Impact of Implementing ASQ Developmental Screening in a Pediatric Practice

Kevin Marks, MD
PeaceHealth Medical Group
Eugene, OR 97401
Tel # 541-687-6061
kmarks@peacehealth.org

Hollie Hix-Small, PhD
Early Intervention Program
5253 University of Oregon
Eugene, OR 97403-5253
Tel #541-346-0680
hhixsmal@uoregon.edu

Co-authors of “Impact of Implementing Developmental Screening at 12 and 24 Months in a Pediatric Practice” to appear in Pediatrics, 2007 along with Jane Squires, PhD and Robert Nickel, MD

PowerPoint presentation amended from a doctoral
Why do Universal Screening & Surveillance?

1. Early Intervention improves developmental outcomes (especially with low SES/ Medicaid, mildly delayed and autistic children)

2. Yet, pediatricians fail to identify & refer 60 – 80% of children with developmental delays in a timely manner
Where to do Screening?

- Physician’s office = most ideal
- Should investigate past medical and social history
  - Preemie? likelihood of a learning disorder (LD) increases
  - SGA? BW < 2500gms? (OR=2.49, 95% CI=0.96-4.79) of a LD
  - LGA? BW >4500gms? (OR=1.41, 95% CI=0.62-2.61) of a LD
  - If neglect or abuse (DHS) history, 53% incidence of delays
- Should investigate family history, possible medical issues
  - R/o future behavioral disorder (e.g. ADHD)
Where to do Screening?

- 1 in 9 children do not have medical insurance— not ideal

Well-child care compliance at the physician’s office as a % of the AAP guidelines is subpar in the USA

- 83.2% < 1 year old
- 68.1% for 1 year olds
- 71% for 2 year olds
- 68.7% for 3 to 5 year olds
- 56.8% for all kids in the Pacific region

Screening at Early Childhood Agencies

- All DHS kids should continue to have mandatory screening
- Headstart— wonderful place to do screening
When to Screen?

- 2006 AAP Developmental Surveillance and Screening Statement--- Universal screening at 9, 18 and (24 vs. 30) months-- based on an expert panel

- Compliance Ratio for well-child visits as % of AAP guidelines begins decreasing at 2 years of life

- Not much clinical research on the most optimal timing for screening as
When to Screen?

What would generate the largest # of appropriate referrals-- Universal screening at 9 vs. 12 months?

9 months- good for gross motor delay identification

9 months- evidence says early signs of autism can be identified

9 months- good time to universally ask about vision and hearing

But no 9 month ASQ

Anecdotally, WCC compliance better at 12 months

Anecdotally, kids present to their 12 visit soon after their 1st birthday, making paper-based screening easier

12 month ASQ- has better psychometric properties than the 8 or 10 month ASQ
When to Screen?

Better to do universal screening at 24 vs. 30 months?

24 and 30 month ASQ - both have good psychometric properties

There is no reimbursable 30 month well-child visit

Anecdotally, kids present to their 24 month visit soon after their 2\textsuperscript{nd} birthday, making paper-based screening easier

Autism Expert Panel/ Gupta
When to Screen?

What about screening > 30 months?
• Squires and Glascoe both strongly recommend it
• 2006 AAP statement: “At 4 years, screening for school readiness is appropriate.”
• In Oregon, early intervention eligibility requirements are less strict after 3 years of life
What Screening Tool to Use?

- 2006 AAP Developmental Surveillance and Screening Statement
- But no formally recommend tool
- Pediatricians given their choice of 9 general, 3 language/cognitive, 2 motor and/or 6 autism-specific screening tools.
- 20 options = extra homework for every pediatrician
  - Some tools less accurate
  - Other tools lengthy, not office feasible
  - Parental questionnaire tools - generally more feasible
What Screening Tool to Use?

- Give a toddler 2 – 3 choices and they will proudly take their pick (ASQ, PEDS or PEDS:DM)
- Give a toddler 20 different choices and they’ll get frustrated and bypass the directions altogether
- General pediatricians are no different

Hypothesis: Give general pediatricians 2 - 3 valid & reliable general developmental screening
General Screening Tools

● ASQ (Ages and Stages Questionnaire)
  • 4 to 60 months of age
  • 30 item questionnaire
  • 10 – 15 minutes to fill out and score
  • Valid Tool: overall agreement across all questionnaires compared to gold standard testing = 83%
  • Sensitivity: 0.70 – 0.90 (moderate – high)
  • Specificity: 0.76 – 0.91 (moderate – high)
  • Reliability (test-retest & interrater) = 95%

• Used by: Head Start, many other state screening programs
General Screening Tools

PEDS (Parent’s Evaluation of Developmental Status)

- Only 10 items! Parent-interview form
- Feasible. Only 2-10 min administration time!
- For ages 0 – 8 years old
- Moderate sensitivity (0.74 – 0.79)
- Moderate specificity (0.70 – 0.80)
- But some questions are not always age appropriate…
- E.g. “Do you have any concerns about how your
General Screening Tools

- **Denver II**
  - Most commonly used tool for kids 0 to 6 years
  - Directly administered tool
  - Administration time is 10 – 20 minutes
  - Low - high sensitivity (0.56 – 0.83)
  - Low - high specificity (0.43 – 0.80)
  - Most questionable results not referred so realistic sensitivity is low (56%) and specificity is high (80%)
  - Often not administered correctly
  - Unrealistic in a busy office practice
Autism-specific Screening Tools

- Autism incidence 1:150 overall, 1:94 for males
- Red-flagging ASD/PDD early is critical
- CHAT (Checklist for Autism in Toddlers) / other Autism-specific screening tool recommended at 18 and 24 months by the Autism Expert Panel
Why was our study conducted?

- American Academy of Pediatrics 2001 statement
- Promising pilot study results in 2004
- Lane county detection rates: 1.4% -- below the 1.8% national average
- 12-16% of American children have a developmental or behavioral disorder
- Strong need to overcome “real world” office barriers
Study Objectives?

- Study differences between pediatric developmental impression (PDI) and the ASQ at the 12- and 24-month well-child visits
- Evaluate comparison and screening year referral rates
- Determine number of children with delays or potential delays that would not have been referred without the ASQ
- Examine office/ system feasibility
Methods

Who participated?

• Parents/guardians and children at the 12- & 24-month visits from April 2005 – March 2006
• Children excluded if already identified with a delay and receiving EI-services
• 18 Pediatricians and 2 Nurse Practitioners, PeaceHealth Medical Group in Eugene, Oregon
• EC Cares (Part C agency), Eugene, Oregon
Methods

What information was collected?

• Consent forms
• Family information form (demographics)
• Pediatric Developmental Impression form (PDI)
• Ages and Stages Questionnaires
• Part C agency results
• Anecdotal feedback- receptionists, nurses, pediatricians, Part C agency staff
INFORMATION  (completed during the visit, returned to nurse before leaving)

relationship to this child

gender

age

race

child’s race

years of education completed

primary language

Internet:  Do you log on and use the Internet by yourself, without help, either at work or home?

Is your child currently receiving home visits or other services from EC Cares?

Would you like someone from EIP to call and assist you with completing this questionnaire?

Please hand completed form to the nurse
PEDIATRIC DEVELOPMENTAL IMPRESSION (PDI)

Developmental rating: Typical, Questionable or Delayed with instruction to use adjusted age not chronological age if preterm

If questionable or delayed, identify the area(s) of delay:

1. Communication
2. Gross motor
3. Fine motor
4. Problem solving
5. Personal-social

Preterm (37 weeks or less)

Refer to EC CARES today?

Already receiving services?

Parent declined

*completed after appointment by physician while blind to ASQ results*
Implementation and Feasibility

• Used the “do it in the office or mail it from home” approach
• 30 minutes of training for staff
• Resource staff scored the ASQ forms
• Itemized cost = $1.61 - $2.43 per patient. A medical bargain!
  • Hemogram ($18) + lead level ($28) + Lab draw fee ($14) = $60 for comparison
• Cost varied on the mail-back option and practitioner f/u decisions
• Reception, Nurse, Doctor all said:
  • “The ASQ is a fun and very important part of this well-child visit. Please fill it out. If you
Subjects

- 1428 patients and parents, 11 month period
  - 1 year study, 1st month of data thrown out -- start-up issues.
  - Patient volumes fluctuate month by month in Pediatrics

Patient Characteristics

- 12-months, approximately equal males (49.9%) and females (50.1%)
- 24-months, slightly more males (53.0%) than females (47.0%)
- 72.2% Caucasian

Oregon 10% Hispanic (US Census Bureau, 2009)
Subjects

- Parent/Guardian characteristics
  - Predominantly female (88.9%)
  - Mean age 29.69
  - 88.7% self-reported high school graduate
  - 39% received Medicaid coverage (low income)
  - 81.7% log on and use the Internet independently
Subjects

- Pediatrician characteristics
  - 44.4% female
  - 99.6% practicing for at least five years
  - 44.5% practicing full-time
  - 100% board certified
ASQ Return Rates

- 54% (770 out of 1428)
- Pilot study - 48% return rate (47 out of 98 cases)
- Acceptable for medical studies

- Medicaid and younger parents significantly less likely to return
- 3 out of every 100 parents requested help completing the ASQ
- 67% were Medicaid; 72% Spanish-speaking; 47% less than HS education and 55.8% reported not being able to log on and use the internet independently.
Quality Improvement Ideas

1. Time spent orienting & training staff saves time later

2. Provide support for parents who need help filling out the ASQ

3. Higher return rates likely if the ASQ is completed directly before or after the WCC and the paperwork is streamlined

4. ASQ icon on reception & nurse’s computers to print an appropriate age-interval ASQ for late arrival well visits (e.g. 14 month old child who comes in for the 12
Study and Comparison Year Referrals

224% increase in referrals during the study year

- 14.7% decline in patient volume from comparison to the study year in children 0 – 2 years of age (more uninsured kids?)
- No changes in pediatric staff
- Notable increase for 12-month old referrals
- 78% of referrals were 24-month olds
Control and screening year referrals

- Control year referrals
- Screening year referrals

Bar chart showing referrals for 12-months and 24-months.
Control and screening year referrals
Pediatrician vs. ASQ Referrals

- **12-month Pediatrician**
  - 29% male
  - 83% Caucasian
  - 0% Hispanic
  - 60% Medicaid
  - 40% communication
  - 40% gross motor
  - 20% problem solving
  - No fine motor or personal-social domain delays

- **12-month ASQ**
  - 57% male
  - 70% Caucasian
  - 15% Hispanic
  - 46% Medicaid
  - 23% communication
  - 23% gross motor
  - 6% fine motor
  - 31% problem solving
  - 27% personal-social domain delays
Pediatrician vs. ASQ Referrals

- 24-month physician
  - 70% male
  - 52% Caucasian
  - 19% Hispanic
  - 50% Medicaid
  - 96% communication
  - No gross motor domain delays detected
  - 9% fine motor
  - 4% problem solving
- 24-month ASQ
  - 64% male
  - 73% Caucasian
  - 12% Hispanic
  - 35% Medicaid
  - 60% communication
  - 6% gross motor
  - 24% fine motor
  - 26% problem solving
  - 31% personal social
Referral data

- Pediatricians referred only 45 of the total 107 referred cases
- 62 cases (58%) would not have been referred based on PDI alone
- 82 out of 107 referred cases with Part C agency outcome data were EI-eligible or being monitored (77%)
- 38 (36%) met Oregon’s strict eligibility requirements for EI services
- 44 (41%) are being monitored
Referral Data

When pediatricians referred alone there was 92% agreement with the Part C agency’s follow-up screening.

When pediatrician PDI and ASQ results indicated a delay, the Part C agency agreed 100% of the time!

When the ASQ alone referred the case, the Part C agency agreed 63% of the time (Note: Oregon has strict EI-eligibility criteria).

25 (23%) did not qualify for further follow-up.

Implication: Part C agencies should strongly consider direct, observable, gold-standard testing on all pediatrician suspected delays, most especially if the ASQ is in agreement.
Referral Data

Out of 1428 cases, 3.1% (44) were determined to need further monitoring and 2.7% were made eligible for services. 5.8% received some form of services.

2.7% is higher than Lane County’s 1.4% detection rate.
2.7% is higher than the national target, 1.8%.

Note: children already identified with delays and receiving services were excluded from ASQ screening so the true % of identified delay was > 2.7%.
A “wait & see” or “missed” delay?

82 EI-eligible or EI-monitor Part C agency cases examined

(6 parents refused EI services)

Missed” Delays

• 38% (12/32) of 12-month olds had a “typical” PDI and got no immediate referral

• 22.7% (10/44) of 24-month olds had a “typical” PDI and got no immediate referral

Wait and See” Delays

• 13% (4/32) of 12-month olds NOT referred with a questionable or delayed PDI
A “wait & see” or “missed” delay?

• There were 3x as many “missed” delays at 12 months and 1.43x as many “missed” delays at 24 months compared to “wait and see” delays.

• More “missed” than “wait and see” delays at both intervals but a greater percentage of “missed” delays at 12 months!

• Patient demographics did not explain these patterns.

• So…

• Is there reluctance to refer a child for a suspected delay?
699 children with completed and available PDI and ASQ assessments

<table>
<thead>
<tr>
<th></th>
<th>Typical ASQ</th>
<th>Questionable ASQ</th>
<th>Delayed ASQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical Doctor</td>
<td>523 (83.7%)</td>
<td>38 (6.1%)</td>
<td>64 (10.2%)</td>
</tr>
<tr>
<td>Questionable Doctor</td>
<td>18 (38.3%)</td>
<td>3 (6.4%)</td>
<td>26 (55.3%)</td>
</tr>
<tr>
<td>Delayed Doctor</td>
<td>7 (25.9%)</td>
<td>1 (3.7%)</td>
<td>19 (70.4%)</td>
</tr>
<tr>
<td></td>
<td>548 (78.4%)</td>
<td>42 (6.0%)</td>
<td>109 (15.6%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>699 (100%)</td>
</tr>
</tbody>
</table>
PDI and ASQ agreement after collapsing questionable and delayed cases

<table>
<thead>
<tr>
<th></th>
<th>Delayed or Questionable ASQ</th>
<th>Typical ASQ</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delayed or Questionable PDI</td>
<td>49 (7%)</td>
<td>25 (3.6%)</td>
<td>74 (10.6%)</td>
</tr>
<tr>
<td>Typical PDI</td>
<td>102 (14.6%)</td>
<td>523 (74.8%)</td>
<td>625 (9.4%)</td>
</tr>
<tr>
<td>Total</td>
<td>151 (21.6%)</td>
<td>548 (78.4%)</td>
<td>699</td>
</tr>
</tbody>
</table>

Significant difference noted between the PDI and ASQ results

Chi-squared = 97.27

(That’s high), Overall agreement = 81.8%,
Probability of Referral

What participant characteristics increase the probability of pediatrician referral?

Pediatricians refer mostly for suspected communication and gross motor delays

Female pediatricians were 1.6X more likely to refer than male pediatricians

Full-time pediatricians were more likely to refer than part-time pediatricians (referral rates increased with # of hrs/wk worked)

No difference between pediatricians by percent patient load in the 0 to 2 year old age range

No difference between pediatricians by numbers of years in practice
Part C agency outcomes

- Eleven 12-mo old children were made eligible
  - 6 (55%) female
  - 11 (100%) in more than one domain
  - 11 (100%) communication
  - 6 (55%) social-emotional
  - 3 (27%) cognitive
  - 4 (36%) adaptive
  - 4 (36%) physical
  - 1 (9%) other – such as hearing impairment

- Fifteen 24-mo old children were made eligible
  - 10 (67%) female
  - 11 (73%) in more than one domain
  - 13 (87%) communication
  - 10 (67%) social-emotional
  - 8 (53%) cognitive
  - 5 (33%) adaptive
  - 3 (20%) physical
  - 3 (20%) other – such as hearing impairment
Implications

Highlights the need for standardized developmental screening with an instrument such as the ASQ.

Pediatricians should trust their clinical judgment but realize their observational limitations when assessing development.

Synergistic, collaborative relationship between pediatricians & Part C agencies blossomed.

Pediatricians can expect a jump in referrals especially at 12 months (younger children).
Future Directions

- A well-done, retrospective study of the ASQ’s detection of autistic spectrum disorder & pervasive developmental disorder cases is badly needed.
- If (acquired?) genetic mutations have something to do with autism...
- Then, are there genetic markers for screening?
Future Directions

What about post-partum depression/anxiety screening?

Well child care is not just about the child …

Post partum mood disorders
- correlates to personal-social delays, cognitive delays, future behavioral disorders in the child
- 24 – 50% paternal depression in the 1st postpartum year

2006 AAP statement mentioned nothing about it!
Our Current System

PeaceHealth has electronic medical records but uses paper-based screening. Current developmental screening and surveillance system most feasible for us…

EPDS at 2 months

ASQ screening at 12, 24 and 36 months

CHAT screening at 18 months (if “high risk” or “medium risk- high suspicion”, then immediate Part C agency referral)

ASQ (not CHAT) at 18 months would clearly be better
Drum Rolls and Fanfares
The On-line ASQ!

Need to investigate electronic ASQ psychometric properties
Voice synthesis capabilities in multiple languages to overcome language and illiteracy barriers
Embedded video to demonstrate developmental tasks to parents
Could automatically adjust for prematurity in the first 2 years, as recommended by the Committee On the Fetus and Newborn (COFN) and guide parents to the correct age interval ASQ.
CHADIS!

- From: Center for Promotion of Child Development through Primary Care (Drs Sturner & Howard, John Hopkins)
- [http://www.childhealthcare.org/chadis](http://www.childhealthcare.org/chadis)
- Web-based, diagnostic management and tracking tool for children’s behavior & development
- 25 different, valid and reliable screening tools!
- Includes the EPDS, ASQ, CHAT, Vanderbilt NICHQ behavioral assessment scales, Patient Health