

3

Schizophrenia among Children and Adolescents

Jason Schiffman

Assistant Professor, Department of Psychology, University of Hawaii at Manoa

Summary of Findings

	Grade of evidence
Epidemiology	B–
Age of onset	A–
Presentation	B
Course and progression	B–
Suspected neuropathology	B
Suspected neurochemical abnormalities	C–
Genetic factors	B
Other risk factors	C
Treatment	B

Note: Age of onset received an A- because this is the defining characteristic of childhood onset schizophrenia relative to adulthood. It should be noted, however, that the age of onset varies among youth and can range from as early as 5 until 18. Treatment received a B, but the strength of the evidence is among psychopharmacological treatments. To date, psychosocial interventions have not been systematically examined to the degree psychopharmacological treatments have, and would therefore receive a C if rated independently.

Introduction

Schizophrenia among young people is a devastating and costly mental illness. Considered a more severe variant of adult schizophrenia, childhood schizophrenia can be a terrifying and debilitating condition for youth and family. Although the disorder is rare, interest in schizophrenia among children and adolescents has

grown as researchers and clinicians recognize the benefits of understanding the disorder. Continued research promises to increase the ability to diagnose and treat early forms of schizophrenia. Additionally, the study of early-onset variants of disorders often enables the examination of a more genetically homogeneous and less environmentally influenced disease condition. As such, understanding early-onset schizophrenia may possibly provide useful information about the etiology and course of adult-onset schizophrenia (Kumra *et al.*, 2000). Despite growing interest, however, research on schizophrenia among children and adolescents is limited. Several research groups currently pursue studies of individuals with early schizophrenia to discern functional and structural deficits associated with the disorder (e.g., Asarnow & Asarnow, 2003). While ongoing research continues to increase our understanding of biological and environmental factors associated with and contributing to the disorder, the rarity of the condition has resulted in only modest gains in understanding.

Factors associated with early-onset schizophrenia such as basic demographics (e.g., prevalence, gender distribution, comorbidity), presentation, course and outcome, neuropathology, genetic factors, and treatment remain areas of relative mystery. Increased knowledge of the general portrait presented by children and adolescents with schizophrenia may increase understanding and have implications for mental health care provision.

Epidemiology

Prevalence of Schizophrenia Among Youth

Very few studies have tracked rates of schizophrenia among youth in the general population. Gillberg and Steffenburg (1987) estimated very early onset schizophrenia (10 years of age or younger) rates at 1.6 per 100,000 in western Sweden. Remschmidt *et al.* (1994) suggested that approximately one in 10,000 children develop schizophrenia before 18 years of age. Among slightly older (12 to 19 years) youth receiving psychiatric outpatient services, Evans and Acton (1972) reported that the rate of a more inclusive condition of psychosis was approximately one percent.

A study by Thomsen (1996) looked at childhood and adolescent onset schizophrenia throughout Denmark from 1970 to 1993. Findings indicated that 32 children younger than 15 met criteria for schizophrenia between 1970 and 1993 comprising 86% of the psychiatric in-patient population in this age group. As would be expected, the occurrence of schizophrenia increased with age. Between ages 15 and 17, 284 adolescents with schizophrenia were hospitalized from 1970 to 1993. Although informative, this Danish study did not include youth

41 Schizophrenia among Children and Adolescents

served in non-hospital settings. Given a trend towards least restrictive care in the United States, many children and adolescents with schizophrenia in the USA probably receive treatment outside of the hospital.

While prevalence estimates in the USA are rare, we recently completed a study of youth with schizophrenia spectrum disorders served by the state mental health system of Hawaii (Schiffman & Daleiden, in press). Schizophrenia spectrum disorders (e.g., schizophrenia, schizoaffective disorder, psychotic disorder NOS) may be of particular interest to researchers and clinicians because they are genetically linked to schizophrenia and are slightly more available for study. Among other findings assessing children and adolescents seeking services through both hospitalization and community clinics served by the state mental health system in Hawaii, we estimated an observed prevalence of 5% among all youth registered for mental health services. As might be expected, the Hawaii analysis, which included home and community services, yielded a slightly lower prevalence rate estimate than that reported in a psychiatric in-patient population (Thomsen, 1996).

In general, most studies of the epidemiology of early-onset schizophrenia converge to suggest low rates of the disorder attesting to the rarity of this condition among youth. Additional epidemiological reports are needed to augment the current understanding of schizophrenia in children and adolescents. Overall, Asarnow and Asarnow (2003, p. 461) note that current “prevalence figures must be viewed as highly tentative until more representative data become available”.

Gender Distribution

Previous research suggests a male-to-female ratio ranging from 2:1 to 5:1 (Beitchman, 1985; Evans & Acton, 1972; Green *et al.*, 1992; Hollis, 1995; Thomsen, 1996; Werry, 1992). Findings from the Hawaii study suggest a male-to-female ratio of 1 to 2.38 among youth with schizophrenia spectrum disorders. This range of gender ratios conflicts with general prevalence estimates of adult schizophrenia that suggest approximately equal gender distribution, but is consistent with the notion that males typically have an earlier age of onset than females. Kolvin *et al.* (1971) suggested that the predominance of males among youth with schizophrenia is a distinguishing characteristic of early-onset schizophrenia.

Comorbidity

Youth with schizophrenia typically have multiple diagnoses. A study by Russell, Bott and Sammons (1989) reported that 68% of children with schizophrenia in their sample met criteria for another mental illness. Reports from the literature indicate that externalizing disorders such as conduct or oppositional defiant

disorders as well as internalizing disorders such as depression are commonly diagnosed along with a schizophrenia spectrum diagnosis (Eggers, 1989; Nicolson *et al.*, 2001; Werry, McClellan, & Chard, 1991). Among youth with psychosis, a study by Biederman *et al.* (2004) indicated that 131 of 132 identified youth with psychosis had a comorbid disorder.

In the Hawaii study, disruptive behaviors and attentional problems were the most frequently diagnosed comorbid conditions for both youth with and without spectrum disorders. The rate of comorbid disruptive behavior and attentional problems among the comparison group of all youth in the system without a schizophrenia spectrum disorder (“non-spectrum youth”), however, was significantly greater than among youth with spectrum disorders. This pattern of results suggests that youth with disruptive and attentional disorders are more likely to be registered with the Department of Health than youth with any other diagnosis, but this effect was not as pronounced for youth with schizophrenia spectrum disorders.

Youth with schizophrenia are also more likely to have mental retardation (Aylward, Walker, & Bettes, 1984). Consistent with that finding, youth in the Hawaii study with spectrum disorders were more likely to have a diagnosis of mental retardation than non-spectrum youth. Aylward *et al.* (1984) suggested that mental retardation can serve as a premorbid feature of early-onset schizophrenia and may relate to the course of the illness. This link between mental retardation and early-onset schizophrenia, however, may be underrepresented as some research groups exclude youth with severe intellectual disabilities from their studies of childhood schizophrenia (Friedlander & Donnelly, 2004).

Ethnicity

Given the rarity of the condition, research does not provide a clear description of the ethnic breakdown of youth with schizophrenia. Studying youth in Hawaii offered the advantage of a large multi-ethnic sample. This is particularly beneficial with childhood-onset schizophrenia as demographics in general are poorly understood and under studied. In the Hawaii study, ethnic background did not significantly differ between the spectrum and non-spectrum groups, with the exception of Asian youth (Schiffman & Daleiden, in press). Our findings indicated that Asian youth accounted for a larger proportion of the spectrum disorder group than the non-spectrum control group of all other registered youth. The proportion of Asian youth in the *non*-spectrum group (18.2%) was less than the proportion of Asian youth (29.9%) in the general Hawaii population (US Census Bureau, 2000). The proportion of Asian youth in the spectrum group (30.2%) resembled the general population of Asian youth in Hawaii. Studies have reported lower representation among Asian Americans in hospital-based and

43 Schizophrenia among Children and Adolescents

community mental health service populations than expected based on census estimates (Leong, 1994). The source of underutilization is unclear, however, cultural factors may partially account for this finding (Leong, 1994; Sue & Morishima, 1982). The closer approximation to census estimates in the group of youth with schizophrenia spectrum disorders may suggest that, among other possibilities, the severity of spectrum disorders may contribute to the increased likelihood that Asian youth with schizophrenia spectrum disorders receive mental health services.

Age of Onset

The modal age of onset of typical schizophrenia is in early adulthood, usually before 25 years of age. While specific age cutoffs for early onset vary in the literature, researchers generally consider schizophrenia diagnosed before age 18 as early onset. Diagnoses before age 13 are rare and often labeled as “very early onset.” Given the low base rate of the phenomenon and normal developmental processes (e.g., childhood imagination), diagnosing schizophrenia prior to age seven is extremely uncommon. As might be expected, the rate of schizophrenia among youth increases with age. Among youth in Hawaii, registered youth with a diagnosis of a schizophrenia spectrum disorder in the mental health system were significantly older in relation to all other registered youth (14.6 years versus 12.0 years; Schiffman & Daleiden, in press).

Presentation

First Rank Symptoms

Current DSM-IV-TR diagnostic criteria for childhood-onset schizophrenia are the same as those used for adult schizophrenia. As with adults, the hallmark symptoms include delusions and hallucinations. When sufficiently severe, only one of these symptoms is required for a diagnosis. Other symptoms include disorganized speech, disorganized or catatonic behavior, and negative symptoms. In addition to the characteristic symptoms, DSM-IV-TR (American Psychiatric Association, 1994) also requires social or occupational dysfunction (generally school performance for young people), symptoms for at least six months, and symptoms not better accounted for by mood disorders, schizoaffective disorder, substance use, a general medical condition, or a pervasive developmental disorder (for pervasive developmental disorders, schizophrenia is given if delusions or hallucinations are present for at least a month).

Specific patterns of symptom presentation among youth with schizophrenia are not well studied. Russell *et al.* (1989) reported hallucinations in 80% of their sample of 35 children with schizophrenia, with auditory hallucinations the most common form, followed by visual. Delusions were reported in approximately 63% of cases from this sample. In a descriptive account of 33 youth with schizophrenia, Werry *et al.* (1994) indicated that 61% of their sample reported hallucinations (57% auditory), and 55% of their sample reported delusions. The authors also noted that delusions tended to be less well-formed relative to adults. Communication may be impaired in youth with schizophrenia, with Caplan (1994) noting three patterns of deficits among 31 children with schizophrenia including impaired discourse skills, loose associations, and illogical thinking.

In a relatively large study of 132 youth with psychosis, Biederman *et al.* (2004) reported that 44% of the sample suffered from delusions, and 85% hallucinations. Auditory hallucinations were most common (79%), followed by visual (54%), tactile (23%), and olfactory (13%). Within delusions, delusions of persecution and reference were most common (27% and 23% respectively). Approximately 20% of youth expressed other symptoms such as incoherence, loosening of associations, flat affect, and inappropriate affect.

Diagnostic Methods

Developmental considerations may influence diagnostic decisions when evaluating children for schizophrenia, as the presentation quality of symptoms may differ from those seen in adulthood. For instance, some researchers suggest that negative symptoms are less common among children with schizophrenia, and delusions and hallucinations may be less well developed and involve more childlike themes (monsters or toys versus religious or sexual themes) (Volkmar, 2001). Evidence suggests that when accounting for developmental considerations, schizophrenia in children can be reliably diagnosed (Werry, 1992). Diagnostic interviews such as the Schedule for Affective Disorders and Schizophrenia for School-Age Children are useful in increasing the reliability and validity of the diagnosis (Kaufman *et al.*, 1997). This interview provides the assessor developmentally tailored questions assessing for symptoms associated with schizophrenia and other disorders as expressed in childhood.

Neuropsychological Deficits

In addition to symptom presentation, youth with schizophrenia demonstrate a host of neuropsychological deficits. Most of these deficits are similar to those seen in adult schizophrenia. Kumra *et al.* (2000) reported that children with schizophrenia (average age 14.4 years) consistently demonstrated one to two

45 Schizophrenia among Children and Adolescents

standard deviation impairment across a range of neuropsychological tests (general IQ, achievement, attention, executive functioning, memory, motor skills, etc.). Likewise, in a review, Asarnow and Asarnow (2003) reported a similar array of neurocognitive deficits among children with schizophrenia (attention, visual-motor coordination and fine motor speed, executive functioning, and various forms of memory).

Several studies have looked at particular patterns of neurocognitive deficits among young people with schizophrenia. A study of 17 adolescents with schizophrenia supported the global cognitive dysfunction findings, and specifically noted larger differences between cases and controls on working memory and attention (Kenny *et al.*, 1997). Oie and Rund (1999) also reported similar global impairment among 19 adolescents with schizophrenia compared to control groups with and without other psychiatric conditions (Attention-Deficit Hyperactivity Disorder). The authors indicated particular deficits in the areas of abstraction, visual memory, and motor functioning. Among never medicated, first episode adolescents with psychosis (most of whom either subsequently developed schizophrenia or were deemed to have the disorder after further review of history), Brickman *et al.* (2004) reported global neuropsychological deficits, with the greatest deficits observed in executive functioning, attention, and memory. The authors also reported relatively intact language functioning, a finding also reported by Kenny *et al.* (1997). The findings from Brickman *et al.* (2004) are of particular interest as subjects were free of the potentially confounding impacts of neuroleptic treatment and long duration of illness. Collectively, these findings strongly support global neurocognitive impairment among youth with schizophrenia, with specific areas of relative deficits seeming to fall in the domains of memory (of varying type), attention, executive functioning, and perhaps motor functioning.

Psychosis Not Otherwise Specified

Interestingly, studies of neurocognitive functioning reveal that youth with schizophrenia resemble a potentially related group of youth not meeting full criteria for the disorder. As with adults, youth with psychotic symptoms not reaching diagnostic threshold for full schizophrenia are often diagnosed with psychotic disorder NOS. Neurocognitive reports comparing youth with childhood-onset schizophrenia to a group of youth with psychotic disorder NOS suggest few meaningful differences in neurocognitive profiles (McClellan *et al.*, 2004). Given similarities in neurocognitive performance and symptoms presentations, some researchers speculate that psychotic disorder NOS may be a less severe condition genetically related to childhood-onset schizophrenia (Kumra *et al.*, 2000).

Course and Progression

The premorbid course of childhood-onset schizophrenia appears associated with an array of functional deficits. Kolvin *et al.* (1971) as well as others (Alaghband-Rad *et al.*, 1995; Hollis, 1995; Nicolson *et al.*, 2000; Russell *et al.*, 1989) report high rates of developmental delays including speech and language and social peculiarities. A more recent study by Nicolson and colleagues (2000) reported that over half of the 49 children with schizophrenia in their sample had premorbid impairment in motor, social, and speech and language functioning. While there was no comparison group in this study, the rate of impairment seems strikingly high and suggests a developmentally deviant premorbid course.

The course of childhood schizophrenia once diagnosed is understudied and varies by individual. As seen in adult schizophrenia, it is believed that the progression roughly follows a period of deterioration, followed by stabilization, and hopefully improvement (Merry & Werry, 2001, p. 280). Based on a review of several studies of varying methodology tracking outcome among youth with a schizophrenia diagnosis, reviews by Asarnow, Tompson, and McGrath (2004) and McClellan *et al.* (2001) indicate that about one half of youth with schizophrenia remain severely impaired over time, with the other half showing a variable course with some improvement in psychotic symptoms. A longitudinal descriptive report of psychosocial outcome among adolescents with schizophrenia by Lay *et al.* (2000) indicated that, among those available for follow-up at ten or more years, 83% had at least one re-hospitalization, 57% showed at least moderately vocational impairment, and 75% were supported by either their parents or public means.

Generally, most evidence suggests that the majority of youth with schizophrenia show a slower onset and chronic pattern as opposed to an acute psychotic break (Asarnow *et al.*, 2004). While difficult to compare directly, Nicolson *et al.* (2000) suggest that the premorbid course for individuals with childhood-onset schizophrenia may be worse than the premorbid course for adult-onset schizophrenia. Additionally, it seems that the earlier the onset, the worse the prognosis (Merry & Werry, 2001, p. 294).

Among youth with psychotic disorders, those with worse premorbid characteristics and earlier onset tend to have worse outcomes. McClellan and colleagues note that poor premorbid adjustment, negative symptoms, and low IQ predicted poor outcome among youth with psychotic disorders (McClellan *et al.*, 1999; Werry & McClellan, 1992). Similarly, Nicolson *et al.* (2001) reported that high levels of psychopathology, cognitive deficits, and motor impairments predicted poor outcome among a sample of 26 youth with psychotic disorder NOS. Collectively, these findings suggest that schizophrenia spectrum disorders

47 Schizophrenia among Children and Adolescents

in childhood appear associated with poor long-term outcome with the worst outcomes associated with earlier onset, poor premorbid functioning, and impairment at intake (Asarnow *et al.*, 2004; Gillberg, Hellgren, & Gillberg, 1993; Werry *et al.*, 1991;).

Suspected Neuropathology

A series of studies from the Child Psychiatry Branch of the National Institute of Mental Health (NIMH) suggest reduction in cerebral volume and pervasive pattern of brain deterioration in childhood-onset schizophrenia. Similar to adult schizophrenia, individuals with childhood-onset schizophrenia tend to have ventricular enlargement and progressive loss of gray matter (4% reduction in cerebral volume) (Rapoport *et al.*, 1997; Rapoport *et al.*, 1999). Confirming initial findings, Sowell *et al.* (2000) identified a similar reduction in gray matter and enlarged ventricles in an independent sample. Although limited in number, a handful of imaging studies suggest various other brain abnormalities seen in childhood-onset schizophrenia. Findings include abnormalities in the corpus callosum (Jacobsen *et al.*, 1997; Keller *et al.*, 2003; Sowell *et al.*, 2000), and subcortical structures such as the vermis (Jacobsen *et al.*, 1997) and basal ganglia (Blanton *et al.*, 1999).

Several follow-up studies from the NIMH group identify brain deterioration over time among youth with schizophrenia. For instance, Giedd *et al.* (1999) reported progressive brain deterioration among youth with schizophrenia, noting decreases in cerebrum and hippocampus volume, and increases in the lateral ventricles. The rates of deterioration appeared to level off as youth entered adolescence. Thompson (2002), discussing data from this project, noted a relation between rate of temporal cortical loss and positive symptoms, as well as a relation between gray matter loss in the frontal cortices and negative symptoms.

In a more detailed and recent analysis including additional subjects from the NIH project, Sporn *et al.* (2003) identified progressive loss in the frontal and temporal cortices across multiple assessments, suggesting neural deterioration spreading from parietal regions towards the cortex. Similar to the earlier study, the authors also noted that gray matter loss appeared to level off with age. Gray matter loss was related to premorbid impairment but, in contrast to an earlier report by Thompson (2002), it was also related to greater clinical *improvement* as measured by the Brief Psychiatric Rating Scale and the Scale for the Assessment of Negative Symptoms scores. The authors speculate that perhaps “compensatory ‘pruning’ of malfunctioning neural circuits” might in part begin to explain the relation

between clinical improvement and brain volume loss (Sporn *et al.*, 2003, p. 2188). Future imaging work among youth with schizophrenia is needed to replicate these early studies, as well as provide additional findings with respect to brain structure, function, and change over time.

Related to imaging studies of neuropathology is the study of neurological functioning. Using a subsample from the above-described NIH study, Karp *et al.* (2001) noted high rates of neurologic abnormalities, including elevated rates of primitive reflexes and other abnormalities relative to controls, that persisted with age among youth with childhood-onset schizophrenia. These deficits suggest hemispheric inhibition of the brainstem, and strongly support general deficiencies in normal maturation. According to the authors, results from the study highlight the role of genetically mediated early central nervous system insults in the etiology of childhood-onset schizophrenia.

Suspected Neurochemical Abnormalities

Little is known about specific neurochemical abnormalities underlying schizophrenia in childhood. Perceiving childhood-onset schizophrenia as a related and continuous disorder with adult schizophrenia allows speculation that neurochemical abnormalities present in adult schizophrenia are similar to those found in childhood schizophrenia (e.g., dopamine, glutamate, serotonin). Much of the evidence for the influence of dopamine in adult schizophrenia comes from the fact that patients respond favorably to anti-dopaminergic medications and that dopamine agonists can cause psychotic symptoms among non-psychiatric individuals. This same pattern is true in children. While enough evidence exists to suggest that dopamine plays a role in childhood schizophrenia, specifics of that role are not understood. The few studies conducted in this domain with children report similar patterns of results as those typically found in adult schizophrenia (Asarnow & Karatekin, 2001).

Genetic Factors

Early onset of schizophrenia seems associated with high genetic loading for the disorder. Research has borne out this relation, noting an increased risk of schizophrenia among the relatives of children with schizophrenia (Asarnow *et al.*, 2001; Sham, MacLean, & Kendler, 1994). Asarnow *et al.* (2001) reported that the relatives of children with schizophrenia in their study were 17 times more likely to have a schizophrenia spectrum disorder in relation to controls. This risk is obviously far greater than the risk in the general population, as well as greater than that found in similar studies of relatives of adults with schizophrenia

49 Schizophrenia among Children and Adolescents

(three to six times more likely among relatives of adults with schizophrenia). Findings from this report suggest an increased genetic component to schizophrenia in childhood over and above that found in adult schizophrenia. In a similar report, Nicolson *et al.* (2003) advanced this line of study by including relatives of patients with adult-onset schizophrenia as a control group. Findings confirmed speculations made by Asarnow *et al.* (2001) that youth with schizophrenia are more likely to have relatives with a schizophrenia spectrum disorder in relation to adults with typical-age-of-onset schizophrenia. Collectively, these findings support the strong role of genetic contributions to early-onset schizophrenia.

Other Risk Factors

Obstetrical Complication

In two independent samples, Matsumoto *et al.* (1999; 2001) reported an increase in obstetrical complications (OCs) associated with early-onset schizophrenia (16 years old and younger) in relation to control subjects. In both studies, individuals with obstetrical complications were over three times more likely to develop childhood-onset schizophrenia relative to psychiatric controls. This finding is consistent with other reports suggesting a link between OCs and earlier age of onset in adult schizophrenia (Rosso & Cannon, 2003), and a wealth of literature suggesting increased OCs among individuals with schizophrenia in general. As seen with other correlates, Matsumoto and colleagues suggest that the similarity in the relation between childhood and adult schizophrenia and OCs indicate continuity between the two disorders.

Contrary to the findings from Matsumoto *et al.* (1999, 2001), Nicolson and Rapoport (1999) did not find an elevation in OCs among individuals with childhood-onset schizophrenia. The comparison group employed by Nicolson and Rapoport, however, was composed of the siblings of the patients who may share genetic risk for OCs, rather than genetically independent controls. Interestingly, however, the percentage of individuals with childhood-onset schizophrenia who had OCs were similar in both studies (34.3% in the Matsumoto *et al.* (2001) sample, 27.7% in the Nicolson and Rapoport (1999) sample).

Treatment

Level and Cost of Care

Schizophrenia in adulthood is associated with high levels of care and high cost for services (Cuffel *et al.*, 1996; King, Singh, & Shepherd, 2000). In our analysis

of youth with schizophrenia spectrum disorders in Hawaii, we found above-average use of more restrictive levels of care. More restrictive levels of care may reflect that youth with schizophrenia spectrum disorders struggle with more severe problems. Problems faced by these youth may require great environmental resources and possibly put these individuals in danger. It is important to note, however, that results from the service analyses in the Hawaii study suggest that approximately four out of five youth with services procured for schizophrenia spectrum problems were treated in home or community settings. Approximately one half received intensive home and community services and almost all received less intensive outpatient services.

In addition to requiring more services, we found that youth with spectrum disorders are financially expensive relative to other youth in the system. The average annual cost per youth with a schizophrenia spectrum disorder in Hawaii was \$16,420, a rate nearly twice as high as the average annual cost per youth of others in the system. Schizophrenia is an expensive illness to manage, especially among young people.

The above-average use of more restrictive services would seem to highlight an opportunity for the development of evidence-based strategies that support management of schizophrenia spectrum disorders in home and community settings. Presently, intervention with neuroleptic medication is the only empirically supported treatment for early-onset schizophrenia. Although the benefits of psychopharmacology are well documented, the intervention is global and does not specifically target individual areas of concern. Mental health therapists are likely to benefit from structured psychosocial strategies effective in helping youth with schizophrenia spectrum disorders. The efficacy of structured psychosocial interventions for early-onset schizophrenia has not yet been systematically assessed. Evidence from a range of areas, however, suggests that a psychosocial intervention targeting specific symptoms might benefit youth with early-onset schizophrenia (discussed below), especially when used as an adjunct to psychopharmacological intervention.

Psychopharmacological Treatment

Atypical neuroleptics seem to be the most effective means of treating childhood schizophrenia. Most research has focused on clozapine, with more recent studies beginning to investigate other atypical neuroleptics (Zalsman *et al.*, 2003). As in adults, clozapine seems to offer the advantages of effectively treating both positive and negative symptoms with less extrapyramidal side effects relative to typical neuroleptics. Less side effects, particularly attenuated extrapyramidal symptoms, generally lead to increased tolerability and medication compliance. Potentially fatal risk, however, is associated with clozapine (e.g., agranulocytosis), and

51 Schizophrenia among Children and Adolescents

therefore clozapine is not recommended as the first option in treating early-onset schizophrenia. Rather, non-clozapine atypical neuroleptics, not associated with fatal risk, are generally recommended. Two open-label studies of other atypical neuroleptics (one of risperidone and the other of olanzapine) have been conducted with youth with schizophrenia, with promising results. While these medications are not associated with life-threatening side effects, most do have some significant side effects including, among others, some extrapyramidal symptoms, and significant and sometimes distressing weight gain and sedation.

Given the rarity of the disorder, medication trials pose formidable methodological barriers that have slowed research in this area. In a recent review of the existing literature, Cheng-Shannon *et al.* (2004) concluded that atypical antipsychotic medications are in fact useful in treating psychosis among youth. The American Academy of Child and Adolescent Psychiatry practice parameters for the treatment of childhood schizophrenia also express this sentiment. Despite these positive conclusions, Renschmidt *et al.* (2001) estimated that approximately 15% of childhood-onset patients do not respond to typical or atypical neuroleptics. Additionally, while it appears that pharmacological therapy is useful for youth struggling with psychotic symptoms, little is known about the long-term effects of these medications. Frequent and regular contact with the treating psychiatrist is recommended.

Psychosocial Treatments

Practice parameters for the treatment of childhood schizophrenia established by the American Academy of Child and Adolescent Psychiatry call for a two-pronged symptom-specific and general-functioning approach to treatment. Specific symptom targeting includes addressing positive and negative symptoms directly, while general functioning refers to more broad social, academic, and family needs. The practice parameters call for a “comprehensive multimodal approach” to treatment (McClellan *et al.*, 2001, p. 145) taking into consideration comorbid conditions and developmental considerations. This position is consistent with one study that systematically investigated a comprehensive community treatment approach for a small group of adolescents with schizophrenia reporting positive effects of working with parents, problem solving skills, and re-integration efforts (Rund *et al.*, 1994).

University of Hawaii Child and Adolescent Thought Disorders Program

The Child and Adolescent Thought Disorders Program at the University of Hawaii at Manoa was established in 2003 to provide comprehensive assessment and psychosocial interventions to youth with schizophrenia spectrum disorders in Hawaii. The program is also designed to increase the understanding of thought

disorders in youth through systematic collection of information from this population. Funding for this program is provided by the Hawaii Department of Health Child and Adolescent Mental Health Division. The clinic was designed with the American Academy of Child and Adolescent Psychiatry practice parameters in mind and serves as an example of the assessment and psychosocial treatments available for youth with schizophrenia.

Assessment

Youth with suspected thought disorders eligible for services in our program participate in a thorough mental health examination. The initial assessment battery provides a thorough diagnostic and neuropsychological evaluation to verify diagnosis and identify relative strengths and weaknesses in functioning. The clinic employs a semi-structured interview designed to assess an array of psychopathology in youth, including psychotic processes (Kaufman *et al.*, 1997). To provide more accurate and complete information, we interview the child, parent, and relevant adults in the child's life (e.g., teacher, treating therapist, psychiatrist, etc.). Self-report questionnaires from various informants supplement interview information. Assessments particularly focus on identifying behaviors of impairment through interview as well as direct observation to help determine specific treatment goals for subsequent intervention.

In addition to the diagnostic and functional components, we also offer a screening of neurocognitive functioning. Domains of functioning assessed include areas identified in the literature as potential deficits for youth with schizophrenia. We employ tests of executive functioning, attention, various forms of memory, and an abridged test of intelligence. The neurocognitive examination allows for an assessment of relative strengths and weaknesses in cognitive functioning and provides information useful for recommendations and treatment planning.

Treatment

As mentioned above, there are currently no identified evidence-based psychosocial interventions for schizophrenia among youth. We attempt to systematically study our on-going treatment cases to provide useful approaches to treating other youth with similar conditions. The heterogeneity of the disorder, however, makes generalization from one case to the next difficult. To address the issue of variability of individual presentation, we employ a modular approach to therapy containing specific sections for specific problem behaviors. This approach provides our clinicians with a range of strategies to address target behaviors. Our modules are derived from a range of areas including: cognitive and behavioral treatment for adult schizophrenia; empirically supported therapies for childhood anxiety, depression, and disruptive behavior disorders; social skills training;

53 Schizophrenia among Children and Adolescents

behavioral treatment for autism; community involvement; and motivational interviewing. Even if symptoms directly associated with symptoms of schizophrenia (e.g., hallucinations and delusions) are resistant to treatment, a modular approach is often effective in treating comorbid and related conditions (e.g., specific phobia of water caused by the delusional fear that evil creatures will drown the client).

Family Services

Additionally, our clinic also offers family therapy and multifamily therapy (McFarlane *et al.*, 1995). Collateral work with parents and close relatives is essential for the complete care of youth with schizophrenia spectrum disorders. Additionally, multifamily therapy has been demonstrated effective in the treatment of adult schizophrenia. These groups focus on problem-solving strategies and community building between families struggling with similar issues.

Family work has an underlying goal of reducing critical or over-protective comments from family members, referred to as “expressed emotion”. High levels of expressed emotion are associated with relapse among adults with schizophrenia living with their families (Leff & Vaughn, 1985). The role of families in the lives of youth with schizophrenia spectrum disorders is possibly even more powerful and relevant than among adults with schizophrenia, as young people may be even more dependent on family for support.

Related to work with the family is the importance of interdisciplinary coordination of services. Youth with schizophrenia often have many health care providers as team members. In addition to the parent(s), psychiatrists, psychologists, teachers, nurses, social workers, individual skills trainers, occupational therapists, and others are often involved in cases. Working collaboratively with all treatment team members is crucial to the functioning and outcome of the child.

For all of our cases, we provide ongoing structured single-case evaluation protocols involving multiple informants for therapists to track the effectiveness of specific interventions. Ongoing monitoring and assessment of progress throughout the course of treatment enhances the ability to determine the most effective techniques for specific symptoms in a particular client and enables the monitoring of overall progress.

Conclusions

The field of early-onset schizophrenia holds far more questions than answers. While interest and understanding of the disorder continue to grow, many

unanswered questions remain. By definition, schizophrenia in childhood is similar to adult-onset schizophrenia in terms of defining symptomatology. Certain correlates and expression of the disorder in youth, however, vary relative to typical-onset schizophrenia.

Although rates increase with age, the prevalence of early-onset schizophrenia is rare. This fact, perhaps more than any other, contributes to the limitations in understanding the disorder. Despite the rarity of the condition, schizophrenia in young people can be reliably diagnosed and researched. Research has revealed a preponderance of males relative to females and high rates of comorbidity. Additionally, the course of childhood-onset schizophrenia typically appears worse relative to the adult-onset variant of the disorder, with estimates of nearly half of youth diagnosed having poor outcomes. In line with poor prognosis, in vivo neuroimaging studies tend to show progressive deterioration in the brains of youth with schizophrenia. While research has yet to uncover all causal factors, genetics seem to play a large role in the etiology of the disorder.

Consistent with our lack of understanding of the disorder, the field has only begun to identify effective treatments for schizophrenia among youth. Psychopharmacological treatment is an essential component to managing the disorder, but is rarely a cure. Comprehensive wrap-around psychosocial services for the youth and family are also important in helping individuals with this condition. Further research investigating all factors associated with childhood-onset schizophrenia, including the etiology, demographic profile, neurological correlates, and course and progression, may provide hope for future treatment of, and recovery from, this devastating condition.

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