Developmental Surveillance & Screening:
Understanding the Basics to Improve Early Identification & Referral for Suspected Delays

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Why is it important?
- Why early identification?
  - Pattern of delayed or deviant development
    - Within one stream signals increased risk in other streams
    - Directs evaluation (developmental & medical/etiologic)
    - Directs the type and intensity of early intervention services
  - Early intervention helps prevent or reduce secondary problems

How are we doing?
- Current detection rates actually lower than prevalence
  - Better for disorders of lower prevalence but higher severity
  - Worse for disorders of higher prevalence but lower severity
- Only 15-20% of pediatricians use screening routinely (Sand 2005)
- Variety of techniques currently in use
  - Reviewing developmental milestones
  - Informal collection of age-appropriate tasks
  - " Clinical judgment" by history, exam – used by 71% (Sand 2005)
  - Formal screening with standardized tools

What should we be using?
- How to best perform such early detection is unknown
- Find out what works for you and your practice for screening to go smoothly
  - When is it best to administer during the visit?
  - Who will distribute, collect and/or score?
  - Who will explain the results?
  - Who will make the referrals?
So why is it so tough?
- Development is dynamic, highly variable
- Developmental surveillance takes time
- Pitfalls:
  - Waiting until a problem is observed ("wait and see")
  - Dismissing or ignoring screening results
  - Relying on informal methods
  - Confusing screening with evaluation

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Objectives
- Review basic developmental principles
- Describe principles of surveillance and screening with emphasis on AAP policy
- Discuss screening tools and implementing them into practice
- Interpret results of developmental screening

Domains
- Motor: gross, fine
- Self-help (adaptive)
- Problem-solving (cognitive)
- Social-emotional
- Language: receptive, expressive, pragmatic, speech

Language
- Language delays most common
- Difficult to assess by observation in a well-child visit
  - History will be particularly important
- Language is one aspect of communication
  - Non-verbal: facial expressions, gestures, sign language, written
  - Speech is the production of sound, not language
- Communicative intent is just as important
Language Development
- Pre-speech period (0 to 10 months)
  - Localizing sounds is the earliest step in receptive language
  - Cooing is one of the earliest steps in expressive language
  - Attentive to adult conversations at 4-5 months
  - Non-specific babbling at 6 months
  - Adults assist development of specific babbling by reinforcing babbling (as if it had meaning)

Language Development
- Naming period (10-18 months)
  - Realization of names and labels
  - 1st word (other than mama and dada) at 12 months old
  - Understands 100 words by 12 months old
  - Immature jargoning by 13 months old
  - Mature jargoning by 15 months old
  - Speaks 25 words by 18 months old
  - Pointing is just as important*

Language Development
- Word Combination Period (18-24 months)
  - Giant words at 18 months old (e.g., “All gone”, “Stop that”, “I want”)
  - Holophrases at 20 months old (e.g., “Mommy?” while pointing to keys)
  - 2-word sentences (noun + verb) at 24 months old, usually by 50-word vocabulary
  - 3-word sentences and pronouns at 36 months old, usually has 300 words

Developmental History
- Delay
- Deviancy
- Dissociation
- Regression

One measurement is not helpful.
(Apply similar “principles” as growth.)

Delay
- Definition: pattern of developmental milestones acquired in correct sequence but at later age
- Think:
  - Delayed velocity
  - “Symptom”

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Developmental Quotients

- Rate of acquisition of milestones
- Developmental age / chronological age x 100
- Think “developmental velocity”
- Helps to know how far is too far, how far behind is the child

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<th>Status</th>
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<td>&gt; 85</td>
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<tr>
<td>70-85</td>
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<td>&lt; 70</td>
<td>Significant delay</td>
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Dissociation

- Definition: differing rates of development (DQs) between domains

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<th>FM</th>
<th>SH</th>
<th>PS</th>
<th>SE</th>
<th>RL</th>
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<tr>
<td>Language disorder</td>
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<td>-</td>
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<td>1</td>
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Deviancy

- Definition: skills attained out of sequence within a domain
- Not always abnormal
  - Ex. Walking first before crawling
- Some always abnormal
  - Rolls ≤ 3 months old, supine to prone before prone to supine, pulls to stand before sitting unsupported
    - Suggestive of cerebral palsy
  - Expressive > receptive language, splinter skills (“savant”)
  - Suggestive of autism spectrum disorders

Regression

- Either:
  - Plateau in acquisition of new skills
  - Loss of previously attained skills
  - Pathological until proven otherwise

Regression

- Examples:
  - Neurodegenerative disorders: Tay Sachs, ALD, etc.
  - Genetic: Rett Syndrome
  - Metabolic: amino acid disorders, OTC deficiency, etc.

Background
Basics
Surveillance
Screening
Evaluation
Services
Developmental Surveillance & Screening
AAP Algorithm

Surveillance

- "A flexible, longitudinal, continuous and cumulative process whereby knowledgeable health care professionals identify children who may have developmental problems" [AAP, 2006]
- Components:
  - Soliciting and attending to parental concerns
  - Maintaining developmental history
  - Making informed observations of the child’s development
  - Identifying risk and protective factors
  - Documenting surveillance, screening activities

Eliciting Parents’ Appraisals

- Concerns
  - "Please tell me any concerns about the way your child is behaving, learning and developing."
  - Are accurate indicators of true problems
- Estimations
  - "Compared to others, how old would you say your child acts?"
  - Correlates well with DQs (less in language domain)
- Predictions
  - Reflects parents’ estimate, useful for anticipatory guidance

Eliciting Parents’ Descriptions

- Recall of developmental milestones
  - Notoriously unreliable
  - Reflects prior conceptions of children’s development
  - Accuracy improved by records, diaries (e.g., baby book)
  - Even if accurate, age of milestone is of limited predictive value

- Report of contemporaneous skills
  - Importance of question format
  - Identification: "What words does your child say?"
  - Recognition: "Does your child use any of the following words?"
  - Usually produces higher estimates than through directly eliciting
  - Child within a familiar environment (home)
  - Skills inconsistently demonstrated

Assessing Risks

- Risk Factors
  - Demographic, genetic, biological, social, environmental risks
  - Multiple risk factors are cumulative
  - Protective risk factors contribute to resiliency
  - Adds dimension to interpretation of screening results
  - Often modifies screening and surveillance process
Background
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AAP Algorithm

Is this the 9, 18 or 30 month visit?

Administer screening tool

Screen positive/concerning?

Yes

Administer screening tool

Screen positive/concerning?

No

Does surveillance identify risks?

Yes

No

“Administer a brief standardized tool aiding the identification of children at risk of a developmental disorder” (AAP 2006)

- Applied to asymptomatic children to preemptively identify problems
- Applied to children identified to be at risk, with concerns

“Sorting” strategy to find children who probably have difficulties from those who probably do not

- General screen at 9, 18 and 24 or 30 month visits (AAP 2006)
- Autism-specific screen at 18 and 24 month visits (AAP 2007)

Key Qualities of Screening Tools

- Sensitivity: accuracy of test in identifying delayed development (true positives)
- Specificity: accuracy of test in identifying individuals who are not delayed (true negatives)
- Reliability: ability to produce consistent results (intertest, intratest, test-retest)
- Validity: ability to discriminate a child at a determined level of risk for delay from the rest of the population

Key Qualities of Screening Tools

- Culturally sensitive
- Sensitivity and specificity of 70-80%, reliability of 80% are acceptable for developmental screening
- Will result in 20-30% false positive identification or over-referral (e.g., children with below average skills, high psychosocial risks)

Screening Methods

- Clinician-administered versus parent questionnaire
- Meets same level of sensitivity, specificity at correctly identifying children with delay
- Parental concern not influenced significantly by parent education, income, socioeconomic factors (Glasoe 1997, 1998)
- General versus domain-specific
- Ideally, a general screening measure should be followed by a domain-specific one to narrow scope
Screening Tools: General

- Ages & Stages Questionnaire (ASQ)
- Batelle Developmental Inventory Screening Tool (BDI-ST)
- Bayley Infant Neurodevelopmental Screen (BINS)
- Brigance Screens-II
- Child Development Inventory (CDI)
- Denver-II Developmental Screening Test
- Parents' Evaluation of Developmental Screen (PEDS)

*See AAP 2006 for detailed description.

Screening Tools: Specific

Language & Cognitive

- Capute Scales (Cognitive Adaptive Test/CLinical Linguistic Auditory Milestone Scale [CAT/CLAMS])
- Early Language Milestone (ELM) Scale

Autism Spectrum Disorders

- Checklist for Autism in Toddlers
- Modified Checklist for Autism in Toddlers
- Pervasive Developmental Disorders Screening Tool-II (PDDST-II)

*See AAP 2006 for detailed description.

M-CHAT

- Fails screen if fails ≥ 2 critical items or ≥ any 3 items
- Critical items look for joint attention
- False positives due to other developmental disorders

Modified Checklist for Autism in Toddlers (M-CHAT)

FYI, there are many others...

Ex. Emotional/behavioral:

- Pediatric Symptom Checklist (parent & youth report) and Pictorial Pediatrics Symptom Checklist

Results of Screening

- When screening results are concerning:
  - Schedule developmental evaluations
  - Schedule medical evaluations

- Screening administered due to concerns but results normal:
  - Schedule early return visit for additional surveillance

- Screening administered routinely and results are normal:
  - Inform parents, continue with preventative visit
  - Take the opportunity to focus on developmental promotion
Bilingual Language Development

- Bilingualism is one type of multilingualism
- Same language milestones as a monolingual-exposed child
  - Ex: For vocabulary, add up the absolute number of words
- Types of bilingualism
  - Simultaneous bilingualism: both languages may be blended or mixed, which is normal and not “confusion”
  - Sequential bilingualism: learning the second language after starting the first may cause a “silent period” for a few months, which is normal
- Note: fluency is not the same as from proficiency

Tips on learning 2 languages

- Practice is needed, just like for any other skill
- If child has a dominant language, it could change without practice
- Use 2 languages from the start
  - Ex: Parents speak only Spanish at home if both are Spanish-proficient
  - Ex: Spanish-proficient parent speaks Spanish only, while English-proficient parent speaks English only
- Give opportunities to hear and practice both languages daily

Tips on learning 2 languages

- Use many forms to teach language
  - Books
  - Audiotapes and CDs
  - Videos and DVDs (better for concepts > language)
  - Language camps & educational programs
- Reassure parents that learning 2 languages will not cause speech or language problems, however
- Children with problems in 1 or more languages may need help

Results of Screening

- Documenting results
  - Specifically document actions taken or planned
  - Share your opinions and concerns with relevant professionals
- Explaining abnormal results
  - Use language that encourages follow-up
  - Avoid negative and meaningless words
  - Be sensitive to cultural meaning of words

AAP Algorithm

- Does surveillance show risk?
- Administer screening tool
- Screen positive/concerning?
  - Yes
  - Administer screening tool
  - Schedule early return visit
  - Refer for evaluation and services
- No
  - Does surveillance show risk?
- No
AAP Algorithm

Is this the 9, 18 or 30 month visit? 

- Yes: Administer screening tool
  - Screening positive/concerning?
    - Yes: Schedule next routine visit
    - No: Schedule next routine visit

- No: Schedule next routine visit

Referrals

- Evaluations
  - Developmental evaluation to determine status
  - Medical evaluation to determine etiology
- Services
  - Early Childhood Intervention if <3 years old
  - Early Childhood Special Education if >3 years old

Developmental Evaluation

- “Aimed at identifying the specific developmental disorder or disorders affecting the child” (AAP 2006)
  - Completed in children who have concerns on surveillance, do not pass screening
  - Involves an in depth, comprehensive diagnostic examination of relevant domains
  - Provides further prognostic information, specific appropriate therapeutic interventions

- Who would best do this depends on your DDX
  - Neurodevelopmental pediatrician
  - Developmental-behavioral pediatrician
  - Child neurologist
  - Child psychiatrist
  - Child psychologist
  - Early childhood professionals (e.g., ECI)
  - Allied health therapists: speech-language, physical, occupational

Standardized Quotients

- Standardized quotients (or scores) often are reported with mean = 100 and SD = 15

Intellectual Quotients

- Intellectual disability: Borderline (-1.5 to -2SD), Mild (-2 to -3SD), Moderate (-3 to -4SD), Severe (-4 to -5SD), Profound (<-5 SD)
**Language Disorders**
- Strong familial component, especially first degree relatives
- High concordance rate in twin studies
- Categorized descriptively
  - Language disorders: expressive, receptive and expressive
  - Speech disorders: articulation disorder, dysfluency
- Prognosis depends on type & severity of language disorder
  - Ex. Moderate-severe language disorders often lead into language-based learning struggles or disabilities

**Language Quotients**
- Language disorders: (lower threshold) Mild (-1.5 to -2.0 SD), moderate (-2 to -2.5SD), severe (-2.5 to -3SD)

**Medical Evaluation**
- Aimed at determining underlying etiology
- Takes into consideration biological, environmental, other risks
- Includes:
  - Vision screening/evaluation
  - Hearing screening/evaluation
  - Review of newborn metabolic screening, growth charts
  - Update of environmental, medical, family and social history
  - Specific testing as indicated (imaging, EEG, genetic, etc) in conjunction with subspecialist

**Clinical application**
- Developmental dissociation
  - Expressive language delay
  - Communication disorder
Early Childhood Intervention
- Can be initiated even before the developmental and medical evaluations are complete
- Works because development is malleable and affected by the environment
- Offers
  - Developmental evaluation
  - Services in a naturalistic setting: developmental service, therapies, service coordination, social work services, assistance with transportation, parent/family training, behavioral counselling

Early Childhood Intervention
- Teaches mothers to interact, communicate better
- Provides information on child development
- Provides appropriate expectations, general social support
- Enhances the child's intellectual, language, and social competence
- Removes external risk factors
- Places children in developmentally enriched settings
- Trains parents in responsiveness and effectiveness
- Optimizes the ability of families to meet child's special needs
- Provides continuous positive redirection and focused building skills

Is a Disorder Identified?
- If a disorder is not identified, schedule earlier return visits for close surveillance
- If a disorder is identified, initiate chronic-condition management
  - By underlying etiology (e.g., Trisomy 21)
  - By developmental disorder (e.g., cerebral palsy, intellectual disability, autism spectrum disorders, language disorders)

Prognosis
- Variable but predictable based on severity

Final Remarks
- Development is dynamic, variable – be on your toes
- Surveillance and screening is important – time is precious
- Listening to parents is valuable
- Screening tools can and do help our children
- Administer a screening tool if there are concerns or risk factors identified on usual surveillance and at the 9, 18 and 24 or 30 months (even if asymptomatic)

Final Remarks
- Screening sorts children into 3 categories:
  - Needs additional evaluation (did not pass screen)
  - Needs close monitoring/surveillance (passed screen but has risks)
  - Needs ongoing monitoring in context of well-child care (passed screen and has no risk factors)
- Pattern of screening results will guide referrals
- When referring for a developmental evaluation, forward results of surveillance and screening and your concerns
References

- Glascoe FP. Parents’ concerns about children’s development: prescreening technique or screening tool? Pediatrics, 1997; 99(4); 522-528.