Developmental assessment and Developmental Delay

A Child Neurologists Perspective

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Why Assess Development ?

- Delay in specific developmental domains may give diagnostic information for specific neurological disorders

- Early detection of disorders like Global Developmental Delay & Autism only possible by developmental surveillance

General Principles of Development

- A continuous process that starts at conception
- Affected by pre and peri-natal factors, by Nature and Nurture.
- Dependent on CNS maturation
- Cephalo - caudal progression
- Range of normal development

General Principles of Development

- Rate of Development variable over unit time.
- At any point in time development in different domains rarely at an identical stage

Domains of Developmental Assessment

- **Motor** : Gross motor and Fine motor
- **Adaptive**: Reaction to Environment
- **Language**: Expressive and Receptive
- **Personal-Social**: feeding, dressing, toileting (ADLs)
- Special senses

Birth to 16 wks

- Rapid changes
- Further divided into
- 0 – 4 wks: Neonatal reflexes: rooting, sucking, Moro, grasp, ATNR.

  Fade away by 3-4 months
- 6 – 8 wks
- 12 – 16 wks.

Limit Ages for Developmental Milestones

Age (mths)	ABILITY
1	Some indication of attention
2	Attn to objects. Some response to nearby voices and everyday noises.
3	Head held erect
4	Hands not fisted
5	Reaches for objects
6	ATNR ABSENT. Visual fix & follow, turns to sound

Limit Ages for Developmental Milestones

Age (mths)	Ability
7	Holds object in hand
9	Gives attention to gestures
10	Sits without support, tuneful babble bears most wt on legs, chews lumpy food.
12	Attends to words
15	Releases held object

Limit Ages for Developmental Milestones

Age (mths)	ABILITY
18	Walks alone, no casting, mouthing, drooling
21	Kicks when standing, single words with meaning
27	Puts 2 – 3 words together
36	Stands on one leg. Talks in sentences.
48	Fully intelligible speech.

Gross motor development

	Age in Months	
	Mean	**Range**
Rolls/belly crawl	8 ½	6 – 11
Crawl	9 ½	7 – 13
Walks with hand held	10	8 – 12
Walks around furniture	10 ½	8 – 13
Walks alone	13	11 - 18

Gross motor development

	Age in Months	
	Mean	**Range**
Runs	14 ½	12 – 19
Jumps	18	
Walk Tiptoe	20	
Runs Tiptoe	24	
Hops on one foot (for 3 steps each foot)	36	

Speech and Language

	Age in mths	
Language Comprehenhion	*Mean*	*Range*
Understands "no"/"bye-bye"	7	6 – 9
Recognizes own name	8	6 – 10
Understands familiar names	12	10- 15
Points to body parts self/ carer	15	12 – 18
Points to body parts on doll	18	15 – 21
Follows 2 step command	24	18 - 27

Speech and Language

	Age in yrs	
Language Comprehension	*Mean*	*Range*
Functional understanding	2 ½	21 -33m
Prepositions	2 ½	2 – 3
Simple negatives	3	2 ½-3 ½
Command w 2 instructions	3 ½	3 – 4
Command w 3 instructions	4 ½	4 – 5 ½

Speech and Language

Language Expression	*Age in months*	
	Mean	*Range*
Jargon	12	10 – 15
One word	15	12 – 18
1 – 6 words	18	15 – 21
7 – 20 words	21	18 – 24
50 + words	24	18 – 27
2 word joining	24	18 - 30

Speech and Language

Language Expression	*Age in years*	
	Mean	*Range*
200 + words	2 ½	2 – 3
3-4 word phrases	2 ½	2 ¼ - 3
Intelligible speech	2 ½	2 ½ - 3 ½
Question words	3	2 ½ - 3 ½
Pronouns	3 ½	3 – 4
Conjunctions	3	3 – 4 ½
Phrases of 5 + words	4	3 – 4 ½
Complex explanations	4 ½	4 – 5 1/2

Feeding skills

Skill	*Mean*
• Holds spoon, does not feed	12 mths
• Hold spoon, brings to mouth, can't prevent it turning over	15 mths
• Gets food safely to mouth	18 mths
• Eats with spoon skillfully	2 – 2 ½ yr
• Eats with fork and spoon	3 yrs
• Eats skillfully w little help	3 ½ - 4 yrs
• Copes with entire meal unaided	5 yrs

Pencil Skills

Skill	Mean
• Spontaneous scribble	15 mths
• Imitates stroke	18 mths
• Imitates vertical line (within 30 degrees)	2 yrs
• Imitates horizontal line	2 ½ yrs
• Imitates circle	3 yrs
• Imitates Cross	4 yrs
• Imitates square	4 ½ yrs
• Imitates triange	5 yrs

Causes of Developmental Delay

Motor

- Familial
- Environ: Emotional dep, lack of opport
- Mental subnormality
- Hypotonia
- NM disorder
- Blindness

Speech

- Hearing Impairment
- Environ: emotional deprivation
- Familial
- Autism
- Cerebral Palsy
- Dyspraxia

Approach to a child with Developmental Delay

- Dev Delay – a common ref to Child Neurol
- Determine if there is Dev Delay vs. Dev in range but later than mean age for milestones.
- Delay in specific Domain Vs Global Delay
- Global Dev Delay – delay in 2 or more domains (motor, language, cognition, personal/social, ADLs) (*AAN,CNS)*

Evaluation of The Child with Global Developmental Delay
AAN and CNS Practice Guidelines

- 40,000 – 120,000 children born with GDD each yr in North America.
- Though Incurable, early diagnosis may help find cause and assist physician and parents planning management.
- Implications for genetic counselling
- GDD affects 1 – 3 % of all children < 5yrs.

Evaluation of the Child with GDD

- Obtain a detailed history and examination
- Ref for Auditory and Ophthalm screening
- Consider metabolic studies/T4 if universal newborn screening not done.
- If h/o suspected Szs/epilep synd : EEG
- Consider screening for Autism or a language disorder.

GDD – Evaluation
Guideline recommendations

- Routine Cytogenetic studies and molecular testing for Fragile X mutation
- Serum lead levels only in those with risk factors for excessive lead exposure
- EEG not needed unless h/o seizures
- Neuroimaging recommended, sp if abn PE

GDD – Evaluation
Guideline recommendations

- Routine metabolic screening not needed for initial evaluation.
- Thyroid tests not needed if done in newborn screen, unless signs of Thyroid dysfunction.
- Rett syndrome should be considered in girls with unexplained mod – sev dev delay.

Evaluation of the Child with GDD

- F/H of GDD: (sib, uncle/aunt, 1st cousin)

A. Due to known metabolic, genetic or structural nervous system disorder ?

B. Unexplained GDD ?

Evaluation of the Child with GDD

- If yes to either A or B

A. Obtain specific tests for that disorder

B. Obtain cytogenetic screen and consider testing for subtelomeric rearrangements.

Evaluation of the Child with GDD

- ***No F/H*** : ? ***Features suggesting a sp diag***

A. History or PE findings (dysmorphism) to suggest Down, Frag X, Rett, Hypothy, other genetic disorders ? : ***Specific tests***

B. History (perinatal asphyxia) or PE (microcephaly, tone abn, focal findings), Szs, to suggest CNS injury or malformation ?

MRI preferred to CT scan

Evaluation of the Child with GDD no F/H

C. Identifiable risk factors for excessive lead exposure ? ***Lead screen***

D. Developmental regression ? H/O parental consanguinity, prior unexplained loss of a child or multiple miscarriages ?

Comprehensive eval with MRI, Metabolic tests, EEG, Cytogenetic screen, Genetics consult

Evaluation of the Child with GDD

No F/H and no Features suggesting a specific diagnosis:

Stepwise evaluation:

1. MRI
2. Cytogenetic Screen/Frag X
3. Metabolic testing
4. Test for subtelomeric rearrangements
5. Test for Rett Syndrome.

Early Detection of Autism

Cardinal Features

- Impaired socialization
- Impaired verbal **and non-verbal** communication
- Restricted and repetitive patterns of behavior

Screening & diagnosis of Autism Practice parameter – AAN and CNS

Level one: ***Routine Developmental surveillance***: by all providers at every well child visit.

Absolute indications for immediate evaluation

- No single words by 16 months.
- No babbling, pointing or other gestures by 12 months.
- No 2-word spontaneous phrases by 2 yrs.
- ANY loss of ANY language or social skills at ANY age

Screening & diagnosis of Autism Practice parameter – AAN and CNS

- Investigations: Formal audiological assessment, lead screen if Pica present.

- Specifically screen for Autism: CHAT, Autism screening questionnaire, Australian scale for Asperger syndrome, PDDST

If fails above, ref to Early intervention or local school district and proceed to level two.

If passes above, ref to level Two as indicated.

Screening & diagnosis of Autism Practice parameter – AAN and CNS

Level Two: Diagnosis & Evaluation of Autism

- Formal diagnostic procedures by experienced clinician. History and Neurological evaluation.
- Specific evaluations to Determine Developmental profile
- Expanded Lab evaluations only if indicated

Limitations of Developmental Assessment

- Accurate predictions of future intelligence and achievements cannot be made.
- Some factors cannot be easily quantified, e.g. alertness, general responsiveness and concentration; yet may be more relevant to future development and achievement.