PSYCHOMETRIC
AND BEHAVIOR OBSERVATIONS
TRAINING GUIDE

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Washington State

Fetal Alcohol Syndrome Diagnostic and Prevention Network

(FAS DPN)

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I. Psychometric Assessment at the University of Washington Fetal Alcohol Syndrome Diagnostic and Prevention Network (FAS DPN).

Alcohol acts as a neurobehavioral teratogen with the potential for wide-ranging and individually variable compromise of central nervous system (CNS) function. Reviews of the neurobehavioral effects of heavy prenatal alcohol exposure have focused on deficits in IQ, visuospatial skills and memory, verbal learning and memory, attention, sensory processing and integration, motor abilities, and important deficits in executive functions and language (Carmichael Olson, Morse, & Huffine, 1998; Connor & Streissguth, 1996; Institute of Medicine, 1997; Jirikowic, 2003; Mattson & Riley, 1998; Streissguth, 1997)

Recent consensus takes the viewpoint that individuals with clinically concerning teratogenic effects of prenatal alcohol exposure show an impact of prenatal alcohol exposure in multiple "domains" of neurobehavioral function. Alternatively, they may present with significant global developmental delays or general cognitive impairment (Astley, 2004; CDC, 2004, Chudley et. al., 2005). Cut-offs used to determine what comprises a clinically concerning CNS deficit, either globally or in one or more domains of neurobehavioral function, is typically determined by the experienced judgment of a interdisciplinary team and application of appropriate diagnostic guidelines. While several sets of diagnostic guidelines are being used in the US, Canada, and internationally, the FAS DPN standard is to use the operational definitions laid out in the 4-Digit Diagnostic Code (Astley, 2004). The FAS DPN assessment strategies and behavioral observations described in this guide are designed to support a diagnostic process using the 4-Digit Diagnostic Code standard.

Appropriate assessment strategies for diagnosing fetal alcohol spectrum disorders (FASD) are continually evolving. In this training guide, we offer suggestions for record review and diagnostic assessment by the psychologist, occupational therapist (OT) (or physical therapist), and speech-language pathologist, typical members of an interdisciplinary FASD diagnostic team. We also offer suggestions to guide behavioral observations that can be accomplished during a clinic visit.

The primary goal of the Washington State FAS DPN Clinics is *diagnosis* of FASD and referral to appropriate community-based services for intervention. The assessment strategies described here fit with the model used at the University of Washington interdisciplinary FAS DPN clinic, which is based in a tertiary care setting within a large urban area. These assessment strategies work well to diagnose neurodevelopmental disabilities in the population seeking services at the UW FAS DPN clinic. Experienced clinicians working in an FASD diagnostic clinic in different settings may choose other tools to assess CNS dysfunction, and may create an assessment model that is more comprehensive and time-intensive. In a setting in which individuals only have limited prior test data available, or where the diagnostic clinic also aims to provide more comprehensive diagnosis, care, or ongoing intervention, more comprehensive diagnostic assessment than that described in this guide will be necessary.

I.A. Review of Existing Psychometric Test Data.

The first step in assessment of CNS dysfunction as part of an FASD diagnostic evaluation involves test record review. Typically, at least some test records will be available for patients coming to the diagnostic clinic. Records may come from many sources, including daycares, schools, physicians and psychiatrists, psychological testing, caseworkers, and the legal system. The types of records will vary based on the age of the patient. Records should be reviewed for all available behavioral observations, psychometric data, developmental history, and potential etiologic factors in addition to prenatal alcohol exposure. Relevant scores and data should be transferred to the FASD Diagnostic Form. The FASD Diagnostic Form is a standardized form provided in the Diagnostic Guide for FASD: The 4-Digit Diagnostic Code (Astley, 2004).

The FASD Diagnostic Form guides the interdisciplinary clinical team in the collection, recording, and interpretation of all key information used to derive accurate and precise diagnoses across the full spectrum of outcomes.

Prior assessment data are less likely to be available for young children, who are often referred for diagnosis due to concerns about the mother's drinking rather than because of developmental concerns about the child. When information is available, it may consist of the results of developmental screening or more complete assessment of mental, sensory-motor, motor, and communication skills. Standardized reports of adaptive behavior from a reliable informant may be available, and there are usually care providers (e.g., foster parents, daycare providers, visiting nurses, early interventionists) who can offer informed observations when carefully interviewed. Some governmental or other agencies may have Early Periodic Screening, Diagnosis, and Treatment (EPSDT) screening data for young children, or may have compiled all available health and developmental information for young children in foster care or adoption systems (e.g., as in a Foster Care Passport), and these may be important sources of information.

School-aged patients may have been tested in the schools or a mental health setting. There will often be some form of academic testing or a series of report cards available. Many times IQ test scores or behavior problem checklists completed by parents and/or teachers will be found in the records. School-based multidisciplinary team assessment information may be available, including cognitive, academic, speech/language, occupational therapy, and/or physical therapy evaluations. Sometimes data will include DSM-III-R or DSM-IV diagnoses, or mental health/behavioral information available from primary care providers. Occasionally there may be results from adaptive behavior or neuropsychological assessment.

For adult patients, reports and records will typically come from past and present mental health settings, although there may also be past school records. There may be psychological evaluations, personality testing, and DSM-III-R or DSM-IV diagnoses. In the UW FAS DPN clinic setting, adults are only seen if a recent, valid, full neuropsychological assessment has been carried out. This provides comprehensive data on neurobehavioral function and assures that other explanations for CNS dysfunction that may occur for adults (such as secondary cognitive impairment due to a history of any head injury or the adult's own substance abuse) will have been considered by an appropriately trained professional.

I.B. Assessment on the Day of the Diagnostic Evaluation.

In an FAS DPN diagnostic clinic setting, the primary purpose for test record review and screening by the psychologist, OT, and SLP during the diagnostic evaluation is to document the degree and types of CNS dysfunction across multiple domains. Given the brief nature of assessment in many FASD diagnostic clinic settings, assessment of CNS dysfunction on the day of the diagnostic is unlikely to be comprehensive. The diagnostic evaluation of a patient in a Washington State FAS DPN clinic is typically 4-5 hours in duration. A detailed description of a typical FAS DPN diagnostic evaluation is presented in Clarren et. al (2000). Testing is carried out during the clinic day to support the process of making a diagnosis. These screening results supplement existing test data, and can be used to determine if a more complete evaluation is needed and to guide referrals for further assessment and intervention.

Prenatal alcohol exposure can cause structural, neurological and/or functional impairment of the CNS. Structural and neurological damage may include, but is not limited to microcephaly, abnormal structure documented on brain images and/or a seizure disorder of prenatal origin.

However, even in cases where there is clear evidence of structural or neurological damage to the CNS, psychometric assessment by the psychologist, OT, and SLP team members during the clinic day should still

be carried out. An understanding of FASD requires careful evaluation to assess multiple domains of neurobehavioral and academic function, determine levels of performance, guide referrals, and develop intervention recommendations. In fact, a 4-Digit Diagnostic Code can only be fully determined if there are appropriate psychometric data available to the diagnostic team.

The specific assessments used by each diagnostic clinic may vary based on the preferences of the clinicians and the clinic model. Testing should be performed by qualified professionals in disciplines appropriate to the patient's needs. For example, a psychologist can assess cognitive and neuropsychological status (e.g., attention, memory, learning, executive function), academic achievement, adaptive behavior, and behavior problems and social competence An occupational therapist can provide assessment of neuromotor, sensory processing and sensory-motor foundational skills, and can make observations of behavioral regulation, functional play, social, fine and gross motor skills. A speech-language pathologist may assess speech/language skills, including both receptive and expressive language, or evaluate social communication and the interface between cognition, social skill, and language. For young children, a psychologist and/or OT can evaluate developmental status. Psychologists, occupational therapists, physical therapists, speech-language pathologists, and psychiatrists can all participate in assessment of CNS dysfunction in FASD clinics.

As the literature on FASD evolves, more data are becoming available to empirically guide the choice of assessment tools. At the cutting edge of the field are studies that are conducting both psychometric testing and neuroimaging/spectroscopy research of individuals with clearly diagnosed FASD. These studies promise to provide information about useful psychometric tools and structural, functional, and neurochemical evidence of CNS dysfunction and damage among individuals exposed to alcohol before birth. At this point in evolution of the field, the best guide to the choice of assessment tools is the collective experience of the team clinicians and consideration of the empirical data in the field to date.

Table 1 provides an overview tests that, in our experience, can be useful in assessment of CNS dysfunction during an FASD diagnostic evaluation. These tests are described below. Further examples of tests that are widely used to assess brain function are presented in Appendix 3 of the Canadian FASD Diagnostic Guidelines (Chudley et. al., 2005). While the approach to assessment used here examines function across multiple domains, instruments have been chosen that are both clinically valid and targeted to areas likely to be impacted by prenatal alcohol exposure. Yet, it is important to note that deficits revealed by testing with these instruments may be the result of multiple factors, only one of which may be the impact of prenatal alcohol exposure. It is always essential to remember that the goal of brief assessment in the diagnostic clinic setting is to document the degree and types of CNS dysfunction and to examine whether there are deficits across multiple neurobehavioral domains or global delay/cognitive impairment.

Table 1. Standardized psychometric tests and caregiver report tools typically used in the Washington State FAS DPN clinics for assessment of central nervous system dysfunction.

Domain Assessed, Name of Test Instrument	Age Range in Years;Months
Neurological and Sensory-Motor Status	
Quick Neurological Screening Test 2nd Edition (QNST-II)	5 - 18+
Sensory Profile (short or long form)	3 - 10
Adaptive Behavior Status/Behavior & Social Competence	
Youth Self Report	11 - 18
Vineland Adaptive Behavior Scales (VABS)	0 to 18 or low-functioning adult
Child Behavior Checklist (CBCL) 2-3 or 4-18 parent report versions	2 - 18
Young Adult Self Report (YASR) and Young Adult Behavior Checklist (parent report version)	18 - 30
Neuropsychological Status/Drawing Tasks	
Behavior Rating Inventory of Executive Functioning (BRIEF)	5 - 18
Beery-Buktenica Developmental Tests of Visuomotor Integration (VMI)	2 - 18
Rey Complex Figure Test (REY)	6 - adult
California Verbal Learning Test (CVLT: for adults, CVLT-C: for children)	5 - adult
Wide Range Assessment of Memory and Learning-Screening Form (WRAML-S)	5;0 - 17;11
A Developmental Neuropsychological Assessment (NEPSY)	3 - 12
Delis-Kaplan Executive Function Scale (D-KEFS)	8 - 89
Wisconsin Card Sorting Test (WCST)	6;6 - adult
Integrated Visual and Auditory Continuous Performance Test (IVA+Plus)	5 - adult
Language	
Test of Auditory Comprehension of Language-Third Edition (TACL-3)	3;0 to 9;11
Test of Language Competency-Expanded Edition (TLC-Expanded)	5 to 9; 10 to 18
Test of Word Knowledge (TOWK)	5 to 17
Clinical Evaluation of Language Fundamentals (Preschool, CELF-3)	preschool to 21
Developmental Status	
Bayley Infant Neurodevelopmental Screener (BINS)	3 months to 2
Bayley Scales of Infant Development-Second Edition (BSID-2)	16 days to 3;6
Miller Assessment for Preschoolers (MAP)	2;9 to 5;8
Intellectual / Academic Status	
Wechsler Intelligence Scale for Children-4 (WISC-4)	6 to 16
Wide Range Achievement Test-3 (WRAT-3)	5 to adult
Wechsler Individual Achievement Test-Second Edition (WIAT-II)	4 to adult
KeyMath-Revised/NU Diagnostic Inventory of Essential Mathematics-Normative Update	5 to 22

The tests listed above should be administered by trained clinicians and supplemented by careful behavioral observations. The use of these tests should be subject to experienced clinical judgment. Not all tests will be given to each patient. These tests cover the age range of patients generally seen in a FASD Diagnostic Clinic. Tests for brain function are regularly updated and the most current versions should be used where appropriate.

NOTE: This section is organized according to the order of tests in Table 1.

Neurological, Motor and Sensory-Motor Status. Evaluation of the child's neurological, motor, and sensory-processing status is important in documenting CNS dysfunction. Children prenatally exposed to alcohol may show a range of problems in these areas. Screening for the presence of neurological "soft signs," sensory processing problems, and fine and gross motor deficits are part of the FASD diagnostic process. This is especially important for toddlers, preschoolers, and school-aged children. Brief assessment using the tools described below can supplement testing that has already been completed by a school district or clinic, or provide evidence that further assessment should be performed. Testing with the instruments listed below should be supplemented with careful observations of qualitative motor performance.

- **Quick Neurological Screening Test-II (QNST-II)**. In the FAS DPN clinics, the QNST-II has been a useful measure for documenting soft neurological signs. It consists of 15 items adapted from pediatric neurologic and neuropsychological examinations that sample fine and gross motor coordination, balance and vestibular function, visual and auditory perceptual skills, motor planning and sequencing, and spatial organization. Items on the QNST-II are presumed to be indicators of neurological maturation or integrity. The QNST-II classifies children's performance into categories of "normal," "moderate discrepancy," or "severe discrepancy" in terms of the presence of neurological soft signs that may be suggestive of neurological or developmental dysfunction. The final classification is evaluated in terms of how a child scores according to clinically-established cut-off scores.

  This screening tool takes about 20 minutes to administer, is used as a guide for clinical observations, and is best suited for descriptive purposes. The QNST-II, which can be used for patients 5 to 18 years, is most successfully employed with children aged 8 to 14. It is important to use this test with caution, especially with children aged 5 through 7, as the psychometric data supporting this tool have limitations and children with typical development may also show signs of neurological immaturity. The QNST-II should not be employed as the only measure of a child's neurological status. The QNST-II is most useful if administered by an occupational/physical therapist, but can be administered by other qualified staff that undertake the training described in the QNST-II manual. A videotape that demonstrates test administration is also available from the publishers. In the University of Washington FAS DPN clinic, most patients are administered the QNST, and all have neurological status evaluated by an experienced pediatrician.

  Children with FASD tend to demonstrate a higher prevalence of neurological soft signs in comparison to children with typical development (Jirikowic, 2003). In a study that compared 5 to 8 year-old children with FASD to a group of matched peers with typical development, most children with FASD were classified in the moderate discrepancy category (80%), which indicated that this clinical group of children with FASD did not demonstrate severe, distinct neurological or motor impairments, but rather one or more subtle symptoms indicative of immature or qualitatively poor neuromotor performance (e.g. difficulty with balance, the inability to smoothly coordinate fine motor movements, poor or irregular figure copying, etc.). It is also important to note that a group of children with typical development (28%) in this study were also classified in the moderate discrepancy category, which suggests that neurological or developmental immaturities are not unique to children with FASD, and that clinical judgment is critical to interpreting results of this measure.

- **Short Sensory Profile (SSP)** The SSP (Dunn, 1999) measures a caregiver's report of behaviors related to sensory processing and integration. The SSP is a standardized questionnaire of sensory processing abilities for children ages 3 to 10 years.[1] The SSP consists of seven sections that measure

the following domains of sensory processing: 1) Tactile Sensitivity, 2) Taste/Smell Sensitivity, 3) Movement Sensitivity, 4) Under-responsive /Seeks Sensation, 5) Auditory Filtering, 5) Low Energy/Weak, and 7) Visual/Auditory Sensitivity. This questionnaire takes about 15 minutes to complete and can be filled out the day of the clinic visit. Results for the total score and each section are classified in the categories of "normal", "probable difference" and definite difference" based on clinical cut-offs. For children under 3 years of age the Infant Toddler Sensory Profile may be used. For patients 12 and older the Adolescent/Adult Sensory Profile may be used, which is a self-report. Both tools are best suited for descriptive purposes.

The long form of the Sensory Profile may also be used for a more comprehensive assessment of sensory processing, however, it is suggested that this form be sent to the caregiver ahead of time due to the length of the tool and the extra time needed to complete it. Information from the SSP can provide insight into the child's adaptive and behavior difficulties, as well as the child's regulatory and coping abilities from a sensory integration perspective. Results of the Sensory Profile should be interpreted by a qualified clinician. If this history suggests concerns, referral for further occupational therapy assessment would be appropriate.

Sensory processing is an important area to evaluate. In a study of children with FASD and a matched group of children with typical development ages 5 through 8 years of age, 88% of children with FASD were classified as having probable or definite differences on the SSP (Jirikowic, 2003). Children with FASD performed significantly more poorly on subsections measuring tactile sensitivity, auditory filtering, visual/auditory sensitivity and under-responsivity/seeks sensation when compared to matched peers with typical development. However, in this study, an elevated percentage (30%) of children with typical development also demonstrated probable and definite sensory processing differences, thus careful interpretation of sensory profile results, particularly the short form, in a diagnostic setting is warranted.

Adaptive Behavior Assessment *(Caregiver Report)*. Assessment of adaptive behavior and functional skills (including play skills in young children) are important in an FASD diagnostic evaluation. An adaptive behavior assessment is critical for very young children (especially if other data are not available). It is ideal to obtain an adaptive behavior assessment for diagnostic clinic patients of any age. Clinical experience in the FAS DPN suggests that obtaining information on adaptive behavior through caregiver interview, instead of through a caregiver checklist, is most helpful. At times the important issue is how a patient carries out an activity (which can be quite atypical in this population) rather than whether or not the activity can be accomplished. Interviewers can also learn whether the parent even offers the child a chance to perform certain functional skills; at times, parents may appropriately protect a child with FASD from the consequences of mistakes by simply performing a functional skill for the child. This qualitative information, which helps the diagnostician more fully understand the patient's behavioral style and actual ability to function in the world, is best obtained via an interview format. In the FAS DPN clinic, these interviews can be done over the phone before the patient comes in if needed, and can be administered to parents, daycare providers, and/or early interventionists as time permits to understand the child's behavior from multiple perspectives.

- **Vineland Adaptive Behavior Scales (VABS)**. The VABS taps functioning in the communication, self-help, and socialization domains, and also evaluates maladaptive behavior. The VABS is a psychometrically valid, standardized caregiver interview that appears well suited for use with alcohol-affected individuals. The VABS can be used with patients aged birth to adulthood. Administering the VABS requires careful advance study of the manual, some practice interviewing,

and careful use of the scoring appendix during administration of the interview. The VABS has several versions. The "summary version" is recommended for clinic use, and involves a standardized interview of the primary caregiver,[1] which generally takes from 20 to 60 minutes. Scoring can be done by hand, requires about 10-15 minutes, and generates three sub-domain scaled scores and one composite scaled score. One major study used the VABS with individuals diagnosed with FAS/FAE, aged 3 to 51. Findings indicated that patients' VABS adaptive behavior scores were low relative to their respective IQ levels. In fact, the relative deficit between IQ and adaptive behavior scores was greater than patients' shortfalls (relative to IQ) in academic achievement, regardless of whether the patients' diagnosis was that of FAS or the clinical label of FAE (Streissguth et al., 2004) In the diagnostic process, it is of interest to examine the IQ and VABS scores to see if a discrepancy exists between those scores.

- **Child Behavior Checklist.** The family of tools arising from the well-standardized Child Behavior Checklist can be used to gain an objective report of the patient's behavioral function. Versions are available for patients aged 2 to 30 years, and for different informants (parent, teacher, child). [2] For young children, there is a CBCL/2-3 parent report form which asks the caregiver to indicate the presence and frequency of a number of types of behavior problems that a toddler or preschooler may show. For children aged 4 to 18, there are several versions of the checklist, including a parent report form (CBCL/4-18), a teacher report form (CBCL-TRF), and (for 11 to 18 years old) a youth self report form (CBCL-YRF). The parent report and youth self report forms provide information on both the presence and frequency of many types of internalizing and externalizing behavior problems, and on social competence. For patients aged 18 years and older, there is also a Young Adult Self-Report (YASR) and a Young Adult Behavior Checklist (a parent report) that include information about substance use as well as other behavioral issues in adulthood. These parent report or youth/adult self-report questionnaires can be completed prior to the clinic day or during a waiting period in the diagnostic clinic visit. They typically take about 20 minutes apiece. Scoring can be accomplished using a computer-scoring program, which generates several problem and social competence scaled scores. In the FAS DPN diagnostic clinic at the University of Washington, appropriate parent and youth self report versions of the Child Behavior Checklist are given to all patients. (There is also versions of the Child Behavior Checklist for teachers called the Teacher Report Form (TRF) or childcare providers (CRF), which could be mailed out to teachers or childcare providers before a clinic visit.)

Brief Neuropsychological Assessment for Screening Purposes. Based on research data and clinical experience, neuropsychological instruments appear of value in documenting evidence of CNS dysfunction in a population with FASD. There is a growing literature that will help clinicians select tools based on empirical guidance as time goes on. The following tools have good psychometric validity. Measures discussed below tap combinations of skills that may be especially difficult for individuals impacted by the teratogenic effects of alcohol. Assessment needs and time constraints will dictate whether neuropsychological measures can be administered during a clinic day. In the FAS DPN clinic at the University of Washington, a combination of the VMI, REY, and (the CVLT-C (or CVLT for adults) and (when time allows and there is an appropriate reason) D-KEFS subtests and/or the IVA+Plus are often given for screening purposes for patients of the appropriate age range and functional level for these instruments and their norms.

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1 The validity of any caregiver interview rests on the caregiver's degree of knowledge about the patient, and the caregiver's level of competence.

2 The validity of any caregiver interview rests on the caregiver's degree of knowledge about the patient, and level of competence.

- **Behavior Rating Inventory of Executive Functioning (BRIEF)**. The BRIEF is a checklist useful in evaluating children aged 5 to 18 years with a wide range of developmental and acquired neurological conditions. The BRIEF has been used in a recent collaborative study of intervention for children with FASD, and is a questionnaire that parents comment on as relevant to concerns about their alcohol-exposed children. The BRIEF provides a report of child/adolescent behaviors in the home and school environments that measure aspects of executive functioning. These behaviors include those that reflect the child/adolescent's ability to inhibit, shift activities and behaviors, show emotional control, initiate activities, and show what is called "working memory" (the ability to mentally manipulate and reformulate information while holding it in memory). These behaviors also include children/adolescents' ability to plan, organize school or home materials, and monitor the quality of their own activities and schoolwork. The BRIEF generates an Executive Composite Score and two summary indexes (Behavioral Regulation Index and Metacognitive Index), and scores on individual component scales. There are two BRIEF rating forms (Parent and Teacher versions) designed to assess executive functioning in the home and school environments. Each form takes about 10 to 15 minutes to complete.

- **Beery-Buktenica Developmental Tests of Visuomotor Integration-5th edition (VMI)**. The VMI-provides information on visuomotor integration and visual-spatial skills for patients aged 2 to 18 years. The VMI has good psychometric data. A series of progressively more complex designs are presented to the child, who is asked to copy them. The VMI offers a fairly structured task situation. The VMI takes about 5-15 minutes to administer, depending on the patient's age and behavioral style. The VMI is easy to score, is scored by hand, and provides an opportunity for relevant clinical observations of fine motor function. The VMI also provides separate tasks to briefly assess the separate domains of motor function and visual perceptual abilities, which may take an additional 5 to 10 minutes to administer if time permits.

- **Rey Complex Figure Test (REY)**. The REY is a drawing test that can quickly provide data on visual memory, visuomotor and visual-spatial skills, as well as on the patient's ability to organize his/her behavior toward a complex goal. This tool has good psychometric data, and is useful with patients aged about 6 years and older. A complicated figure is presented to the patient, who is asked to copy it, then to draw it from memory after a short and long delay, and later to identify parts of the figure that appear familiar to them. Information on interpretation is given in the manual. Watching the patient carry out the REY drawing provides critical assessment information. Administering both the VMI and the REY to patients up to about age 18 can allow clinicians to evaluate the impact of low and high structure on patient performance. Both the VMI and REY are visuomotor tasks, but the REY provides much less structure. Based on clinical experience, it is feasible to administer the copy task and the immediate recall task during a clinic day; (when possible, the delayed recall and recognition tasks can also be administered). Administering the REY generally requires up to 15 minutes (for the first two tasks and the 3-minute interim waiting period during which a verbal task is administered); for the final two tasks, another 15 minutes or so is then required after a 30-minute delay period. If clinical judgment suggests it is appropriate, it can be useful to show the patient's results on the REY, when talking with the caregiver, to demonstrate to the caregiver the patient's difficulties with organization and memory. The REY has been used with patients with FAS, and seems to be a useful tool to document deficits that occur in this population (Coles, et al, 1997).

- **California Verbal Learning Test (CVLT (for adults) CVLT-C (for children))**. The Children's Version (CVLT-C) of the well-validated California Verbal Learning Test provides information about verbal learning and memory for patients 5 years and older. While there is an adult version of the

California Verbal Learning Test, applicable for ages 17-80, the children's version will most often be used in the diagnostic clinic. The CVLT-C generates scores in the following categories: level of recall and contrast scores, learning characteristics, recall errors (perseverations and intrusions), recognition measures and a contrast score, and measures of false positives and response bias. Administration of the test requires about 20 minutes, followed by a 30-minute waiting period and several long-delay trials that take about 15 additional minutes. Although hand-scoring instructions are available, scoring really requires the computer-scoring program. The manual provides important information for interpretation of patterns of test results. Briefly reported in the CVLT-C manual are data about the use of the test with a small sample of patients with FAS that can be carefully studied. One recent research study found that the patients with FAS had multiple memory deficits when assessed with the CVLT-C (Mattson, et al, 1996).

- **Wide Range Assessment of Memory and Learning-Screening Form (WRAML-S).** At times, the combination of the VMI, CVLT-C, and REY often given in the University of Washington FAS DPN clinic will be too difficult for a patient aged 5 to 9 years. This may be because of the patient's high distractibility or limited cognitive functioning. In those situations, it can be useful to administer the WRAML Screening Form (WRAML-S) in addition to the VMI. The WRAML-S is a neuropsychological screening test comprised of four WRAML subtests which, taken together, provide rich qualitative data about the attention, verbal and nonverbal memory, and organizational abilities of the young patient. The WRAML-S generates a single scaled score, which quantitatively captures the degree of the child's impairment in memory and learning. Individual subtest scores are also available.

- **A Developmental Neuropsychological Assessment (NEPSY).** The NEPSY is a newly-developed and comprehensive battery of neuropsychological tests designed for use with children aged 3 to 12 years. Selected NEPSY subtests, such as List Learning, Narrative Memory, Tower, Statue, Auditory Attention & Response Set, Comprehension of Instructions (or others), can be administered to provide evidence of CNS dysfunction. Tests from the NEPSY assess skills in the core areas of language, attention/executive functions, visuospatial processing, memory/learning, and sensorimotor function. Selection of appropriate subtests should be based on judgment of an experienced clinician and specific needs of the child. Both individual test scores and core domain scores can be generated. Data in the NEPSY manual show that children with FAS perform significantly more poorly, compared to typically developing controls, on all core domains of the NEPSY except sensorimotor function (Korkman, Kirk & Kemp, 1998).

  However, in younger children it may be important to assess sensorimotor function. One recent study indicated that 5-8 year old children with FASD performed significantly more poorly on the sensorimotor and visualspatial processing core domains than a matched group of children with typical development and that the sensorimotor domain discriminated between these two groups of children (Jirikowic, 2003). Children with FASD performed most poorly on the visual-motor tasks of visual-motor precision and design copying.

- **Delis-Kaplan Executive Function Scale (D-KEFS)**. Executive functioning is a broad domain of cognitive function that includes a wide variety of higher-level cognitive and problem-solving skills, such as strategic planning, working memory, behavioral organization, the ability to inhibit responses, and other skills. This domain of cognitive functioning is usually assessed during the school-age years (e.g., starting around age 8) and beyond. A battery of tests are needed to assess aspects of executive functioning, and the D-KEFS is a published battery of re-normed, updated, classic tasks that assess

key components of executive functions within verbal and spatial modalities. The D-KEFS provides administrative flexibility in test selection, so that an examiner can choose one or more subtests to investigate aspects of executive function appropriate to the purpose of assessment. Subtests acquiring a track record in study of the neuropsychological characteristics of individuals with FASD include the following: (1) Trail-Making: This well-known pencil-and-paper task assesses planning, organization, sequencing, motor speed, and flexible thinking skills. (2) Verbal Fluency: This spoken test evaluates an individual's ability to access verbal information in a phonemic format (words beginning with a specific letter) and semantic format (over-learned information to be recalled in categories), and to make shifts between categories. (3) Color-Word Interference Test: This test typically measures inhibition and cognitive flexibility, and is comprised of four conditions. (4) Tower: This puzzle-like test evaluates the ability to follow rules, plan ahead, perform visual-spatial problem solving, and inhibit impulsive and perseverative responding. The ability to tolerate frustration is also assessed with this task. The D-KEFS is appropriate for individuals from age 8 years through adulthood (age 89).

- **Wisconsin Card Sorting Test (WCST)**. Useful for patients aged 6 years, 5 months to adulthood, the WCST is a concept identification task and neuropsychological test of presumed frontal dysfunction that assesses the ability to abstract information and shift attentional set. It is a classic category-sorting test in which four criterion cards are presented that vary on three parameters: color, form (shape), and number of items. The patient must abstract the rules of the test given feedback only about whether each sorting choice s/he makes is right or wrong. Among other issues, the WCST provides information about the patient's abstract problem-solving skills and tendency to perseverate. Scoring approaches generate several scores depending on the scoring methods that are selected. Computerized versions are the most useful for clinic settings because they can be quickly scored and administered without error.

- **Integrated Visual and Auditory Continuous Performance Test (IVA+PLUS)**. The IVA+Plus is a computerized continuous performance task that has been used in research on children and adolescents with FASD. On the IVA, a child/adolescent must attend to a computer for a period of 13 minutes, watching and listening for specific target stimuli. To carry out this task, the child/adolescent must sustain attention for a relatively long period of time, which allows assessment of the child/adolescent's ability to stay focused and attentive, and to control impulsive responses, in response to both visual and auditory stimuli. The child/adolescent's activity level (called "hyperactivity") is captured in a very specific way by tracking off-task behaviors with the computer mouse, such as clicking during instructions, anticipatory clicks, and over-clicking when responding to stimuli. The IVA generates a profile of scores, including measures of response control and attention in both auditory and visual modalities. Six aspects of attention are assessed, three in each of two categories, in both the auditory and visual modalities: Response Control (response inhibition/impulse control, ability to stay on task, and ability to maintain effort over time) and Attention (ability to remain alert, ability to remain focused, and mental processing speed).

Language Assessment of language includes screening of receptive and expressive language appropriate to the child's developmental level. Specific subtests used in the FAS DPN diagnostic clinic are described below.

In addition, testing of social-communicative competence and social cognition has been reported as useful for individuals with FASD. Specifically, assessment of the structure and content of narratives (Coggins, Friet, & Morgan,1998), "false beliefs" (which tap whether a patient can understand the perspective of another), and

more abstract linguistic tasks (such as using and understanding conjunctions) have so far been identified as useful areas to assess. This is a rapidly evolving field of study, with a theoretical framework that has been discussed by researchers in the field of FASD (Coggins et al., 2003).

- **Test of Auditory Comprehension of Language-Third Edition (TACL-3).** This test battery measures receptive spoken vocabulary, grammar, and syntax. There are three subtests that assess a child's ability to understand vocabulary, grammatical morphemes, and elaborated phrases and sentences. There administrative flexibility so that individual subtests can be given depending on assessment needs. The TACL-3 Elaborated Phrases and Sentences subtest has been useful in the FAS DPN clinic setting and in research on FASD.

- **Test of Language Competence (TLC)**. The TLC is a standardized language battery that measures metalinguistic, higher-level language functions. The entire battery takes about an hour, but there is administrative flexibility allowing individual subtests to be given depending on the purpose of the assessment. The TLC Oral Expression: Recreating Sentences subtest has been useful in the FAS DPN clinic setting and in research on FASD. This subtest presents a relatively unstructured task in which a child/adolescent must combine words into sentences. The child/adolescent is given three words and a picture, and must create a sentence about the picture using all three words.

- **Test of Word Knowledge (TOWK)**. The TOWK is a standardized language battery with a variety of tasks assessing knowledge of figurative language, multiple meanings, conjunctions and transitions words, receptive and expressive vocabulary, and more. Used for ages 5 through 17 years, there is administrative flexibility so subtests can be given individually depending on the assessment purpose. In the FAS DPN, and in research on individuals with FASD, the Conjunctions and Transition Words task has been useful. In this subtest, a child/adolescent reads and hears read aloud a paragraph in which one word or conjunction is missing, and chooses a word or phrase from among four choices to fill in the blank. This assesses "higher-level" school-age language.

- **Clinical Evaluation of Language Fundamentals (CELF-P, CELF-3)** The CELF-3 is designed to identify students in grades K-12 who lack the basic foundation of form and content that characterize mature language use: word meanings, word and sentence structure, and recall and retrieval of meaning language structures. The CELF-P evaluates a broad range of language skills such as linguistic concepts, formulating sentences, following directions, and listening to paragraphs.

Other Non-Computerized and Computerized Neuropsychological Assessment Measures Useful on the Day of a Clinic Visit. It can be worthwhile to perform additional neuropsychological assessment of several domains found to be problematic in studies of alcohol-affected patients; some of these include other aspects of executive functioning, spatial memory, auditory memory, and auditory/visual attention-- especially under different levels of distraction and difficulty. There are a wide variety of measures that may be useful in assessing these cognitive domains, and efficiency of a patient's information processing. Recent discussion has highlighted both non-computerized and computerized assessment instruments. Tests with potential clinical utility (that do not require computer equipment) include: the Cognitive Estimation Test, the Auditory Process Training measure, the Word Attack subtest from the Woodcock Oral Reading Mastery Tests, the Progressive Planning Test, the Children's Memory Scale, and the Wechsler Memory Scale. The following computer-administered tests (or similar measures) have been used in studies of school-aged or older patients with FAS, and can be considered for evaluation during an FAS DPN diagnostic clinic day: Continuous performance tasks other than the IVA+Plus, the Stepping Stone Maze, and the Spatial-Visual Reasoning Test (Carmichael Olson, et, al, 1998). Measures such as the WCST are also available in hand-administered and

other types of computerized versions. Using these kinds of tests will add considerably to the amount of time the patient spends in assessment, and some of these tools provide only research norms. Again, it should be noted that for adults it is FAS DPN procedure to require a full, valid, recent neuropsychological evaluation by a qualified provider prior to the clinic visit.

General Developmental or Intellectual/Academic Assessment. If there are no formal testing records available for a patient, a developmental assessment for young children from infancy through preschool should be conducted, or screening for CNS dysfunction for school-aged children and older patients can be supplemented with academic and intellectual screening. If results of such assessment suggest concerns, then referral for further occupational therapy, psychological, speech-language, or other assessment (as needed) is appropriate.

For children up to age 3 years.

- **Bayley Infant Neurodevelopmental Screener (BINS).** For this age range, the very brief Bayley Infant Neurodevelopmental Screener (BINS) (3 to 24 months) can be useful. If the BINS is used, supplementary information should be gathered regarding the child's feeding, regulatory behaviors, general responses to stimulation, as well as neuromotor and play observations if not fully covered in the caregiver interview.

- **Bayley Infant Scales of Development-Second Edition BSID-II.** The more complete Bayley Infant Scales of Development-Second Edition may provide more comprehensive information on motor and mental development, and can be used over a wider age range (to 42 months) and is recommended if time permits. It is important to note that the BSID-II results may not be very sensitive to early neurodevelopmental concerns of young children with prenatal alcohol exposure. Some researchers have found clinically significant effects on motor performance only with infants at high exposure levels (Jacobsen et al., 1993). In children with lower levels of exposure, however, qualitative differences (for example, in the ability to imitate, stand, and walk) have been noted when compared to children without alcohol exposure. New information is now being gathered among infants and young children prenatally exposed to alcohol that focuses on quantitative concepts and math skills, visual-spatial skills, and early fine motor skills. As more data are gathered, tools appropriate for use with younger children will become clearer. It is recommended that clinicians tend toward a more vigilant stance with young children, recognizing the importance of prenatal alcohol exposure as a very significant risk factor for emerging neurodevelopmental and neurobehavioral difficulties.

For children aged 2 years, 9 months to 5 years, 8 months.

- **Miller Assessment for Preschoolers (MAP)** In this age range, the Miller Assessment for Preschoolers (MAP) can be used. The MAP is a screening tool that assesses sensory-motor abilities (foundational skills and coordination), cognitive abilities (verbal and non-verbal), and combined abilities (complex tasks). Items in the sensory-motor category include tasks performed in a modified neurological examination; this category could be used alone for the purpose of screening if time is limited and sensory-motor observations are indicated. A behavior checklist and supplemental movement observation checklist are also provided. The MAP can provide supplementary information for young children who may have already received developmental motor testing (e.g. with the Peabody Developmental Motor Scales).

For school-aged children.

- **Wechsler Intelligence Scale for Children-Fourth Edition (WISC-4)**
  Wide Range Achievement Test -3 (WRAT-3)
  Woodcock-Johnson Psychoeducational Tests Battery-Tests of Achievement
  Wechsler Individual Achievement Test-Second Edition (WAIT-II)
  Test of Nonverbal Intelligence-Second Edition (TONI-2)
  KeyMath-Revised/NU
  For patients of school age, the Wechsler Intelligence Scale for Children-Fourth Edition (WISC-4), Wide Range Achievement Test -3 (WRAT-3), and an assessment of reading comprehension and a writing sample can be helpful. This information is often available from recent school assessment. The latest edition of the Woodcock-Johnson Psychoeducational Tests Battery-Tests of Achievement or the Wechsler Individual Achievement Test-Second Edition (WAIT-II) are useful for more thorough assessment of academic achievement. In the clinic setting, the Test of Nonverbal Intelligence-Second Edition (TONI-2) can provide a brief assessment of intellectual status. Some clinical researchers have found Progressive Matrices tests helpful in assessing cognitive skills across progressively more complex conditions. Clinical researchers have been looking carefully at mathematics skills, and related cognitive skills such as cognitive estimation. A careful assessment of math skills and concepts may be useful in a diagnostic work-up, especially when math skills are compared to other areas of academic achievement. One individual test that measures understanding and application of important mathematics concepts and skills is the KeyMath-Revised/NU diagnostic inventory of essential mathematics (normative update).

For adults.
In the FAS DPN diagnostic setting, adults are required to have a recent, valid, full neuropsychological evaluation prior to their diagnostic visit. This procedure means that appropriate, complete data will be available on neurobehavioral function beyond what can be learned from an intelligence test and academic assessment. It has been our experience that with adults, a psychometric screening does not yield enough information to render a diagnosis.

Extended Psychometric Assessment Beyond What Can Be Done on the Clinic Day. Additional occupational therapy, physical therapy, psychological, and speech-language assessment can be performed to provide data for diagnosis, referrals, and recommendations, according to the clinical judgment of diagnostic clinic staff. For school-aged patients, it is useful to know the requirements of the patient's school district when choosing assessment instruments, so that test results can be used for placement and intervention planning in the school setting.

II. Behavioral Observations

In a FASD diagnostic evaluation by the psychologist, OT/PT, and/or SLP, the purposes of behavior observations are:

- To document evidence of CNS dysfunction.
- To assess the positive characteristics of the patient.
- To think through whether behaviors displayed by the patient fit with what is known about FASD over the life span.
- To gain a sense of how the caregivers must feel, and what they may have to do to handle the client's behavior.

To understand the patient's behavior, testing records can be inspected for behavioral data such as behavioral observations completed by psychologists, descriptive data from caregiver questionnaires, or information gleaned from interviews with providers familiar with the child's behavior. One interesting questionnaire now being used by clinical researchers interested in FASD, for example, is the Social Skills Rating System (SSRS), which has parent and teacher forms that can provide specific information about problem social skills in different settings. An SSRS could be sent out ahead of the clinic visit to school and home in order to gather objective behavioral information useful in the diagnostic and recommendation process. Of course, caregivers can be queried to gather information on their behavioral observations during the diagnostic clinic interview. In addition, brief clinical observations can be made informally on the day of the clinic visit, and during any formal assessment that is carried out in conjunction with the clinic visit. Ideally, a trained observer from the clinic could actually assess the patient in their natural environments, such as school, early intervention setting, childcare, and/or home, if time and funding permit. For example, an OT could carry out or consult with a school-based OT in administering a time-intensive tool such as the School Function Assessment, or an SLP could do a focused and systematic observation of a child's peer communication and interaction in the classroom using newly developed tools that evaluate school-age language or social skills. Additional observation assessment such as this is rarely done in the FAS DPN clinic at the University of Washington because of time, distance, and funding constraints, but might be feasible in community-based clinics.

Basic Information. One category of information to be gathered involves the client's general behavior and developmental status, similar to that gathered in most developmental intake interviews (e.g., developmental milestones and tasks, self-help skills, school or daycare experiences, and social interaction patterns with family members, peers, adults.) Questions from standard developmental interviews can be used to gather this type of information. In addition, information from objective behavior checklists and prior test records can provide data about the client's general behavior and developmental status. The most essential type of basic information undoubtedly comes from caregiver report-- especially caregiver report that gives real-life evidence of problems in daily function (e.g., school failure, legal problems, and descriptions of daily function).

Behavior of Interest in Alcohol-Related Diagnosis. A second category of information involves observations of behavior that are specifically directed toward documenting CNS dysfunction in specified behavioral domains shown to be especially problematic in patients with FASD. Table 2 presents a list of positive characteristics and problem characteristics we have found useful in the FAS DPN when conducting a FASD diagnostic evaluation. Notice that the problem characteristics in Table 2 correspond to page 6 of the FASD Diagnostic Form entitled "FUNCTIONAL / Non-Standardized Observational Measures".

Table 2. Constructs to be briefly assessed through behavioral observations during a FASD diagnostic evaluation.

Constructs
Positive characteristics
Apparent alertness
Ability to charm or engage others/ friendliness/ sociability
Apparent verbal fluency and adequate vocabulary level *(though with deficits in effective communication and social-communicative competence)*[1]
Problem characteristics
Planning / Temporal Skills
Behavioral Regulation / Sensory Motor Integration
Abstract Thinking / Judgment
Memory / Learning / Information Processing
Spatial Skills and Spatial Memory
Social Skills and Adaptive Behavior
Motor / Oral Motor Control

During a diagnostic evaluation, considerable information can be gathered about positive and problem characteristics of particular interest among clients with FASD. Sources of data are test records and multiple assessment methods described here. These include specific caregiver interview questions, specific items from objective behavior checklists (such as the CBCL), and informal observations from spontaneous behavior and arranged situations. Table 3 provides examples of information that can be gathered from these various sources that will help in screening assessment of patients with FAS and related conditions. Note that it is important to phrase interview questions indirectly (e.g., "How does your child do when you leave him on his own in the house for half an hour?") rather than directly (e.g., "Does your child have judgment problems?") Parents tend to answer affirmatively to direct questions based on their reading or understanding of FASD rather than their child's specific characteristics, which can be a problem during diagnostic assessment. It works well to ask for examples or to ask open-ended questions calling for behavioral descriptions. This is especially true when asking whether a child has problems linking cause and effect.

Table 3. Examples of information to be gathered about problem domains to be obtained from interview questions, written reports or direct observations

Problem Domain(s) [1]	Examples of Information to be Gathered
Planning	Reports of how the child cleans up their room Reports of how the adult goes about keeping house Examples of how the adult organizes time/is aware of time Examples of how much help is needed to organize daily tasks Observations on how the patient misbehaves (*Is misbehavior planful?*) Examples of difficulties linking ideas, or linking cause and effect
Behavioral regulation/ attention	Examples of how the patient handles stress Examples of anger management or temper tantrums Observations of mood swings or emotional lability Examples of impulsive acts Reports of sleeping problems Examples of over- or under-reactivity to stimuli (*e.g., noise, pain, movement, touch*) Reports of inappropriate activity level; descriptions of patient as "hyper" or "restless" Examples of attentional difficulties Reports of difficulty calming down or making transitions between tasks Examples of problem behaviors defined as "stealing" or "lying" by teachers or parents (*Yet when these behaviors are described, they seem to the examiner to be due to impulsivity or not recognizing boundaries—to clarify this distinction, assessment should focus on eliciting information on whether the patient appears to plan misbehavior, how they explain themselves when caught, and/or how they appear to understand why they have been disciplined*) Reports of high-risk behaviors that continue in spite of discipline or earlier accidents/injuries, including questions about youth substance use

Table 3. (continued) Examples of information about problem domains to be obtained from interview questions, written reports or direct observations.

Problem Domain	Examples of Information to be Gathered
Abstract thinking/judgment	Examples of what happens if patient is left alone Reports of how the patient responds to peer pressure Examples of poor social judgment Examples of perseveration Examples of difficulty in taking another's viewpoint "How to spend a perfect day" interview question *(see footnote 1 below)*
Attention/memory/learning/ information-processing	Observations of an atypical rate and relevancy of verbal responses (*Examples: (1) patient gives many answers on learning tasks hoping to get the right answer by sheer volume; (2) patient's increases in task speed result in a clear drop in task accuracy*) Patient shows difficulty completing tasks Patient gives disorganized answers, especially under stress timed conditions Patient has difficulty with new learning Clear descriptions of memory deficits/unpredictable retrieval of learned information
Spatial memory & reasoning	Reports of trouble reading maps or getting around familiar locations *(such as whether a child recognizes neighborhood landmarks, or routes to familiar places such as their grandparent's home)* Reports of not being able to find own possessions
Social skills & adaptive behavior	Caregiver report of poor school adjustment and performance, and failure in daily function Descriptions characterizing the patient as younger than their chronological age Reports that the patient prefers younger peers Observations of a "tough" or antisocial demeanor
Motor control	Reports of clumsiness, poor balance, tremors Examples of poor fine motor skills Examples of poor postural control Reports of poor oral-motor skill, drooling, significant articulation deficits.

1 See next section for discussion of "how to spend a perfect day" interview question.

Below are examples of situations we create to more easily make behavioral observation of problem domains and positive characteristics, as listed in Table 2, during the clinic day at the University of Washington. The patient's behavior can be observed:

- **During on-site testing, especially in a room filled with equipment.**

  We try to contrast the patient's ability to handle structured versus unstructured situations, understand directions, generate a number of solutions to a proposed problem, and handle social interactions as the patient becomes progressively more tired. We also try to assess the child's general safety and level of impulsivity.

- **In an unstructured, highly stimulating area**
  (e.g., elevator ride, on an outside deck, playing on playground equipment, in the playroom or waiting room).

  We try to look at the patient's behavior changes as they grow more tired and stressed, or as they play with peers--and observe the patient's pacing, modulation, attention, vocabulary, ability to handle lack of structure, ability to handle abstract questions and capacity to follow directions. This kind of informal assessment setting can provide information on a child's ability to internally "map" the clinic setting, and guide the examiner back to the testing room or waiting room after being shown a new route in the building.

- **As they respond to abstract, motivating, but unstructured questions ("how to spend a perfect day" question).**

  One possible question series is as follows:

  Imagine-- if you had a perfect day, and could do anything you wanted to do-- anything at all-- tell me, what would you do? (Patient answers.) OK, now imagine you have a big bag of money-- that never runs out-- to spend on your perfect day. How would you spend it? Would that change your perfect day? (Patient answers.)

  Very abstract questions like these allow us to hear how the child organizes an answer to a very motivating but unstructured linguistic task. This type of abstract interview question allows observation of how impulsive patients are, how they are able to communicate complex information, and how socially appropriate their answers are.

- **As they perform unstructured tasks which require planning.** (e.g., commonly used drawing tasks in a psychologist's repertoire, such as Draw-a-Person or Kinetic Family Drawings)

  Examples: We look more at <u>how</u> the patient performs these tasks than at the final outcome. Talking with a patient while they are engaged in a drawing task can also be used as a time to see how a patient handles a conversational situation, and a time to elicit important information such as why they think they have come to the clinic visit that day.

- **Comparison of performance across tests, or on tests that have more progressively more complex conditions.** (e.g., VMI vs. REY; different levels of the NEPSY Visual Attention subtest; D-KEFS Trail-making Test)

Examples: Comparison of the patient's performance in more structured vs. less structured tasks, or tasks with a defined outcome vs. an outcome the patient can create, or tasks with progressively more complex conditions, can provide information about the helpfulness of structure for the patient's performance and about whether a patient's performance breaks down as complexity increases. If these instruments are given by different examiners, discussion between examiners can yield these comparisons. Open dialogue and flexibility among clinical evaluators can, in general, enhance the diagnostic process.

III. Conclusions

Appropriate assessment strategies for individuals with FASD are continually evolving. This training guide, describes recommendations for test record review and brief diagnostic assessment by core diagnostic clinic team members based on the model used in the interdisciplinary UW FAS DPN clinic. We encourage readers of this guide to consider these assessment and observation strategies, which are based on the literature in the field to date and the clinical experiences of evaluating a large number of clients with FASD in a tertiary care setting within a large urban area. However, it is essential to remember that the tools and strategies used in different FASD diagnostic clinics will vary as a factor of the clinic model and the goals and preferences of clinic team members. Regardless of the specific assessment tools being used, when determining diagnostic conclusions and intervention recommendations, the full range of past and current psychometric data, behavioral observations, and anecdotal information from the caregiver interview should be considered. In addition, the collective expertise of the interdisciplinary team members during discussion and synthesis of this information remains an invaluable part of the diagnostic process. Only through careful consideration of all data can the impact of prenatal alcohol exposure on the brain, and other factors that may be impacting the individual's behavior and function, be determined.

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