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Comparison of Preparation and Narcotic-Sedative Premedication in Children Undergoing Surgery

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A psychological preparation program was developed for use prior to emergency surgery in children. The purpose of this study was to test the hypothesis that provision of specific information prior to an emergency operation would reduce the need for premedication to control anxiety and stress. Children were randomly assigned to either a verbally prepared group given narcotic-sedative premedication (control) or to a psychologically prepared group given only atropine as premedication. The child and parent rated their own anxiety on a Visual Analogue Scale (VAS). The children and parents were also assessed by a nurse preoperatively and postoperatively using a similar scale. The children's pulse, blood pressure, and cortisol were also measured. The results showed no significant difference between the psychologically prepared group and the premedicated group, suggesting that psychological preparation compares favorably with narcotic-sedative premedication.

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When children are admitted to the hospital, they face a new and unfamiliar situation and usually undergo procedures and treatments. Helping the child to cope with these situations is an important task for the medical and nursing staff. During the past 40 years, a large amount of literature has confirmed that children and parents experience some degree of anxiety related to health care encounters, such as hospitalization and surgery. The international literature on children hospitalized for surgery suggests that there is a consensus that all children need some kind of psychological preparation for the hospital experience, particularly in connection with surgery (Chan, 1976; Eckhardt & Prugh 1978; Mahan & Mahan, 1987; Ritchie, 1979; Schreier & Kaplan, 1983).

Several different methods have been used to decrease the anxiety and stress that children experience when admitted to the hospital. Most methods of preparation emphasize the communication of information about upcoming events. Information is provided to the child because vague, undefined threats are more upsetting than threats that are known and understood. Unexpected stress is more upsetting than expected stress. In the absence of accurate information, children of all ages often develop fantasies and distorted ideas. The manner of imparting the information should be *simple, honest,* and *reassuring* and done at level appropriate to the child's cognitive and psychological development. Preparation programs generally involve some or all of the following components:

- giving the child information about what will be done,

- letting the child handle equipment,
- having the child practice the procedure on a doll,
- introducing the child to medical personnel,
- discussing the child's fear, feelings, and questions,
- helping the child to reconstruct the information given.

Various methods have been used, including doll-play, hospital tours, story telling, pamphlets, and photo albums. In most of the literature, parents are present while the preparation is given to the child.

The effect of a preparation program prior to hospitalization and surgery has been investigated in numerous studies. Vaughan (1957) found that psychological upset was more common in unprepared than in prepared children. He investigated 40 children, who averaged 5.9 years of age (2.3-9.2). Tarnow and Gutstein (1983) presented data showing that children's preparatory play behavior may provide a means for predicating their adaptation to surgery and that coping behaviors are related to what a child is doing, thinking and feeling during a stressful situation. These children were between 4 and 9 years of age. Visintainer and Wolfer (1975, 1979) have shown that children between 3 and 12 year of age, who receive a combination of systematic preparation, rehearsal and supportive care prior to each stressful procedure, show significantly less upset and more cooperation. Similar findings have been reported by Melamed and Siegel (1975), who found lower sweat gland activity, fewer self-reported medical concerns, and fewer anxiety-related behaviors in a prepared group of children between 4 and 12 years of age.

Pharmacologic premedication is usually given before surgery. Seeman and Rockoff (1986) claim that premedication may give variable effects, due to such uncontrolled factors as unpredictable surgical starting time or postoperative sedation. This may constitute a reason for not giving routine premedication on the ward. Preparation via a preadmission program can lead to less stress at the time of anesthesia according to Atkins (1987). In a previous study, Edwinson, Arnbjörnsson, and Ekman (1988) found that the addition of a preoperative psychological program reduced the level of anxiety in pharmacologically premedicated children. The study suggested that preparation may reduce the need for premedication.

In Swedish hospitals, a short verbal information session prior to surgery has been used in combination with premedication. Some hospitals have started to use special preparation programs. For many years, parents have been encouraged to stay with the child until admission to the operating unit and then again in the postoperative unit as well as during subsequent hospitalization. Overnight facilities are provided. Tradition has favored the continued use of pharmacologic premedication regardless of whether a preparation program has been introduced or not.

The purpose of the present study was to investigate the value of a psychologic preparation program compared to conventional premedication alone. It was hypothesized that a psychologic preparation program should compare favorably with pharmacologic premedication in terms of effect on children's and family's anxiety.

Methodology

Thirty children (12 boys and 18 girls ages, 7 to 15) admitted to the hospital for acute pain, and subsequently operated on for appendicitis, were randomly assigned to one of two groups. No child with peritonitis was included in order to avoid unnecessary delay of the operation and because the child in acute severe pain probably cannot use the information effectively. Two children in each group had previously undergone minor surgical procedures. Parental consent was obtained prior to the inclusion of children in this study. The Committee of Ethics at the University of Lund gave its consent.

Group I was prepared verbally before the operation by the nurse in charge in the pediatric unit and then given conventional narcotic-sedative premedication (see under **Premedication**). These children were considered the control group. The information consisted of a verbal explanation about what was to happen while the child was awake. A conscious effort was made by the nurse in charge to provide a consistent pattern of verbal information to all children, but with attention to age-related requirements of each individual child. Such verbal information included a brief mention of the expected stages of the procedure, such as receiving premedication, feeling dizzy, transportation into the operating room, and finally waking up in the recovery room.

Experimental group II was prepared using the special preparation program.The program included a detailed explanation of preoperative and postoperative procedures (see Table 1). This information was given by the nurse in charge in the pediatric unit. These children received only atropine as premedication.

In both groups, parents were present during information sessions. In the interest of uniformity, all pediatric nurses involved in the preparation program had been instructed on how to inform children of different ages. The nurses doing the evaluations were trained on how to use the rating scales prior to the start of the study.

Stress Measurements. Anxiety was registered using a Visual Analogue Scale (VAS). This is a 10-cm graphical rating scale labeled "very calm" (0cm) at the left extreme and "very afraid" (10cm) at the right extreme. This technique is a modification of that previously described as reliable and sensitive by Clarke and Spear (1964) for use by adult patients, and subsequently used by Abu-Saad (1984) with pediatric patients. Picture series, including line drawings of faces, or a photographic scale of facial expressions indicating varying intensities of pain, have been suggested by Abu-Saad (1984) as an alternative instrument by which children can indicate their own experience of pain. In this study, the VAS method was chosen because of its usability with both adult observers and children.

In the pediatric unit the nurse in charge first rated the children's and parent's anxieties independently on a VAS rating-scale. The children's pulse and blood pressure were then recorded. Finally, both child and parent were asked: "How afraid are you?" and they rated their perceptions on a VAS measuring-stick. The nurses' evaluations, along with pulse and blood pressure, were subsequently repeated on admission to the operating theatre, in the postoperative ward (when the child was awake and could cooperate), and on return to the pediatric ward. Questions to the child and parent were not repeated on return to the pediatric ward. Neither information nor premedication had been given prior to the first evaluation in the pediatric unit. VAS scores, the children's pulse and blood pressure measurements in the operating unit, the postoperative unit and again in the pediatric unit, were performed by three separate nurses who were blind to the children's group assignment. The need for

Table 1. Preparation Program

1. A doll was used as a model and materials to be used in the procedure were demonstrated. The purpose was to familiarize the child with what he or she would see while still awake, for example, needle, syringe, sterile clothes, mask, cap and anesthetic mask. The doll was consistently used for children under 12 years of age.

2. The operative procedure was described by showing a book with photographs of a child who had previously undergone an operation. The illustrations showed events from premedication through induction of anesthesia, and ended with the child waking up after the operation. The operation itself was not described. The child's understanding of the procedure was assessed by allowing the child to verbalize and ask questions. Observed misconceptions were corrected by the nurse in charge, considering the child's age. The preparation program required approximately 5-8 minutes with each child. This method is an adaptation of that proposed by Petrillo and Sanger (1980).

Table 2. Visual Analogue Scale Measurements in four Units Mean ± SD

Group		Pediatric Unit	Operating Unit	Postoperative Unit	Pediatric Unit
Nurse rating					
Children					
	I	3.1 ± 1.6[a]	2.7 ± 2.3	1.0 ± 0.9	1.3 ± 1.2
	II	2.5 ± 1.7[a]	2.7 ±2.8	1.1 ± 0.8	1.5 ± 1.5
Parent					
	I	2.2 ± 1.2	not done	1.6 ± 2.0	1.7 ± 2.8
	II	2.3 ± 1.6	not done	1.8 ± 1.9	1.8 ± 2.2
Self-rating, Children					
	I	3.6 ± 2.5[b]	2.9 ± 2.2	1.2 ± 1.3	not done
	II	2.8 ± 2.8[c]	2.9 ± 2.9	0.8 ± 0.8	not done
Parent					
	I	2.3 ± 1.9	not done	1.1 ± 1.1	not done
	II	3.1 ± 1.9	not done	1.7 ± 2.4	not done

Key
[a] $p<.01$ between pediatric unit and postoperative unit
[b] $p<.05$ between pediatric unit and postoperative unit
[c] $p<.001$ between pediatric unit and postoperative unit

Notes
Group I given narcotic-sedative, group II preparation program. Using two-tailed paired t-test
- Results are presented as mean centimeters on the VAS Scale ± 1 SD. 0 = very calm, 10 = very afraid. Statistical significance is determined by two-tailed paired t-test.

analgesics was recorded during 12 hours postoperatively.

When the child was admitted to the hospital, a needle was inserted and IV fluid started. Blood samples were drawn upon arrival in each new clinical unit and were analyzed for serum cortisol, using the FARMOS DIAGNOSTICA Cortisol[^{125}I] Radioimmunosassay Kit. Serum cortisol has been reported by Lundberg (1983), Sigurdsson (1982), and Pickar, Cohen and Dubois (1983) as an objective measure of stress in children and adults, respectively.

Five children and their parents from each group were interviewed regarding their opinions on hospitalization for surgical treatment at 4 to 15 months after surgery. The objective of this follow-up study was to evaluate the psychological preoperative preparation. Questions centered on memories of pain, anxiety, and nausea and were related to three distinct occasions: (a) at home before admission, (b) before anesthesia, and (c) after surgery.

Premedication. All patients were given atropine sulphate (0.01 mg per kg body weight) rectally to those weighing less than 30 kg and intramuscularly to all others. Patients in group I received in addition diazepam (0.5 mg per kg body weight) and morphine (0.15 mg per kg body weight) rectally, or if the body weight exceeded 30 kg, meperidine (1 mg per kg body weight) and promethazin (0.5 mg per kg body weight) intramuscularly. Parents were present until the child arrived in the operating theatre.

Anesthesia. The same anesthetic technique was used in both groups. Anesthesia was induced with thiopentone and after muscle relaxation with succinylocholine, an endotracheal tube was passed. Anesthesia was maintained with enflurane and meperidine as needed. The surgical and anesthetic staff were unaware of the actual preoperative regimen used.

Statistical methods. The VAS must be regarded as, at best, an ordinal scale. Mean VAS values and standard deviations are nonetheless presented; in small samples the estimate of the mean "converges" more rapidly, compared to other measures of central tendency, such as the median. In the case of age, however, median values are shown in order to allow comparison with some other published reports. For comparisons between groups, the Mann-Whitney U test was used. For within-group comparisons of paired observations, the simplest appropriate test, the binomial test (Snedecor & Cochran, 1967) or, where appropriate, the Wilcoxon's signed-rank test was used. Whenever possible, at least one corroborative method was applied, the conventional paired T-test as a check on the Wilcoxon test, for example (Siegel, 1956).

Results

No statistically significant differences were found between the groups regarding sex distribution, appendical status or age. Median age was 12.3 years for the control group I (range 8-14.5), and 12.8 years for the experimental group II (range 8-15.5). Two children in each group were premedicated rectally and the other 14 in each group received premedication intramuscularly. The total amount of analgesics given postoperatively did not differ between the

groups.

The control group I consisted of 15 children, 6 boys and 9 girls. Two were diagnosed as suffering from mesenteric lymphadenitis and 13 from appendicitis. The experimental group II also consisted of 15 children, 6 boys and 9 girls: 5 with mesenteric lymphadenitis and 10 with appendicitis. The results are presented without reference to the degree of the inflammation.

Mean values and standard deviations of VAS ratings of children by nurses are presented in Table 2 and graphically displayed in Figure 1. Statistically significant decreases were found for children between the pediatric unit and postoperative unit in both groups ($p<0.01$). A decrease for parents' ratings was also found between the same units in both groups, but the differences were not statistically significant.

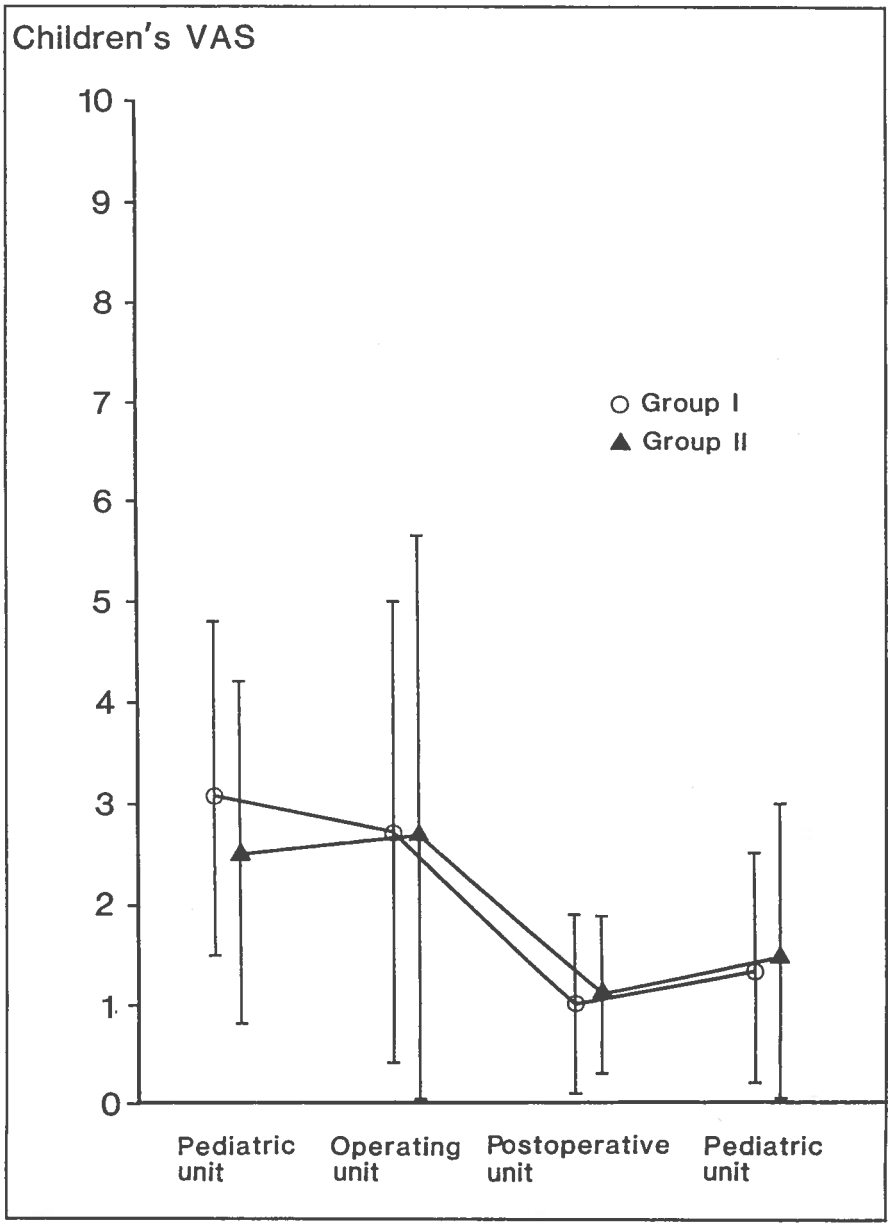
Children's and parents' self ratings on the VAS scale are also presented in Table 2. In the control group I, children's self-ratings decreased significantly between the pediatric unit and postoperative unit ($p<0.05$), and a corresponding decrease was seen in the experimental group II ($p<0.001$). There were no statistically significant differences between the two groups in any unit. Parents' VAS scores were similar to those of their children, but did not present any statistically significant changes.

The mean values and standard deviations for pulse rates and blood pressure are presented in Table 3. Pulse rates were higher in experimental group II than in the control group I on return to the pediatric unit postoperatively ($p<0.05$). Pulse rates in the control group I increased significantly between pediatric and operating units ($p<0.05$) but decreased between the postoperative unit and the pediatric unit postoperatively ($p<0.001$). In the experimental group II, the pulse rates did not change significantly throughout the study. Systolic and diastolic blood pressures did not change significantly during the study, nor did temperatures which remained between 37.5°C and 38.5°C.

Table 4, shows that cortisol concentrations were approximately equal in both groups at the first measurement (pediatric unit preoperatively). In control group I, concentrations then decreased between the pediatric and operating units, increased significantly between the operating and postoperative units ($p<0.05$), decreasing again between the postoperative and pediatric units ($p<0.01$). In experimental group II, cortisol increased between the pediatric unit, operating and postoperative units but decreased in the pediatric unit postoperatively; these changes were not statistically significant. No significant differences were seen between the groups regarding need for postoperative analgesics, nor was it possible to identify any relationship between analgesic usage and VAS ratings.

The results of interviews done 4 to 15 months after surgery demonstrated that children who received the psychological preparation program without narcotic-sedative premedication remembered somatic symp-

Figure 1. Psychological Preparation Compared to Narcotic-Sedative Premedications in Emergency Surgery
(Edwinson, Fredrikzon, & Rosberg, 1992)



Note: Children's reaction on Visual Analogue Scale (VAS) in 4 units as reported by nurses. Results are presented as mean ± 1 SD. o = children are verbally prepared given narcotic-sedative as premedication. Δ = children prepared with the preoperative program and given only atropine as premedication. 0 = very calm, 10 = very afraid.

Table 3. Pulse and Blood Pressure in the Four Units Mean ± 1SD

Vital Sign and Group	Pediatric Unit	Operating Unit	Postoperative Unit	Pediatric Unit
Pulse rate (beat/min)				
I	83 ± 16[b]	93 ± 14	92 ± 20[c]	72 ±10
II	88 ± 17	100 ± 21	92 ± 24	91 ± 20[a]
BP (mmHg) systolic				
I	119 ± 4	121 ± 12	121 ± 6	116 ± 8
II	116 ± 11	113 ± 9	111 ± 9	115 ±11
diastolic				
I	70 ± 8	not done	not done	67 ± 11
II	70 ± 10	not done	not done	70 ± 10

Key
[a] $p<0.02$ paired t-test
[b] $p<0.05$ binomial test
[c] $p<0.001$ binomial test
Note: Results are presented as mean ± 1 SD. Statistically significant differences were found between the groups in the pediatric unit postoperatively.

Table 4. Stress Hormone (Cortisol) Determination in the Four Units

Hormone and Groups	Pediatric Unit	Operating Unit	Postoperative Unit	Pediatric Unit
	[nmol/L]	[nmol/L]	[nmol/L]	[nmol/L]
I	515.9 ± 322.4[a] (131-1103)	404.8 ± 258.2[b] (90-935)	785 ± 316.4[c] (161-1443)	286.3 ± 174.9 (68-614)
II	578 ± 463.2 (102-1586)	661. ± 440 (124-1410)	846.9 ± 298.6 (412-1451)	565.5 ± 407.6 (105-1538)

Key
[a] $p<0.01$ between pediatric unit and postoperative unit two-tailed paired t-test. By two-tailed binomial test;
[b] $p<0.05$ operating unit versus postoperative unit,
[c] $p<0.01$ postoperative unit versus pediatric unit.
Note: Results are presented as Mean ± 1 SD. Ranges of values are in parentheses. Statistical significance was determined by two-tailed paired t-test and binomial test.

toms, pain, nausea, and had more realistic memories of the procedure. They also asked more questions and received more answers during their time in hospital. On the other hand, children, who had been conventionally prepared and given narcotic-sedative drugs preoperatively remembered primarily their fears. More parents of children in the control group considered their child to be afraid during the stay at the hospital compared to parents in the prepared group.

Discussion

In a previous study of children suffering from acute appendicitis (Edwinson et al., 1988), psychological preparation together with narcotic-sedative premedication were shown to be more effective in reducing the level of preoperative anxiety as compared to preoperative medication alone. The present study shows that children receiving psychological preparation reacted in a similar way to those who received narcotic-sedative drugs alone. Children's and parents' self-ratings on the VAS scale were very similar to ratings done by nurses in the various units. Small differences, though not statistically significant, were found preoperatively in the pediatric unit, where parents rated themselves as more afraid compared to the ratings done by nurses. Postoperatively, the reverse was found, with parents rating themselves as less afraid compared to nurses' ratings. It should be noted here that interrater reliability was not tested in this study, but an effort was made to encourage consistency by providing identical instructions to all participating nurses.

A Visual Analogue Scale (VAS) can be used to measure different dimensions and types of pain in a variety of medical and dental situations (McGrath, 1987). In a study performed by Abu-Saad (1984), self-assessment of pain was investigated in 10 children. The pain-scale responses were found to be related to physiological parameters, body, facial, and vocal indicators of pain. The child's mark on the pain scale was a valid indicator of the severity of the pain experience at that moment. Clarke and Spear (1964) investigated the adults' self-rating of well-being on a VAS-scale and found it to be both sensitive and reliable. The VAS registration of anxiety as done by the patient may be influenced by the actual degree of pain. As shown by Katz, Kellerman, and Siegel (1980) in children suffering from cancer, the differentiation between pain and anxiety may be very difficult. While behavioral measures have been shown to be reliable and valid indices of children's distress, overt behavior does not always constitute a direct expression of the intensity or quality of their pain experiences.

In this study, analgesics were given preoperatively only to children in control group I. In addition, analgesics were given to all patients when judged necessary by the responsible anesthetist and nurse during anesthesia. The effect of the preoperative sedative medication in control group I probably had an impact on anxiety in the postoperative unit and later in the pediatric ward as well. Postoperatively in the pediatric unit, pulse rate was significantly lower in control group I. This may be due to the narcotic-sedative drugs given preoperatively. Even though no sedative had been given to children in experimental group II, their blood pressures were below those in control group I, who might have been expected to show tendency to hypotension due to the narcotic-sedative medication.

Several physiological responses, such as cortisol, pulse, and blood pressure, have been studied in

infants and children as potential pain measures. According to McGrath (1987), there is evidence indicating that physiological responses mirror the state of the infant or child in a stressful and painful situation. In this study, plasma cortisol concentrations showed an extremely wide range, in accordance with previous results (Edwinson et al., 1988). The well-known diurnal variation in plasma cortisol might have contributed to this, since the timing of samples was determined by events and could not be standardized according to the clock.

Cortisol concentrations tended to be higher in experimental group II, although this difference was not statistically significant. The most obvious difference was found in the operative unit, where patients in group I showed a decreased plasma concentration, probably due to the effects of narcotic-sedative medication given. The difference might also be due to a higher initial stress level prior to operation in experimental group II. In the postoperative unit concentrations increased, probably a normal stress reaction caused by the operation. Other authors have used clinical parameters, such as, pulse, blood pressure, (Visintainer & Wolfer, 1975), the Palmar Sweat Index (PSI), (Melamed & Siegel, 1975) and stress hormones, cortisol, ACTH and catecholamines (Sigurdsson, 1982; Pickar et al., 1983; Lundberg, 1983) to evaluate stress in children.

In interviews done with 10 of the children after the hospital stay, between-group differences were found regarding the ability to handle fears. Children in group II (the prepared group) had more realistic memories of their perioperative procedures, their anxiety and fear having probably been dealt with in the hospital. It was concluded that a preoperative psychological preparation program gives the child a realistic view of hospitalization.

In conclusion, no significant differences in terms of VAS recordings of anxiety or somatic stress parameters were found during hospital stay in children who received psychological preparation as compared to those given conventional narcotic-sedative premedication for acute appendectomy. Interviews with the children several months postoperatively indicated a more realistic dealing with the memory of the hospital experience in the group that underwent the psychological preparation program. The findings suggest that the psychological preparation program may be as effective as narcotic-sedative premedication. Further study regarding the use of psychological preparation alone, prior to anesthesia, is needed to support this hypothesis. A more thorough understanding of the underlying psychological and behavioral processes is needed, particularly in relation to the cognitive development of children with increasing age.

Implications for practice. Introduction of a preparation program in the pediatric clinic should not require employment of extra personnel, but a training program for each nurse should be planned to include at least 10 meetings of 45 minutes each, together with the instructor. Some individual training should be included but most meetings can be carried out in a group. The time required with each child in the clinical setting should be less than 10 minutes but should not disturb other existing routines.

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