

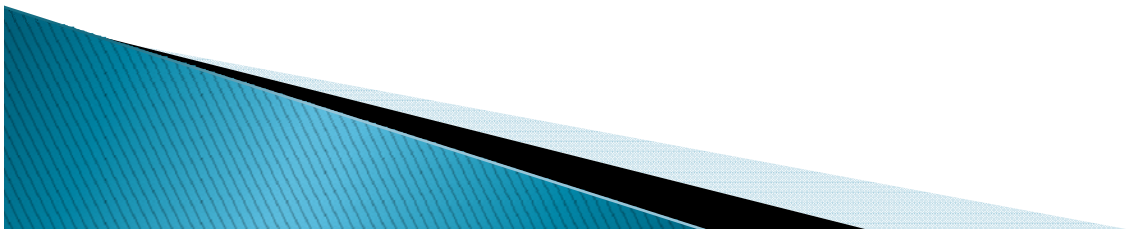
Monitoring Learning Abilities in Children at High Risk

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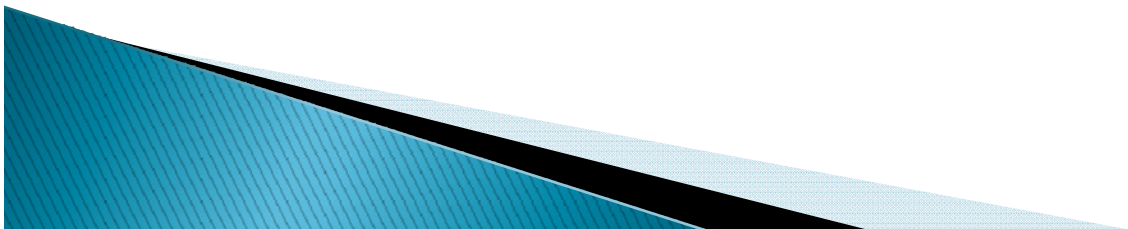
Objectives

- ▶ What are learning abilities and learning disabilities?
- ▶ Who is high risk?
- ▶ Review surveillance, screening, evaluation and intervention in the high risk populations
- ▶ How to monitor for learning abilities



Definition of Learning Ability

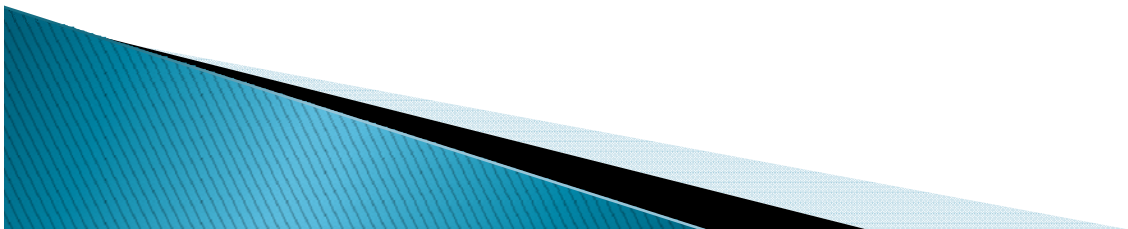
- ▶ “The ability to comprehend; to understand and profit from experience”
 - Comprehend: Sensory input and Attention
 - Understand: Cognitive
 - Profit from: Output
 - Motor output
 - Communication



Learning Disability

- ▶ In individuals with at least average abilities, learning disabilities affect one or more of:
 - acquisition,
 - organization,
 - retention,
 - understanding or
 - use of verbal or nonverbal information
 - learning disabilities are distinct from global intellectual deficiency.

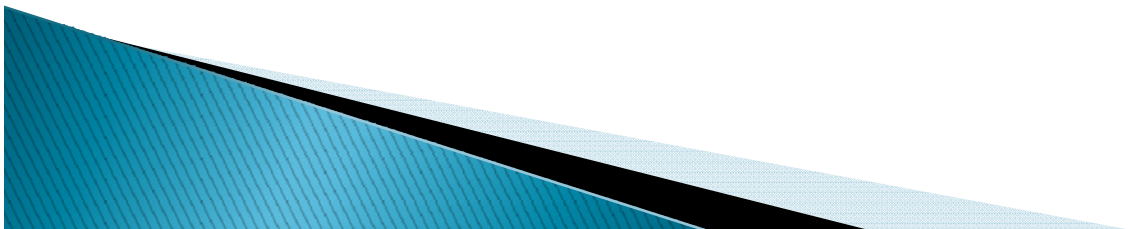
Adapted from Learning Disabilities Association of Canada 2015



Learning Disability

- ▶ Learning disabilities range in severity
- ▶ Interfere with one or more of the following:
 - oral language (e.g. listening, speaking, understanding);
 - reading (e.g. decoding, phonetic knowledge, word recognition, comprehension);
 - written language (e.g. spelling and written expression);
 - mathematics (e.g. computation, problem solving).
- ▶ Learning disabilities may also involve difficulties with organizational skills, social perception, social interaction and perspective taking.

Adapted from Learning Disabilities Association of Canada 2015



Who is High Risk?

	Preterm	Term
Biologic Risk	VLBW SGA Abnormal neuroimaging or exam NICU complications (BPD/ NEC/ROP/sepsis/ A&Bs/jaundice Multiple gestation Congenital anomalies	Encephalopathy Other neurologic problems Complex medical problems Sepsis / meningitis Exchange transfusion for jaundice Multiple gestation Complex congenital anomalies
Interventions	Resuscitation BPD/ postnatal steroids/prolonged ventilation or oxygen Prolonged TPN Surgical NEC	Resuscitation CLD/ postnatal steroids/prolonged ventilation or oxygen Prolonged TPN ECMO
Social / environmental	Low maternal education Teen mother Single mother Low income Drugs/ alcohol Environmental stress	Low maternal education Teen mother Single mother Low income Drugs/ alcohol Environmental stress

Adapted from American Academy of Pediatrics et al. Pediatrics 2004;114:1377-1397

Long term follow up of high risk children: **who, why and how?**

- ▶ Workshop held in Australia, 2011 with health professionals as well as parents of high-risk children.
 - Child variables with different levels of risk:
 - Preterm:
 - High: gestational age <37 weeks;
 - Higher risk – very preterm < 32 weeks;
 - Highest risk - extremely preterm (<28 weeks)
 - Low birth weight:
 - High: birth weight <2500 g;
 - Higher risk – very low birth weight (VLBW; <1500 g);
 - highest risk – extremely low birth weight (ELBW; <1000 g).

Long term follow up of high risk children: **who, why and how?**

▶ Child variables

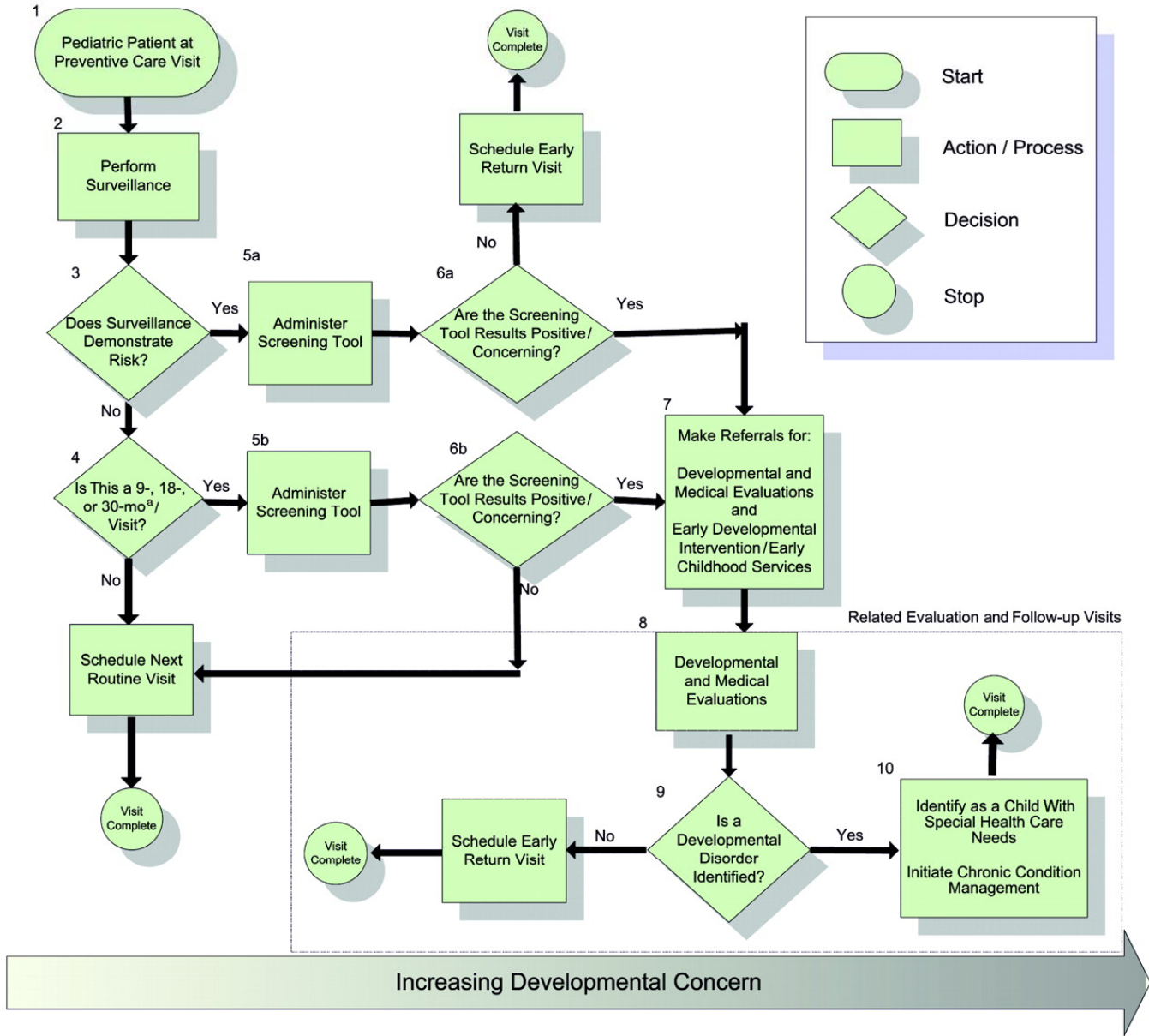
- Neonatal encephalopathy (including seizures),
- Term babies ventilated for >24 hours
- Congenital brain malformations, genetic syndromes or inborn errors of metabolism that affect neurodevelopmental outcomes
- Congenital heart disease
- Failed newborn hearing screening
- Neonatal central nervous system infections – meningitis/encephalitis
- Infants requiring major surgery (brain, cardiac, thoracic or abdominal)
- Hyperbilirubinaemia (bilirubin >400 $\mu\text{mol/l}$ or bilirubin encephalopathy)
- Neurobehavioural abnormalities noted in the newborn period.

Long term follow up of high risk children: **who, why and how?**

- ▶ **Family/environmental variables**
 - High social risk (e.g., domestic violence, previous child abuse, severe poverty or homelessness)
 - Substance abuse by either parent
 - Major psychiatric history in either parent
 - Developmental disability in either parent.

Long term follow up of high risk children: who, **why** and how?

- ▶ Child/parental/family viewpoint
 - clinical service for families
 - -“onus on those who provide neonatal care to high-risk babies to ensure that the baby’s care beyond the nursery is optimised”
 - -information, advocacy and resources
- ▶ Ethical viewpoint
 - Obligation to meet ongoing clinical needs
 - Identify and appreciate long term morbidities
 - Improve outcomes
 - Identify a framework for follow-up
 - To identify causal pathways, and in particular risk and resilience factors.



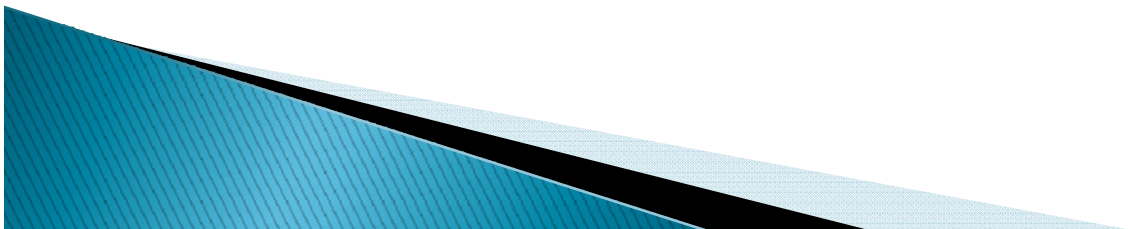
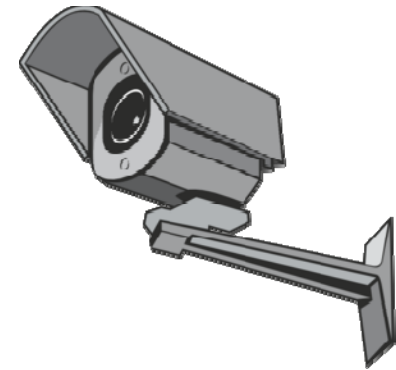
Council on Children With Disabilities et al.
 Pediatrics 2006;118:405-420

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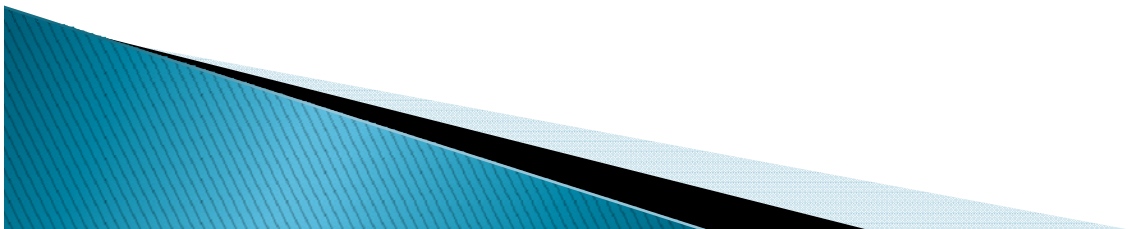
Surveillance, Screening, Evaluation and Intervention

- ▶ Who: All children
- ▶ When: Every well child visit
- ▶ How:
 - Parents concerns
 - Developmental history
 - Observations of development
 - Identify risk factors
 - Document



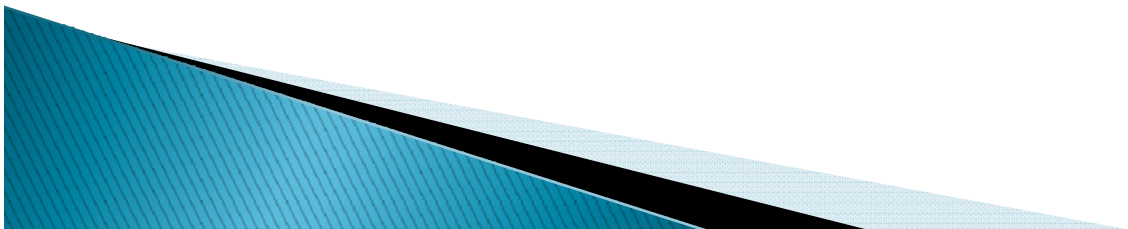
Surveillance, **Screening**, Evaluation and Intervention

- ▶ Who:
 - Children identified through surveillance
 - High risk children
- ▶ When:
 - At standard ages
- ▶ How:
 - Formal developmental evaluation
 - Standardized testing



Surveillance, Screening, **Evaluation** and Intervention

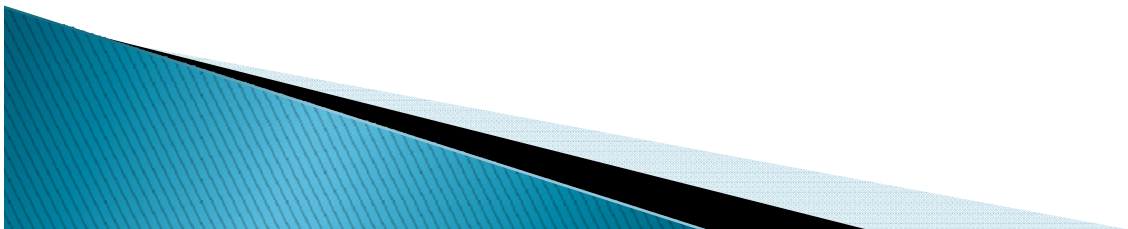
- ▶ Why:
 - Make a diagnosis
- ▶ Who:
 - Children identified through screening
- ▶ When:
 - After being identified by screening
- ▶ How:
 - Formal individualized developmental evaluation



Surveillance, Screening, Evaluation and **Intervention**

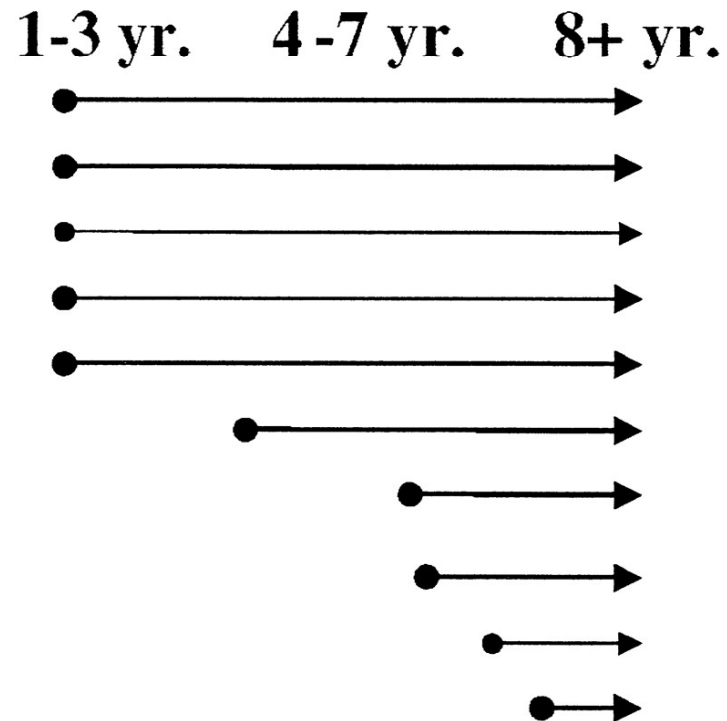
- ▶ Intervention
 - Provide treatment to improve outcome in a diagnosed case as close to home as possible

- ▶ “Early Intervention”
 - Different definitions
 - Is it for “Defined difficulties” vs “risk factors”



Timeline – Child outcomes

- Cognition
- Executive function
- Motor control
- Temperament, Self-Regulation
- Relationship to parent
- Behavior Problems
- Relationship to peers
- Psychopathology
- Antisocial behavior
- School failure



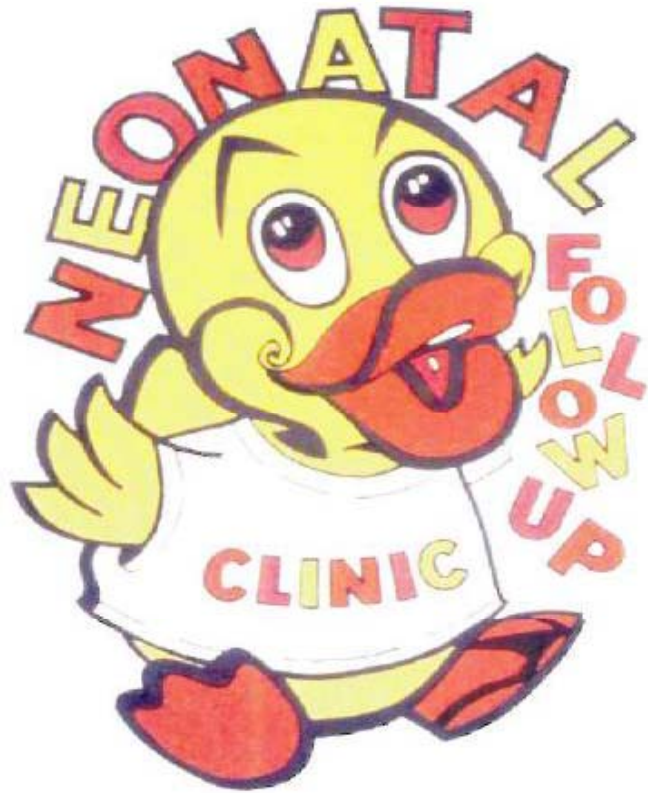
Follow-up Care of High Risk Infants. Pediatrics
2004;114:1377-1397

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Neonatal Follow-up Program, Vancouver

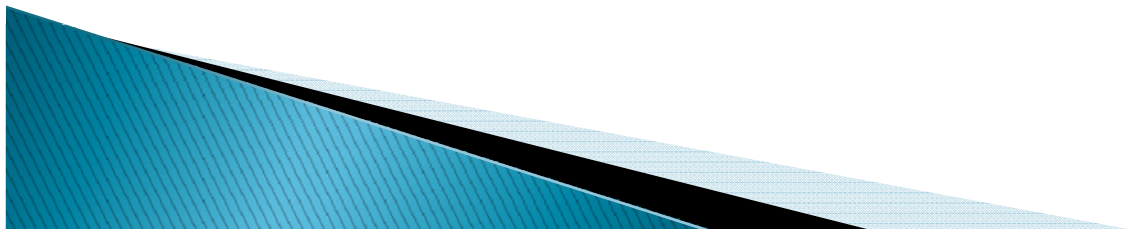
GOALS



1. **Screening** and Clinical Care
2. Audit
3. Research
4. Teaching
5. Cooperate with other programs

Follow-up Schedule

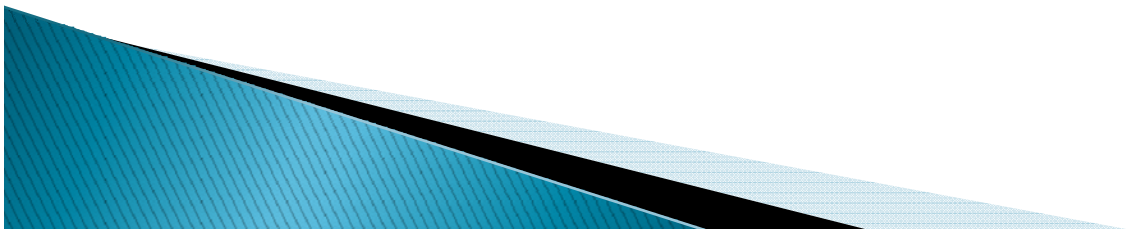
Age	MD/RN	OT/PT	Psych	Speech	Audio
4m	*	*			
8m	*	*			*
18m	*	*			
3y	*	*		*	*
4 1/2	*	*	*	*	



Screening for Learning Abilities

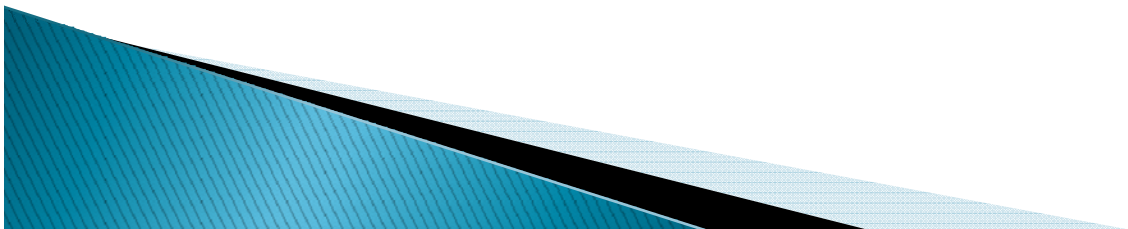
▶ Input:

- Hearing
- Vision
- Motor
- Receptive Language
- **Behaviour**
- Social



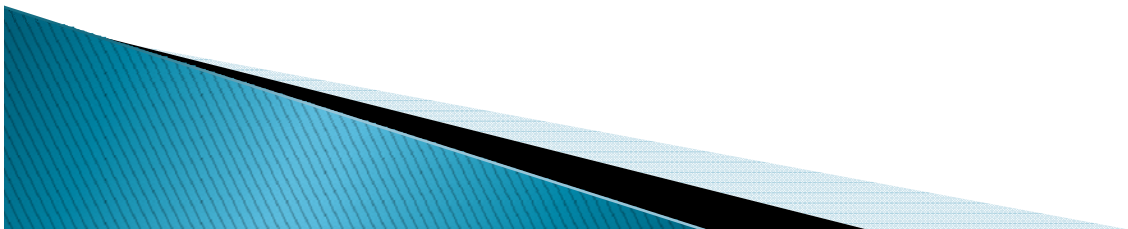
Learning Abilities Assessment

- ▶ Understanding:
 - **Cognitive development (< 3 years)**
 - **Intelligence (age > 3 years)**
 - Verbal and non-verbal aspects



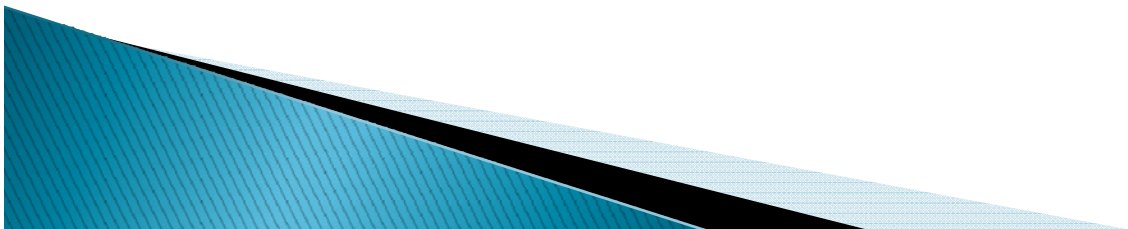
Learning Abilities Assessment

- ▶ Output
 - **Executive function**
 - Gross motor
 - Fine motor
 - Visual-motor functions:
 - visuomotor control,
 - visual perception
 - **visuomotor integration**
 - Language



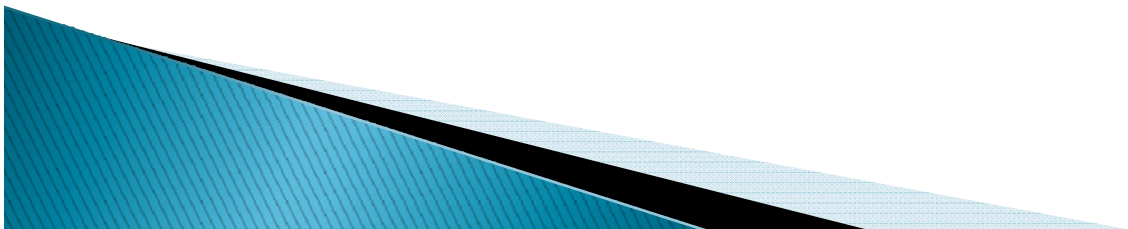
Behaviours

- ▶ Child Behavior Checklist (CBCL 1.5-5 and 6-18)
 - Parent or caregiver completed Questionnaire
 - Diagnostic tool for a variety of behavioral and emotional problems (eg ADHD, oppositional defiant disorder, conduct disorder, childhood depression, separation anxiety, childhood phobia)
 - Externalizing :
 - Acting out, oppositional defiant behavior, conduct disorders, etc
 - Internalizing :
 - Anxiety, depression, etc
 - Total Scores



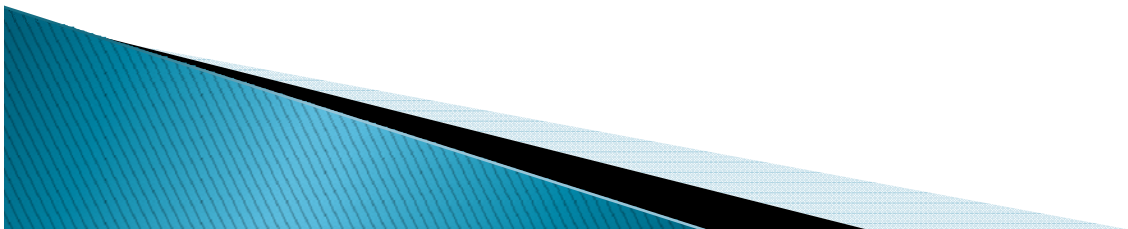
Attention Problems Screening

- ▶ **Diagnosis:**
 - Input from the patient, parents, and teachers.
 - Standard behavioral rating scales:
 - Child Behavior Checklist
 - ADHD Rating Scale IV (ADHD-RS-IV)
 - Conners' Rating Scales age 6-18



Attention Deficit Hyperactivity Disorder

- ▶ Diagnosis and Evaluation
- ▶ Assess for comorbid conditions:
 - Oppositional defiant disorder 67%
 - Conduct disorder 46%
 - Anxiety 44%
 - Developmental coordination disorder 33%
 - Depression 32%
 - Tic disorder 8%
- ▶ Psychoeducational testing for associated learning disabilities.



Cognitive abilities

	< 3 years	3–4 yrs	School Age
Limited Assessment	BINS Ages and Stages questionnaire CAT/CLAMS	K-BIT	WASI
Comprehensive assessment	Bayley-III	WPPSI-IV DAS McCarthy Kaufman-ABC	WISC NEPSY

BINS: Bayley Infant Neurodevelopmental Screener
 CAT/CLAMS: The Capute Scales
 K-BIT: Kaufman Brief Intelligence test
 WPPSI-IV: Wechsler Preschool and Primary Scales of Intelligence
 DAS: Differential Ability Scale
 McCarthy Scales of Children's Abilities
 K-ABC: Kaufman Assessment Battery for Children
 WISC: Wechsler intelligence Scale for Children
 NEPSY: A Developmental NEuroPSYchological Assessment

Adapted from:
 American Academy of Pediatrics et al.
 Follow-up Care of High-risk Infants
 Pediatrics 2004;114:1377-1397

Executive Functions (EFs)

- ▶ Most definitions include notion of an ‘umbrella term’ for a number of higher-order processes needed for goal directed behavior (e.g. Anderson 2002; Huisinga 2006; Lehto 2003; Welsh 1991).
- ▶ Sub-components include but are not limited to:
 - Inhibition
 - Working memory
 - Planning
 - Shifting
 - Fluency

Executive Functions (EFs)

- ▶ “Cognitive control” set of neurocognitive processes that regulate behavior and cognition
- ▶ Develop most rapidly in the preschool years with evidence of adult-level performance achieved during adolescence (Anderson 2002; Zelazo 2003)
- ▶ Linked to school readiness (Blair & Peters 2003)
- ▶ Linked to academic performance (e.g. St. Clair-Thompson & Gathercole 2006)
- ▶ Critical for daily functioning and success

Developmental Test of Visual Motor Integration (VMI)

- ▶ Individually administered, paper-and-pencil test of visual-motor skills
 - Child draws several basic geometric figures
 - Performance on this test involves fine motor development, perceptual discrimination skills, and the ability to integrate perceptual and motor processes
 - Involves both perceptual Input and motor Output. Poor performances on this test may be indicative of perceptual (input) difficulties, fine motor (output) difficulties, and/or problems with integrating these processes



***The Beery-Buktenica
Developmental Test of
Visual-Motor Integration (4th
Edition) (1997)***

Psychoeducational Testing

- ▶ A process which utilizes standardized tests and questionnaires in an effort to identify a child's strengths and weaknesses across many areas of functioning and attributes
- ▶ These areas include but are not limited to:
 - Cognitive Development
 - Academic Achievement
 - Adaptive Functioning
 - Visual Perception
 - Motor Coordination
 - Visual-Motor Integration
 - Behavior (e.g., Attention, Aggression, etc.)
 - Emotion (e.g., Anxiety, Depression, etc.)

Complexity of Development

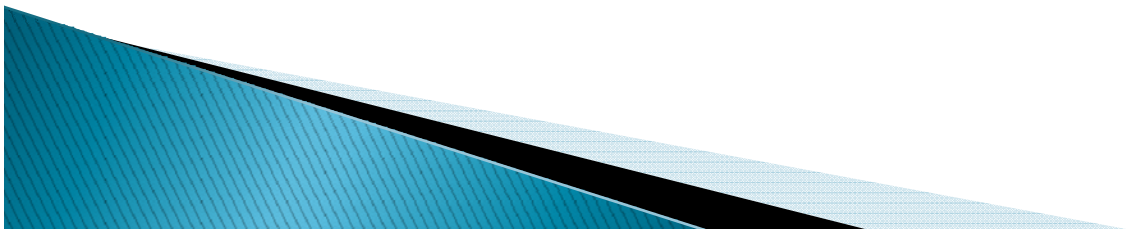


Prematurity: Large Variation of Outcomes

- ▶ Recognize that across time dynamics & constituents of developmental processes
 - NOT static
 - NOT linear
- ▶ Complex interplay of biological vulnerability and psycho-social influence

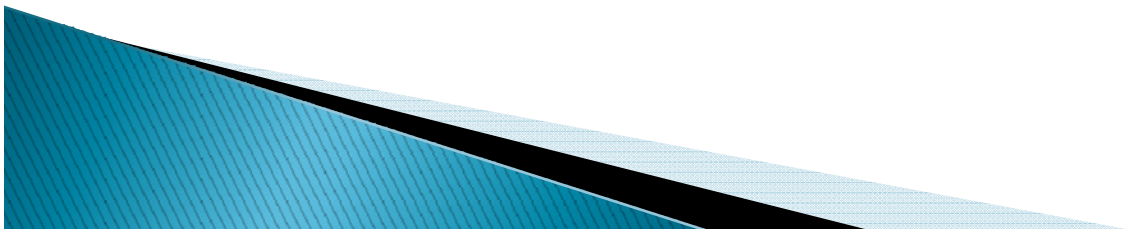
Conclusions

- ▶ Learning abilities and learning disabilities involve:
 - Sensory input and Attention
 - Cognitive
 - Output
- ▶ Risk exists on a spectrum for preterm and term
 - Biologic
 - Interventions
 - Social / environmental



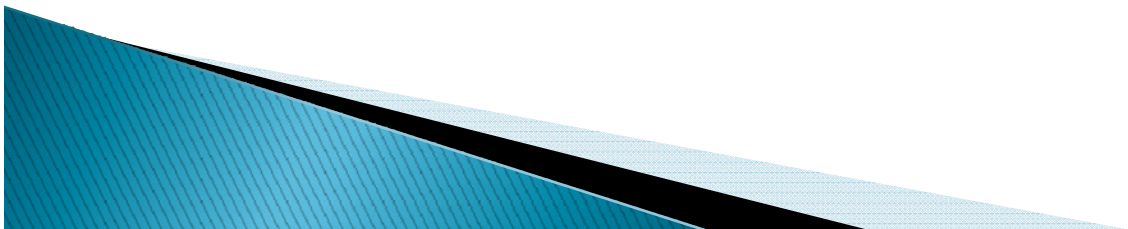
Conclusions

- ▶ **Surveillance**
 - Every well child visit parental concerns, history and developmental observation
- ▶ **Screening**
 - Formal developmental evaluation using standardized testing at standard ages
- ▶ **Evaluation**
 - Formal individualized developmental evaluation



Conclusions

- ▶ How to screen for learning abilities
 - Multidisciplinary team at standard ages
 - Sensory input (vision and hearing)
 - Cognitive < 3 yrs and intelligence > 3 yrs
 - Behaviour and Attention
 - Output (motor and language)





3 1/2 years old---2009



Chloe Beatrice Johnson
Born June 17/05 @ Royal Columbian Hospital
Birth Weight 890 gms
SVD 25 weeks --- 1 hour old



1 month old---2005



K. Maloney

5 years old ---2010



Thank You...



Dr. Julie Petrie