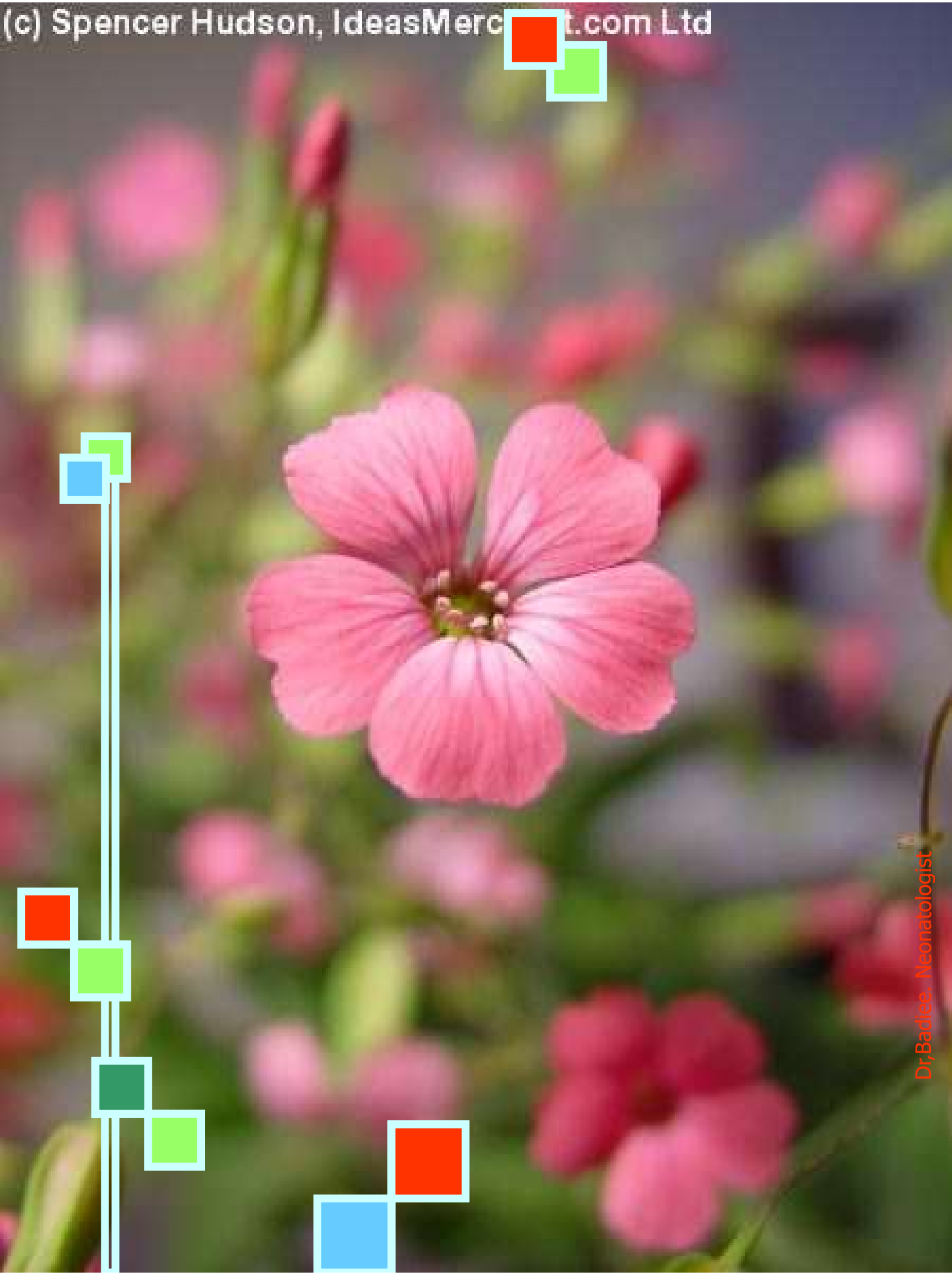
In the name of God

Dr,Badiee. Neonatologist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Dr,Badiee, Neonatologist

DICHARGE PLANNING

Zohreh Badiee, Professor of Pediatrics,
Neonatologist

- discharge planning program provides sufficient education and support to families/caregivers to help them transition successfully to home

- It includes the following:
- Assessment of the infant's medical status and readiness for discharge
- Preparation of families to care for their infant at home
- Transition of ongoing care for the infant to community providers

Checklist for discharge planning for infants admitted to the neonatal intensive care unit (NICU)

Neonatal planning

1. Neonatal status and readiness:
    a. Able to maintain temperature in open crib with normal ambient temperature
    b. Adequate cardiorespiratory control without episodes of apnea and bradycardia
    c. Adequate intake to promote appropriate growth and demonstrated a consistent pattern of appropriate weight prior to discharge
    d. Able to sleep in a flat and supine position
2. Completion of routine screening including:
    a. Metabolic and genetic disorders
    b. Retinopathy of prematurity for infants with gestational age <30 weeks
    c. Hearing screening using auditory brainstem response
    d. Other screening tests based on clinical settings may include brain imaging and laboratory studies (eg, complete blood count or alkaline phosphatase)
3. Routine immunization based on chronological age consistent with the schedule and dose recommended for normal full-term infants
4. Passing car seat/bed test
5. Identify specialized needs for individual patients, including medication, formula, medical equipment, and in cases of incurable terminal conditions, hospice care

Family planning

1. Parental education and readiness:
    a. Demonstrate competency in the daily care of their infant
    b. Demonstrate knowledge of normal behavior of their infant and ability to recognize signs and symptoms of illnesses that require medical consultation
    c. Understand safety (eg, sleep position and environment) and coping measures for the care of their infant
2. Home environment preparation:

c. Adequate intake to promote appropriate growth and demonstrated a consistent pattern of appropriate weight prior to discharge
d. Able to sleep in a flat and supine position

2. Completion of routine screening including:
   a. Metabolic and genetic disorders
   b. Retinopathy of prematurity for infants with gestational age <30 weeks
   c. Hearing screening using auditory brainstem response
   d. Other screening tests based on clinical settings may include brain imaging and laboratory studies (eg, complete blood count or alkaline phosphatase)
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Family planning

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   b. Demonstrate knowledge of normal behavior of their infant and ability to recognize signs and symptoms of illnesses that require medical consultation
   c. Understand safety (eg, sleep position and environment) and coping measures for the care of their infant
2. Home environment preparation:
   a. Obtain the necessary supplies and equipment needed for the daily care of their infant
   b. Evaluation of social and financial needs that may require additional supports, and if needed, appropriate referrals are made

Transition planning and post-discharge care

1. Primary care provider:
   a. An appointment with a primary care provider (PCP) with expertise in the care of graduates from the NICU is scheduled within 48 to 72 hours after discharge
   b. Prior communication between the NICU team and PCP has occurred with review of the infant's NICU course and a summary of ongoing care issues
2. Specialty follow-up:
   a. If appropriate, appointments scheduled for post-discharge follow-up with subspecialty services
3. Community services:
   a. If appropriate, follow-up with community services

Medical readiness

- Infants ready for discharge must be medically stable and without any acute illness.
- For preterm infants, discharge is considered only if an infant demonstrates physiologic stability by showing competency in all of the following functions:

Maintain normal body temperature

- Infants must maintain axillary temperature between ۳۶٫۵ and ۳۷٫۵°C (۹۷٫۰ and ۱۰۰٫۳°F) or rectal temperature between ۳۶٫۶ and ۳۸٫۰°C (۹۷٫۸ to ۱۰۰٫۴°F) in an open crib with normal ambient temperature between ۲۰ and ۲۲٫۲°C

Demonstrate maturity of respiratory control without episodes of apnea and bradycardia

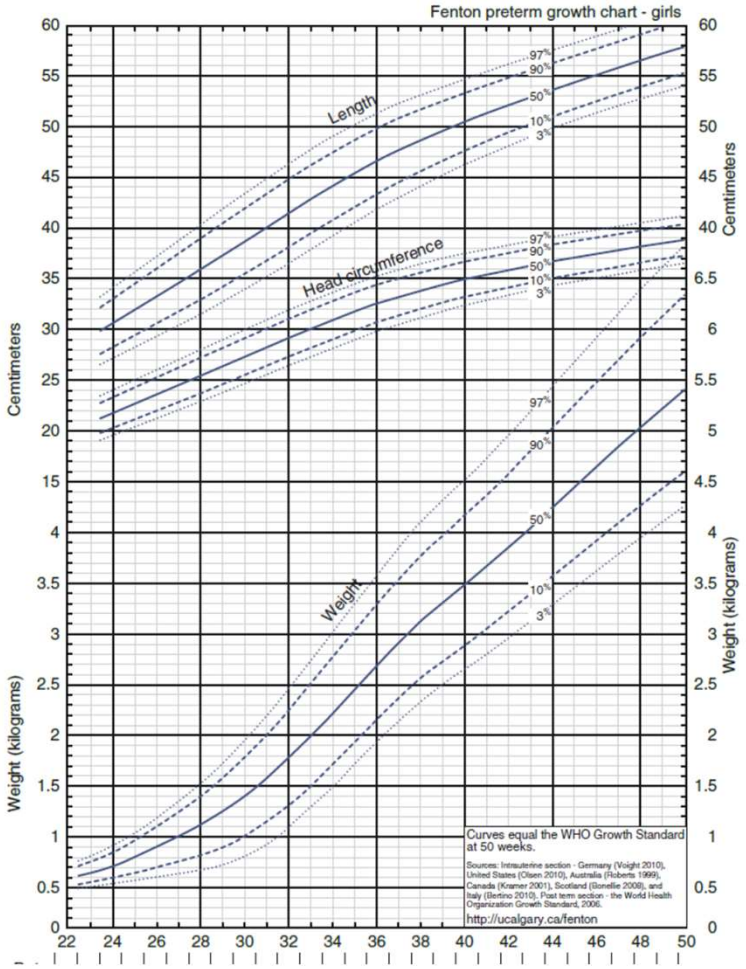
- – The length of time before discharge that an infant should be free from apnea and bradycardia is controversial.
- However, five to eight days of observation after discontinuation of caffeine therapy probably offers a sufficient margin of safety

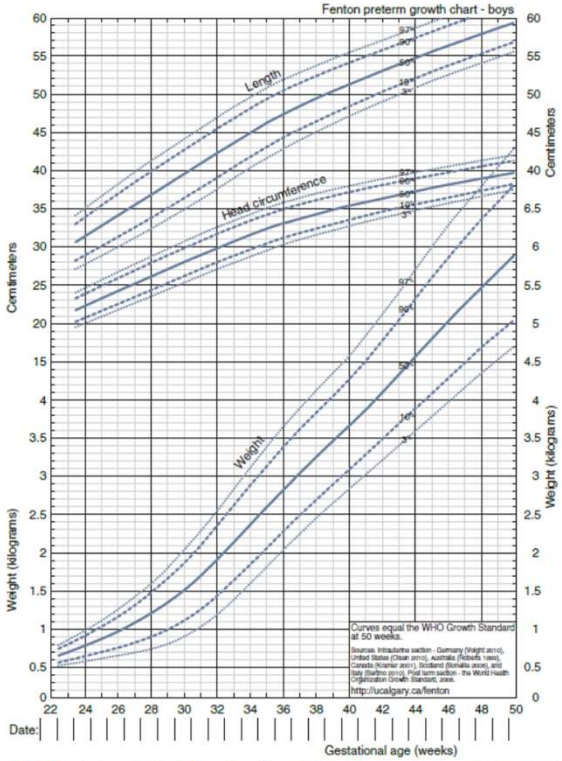
- **Demonstrate mature oral feeding skills** – Infants must demonstrate appropriate breast and/or bottle feeding that will allow enough nutritional intake to promote appropriate growth

Demonstrate a consistent pattern of appropriate weight gain

- There is a lack of clarity on how best to define optimal rates of growth for preterm infants.
- In our centers, for preterm infants who weigh <٢ kg, we use a weight gain goal of ١٥ to ٢٠ g/day;
- for preterm infants ≥٢ kg, we use a goal of ٢٠ to ٣٠ g/day.
- For term infants, we use a goal of ٢٥ to ٣٥ g/day.
- Growth should be parallel to the normal growth curve. If the other criteria are met, attaining a specific weight is not necessary for discharge.

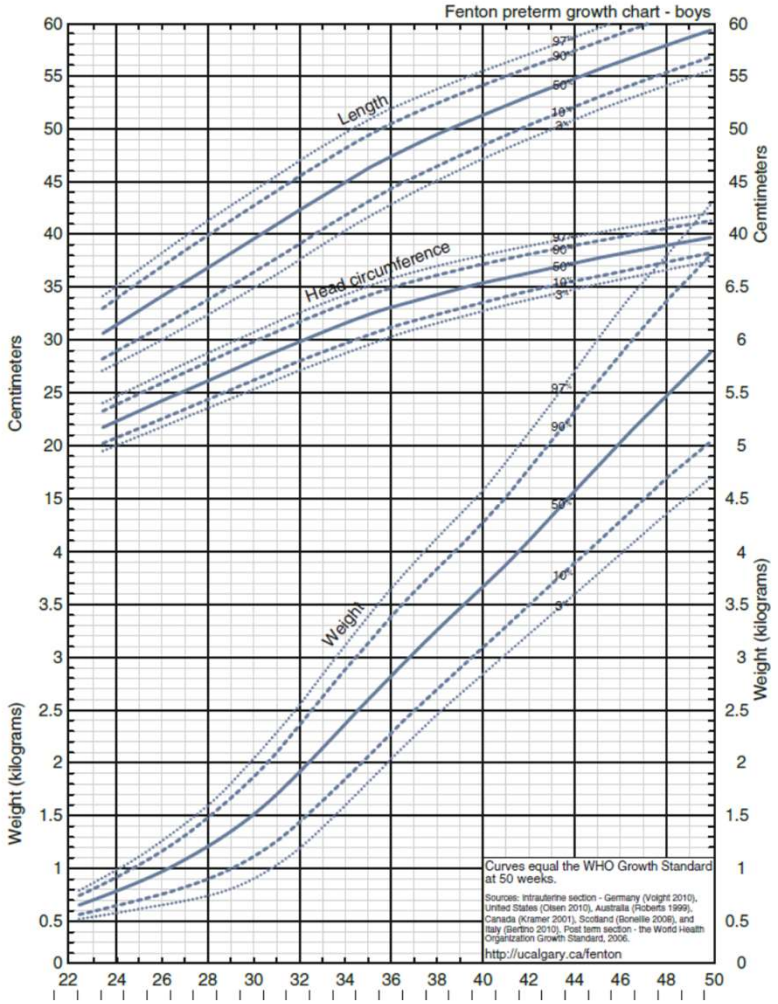
girls


Fenton preterm growth chart - girls
Length
Head circumference
Weight
97%
90%
50%
10%
3%
Centimeters
Weight (kilograms)
Curves equal the WHO Growth Standard at 50 weeks.
Sources: Intrauterine section - Germany (Voigt 2010), United States (Olsen 2010), Australia (Roberts 1999), Canada (Kramer 2001), Scotland (Bonellie 2008), and Italy (Bertino 2010). Post term section - the World Health Organization Growth Standard, 2006.
http://ucalgary.ca/fenton



• **Fig. B.9** Revised growth chart for boys. (From Fenton TR, et al. A systematic review and meta-analysis to revise the Fenton growth chart for preterm infants. *BMC Pediatr*. 2013;13:59.)

bo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http://ucalgary.ca/fenton

Demonstrate stability in supine sleeping position

- The infant needs to be able to sleep in a supine position with the head of the bed flat without compromising the infant's health and safety.
- Because the medical needs of the high-risk newborn may require non supine positioning, each NICU should have an established protocol in place to transition the infant to a safe sleep position and environment as soon as medically possible and well before discharge

- The medical team also prepares and educates parents/caregivers on the importance of maintaining a safe home environment to prevent sudden infant death syndrome, including caution about sleeping in infant swings or seating devices.

Routine discharge screening

Retinopathy of prematurity (ROP) –

Infants at risk for developing ROP include those with:

gestational age [GA] <٣٠ weeks or birth weight<١٥٠٠ g and

select infants >٣٠ weeks with birth weight ١٥٠٠ to ٢٠٠٠ g who have other risk factors.

Retinopathy of prematurity (ROP)

. Examinations should continue until the infant's retinal vessels are mature and no longer at risk for developing ROP.

After the retinal vessels are mature, follow-up with a pediatric ophthalmologist should be scheduled before the end of the first year of life, and sooner if concerns arise such as strabismus, nystagmus, or poor visual tracking

Retinopathy of prematurity (ROP)

- These infants should have ophthalmologic screening.
- Examinations should continue until the infant's retinal vessels are mature and no longer at risk for developing ROP.
- After the retinal vessels are mature, follow-up with a pediatric ophthalmologist should be scheduled before the end of the first year of life, and sooner if concerns arise such as strabismus, nystagmus, or poor visual tracking

• BOX 100.2 Schedule for First Indirect Ophthalmoscopy in Premature Infants

Who

- All infants with a birth weight of 1500 g or less or a gestational age of 30 weeks or less
- Selected infants with birth weight 1500 to 2000 g or gestational age over 30 weeks who are believed to be at risk for ROP

When

- By the later of 31 weeks' postmenstrual age or 4 weeks after birth
- Recommend first examination before discharge from the hospital

Adapted from Fierson WM. American Academy of Pediatrics, Section on Ophthalmology, American Academy of Ophthalmology, American Association for Pediatric Ophthalmology and Strabismus, American Association of Certified Orthoptists. Screening examination of premature infants for retinopathy of prematurity. *Pediatrics* 2018;142(6):e20183061.

Hearing screening

Hearing screening is performed using automated auditory brainstem responses (AABR).

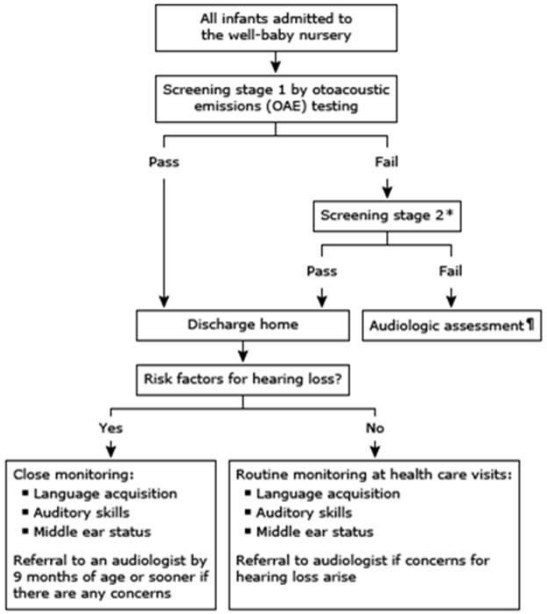
of the increased risk of late-onset hearing loss in neonatal intensive care graduates, follow-up hearing evaluation should be scheduled by nine months corrected age

follow-up evaluation is scheduled For certain at-risk infants

- (infants with cytomegalovirus, meningitis, severe hyperbilirubinemia, perinatal asphyxia or hypoxic ischemic encephalopathy), follow-up evaluation is scheduled within one to three months after the initial hearing screen.

All infants who do not pass their NICU screen should be tested for congenital CMV infection.

Two-stage newborn hearing screening for infants admitted to the well-baby nursery (neonatal level 1 care)



* Screening test for stage 2 is either by OAE or automated auditory brainstem response.

¶ Audiologic assessment for hearing loss is based on a diagnostic auditory brainstem response and is performed by an audiologist skilled in assessing infants and young children. The preferred timing for evaluation is prior to discharge from the birth hospitalization. However if this is not possible, evaluation should be done as soon as possible and no later than 3 months of age.

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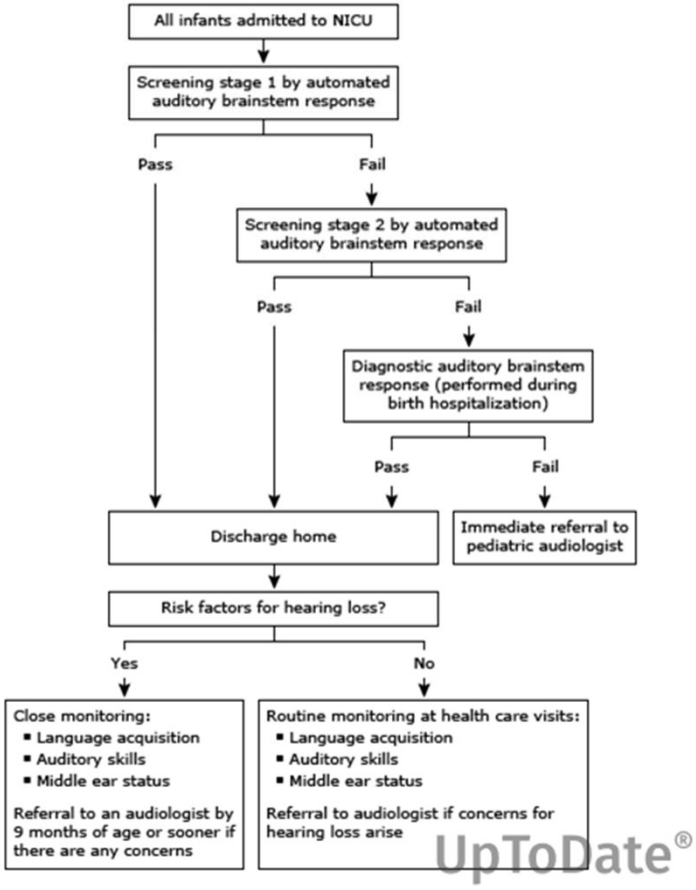
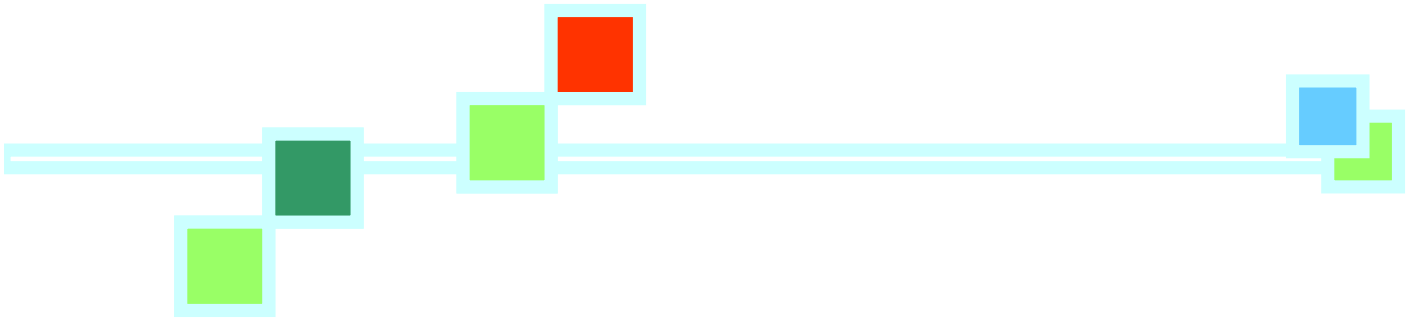
Two-stage newborn hearing screening for infants admitted to neonatal level 2 and 3 care unit (neonatal intensive care unit [NICU])





Intraventricular hemorrhage

- Infants at highest risk are :
- gestational age of less than ٣٢ weeks or a birth weight of less than ١٥٠٠ g.
- Most hemorrhages occur by the first week of life.
- The site of origin:
- for GMH-IVH is the caudothalamic groove, an area bordered
- by the ventricular surface of the caudate nucleus and the
- thalamus.

more than ٩٠% of

- GMH-IVH occurs within the first ٣ days of life
- and of those, around half occur within the first ٢٤ hours and
- two thirds within the first ٢٤ hours of postnatal life.
- The lesion reaches its maximal extent by ٣ to ٥ days after initial detection.
- Only around ١٠% of cases occur beyond the first
- week, in contrast to preterm white matter injuries wherein
- late onset is not uncommon

American Academy of Pediatrics ٢٠٢٠

routine neuroimaging of the preterm brain and recommended

- cUS screening of all preterm infants less than ٣٠
- weeks with an initial scan within the first ٧ days and repeat
- scans at ٣ to ٤ weeks of life and around term or discharge
- from the hospital.

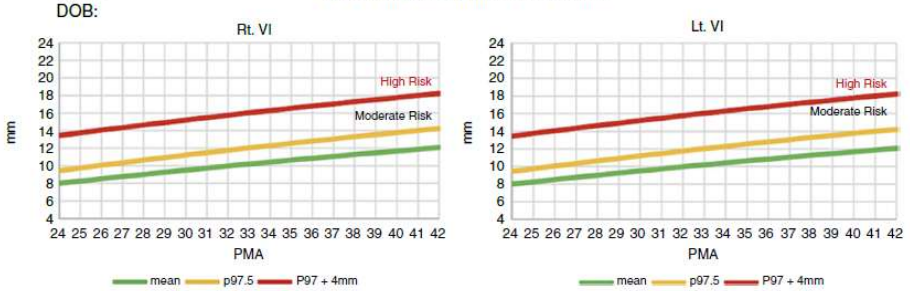
TABLE 55.2 Proposed Ultrasound Screening Protocol in Preterm Infants

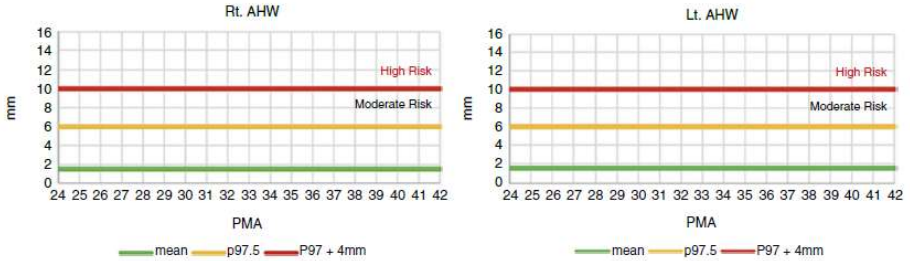
Timing	<28 Weeks and/or <1000 g	28–32 Weeks
1st cUS scan	Day 1 (optional)	Day 1 (optional)
2nd cUS scan	3	4–7
3rd cUS scan	7	14
4th cUS scan	14	28
Subsequent cUS scan	21	At term or discharge
Subsequent cUS scan	28	
Subsequent cUS scan	Every other week until 34 weeks' PMA	
Subsequent cUS scan	At term or discharge	
Brain MRI	Routine MRI at term	Routine MRI at term if significant risk factors

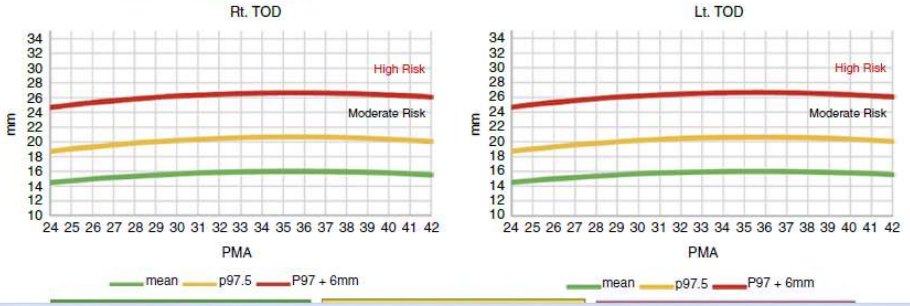
cUS, Cranial ultrasonography; *MRI,* magnetic resonance imaging; *PMA,* postmenstrual age.
Adapted from Inder TE, de Vries LS, Ferriero DM, et al. Neuroimaging of the preterm brain: review and recommendations. *J Pediatr*. 2021;237:276-287.e274.

Name:
DOB:

Ventricular Measurement Risk Zones







Brain imaging

– In addition to performing earlier screening for intraventricular hemorrhage, brain imaging with ultrasound or magnetic resonance imaging (MRI) may be indicated at a postmenstrual age close to term and prior to discharge to detect periventricular leukomalacia or white matter injury in at-risk infants

enteral iron supplementation

- may be started between ٢ and ٤ weeks of age.
- Infants

receiving an erythrocyte-stimulating agent such as erythropoietin

- or darbepoetin may need a higher dose of iron.
- Phlebotomy and blood transfusions may dramatically alter iron
- stores, and serum ferritin measurements may be helpful to
- guide decisions for iron supplementation. If the serum ferritin
- is greater than ٣٠٠ µg/L, iron supplementation should
- be held until the ferritin normalizes

vitamines

- Vitamin D: ٤٠٠-١٠٠٠
- Multivitamin
- Folic acid

Osteopenia of Prematurity

- The incidence is inversely proportional to gestational age and birth
- weight,
- it was estimated to be ٥٠% in infants weighing less than ١٠٠٠ g
- and ٢٣% to ٣٢% in infants weighing less than ١٥٠٠ g;

Osteopenia of Prematurity

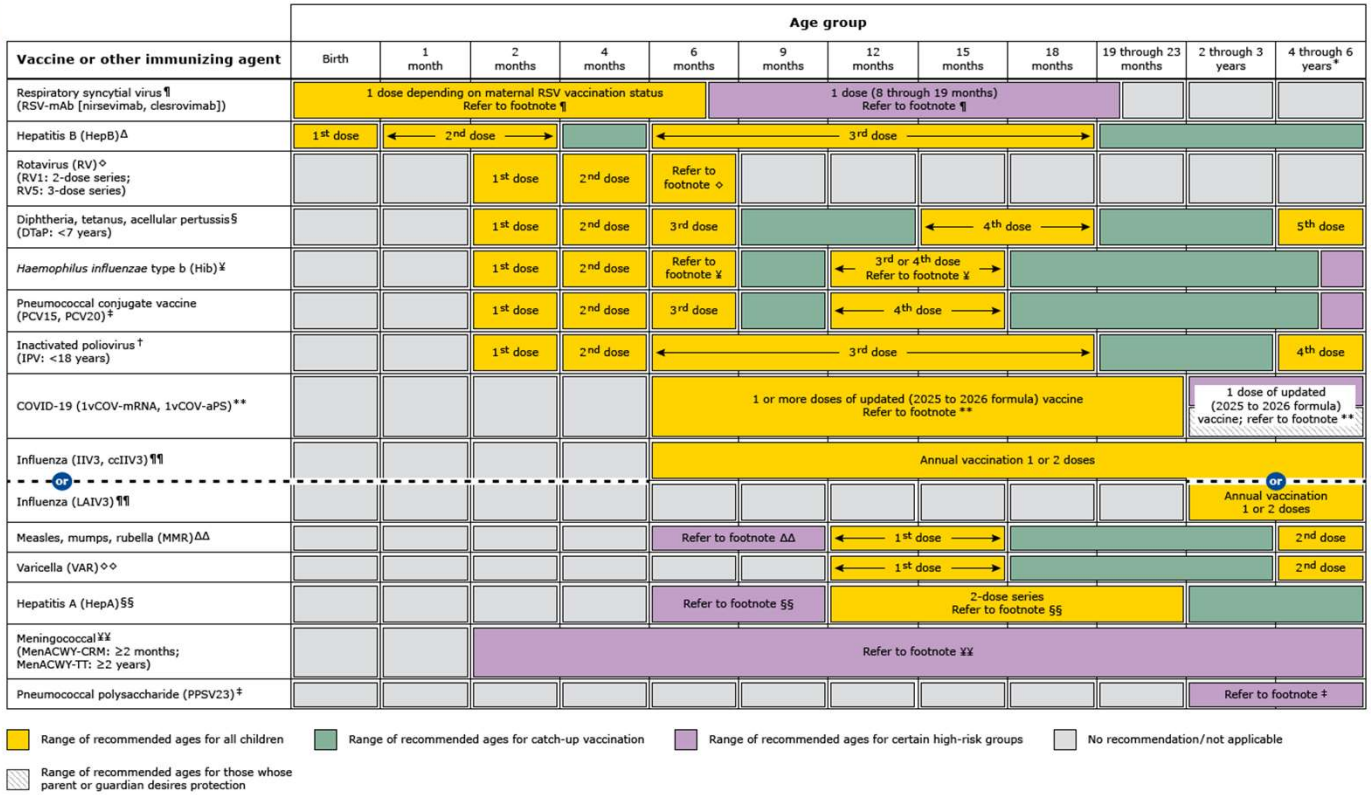
- Routine evaluation of bone mineral status using biochemical
- testing is indicated for infants with birth weight
- less than ١٥٠٠ g but not those with birth weight greater
- than ١٥٠٠ g.
- Biochemical testing should usually be started ٢ to ٥ weeks after birth.

- Serum alkaline phosphatase greater than ٨٠٠ to ١٠٠٠
- IU/L or clinical evidence of fractures should lead to a
- radiographic evaluation for rickets and management
- focusing on maximizing calcium and phosphorus intake
- and minimizing factors leading to bone mineral loss.

- A persistent serum phosphorus concentration less than
- approximately ٢٫٥ mg/dL should be followed, and consideration
- should be given for phosphorus supplementation.

- At the time of discharge from the hospital, VLBW infants will often be provided higher intakes of minerals than are provided by human milk or formulas intended for term infants using transitional (also referred to as post-discharge) formulas.
- If exclusively breastfed, a follow- up serum alkaline phosphatase at ٢ to ٤ weeks after
- discharge from the hospital may be considered.

Recommended immunization schedule for children age 0 through 6 years – United States, 2025 (for those who fall behind or start late, refer to UpToDate content related to the catch-up schedule)



Historically, this schedule has been based on guidance from the Advisory Committee on Immunization Practices and the American Academy of Pediatrics (AAP), but the UpToDate editors have made the decision to update this schedule based only on the AAP's 2025 recommendations.

- Consult the AAP immunization schedule for detailed recommendations.
- When a vaccine is not administered at the recommended age, administer at a subsequent visit.
- Use combination vaccines instead of separate injections when appropriate.
- Report clinically significant adverse events to the Vaccine Adverse Event Reporting System (VAERS) online at https://vaers.hhs.gov or by telephone, 800-822-7967.
- Report suspected cases of reportable vaccine-preventable diseases or outbreaks to your state or local health department.
- For information about precautions and contraindications, refer to https://www.cdc.gov/vaccines/hcp/imz-best-practices/contraindications-precautions.html.
- For information regarding vaccination in the setting of a vaccine-preventable disease outbreak, contact your state or local health department.

1vCOV-aPS: adjuvanted, protein subunit COVID-19 vaccine; 1vCOV-mRNA: monovalent mRNA COVID-19 vaccine; anti-HBs: hepatitis B surface antibody; COVID-19: coronavirus disease 2019; HBeAg: hepatitis B e antigen; HBIG: hepatitis B immune globulin; HBsAg: hepatitis B surface antigen; IIV3: trivalent inactivated influenza vaccine; LAIV3: trivalent live attenuated influenza vaccine; MenACWY-CRM: Menveo; MenACWY-TT: MenQuadfi; mIU: milli-international units; MMRV: combined measles, mumps, rubella, and varicella vaccine (ProQuad); PCV13: 13-valent pneumococcal conjugate vaccine; PCV15: 15-valent pneumococcal conjugate vaccine; PCV20: 20-valent pneumococcal conjugate vaccine; PPSV23: Pneumovax 23; RSV: respiratory syncytial virus; RV1: Rotarix; RV5: RotaTeq.

* School entry age group.

¶ Respiratory syncytial virus monoclonal antibody (RSV-mAb; nirsevimab [Beyfortus]; clesrovimab [Eflonsia])

(Minimum age: Birth)

- **Routine vaccination:**

- For information regarding vaccination in the setting of a vaccine-preventable disease outbreak, contact your state or local health department.

[vCOV-aPE: adjuvanted, protein subunit COVID-19 vaccine; [vCOV-mRNA: monovalent mRNA COVID-19 vaccine; anti-HBs: hepatitis B surface antibody; COVID-19: coronavirus disease 2019; HBeAg: hepatitis B e antigen; HBIG: hepatitis B immune globulin; HBsAg: hepatitis B surface antigen; IIV3: trivalent inactivated influenza vaccine; LAIV3: trivalent live attenuated influenza vaccine; MenACWY-CRM: Menveo; MenACWY-TT: MenQuadfi; mIU: milli-international units; MMRV: combined measles, mumps, rubella, and varicella vaccine (ProQuad); PCV13: 13-valent pneumococcal conjugate vaccine; PCV15: 15-valent pneumococcal conjugate vaccine; PCV20: 20-valent pneumococcal conjugate vaccine; PPSV23: Pneumovax 23; RSV: respiratory syncytial virus; RV1: Rotarix; RV5: RotaTeq.

* School entry age group.

¶ Respiratory syncytial virus monoclonal antibody (RSV-mAb; nirsevimab [Beyfortus]; clesrovimab [Ffilonsia])
(Minimum age: Birth)

- **Routine vaccination:**
  - **Infants <8 months of age born during their first RSV season (October through March in most of the continental United States):**
    - Pregnant parent did not receive RSV vaccine **or** pregnant parent's RSV vaccination status is unknown **or** pregnant parent received RSV vaccine during previous pregnancy: Administer 1 dose nirsevimab or clesrovimab within 1 week of birth (ideally during the birth hospitalization).
    - Pregnant parent received RSV vaccine <14 days prior to delivery: Administer 1 dose nirsevimab or clesrovimab within 1 week of birth (ideally during the birth hospitalization).
    - Pregnant parent received RSV vaccine at least 14 days prior to delivery: Nirsevimab/clesrovimab not needed. Refer to UpToDate content for rare circumstances when nirsevimab or clesrovimab can be considered.
  - **Infants <8 months of age born before their first RSV season (April through September in most of the continental United States):**
    - Pregnant parent did not receive RSV vaccine **or** pregnant parent's RSV vaccination status is unknown **or** pregnant parent received RSV vaccine during previous pregnancy: Administer 1 dose nirsevimab or clesrovimab shortly before start of RSV season.
    - Pregnant parent received RSV vaccine <14 days prior to delivery: Administer 1 dose nirsevimab or clesrovimab shortly before start of RSV season.
    - Pregnant parent received RSV vaccine at least 14 days prior to delivery: Nirsevimab/clesrovimab not needed. Refer to UpToDate content for rare circumstances when nirsevimab or clesrovimab can be considered.
- **Special situations:**
  - Age 8 through 19 months and at risk for severe RSV disease: 1 dose nirsevimab shortly before start of 2nd RSV season. High-risk conditions include:
    - Children with chronic lung disease of prematurity who required medical support at any time during the 6-month period before the start of the 2nd RSV season.
    - Children who are severely immunocompromised.
    - Children with cystic fibrosis who have manifestations of severe lung disease or have weight-for-length that is <10th percentile.
    - American Indian and Alaska Native children.
  - Age-eligible and undergoing cardiac surgery with cardiopulmonary bypass: 1 additional dose of nirsevimab or clesrovimab after surgery. For additional details, refer to UpToDate content.

Infants with prolonged birth hospitalization (eg, for prematurity) discharged October through March should be immunized shortly before or promptly after discharge.

Refer to UpToDate content for additional details.

Δ Hepatitis B (HepB) vaccination
(Minimum age: Birth)

- **Routine vaccination (pregnant parent is HBsAg-negative):**
  - 3-dose series at age 0, 1 through 2, and 4 through 18 months (use monovalent HepB vaccine for doses administered before age 6 weeks).
    - Birth weight ≥2 kg: 1 dose within 24 hours of birth if medically stable.
    - Birth weight <2 kg: 1 dose at chronological age 1 month or hospital discharge (whichever is earlier and even if weight is still <2 kg).
  - Infants who did not receive a birth dose should begin the series as soon as possible. Refer to UpToDate content related to the catch-up immunization schedule.
  - Administration of 4 doses is permitted when a combination vaccine containing HepB is used after the birth dose.
  - Final (3rd or 4th) dose: Age 6 through 18 months (minimum age 24 weeks).
- **Pregnant parent is HBsAg-positive:**
  - Birth dose (monovalent HepB vaccine only): Administer HepB vaccine and HBIG (in separate limbs) within 12 hours of birth, regardless of birth weight.
  - Birth weight <2 kg: Administer 3 additional doses of HepB vaccine beginning at age 1 month (total of 4 doses).
  - Final (3rd or 4th dose): Administer at age 6 months (minimum age 24 weeks).
  - Test for HBsAg and anti-HBs at age 9 through 12 months. If HepB series is delayed, test 1 to 2 months after final dose. Do not test before age 9 months.
- **Pregnant parent is HBsAg-unknown:** If other evidence suggestive of pregnant parent hepatitis B infection exists (eg, presence of HBV DNA, HBeAg-positive, or pregnant parent known to have chronic hepatitis B infection), manage infant as if pregnant parent is HBsAg-positive.
  - Birth dose (monovalent HepB vaccine only):
    - Birth weight ≥2 kg: Administer HepB vaccine within 12 hours of birth. Determine pregnant parent's HBsAg status as soon as possible. If pregnant parent is determined to be HBsAg-positive, administer HBIG as soon as possible (in separate limb) but no later than 7 days of age.
    - Birth weight <2 kg: Administer HepB vaccine and HBIG (in separate limbs) within 12 hours of birth. Administer 3 additional doses of HepB vaccine beginning at age 1 month (total of 4 doses).
  - Final (3rd or 4th) dose: Administer at age 6 months (minimum age 24 weeks).
  - If pregnant parent is determined to be HBsAg-positive or if status remains unknown, test for HBsAg and anti-HBs at age 9 through 12 months. If HepB series is delayed, test 1 to 2 months after final dose. Do not test before age 9 months.
- **Special situations:**
  - Revaccination is generally not recommended for persons with a normal immune status who were vaccinated as infants, children, adolescents, or adults.
  - Postvaccination serology testing and revaccination (if anti-HBs <10 mIU/mL) is recommended for certain populations, including:
    - Infants born to HBsAg-positive pregnant parents.
    - Persons who are predialysis or on maintenance dialysis.
    - Other immunocompromised persons.
  - For detailed revaccination recommendations, refer to https://www.cdc.gov/mmwr/volumes/67/rr/rr6701a1.htm.

○ Rotavirus (RV) vaccination
(Minimum age: 6 weeks)

- RV1 (Rotarix): 2-dose series at age 2 and 4 months.
- RV5 (RotaTeq): 3-dose series at age 2, 4, and 6 months.
- If any dose in the series is either RV5 or unknown, default to 3-dose series.

§ Diphtheria and tetanus toxoids, and acellular pertussis (DTaP) vaccination
(Minimum age: 6 weeks; exception: 4 years for DTaP-inactivated poliovirus [Kinrix, Quadracel])

- Routine: 5-dose series (3-dose primary series at age 2, 4, and 6 months, followed by booster doses at 15 through 18 months and 4 through 6 years).
- Prospectively: Dose 4 may be administered as early as age 12 months if at least 6 months have elapsed since dose 3.
- Retrospectively: A 4th dose that was inadvertently administered as early as 12 months may be counted if at least 4 months have elapsed since dose 3.
- Children younger than age 7 years with a contraindication specific to the pertussis component of DTaP: May administer Td for all recommended remaining doses in place of DTaP. Encephalopathy within 7 days of vaccination when not attributable to another identifiable cause is the only contraindication specific to the pertussis component of DTaP. For additional information, refer to https://publications.aap.org/redbook/book/755/chapter/14579836/Diphtheria.
- Wound management: Refer to www.cdc.gov/mmwr/volumes/67/rr/rr6702a1.htm for DTaP vaccination indications as part of wound management.

ε *Haemophilus influenzae* type b (Hib) vaccination
(Minimum age: 6 weeks)

- **Routine vaccination:**
  - ActHIB, Hiberix, Pentacel, or Vaxelis: 4-dose series (3-dose primary series at age 2, 4, and 6 months, followed by a booster dose at age 12 through 15 months). Vaxelis is not recommended for use as a booster dose. A different Hib-containing vaccine should be used for the booster dose.
  - PedvaxHIB: 3-dose series (2-dose primary series at age 2 and 4 months, followed by a booster dose at age 12 through 15 months).
  - American Indian and Alaska Native infants: Vaxelis and PedvaxHIB preferred over other Hib vaccines for the primary series.
- **Special situations:**
  - Refer to UpToDate content related to Hib vaccination and immunization in specific high-risk groups and the 2025 AAP Child and Adolescent Immunization Schedule. Special situations and high-risk groups include chemotherapy or radiation treatment, hematopoietic cell transplant, anatomic or functional asplenia (including sickle cell disease), elective splenectomy, HIV infection, immunoglobulin deficiency, and early complement component deficiency.

ŧ Pneumococcal vaccination
(Minimum age: 6 weeks [PCV15, PCV20], 2 years [PPSV23])

- **Routine vaccination with PCV:**
  - 4 dose series at age 2, 4, 6, and 12 through 15 months.
- **NOTE:** PCV15 and PCV20 can be used interchangeably for children who are healthy or have underlying conditions. If the infant received PCV13 for the initial doses, the series may be completed with PCV15 or PCV20; restarting the series is not necessary.
- **Special situations:**
  - High-risk conditions: Refer to separate UpToDate content and the 2025 AAP Child and Adolescent Immunization Schedule for information on pneumococcal vaccination in children with high-risk conditions.
  - High-risk conditions include cerebrospinal fluid leak; chronic heart disease; chronic kidney disease (excluding maintenance dialysis and nephrotic syndrome, which are included in immunocompromising conditions); chronic liver disease; chronic lung disease (including moderate persistent or severe persistent asthma); cochlear implant; diabetes mellitus; immunocompromising conditions (on maintenance dialysis or with nephrotic syndrome; congenital or acquired asplenia or splenic dysfunction; congenital or acquired immunodeficiencies; diseases and conditions treated with immunosuppressive drugs or radiation therapy, including malignant neoplasms, leukemias, lymphomas, Hodgkin disease, and solid organ transplant; HIV infection; and sickle cell disease or other hemoglobinopathies).

† Inactivated poliovirus (IPV) vaccination
(Minimum age: 6 weeks)

- 4-dose series at age 2, 4, and 6 through 18 months, and 4 through 6 years; administer the final dose on or after age 4 years and at least 6 months after the previous dose.
- 4 or more doses of IPV can be administered before age 4 years when a combination vaccine containing IPV is used. However, a dose is still recommended at or after age 4 years and at least 6 months after the previous dose.

**** COVID-19 vaccination**
(Minimum age: 6 months [1vCOV-mRNA: Moderna Spikevax; updated 2025-2026 formula], 5 years [Pfizer-BioNTech Comirnaty; updated 2025-2026 formula])

- **Age 6 through 23 months (everyone):**
  - Unvaccinated:
    - 2-dose series of Moderna at 0, 4 through 8 weeks.
  - Previously vaccinated with:
    - 1 dose of Moderna: Complete initial series with 1 dose of Moderna 4 to 8 weeks after most recent dose.
    - 1 dose of Pfizer-BioNTech: Complete initial series with 2 doses of Moderna 8 weeks apart (administer first dose 4 to 8 weeks after most recent dose).
    - 2 doses of Pfizer-BioNTech: Complete initial series with 1 dose of Moderna at least 8 weeks after most recent dose.
  - Completed initial vaccine series:
    - 1 dose of Moderna at least 8 weeks after most recent dose.
- **Age 2 through 5 years (desire protection or in a risk group**):**
  - Ages 2 to 4 years: 1 dose of Moderna regardless of previous vaccination status at least 8 weeks after the most recent dose.
  - Ages 5 to 5 years: 1 dose of Moderna or Pfizer-BioNTech regardless of previous vaccination status at least 8 weeks after the most recent dose.
- **Moderately or severely immunocompromised*†:**
  - Age 6 months through 4 years and unvaccinated:
    - 4 doses of Moderna: Initial 3-dose series at 0, 4 weeks, and at least 4 weeks after dose 2, followed by 1 dose of Moderna 6 months later (minimum interval 2 months).
  - Age 6 months through 4 years and previously vaccinated with:
    - 1 dose of Moderna: Complete initial series with 2 doses of Moderna at least 4 weeks apart (minimum interval between previous dose and dose 1 is 4 weeks), followed by 1 dose of Moderna 6 months later (minimum interval 2 months).
    - 2 doses of Moderna: Complete initial series with 1 dose of Moderna at least 4 weeks after most recent dose, followed by 1 dose of Moderna 6 months later (minimum interval 2 months).
    - 3 or more doses of Moderna before 2025-2026 vaccine available: 2 doses of Moderna at least 6 months apart (minimum interval 2 months). Administer dose 1 at least 8 weeks after most recent dose.
    - 1 dose of Pfizer-BioNTech: Complete initial series with 2 doses of Moderna at least 8 weeks apart (administer dose 1 Moderna 4 weeks after most recent dose), followed by 1 dose Moderna 6 months later (minimum interval 2 months).
    - 2 doses Pfizer-BioNTech: Complete initial series with 1 dose Moderna at least 8 weeks after most recent dose, followed by 1 dose Moderna 6 months later (minimum interval 2 months).
    - 3 or more doses of Pfizer: 2 doses Moderna 6 months apart (minimum interval 2 months), Administer dose 1 at least 8 weeks after the most recent dose.

    All vaccine doses of the primary series should be from the same manufacturer for immunocompromised children ages 5 through 6 years.
  - Age 5 through 6 years and unvaccinated:
    - 4 doses (initial 3-dose series at 0, 4 weeks, and at least 4 weeks after dose 2) of Moderna, followed by 1 dose of Moderna or Pfizer-BioNTech 6 months later (minimum interval 2 months) **or**
    - 4 doses (initial 3-dose series at 0, 3 weeks, and at least 4 weeks after dose 2) of Pfizer-BioNTech, followed by 1 dose of Moderna or Pfizer-BioNTech 6 months later (minimum interval 2 months).
  - Ages 5 through 6 years and previously vaccinated with:
    - 1 dose of Moderna: Complete initial series with 2 doses of Moderna at least 4 weeks apart (minimum interval between previous dose and dose 1: 4 weeks), followed by 1 dose of Moderna or Pfizer-BioNTech 6 months later (minimum interval 2 months).
    - 2 doses of Moderna: Complete initial series with 1 dose of Moderna at least 4 weeks after most recent dose, followed by 1 dose of Moderna or Pfizer-BioNTech 6 months later (minimum interval 2 months).
    - 1 dose of Pfizer-BioNTech: Complete initial series with 2 doses Pfizer-BioNTech at least 4 weeks apart (minimum interval between previous dose and dose 1: 3 weeks), followed by 1 dose of Moderna or Pfizer-BioNTech 6 months later (minimum interval 2 months).
    - 2 doses of Pfizer-BioNTech: Complete initial series with 1 dose of Pfizer-BioNTech at least 4 weeks after the most recent dose, followed by 1 dose of Moderna or Pfizer-BioNTech 6 months later (minimum interval 2 months).
    - 3 or more doses of Moderna or Pfizer-BioNTech before 2025-2026 vaccine available: 2 doses of Moderna or Pfizer-BioNTech 6 months apart (minimum interval 2 months). Administer dose 1 at least 8 weeks after the most recent dose.

NOTE: Current COVID-19 schedule and dose formulations available at https://downloads.aap.org/AAP/PDF/AAP-Immunization-Schedule.pdf.

¶¶ Influenza vaccination
(Minimum age: 6 months for inactivated influenza vaccine [IIV3]; 2 years for live attenuated influenza vaccine [LAIV3])

- Use any influenza vaccine appropriate for age and health status annually (refer to UpToDate content related to influenza vaccination in children and the AAP policy statement):
  - 2 doses separated by at least 4 weeks for children age 6 months through 8 years who have received fewer than 2 influenza vaccine doses before July 1, 2025, or whose influenza vaccination history is unknown.
  - 1 dose for children age 6 months through 8 years who have received at least 2 influenza vaccine doses before July 1, 2025.
- For the 2025-2026 season, refer to 2025-2026 AAP influenza vaccine recommendations.
- For the 2026-2027 season, refer to the 2026-2027 AAP influenza vaccine recommendations.

ΔΔ Measles, mumps, and rubella (MMR) vaccination
(Minimum age: 12 months for routine vaccination)

- **Routine vaccination:**
  - 2-dose series at age 12 through 15 months and age 4 through 6 years.
  - MMR or MMRV may be administered. For dose 1 in children age 12 through 47 months, it is recommended to administer MMR and varicella vaccines separately. MMRV may be used if parents or caregivers express a preference. If MMRV is used, the minimum interval between MMRV doses is 3 months.
- **International travel:**
  - Infants age 6 through 11 months: 1 dose before departure; revaccinate with 2-dose series at age 12 through 15 months (12 months for children in high-risk areas) and dose 2 as early as 4 weeks later.
  - Unvaccinated children age 12 months or older: 2 doses at least 4 weeks apart with the second dose given at least 2 weeks before departure.
  - Previously received 1 dose and age 12 months or older: Administer dose 2 at least 4 weeks after dose 1.
- **Mumps outbreak:** A third dose of MMR is recommended for individuals who have already received 2 doses.

○○ Varicella (VAR) vaccination
(Minimum age: 12 months)

- 2-dose series at 12 through 15 months and 4 through 6 years.
- VAR or MMRV may be administered. For dose 1 in children age 12 through 47 months, it is recommended to administer MMR and varicella vaccines separately. MMRV may be used if parents or caregivers express a preference.

Clinical indications for monoclonal antibody immunoprophylaxis against severe respiratory syncytial virus infections in infants and children <19 months

Population	RSV-mAb	Indications
Healthy infants	▪ Nirsevimab ▪ Clesrovimab*	▪ Born during RSV season or <8 months when entering their first RSV season ▪ If dose not received during first RSV season and <8 months upon entering their second RSV season
Infants with increased risk of severe disease: ▪ Children with chronic lung disease of prematurity¶ who required medical support△ any time during the 6-month period before the start of the RSV season ▪ Children who are severely immunocompromised ▪ Children with cystic fibrosis who have manifestations of severe lung disease◇ or have weight-for-length that is <10th percentile ▪ American Indian and Alaska Native children	▪ Nirsevimab	▪ All infants born during RSV season or upon entering their first RSV season ▪ If <19 months when entering their second RSV season

This table summarizes our suggested indications for nirsevimab and clesrovimab. Refer to UpToDate's topic on RSV prevention for additional details, including a description of the evidence supporting the efficacy of both mAbs.

mAb: monoclonal antibody; RSV: respiratory syncytial virus.

* Clesrovimab is only approved for a first dose in infants <8 months of age.

¶ Chronic lung disease of prematurity is also known as bronchopulmonary dysplasia.

△ Examples include chronic corticosteroid therapy, diuretic therapy, or supplemental oxygen.

◇ Previous hospitalization for pulmonary exacerbation in the first year of life or abnormalities on chest imaging that persist when stable.

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Clinical indications for monoclonal antibody immunoprophylaxis against severe respiratory syncytial virus infections in infants and children <19 months

Population	RSV-mAb	Indications
Healthy infants	▪ Nirsevimab ▪ Clesrovimab*	▪ Born during RSV season or <8 months when entering their first RSV season ▪ If dose not received during first RSV season and <8 months upon entering their second RSV season
Infants with increased risk of severe disease: ▪ Children with chronic lung disease of prematurity¶ who required medical support△ any time during the 6-month period before the start of the RSV season ▪ Children who are severely immunocompromised ▪ Children with cystic fibrosis who have manifestations of severe lung disease◇ or have weight-for-length that is <10th percentile ▪ American Indian and Alaska Native children	▪ Nirsevimab	▪ All infants born during RSV season or upon entering their first RSV season ▪ If <19 months when entering their second RSV season

This table summarizes our suggested indications for nirsevimab and clesrovimab. Refer to UpToDate's topic on RSV prevention for additional details, including a description of the evidence supporting the efficacy of both mAbs.

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Clinical indications for monoclonal antibody immunoprophylaxis against severe respiratory syncytial virus infections in infants and children <19 months

Population	RSV-mAb	Indications
Healthy infants	▪ Nirsevimab ▪ Clesrovimab*	▪ Born during RSV season or <8 months when entering their first RSV season ▪ If dose not received during first RSV season and <8 months upon entering their second RSV season
Infants with increased risk of severe disease: ▪ Children with chronic lung disease of prematurity¶ who required medical support$^{\Delta}$ any time during the 6-month period before the start of the RSV season ▪ Children who are severely immunocompromised ▪ Children with cystic fibrosis who have manifestations of severe lung disease$^{\diamond}$ or have weight-for-length that is <10th percentile ▪ American Indian and Alaska Native children	▪ Nirsevimab	▪ All infants born during RSV season or upon entering their first RSV season ▪ If <19 months when entering their second RSV season

This table summarizes our suggested indications for nirsevimab and clesrovimab. Refer to UpToDate's topic on RSV prevention for additional details, including a description of the evidence supporting the efficacy of both mAbs.

mAb: monoclonal antibody; RSV: respiratory syncytial virus.

* Clesrovimab is only approved for a first dose in infants <8 months of age.

¶ Chronic lung disease of prematurity is also known as bronchopulmonary dysplasia.

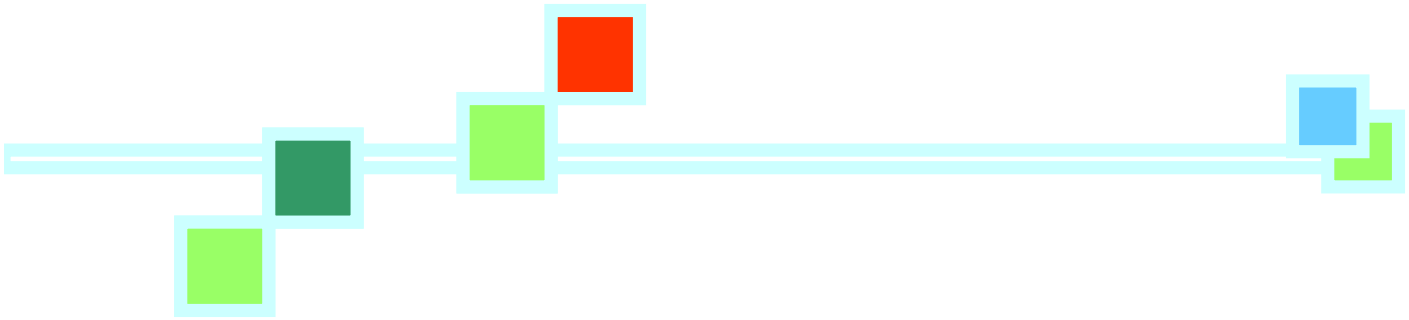
Δ Examples include chronic corticosteroid therapy, diuretic therapy, or supplemental oxygen.

◇ Previous hospitalization for pulmonary exacerbation in the first year of life or abnormalities on chest imaging that persist when stable.

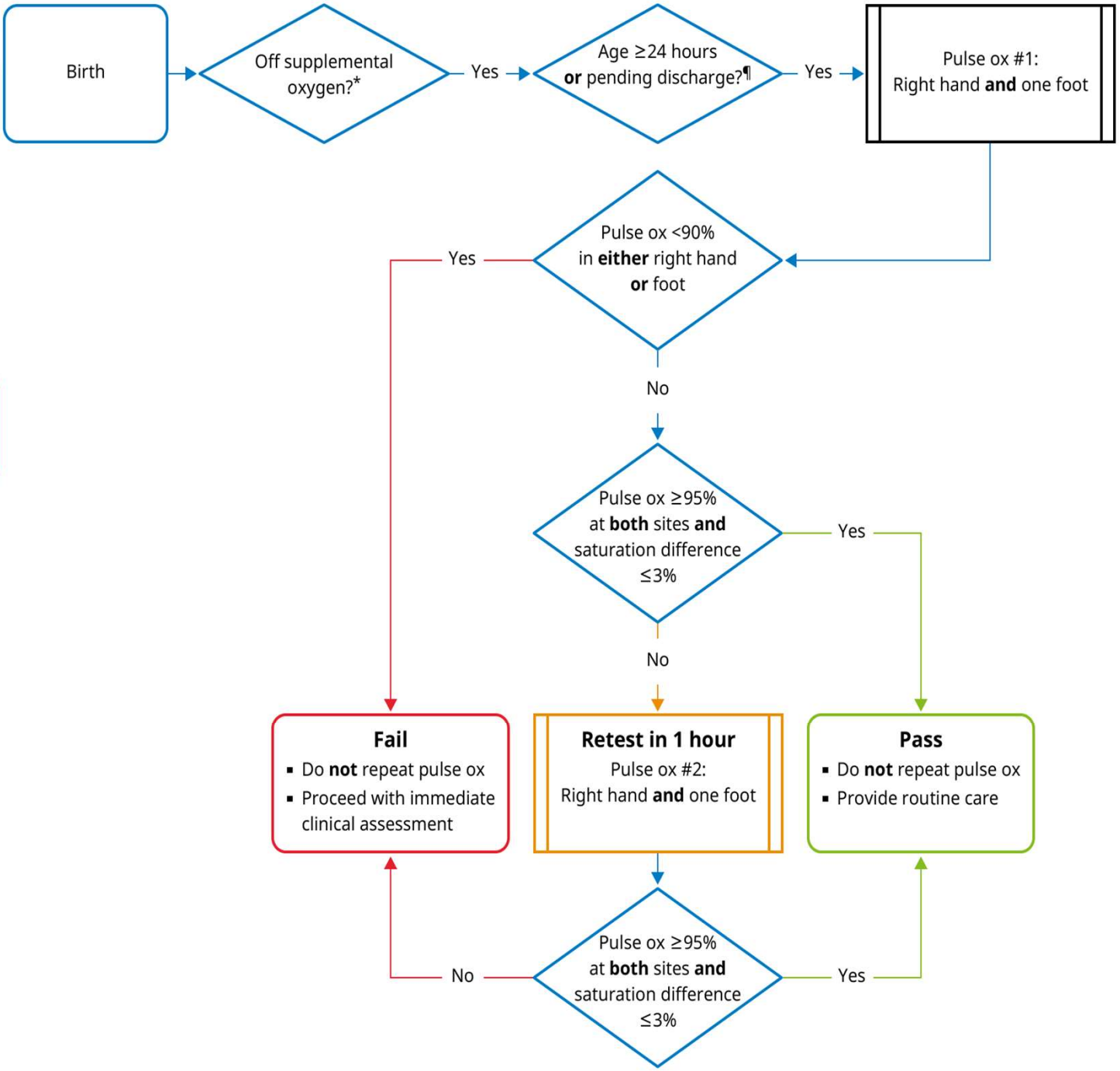
Clinical indications for palivizumab immunoprophylaxis against severe respiratory syncytial virus infections in infants

Population	Indications (only if nirsevimab is not available)
Preterm infants with BPD*	▪ <12 months of age at the start of RSV season ▪ Age 12 through 23 months and required medical therapy (eg, supplemental oxygen, glucocorticoids, diuretics) for BPD within six months of the start of RSV season
Preterm infants without BPD	▪ Infants born at <29 weeks GA who are <12 months of age at the start of the RSV season ▪ Preterm infants born at 29 to <32 weeks GA who are <12 months of age at the start of the RSV season and who have additional risk factors (eg, age <4 months at peak RSV season, attending daycare, older sibling in the household, parental smoking)¶
Infants with CHD	Most likely to benefit: ▪ Infants <12 months of age with acyanotic heart disease who are receiving medication to control heart failure and will require cardiac surgery ▪ Infants <12 months of age with moderate to severe pulmonary hypertension May benefit: ▪ Infants <12 months of age with cyanotic heart disease (decisions should be made in consultation with the infant's cardiologist)
Other potential candidates△	▪ Infants and children <2 years of age with primary immunodeficiency syndrome (eg, SCID) or significant immunosuppression (eg, heart or lung transplant or HCT) ▪ Infants <12 months of age with severe neuromuscular disease ▪ Infants <12 months of age with severe pulmonary disease (eg, TEF) ▪ Infants <12 months of age with Down syndrome

This table summarizes our suggested indications for palivizumab in high-risk infants. **NOTE:** Palivizumab should only be used if nirsevimab is not available. In addition to immunoprophylaxis, other general measures to prevent RSV infection in high-risk infants include hand washing, practicing cough



Algorithm for newborn pulse oximetry screening for critical congenital heart disease



This figure summarizes the approach to newborn screening for CCHD using pulse oximetry as recommended by the AAP. For additional details, refer to UpToDate's topics on CCHD and newborn pulse oximetry screening.


10 inches
or less
5½ inches
or less

Thank you

Thank you