Adherence in children with nocturnal enuresis

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KEYWORDS

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Abstract *Objective:* The treatment of enuresis requires adherence to several guidelines often over a long period of time. The aims of this study were 1) to investigate adherence to the medical treatment regime for enuresis and its influence on therapeutic success, and 2) to gain insight into the socio-demographic, medical, familial and psychological predictors of adherence.

Materials and methods: For 41 children (6–12 years) with nocturnal enuresis, adherence to four common guidelines (drinking and voiding schedule, toilet posture and medication intake) was measured at 1, 3 and 5 months after treatment.

Results and conclusions: Mean adherence to the medical regime is about 70% according to both child and parent reports at the 24-h recall interview. Greater adherence, particularly to the drinking schedule, was associated with greater therapeutic success after 6 months. The best predictor of good adherence was a positive perception of one's physical appearance and to a lesser extent low levels of stress related to the treatment of the disorder.

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Introduction

Nocturnal enuresis is one of the most prevalent childhood problems affecting about 3–7% of 5-year-old girls and boys [1]. The treatment often includes prescription of medication, pelvic re-education, behaviour therapy (e.g. alarm therapy/dry bed training) or a combination of these therapies. The duration of both treatment and aftercare is

stretched out over a period of several months [2]. This requires compliance over a long period of time with medical advice and puts pressure on the child and its environment. As is the case in chronic problems such as diabetes and asthma, symptom monitoring is often a function of compliance with medical advice, the so-called adherence to the medical regime. With respect to serious and often life-threatening chronic diseases, it is commonly accepted that between 40% and 60% of all patients comply with the prescribed regime [3–6]. To our knowledge adherence in childhood enuresis has not been researched before. In this study we set out to investigate adherence to an enuresis treatment regime including four common guidelines: 1) compliance with a drinking schedule in order

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to increase functional bladder capacity, 2) going to the toilet with an adequate body posture (only for boys: sitting instead of standing) in order to get adequate relaxation of the pelvic floor muscles, 3) adherence to medication intake in order to reduce nocturnal diuresis in patients with documented nocturnal polyuria (desmopressin), and 4) compliance with a voiding schedule in order to become aware of bladder sensations and to increase functional bladder capacity. Guidelines 1, 2 and 4 are given in standard urotherapy [7].

Adherence is measured by a 24-h recall interview in which the child's adherence to the four guidelines in the last 24 h is registered at regular intervals.

A second aim of this study was to predict adherence in children with enuresis. Generally, four categories of predictors can be distinguished. First of all, research reveals that characteristics of the physician and the treatment influence adherence. Low adherence is associated with instability of the effectiveness of the medical regime as well as with inconsistent supervision by the physician [8]. Furthermore, adherence is lower in more complex and intrusive treatment methods. For instance, daily medication intake (vs symptom driven), injection (vs oral administration) and side effects of medication diminish the compliance with the medical regime [9]. Secondly, in spite of contradictory findings demographic factors such as adolescent age and low socio-economic status have been linked to lower adherence to medical regimes [10–13]. Thirdly, a direct positive effect of parental involvement and support on adherence is commonly accepted [14]. Butler and his colleagues [15] described two models of parental attributions concerning the cause of the maintenance of their child's enuresis. In the first model, parents attribute the existence of enuresis to internal, stable and uncontrollable factors such as depth of sleep. Consequently, parents become too tolerant of the child's behavior and the voiding problem maintains. The second model, marked by parental intolerance, is observed in families with increased stress levels. Parents attribute the problems to internal and controllable factors, e.g. lack of effort by the child. These parents are not willing to invest both time and energy in the treatment program and withdraw prematurely from the treatment. Finally, psychological variables are researched as predictors of adherence. Several studies indicate that young, highly adherent persons show an internal locus of control [16–18] and higher levels of self-esteem [19,20] and problem-solving skills [21]. In the current study we investigated the impact of potential medical, socio-demographic, familial and psychological predictors on adherence to the medical regime of enuresis. Furthermore, we aimed to determine the effect of adherence on therapeutic success.

Materials and methods

Subjects

Children with monosymptomatic nocturnal enuresis, aged between 6 and 12 years, and their parents were eligible for study entry if they were newly admitted to a specialized pediatric urologic and nephrologic department in

a university setting. Enuresis nocturna was defined as the presence of night wetting with or without daytime incontinence. The inclusion criterion of nocturnal enuresis was documented in a 14-day diary according to the International Children's Continence Society (ICCS) criteria [22], but all patients also met the Diagnostic and Statistical Manual of Mental Disorders, 4th edition, text revision [1] criteria.

The study was spread out over 6 months. Initially 41 children (32M/9F) and their families were enrolled; 35 children were subsequently diagnosed with nocturnal enuresis and six children with both nocturnal and diurnal enuresis. By the end of the study, three boys with nocturnal enuresis had dropped out. The mean age of participants was 7.9 years ($SD = 1.80$).

Instruments

Questionnaires were presented to both parents and children at the start of the study, and a short 24-h recall interview was administered by phone. All procedures were approved by the local ethical committee.

Stress caused by the *medical condition and medical regime* was measured by a self-constructed parent and child questionnaire. Based on 30 interviews with parents and children we constructed a list of the most frequently reported irritations and problems related to enuresis and its treatment. The Enuresis Stress Questionnaire – Parent (ESQ-P) rating consists of 10 items, rated on a 4-point Likert scale and grouped into three subscales: Negative consequences (i.e. time, money and effort invested in treatment), Care (i.e. pressure on family relations) and Dysmaturation (i.e. children's apathetic attitude). The Enuresis Stress Questionnaire – Child (ESQ-C) rating consists of 13 items, rated on a 4-point Likert scale and grouped into two subscales: Social consequences (i.e. impact on school attendance and contact with peers) and Medical Stress (i.e. time and effort caused by adherence to the medical regime). The ESQ-P and the ESQ-C can be requested from the first author. *Socio-demographic* information (e.g. educational level) was provided by the parents. *Familial* factors were covered by the Parenting Stress Index [23], a parent questionnaire which measures parental stress as a function of child, parent and situational characteristics. As for psychological predictors, *locus of control* was measured by the Children's Nowicki–Strickland Internal–External scale [24]. This child questionnaire aims to gain insight into the extent to which individuals, aged between 9 and 15 years, believe that they can effect their environment. *Self-esteem and self-perceived competence* was measured by the six domains of the Self-Perception Profile for Children (SPPC) [25]. Finally, *emotional, social and behavioral functioning* of the child was judged by the parents on the Child Behavior Checklist [26]. This contains eight syndrome scales and two aggregate broad band factor scales. All items form Total Problem Behavior.

Therapeutic success was measured by a voiding diary of the number of wet and dry nights during 2 weeks. Parents were asked to fill out the diary at the start of the treatment and after 6 months.

Adherence to the four guidelines was measured by the 24-h recall interview. This interview is administered to both parents and child by phone. Research revealed good test–

Table 1 Mean percentage adherence as reported by parent and child

	Drinking schedule (<i>n</i> = 41)	Medication (<i>n</i> = 34)	Body posture (<i>n</i> = 32)	Voiding schedule (<i>n</i> = 30)	Average/total adherence (<i>n</i> = 41)
Parent	80.2%	83.1%	64.7%	75.1%	74.0%
Child	77.7%	77.6%	60.1%	—	72.6%

retest reliability and inter-informant agreement for this method [27]. Because treatment is case-specific, we computed an average adherence score based on a varying number of medical guidelines that were prescribed to each patient: the drinking schedule was suggested to all participants, an adequate body posture was advised for all 32 boys, medication was prescribed to 34 patients and the voiding schedule was advised for 30 children. Children were often unaware of the existence of this last schedule as parents usually took full responsibility for compliance. Therefore, we chose not to measure the child reports on this guideline. The 24-h recall interview took place at 1, 3 and 5 months after the start of the study.

Statistical analysis

In order to calculate adherence scores for both parent and child reports, the extent of compliance with each guideline was measured (%). Fluctuation in adherence over time for each informant was measured using an analysis of variance with repeated measures design. Pearson correlations were used to determine the agreement in adherence between parents and child on the one hand and the association between adherence and therapeutic success (differences between % wet nights at the start of the treatment and 6 months later) on the other hand. Possible predictors of adherence were selected when Pearson correlations between the questionnaire subscales and the adherence scores reached (a trend towards) significance. These variables were then entered in a stepwise regression in order to determine to what extent the variance in adherence can be explained by medical, socio-demographic, familial and psychological predictors. The inclusion criterion for predictors in the stepwise regression was $P < 0.05$, while the exclusion criterion of predictors was $P \geq 0.10$.

Results

Adherence

The average percentage adherence for each guideline and total adherence are reported in Table 1. Parent and child reports on adherence reveal significant agreement at 1, 3 and 5 months after treatment onset ($r = 0.84$, $r = 0.64$,

$r = 0.61$ respectively, $P < 0.01$). Average adherence did not fluctuate significantly across the three intervals for either parent or child reports [$F(2,79) = 2.3$, $P = 0.10$] (see Table 2).

Association between adherence and therapeutic success

Mean therapeutic success after 6 months was 24.4% (SD = 37.9, range between -21.43% and 100%). According to child reports of adherence, higher levels of adherence at 1, 3 and 5 months after treatment onset are associated with greater therapeutic success half a year later ($r = 0.36$ – 0.84 , $P < 0.02$). Parents only report a significant association between adherence at the third interval and therapeutic success ($r = 0.34$, $P = 0.03$). Looking at the guidelines separately, we found that adherence to the drinking schedule after 1 month of treatment is associated with greater therapeutic success (parent reports: $r = 0.32$, $P = 0.04$). This association persists at the second and third interval, although only as a trend towards significance ($r = 0.26$, $P = 0.10$ for both intervals).

Predictors of adherence

Medical, socio-demographic, familial and psychological variables as measured by parent and teacher questionnaires were entered in a stepwise regression if the correlation with adherence reached (a trend towards) significance (see Table 3).

These possible predictors were entered in two stepwise regressions (parent and child reports) (see Table 4). Child reports on adherence were best predicted by SPPC Physical

Table 2 Mean (SD) % adherence at 1 (T1), 3 (T2) and 5 (T3) months after treatment onset

	T1	T2	T3
Parent	74.8 (24.4)	74.5 (23.8)	73.6 (22.1)
Child	66.1 (25.5)	80.0 (20.7)	72.0 (20.9)

Table 3 Pearson correlations between questionnaire subscales and adherence ($P < 0.10$)

Questionnaire subscale	<i>n</i>	Adherence: child report	Adherence: parent report
CBCL total problems	41		-0.28 ^a
ESQ-C medical stress	38	-0.27 ^a	-0.29 ^a
ESQ-P dysmaturaton	41	-0.31*	-0.27 ^a
SPPC scholastic competence	40	0.42**	0.31*
SPPC social acceptance	40	0.46**	0.39**
SPPC athletic competence	40	0.30 ^a	
SPPC physical appearance	40	0.51**	0.55**
SPPC behavioral conduct	40	0.47**	0.43**
SPPC general self-worth	40	0.45**	0.46**
PSI adaptability	41	-0.26 ^a	-0.37**
PSI distractibility	41	-0.30*	-0.33**

** $P < 0.01$, * $P < 0.05$, ^a $P < 0.10$.

Table 4 Coefficient R^2 , standardized regression coefficient and P -values of the stepwise regression

	R^2	β	P
<i>Adherence: child report</i>			
Physical appearance	0.26	0.40	0.00
Medical stress	0.34	-0.34	0.01
Dysmaturation	0.44	-0.32	0.01
<i>Adherence: parent report</i>			
Physical appearance	0.31	0.55	0.00

Appearance, ESQ-C Medical Stress and ESQ-P Dysmaturation [$F(3,39) = 9.55$, $P = 0.01$]. Together, these three variables explain 44% of the variance of adherence. Parent reports on adherence were best predicted by SPPC Physical Appearance [$F(1,39) = 16.74$, $P = 0.01$]. This factor explains 31% of the variance of adherence.

Discussion

As treatment of nocturnal enuresis is stretched out over several months, adherence to the medical regime intuitively becomes an essential predictor of therapeutic success. However, adherence to enuresis treatment remained understudied. Therefore, we set out to investigate adherence to common medical guidelines for an enuresis treatment and to determine its effect on therapeutic success. We are aware that of the Evidence Based Management therapies level 1, we have included only desmopressin [7]. Although alarm therapy is also level 1 grade A, this treatment was not taken into account in this adherence study for two reasons. Firstly, there is our center's policy to introduce alarm treatment only after more than 3 months of urotherapy and correction of nocturnal polyuria. Secondly, the introduction of the alarm during the observation period could have influenced the adherence parameters significantly because: 1) the alarm treatment demands almost 100% adherence, 2) the high success rate within 3 months may mask the results of other parameters, and 3) almost all patients admitted to a university centre have already received prior therapy in primary care, often including alarm therapy. Therefore, alarm therapy was believed to be a less suitable parameter to monitor for this study design, and focus was only on compliance with guidelines concerning drinking schedule, body posture, medication intake and voiding schedule.

Compared to an adherence rate of about 50% in life-threatening conditions such as diabetes and asthma [3–6], adherence to enuresis treatment is much higher: we found an average adherence of more than 70%. Adherence reports at the 24-h recall interview of both parents and children revealed a near perfect agreement. In line with studies of other conditions [28] highest adherence was reported for medication intake (83.1% according to parents and 77.6% according to children). Compliance with other guidelines was considerably lower, particularly with adequate body posture in boys (64.7% according to parents and 60.1% according to children). Supervision by parents of their child's body posture is limited and time consuming which in the long term could result in less reinforcement for the child's effort. Furthermore, the required (sitting) body posture is very

noticeable for peers in a school context. It seems plausible that the child fails to sit down because of fear for questions and negative comments. Therefore, it is highly recommended that physicians discuss thoroughly with patients how to implement a guideline in daily life and that they anticipate frequently encountered problems and challenges. As our data reveal that adherence remains rather constant over time, this timely investment by the physician may prove its worth assuming that adherence predicts therapeutic success.

Indeed, based on both parent and child reports, we found that higher levels of adherence result in greater therapeutic success after 6 months of treatment. It is important to note that therapeutic success in this study refers to difference in percentage wet nights at treatment onset and 6 months later, and does not necessarily result in the child becoming continent. As the design of the study only included conservative treatment, it is important to note that excluding options such as alarm therapy, voiding camps and voiding school may have attenuated success rate results. Furthermore, the effect of adherence on therapeutic success was mainly driven by compliance with the drinking schedule already after 1 month from treatment onset. As monosymptomatic nocturnal enuresis results from a mismatch between functional bladder capacity, nocturnal diuresis and decreased arousal to bladder sensations [29], adherence to the drinking schedule increases functional bladder capacity and thereby acts directly on the etiology of most cases of enuresis.

Taking into account the importance of adherence for therapeutic success, we aim to determine medical, socio-demographic, familial and psychological predictors of adherence. For child reports, high levels of adherence are best predicted if the child perceives his/her physical appearance positively (SPPC Physical Appearance), if the child experiences less stress from medical aspects of the treatment (ESQ-C Medical Stress), and if the child shows mature behavior and an active attitude towards handling the problem (ESQ-P Dysmaturation). The parent reports of adherence are best predicted by just one variable: the child's perception of his/her physical appearance. Perception of physical appearance seems to be a very powerful predictor of adherence in both parent and child reports. Hypothetically, parents and children feel that physical appearance is strongly related to social acceptance by peers and as such influences adherence.

Quite remarkably, parameters that were previously associated with adherence in chronic disorders were not selected as a predictor in the case of nocturnal enuresis. We failed to find a (significant) association between adherence and locus of control, the presence of emotional and behavioral problems, parental stress, and socio-demographic variables such as gender and socio-economic status. This could be explained by characteristics of nocturnal enuresis itself: although the treatment process is also long, the symptoms are not in the least life threatening as is the case in for instance mucoviscidosis. It could be interesting to study adherence over a longer time period: perhaps de-motivation and similarities with (life-threatening) chronic diseases only occur at later stages of the treatment. Alternatively, the rather small sample size could mask subtle effects of specific parameters due to relatively low power.

Another limitation of this study is the possibility that the process of informed consent and participation could have enhanced adherence to the medical regime: participants were informed that adherence would be registered on three occasions which perhaps stimulated them to comply more strongly with the treatment regime. Finally, the inclusion and exclusion criteria may largely influence results. For instance, inclusion of only patients from a specialized center with more severe cases and higher rates of co-morbidity makes extrapolation to a primary-care population almost impossible.

Conclusions

In spite of some limitations, this study is the first of its kind to reveal important insights into adherence to enuresis treatment. First of all, data revealed (relatively) high and stable levels of adherence to four common guidelines. Furthermore, taking into account the high informant agreement, the child proves to be an equally reliable informant on adherence as the parent. Secondly, the level of adherence to specific guidelines (e.g. adequate body posture) could be increased by explaining the aim of each guideline, by anticipating difficult contexts for adherence (e.g. school setting), and by stressing the important contribution of both child and family in therapeutic success. This could be facilitated by using creative and original methods, adapted to the child's age and interest. Thirdly, a physician should be sufficiently sensitive to specific predictors of adherence in enuresis. If the child reports high distress with (aspects of the) medical regime or his/her physical appearance, the physician should be more alert to failing adherence. Fourthly, time and effort to increase adherence will prove to be worthwhile as high adherence (to the drinking schedule) is associated with greater therapeutic success.

Conflict of interest

None of the authors report competing interests.

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