Developmental Milestones

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Practice Gap

Clinicians should be aware of developmental milestones for children and especially areas of concern that may prompt referral of a child for further evaluation. Pediatric clinicians should carefully monitor developmental progress in children born preterm.

Objectives

After completing this article, readers should be able to:

1. Discuss progress in typical development in motor, language, social, and cognitive domains.
2. Note differences in development for children born preterm.
3. Identify delays that warrant referral for further evaluation.

CHILD DEVELOPMENT

The first years of development are crucial for lifelong learning and development. Milestones follow predictable courses in infants and children, and later developmental skills build on previous ones achieved. Understanding normal development can help clinicians to recognize delayed development. Early identification of developmental delays allows for referral to therapeutic services, and children referred for early intervention are more likely to make gains in developmental milestones. Research into outcomes of intervening early in a child's life has shown a great variety of benefits when a child receives needed speech/language therapy, physical therapy, occupational therapy, or special education services in a language-rich preschool classroom environment. (1)(2)(3)(4) Coordination of these services is often provided by state-based early intervention programs. These services may also be found in health care settings or departments of education. Manning and associates (5)(6) created a useful summary of some of the positive results seen in intervention, which may be considered in economic analyses as well as policy (Table 1). Targeted early intervention services may provide particular benefit for children living in families with access to fewer resources or low educational status.

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TABLE 1. **The Benefits of Early Childhood Intervention (5)**

EDUCATIONAL/ COGNITIVE OUTCOMES	BEHAVIORAL OUTCOMES	HEALTH OUTCOMES	ECONOMIC OUTCOMES	SOCIAL OUTCOMES	OTHER POSITIVE OUTCOMES
Increase in intellectual competence	Improved school readiness	Earlier identification of children at risk	Improved living conditions	Decrease in teen pregnancies	Improved parent-child relationships
Positive home-school relationships	Reduction in juvenile delinquency	Improved knowledge of nutrition	Improved work skills	Reduction in child abuse	Increased self-respect
Increased parental involvement in a child's schooling	Increase in child-school engagement	Increase in medical check-ups	Increase in family income	Elimination of infant and child homicide	Acceptance of personal responsibility
Improved literacy	Less disruptive behavior in classroom	Decrease in licit and illicit drug use	Increased employment rates	Development of social support networks	Mental health benefits; environment with reduced stress
Improved school achievement	Improved parent-child relationships	Improved prenatal care	Decrease in welfare dependence	Increased familiarity with local health care/social service support systems	Self-efficacy
Less need for remedial assistance	Reduced participation in criminal activity	Fewer emergency department visits		Improved peer relationships	Lower rates of family adversity and conflict
Less school failure				Reduced social isolation	
Higher school completion rates				Improved networks of support	

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SURVEILLANCE AND SCREENING

Surveillance is attentiveness to population trends in disease, and screening involves administration of specific assessments to detect disease or disorder in individual children at a period when intervention would improve developmental trajectories. Screening is not intended for diagnosis but rather for more rapid identification of individuals who require further evaluation. Children identified via screening as positive for a particular disorder can be referred for further evaluation, which usually entails more comprehensive history, testing, and examination to elucidate diagnoses more clearly.

TOOLS FOR SCREENING

Various valid tools are available for standardized screening of childhood disorders and concerns. The American Academy of Pediatrics (AAP) recommends that clinicians screen children for general development using standardized, validated tools at 9, 18, and 24 or 30 months and for autism at 18 and 24 months or at any point when a caregiver or the clinician has a concern. Some tools, such as the Denver Developmental Screening Test and the Ages & Stages Questionnaires, assess milestones across multiple domains. Other tools, such as the Modified Checklist for Autism in Toddlers, examine specific areas of concern, such as autism spectrum disorders. Clinicians should use a tool, such as those recommended by the AAP, for screening children at routine intervals during health supervision visits. These tools and their use are discussed further in several useful articles. (7)(8)(9)

DOMAINS OF DEVELOPMENTAL DELAY

Specific developmental skills are described within larger domains (Table 2). In children, developmental delays are classified as specific or global. Children with global developmental delay have delays in multiple domains of development, while children with specific delay may have a delay in only one area of development, such as language or motor skills. Delays in one domain may affect skills in another. For example, a child with severe motor delays may not have as many opportunities to play and explore, thus affecting the cognitive domain, or a child with language impairment may not be able to interact as well

TABLE 2. **Developmental Domains**

DEVELOPMENTAL DOMAIN	SKILLS LEARNED BY CHILD
Gross Motor	Movements using the large muscles
Fine Motor	Movements using the hands and smaller muscles, often involving daily living skills
Language	Receptive and expressive communication, speech, and nonverbal communication
Cognitive	Reasoning, memory, and problem-solving skills
Social-Emotional and Behavioral	Attachment, self-regulation, and interaction with others

with playmates, thus slowing progress in the social domain.

DEVELOPMENTAL MILESTONES

Developmental milestones have been established in gross and fine motor skills, self-help, problem-solving, social/emotional, and receptive and expressive language domains (Table 3). (10)(11)(12)

Neonatal

The 4 weeks after birth set the stage for the infant's first year. Parents are learning to care for their infant, and early patterns of feeding, sleeping, and alert times are set. Infants learn to look at faces, discriminate parents' voices from others', cry, make noises with their throats, and raise their chins when prone. During this time, as well as prenatally, infants hear their parents' voices, beginning the attachment process. Infants are learning that their caregivers meet their needs, initiating a sense of security in these early days. All infants should receive hearing screenings in the neonatal period, and older infants or young children who do not alert to sounds or visually fixate on objects within a few inches of their face should be referred for further hearing and vision assessments. Infants whose muscle tone is too low to allow for adequate feeding or movement should be referred for evaluation. Neonatal protective reflexes are a useful way for the clinician to assess neurologic and motor function (Table 4).

Two Months

The major milestone of 6 weeks is the social smile, further endearing the infant to the parents. Around 2 months of age, infants coo and make noises responsively to caregivers. At this age, infants can bring their hands together at midline. When in a prone position, infants begin to lift their chests off the table at 2 months, but they may still exhibit head bobbing when supported in a seated position.

Four Months

By 4 months of age, head-lag disappears when infants are pulled to sitting. The infant is learning to roll from prone to supine positions. However, because of the current recommendation that all infants be put to sleep on their backs to prevent sudden infant death syndrome, rolling from front to back is sometimes delayed. Occasionally, infants learn to roll back to front first, despite it being generally easier to roll prone to supine. Infants at this age can reach for objects consistently, put them in their mouths, and shake a rattle. Interaction with others blossoms and infants laugh out loud.

Six Months

From 5 to 6 months of age, infants learn to roll supine to prone and sit with hands propped in front of them. They can sit upright for a brief time, and when sitting is supported, they can use their hands to transfer an object from one hand to the other. They reach for objects and can hold two objects simultaneously. Infants begin to feed themselves easy foods such as crackers and may hold a bottle. At this age, children move from cooing (using vowel sounds such as aaah and oooo) to babbling (using consonants to make duplicating noises with sounds such as ba, ma, and da). They smile and make noises in front of a mirror. At this age, infants begin "stranger anxiety;" 6-month-old infants are more likely to be wary of strangers and be comforted by familiar caregivers.

Nine Months

Around 9 months of age, children pull to stand and may begin creeping or cruising. Infants can play with toys from their seated position and take objects in and out of containers, bang toys or blocks together, and hold food to take

TABLE 3: Developmental Milestones

AGE	GROSS MOTOR	FINE MOTOR	SELF-HELP	PROBLEM-SOLVING	SOCIAL/ EMOTIONAL	RECEPTIVE LANGUAGE	EXPRESSIVE LANGUAGE
1 month	• Chin up in prone position • Turns head in supine position	• Hands fisted near face	• Sucks well	• Gazes at black-white objects • Follows face	• Discriminates mother's voice • Cries out of distress	• Startles to voice/ sound	• Throaty noises
2 months	• Chest up in prone position • Head bobs when held in sitting position	• Hands unfisted 50% of the time • Retains rattle if placed in hand • Holds hands together	• Opens mouth at sight of breast or bottle	• Visual threat present • Follows large, highly contrasting objects • Recognizes mother	• Reciprocal smiling: responds to adult voice and smile	• Alerts to voice/ sound	• Coos • Social smile (6 weeks) • Vowel-like noises
3 months	• Props on forearms in prone position • Rolls to side	• Hands unfisted 50% of the time • Inspects fingers • Bats at objects	• Brings hands to mouth	• Reaches for face • Follows objects in circle (in supine position) • Regards toys	• Expression of disgust (sour taste, loud sound) • Visually follows person who is moving across a room	• Regards speaker	• Chuckles • Vocalizes when talked to
4 months	• Sits with trunk support • No head lag when pulled to sit • Props on wrists • Rolls front to back	• Hands held predominately open • Clutches at clothes • Reaches persistently • Plays with rattle	• Briefly holds onto breast or bottle	• Mouths objects • Stares longer at novel faces than familiar • Shakes rattle • Reaches for ring/ rattle	• Smiles spontaneously at pleasurable sight/ sound • Stops crying at parent voice • To and fro alternating vocalizations	• Orients head in direction of a voice • Stops crying to soothing voice	• Laughs out loud • Vocalizes when alone
5 months	• Sits with pelvic support • Rolls back to front • Puts arms out front when falling • Sits with arms supporting trunk	• Palmar grasps cube • Transfers objects: hand-mouth-hand • Reaches/grasps dangling ring	• Gums/mouths pureed food	• Turns head to look for dropped spoon • Regards pellet or small cracker	• Recognizes caregiver visually • Forms attachment relationship to caregiver	• Begins to respond to name	• Says "Ah-goo" • Razzes, squeals • Expresses anger with sounds other than crying
6 months	• Sits momentarily propped on hands • Pivots in prone • In prone position, bears weight on one hand	• Transfers hand-hand • Rakes pellet • Takes second cube and holds on to first • Reaches with one hand	• Feeds self crackers • Places hands on bottle	• Touches reflection and vocalizes • Removes cloth on face • Bangs and shakes toys	• Stranger anxiety (familiar versus unfamiliar people)	• Stops momentarily to "no" • Gestures for "up"	• Reduplicative babble with consonants • Listens, then vocalizes when adult stops • Smiles/vocalizes to mirror
7 months	• Bounces when held • Sits without support steadily • Lateral protection • Puts arms out to sides for balance	• Radial-palmar grasp	• Refuses excess food	• Explores different aspects of toy • Observes cube in each hand • Finds partially hidden object	• Looks from object to parent and back when wanting help (eg, with a wind-up toy)	• Looks toward familiar object when named • Attends to music	• Increasing variety of syllables
8 months	• Gets into sitting position • Commando crawls • Pulls to sitting/ kneeling position	• Bangs spoon after demonstration • Scissor grasp of cube • Takes cube out of cup • Pulls out large peg	• Holds own bottle • Finger feeds Cheerios® or string beans	• Seeks object after it falls silently to the floor	• Lets parents know when happy versus upset • Engages in gaze monitoring: adult looks away and child follows adult glance with own eyes	• Responds to "Come here" • Looks for family members, "Where's mama? "… etc	• Says "Dada" (nonspecific) • Echolalia (8 to 30 months) • Shakes head for "no"

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TABLE 3. (Continued)

AGE	GROSS MOTOR	FINE MOTOR	SELF-HELP	PROBLEM-SOLVING	SOCIAL/ EMOTIONAL	RECEPTIVE LANGUAGE	EXPRESSIVE LANGUAGE
9 months	• "Stands" on feet and hands • Begins creeping • Pulls to stand • Bear walks (all four limbs straight)	• Radial-digital grasp of cube • Bangs two cubes together	• Bites, chews cookie	• Inspects bell • Rings bell • Pulls string to obtain ring	• Uses sounds to get attention • Separation anxiety • Follows a point, "Oh look at…" • Recognizes familiar people visually	• Enjoys gesture games • Orients to name well • Orients to bell	• Says "Mama" (nonspecific) • Nonreduplicative babble • Imitates sounds
10 months	• Creeps well • Cruises around furniture using two hands • Stands with one hand held • Walks with two hands held	• Clumsy release of cube • Inferior pincer grasp of pellet • Isolates index finger and pokes	• Drinks from cup held for child	• Uncovers toy under cloth • Pokes at pellet in bottle • Tries to put cube in cup, but may not be able to let go	• Experiences fear • Looks preferentially when name is called	• Enjoys peek-a-boo • Waves "bye-bye" back	• Says "Dada" (specific) • Waves "bye-bye"
11 months	• Pivots in sitting position • Cruises furniture using one hand • Stands for a few seconds • Walks with one hand held	• Throws objects • Stirs with spoon	• Cooperates with dressing	• Finds toy under cup • Looks at pictures in book	• Gives objects to adult for action after demonstration (lets adult know he or she needs help)	• Stops activity when told "no" • Bounces to music	• Says first word • Vocalizes to songs
12 months	• Stands well with arms high, legs splayed • Posterior protection • Independent steps	• Scribbles after demonstration • Fine pincer grasp of pellet • Holds crayon • Attempts tower of two cubes	• Finger feeds part of meal • Takes off hat	• Rattles spoon in cup • Lifts box lid to find toy	• Shows objects to parent to share interest • Points to get desired object (proto-imperative pointing)	• Follows one-step command with gesture • Recognizes names of two objects and looks when named	• Points to get desired object (proto-imperative pointing) • Uses several gestures with vocalizing (eg, waving, reaching)
13 months	• Walks with arms high and out (high guard)	• Attempts to release pellet in bottle	• Drinks from cup with some spilling	• Dangles ring by string • Reaches around clear barrier to obtain object • Unwraps toy in cloth	• Shows desire to please caregiver • Solitary play • Functional play	• Looks appropriately when asked, "Where's the ball?"	• Uses three words • Immature jargoning: inflection without real words
14 months	• Stands without pulling up • Falls by collapse • Walks well	• Imitates back and forth scribble • Adds third cube to a two-cube tower • Puts round peg in and out of hole	• Removes socks/ shoes • Chews well • Puts spoon in mouth (turns over)	• Dumps pellet out of bottle after demonstration	• Points at object to express interest (proto-declarative pointing) • Purposeful exploration of toys through trial and error	• Follows one-step command without gesture	• Names one object • Points at object to express interest (proto-declarative pointing)
15 months	• Stoops to pick up toy • Creeps up stairs • Runs stiff-legged • Walks carrying toy • Climbs on furniture	• Builds three-to four-cube tower • Places 10 cubes in cup • Releases pellet into bottle	• Uses spoon with some spilling • Attempts to brush own hair • Fusses to be changed	• Turns pages in book • Places circle in single-shape puzzle	• Shows empathy (someone else cries, child looks sad) • Hugs adult in reciprocation • Recognizes without a demonstration that a toy requires activation; hands it to adult if can't operate	• Points to one body part • Points to one object of three when named • Gets object from another room upon demand	• Uses three to five words • Mature jargoning with real words

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TABLE 3. (Continued)

AGE	GROSS MOTOR	FINE MOTOR	SELF-HELP	PROBLEM-SOLVING	SOCIAL/ EMOTIONAL	RECEPTIVE LANGUAGE	EXPRESSIVE LANGUAGE
16 months	• Stands on one foot with slight support • Walks backwards • Walks up stairs with one hand held	• Puts several round pegs in board with urging • Scribbles spontaneously	• Picks up and drinks from cup • Fetches and carries objects (same room)	• Dumps pellet out without demonstration • Finds toy observed to be hidden under layers of covers • Places circle in form board	• Kisses by touching lips to skin • Periodically visually relocates caregiver • Self-conscious; embarrassed when aware of people observing	• Understands simple commands, "Bring to mommy" • Points to one picture when named	• Uses 5 to 10 words
18 months	• Creeps down stairs • Runs well • Seats self in small chair • Throws ball while standing	• Makes four-cube tower • Crudely imitates vertical stroke	• Removes garment • Gets onto adult chair unaided • Moves about house without adult	• Matches pairs of objects • Replaces circle in form board after it has been turned around (usually with trial and error)	• Passes M-CHAT • Engages in pretend play with other people (eg, tea party, birthday party) • Begins to show shame (when does wrong) and possessiveness	• Points to two of three objects when named • Points to three body parts • Points to self • Understands "mine" • Points to familiar people when named	• Uses 10 to 25 words • Uses giant words (all gone, stop that) • Imitates environmental sounds (eg, animals) • Names one picture on demand
20 months	• Squats in play • Carries large object • Walks downstairs with one hand held	• Completes round peg board without urging • Makes five- to six-cube tower • Completes square peg board	• Places only edibles in mouth • Feeds self with spoon entire meal	• Deduces location of hidden object • Places square in form board	• Begins to have thoughts about feelings • Engages in tea party with stuffed animals • Kisses with pucker	• Points to three pictures • Begins to understand her/him/me	• Holophrases ("Mommy?" and points to keys, meaning: "These are Mommy's keys.") • Two-word combinations • Answers requests with "no"
22 months	• Walks up stairs holding rail, putting both feet on each step • Kicks ball with demonstration • Walks with one foot on walking board	• Closes box with lid • Imitates vertical line • Imitates circular scribble	• Uses spoon well • Drinks from cup well • Unzips zippers • Puts shoes on partway	• Completes form board	• Watches other children intensely • Begins to show defiant behavior	• Points to four to five pictures when named • Points to five to six body parts • Points to four pieces of clothing when named	• Uses 25 to 50 words • Asks for more • Adds one to two words/week
24 months	• Walks down stairs holding rail, both feet on each step • Kicks ball without demonstration • Throws overhand	• Makes a single-line "train" of cubes • Imitates circle • Imitates horizontal line	• Opens door using knob • Sucks through a straw • Takes off clothes without buttons • Pulls off pants	• Sorts objects • Matches objects to pictures • Shows use of familiar objects	• Parallel play • Begins to mask emotions for social etiquette	• Follows two-step command • Understands me/you • Points to 5 to 10 pictures	• Two-word sentence (noun + verb) • Telegraphic speech • Uses 50+ words • 50% intelligibility • Refers to self by name • Names three pictures
28 months	• Jumps from bottom step with one foot leading • Walks on toes after demonstration • Walks backward 10 steps	• Strings large beads awkwardly • Unscrews jar lid • Turns paper pages (often several at once)	• Holds self and verbalizes toilet needs • Pulls pants up with assistance	• Matches shapes • Matches colors	• Reduction in separation anxiety	• Understands "just one"	• Repeats two digits • Begins to use pronouns (I, me, you) • Names 10 to 15 pictures

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TABLE 3. (Continued)

AGE	GROSS MOTOR	FINE MOTOR	SELF-HELP	PROBLEM-SOLVING	SOCIAL/ EMOTIONAL	RECEPTIVE LANGUAGE	EXPRESSIVE LANGUAGE
30 months	• Walks up stairs with rail, alternating feet • Jumps in place • Stands with both feet on balance beam • Walks with one foot on balance beam	• Makes eight-cube tower • Makes a "train" of cubes and includes a stack	• Washes hands • Puts things away • Brushes teeth with assistance	• Replaces circle in form board after it has been turned around (little or no trial and error) • Points to small details in pictures	• Imitates adult activities (eg, sweeping, talking on phone)	• Follows two prepositions: "put block in…on box" • Understands actions words: "playing … washing … blowing"	• Echolalia and jargoning gone • Names objects by use • Refers to self with correct pronoun • Recites parts of well-known story/ fills in words
33 months	• Walks swinging arms opposite of legs (synchronous gait)	• Makes 9- to 10-cube tower • Puts six square pegs in pegboard • Imitates cross	• Toilet trained • Puts on coat unassisted	• Points to self in photos • Points to body parts based on function ("What do you hear with?")	• Begins to take turns • Tries to help with household tasks	• Understands three prepositions • Understands dirty, wet • Points to objects by use: "ride in…put on feet…write with"	• Gives first and last name • Counts to 3 • Begins to use past tense • Enjoys being read to (short books)
3 years	• Balances on one foot for 3 seconds • Goes up stairs, alternating feet, no rail • Pedals tricycle • Walks heel to toe • Catches ball with stiff arms	• Copies circle • Cuts with scissors: side-to-side (awkwardly) • Strings small beads well • Imitates bridge of cubes	• Independent eating • Pours liquid from one container to another • Puts on shoes without laces • Unbuttons	• Draws a two- to three-part person • Understands long/short, big/small, more/less • Knows own gender • Knows own age • Matches letters/ numerals	• Starts to share with/without prompt • Fears imaginary things • Imaginative play • Uses words to describe what someone else is thinking ("Mom thought I was asleep")	• Points to parts of pictures (nose of cow, door of car) • Names body parts with function • Understands negatives • Groups objects (foods, toys)	• Uses 200+ words • Three-word sentences • Uses pronouns correctly • 75% intelligibility • Uses plurals • Names body parts by use • Asks to be read to

4 years	• Balances on one foot 4 to 8 seconds
	• Hops on one foot two to three times
	• Standing broad jump: 1 to 2 feet
	• Gallops
	• Throws ball overhand 10 feet
	• Catches bounced ball (4½ yrs)
		• Copies square
		• Ties single knot
		• Cuts 5-inch circle
		• Uses tongs to transfer
		• Writes part of first name
		• Imitates gate with cubes
			• Goes to toilet alone
			• Wipes after bowel movement
			• Washes face/ hands
			• Brushes teeth alone
			• Buttons
			• Uses fork well
				• Draws a four- to six-part person
				• Can give amounts (usually less than 5) correctly
				• Simple analogies:
				  • dad/boy: mother/???
				  • ice/cold: fire/???
				  • ceiling/up: floor/???
				• Points to five to six colors
				• Points to letters/ numerals when named
				• Rote counts to 4
				• "Reads" several common signs/ store names
					• Deception: interested in "tricking" others and concerned about being tricked by others
					• Has a preferred friend
					• Labels happiness sadness, fear, and anger in self
					• Group play
						• Follows three-step commands
						• Points to things that are the same versus different
						• Names things when actions are described (eg, swims in water, you cut with it, it's something you read, it tells time…)
						• Understands adjectives: bushy, long, thin, pointed
							• Uses 300 to 1,000 words
							• Tells stories
							• 100% intelligibility
							• Uses "feeling" words
							• Uses words that tell about time

Continued

TABLE 3. (Continued)

AGE	GROSS MOTOR	FINE MOTOR	SELF-HELP	PROBLEM-SOLVING	SOCIAL/ EMOTIONAL	RECEPTIVE LANGUAGE	EXPRESSIVE LANGUAGE
5 years	• Walks down stairs with rail, alternating feet • Balances on one foot > 8 seconds • Hops on one foot 15 times • Skips • Running broad jump 2 to 3 feet • Walks backward heel-toe • Jumps backward	• Copies triangle • Puts paper clip on paper • Can use clothes-pins to transfer small objects • Cuts with scissors • Writes first name • Builds stairs from model	• Spreads with knife • Independent dressing • Bathes independently	• Draws an 8- to 10-part person • Gives amounts (<10) • Identifies coins • Names letters/ numerals out of order • Rote counts to 10 • Names 10 colors • Uses letter names as sounds to invent spelling • Knows sounds of consonants and short vowels by end of kindergarten • Reads 25 words	• Has group of friends • Apologizes for mistakes • Responds verbally to good fortune of others	• Knows right and left on self • Points to different one in a series • Understands "er" endings (eg, batter, skater) • Understands adjectives: busy, long, thin, pointed • Enjoys rhyming words and alliterations • Produces words that rhyme • Points correctly to "side," "middle," "corner"	• Repeats six- to eight-word sentence • Defines simple words • Uses 2,000 words • Knows telephone number • Responds to "why" questions • Retells story with clear beginning, middle, end
6 years	• Tandem walks	• Builds stairs from memory • Draws diamond • Writes first and last name • Creates and writes short sentences • Forms letters with down-going and counterclockwise strokes • Copies drawing of flag	• Ties shoes • Combs hair • Looks both ways at street • Remembers to bring belongings	• Draws a 12- to 14-part person • Number concepts to 20 • Simple addition/ subtraction • Understands seasons • Sounds out regularly spelled words • Reads 250 words by end of first grade	• Has best friend of same sex • Plays board games • Distinguishes fantasy from reality • Wants to be like friends and please them • Enjoys school	• Asks what unfamiliar words mean • Can tell which words do not belong in a group	• Repeats 8- to 10-word sentences • Describes events in order • Knows days of the week • 10,000 word vocabulary

bites. At this age, gaze monitoring (following the adult glance with the child's own eyes) begins. Nine-month-olds are interested in what others around them find interesting and are eager to engage. These infants respond to simple commands and may begin using dada/papa and mama nonspecifically in babble.

Twelve Months

The 1 year old mark hails numerous changes in a child's life. Children begin to walk and talk around this age. Increased communication and mobility have cascading effects for learning in all domains. By 12 months, many infants can stand well, with legs apart and arms out or overhead. They can walk, either independently or while holding the hand of a caregiver. They have learned to throw objects and can enjoy the wonders of gravity by dropping objects over the side of the high chair or stroller. One-year-olds cooperate with dressing, remove hats and socks, and finger feed themselves using a mature pincer grasp. They look for hidden toys and can let adults know when they need help. Proto-imperative pointing involves pointing to obtain a desired object, an action that becomes very useful for emerging toddlers discovering their own wishes. These children understand and respond to "no" (even if they don't always obey) and they begin using words.

Fifteen Months

As children pass their first birthday, many new skills continue to emerge. Early toddlers are beginning to learn more words; many combine babbling, jargon, and words for a delightful language all their own. The children begin to point to body parts or objects in books upon request and retrieve an object when sent (eg, when asked to go get their shoes so they will be ready to go to the park). In addition, they can turn pages in a book (important for early reading development) and place 10 cubes in a cup, a pellet in a small bottle, and a circle in a shape puzzle. A key skill by this age is proto-declarative pointing or pointing to express interest. Fifteen-month-olds scribble on paper with a crayon and build a three-cube tower. At this age, empathy begins to develop and children can feel happy or sad alongside a peer or family member.

Eighteen Months

At 18 months of age, children can run, seat themselves in a chair, make a four-cube tower with blocks, and imitate vertical strokes with a crayon. They pretend to talk on the phone, drive a car, or have a tea party. Children now begin to understand the concept of "mine," and this often becomes a favorite word as children learn possessiveness. Shame, guilt, or sadness after wrongdoing emerge at this age and may affect a child's choice of actions. Children at 18 months often use 10 to 25 words (or more!) and point to pictures, people, and body parts as well as name a familiar object when requested.

Twenty-four Months

Here begins the wonderful world of two-year-olds. Children who are 24 months can kick a ball, throw overhand, and begin to learn to jump. They can imitate circles and horizontal lines. They are beginning to take clothes off independently (a key step to potty-training) and can turn door knobs. Socially, they often play in parallel, ie, side-by-side but often without significant cooperation. They can demonstrate defiant behavior as well as mask certain feelings when socially appropriate. At 2 years of age, children are using between 50 and 200 words, putting two words together in sentences with a noun and verb, and calling themselves by name.

Thirty-six Months

Three years is the magical year of pretend play, socialization, and developing creativity. By 3 years, most children can identify their own gender as well as the gender of their friends. Children learn to draw a circle, are able to climb on a jungle gym, and run much more quickly than before. Sentences develop into paragraphs and children begin to take part in back and forth conversation. A three-year-old can fear imaginary things and describe what others might be thinking.

Four Years

At 4 years, children are gaining greater balance and learn to hop on one foot a few times in a row. They can balance on each foot for 4 to 8 seconds, jump 1 to 2 feet forward, and gallop. Four-year-olds learn to copy a cross and a square with a crayon, tie a knot, and cut paper. Four-year-olds can also draw a four- to six-part person. They can point to five to six colors, identify many numbers and letters, count to 4 by rote, and possibly recognize signs (such as a Stop sign) or favorite stores or brands. They are able to use the restroom independently, brush teeth, wash hands and face, and use a fork. During the year, four-year-olds often develop a preference for certain friends, can identify emotions they may feel, and are learning to play in groups.

Five Years

At the 5-year birthday, children enter the "school-age" years. Their balance improves to more than 8 seconds per foot, they can hop on one foot 15 times in a row, and they learn to skip. They can copy a triangle, cut out shapes with scissors, write their names, and use blocks to build stairs. They can dress themselves in the morning and are often able to bathe independently. Children draw a person with 8 to 10 parts, identify coins, recite the alphabet, and count out loud. At this age, children sometimes skip letters or give numbers out of order, and they may still write some letters or numbers reversed. The ability to hear and produce rhyming words is an important predictor of early phonemic awareness and literacy skills. By the end of kindergarten, children usually know the sounds that consonants and short vowels make and can often read 25 words (or more). Socially, children in kindergarten usually have a group of friends and are able to be glad for their friends when good things happen. During this year, children learn right from left (from their own perspective) and can identify locations. At this age, children have more than 2,000 words and can define simple words, use sentences competently, and memorize their telephone number or address. They can answer "why" questions. Children often love to be read to and can repeat stories, retelling the beginning, middle, and end of the plot. Creativity and unique interests begin to emerge in this delightful age.

Six to Twelve Years

The school years are devoted to gaining and refining skills. Children develop greater motor skills and proceed from learning to run, hop, and skip to more complex skills such as soccer, swimming, or dancing. By 6 years, many children have mastered riding a bicycle without training wheels. Fine motor skills progress to improved handwriting and then more complex tasks such as fingering on the violin, drawing and painting, woodworking, or typing. Children are able to speak in paragraphs, hold conversations, and recount stories with detail. Around the third grade, children progress from learning to read and begin reading to learn, thus opening a world of knowledge. The elementary years are an enjoyable time of learning, growing, and exploring.

TABLE 4. **Neonatal Reflexes**

REFLEX	DESCRIPTION	APPEARANCE/DISAPPEARANCE
Rooting	The infant's head turns toward the side, the cheek is touched, and the mouth opens.	Present in utero at 24 weeks, disappears at 3-4 months, although may persist in sleep until 1 year.
Sucking	Placing something in the mouth causes infant to suck and draw liquid into the mouth.	Sucking appears in utero early in gestation. Sucking and swallowing may not mature until 32-36 weeks' gestation. Sucking may disappear around 3 months of age, although it persists longer in sleep.
Moro/Startle	A sudden change in position or loud noise causes the infant's arms/fingers to extend and then come together.	In utero at 28 weeks' gestation, disappears at 3-6 months of age.
Withdrawal	The infant moves the hand or foot from painful stimuli.	Present at birth and remains for life.
Palmar/Plantar Grasp	Placing a small object or finger in palm or beneath toe causes fingers or toes to curl around object.	Present at 32 weeks' gestation. Palmar disappears at 3-4 months and is replaced by voluntary grasp at 4-5 months. Plantar disappears at 9-12 months.
Asymmetric Tonic Neck (ATNR)	When supine and head turned to one side, the arm and leg on that side extend while opposite limbs are flexed.	Present at birth and disappears at approximately 3-4 months (and allows for rolling).
Babinski	Stroking bottom of foot causes big toe to raise while other toes fan out and foot twists in.	Present at birth and disappears at 9-10 months. If found when child is older, may indicate neurologic disease.
Landau	When infant is suspended horizontally and prone, if head is flexed against the trunk, the legs flex against the trunk.	Appears at 3 months and disappears between 1 and 2 years.
Parachute	Suddenly moving the infant downward when horizontal causes hands and fingers to extend forward and spread to protect from fall.	Appears at 7-9 months and persists indefinitely.
Knee Jerk	A tap on the tendon below the patella causes the leg to extend quickly.	Becomes more pronounced at postnatal day 2 and remains throughout life.

RED FLAGS

Clinicians may note red flags in developmental milestones that are cause for concern, further monitoring, or referral (Table 5). In children, certain absent milestones may indicate a developmental delay that is more likely to be long-lasting or to require earlier intervention. Areas that benefit from intervention are particularly important to identify and treat to allow the child the greatest likelihood of healthy development. Studies show that beginning intervention earlier in a child's developmental course leads to improved outcomes and can improve engagement of a family in the child's developmental progress (Table 1). (5)

Parents may also exhibit patterns that are red flags for a child's development. If a parent is frequently insensitive to an infant's communication, is unable to recognize the infant's cues, is easily angered by the infant, or ignores the infant, this may be a sign of difficulty with attachment and family support may be warranted. (13) Furthermore, parents struggling with depression or substance abuse may have challenges promoting their child's growth and development and may benefit from aid in providing developmental stimulation and opportunities for play and learning. Parents with low educational attainment or fewer community resources may require additional support services. (14)

The pediatrician is often the primary support for families in identifying red flags and guiding interventions. Children with unexplained early motor delays or hypotonia may benefit from further evaluation for conditions such as cerebral palsy, muscular dystrophy, or other neuromuscular disorders. A recent AAP Guideline for Early Identification of Motor Delay provides a helpful algorithm for motor evaluation at routine periods. The algorithm suggests obtaining creatinine kinase measurements and thyroid studies when hypotonia is found and ordering magnetic resonance imaging of the brain in specific settings of persistent, unexplained hypertonia. (15) Children who exhibit red flags in the areas of social communication can be referred for evaluation for autism spectrum

disorders or language concerns. Children with receptive or expressive language delays benefit from a thorough evaluation and treatment by a speech/language pathologist. Children with developmental delay not explained by the medical history may benefit from evaluation by a pediatric genetics team. (16)

IMPLICATIONS FOR PRETERM INFANTS

Each year, approximately 12% of infants in the United States – almost 500,000 – are born preterm (before the 37th postmenstrual week). (17) Although stable in the recent past, the preterm birth rate rose dramatically between 1980 and 2006, due both to the development and increased use of assisted reproductive technologies and to advances in obstetric management that allowed intervention before intrauterine demise. (18) Long-term survival of infants born preterm has also risen dramatically. Preterm birth is now a leading cause of neurodevelopmental disabilities in children, (19) and the degree of neurodevelopmental disability is inversely correlated with gestational age at birth. Although previously believed to be at low risk for developmental delay, even children born in the late preterm period (34-0/7 to 36-6/7 weeks' gestation) have a significantly increased risk of behavioral disorders and learning delay compared with children born at term. (20) Delays associated with prematurity include cognitive, language, motor, social-emotional, and learning domains. (21) Risk factors for delay can manifest before or after preterm birth (Table 6). Many of the most significant contributors to developmental challenges are social and may need to be addressed using

TABLE 5. **Developmental Red Flags**

TIME PERIOD	LANGUAGE/COGNITIVE	MOTOR	SOCIAL-EMOTIONAL
Neonatal period	Infant does not respond to loud sounds.	Muscle tone too low to feed.	Caregiver shows indifference or disinterest in infant.
2 months	Does not alert to voice.	Cannot raise head when prone.	Lack of looking at faces/lack of fixation.
4 months	No cooing or gurgling sounds.	Unable to bring hands to midline.	Lack of smiling.
6 months	Lack of turning toward voices.	Does not pass object from one hand to another.	No smiling, laughing, or expression.
9 months	Lack of babbling with consonants.	Inability to sit. Lack of rolling.	Absence of back-and-forth smiles and vocalizations in "conversation."
12 months	Child does not respond to name. Does not understand "no".	Does not stand or bear weight on legs when supported.	Indifferent or resistant attachment to caregiver. Does not look where caregiver points.
15 months	Does not use words such as mama and papa/dada.	No pincer grasp.	Absence of proto-imperative pointing (point to desired object).
18 months	Not using at least 6 words.	Inability to walk independently.	Absence of proto-declarative pointing (point to show interest) or showing gestures.
24 months	Lack of words and two-word meaningful sentences. Inability to follow simple commands.	Inability to walk well.	Does not imitate actions or words of caregivers. Poor eye contact.
36 months	Inability to use three-word sentences.	Frequent falling or difficulty with stairs.	Lack of pretend play.
4 years	Unclear speech. Does not answer simple questions. Inability to use pronouns.	Does not jump in place.	Ignores other children.
5 years	Inability to rhyme. Inability to recognize shapes, letters, colors. Resists dressing, sleeping, using the toilet.	Does not draw pictures, a square, or a cross. Poor balance.	Unusually fearful, sad, shy, angry. Does not distinguish between real and make-believe.
6-12 years	Cannot retell or summarize a story with beginning, middle, and end.	Does not skip or hop on one foot. Does not write name.	Does not name friends. Cannot recognize feelings in others.
Any age		Loss of previously acquired skill.	

community support services addressing the entire family's needs or concerns.

Screening tests and treatment algorithms for developmental delay in children born at term can be used for preterm children. When comparing performance of preterm children to developmental norms, "corrected age" or age from due date rather than birth date is generally used. (22)(23) There is no consensus among experts in perinatal care regarding the specific duration of time that gestational age correction should be performed. Both the AAP and Centers for Disease Control and Prevention support gestational age correction, as do most researchers focused on neurodevelopmental outcomes, although formal policy guidelines for when and how to apply gestational age correction have not been formulated. (24) As a result, some developmental centers do not correct for prematurity, while others continue correcting until a child is attending school. Many screening tools have specific guidelines for gestational age correction; in those cases, the recommended tool-specific correction should be used. In the absence of formal guidelines, most developmental clinicians and researchers correct for prematurity for the first 24 months after birth. (23) When children are delayed beyond their corrected age, this is a red flag for concern. Pediatric clinicians should be aware that correcting for gestational age may overcorrect for milestones in the social and language domains, and these may need closer attention. By age 2 or 3 years, most children with transient delays related to prematurity have "caught up" with their term peers, and chronologic age can be used. (25) This time point also corresponds to preschool entrance for many children, and because school entrance is based on chronologic rather than corrected age, reverting to chronologic age allows the provision of appropriate services for preterm children cared for alongside their term peers.

Besides age-adjustment, clinicians should pay specific attention to sensory function in children born preterm. The incidence of visual and hearing impairments is higher in preterm than term children due to increased risk for retinopathy of prematurity, jaundice, cortical hemorrhages, infections, and extended hospitalization. Unrecognized visual or hearing impairment can distort performance on cognitive and behavioral testing. Children born preterm are also at greater risk than their term peers for intraventricular hemorrhage and possible cerebral palsy, particularly spastic diplegia, which can also affect performance on assessments of motor function.

Language delays are more common in infants born preterm due to distinct or compounded difficulties with processing auditory and visual information, learning and conceptualizing verbal language, and producing speech sounds. (23) As they reach school age, children born preterm are at particular risk for learning delays, both those related to spoken and written language production and those related to behavioral problems that make classroom learning challenging. Both externalizing and internalized behaviors, as well as social difficulties, are more common in preterm than term children. (22)(26)(27)(28) Due to the elevated risk of sometimes subtle cognitive and behavioral disabilities, pediatric clinicians caring for children born preterm must be particularly vigilant when performing developmental assessments to engage the

TABLE 6. **Risk Factors for Developmental/Behavioral Concerns Following Preterm Birth (23)**

Prenatal	Very low birthweight (<1500 g) Extremely low gestational age (birth <28 weeks' gestation) Intrauterine growth restriction Male gender
Postnatal	Neonatal seizures (before 28 days of age) Abnormal brain imaging (white matter injury/periventricular leukomalacia, grade 3 or 4 intraventricular hemorrhage) Chronic lung disease/bronchopulmonary dysplasia Prolonged mechanical ventilation (>96 hours) Bacteremia, meningitis, or sepsis Necrotizing enterocolitis Feeding problems beyond 36 weeks postmenstrual age Extracorporeal membrane oxygenation
Social	Low socioeconomic status Low parental educational achievement Language barrier with family Parental depression

appropriate therapeutic services as early as possible. (3) Available dedicated early intervention programs should be used because they may have a lasting benefit on cognitive outcome and educational achievement. (29)(30) In addition, counseling and parent support groups may have benefit for families seeking to provide behavioral and emotional support to their children born preterm. (31)(32)

CONCLUSION

The first years of development are crucial for lifelong learning and development. Milestones follow predictable courses in infants and children, and later developmental skills build on previous ones achieved. Understanding normal development is important for the pediatrician to be able to recognize delayed development. (1)(5)(33) Developmental screening identifies developmental delays at a time period in which formal evaluation and intervention would be beneficial. Children with global developmental delay have delays in multiple domains of development, while children with specific delay may have a delay in only one area of development such as language or motor skills.

Summary

- On the basis of observational studies (level C), preterm birth is a leading cause of neurodevelopmental disabilities in children, (19) and the degree of neurodevelopmental disability is inversely correlated with gestational age at birth. When comparing performance of preterm children to developmental norms, "corrected age" or age from due date rather than birth date should be used for the first 24 to 36 months. (22)(23)
- On the basis of observational studies (level C), clinicians should pay specific attention to sensory function in children born preterm because the incidence of visual and hearing impairments is higher in preterm than term children. Due to the elevated risk of cognitive and behavioral disabilities, clinicians caring for children born preterm should be vigilant when performing developmental assessments to improve outcomes. (3)
- On the basis of observational studies (level C), early identification of developmental delays allows for referral to therapeutic services, and children referred for early intervention are more likely to make gains in developmental milestones. (1)(5)(33)(34)

CME quiz and references for this article are at http://pedsinreview.aappublications.org/content/37/1/25. Access this and all other PIR CME quizzes available for credit at: http://www.aappublications.org/content/pediatrics-review-quizzes.

Parent Resources from the AAP at HealthyChildren.org

- Developmental Milestones: 1 Month: https://www.healthychildren.org/English/ages-stages/baby/Pages/Developmental-Milestones-1-Month.aspx
- Developmental Milestones: 3 Months: https://www.healthychildren.org/English/ages-stages/baby/Pages/Developmental-Milestones-3-Months.aspx
- Developmental Milestones: 7 Months: https://www.healthychildren.org/English/ages-stages/baby/Pages/Developmental-Milestones-7-Months.aspx
- Developmental Milestones: 12 Months: https://www.healthychildren.org/English/ages-stages/baby/Pages/Developmental-Milestones-12-Months.aspx
- Developmental Milestones: 2 Year Olds: https://www.healthychildren.org/English/ages-stages/toddler/Pages/Developmental-Milestones-2-Year-Olds.aspx
- Developmental Milestones: 3 to 4 Year Olds: https://www.healthychildren.org/English/ages-stages/toddler/Pages/Developmental-Milestones-3-to-4-Years-Old.aspx
- Developmental Milestones: 4 to 5 Year Olds: https://www.healthychildren.org/English/ages-stages/toddler/Pages/Developmental-Milestones-4-to-5-Years-Old.aspx

CME Quiz Correction

In the November 2015 article "Otitis Media: To Treat, To Refer, To Do Nothing: A Review for the Practitioner," (Rosa-Olivares J, Porro A, Rodriguez-Varela M, Riefkohl G, Niroomand-Rad I. Pediatrics in Review. 2015;36(11):480, DOI: 10.1542/pir.36-11-480), there were errors in CME quiz question 4. In the question body, the following sentence should have been omitted: "You refer her to the audiologist, who documents a 30-dB hearing loss." In addition, the correct answer option should be "C. Referral to audiology." The online version of the quiz and the article have been corrected. The journal regrets the error.

PIR Quiz

There are two ways to access the journal CME quizzes:
1. Individual CME quizzes are available via a handy blue CME link in the Table of Contents of any issue.
2. To access all CME articles, click "Journal CME" from Gateway's orange main menu or go directly to: http://www.aappublications.org/content/journal-cme.

1. What is the purpose of screening for developmental milestones?
    A. Assess the incidence of developmental delays in a clinic population.
    B. Diagnose developmental delays.
    C. Identify children for referral to special education programs.
    D. Identify children who should be referred for further evaluation.
    E. Plan for treatment of developmental delays.
2. A term 4-month-old male infant is developing normally. Which of the following is the major milestone for normally developing children at this age?
    A. Bring hands together to midline.
    B. Lift head up when prone.
    C. No head lag when pulled to sit.
    D. Social smile.
    E. Roll supine to prone.
3. A child is able to run, make a four-cube tower with blocks, and have a tea party. She understands "mine" and she feels badly when she steps on her mother's foot. Given normal developmental progress, how old is she?
    A. 15 months.
    B. 18 months.
    C. 2 years.
    D. 2.5 years.
    E. 3 years.
4. A 3-year-old girl is developing normally. Which of the following milestones is consistent with her developmental age?
    A. Copy a square.
    B. Identify her own gender.
    C. Imitate a horizontal line.
    D. Throw a ball overhand.
    E. Turn door knobs.
5. How long should you correct for gestational age when evaluating preterm infants?
    A. 6 months.
    B. 12 months.
    C. 24 months.
    D. Until kindergarten.
    E. Until entry to high school.

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This journal-based CME activity is available through Dec. 31, 2018, however, credit will be recorded in the year in which the learner completes the quiz.