SPECIAL ARTICLE

Current Scope of Practice for Newborn Care in Non-Intensive Hospital Settings

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The scope of practice for newborn care in nonintensive hospital settings is ever changing, with obstetric care advances, shorter length of stay (LOS), and increased family-centered care.[1] In response to the US Surgeon General's call to support breastfeeding and Baby Friendly USA, more infants receive care in their mothers' rooms.[2,3] Newborn clinicians require skills including diagnostic expertise and critical thinking, adaptability and sensitivity, and an understanding of this critical period of infant bonding. They also require leadership skills to manage hospital policies and link families with targeted community resources.

This overview is based on the experience and research of a working group of the Academic Pediatric Association Newborn Nursery Special Interest Group (NN SIG), which consists of medical directors and physicians with expertise in newborn care from across the United States. The workgroup consisted of 17 newborn physicians ranging from young faculty to full professors at urban and rural academic and community hospitals in 17 cities and

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12 states. Led by the immediate-past NN SIG co-chair, the group determined the article outline and content over 7 monthly, hour-long teleconferences. Over the subsequent 6 months, group content experts drafted each section on the basis of published guidelines and evidence. All sections were reviewed and vetted by the group and compiled into this Special Article, which is meant to fill gaps in the literature by addressing the current scope of practice for newborn clinicians, including 7 common clinical topics, newborn screening, anticipatory guidance, and provider tools. This overview is meant for novice and seasoned physician and nonphysician clinicians interested in newborn care in Level 1 nurseries (ie, well-newborn nurseries)[4] in academic and community settings. It provides useful information for those interested in a career involving newborn care, in general pediatrics, and/or pediatric hospital medicine as a subspecialty.[5]

CLINICIANS PROVIDING DIRECT MEDICAL CARE TO NEWBORNS

Practitioners with varied educational backgrounds and expertise care for newborns during birth hospitalization. Depending on state law, nurse practitioners and physician assistants provide newborn care, with or without licensed physician supervision.[6] Medical directors have responsibilities beyond direct patient care, which are summarized in Table 1.

All newborn clinicians should be well versed in taking a newborn's history and performing an examination to identify common findings and rare anomalies. Examinations conducted in the presence of families provide reassurance that their newborns are healthy, facilitate family involvement, and allow questions to be addressed. Expertise accrued after caring for a high volume of newborns may prevent unnecessary or invasive testing or imaging. Newborn clinicians need to work as part of a multidisciplinary team that includes those mentioned above, obstetricians, nurses, nurse midwives, lactation specialists, social workers, case managers, and/or persons in training across the health professions. The clinical team shares the responsibility of educating families about routine care, providing anticipatory guidance, and considering birthing plans on the basis of varying beliefs, traditions, and values.

Newborn nursery medical directors should address care quality, expand knowledge through research and teaching, and stay current with changing guidelines by using resources such as the Academic Pediatric Association Better Outcomes through Research for Newborns (BORN) network,[7] the NN SIG, and the American Academy of Pediatrics (AAP) Section on Hospital Medicine.

COMMON CLINICAL TOPICS

Newborn clinicians should be familiar with routine care, including recommendations for vitamin K administration to prevent hemorrhagic disease of the newborn, hepatitis B vaccination (HBV), and erythromycin ointment to prevent gonococcal ophthalmia neonatorum.[8–10] In this section, 7 common topics are discussed in the context of current evidence and practices. Table 2 provides Web-based tools and resources.

Infant Feeding and Nutrition

The AAP, the Academy of Breastfeeding Medicine (ABM), and the US Surgeon General's Call to Action emphasize the central role of clinicians in promoting and supporting breastfeeding.[2,11,12] Approximately 80% of US mothers initiate breastfeeding, but <20% exclusively breastfeed for the recommended 6 months.[2,13] In 2014, the Joint Commission added a core measure to track exclusive-breastfeeding rates for hospitals delivering ≥1100 infants annually.[14] Hospitals should routinely promote exclusive breastfeeding and incorporate the World Health Organization and United Nations International Children's Fund (WHO/UNICEF) "Ten Steps to Successful Breastfeeding."[2,11,12]

Policies that promote skin-to-skin (STS) immediately after delivery, breastfeeding within the first hour, and rooming-in with the mother are associated with increased breastfeeding initiation, duration, and exclusivity.[11,15] The clinical team should offer families access to lactation specialists and community resources. Most pediatric training programs provide limited breastfeeding education, and attitudes and practices vary among pediatricians.[16,17] Clinicians can obtain additional training by participating in the AAP Section on Breastfeeding, International Board Certified Lactation Consultant (IBCLC) certification, and the ABM.[11,18,19]

Early, frequent feeding is critical for breastfeeding success,[15,20] but it may be difficult for some mother-newborn dyads. Early hand expression (demonstrated by a trained lactation consultant or nurse), when compared with pumping in the first few postpartum days, is associated with longer breastfeeding duration and larger expressed breast milk volume.[21,22] To prevent excess weight loss and dehydration, breastfed newborns should be monitored with daily weights, understanding that weight loss may be more pronounced in those born via cesarean delivery.[23] The Newborn Weight Tool (Newt; Table 1), according to data from >160 000 newborns, allows clinicians to assess an infant's weight in comparison with that of other newborns while taking into account his or her delivery mode and feeding method.[24]

When determining the safety of maternal medications, it is important to consider the drug indication, impact on lactation, solubility and transfer into breast milk, absorption by infant mucosa, and the potential effect on the infant.[25] Most medications are compatible with breastfeeding, and evidence-based resources like LactMed (Table 2) can help clinicians. Maternal use of illicit substances, rising opioid-use disorder rates, and marijuana legalization present added challenges. Mothers in a stable treatment program and on opioid-maintenance therapy with methadone or buprenorphine should be encouraged to breastfeed on the basis of associated reductions in neonatal abstinence syndrome (NAS) duration and severity, and LOS (see the Maternal Substance Use and NAS section).[11,26] The AAP and ABM do not support marijuana use among breastfeeding mothers because of the lipid-soluble properties of the psychoactive substance in marijuana, δ-9-tetrahydrocannabinol, and potential adverse effects on the developing brain.[11,26]

TABLE 1 Recommended Skills and Responsibilities for Newborn Nursery Medical Directors

Certifications and training	Have board certification in pediatrics or family medicine. Have Basic Life Support and Neonatal Resuscitation Program or Pediatric Advanced Life Support (or equivalent) certification.
Quality improvement and patient-safety skills	Promote care coordination (physicians, nurses, lactation consultants, and social services). Collaborate to enhance patient care, education, and safety. Set practice standards and support faculty and staff initiatives. Foster family-centered care. Be familiar with, update, and develop policies and procedures that guide patient care, working in collaboration with nursing, neonatology, and other newborn providers. Participate in other institutional continuous quality-improvement and patient-safety measures and research. Participate in collaborative research to increase the evidence base for newborn care (eg, Better Outcomes through Research for Newborns [BORN] network).
Communication skills	Have skills in communicating about unanticipated findings such as trisomy, disorders of sexual development, positive urine toxicology, and the need for transfer to higher-level care. Model and promote culturally effective communication that is responsive to the needs of the communities served. Protect patient confidentiality. Encourage vaccine promotion and be familiar with reasons for parental refusal. Address family concerns or complaints regarding the infant's care. Address staff concerns about members of the clinical or ancillary teams. Build a consensus among newborn physicians and work collaboratively with nurse managers, obstetricians and gynecologists, primary care physicians, neonatologists, residents, medical students, nurses, and social workers.
Evaluation skills	Support and provide verbal and written feedback (ie, performance evaluations) for physicians, ancillary staff, medical students, and residents. Conduct faculty and staff performance reviews and be familiar with metrics (eg, relative value units and patient satisfaction scores). Develop professional performance improvement plans. Provide opportunities for professional and faculty development.
Committee and meeting responsibilities	Participate in clinically relevant hospital and local committees, and attend meetings on behalf of the newborn service. Possess leadership skills in strategic development and program planning, understand and influence others' perspectives, and represent newborn faculty.
Service organization and operations	Have input on staffing requirements across disciplines, and oversee physician schedules and billing. Be familiar with budgets, service-line expenses, revenues (annual budget allocations and reductions), equipment, and other needed resources. Work collaboratively with senior leadership, including division chiefs and/or department chairs and hospital administrative leaders. Contribute to community outreach and advocacy efforts related to maternal and child health topics, such as maternity care, infant mortality, and infant feeding.

All newborns should have outpatient follow-up within 2 to 3 days of discharge[27] to support breastfeeding, assess weight loss, and monitor jaundice. Further studies are needed to understand the impact of donor milk and human-milk fortifier on late-preterm and term infants and the impact of pacifier and formula use on breastfeeding duration and exclusivity.

Hyperbilirubinemia

Up to 60% of term newborns develop jaundice in their first week.[28] AAP guidelines provide strategies for addressing jaundice in infants born at ≥35 weeks' gestation.[29] Clinicians should examine all newborns for jaundice with the understanding that bilirubin prediction based solely on examination is unreliable. Therefore, hospitals may employ targeted or universal predischarge measurement of total serum bilirubin (TSB) and/or transcutaneous bilirubin (TcB).[29] The risk of developing severe hyperbilirubinemia can be estimated by plotting TSB levels on the Bhutani nomogram[29,30] or by using an online assessment tool such as BiliTool (Table 2). Although the Bhutani nomogram identifies infants of ≥35 weeks' gestation who are at risk for significant hyperbilirubinemia,[31] this tool should be used to inform, not dictate, clinical care. TcB measurements are best used when TSB levels are estimated to be <15 mg/dL and are relatively easy and painless[29,32]; however, result discrepancies may occur in neonates of African descent, and levels may vary on the basis of the type of TcB meter being used.[32]

Phototherapy, which is effective in treating unconjugated hyperbilirubinemia, has reduced the need for exchange transfusion. Current guidelines recommend that phototherapy be applied to the maximal body surface area with appropriate irradiance.[33] In many hospitals, newer technology lights with higher irradiance and lower heat output have replaced the "double" and "triple" phototherapy of the past.[33] Effective phototherapy can be delivered while avoiding mother-infant separation,[34] and clinicians should be selective in its use. In addition to the well-known risks of insensible water loss and retinal damage, a concern for an increased risk of infantile cancer[35] and a lower likelihood of exclusive breastfeeding at 4 months have been found among those with a history of phototherapy.[36]

Discharge timing for jaundiced newborns should be based on the availability of outpatient office, laboratory, and home care services; and follow-up should be guided by gestational age (GA) and other clinical risk factors. Home phototherapy

TABLE 2 Web-based Resources and Tools (in Alphabetical Order) for Clinicians by Topic

Topic	Resources and Tools	Website
Infant feeding and nutrition	Colorado Department of Public Health & Environment	Fact sheet: marijuana and your baby. https://www.colorado.gov/pacific/sites/default/files/MJ_RMEP_Factsheet-Pregnancy-Breastfeeding.pdf. Accessed February 14, 2017
	Stanford University	Instructional video on hand expression of breast milk. http://med.stanford.edu/newborns/professional-education/breastfeeding/hand-expressing-milk.html. Accessed February 14, 2017
	US National Library of Medicine	LactMed. Drugs and lactation database. https://toxnet.nlm.nih.gov/newtoxnet/lactmed.htm. Accessed February 14, 2017
	Pennsylvania State University Milton S. Hershey Medical Center	Newborn weight tool. https://www.newbornweight.org/. Accessed February 14, 2017
Hyperbilirubinemia	BiliTool	An assessment tool to help clinicians determine the risk of developing severe hyperbilirubinemia in newborns >35 wks gestational age. www.bilitool.org. Accessed February 14, 2017
Newborn infection	CDC	For clinicians: Group B strep (GBS) http://www.cdc.gov/groupbstrep/clinicians/index.html. Accessed February 14, 2017
	Kaiser Permanente	Neonatal early-onset sepsis calculator. https://neonatalsepsiscalculator.kaiserpermanente.org. Accessed February 14, 2017
	AAP	Red Book 2015 Online. http://redbook.solutions.aap.org/book.aspx?bookid=1484. Accessed February 14, 2017
Maternal substance use and NAS	AAP	Clinical report: neonatal drug withdrawal. http://pediatrics.aappublications.org/content/pediatrics/129/2/e540.full.pdf. Accessed February 14, 2017
	March of Dimes	Neonatal abstinence syndrome. http://www.marchofdimes.org/complications/neonatal-abstinence-syndrome-(nas).aspx. Accessed February 14, 2017
	Substance Abuse and Mental Health Services Administration	Neonatal abstinence syndrome. https://ncsacw.samhsa.gov/resources/opioid-use-disorders-and-medication-assisted-treatment/neonatal-abstinence-syndrome.aspx. Accessed February 14, 2017
Hypoglycemia	ABM	ABM clinical protocol #1: guidelines for blood glucose monitoring and treatment of hypoglycemia in term and late-preterm neonates. http://www.bfmed.org/Media/Files/Protocols/HypoglycemiaEnglish922.pdf. Accessed February 14, 2017
	AAP	Clinical report: postnatal glucose homeostasis in late-preterm and term infants, 2011. http://pediatrics.aappublications.org/content/pediatrics/127/3/575.full.pdf. Accessed February 14, 2017
	Pediatric Endocrine Society	Recommendations from the Pediatric Endocrine Society for evaluation and management of persistent hypoglycemia in neonates, infants, and children. https://www.pedsendo.org/education_training/healthcare_providers/consensus_statements/assets/PES_recommendation_hypoglycemia.pdf. Accessed February 14, 2017
Late preterm infant	National Perinatal Association	Multidisciplinary guidelines for the care of late preterm infants, 2013. http://www.nationalperinatal.org/Resources/LatePretermGuidelinesNPA.pdf. Accessed February 14, 2017
Newborn screening and anticipatory guidance	AAP	Policy statement—hospital stay for healthy term newborns, 2010 (reaffirmed, 2015). http://pediatrics.aappublications.org/content/pediatrics/125/2/405.full.pdf. Accessed February 14, 2017
	Baby's First Test	Pediatric providers' resources. http://www.babysfirsttest.org/newborn-screening/pediatric-providers. Accessed February 14, 2017
	CDC	Newborn screening portal https://www.cdc.gov/newbornscreening/ Accessed February 14, 2017
Newborn bedside surgical procedures	AAP	Circumcision. https://www.healthychildren.org/English/ages-stages/prenatal/decisions-to-make/Pages/Circumcision.aspx. Accessed February 14, 2017
	AAP	Tongue tie and frenotomy in the breastfeeding newborn. Video 2. http://neoreviews.aappublications.org/content/11/9/e513.supplemental. Accessed February 14, 2017
	New England Journal of Medicine video	Cagno CK, Gordon PR. Videos in clinical medicine (summary points). Neonatal circumcision. *N Engl J Med.* 2012;367(2):e3. Subscription only

and nursing visitation, including the ability to assess TSB levels, are options for outpatient management.

Research reveals a complex genetic pattern that influences neonatal jaundice, including genetic mutations in glucose-6-phosphate dehydrogenase coding and polymorphisms related to enzymes involved in hepatic bilirubin uptake and conjugation.[37,38] Further genetic research may influence future algorithms for hyperbilirubinemia risk assessment.

Newborn Infections

Group B streptococcus (GBS) remains the leading cause of neonatal sepsis and meningitis in the United States despite an 80% decline in early-onset GBS disease after routine use of intrapartum antibiotic prophylaxis.[39] In 2010, the Centers for Disease Control and Prevention (CDC) updated guidelines for perinatal GBS disease prevention.[40] In 2011, Puopolo et al[41] described a predictive model based on maternal information to establish a probability guide for sepsis management; the resultant "Neonatal Sepsis Calculator" (Table 2) takes into account a newborn's clinical status.[42] Evaluation and management of neonates at risk for sepsis varies, with some hospitals following the CDC guidelines and others using the "Neonatal Sepsis Calculator" or different combinations of laboratory tests, including complete blood counts with differentials, C-reactive protein levels, and blood cultures.[43]

Neonates born to mothers with chorioamnionitis are at increased risk for sepsis. Recently, the American College of Obstetricians and Gynecologists held a workshop on chorioamnionitis, which by definition is inflammation of the chorion and amnion, but in clinical practice refers to a "heterogeneous array of conditions."[44] The American College of Obstetricians and Gynecologists' chorioamnionitis workshop panel suggested that use of intrapartum "chorioamnionitis" be discontinued and replaced with "Triple I": intrauterine inflammation, infection, or both.[44] Efforts to build a consensus on evaluation and management of chorioamnionitis and newborn sepsis are ongoing.[43,44] Integrative use of rapidly resulting serum tests and biomarkers may augment future decision-making.[45,46]

Clinicians should consider logistical and medical consequences of treating newborns for presumed infection. For example, limited NICU space may require initial evaluation in a monitored nursery room. In certain circumstances, antibiotics may be administered to well-appearing, low-risk newborns in nonintensive settings. However, there are concerns about antibiotic overuse and the negative impact on the newborn microbiome.[47]

Newborn clinicians should be familiar with the rationale for routine screening of pregnant women for syphilis, gonorrhea, chlamydia, and herpes simplex, hepatitis B, and human immunodeficiency viruses. The 2015 AAP Red Book provides detailed information on managing newborns who are exposed to these and other infections.[48] Clinicians also should be familiar with their departments of public health and infectious disease reporting requirements. Prevention of hepatitis B virus infection is critical, and clinicians should be able to explain the reasons for universal newborn vaccination, particularly to families that refuse HBV.[49] Hepatitis B immunoglobulin and HBV, when given in the first 12 hours of life to infants born to hepatitis B surface antigen-positive mothers, are highly effective in preventing neonatal infection.[48] The AAP recommends that all pregnant women be tested for HIV to reduce pediatric infection.[50] Newborn clinicians should be familiar with current guidelines for antiretroviral therapy[51] and consult pediatric HIV specialists for proper management.

Maternal Substance Use and NAS

Rising rates of NAS are well documented, with the majority of cases attributable to chronic opioid use during pregnancy.[52,53] Determining which mothers should undergo toxicology testing remains controversial. Prenatally and at delivery, all mothers should be screened by their histories. Many obstetric groups use risk-based testing, whereas others conduct universal testing because of high opioid-use rates.[54] Studies show the highest NAS risk with long-acting opioid exposure in late gestation, especially when combined with benzodiazepines, serotonin-specific reuptake inhibitors, or nicotine.[53] Hospitals need policies to address all care aspects for substance-exposed neonates.[52,53] Using a standard NAS-treatment protocol shortens LOS and pharmacological treatment duration and amount.[3,53,55] Policies that use a multidisciplinary approach should address staff training, targeted versus universal drug testing, indications for abstinence scoring, supportive care, feeding plans, pharmacologic treatment, and designated care areas.[52,55,56] Current recommendations are to monitor infants who are exposed to short-acting substances for at least 3 days and up to 4 to 7 days for long-acting substances such as methadone or buprenorphine.[52] Designated care areas vary; some hospitals use high-cost NICUs, nonintensive settings, or both.[3] Extended stays for mothers can be accomplished by converting the room charge from mother to infant on the mother-infant unit or by transferring the couplet to an inpatient pediatric service. When ongoing couplet care is not possible, some hospitals use low-acuity nursery space to monitor affected newborns.[52,55–58]

In symptomatic infants, conditions mimicking NAS such as sepsis, hypoglycemia, and hypocalcemia should be considered.[52] Supportive measures include a low-stimulation environment, swaddling, gentle handling, strategic positioning, kangaroo care, and soothing techniques. Thresholds for initiating medication depend on the NAS tool being used.[56] The Finnegan Neonatal Abstinence Scoring Tool is the most commonly used.[52] Morphine and methadone solutions are used when maximized environmental measures have failed to sufficiently control withdrawal symptoms, and patients typically are discharged when treatment is no longer necessary.[52,56,59] Standardized treatment thresholds for newborns who are at high risk for NAS, breastfeeding promotion, and rooming-in with a combined inpatient-outpatient–weaning model have been effective.[60,61] Hospitalized infants who require medication should be monitored with pulse oximetry and/or cardiorespiratory monitoring to detect apnea, bradycardia, seizures, and cardiac

arrhythmias that may occur with NAS or oversedation from pharmacotherapy.[57] Once symptoms are stable for at least 48 hours, weaning the medication dose by 10% to 20% every 24 to 72 hours is recommended.[52,56,57] Outpatient weaning is acceptable when local resources allow for safe and effective care.[55] After discharge, all infants with a history of substance exposure and/or NAS should be monitored for developmental, behavioral, and social concerns within the medical home context. When possible, drug-dependent mothers should be screened for depression, given their increased risk.[62]

The management of NAS continues to challenge newborn clinicians. Mothers with substance use disorders often have mental health comorbidities and high rates of child protective and law enforcement involvement.[63] The effects of NAS, perinatal substance exposure, and the home environment on brain development have not clearly been delineated.[52,63,64] Researchers need to define additional NAS risks related to exposure and explore safe, effective, and cost-efficient models of care.[3,53,56,65]

Neonatal Hypoglycemia

The newborn clinician should be skilled in the recognition and management of neonatal hypoglycemia (NH) and familiar with various management guidelines from the ABM, the AAP, and the Pediatric Endocrine Society.[66–70] Preventative measures for at-risk infants include use of STS immediately after birth and feeding initiation within 30 to 60 minutes followed by on-demand feedings. Clinicians must carefully monitor newborns given the potential for adverse effects of NH on neurodevelopment.[70] At-risk infants include those who were born to mothers with diabetes, are large or small for GA, are preterm, those who were exposed to antenatal betamethasone or are experiencing perinatal stress, and those with a family history of genetic forms of hypoglycemia or syndromes associated with hypoglycemia, such as Beckwith Wiedemann.[66–69,71]

Initial glucose screening for asymptomatic, at-risk infants is recommended 30 minutes after the first feeding or within 2 hours of birth,[66,67] but the ideal timing and frequency of screening has not been determined. Some experts advocate delaying screening in asymptomatic infants until after the physiologic nadir and "physiologic glucose homeostasis," which occurs between 1 and 2 hours of life.[69] The brain preferentially uses glucose for energy, but alternative fuel sources include plasma ketones and lactate.[69] The availability of such alternative fuel sources may be neuroprotective; however, ketone levels may be suppressed in high-risk neonates.[68] Relatively low in the first 24 hours, ketone levels typically rise by day 2 to 3 in breastfed infants, but not in formula-fed infants, or those with hyperinsulinism.[68,69]

For asymptomatic newborns, the absolute value of serum glucose (SG) defining NH has been debated. A previously acceptable definition of NH was a SG <40 mg/dL, but experts now recommend maintaining levels >45 to 47 mg/dL.[67,70,72] The Pediatric Endocrine Society notes the SG nadir to be 55 to 60 mg/dL by 1 to 2 hours and rising to >70 mg/dL by day 2 to 3.[68] Accurate SG measurement presents its own challenges. Point of care (POC) SG meters are known for their limitations at low levels, with margins of error as high as 10 to 15 mg/dL.[69] Cutoffs for normal newborn values are often below the accuracy limit for POC devices. "LO" readings require emergent attention and often correspond to critical SG levels of <10 mg/dL.[73] Delays in assays can reduce SG by up to 6 mg/dL per hour[69]; therefore, it is essential to process samples quickly to avoid factitiously low measurements.[69]

The need for intravenous dextrose in asymptomatic newborns is limited to the subset that fails to maintain normal glucose levels with breast milk or formula intake. In contrast, infants who are symptomatic and hypoglycemic require emergent intravenous access and dextrose treatment.[66] Harris et al[74] presented a novel treatment approach using 40% dextrose gel massaged into an infant's buccal mucosa, and some centers found reductions in NH treatment failures and NICU transfers.[75] Further evaluation is indicated for any persistent hypoglycemia beyond 48 hours. NH remains an area rich in opportunities for quality improvement and research.

The Late-Preterm Infant

The late-preterm infant (LPI), who is born between 34 and 36 6/7 weeks' gestation, is at increased risk for temperature instability, infection, respiratory distress, apnea, hypoglycemia, feeding difficulties, weight loss, jaundice, and developmental delays when compared with the term infant.[20,76] The LPI birth rate is currently 6.9%,[77] and contributing factors include an increase in the number of pregnant women >35 years old, use of assisted reproductive technologies, electronic fetal monitoring and prenatal ultrasonography surveillance, and resulting increased medical intervention.[76] The average LOS and cost of birth hospitalization for LPIs is 8.8 days and $26 054, compared with 2.2 days and $2061 for term infants,[78] and the mortality rate is 4 times that of term infants.[79]

Stable LPIs typically are admitted to Level 1 nurseries,[4] often in a mother-infant unit. Providers should understand that these infants are preterm and require close monitoring. Special precautions to prevent hypothermia include thorough drying, hat and warm blanket use, STS, and delaying the first bath until 6 to 24 hours after birth.[80] STS, which is associated with a reduction in infant crying and heart rate, also optimizes respiration and oxygen saturation.[81,82] LPIs are twice as likely as term infants to have hyperbilirubinemia.[82] The AAP recommends that all infants <37 weeks' gestation have a car seat safety test before discharge.[76,83] Studies have revealed an increased rate of readmission for LPIs when compared with term infants that is independent of LOS for those born via vaginal delivery. However, for LPIs born via cesarean delivery, a longer LOS may decrease readmission risk.[84,85] Clinicians are challenged to monitor for complications of prematurity and manage family expectations for routine care when additional testing and treatment may be necessary. With LPIs increasingly cared for in low-acuity nurseries, policies designed for term infants will need to be adapted accordingly. Long-term outcome studies demonstrate worse school readiness at age 5 to 6, and a higher risk for cerebral palsy, mental retardation, attention and behavior problems, and developmental delays among

LPIs when compared with term infants.[76,86] Research is needed to prevent long-term morbidity. Continued family and provider education is needed regarding the short- and long-term risks for LPIs and the implications for clinical management.[82]

Newborn Bedside Surgical Procedures

The following 3 bedside procedures are commonly performed during the birth hospitalization: circumcision, accessory digit ligation, and sublingual frenotomy. Providers performing these procedures should be credentialed as required by the hospital medical staff. Every procedure should involve informed consent, Universal Protocol,[87] effective analgesia, and sterile techniques when appropriate. Before elective procedures, newborns should be clinically well for >12 hours. Staff should monitor for bleeding, infection, swelling, and other procedure-specific complications. Elective procedures should be avoided when there are known risk factors associated with excess bleeding such as thrombocytopenia, a family history of heritable bleeding disorders, or when parents refuse intramuscular vitamin K.[88]

Circumcision, the most common newborn procedure worldwide, is typically performed by using the Gomco or Mogen clamp or the Plastibell device.[89] Although obstetricians commonly perform this procedure, there are benefits to having pediatricians perform circumcisions.[90] The AAP statement on circumcision reviews the risk and benefits and justifies access to circumcision.[91] A recent study showed that early circumcision was not associated with adverse effects on breastfeeding.[92] The procedure, however, remains controversial because of concerns about a child's right to self-determination. Procedural anesthesia and analgesia are recommended and often consist of a penile nerve block with lidocaine sometimes accompanied by oral sucrose. Afterward, medication is not standard practice given the lack of evidence for persistent, postoperative pain.[91] Clinicians should avoid circumcision and consult pediatric urology for infants with penile anomalies including hypospadias, epispadias, and significant penile torsion.

Accessory digit removal, mainly for cosmetic reasons, is performed typically by suture ligation.[93] Risks include infection, poor cosmetic result, and neuroma formation.[94] Limited evidence suggests that placement of a surgical clip with ligation of distal tissue may be associated with improved outcomes.[95] Operative digit removal with nerve dissection has excellent cosmetic and neurologic outcomes, but is neither practical nor cost-effective, requiring anesthesia and its associated risks.[96] Infants whose accessory digits have a thickened or short stalk should be referred to a pediatric surgeon for removal.

No position statements or guidelines on ankyloglossia management are available from the AAP or the American Academy of Otolaryngology. A comprehensive literature review by the Agency for Healthcare Research and Quality concludes that frenotomy is associated with maternally reported breastfeeding improvement.[97] Harmful effects are rare, with the most common complications being self-limited bleeding, scarring, and recurrent tongue-tie.[97] The ABM, which recommends that all neonates be assessed for ankyloglossia, notes that conservative management may be sufficient.[98] When deemed necessary, bedside frenotomy should be performed by a trained clinician.[99] Current evidence does not support the use of more complex procedures (such as laser therapy) over simple frenotomy or division of the labial frenulum to improve breastfeeding. Infants with a thick, fleshy, or short frenulum should be referred to a pediatric otolaryngologist for evaluation.

Newborn bedside procedures require trained clinicians, timely completion, consideration of parental requests, maintenance of necessary equipment, and staffing. Additional challenges include variability in clinician procedural training and insurance reimbursement. In many hospitals, minor surgical procedures are performed by obstetricians or surgical specialists, requiring processes for care coordination. Further research is needed in postoperative pain control, long-term benefits of frenotomy, and the use of an ankyloglossia assessment tool. For all of these procedures, updated technique articles and simulation modules would be helpful.

NEWBORN SCREENING

Through state newborn screening programs, >12 500 US infants annually are identified with conditions for which early identification and treatment lead to significant reductions in morbidity and mortality.[100] Clinicians should be familiar with state-specific regulations and policies to ensure that infants receive all appropriate screenings before discharge. Follow-up for most screening tests will occur after discharge; therefore, hospitals should have mechanisms in place to ensure that abnormal results receive timely and appropriate follow-up.[101]

The Health Resources and Services Administration now publish recommendations on screening for heritable disorders in newborns. The current Uniform Recommended Newborn Screening Panel contains 32 core disorders and 26 secondary disorders.[102,103] Although all states screen for the core conditions, the methodology, follow-up, oversight, and addition of new tests varies among states.[100,101,104] Fifteen states include conditions outside of their mandates, such as HIV and glucose-6-phosphate dehydrogenase deficiency.[104]

The inclusion of newborn hearing screening to the panel brought POC testing to state screening programs, which shifted the responsibility for test management, cost, and follow-up from state laboratories to birthing centers. Abnormal hearing is one of the most common conditions identified through newborn screening programs, but there is variability in surveillance. Nearly half of the infants who fail testing are lost to follow-up.[100]

The addition of critical congenital heart disease screening to the panel in 2011 brought added responsibility to newborn physicians.[105,106] Failure of the critical congenital heart disease screen requires immediate evaluation and necessitates the availability of an experienced pediatric echocardiography technician and rapid review by a pediatric cardiologist.[105,106]

Mistrust of the medical community and government may lead some families to decline testing; thus, the provider should be prepared to address questions and concerns. Concerns about privacy of remaining blood samples and informed consent led to the Newborn Screening Reauthorization Act of 2014, which changed the way blood spots are stored and used for research.[107]

ANTICIPATORY GUIDANCE

Guidance on safe sleep, optimal feeding practices, skin and umbilical cord care, recognition of jaundice, signs of illness, and fall prevention should be incorporated into clinical care and modeled throughout the hospitalization.[27] The clinical team should assess families for risk factors and consult with social workers and child protective services when indicated. Information about signs and symptoms of postpartum depression and relevant community resources should be provided to mothers.[1,27] Minimum criteria for infant discharge include stable vital signs for >12 hours in an open crib, at least 2 successful feedings, passage of stool, age-appropriate voiding, and screening for jaundice or other medical problems.[1] Before discharge, families should receive counseling on the prevention of abusive head trauma and sudden infant death syndrome, car safety seats, and reasons for urgent care. Communication between the hospital and primary care providers is essential, especially for those with complex medical or social needs. A family should identify a medical home, and outpatient follow-up should occur within 2 to 3 days of discharge on the basis of GA and discharge age, jaundice risk level, feeding adequacy and method, and weight loss amount.[1,27]

CONCLUSIONS

As clinical practice continues to advance technologically, newborn clinicians and nursery medical directors will need to expand their skills and maintain a broad knowledge base. Clinical efforts in 1 area, such as breastfeeding and rooming-in, unexpectedly may be at odds with other efforts, such as preventing excess weight loss and maintaining adequate glucose levels. The newborn clinician is in a unique position to work across disciplines to orchestrate care so that all newborns receive the best care possible. A number of tools and resources are available to help clinicians care for and transition newborns from the hospital to the outpatient setting. Newborn care is a growing field with many exciting opportunities for collaborative work in quality improvement, models of care, and research.

REFERENCES

1. Benitz WE; Committee on Fetus and Newborn, American Academy of Pediatrics. Hospital stay for healthy term newborn infants. *Pediatrics*. 2015; 135(5):948–953
2. Office of the Surgeon General; The Centers for Disease Control and Prevention; Office on Women's Health. *The Surgeon General's Call to Action to Support Breastfeeding*. 15th ed. Rockville, MD: Office of the Surgeon General (US); 2011
3. Holmes AV, Atwood EC, Whalen B, et al. Rooming-in to treat neonatal abstinence syndrome: improved family-centered care at lower cost. *Pediatrics*. 2016;137(6):e20152929
4. American Academy of Pediatrics Committee on Fetus And Newborn. Levels of neonatal care. *Pediatrics*. 2012;130(3):587–597
5. American Academy of Pediatrics Section on Hospital Medicine. Guiding principles for pediatric hospital medicine programs. *Pediatrics*. 2013; 132(4):782–786
6. American Academy of Pediatrics and the American College of Obstetricians and Gynecologists. *Guidelines for Perinatal Care*. 7th ed. Elk Grove Village, IL: AAP; Washington, DC: American College of Obstetricians and Gynecologists; 2012
7. Academic Pediatric Association. Better Outcomes through Research for Newborns (BORN) network. Available at: https://www.academicpeds.org/research/research_BORN.cfm. Accessed February 12, 2017
8. U.S. Preventative Services Taskforce. Ocular prophylaxis for gonococcal ophthalmia neonatorum: preventive medication. Available at: https://www.uspreventiveservicestaskforce.org/Page/Document/UpdateSummaryFinal/ocular-prophylaxis-for-gonococcal-ophthalmia-neonatorum-preventive-medication?ds=1&s=ophthalmia%20neonatorum. Accessed September 21, 2016
9. Lippi G, Franchini M. Vitamin K in neonates: facts and myths. *Blood Transfus*. 2011;9(1):4–9
10. Immunization Practices Advisory Committee. Hepatitis B virus: a comprehensive strategy for eliminating transmission in the United States through universal childhood vaccination. Recommendations of the Immunization Practices Advisory Committee (ACIP). *MMWR Recomm Rep*. 1991;40(RR-13):1–25
11. Section on Breastfeeding. Breastfeeding and the use of human milk. *Pediatrics*. 2012;129(3). Available at: www.pediatrics.org/cgi/content/full/129/3/e827
12. Chantry CJ, Eglash A, Labbok M. ABM position on breastfeeding-revised 2015. *Breastfeed Med*. 2015;10(9):407–411
13. Centers for Disease Control and Prevention. Breastfeeding report card. Available at: https://www.cdc.gov/breastfeeding/pdf/2014breastfeedingreportcard.pdf. Accessed September 14, 2016
14. The Joint Commission. Specifications manual for Joint Commission national quality measures (v2016A)- PC-05 exclusive breast milk feeding. Available at: https://manual.jointcommission.org/releases/TJC2016A/MIF0170.html. Accessed September 14, 2016
15. Academy of Breastfeeding Medicine Protocol Committee. ABM clinical protocol #3: hospital guidelines for the use of supplementary feedings in the healthy term breastfed neonate, revised 2009. *Breastfeed Med*. 2009; 4(3):175–182

16. Walton DM, Edwards MC. Nationwide survey of pediatric residency training in newborn medicine: preparation for primary care practice. *Pediatrics*. 2002; 110(6):1081–1087

17. Feldman-Winter LB, Schanler RJ, O'Connor KG, Lawrence RA. Pediatricians and the promotion and support of breastfeeding. *Arch Pediatr Adolesc Med*. 2008;162(12): 1142–1149

18. International Board of Lactation Consultant Examiners. Available at: http://iblce.org/about-iblce/. Accessed February 8, 2017

19. The Academy of Breastfeeding Medicine. Available at: www.bfmed.org/. Accessed March 31, 2017

20. Academy of Breastfeeding Medicine. ABM clinical protocol #10: breastfeeding the late preterm infant (34(0/7) to 36(6/7) weeks gestation) (first revision June 2011). *Breastfeed Med*. 2011;6(3):151–156

21. Flaherman VJ, Gay B, Scott C, Avins A, Lee KA, Newman TB. Randomised trial comparing hand expression with breast pumping for mothers of term newborns feeding poorly. *Arch Dis Child Fetal Neonatal Ed*. 2012;97(1): F18–F23

22. Morton J, Hall JY, Wong RJ, Thairu L, Benitz WE, Rhine WD. Combining hand techniques with electric pumping increases milk production in mothers of preterm infants. *J Perinatol*. 2009; 29(11):757–764

23. Flaherman VJ, Schaefer EW, Kuzniewicz MW, Li SX, Walsh EM, Paul IM. Early weight loss nomograms for exclusively breastfed newborns. *Pediatrics*. 2015; 135(1). Available at: www.pediatrics.org/cgi/content/full/135/1/e16

24. Penn State Hershey Medical Center. Newt newborn weight tool. Available at: www.newbornweight.org. Accessed February 8, 2017

25. Sachs HC; American Academy of Pediatrics Committee On Drugs. The transfer of drugs and therapeutics into human breast milk: an update on selected topics. *Pediatrics*. 2013;132(3). Available at: www.pediatrics.org/cgi/content/full/132/3/e796

26. Reece-Stremtan S, Marinelli KA. ABM clinical protocol #21: guidelines for breastfeeding and substance use or substance use disorder, revised 2015. *Breastfeed Med*. 2015;10(3):135–141

27. Committee on Practice and Ambulatory Medicine and Bright Futures Periodicity Schedule Workgroup. 2015 Recommendations for preventive pediatric health care. *Pediatrics*. 2015; 136(3). Available at: www.pediatrics.org/cgi/content/full/136/3/e727

28. Maisels MJ, McDonagh AF. Phototherapy for neonatal jaundice. *N Engl J Med*. 2008;358(9):920–928

29. American Academy of Pediatrics Subcommittee on Hyperbilirubinemia. Management of hyperbilirubinemia in the newborn infant 35 or more weeks of gestation. *Pediatrics*. 2004;114(1): 297–316

30. Bhutani VK, Johnson L, Sivieri EM. Predictive ability of a predischarge hour-specific serum bilirubin for subsequent significant hyperbilirubinemia in healthy term and near-term newborns. *Pediatrics*. 1999;103(1):6–14

31. Schutzman DL, Sekhon R, Hundalani S. Hour-specific bilirubin nomogram in infants with ABO incompatibility and direct Coombs-positive results. *Arch Pediatr Adolesc Med*. 2010;164(12): 1158–1164

32. Taylor JA, Burgos AE, Flaherman V, et al; Better Outcomes through Research for Newborns Network. Discrepancies between transcutaneous and serum bilirubin measurements. *Pediatrics*. 2015;135(2):224–231

33. Bhutani VK; Committee on Fetus and Newborn; American Academy of Pediatrics. Phototherapy to prevent severe neonatal hyperbilirubinemia in the newborn infant 35 or more weeks of gestation. *Pediatrics*. 2011;128(4). Available at: www.pediatrics.org/cgi/content/full/128/4/e1046

34. Szucs KA, Rosenman MB. Family-centered, evidence-based phototherapy delivery. *Pediatrics*. 2013;131(6). Available at: www.pediatrics.org/cgi/content/full/131/6/e1982

35. Wickremasinghe AC, Kuzniewicz MW, Grimes BA, McCulloch CE, Newman TB. Neonatal phototherapy and infantile cancer. *Pediatrics*. 2016;137(6): e20151353

36. Waite WM, Taylor JA. Phototherapy for the treatment of neonatal jaundice and breastfeeding duration and exclusivity. *Breastfeed Med*. 2016;11:180–185

37. Watchko JF, Lin Z. Exploring the genetic architecture of neonatal hyperbilirubinemia. *Semin Fetal Neonatal Med*. 2010;15(3):169–175

38. Watchko JF, Lin Z, Clark RH, Kelleher AS, Walker MW, Spitzer AR; Pediatrix Hyperbilirubinemia Study Group. Complex multifactorial nature of significant hyperbilirubinemia in neonates. *Pediatrics*. 2009;124(5). Available at: www.pediatrics.org/cgi/content/full/124/5/e868

39. Tumbaga PF, Philip AGS. Perinatal group B streptococcal infections: current status and future directions. *Neoreviews*. 2013;14(6):e306–e316

40. Verani JR, McGee L, Schrag SJ; Division of Bacterial Diseases, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention (CDC). Prevention of perinatal group B streptococcal disease–revised guidelines from CDC, 2010. *MMWR Recomm Rep*. 2010;59(RR-10):1–36

41. Puopolo KM, Draper D, Wi S, et al. Estimating the probability of neonatal early-onset infection on the basis of maternal risk factors. *Pediatrics*. 2011; 128(5). Available at: www.pediatrics.org/cgi/content/full/128/5/e1155

42. Escobar GJ, Puopolo KM, Wi S, et al. Stratification of risk of early-onset sepsis in newborns ≥ 34 weeks' gestation. *Pediatrics*. 2014;133(1):30–36

43. Polin RA; Committee on Fetus and Newborn. Management of neonates

with suspected or proven early-onset bacterial sepsis. *Pediatrics*. 2012; 129(5):1006–1015

44. Higgins RD, Saade G, Polin RA, et al; Chorioamnionitis Workshop Participants. Evaluation and management of women and newborns with a maternal diagnosis of chorioamnionitis: summary of a workshop. *Obstet Gynecol*. 2016;127(3): 426–436
45. Dhas DB, Ashmi AH, Bhat BV, Kalaivani S, Parija SC. Comparison of genomic DNA methylation pattern among septic and non-septic newborns - an epigenome wide association study. *Genom Data*. 2014;3:36–40
46. Delanghe JR, Speeckaert MM. Translational research and biomarkers in neonatal sepsis. *Clin Chim Acta*. 2015;451(pt A):46–64
47. Cotten CM. Adverse consequences of neonatal antibiotic exposure. *Curr Opin Pediatr*. 2016;28(2):141–149
48. Kimberlin DW, Brady MT, Jackson MA, Long SS, eds; American Academy of Pediatrics. *Red Book: 2015 Report of the Committee on Infectious Diseases*. 30th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2015
49. Dunkelberg JC, Berkley EM, Thiel KW, Leslie KK. Hepatitis B and C in pregnancy: a review and recommendations for care. *J Perinatol*. 2014;34(12):882–891
50. American Academy of Pediatrics Committee on Pediatric AIDS. HIV testing and prophylaxis to prevent mother-to-child transmission in the United States. *Pediatrics*. 2008;122(5): 1127–1134
51. Panel on Treatment of HIV-Infected Women and Prevention of Perinatal Transmission. Recommendations for use of antiretroviral drugs in pregnant HIV-1-infected women for maternal health and interventions to reduce perinatal HIV transmission in the United States. Available at: https://aidsinfo.nih.gov/contentfiles/lvguidelines/PerinatalGL.pdf. Accessed September 11, 2016
52. Hudak ML, Tan RC; Committee on Drugs; Committee on Fetus and Newborn; American Academy of Pediatrics. Neonatal drug withdrawal. *Pediatrics*. 2012;129(2). Available at: www.pediatrics.org/cgi/content/full/129/2/e540
53. Patrick SW, Dudley J, Martin PR, et al. Prescription opioid epidemic and infant outcomes. *Pediatrics*. 2015;135(5): 842–850
54. Wexelblatt SL, Ward LP, Torok K, Tisdale E, Meinzen-Derr JK, Greenberg JM. Universal maternal drug testing in a high-prevalence region of prescription opiate abuse. *J Pediatr*. 2015;166(3): 582–586
55. Backes CH, Backes CR, Gardner D, Nankervis CA, Giannone PJ, Cordero L. Neonatal abstinence syndrome: transitioning methadone-treated infants from an inpatient to an outpatient setting. *J Perinatol*. 2012; 32(6):425–430
56. Jansson LM, Velez M, Harrow C. The opioid-exposed newborn: assessment and pharmacologic management. *J Opioid Manag*. 2009; 5(1):47–55
57. Hudson J, Mayo R, Dickes L, et al. Early treatment for neonatal abstinence syndrome: a palliative approach. *Am J Perinatol*. 2017;34(6):576–584
58. McQueen K, Murphy-Oikonen J. Neonatal abstinence syndrome. *N Engl J Med*. 2016;375(25):2468–2479
59. Kocherlakota P. Neonatal abstinence syndrome. *Pediatrics*. 2014;134(2). Available at: www.pediatrics.org/cgi/content/full/134/2/e547
60. Hall ES, Wexelblatt SL, Crowley M, et al; OCHNAS Consortium. A multicenter cohort study of treatments and hospital outcomes in neonatal abstinence syndrome. *Pediatrics*. 2014; 134(2). Available at: www.pediatrics.org/cgi/content/full/134/2/e527
61. Patrick SW, Schumacher RE, Horbar JD, et al. Improving care for neonatal abstinence syndrome. *Pediatrics*. 2016; 137(5):e20153835
62. Le Strat Y, Dubertret C, Le Foll B. Prevalence and correlates of major depressive episode in pregnant and postpartum women in the United States. *J Affect Disord*. 2011;135(1–3): 128–138
63. Jansson LM, Velez ML. Infants of drug-dependent mothers. *Pediatr Rev*. 2011; 32(1):5–12, quiz 12–13
64. Behnke M, Smith VC; Committee on Substance Abuse; Committee on Fetus and Newborn. Prenatal substance abuse: short- and long-term effects on the exposed fetus. *Pediatrics*. 2013; 131(3). Available at: www.pediatrics.org/cgi/content/full/131/3/e1009
65. Dow K, Ordean A, Murphy-Oikonen J, et al; Neonatal Abstinence Syndrome Work Group. Neonatal abstinence syndrome clinical practice guidelines for Ontario. *J Popul Ther Clin Pharmacol*. 2012;19(3):e488–e506
66. Wight N, Marinelli KA; Academy of Breastfeeding Medicine. ABM clinical protocol #1: guidelines for blood glucose monitoring and treatment of hypoglycemia in term and late-preterm neonates, revised 2014. *Breastfeed Med*. 2014;9(4):173–179
67. Adamkin DH; Committee on Fetus and Newborn. Postnatal glucose homeostasis in late-preterm and term infants. *Pediatrics*. 2011;127(3):575–579
68. Stanley CA, Rozance PJ, Thornton PS, et al. Re-evaluating "transitional neonatal hypoglycemia": mechanism and implications for management. *J Pediatr*. 2015;166(6):1520–1525.e1
69. Thornton PS, Stanley CA, De Leon DD, et al; Pediatric Endocrine Society. Recommendations from the Pediatric Endocrine Society for evaluation and management of persistent hypoglycemia in neonates, infants, and children. *J Pediatr*. 2015;167(2):238–245
70. Adamkin DH. Neonatal hypoglycemia. *Curr Opin Pediatr*. 2016;28(2):150–155
71. Gyamfi-Bannerman C, Thom EA, Blackwell SC, et al; NICHD Maternal–Fetal Medicine Units Network. Antenatal betamethasone for

women at risk for late preterm delivery. *N Engl J Med*. 2016;374(14):1311–1320

72. Cornblath M, Hawdon JM, Williams AF, et al. Controversies regarding definition of neonatal hypoglycemia: suggested operational thresholds. *Pediatrics*. 2000;105(5):1141–1145
73. Roche Diagnostics. Accu-Chek inform II. Available at: www.accu-chekinformii.com/pdf/SHR-ART-05942934003.pdf. Accessed December 17, 2016
74. Harris DL, Weston PJ, Signal M, Chase JG, Harding JE. Dextrose gel for neonatal hypoglycaemia (the Sugar Babies Study): a randomised, double-blind, placebo-controlled trial. *Lancet*. 2013;382(9910):2077–2083
75. Weston PJ, Harris DL, Battin M, Brown J, Hegarty JE, Harding JE. Oral dextrose gel for the treatment of hypoglycaemia in newborn infants. *Cochrane Database Syst Rev*. 2016;(5):CD011027
76. Engle WA, Tomashek KM, Wallman C; Committee on Fetus and Newborn, American Academy of Pediatrics. "Late-preterm" infants: a population at risk. *Pediatrics*. 2007;120(6):1390–1401
77. Hamilton BE, Martin JA, Osterman MJ. Births: preliminary data for 2015. *Natl Vital Stat Rep*. 2016;65(3):1–15
78. McLaurin KK, Hall CB, Jackson EA, Owens OV, Mahadevia PJ. Persistence of morbidity and cost differences between late-preterm and term infants during the first year of life. *Pediatrics*. 2009;123(2):653–659
79. Matthews TJ, MacDorman MF, Thoma ME. Infant mortality statistics from the 2013 period linked birth/infant death data set. *Natl Vital Stat Rep*. 2015;64(9):1–30
80. World Health Organization. Recommendations on newborn health. Available at: www.who.int/maternal_child_adolescent/documents/guidelines-recommendations-newborn-health.pdf?ua=1. Accessed September 11, 2016
81. Moore ER, Anderson GC, Bergman N, Dowswell T. Early skin-to-skin contact for mothers and their healthy newborn infants. *Cochrane Database Syst Rev*. 2012;(5):CD003519
82. Phillips RM, Goldstein M, Hougland K, et al; National Perinatal Association. Multidisciplinary guidelines for the care of late preterm infants. *J Perinatol*. 2013;33(suppl 2):S5–S22
83. Davis NL, Condon F, Rhein LM. Epidemiology and predictors of failure of the infant car seat challenge. *Pediatrics*. 2013;131(5):951–957
84. Moyer LB, Goyal NK, Meinzen-Derr J, et al. Factors associated with readmission in late-preterm infants: a matched case-control study. *Hosp Pediatr*. 2014;4(5):298–304
85. Goyal N, Zubizarreta JR, Small DS, Lorch SA. Length of stay and readmission among late preterm infants: an instrumental variable approach. *Hosp Pediatr*. 2013;3(1):7–15
86. Woythaler M, McCormick MC, Mao WY, Smith VC. Late preterm infants and neurodevelopmental outcomes at kindergarten. *Pediatrics*. 2015;136(3):424–431
87. The Joint Commission. The universal protocol for preventing wrong site, wrong procedure, and wrong person surgery: guidance for health care professionals. Available at: https://www.jointcommission.org/assets/1/18/UP_Poster1.PDF. Accessed September 13, 2016
88. Weddle M, Empey A, Crossen E, Green A, Green J, Phillipi CA. Are pediatricians complicit in vitamin K deficiency bleeding? *Pediatrics*. 2015;136(4):753–757
89. Holman JR, Lewis EL, Ringler RL. Neonatal circumcision techniques. *Am Fam Physician*. 1995;52(2):511–518, 519–520
90. Johnson TR, Pituch K, Brackbill EL, Wan J, van de Ven C, Pearlman MD. Why and how a Department of Obstetrics and Gynecology stopped doing routine newborn male circumcision. *Obstet Gynecol*. 2007;109(3):750–752
91. American Academy of Pediatrics Task Force on Circumcision. Male circumcision. *Pediatrics*. 2012;130(3). Available at: www.pediatrics.org/cgi/content/full/130/3/e756
92. Mondzelewski L, Gahagan S, Johnson C, Madanat H, Rhee K. Timing of circumcision and breastfeeding initiation among newborn boys. *Hosp Pediatr*. 2016;6(11):653–658
93. MacDonald MG, Ramasethu J, Rais-Bahrami K. *Atlas of Procedures in Neonatology*. 5th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2012
94. Rayan GM, Frey B. Ulnar polydactyly. *Plast Reconstr Surg*. 2001;107(6):1449–1454; discussion 1455–1457
95. Mills JK, Ezaki M, Oishi SN. Ulnar polydactyly: long-term outcomes and cost-effectiveness of surgical clip application in the newborn. *Clin Pediatr (Phila)*. 2014;53(5):470–473
96. Leber GE, Gosain AK. Surgical excision of pedunculated supernumerary digits prevents traumatic amputation neuromas. *Pediatr Dermatol*. 2003;20(2):108–112
97. Francis DO, Chinnadurai S, Morad A, et al. *Treatments for Ankyloglossia and Ankyloglossia With Concomitant Lip-Tie*. Rockville, MD: Agency for Healthcare Research and Quality; 2015
98. Academy of Breastfeeding Medicine. Academy of Breastfeeding Medicine Protocol # 11: guidelines for the evaluation and management of neonatal ankyloglossia and its complications in the breastfeeding dyad. Available at: www.bfmed.org/Media/Files/Protocols/ankyloglossia.pdf. Accessed August 28, 2016
99. Francis DO, Krishnaswami S, McPheeters M. Treatment of ankyloglossia and breastfeeding outcomes: a systematic review. *Pediatrics*. 2015;135(6). Available at: www.pediatrics.org/cgi/content/full/135/6/e1458
100. Centers for Disease Control and Prevention (CDC). CDC grand rounds: newborn screening and improved outcomes. *MMWR Morb Mortal Wkly Rep*. 2012;61(21):390–393

101. American Academy of Pediatrics Newborn Screening Authoring Committee. Newborn screening expands: recommendations for pediatricians and medical homes–implications for the system. *Pediatrics*. 2008;121(1):192–217

102. Health Resources and Services Administration. Advisory Committee on Heritable Disorders in Newborns and Children. Available at: https://www.hrsa.gov/advisorycommittees/mchbadvisory/heritabledisorders/index.html. Accessed February 12, 2017

103. Health Resources and Services Administration. Advisory Committee on Heritable Disorders in Newborns and Children. Recommended Uniform Screening Panel. Available at: https://www.hrsa.gov/advisorycommittees/mchbadvisory/heritabledisorders/recommendedpanel/uniformscreeningpanel.pdf. Accessed February 12, 2017

104. National Newborn Screening and Genetics Resource Center. National newborn screening status report. Available at: https://genes-r-us.uthscsa.edu/sites/genes-r-us/files/nbsdisorders.pdf. Accessed September 14, 2016

105. Oster ME, Aucott SW, Glidewell J, et al. Lessons learned from newborn screening for critical congenital heart defects. *Pediatrics*. 2016;137(5):e20154573

106. Kemper AR, Mahle WT, Martin GR, et al. Strategies for implementing screening for critical congenital heart disease. *Pediatrics*. 2011;128(5). Available at: www.pediatrics.org/cgi/content/full/128/5/e1259

107. Bayefsky MJ, Saylor KW, Berkman BE. Parental consent for the use of residual newborn screening bloodspots: respecting individual liberty vs ensuring public health. *JAMA*. 2015;314(1):21–22

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