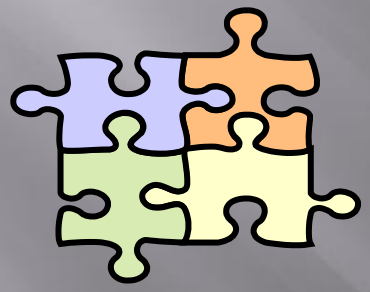
THE MODIFIED CHECKLIST FOR AUTISM IN TODDLERS (M-CHAT™)

(ROBINS, FEIN, & BARTON, 1999)

A Training Module for Physicians



VT-ILEHP ASD LEND Program

2009

What is the M-CHAT?

- A **screening** tool used for the early detection of Autism Spectrum Disorder (ASD).
- Screens children whose diagnosis might be missed until much later.
- A **practical tool for primary care pediatric offices** as it is an expanded American version of the CHAT (Baron-Cohen et al., 1992)

The original CHAT Study

- A screening tool to identify early signs of Autism at 18 months
- Included 9-questions & observations of behavior
- 3 items on the CHAT indicated early signs of autism (Baron-Cohen et al., 1992):
  1. Gaze-monitoring (GM)
  2. Protodeclarative pointing (PDP)
  3. Pretend Play (PP)

- Administered to 90 children (18 mos.), 41 at risk & 50 without risk
- 4 from the at risk group failed all 3 key items (GM, PDP, PP)
- At a follow-up 12 months later, all 3 received a diagnosis of autism. (Baron-Cohen et al., 1996)
- Designed for Autistic Disorder, rather than the broader population of children with autistic features who need intervention (Robins et al., 2001)

Types of Screening for ASD

Level I Screening

- Children in the general population
- Used by primary care physicians
- Brief format
- Most screened are not at risk of developmental delay (DD)

Level II Screening

- Selected group of children identified to be at increased risk
- Administered by specialists
- Include parental report and professional observation
- More time-consuming

The M-CHAT is both a Level I and Level II screening tool (Robins et al., 2006)

The NEED for screening

- **1 in 150 children are diagnosed with an ASD** (CDC, 2007)
- **Recent national survey suggests 1 in 91** (Kogan et al., 2009)

About 17 % of children under the age of 18 are affected by a developmental, behavioral, or learning disability. Autism is the fastest growing developmental disorder in the U.S.

M-CHAT Screening: Casting a Wide Net

- CHAT=>goal to have a high positive predictive power (i.e., the ability to definitively predict which children would develop Autism without misdiagnosing false-positives)

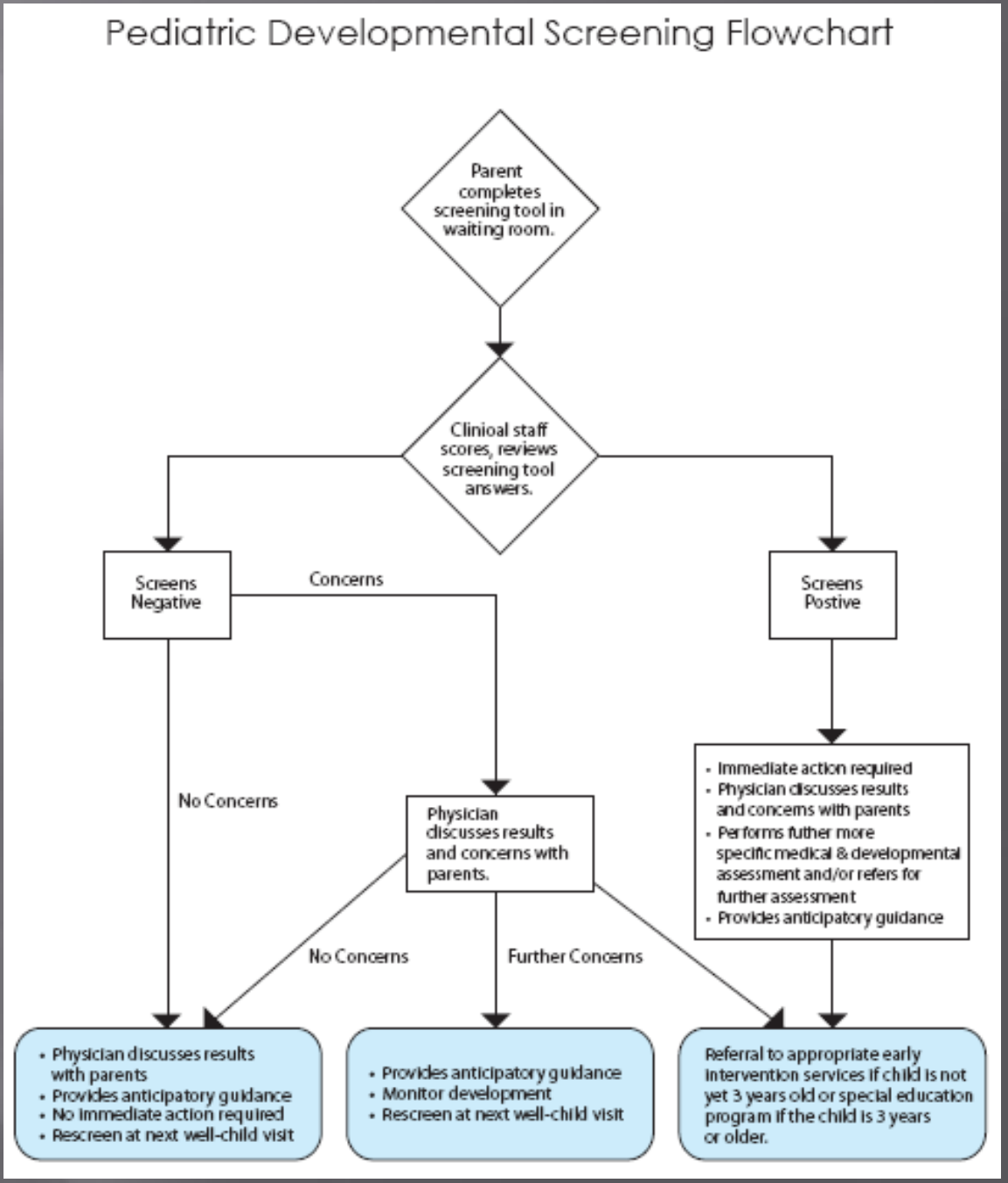
- M-CHAT=>goal to screen with much **wider sensitivity**, to identify more children with ASD earlier, even though this might mean some false-positives.

- Autism can be difficult to identify at an early age as nearly 30% of children with autism present with periods of normal development followed by a plateau or regression (Chawarska et al., 2007; Tuchman & Rapin, 1997).

- To account for potential regressions, the M-CHAT should be administered both at 18 & 24-months to increase sensitivity.

A Pediatrician's Role in Screening

CDC **Screening and Diagnosis for Healthcare Providers**
http://www.cdc.gov/ncbddd/autism/hcp-screening.html



AAP and its screening recommedations

- The **American Academy of Pediatrics (AAP)** strongly believes in:

  "early and continuous surveillance and screening for ASD to ensure that children are identified and receive access to services as early as possible"

  (retrieved from http:www.aap.org)

- AAP (2006) guidelines endorse autism-specific screening for *all* children at 18 months.

- Current data suggests most American pediatricians **(82%)** screen for general developmental delays; *however more than half used inadequately validated procedures* & **only 8% reported screening for ASD** (dosReis et al, 2006)

Early Intervention

Empirical studies of toddlers with ASDs suggest intensive, specialized early intervention leads to quantifiable gains (Horner et al., 2002; McEachin et al., 1993; Sallows & Graupner, 2005; Schreibman, 2000).

It is important for children simply suspected of ASD to start intervention services (Johnson et al., 2007, AAP).

Early intervention services by age 3 show significant developmental gains. (Robins et al., 2006)

Children with Autism who develop language and symbolic play before age 5:

- are more likely to be enrolled in a regular classroom
- show pronounced improvements in communication
- show additional improvements in developmental skills & language skills (ibid.)

Early intervention reduces the severity of ASD-associated deficits

The M-CHAT & the DSM-IV-TR

- The DSM-IV-TR is the official manual for diagnosing children with Autism.
- Skill areas assessed in the M-CHAT, cross reference the diagnostic criteria for Pervasive Developmental Disorders (PDD) in the DSM-IV-TR.
- M-CHAT is a **screening tool** whereas the DSM-IV-TR is a **set of diagnostic criteria**.
- The DSM-IV-TR identifies five subcategories of PDD diagnoses:
  - **Autistic Disorder**
  - **Asperger's Disorder**
  - **Childhood Disintegrative Disorder (CDD)**
  - **Rett's Disorder**
  - **Pervasive Developmental Disorder – Not Otherwise Specified (PDD-NOS)**

DSM-IV-TR Criteria for PDD

While each of the 5 disorders has its own subset of diagnostic criteria, a child with a PDD generally displays some or all of the behaviors below prior to age 3:

- **Qualitative Impairments in Social Interaction**
  - Noticeably solitary, detached, not sharing in activities with others; may refrain from using body language to indicate wants or needs.
- **Qualitative Impairments in Communication**
  - May have no speech, delayed speech, idiosyncratic or repetitive speech; about 40% of children with ASD do not speak at all.
  - Lack of make-believe play (which involves non-verbal communication).
- **Restricted, Repetitive, & Stereotyped Patterns of Behavior, Interests and Activities**
  - Fixated on a certain subject; can appear rigid in their observance of routines or rituals; heightened sensitivity to sounds, sights, smells, tastes, &/or textures.

(Exkorn, 2005)

Developmental components of the M-CHAT

M-CHAT includes a wider range of behavior & removed the observation component which is not practical for American Pediatric visits.

Screening areas:

- **Social play**
- **Social interest**
- **Pretend play** – *using objects/ toys as though they have other properties or identities*
- **Joint attention** – *sharing of an activity with a partner*
- **Protodeclarative pointing** – *a joint attention behavior, in which the point is intended to share*
- **Use of expressive and receptive language**
- **Functional play** – *objects used as intended*
- **Protoimperative pointing** – *use of the index finger to obtain or name an object (a non-social purpose).*
- **Motor development**
- **Rough and tumble play**
- **Sensory Impairment**

Properties of the M-CHAT

- Physicians cannot always reliably identify a developmental delay based on a child's behavior in one session
- For younger children, a communication & social delay may be confused with shyness & behavior in a doctor's office may not represent the child's typical behavior.
- "The primary goal [in creating the] M-CHAT was to maximize sensitivity, meaning to detect as many cases of ASD as possible. Therefore, there is a high false positive rate, meaning that not all children who score at risk for ASD will be diagnosed with ASD. Even with the follow-up questions, a significant number of the children who fail the M-CHAT will not be diagnosed with an ASD; however, these children are at risk for other developmental disorders or delays, and therefore, evaluation is warranted for any child who fails the screening." (Robins et al., 2001)

Application of the M-CHAT

- 2-step screening tool for any ASD; objective & easy to administer to accommodate PHCP's high patient needs.
- 23 questions (including the original 9 taken from CHAT).
- Simple screen with a 6th-grade reading level that can be given to all parents during pediatric visits (Kleinman, 2007).
- Doesn't rely on physician's observation of the child,
- Must be used in its entirety to be valid
- Children for whom there are additional concerns or who fail a specific number of items will receive a follow-up interview to assess whether concerning behaviors indicate risk or whether the behaviors which might have indicated risk have continued.

How to administer the M-CHAT

- Can be given to parents or guardians before a well-child visit while they sit in the waiting room
- Can be scored by a nurse or pediatrician rapidly for discussion with parents during the visit
- Questions or concerns can be resolved during the follow-up interview

The M-CHAT

Directions

Please fill out the following about how your child usually is. Please try to answer every question. If the behavior is rare (e.g., you've seen it once or twice), please answer as if the child does not do it.

1. Does your child enjoy being swung, bounced on your knee, etc.?
2. Does your child take an interest in other children?
3. Does your child like climbing on things, such as up stairs?
4. Does your child enjoy playing peek-a-boo/hide-and-seek?
5. Does your child ever pretend, for example, to talk on the phone or take care of a doll or pretend other things?
6. Does your child ever use his/her index finger to point, to ask for something?
7. Does your child ever use his/her index finger to point, to indicate interest in something?
8. Can your child play properly with small toys (e.g. cars or blocks) without just mouthing, fiddling, or dropping them?
9. Does your child ever bring objects over to you (parent) to show you something?
10. Does your child look you in the eye for more than a second or two?
11. Does your child ever seem oversensitive to noise? (e.g., plugging ears)
12. Does your child smile in response to your face or your smile?
13. Does your child imitate you? (e.g., you make a face-will your child imitate it?)
14. Does your child respond to his/her name when you call?
15. If you point at a toy across the room, does your child look at it?
16. Does your child walk?
17. Does your child look at things you are looking at?
18. Does your child make unusual finger movements near his/her face?
19. Does your child try to attract your attention to his/her own activity?
20. Have you ever wondered if your child is deaf?
21. Does your child understand what people say?
22. Does your child sometimes stare at nothing or wander with no purpose?
23. Does your child look at your face to check your reaction when faced with something unfamiliar?

Scoring the M-CHAT

- Can be scored in less than 2 minutes.
- An overhead transparency is laid over the completed M-CHAT to facilitate scoring.
- A follow-up interview for those children **who fail 2 critical items** or **3 non-critical items** is conducted to determine if the identified typical or delayed behaviors are truly risk factors or are continuing after the initial screening
- Follow-up interview decreases rate at which false-positive diagnoses are obtained.

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Critical items

For these items, a score of "No" indicates a risk for Autism

2. Does your child take an interest in other children?
7. Does your child ever use his/her index finger to point, to indicate interest in something?
9. Does your child ever bring objects over to you (parent) to show you something?
13. Does your child imitate you? (e.g., you make a face-will your child imitate it?)
14. Does your child respond to his/her name when you call?
15. If you point at a toy across the room, does your child look at it?

Reverse Score Items

For these items meaning, a score of "Yes" indicates risk for Autism.

11. Does your child ever seem oversensitive to noise? (e.g., plugging ears)

18. Does your child make unusual finger movements near his/her face?

20. Have you ever wondered if your child is deaf?

22. Does your child sometimes stare at nothing or wander with no purpose?

Non critical items

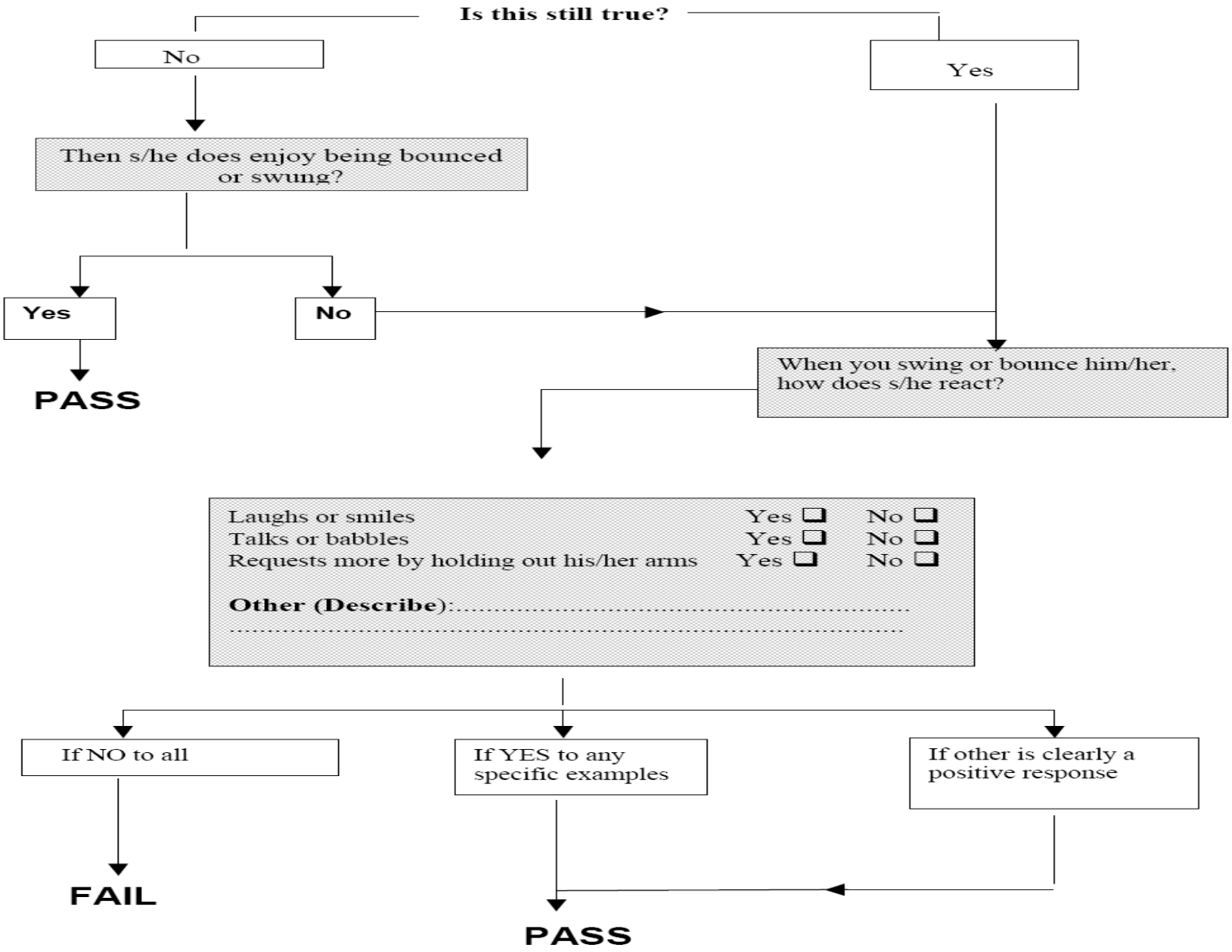
For these items, a score of "No" indicates a risk of Autism

1. Does your child enjoy being swung, bounced on your knee, etc.?
3. Does your child like climbing on things, such as up stairs?
4. Does your child enjoy playing peek-a-boo/hide-and-seek?
5. Does your child ever pretend, for example, to talk on the phone or take care of a doll or pretend other things?
6. Does your child ever use his/her index finger to point, to ask for something?
8. Can your child play properly with small toys (e.g. cars or blocks) without just mouthing, fiddling, or dropping them?
10. Does your child look you in the eye for more than a second or two?
12. Does your child smile in response to your face or your smile?
16. Does your child walk?
17. Does your child look at things you are looking at?
19. Does your child try to attract your attention to his/her own activity?
21. Does your child understand what people say?
23. Does your child look at your face to check your reaction when faced with something unfamiliar?

Follow-up interview

- Follows a structured questionnaire.
- Occurs during the well-child visit after scoring the M-CHAT if it indicates concern with a significant number of behaviors.
- If behaviors occur irregularly or are only slightly concerning, the interview occurs over the phone after 2 weeks.
- If after the follow-up interview, an item is failed, it indicates risk for an ASD.
- Failure of 2 critical items (items 2, 7, 9, 13, 14, 15) or any 3 items warrants referral to a specialist.
- Failing the interview does not diagnose ASD; it indicates increased risk (Robins et al., 2001)

1. You reported that _____ does not enjoy being swung, bounced on your knee, etc.



After the Interview

- Children who still fail **more than 3 items total or 2 critical** items should be **referred for evaluation by a specialist trained to evaluate ASD in young children**.

- Children for whom there are physician, parent, or other professionals' concerns about ASD should be referred for evaluation, given that it is unlikely for any screening instrument to have 100% sensitivity (Robins et al., 2006)

Validity of the M-CHAT

- Validated for **screening** toddlers between 16 & 30 months

- Even with follow-up questions, a significant number of the children who fail the M-CHAT will not be diagnosed with an ASD. **However, these children are at risk for other developmental disorders or delays, warranting additional evaluation for any child who fails the screening**.

- Improved sensitivity at 24 months over 18 months on the basis that screening at 24 months will identify children who have passed at 18 months but subsequently regress by the time the screening is conducted 6 months later (Robins et al., 1999).

Validity of the M-CHAT

- While early screening is effective, ASD symptoms can appear at ages beyond 30 months.

- Autistic symptoms at the onset may not fully reflect their final outcome in an individual; children may present non-typical developmental behaviors at different ages (Charman et al., 2001).

Why the M-CHAT?

- Developmental surveillance should be performed at all well-child visits from infancy through school-age, & at any age thereafter if concerns are raised about social acceptance, learning, or behavior (Filipek et al., 2000).
- The Denver-II has been the traditional tool used for developmental screening, but research has found that it is insensitive and lacks specificity.
- The Revised Denver Pre-Screening Developmental Questionnaire (R-DPDQ) was designed to identify a subset of children needing further screening.
- R-DPDQ detects only 30% of children with language impairments & 50% of children with mental retardation. (Filipek et al., 2000)

Why the M-CHAT?

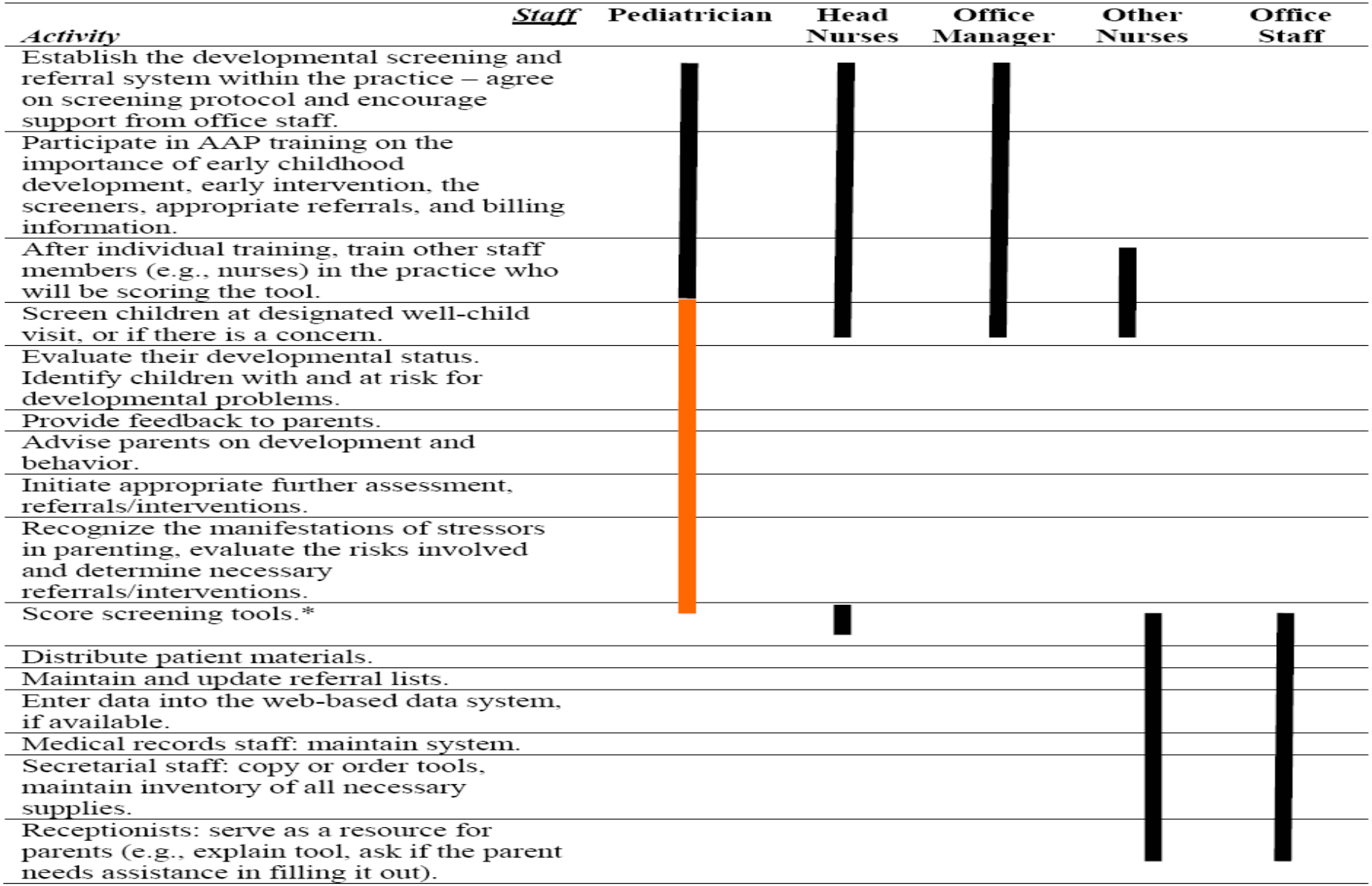
- Because of the lack of sensitivity and specificity, the Denver-II & R-DPDQ are not recommended for appropriate primary-care developmental surveillance (Filipek et al., 2000).

- To optimize long-term prognosis, early identification & early intervention are essential. (Robins et al., 2006)

- Although false-positive screening cases do not have ASD, most children, to date, show significant delays warranting intervention (e.g., language delay); therefore, overidentification with the M-CHAT is preferable to underidentification. (Robins et al., 2006)

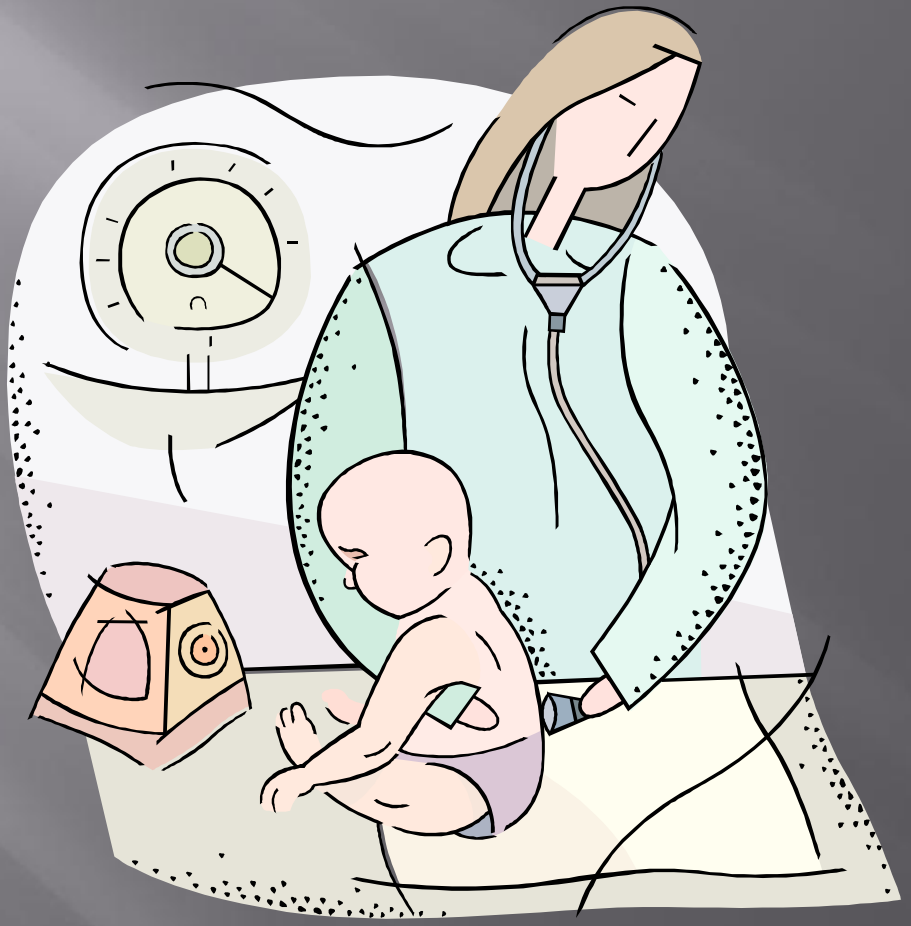
Sample Delineation of Pediatric Staff Roles for Developmental Screening

Shaded areas indicate which activities are the responsibilities of each staff member.
Items in orange are the primary responsibility of the pediatrician.



*Scoring could be automated.

Case Examples



Case Study #1

"Abigail" (19-month-old, non-verbal female)

Background: Abigail's mother brought her to her well-child visit. Abigail clung tightly to her mother while in the waiting room, and began to make whining sounds when the doctor greeted her mother. During the visit, the pediatrician administered the M-CHAT as an interview with the mother while Abigail played on her mother's lap.

Initial M-CHAT Results:

According to the mother, Abigail failed the following items:

- 3. Does your child like climbing on things, such as up stairs? (No)
- 5. Does your child ever pretend, for example, to talk on the phone or take care of dolls, or pretend other things? (No)
- 13. Does your child imitate you? (e.g., you make a face-will your child imitate it?) (No)
- 14. Does your child respond to his/her name when you call? (No)
- 15. If you point at a toy across the room, does your child look at it? (No)
- 16. Does your child walk? (No)
- 20. Have you ever wondered if your child is deaf? (Yes)
- 21. Does your child understand what people say? (No)

Case Study #1

QUESTIONS:

1. Should the pediatrician do a follow-up interview? Why or why not?

ANSWER: Yes, because more than three items total and more than two critical items were failed, a follow-up interview is warranted.

2. What critical items were failed?

ANSWER: Three critical items were failed, numbers 13, 14, & 15.

Case Study #1

Follow-up Interview: The pediatrician administered the follow-up interview at the end of Abigail's well child visit, and found that Abigail failed the same items excluding item 15 as it was reported by her mother that Abigail occasionally pointed across the room.

Case Study #1

QUESTION:

1. Does Abigail have autism?

ANSWER: The M-CHAT is a screening tool and is appropriate to identify red flags or those children who may be at risk for autism. It should not be used to make a diagnosis but would instead be used to support a referral indicating concerns in key areas typically identified for children suspected of autism.

2. What follow-up is needed by the pediatrician?

ANSWER: A child who fails two critical items or three or more other items, after the follow-up interview should be automatically referred for a developmental evaluation. Whether or not a child receives a diagnosis, these red flags indicate that a child is likely to have some developmental challenge and would benefit from intervention.

Case Study #1

Conclusion: A follow up interview was completed, the failed items were confirmed, and Abigail was referred to the Family Infant Toddler Program (for children birth to 3 with or at risk for developmental disabilities) for a developmental evaluation, and to begin intervention. She was also referred to a developmental pediatrics program and later diagnosed with Autism and received early intervention services.

Case Study #2

"Enrique" (20 month-old verbal male)

Background: Enrique's mother brought him in to his well-child visit. When they arrived, the receptionist asked the mother to fill out the M-CHAT while waiting. Enrique played with the blocks by himself while his mother worked on the paperwork. The M-CHAT was then scored by a nurse in the office who had been trained to score M-CHATs.

Initial M-CHAT:

According to the mother, Enrique failed:

- Item 9. Does your child ever bring objects over to you (parent) to show you something? (No)
- Item 17. Does your child look at things you are looking at? (No)
- Item 18. Does your child make unusual finger movements near his/her face? (Yes)

Case Study #2

QUESTION: Should Enrique be referred for further evaluation or should a follow-up phone call be made?

ANSWER: Because Enrique failed three items (and only one critical item (#9)), the recommendation would be that Enrique's mother be contacted within two weeks by phone for a follow-up interview to determine if the three failed items continued to be a concern prior to making a referral for further evaluation.

Case Study #2

Follow-up Interview:

Within 2 weeks, the nurse from the pediatric office contacted Enrique's mother and used the follow-up question algorithm to determine if Enrique was still failing items 9, 17 and 18. The response to each of these questions indicated a failure.

Case Study #2

QUESTIONS:

1. What should be the pediatrician's next step?

ANSWER: Enrique should be referred to the local birth to three program for a developmental evaluation as screening results indicate further referral is appropriate.

2. Does Enrique have autism?

ANSWER: The results of the M-CHAT screening tool suggest Enrique is at risk for a diagnosis of autism but would require further evaluation and should take part in early intervention with ongoing follow-up to track his progress.

Case Study #2

Conclusion:

Enrique was evaluated by a developmental pediatrician and was diagnosed with PPD-NOS. He also attended an early intervention program and continued to make progress in his language although his ability to engage socially was not typical compared to his peers.

Case Study #3

"Brittany" (24-month-old non-verbal female)

Background: Brittany's adoptive father and mother brought Brittany to her well-child visit. Brittany was interested in touching different textures and hugging the legs of the pediatrician and nurses she met in the hallway as she came into the exam room. During the beginning of the visit, Brittany's adoptive parents described the traumatic events surrounding Brittany's early childhood. The pediatrician administered the M-CHAT to the family.

Initial M-CHAT:

Brittany failed the following items:

- 11. Does your child ever seem oversensitive to noise? (e.g., plugging ears) (Yes)
- 18. Does your child make unusual finger movements near his/her face? (Yes)
- 22. Does your child sometimes stare at nothing or wander with no purpose? (Yes)

The pediatrician immediately followed the survey with the associated follow up questions.

Case Study #3

Follow-up Interview:

The family mentioned that Brittany calmly covers her ears when she hears loud noises such as people yelling on the television. It was also determined that she only rarely moves her fingers in front of her face. Brittany's mom noted that her daughter continued to stare or wander off with no specific purpose.

Case Study #3

QUESTIONS:

1. Did Brittany continue to fail items 11, 18 & 22?

ANSWER: The parents' responses during the follow-up interview indicated that items 11 & 18 were now passed but item 22 was considered a failure.

2. Are there any concerns that would warrant further assessment?

ANSWER: The M-CHAT results indicate it is unlikely that autism is characteristic of this child's profile. Considering Brittany's adoptive history, however, it is likely that Brittany may be having some difficulties adjusting or attaching to her environment.

Conclusion:

While Brittany passed the M-CHAT follow-up interview, the pediatrician still recommended that the family contact the local early intervention program for further assessment related to a potential Attachment Disorder. Brittany was later diagnosed with Disinhibited Attachment Disorder.

Case Study #4

"Timothy" (non-verbal, 22-month old male)

Background: Timothy is slightly microcephalic. His father and mother filled out the M-CHAT survey in the waiting room. A nurse scored the M-CHAT during the first part of the well-child visit.

Initial M-CHAT Survey:

Timothy's parents reported that he failed items:

- 11. Does your child ever seem oversensitive to noise? (e.g., plugging ears) (Yes)
- 14. Does your child respond to his/her name when you call? (No)
- 15. If you point at a toy across the room, does your child look at it? (No)
- 20. Have you ever wondered if your child is deaf? (Yes)
- 21. Does your child understand what people say? (No)
- 22. Does your child sometimes stare at nothing or wander with no purpose? (Yes)

Case Study #4

QUESTION: Did Timothy fail any critical items on the M-CHAT, and if so, what were they? Should an interview be completed?

ANSWER: Timothy failed six items total and two critical items (14 and 15); therefore, the pediatrician administered the M-CHAT follow-up interview.

Case Study #4

Follow-up Interview:

On the follow-up interview, parent responses did not change, therefore, Timothy continued to fail the previously identified failed items.

Conclusion:

The pediatrician referred the child for a developmental assessment and to the early intervention program. Timothy was later diagnosed with a global developmental delay, and the developmental pediatrician recommended additional surveillance for risk of Autism through his 3rd birthday.

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