

The Need for Interdisciplinary Pediatric Sleep Clinics

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The purpose of this study was to describe the function and structure of an interdisciplinary outpatient pediatric sleep clinic. In addition, the frequency of individual and comorbid sleep diagnoses, the prevalence of comorbid medical or psychiatric disorders, and the types of treatment recommendations and referrals provided to patients at the end of their clinic visits was examined. Over a 4-month period, 265 consecutive patients were evaluated in the sleep clinic by trainees, nurses, and attendings in pulmonary medicine, neurology, and psychology. Obstructive sleep apnea was the most common diagnosis, followed by behavioral insomnia of childhood. Over half of the patients had a comorbid medical diagnosis, and 31% had a comorbid psychiatric diagnosis. Polysomnography was the most

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common recommendation, with 38% of patients receiving at least one behavioral recommendation. The results of this descriptive study support the need for an interdisciplinary approach to pediatric sleep medicine, providing broad training to trainees of all disciplines while improving the clinical care for children with sleep problems.

Approximately 25% to 40% of children and adolescents experience sleep problems (Armstrong, Quinn, & Dadds, 1994; Blader, Koplewicz, Abikoff, & Foley, 1997; Blunden et al., 2004; Goodlin-Jones, Burnham, Gaylor, & Anders, 2001; Owens, 2005b; Owens, Spirito, McGuinn, & Nobile, 2000; Richman, 1985). The etiology of different sleep disorders is varied and complex. For example, obstructive sleep apnea (OSA) is a pulmonary disorder, restless legs syndrome (RLS) and periodic limb movement disorder (PLMD) are neurological disorders, and insomnia in young children is primarily a behavioral disorder. In addition, sleep problems often have comorbid presentations (e.g., OSA and insomnia); and children with sleep problems often have comorbid medical issues (e.g., asthma, obesity), psychiatric disorders (e.g., anxiety, autism, attention deficit hyperactivity disorder [ADHD]), or both, which may predispose patients to disordered sleep. When families present to a pediatric sleep clinic, they may not be aware of the different etiologies of sleep problems; rather, they are concerned that their child is having difficulty sleeping at night or is excessively sleepy during the day. Thus, it is important to have health care professionals of different disciplines working together to diagnose and treat pediatric sleep disorders (Stores & Wiggs, 1998; Wiggs, 2003).

There are two approaches to pediatric sleep medicine that involve providers from different disciplines: multidisciplinary and interdisciplinary. Although these terms are often used interchangeably, there are clear differences between these two types of teams (Zeiss & Steffen, 1996). A traditional multidisciplinary team includes members from different disciplines who have independent roles, but meet to share patient information. Each discipline will do its own assessment, treatment planning, interventions, and evaluation of progress. Although team members may meet regularly (e.g., weekly rounds), there is no attempt to create a common plan, although information provided by one team member may help another team member modify his or her treatment goals or plans. Another way to think of a multidisciplinary team is a cooperation between professionals (Drotar, 1995; Walsh, Brabeck, & Howard, 1999; Zeiss & Steffen, 1996).

Interdisciplinary teams also involve members from different disciplines. However, rather than working cooperatively and in tandem, the team works collaboratively, with interdependent roles (Drotar, 1995; Walsh et al., 1999; Zeiss & Steffen, 1996). In other words, assessments and decisions about treatment are made together by all the disciplines in the team.

According to Zeiss and Steffen (1996), interdisciplinary teams are beneficial for a number of reasons. First, patients receive more comprehensive and creative interventions, as team members' knowledge is integrated and can enhance the ideas of others. Second, problems or treatment recommendations do not "fall through the cracks." Third, the duplication of services (and questions asked of families) is reduced. Finally, an interdisciplinary team approach can prevent patients from receiving conflicting information or treatment recommendations.

Although there have been no reports on interdisciplinary pediatric sleep clinics, there are a number of other complex medical problems in children that commonly have been shown to successfully integrate providers from multiple disciplines. This includes pain (Shapiro, Cohen, Covelman, Howe, & Scott, 1991), headaches (Kabbouche et al., 2005), feeding and swallowing disorders (Miller et al., 2001; S. Williams, Witherspoon, Kavsak, Patterson, & McBlain, 2006), craniofacial anomalies (Robin et al., 2006), failure to thrive (Hobbs & Hanks, 1996), Fragile X syndrome (Alanay et al., 2007), atopic dermatitis (Lebovidge et al., 2007), and obesity (Dao, Frelut, Peres, Bourgeois, & Navarro, 2004). Such interdisciplinary approaches have been associated with increased parent satisfaction (Naar-King, Siegel, & Smyth, 2002), as well as improved follow up (Stores & Wiggs, 1998), parent perceptions of clinic quality, and staff attitudes (J. Williams et al., 1995). Despite the clear need for an interdisciplinary approach to pediatric sleep and the reported benefits of interdisciplinary teams for other pediatric conditions, to our knowledge, there is currently no description of an interdisciplinary pediatric sleep clinic in the literature.

An interdisciplinary approach throughout sleep medicine has been recommended (Pack, 2007), and is becoming a necessity for all sleep centers. One of the standards that must be met to become an accredited sleep center by the American Academy of Sleep Medicine is that "The center demonstrates capability and experience in the diagnosis and management of the full range of sleep disorders. This includes availability (within the center or by referral) of recognized and effective treatments for these disorders" (American Academy of Sleep Medicine, 2007, p. 5). Furthermore, the recent Institute of Medicine (2006) report on sleep and sleep deprivation included as one of its top four recommendations that sleep programs in academic health centers be organized as interdisciplinary programs that encompass the relevant clinical disciplines.

Along with the general benefits described previously, in pediatric sleep an interdisciplinary approach can enhance patient care in several ways (Hart, Palermo, & Rosen, 2005; Moore, Allison, & Rosen, 2006; Wiggs, 2003). First, this approach can help to clarify a sleep problem that has both behavioral and physiological etiologies. For example, partial-arousal parasomnias (e.g., sleep terrors, sleep walking) can be exacerbated by insufficient sleep that is caused by behavioral factors (e.g., poor sleep hygiene) or medical factors (e.g., OSA;

Wiggs, 2003). An integrated assessment by both a medical and behavioral provider may facilitate diagnostic clarity and provide treatment recommendations that address both behavioral and physiological concerns.

Next, there is often a complex and bidirectional relationship between pediatric sleep and certain developmental and psychiatric conditions (Ivanenko, Crabtree, O'Brien, & Gozal, 2006; Wiggs & Stores, 2004). For example, 44% to 83% of children diagnosed with autism spectrum disorders have sleep problems including prolonged sleep onset latency, frequent night wakings, or early morning wakings (Richdale, 1999; Wiggs & Stores, 2004). Children with ADHD often present with both physiological and behavioral sleep problems including a higher prevalence of PLMD; higher rates of sleep-disordered breathing; and reports of bedtime resistance, prolonged sleep onset latency, and poor sleep maintenance (Owens, 2005a). Furthermore, daytime behavior in children is known to deteriorate with insufficient sleep (Fallone, Owens, & Deane, 2002), often resulting in "ADHD-like symptoms" for children with disrupted sleep due to either OSA or behavioral insomnia of childhood (BIC). Similarly, sleep problems are both a symptom and a result of both depression and anxiety in children. Thus, in order to provide the most appropriate treatment recommendations in these cases, patients may benefit from an interdisciplinary team that is better equipped to disentangle physiological versus behavioral etiologies of a child's sleep problems.

Adherence is another area within pediatric sleep medicine that may also benefit from an interdisciplinary approach. For example, for a small percentage of children, surgical techniques, such as adenotonsillectomy, are not successful in treating OSA, requiring these children to use positive airway pressure (PAP) every night. However, adherence to this uncomfortable treatment has been shown to be poor in children (Marcus et al., 2006; O'Donnell, Bjornson, Bohn, & Kirk, 2006). An interdisciplinary sleep clinic allows for mental health specialists and nurse practitioners to provide behavioral interventions and family-based treatment plans that improve adherence to this important treatment. Studies have shown that these types of integrated interventions are successful in improving adherence to PAP treatments (Koontz, Slifer, Cataldo, & Marcus, 2003; Slifer et al., 2007).

In this article, we describe one interdisciplinary pediatric sleep clinic in a large children's hospital. Our sleep center includes an outpatient sleep clinic, a six-bed pediatric sleep laboratory, and professionals from multiple disciplines including pulmonary medicine, neurology, psychology, and nursing. The goals of this article are to (a) describe the structure and function of an interdisciplinary outpatient pediatric sleep clinic, (b) examine the frequency of individual and comorbid sleep diagnoses, (c) explore the prevalence of comorbid medical or psychiatric disorders, and (d) evaluate the types of treatment recommendations and referrals provided to patients at the end of their clinic visit.

DESCRIPTION OF THE PROGRAM

Setting

The pediatric sleep center described in this article is part of a large, urban academic children's hospital that serves a broad geographic area. The hospital provides training to medical students, residents, and psychology interns. In addition, there is a fellowship program for both medical and psychology trainees.

The Sleep Team

The primary outpatient clinic team consists of three pulmonologists, a neurologist, two psychologists, and a pediatric nurse practitioner. When this study was conducted, there were two separate clinics (morning clinic with two pulmonologists, one psychologist, and the nurse practitioner; afternoon clinic with one pulmonologist, one neurologist, two psychologists, and the nurse practitioner). The sleep center also trains both pulmonary and sleep fellows, psychology interns, practicum students, and post-doctoral fellows; and a rotating number of medical students, residents, and trainees from within the institution and from other institutions.

Since the completion of data collection, we have expanded our program in a number of areas: (a) we now have three clinic sessions per week—two that include pulmonary, neurology, and psychology attendings, and one with only pulmonary attendings; (b) we have also added a full-time registered nurse to our team; and (c) we have begun a CPAP adherence clinic, run by the nurse practitioner and a psychologist.

The Sleep Clinic

Typically, when a patient presents to our clinic, a medical or psychology trainee will meet with the family to conduct a thorough history of sleep, medical, and psychiatric concerns. An attempt is made to triage patients based on the trainee's discipline. However, the referral question is not always provided, and due to patient flow, we are not always able to match trainees in this way. Thus, all trainees are taught how to evaluate any type of sleep problem that presents in our clinic. This way, trainees are provided the opportunity to become "sleep specialists," who are able to diagnose and provide treatment recommendations for all sleep patients.

Based on the presenting concerns and relevant medical, psychological, and sleep history taken by the trainee, a team is formed with one or more medical attending (pulmonary or neurology); and, if needed, a psychologist or nurse practitioner. All patient visits are considered medical visits (see the Billing

section that follows), thus all patients must be seen by a physician. The “mini team” that is formed will discuss the patient’s history, formulate a diagnosis based on International Classification of Sleep Disorders–Second Edition criteria (American Academy of Sleep Medicine, 2005), and decide upon a treatment plan for the patient. Together, the entire mini team will meet with the family to elicit any additional information needed, provide feedback about the child’s diagnosis, and give treatment recommendations. Clinic visits typically last 60 to 90 minutes for families, depending on the complexity of the child’s presenting concerns.

Billing and Follow-Up

In our sleep clinic, as previously mentioned, psychologists do not bill; thus, all patients must be seen by a physician. This policy was established due to the lack of mental health contracts between the institution and the major insurance companies in the region. In addition, due to the high demand for our services, we have a limited number of follow-up appointments (typically 3 per clinic, although there may be up to 12 new appointments per clinic). Patients who require ongoing treatment (e.g., CPAP adherence, medication management) return to the clinic for follow-up appointments as needed (e.g., every 2–4 weeks for CPAP adherence, every 3–6 months for medication management).

Because of the limited number of follow-up appointment slots, a significant amount of our follow-up is done by telephone. For example, following a polysomnography (PSG), if there are no significant medical or behavioral issues that need to be addressed (e.g., CPAP initiation, insomnia), we call families with the results of the study and provide referral information (e.g., otolaryngology [ENT]) as appropriate. A copy of the PSG report is then sent to the primary physician and any additional consulting health care practitioners.

For behavioral issues, almost all of the follow-up is done with weekly phone calls. The reasons for this type of follow-up are twofold: (a) Due to the shortage of follow-up appointment slots, patients may need to wait anywhere from 4 weeks to 3 months for a follow-up appointment; and (b) for most patients, a graduated extinction approach is used, with each step of the intervention easily provided in a 10-minute phone call instructing the family in what to do for the next few nights. We do not bill for any telephone follow ups (PSG feedback, BIC treatment, etc.).

METHOD

Procedure

Consecutive patients presenting to our sleep clinic over a 4-month period were tracked using a data form completed by the initial interviewer (typically, the

trainee). Information was collected about the initial interviewer, which attending(s) were involved, the given sleep diagnosis based on the clinical interview, any comorbid medical or psychiatric disorders that the child presented with, treatment recommendations, and any referrals provided. Demographic information was also collected including the child's age, sex, race, and zip code (used as a proxy for socioeconomic status).

Participants

In the 4 months of data collection, there were 271 patient visits (265 children) in the outpatient sleep clinic. Seventy-three percent ($n = 199$) of the appointments were new patient visits, with 27% ($n = 72$) follow-up visits. The majority of patients were male (60%), with a mean age of 8.2 years ($SD = 5.5$ years; range = 18 days–22 years). The racial composition of the patients was representative of patients seen in our hospital (58.1% White, 26.8% Black, 2.7% Hispanic, 2.6% Asian or Asian American, and 9.8% other). The patient's zip code was used to identify median household income using U.S. census data (www.census.gov), with a median household income of \$53,816 ($SD = \$23,716$; range = \$8,096–\$159,905) for our sample.

RESULTS

Descriptive analyses were used to examine the role of providers, types of sleep diagnoses, medical or psychiatric comorbidities, and treatment recommendations provided in our interdisciplinary sleep clinic. When comparing groups of patients, chi-square analyses were used for categorical variables, using a more conservative p value to control for multiple comparisons ($p < .01$). Six children had more than one visit during the study period. For these patients, only the first visit during the study was included in the analyses ($n = 265$).

Provider Involvement

More than half of the patients ($n = 151$; 57%) were initially interviewed by medical trainees (medical students, residents, fellows), with 28% ($n = 74$) interviewed by psychology trainees (interns, practicum students), and 15% ($n = 40$) by the nurse practitioner. In terms of attending physicians, 58% of patients ($n = 153$) were seen by a pulmonologist, 41% ($n = 109$) were seen by a neurologist, and 1% ($n = 3$) were seen by both a pulmonologist and a neurologist. A psychologist was involved with 36% ($n = 95$) of patients.

Diagnoses

OSA was the most common sleep diagnosis (67.9%), followed by BIC (19.6%; see Figure 1), with 22.6% of patients given more than one diagnosis for a sleep disorder. Over half of the patients seen had at least one comorbid medical diagnosis (55.5%), with asthma (24.5%) and obesity (15.5%) the most common medical problems. Thirty-one percent of patients had at least one comorbid psychiatric diagnosis, with developmental delay (15.8%) and ADHD (10.2%) the most common. The frequency and types of comorbid diagnoses can be found in Table 1. Diagnoses did not vary depending on the discipline of the providers involved with the patient (Table 2).

Recommendations

PSG was the most common recommendation given to patients (61.9%), followed by sleep hygiene (18.1%) and changes to the bedtime routine (17.0%). The frequencies of all recommendations given in clinic are seen in Figure 2. Medications were prescribed for 4.9% of the patients. Of those receiving a medication, narcolepsy was the most common diagnosis ($n = 6$; 2.3%), followed by OSA ($n = 3$; 1.1%). There were no differences in the frequency of prescribed medications for patients with and without medical and psychiatric diagnoses.

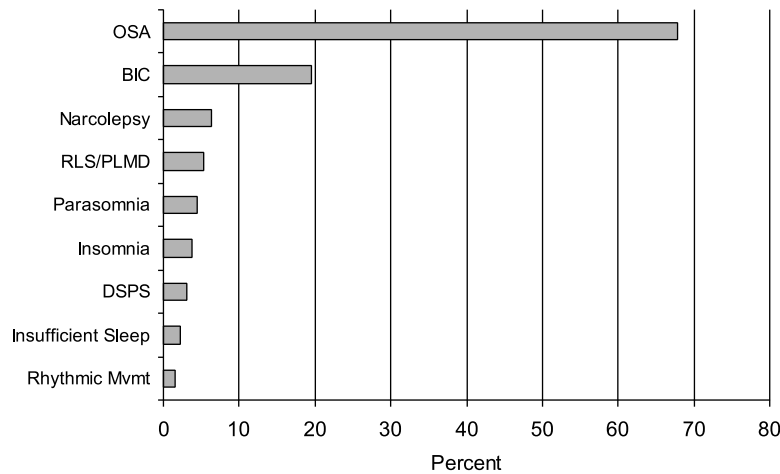


FIGURE 1 Percentage of sleep diagnoses given to patients. *Note.* OSA = obstructive sleep apnea; BIC = behavioral insomnia of childhood; RLS = restless legs syndrome; PLMD = periodic limb movement disorder; DSPS = delayed sleep phase syndrome.

TABLE 1
Frequency and Percentage of Patients With Comorbid Medical
or Psychiatric Disorders

<i>Variable</i>	<i>Frequency</i>	<i>%</i>
No comorbid medical diagnoses	118	44.5
One comorbid medical diagnosis	102	38.5
Two or three comorbid medical diagnoses	45	17.0
Medical comorbidities		
Asthma	65	24.5
Obesity	41	15.5
Seizure disorder	13	4.9
Reflux	13	4.9
Genetic syndrome	11	4.2
Down Syndrome	8	3.0
Sickle cell disease	6	2.3
Prader-Willi syndrome	6	2.3
Arnold-Chiari malformation	5	1.9
No comorbid psychiatric diagnoses	185	68.3
One comorbid psychiatric diagnosis	60	22.6
Two or three comorbid psychiatric diagnoses	24	9.1
Psychiatric comorbidities		
Developmental delay or mental retardation	42	15.8
Attention deficit hyperactivity disorder	27	10.2
Anxiety	20	7.5
Depression	14	5.3
Autism spectrum disorder	10	3.8

Note. $N = 265$.

TABLE 2
Frequency and Percentage of Patient Diagnoses for Each Provider Specialty

<i>Variable</i>	<i>Pulmonologist</i>		<i>Neurologist</i>		<i>Psychologist</i>	
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>
Obstructive sleep apnea	109	61.9	70	56.0	49	42.2
Behavioral insomnia of childhood	28	15.9	24	19.2	41	35.3
Narcolepsy	10	5.7	6	4.8	1	0.8
Restless legs syndrome or periodic limb movement disorder	5	2.8	9	7.2	4	3.4
Parasomnias	5	2.8	7	5.6	7	6.0
Insomnia	6	3.4	4	3.2	7	6.0
Delayed sleep phase syndrome	6	3.4	2	1.6	3	2.6
Insufficient sleep	6	3.4	0	0.0	2	1.7
Rhythmic movement disorder	1	0.5	3	2.4	2	1.7

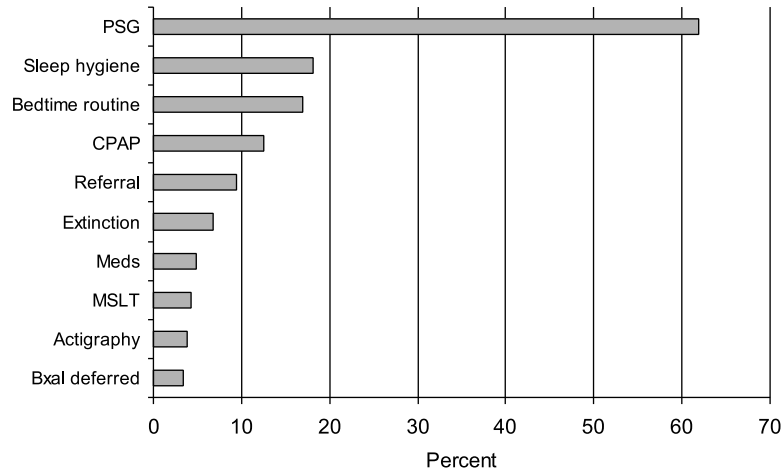


FIGURE 2 Percentage of recommendations given to patients. *Note.* PSG = polysomnography; CPAP = continuous positive airway pressure; MSLT = multiple sleep latency test; Bxal = behavioral.

A category of “behavioral recommendations” was created, and included at least one of the following: sleep hygiene (e.g., consistent sleep bedtimes and wake times, no caffeine after lunch, no television in the bedroom), bedtime routine (e.g., consistent and short, always moving toward the child’s bedroom), standard or graduated extinction (e.g., sleep training, putting the child to bed drowsy but awake and gradually removing parental presence), light therapy (to address circadian rhythm disorders), the bell and pad (to treat enuresis), and behavioral recommendations indicated but deferred. Thirty-eight percent of all patients received at least one behavioral recommendation.

Fourteen percent of children diagnosed with only OSA were given behavioral recommendations. A similar number of children both with and without comorbid psychiatric diagnoses were given behavioral recommendations (32.1% vs. 40.9%, respectively), $\chi^2(1, N = 265) = 1.9, ns$. However, fewer children with a comorbid medical diagnosis were given behavioral recommendations than children without a comorbid medical diagnosis (25.2% and 54.2%, respectively), $\chi^2(1, N = 265) = 23.4, p < .001$. Behavioral recommendations were provided to over one third of all patients seen by the pulmonologists (37.7%) and the neurologist (38.5%), and two thirds of patients seen by a psychologist (67.0%). Of the children who received behavioral recommendations, 32% were not seen by a psychologist. In other words, behavioral recommendations were provided to 14.6% of the patients seen only by a pulmonologist and 9.2% of the patients seen by only a pulmonologist.

Referrals were provided in the clinic to 8.0% of patients for the following reasons: mental health follow up (anxiety, ADHD; $n = 8$; 3.0%), weight management ($n = 5$; 1.9%), ENT ($n = 6$; 2.3%), and a specialized enuresis clinic within our hospital ($n = 2$; 0.8%).

DISCUSSION

Consistent with previous reports of pediatric sleep clinics (Hart et al., 2005; Stores & Wiggs, 1998), the results of this descriptive study clearly indicate the need for an interdisciplinary approach to pediatric sleep, as exemplified by the wide breadth of sleep disorders and treatment recommendations seen within our clinic. Although the majority of patients presenting to our clinic were evaluated for sleep-disordered breathing, one third presented with a behaviorally based sleep problem, and an additional 11.7% were seen for more neurologically based sleep issues including RLS, PLMD, and narcolepsy. In addition, almost one fourth of patients received multiple diagnoses, exemplifying the need for specialists from a variety of health care disciplines. Although these findings differ slightly from previous reports, the differences may be attributed to the type of clinic (psychiatric vs. interdisciplinary; Stores & Wiggs, 1998) or the age of the patient population (18 days–22 years vs. 5–18 years; Hart et al., 2005).

In terms of recommendations given at the clinic visit, over 60% of patients were to be evaluated by PSG for an underlying physiological sleep disruptor, but behavioral recommendations were provided for almost 40% of patients. In addition, the majority of patients also had a comorbid medical or psychiatric–developmental disorder. This latter finding is consistent with elevated rates of sleep complaints reported in children evaluated in a pediatric mental health clinic (Ivanenko et al., 2006). Together, these findings emphasize the need for an interdisciplinary approach to pediatric sleep problems. Along with the specialists in our clinic (pulmonologists, neurologists, psychologists, nurse practitioners), the high rate of comorbid obesity and psychiatric disorders found in this study also suggest the need for additional providers to be part of the team (e.g., a nutritionist to address obesity and a psychiatrist to manage psychiatric medications that affect sleep). We have started to address these needs, as indicated above, by adding a child psychiatrist to our team.

Similar to the suggestions provided by Zeiss and Steffen (1996), our pediatric sleep clinic has a number of benefits that result from interdisciplinary care. First, we are able to approach each presenting problem from a number of angles, resulting in comprehensive and immediate feedback to families about the diagnosis and treatment recommendations for their children. The ability to integrate information across disciplines has been shown to reduce the likelihood

that parents will receive contradictory recommendations from different providers (Sheehan, Robertson, & Ormond, 2007).

Along with preventing miscommunications between patients and providers, an interdisciplinary approach can also improve communication between providers. When professionals from different disciplines work together, there are fewer communication gaps that may occur when families are referred to multiple specialists (Miller et al., 2001). In our clinic, interprovider communication occurs in a conference room, where every patient is presented with multiple team members involved with the diagnoses and treatment. In addition, we facilitate continuity of patient care by sending an integrated summary letter to the child's primary physician from all team members, documenting the child's evaluation and treatment recommendations. A study of a pediatric sleep clinic in Britain found that when patients were referred to an outside provider for treatment, follow-up rates declined, regardless of the severity of the child's condition or complexity of the treatment recommendations (Stores & Wiggs, 1998). Another study found that interdisciplinary teams are characterized by the use of inclusive language, continual sharing of information between team members, and a collaborative working approach (Sheehan et al., 2007). The benefits of communication that result from an interdisciplinary approach to pediatric sleep should be examined in future studies.

Finally, in addition to patient care, an interdisciplinary clinic provides a unique opportunity for both medical and psychology trainees to learn about all aspects of pediatric sleep. In our clinic, trainees are responsible for the majority of initial interviews, regardless of the presenting problem. Thus, medical students and residents learn about BIC, and psychology students and interns learn about OSA and RLS. Furthermore, given that interdisciplinary approaches are becoming increasingly common in health care, this training model not only provides specific training in pediatric sleep medicine, but also provides the opportunity for trainees to function as part of an interdisciplinary team.

There are some methodological limitations in this study that need to be considered. First, there may be a sample bias that resulted from the referral patterns of patients to our clinic, so that our patient population may not be representative of other pediatric sleep clinics. Related to this issue, as the largest children's hospital in the region and the primary training site for pediatric residents and fellows, we often see more complicated and unusual patients compared to smaller, non-academic hospitals or clinics. However, these two limitations can also be seen as strengths of this study, as this report provides a realistic overview of an interdisciplinary sleep clinic compared to a study that may use a controlled environment with selective inclusion criteria. Finally, follow-up information on the patients in this report was not collected, limiting our ability to confirm OSA diagnoses by PSG, evaluate patient satisfaction, or track outcomes based on treatment recommendations.

Clearly, pediatric sleep problems are best addressed using an interdisciplinary approach. Pediatric sleep medicine is a field that covers a diverse array of problems, requiring a variety of health care specialists. Furthermore, such an approach improves the diagnosis, treatment planning, and treatment delivery for patients with a wide range of sleep disorders; and provides training for the next generation of pediatric sleep specialists. Both assessment and treatment planning within an interdisciplinary team can encompass all aspects of sleep, providing families with a comprehensive and integrated plan, and optimizing the care of children with sleep problems.

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