publication do not indicate an exclusive course of treatment or serve as a standard of medical care.

Immunizations

- H: ***Hepatitis B vaccine*** - Hepatitis B vaccine is the only routine childhood vaccine that has been shown to produce insufficient immunogenicity in preterm and low birth weight infants. A dose received by an infant <2000 grams AND <1 month of age does not count towards the primary series. There are special considerations for infants <2000 grams.
  - **Mother is HBsAg-negative:** 1 dose within 24 hours of birth for all medically stable infants ≥2,000 grams. Infants <2000 grams: administer 1 dose at chronological age 1 month or hospital discharge. A dose received by an infant <2000 grams AND <1 month of age does not count towards the primary series.
  - **Mother is HBsAg-positive:**
    - Administer Hepatitis B vaccine and 0.5 mL of Hepatitis B immune globulin (HBIG) within 12 hours of birth, regardless of birth weight. For infants <2000 grams, administer 3 additional doses of vaccine (total of 4 doses) beginning at age 1 month.
    - Test for HBsAg and anti-HBs at age 9-12 months. If Hepatitis B vaccine series is delayed, test 1–2 months after final dose.
  - **Mother's HBsAg status is unknown:**
    - Administer Hepatitis B vaccine within 12 hours of birth, regardless of birth weight.
    - For infants <2000 grams, administer 0.5 mL of HBIG in addition to Hepatitis B vaccine within 12 hours of birth. Administer 3 additional doses of vaccine (total of 4 doses) beginning at age 1 month.
    - Determine mother's HBsAg status as soon as possible. If mother is HBsAg-positive, administer 0.5 mL of HBIG to infants ≥2000 grams as soon as possible, but no later than 7 days of age.
- R: ***Rotavirus vaccine*** - Infants usually do not receive rotavirus vaccine in the NICU. The first dose of rotavirus must be administered by age 14 weeks 6 days. Consider administering at the first outpatient visit for infants age 6 weeks to 14 weeks 6 days. All doses must be completed before the age of 8 months.

  For complete recommendations: https://www.cdc.gov/vaccines/schedules/hcp/imz/child-adolescent.html
- P: ***Palivizumab (Synagis®)*** - Do not miss the opportunity to protect vulnerable children from Respiratory Syncytial Virus infections. Consider for infants < 12 months at start of RSV season if less than 29 weeks GA at birth or less than 32 weeks GA and O2 requirement for at least 28 days. Also consider for children with hemodynamically significant heart disease or with pulmonary abnormality or neuromuscular disease that impairs the ability to clear secretions. Consider for children < 24 months at the start of RSV season with chronic lung disease on medical therapy (oxygen, chronic corticosteroid, or diuretic therapy) within 6 months of the start of RSV season. ***For complete recommendations: https://pediatrics.aappublications.org/content/134/2/415.full***

Screening

- DS: ***Developmental surveillance*** - Perform at every well child check (WCC) health maintenance visit and at other visits as feasible.
- DSc: ***Developmental screening*** - Perform with an evidence-based tool at 9, 18, and 30 month WCC visits.
- ASD: ***Autism screening:*** Use autism spectrum disorder screening tool at 18 months and 2 years.
- HS: ***Hearing screening*** - ABR screening (such as ALGO) is performed prior to discharge. If initial screen was not passed, repeat outpatient screening is indicated as quickly as possible and by one month of age. Identify any hearing deficit using ABR by 3 months of age. Begin intervention by 6 months of age.
- HS2: ***Hearing screening after newborn period*** - If newborn hearing screen normal, repeat hearing screen for children hospitalized in NICU > 5 days by 30 months of age. Screen earlier for high-risk conditions such as history of CMV infection, meningitis, ECMO, and hyperbilirubinemia requiring exchange transfusion. Refer at any time for concerns or language delays. In addition, follow Bright Futures guidelines.
- OS: ***Ophthalmologic screening*** - Monitor for ROP until mature retinae for GA<30 weeks or <1500 g or selected infants 1500-2000 g or GA >30weeks. For all, follow up at 4-6 months after ophthalmological care discharge and yearly.
- PS: ***Psychosocial screening*** - Perform at every WCC and at other visits as feasible.

DISCLAIMER: The recommendations in this publication do not indicate an exclusive course of treatment or serve as a standard of medical care.

PERIODICITY CHART | Primary Care for Preterm Infants & Children | May 2020

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&
A

For More Information

- **The slides and webinar recording will be made available on the CPQCC Website** (https://www.cpqcc.org/engage/event/nicu-primary-care-transitions-guidelines-preterm-infants-children) shortly after the webinar.
- If you have any additional questions on the content presented during this webinar, please email Jadene Wong at Jadene.Wong@stanford.edu.