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**REVIEW ARTICLE**

# Alarm therapy for nocturnal enuresis in children: A literature review

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**Abstract**

Nocturnal enuresis is a common childhood problem impacting the quality of life of children and families. Treatment with an enuresis alarm is recommended for 8–12 weeks by the International Children's Continence Society as first line management of monosymptomatic nocturnal enuresis. However, the effectiveness of alarm therapy varies between 80% and 45.9%. There is minimal evidence within the literature exploring the factors impacting this varying response to alarm therapy. Therefore, this literature review aims to explore factors that impact the effectiveness of the enuresis alarm as a treatment for nocturnal enuresis, in children aged 5–17 years. Literature searches were conducted on MEDLINE (Ovid), SCOPUS and CINAHL Databases. The PRISMA tool was used to report the data in the search strategy. The inclusion criteria of children aged 5 to 17 years was chosen based on International Children's Continence Society Guidelines. English language, academic journals and studies in the past 10 years were selected as additional inclusion criterion to identify the most recent, robust literature for the review. All 13 primary research articles were critiqued using the Caldwell Framework. Data were extracted and presented in table format highlighting study methodology, sample, duration of treatment, relevance to review topic and key findings. The findings highlight factors influencing the effectiveness of alarm therapy related to the impact on the child and family, heighten arousal to the alarm, the duration of therapy, age of child and the impact of overlearning. This review provides health professionals with an insight into strategies that may help children and their family to respond successfully to enuresis alarm treatment.

**KEYWORDS**

alarm therapy, bedwetting, children, enuresis alarm, monosymptomatic enuresis, nocturnal enuresis

**What is known about the subject**

- Prevalence of primary monosymptomatic nocturnal enuresis is high.

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- Bedwetting negatively impacts on children's self-esteem and the quality of life of children and families.
- Enuresis alarm intervention is recommended as the first-line management.
- Success with alarm therapy intervention varies considerably among children.

#### What this paper contributes

- A greater understanding of the factors that impact on using an enuresis alarm intervention on the child and family.
- Highlights the importance of early review of progress after 6 weeks of alarms therapy for clinicians.
- Encourages health professionals to consider timing and duration of treatment to identify failure to respond to alarm therapy.

## 1 | BACKGROUND

The International Children's Continence Society (ICCS) define enuresis as intermittent wetting during sleep, occurring at least once per month in children over the age of 5 after all organic causes have been excluded.<sup>1,2</sup> The prevalence of primary monosymptomatic enuresis is estimated to effect 7.5% to 15% of children aged 6–13 years<sup>2–4</sup> and between 1.6% to 5.3% of adolescents.<sup>4</sup> Enuresis has been shown to negatively impact children's self-esteem<sup>1,5</sup> and the stress and suffering on the child and family is frequently underestimated.<sup>6,7</sup>

Treatment is recommended to reduce the psychological and sociological impacts of bedwetting.<sup>1,5</sup> The enuresis alarm is recommended by the ICCS for highly motivated children from the age of 5 years and parental involvement is considered essential to support waking to the alarm and consistency with therapy.<sup>1</sup> The ICCS recommend using an enuresis alarm for 8–12 weeks as first line treatment for monosymptomatic nocturnal enuresis.<sup>1</sup> However, the effectiveness of alarm therapy varies between 80%<sup>1,4,8</sup> and as low as 45.9% to 60%.<sup>1,4</sup> Factors such as the experience of the child and family, duration of treatment and optimal age for treatment have not been widely explored in the literature.

## 2 | AIMS AND OBJECTIVES

This literature review aims to explore the factors that impact on the effectiveness of the enuresis alarm as a mono therapy for enuresis in children aged 5–17 years. This will provide health professionals with current evidence to inform practice and enhance patient–family education. The PICOS (Population Intervention Comparison Outcome Setting) was used to develop the following questions and protocol for inclusion.<sup>9</sup>

- i. Which factors have an impact on the effectiveness of treatment with the enuresis alarm?
- ii. Are there any factors that should be explored for their potential to inhibit or optimize the response to enuresis alarm therapy for children?

A limited systematic literature review was performed using CINAHL Complete (Cumulative Index to Nursing and Allied Health Complete), MEDLINE (Ovid) and SCOPUS electronic databases from January 2013 to December 2022.

The development of a search strategy involved identification of key words and formulation of search terms. Two search concepts with Boolean operators were used consistently within the databases. Key-words used were 'monosymptomatic enuresis' 'OR' bedwetting 'OR' 'nocturnal enuresis' 'AND' 'enuresis alarm' 'OR' 'alarm therapy\*.' Search limiters were applied including the English language and academic journals. The review was limited to children between 5 and 17 years, in accordance with ICCS guideline.<sup>1</sup>

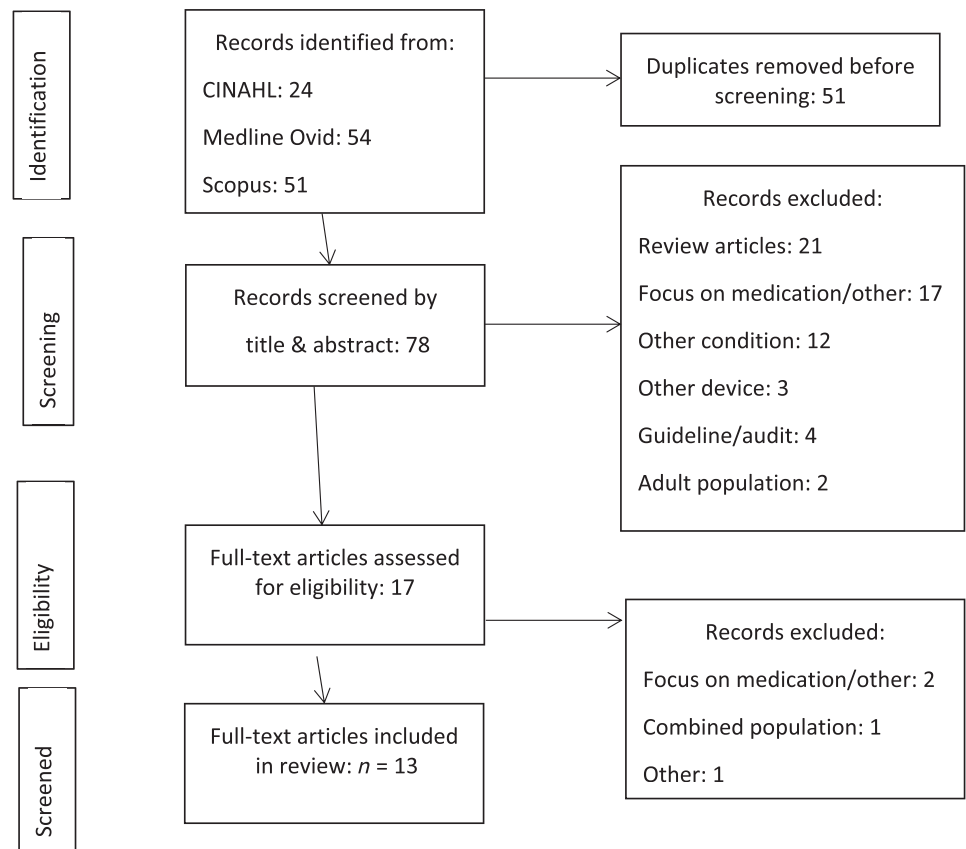
### 2.1 | Review process

The initial search of the literature delivered 129 articles, following de-duplication using RefWorks, 78 articles remained. This systematic review is limited, as screening was completed by one member of the research team (GD), deemed to have clinical expertise in this area. Articles were screened for relevance by title and abstract and 61 articles were removed. The remaining 17 articles were read full text to determine eligibility. Four articles were excluded with reasons displayed in Figure 1 using the Preferred Reporting Items for Systematic Review and Meta analysis (PRISMA).<sup>10</sup> Following this systematic search 13 articles were included for this systematic literature review. The review consists of 12 quantitative and 1 phenomenological study. The Caldwell et al.<sup>11</sup> framework was used to appraise each article for quality and relevance as described by Bettany-Saltikov.<sup>12</sup> Data were extracted from each research article and presented in Table 1, based on study methodology and data collection, sample, duration of treatment, relevance to review topic and key findings.

### 2.2 | Statement of ethics

All studies stated ethical approval had been obtained.

**FIGURE 1** PRISMA flow diagram.<sup>10</sup>



### 3 | RESULTS

#### 3.1 | Impact on child and family

In order for alarm therapy to be effective it must be convenient for both the child and their family. Kosilov et al.<sup>4</sup> identified psychological discomfort as a reason for discontinuing alarm treatment. Through focus group interviews, Caswell et al.<sup>13</sup> explored the lived experience of enuresis and alarm therapy for children and families. Interruption of sleep and the disturbance of other family members caused by the volume of the alarm, were identified as bothersome for the child and family.<sup>13,14</sup> Many factors reduced engagement with the alarm, including the child being frightened by the alarm,<sup>14</sup> not wanting to feel different and feeling isolated.<sup>13</sup> Comparison of bell and pad versus body worn alarms, found that bell and pad alarms were more successful.<sup>15,16</sup> The success rate of the bell and pad was attributed to ease of use and remaining comfortable for the child, despite changing their position during the night.<sup>16</sup>

However, bell and pad alarms were associated with greater parental arousal.<sup>15</sup> To be successful, families require perseverance and resilience to continue with therapy for extended periods of time.<sup>13</sup> This highlights the vulnerability of families and children when treating enuresis. Clinicians must appraise the duration of treatment and its effectiveness for each family to optimize treatment and avoid relapse.

#### 3.2 | Heightened arousal to the alarm

The findings of the review clearly indicated that heightened arousal to the alarm had a positive impact on therapy response.<sup>14,15,17-19</sup> Failure or delay to respond to the alarm reduced the effectiveness of the enuresis alarm response for children.<sup>14,17</sup> The role of parental support cannot be underestimated. In a small study by Peck et al.<sup>15</sup> waking the parent to prompt child arousal was identified as a significant factor contributing to the successful response of 64.4%, when using a bell and pad alarm compared to a body worn alarm. Yet, Tsuji et al.<sup>19</sup> in a pilot study ( $n = 78$ ) found parental assisted waking and spontaneous waking to the alarm were equally effective at 16 weeks and suggest parental support is not required.

One study in the review looked at daytime training. Kosilov et al.<sup>18</sup> found that using the alarm in daytime, was associated with significantly lower enuretic episodes and increased self-waking in children aged 9–14 years ( $n = 452$ ). This finding is significant, as it suggests that activating the sensor during daytime urination can strengthen the reflex and cognitive response to the alarm,<sup>18</sup> therefore, positively impacting on alarm success.

In a randomized controlled trial using an innovative code word alarm system, Caldwell et al.<sup>14</sup> predicted that a higher level of arousal was needed to recall a pre-coded alarm word that sounded during the enuretic episode. Results demonstrated similar waking and success to the pre-coded word and the conventional sound alarm sounds. However, Caldwell et al.<sup>14</sup> observed through further data analysis that

TABLE 1 Data extraction table.

Authors	Methodology	Sample	Duration	Relevance	Key findings
Caldwell et al. (2016) <sup>14</sup>	Design: Randomized control trial Control group: Alarm which sounds when the child wets the bed. Experimental group: Personalized code word sounded when the child wets. Reward for recall of the code word. Data collection: Bladder diary, Questionnaire.	Random assignment of 353 children aged 6–18 years.	Duration: 19 months. Duration of alarm intervention: 16 weeks. Observation period: 6 months.	Predicts a higher level of arousal for recalling a code word compared to waking to alarm sound. Waking to alarm identified as significant factor to success. Positive impact of a heightened level of arousal on the alarm success.	Complete response was not significantly higher with code word alarm therapy. A small but significant increase in waking and reduction in wet nights supports rewarding arousal as opposed to actual dry night.
Caswell et al. (2020) <sup>13</sup>	Design: Qualitative Data collection: Focus group interviews	Self-selected sample. 4 children aged 7, 8 and 11 years (1 parent whose child refused to attend).	Duration of the interview: 3 h.	Informs design of a new pre-void wearable alarm. Families experience of enuresis.	Alarm triggering feelings of isolation, discomfort, sleep disturbance Perseverance and resilience by continuing alarm for prolonged periods.
Hyuga et al. (2017) <sup>20</sup>	Retrospective study Data collected, at 3 and 4 and 6 months. Tools not clearly specified. Bladder bowel diary.	137 children, mean age 10.1 years.	Duration of alarm intervention: 12 weeks.	Analysis of short-term alarm treatment in non-responders (79% of participants) Considering the impact of duration of alarm.	Discontinuing therapy is recommended after 12 weeks in children not responding to maintain trust in the device for reintroduction. Prior enuresis treatment, male gender, daytime incontinence negatively impacted outcome of alarm therapy.
Kosilov et al. (2015) <sup>17</sup>	Design: Retrospective. Data collection: Questionnaire, uroflowmetry, blood, hormone test, bladder diaries, software package. Data collected at 3, 4, 6-month intervals.	Random sample of 339 children aged 7–15 years. Subgroup: 7–9 years, 10–12 years, 13–15 years.	Duration of alarm intervention: 16 weeks. Observational period: 22 weeks.	Alarm efficacy children of different age groups.	12–14 year had the highest success at 4 months and sustained response at 6-month mark. 7–9-year age group and 13–15 years had significant response to treatment, but response was not sustained at 6-months.
Kosilov et al. (2015) <sup>3</sup>	Diagnostic design Data collection: Bladder diary, uroflowmetry, blood and urine tests, OAB questionnaire.	Random sampling of 294 children average age 11.3 years.	Duration: 10 months. Duration of alarm: 12 weeks. Observational period: 12 weeks.	Hypothesis: Additional fluid before bed triggers alarm and enhances the response by increased urination from a bladder challenged. i.e., additional fluid before sleep.	100 to 150 mL of additional water (over learning) before sleep significantly increased the efficiency of the alarm therapy (95%).
Kosilov et al. (2016) <sup>18</sup>	Control group, Standard alarm	Random sample of 452 children aged 9–14 years.	Duration: 19 months. Duration of alarm intervention: 12 weeks.	To determine the impact of sounding the alarm during	Enuretic episodes were lower after 12 weeks of therapy in

TABLE 1 (Continued)

Authors	Methodology	Sample	Duration	Relevance	Key findings
	Intervention group, Participants using alarm in wakefulness (i.e., urinate on device sensor) Data collection: Questionnaire, uroflowmetry		Observation period: 5 months.	daytime waking hours on its success and response rates. Considering the impact of daytime practice with alarm.	the Intervention Group. 23.5% in comparison 40.3% Day training with the use of alarm systems reliably increased dry nights and waking to full bladder.
Kosilov et al. (2018) <sup>4</sup>	Prospective randomized study Data collected: with voiding diaries and parental supervision	Random sampling of 455 children, 9–14 years	Duration: 9 months. Duration of alarm intervention: 20 weeks (study variable). Observational period: 7 months.	To determine the impact of extended duration of alarm therapy treatment on effectiveness and relapse rate.	Long-term alarm use 16–20 week achieves greater success and reduced relapse than 12-week usage.
Larsson et al. (2022) <sup>21</sup>	Multicentre quantitative study. Data collected by linking alarm to smartphone app. Bladder bowel diary excluded as data collection tool.	196 children, 5–17 years, average 8.3 ± 2.1	Duration: 12 weeks. Duration of alarm intervention: 8–12 weeks. Observational period: not specified.	To find the predictors of alarm therapy response and adherence. Predictors of alarm response (A) benefit of case history data (B) Early alarm response (C) Enuresis latency (bedtime and 1st enuretic episode)	Key findings: Case history was non predictive of response. However, response at 1 month was predictive of dryness or drop out. Early identification of non-responders could avoid unnecessary therapy.
Peck et al. (2020) <sup>15</sup>	Prospective randomized adaptive clinical control trial. Experimental control group used body worn alarm. Control group used a bell and pad alarm. Data collection: Daily record of dryness, time of alarm, 25 item tool.	Random sample of 86 children, aged 6–16 years.	Duration of alarm intervention: 16 weeks or 14 consecutive dry nights.	To compare the effectiveness of bell and pad alarm therapy to body worn alarm therapy. Considering if the device itself impacts on therapy response.	Bell and pad device had higher success responses 64% versus 44% with body worn device. A Bell and pad device had more positive outcomes with alarm waking and less false positives. Reduced relapse and false negatives whereby alarm did not sound with wetting with body worn device.
Robertson et al. (2014) <sup>8</sup>	Retrospective Design Data Collection: Archival Data Collection. Interview, recording 14 nights baseline data.	Convenience sample, self-selected. 126 children 5–18 years.	Duration of alarm treatment: Not specified. Observation period: inconsistent follow up, criteria for scheduled follow up not met.	Hypothesis (1) decreased wet nights during treatment and over learning. Hypothesis (2) over learning will enhance treatment success with no additional burden.	Hypothesis 1 and 2 supported, alarm reduced wetting in 86% participants; 90% achieved dryness with overlearning.
Shiroyangi et al. (2014) <sup>22</sup>	Design: Retrospective Data Collection: Bladder Diaries, Night diuresis measured (weight of absorbent products + morning void).	Random sample of 67 children aged 5–13 years.	Duration: 11 months. Duration alarm intervention: 16 weeks Observation period: 16 weeks.	Considering if colder temperatures impact on alarm response.	Winter was associated with failure of alarm in a very small Japanese study.
Tsuji et al. (2017) <sup>19</sup>	Design Retrospective. Family assisted group: (44) child woken by parent	78 children under 15 years	Duration of alarm Intervention: 12–16 weeks. Observation period: up to 8 months	Comparison of an alternative method of alarm therapy. Considering if waking the child impacts on alarm response	Family assisted alarm therapy and self-responsible alarm therapy (child not woken by parent) has comparable results.

(Continues)

TABLE 1 (Continued)

Authors	Methodology	Sample	Duration	Relevance	Key findings
Watanabe et al. (2022) <sup>16</sup>	Alarm control group: (34) children self-responsible for waking to alarm. Data Collection: Questionnaire, Bladder Diary, 4 weekly review, parental recording of waking/voiding. Design Retrospective. Data Collection: Electronic medical records and bladder diaries, reviewed. Same staff collected data from 2012 to 2019.	173 children aged 6–16 years.	Duration of alarm intervention: 12–16 weeks. Observation period: Contacted ever 8 weeks during alarm use (2 follow ups).	Compare effectiveness of - wearable wireless alarm And - wired alarm for monosymptomatic enuresis treatment. Considering if the device itself impacts on therapy response.	Full and Partial response were higher in initial treatment but lower at 6 months review with wireless alarm. Lower drop out with wireless alarm. The wireless alarm has greater cost but may be more advantageous to children due to lower dropout rate and early therapeutic effect which may enhance motivation.

rewarding arousal and recall of the code word, achieved a greater reduction in median wet nights ( $p = 0.01$ ). They attributed the greater state of arousal necessary for recall of a word to a greater level of success ( $p = 0.006$ ). The small sample size and selection criteria used by Caldwell et al.<sup>14</sup> and Tsuji et al.<sup>19</sup> limit the generalisability of the findings.

### 3.3 | Duration of alarm therapy

The ICCS recommend that enuresis alarm treatment for 8–12 weeks but there is no consensus on the optimal length of treatment.<sup>1</sup> There were three studies in the review that focused on the duration of alarm therapy.<sup>2,20,21</sup> Treatment response to alarm therapy after 8 to 12-weeks of therapy varied between 45.9%–67.4%.<sup>4,20,21</sup>

However prolonged alarm therapy for a duration of 16 and 20 weeks has been associated with a greater success rate of 85.5% in comparison to 67.4% with 12-week duration of therapy.<sup>4</sup> In a sample of 455 children aged 9–14 years, prolonged treatment (16–20 weeks) resulted in lower relapse at 3 months.<sup>4</sup> Interestingly, Kosilov et al.<sup>4</sup> reported no statistical difference between the response with 16-week and 20-week therapy treatment. Other studies support the continuation of alarm therapy for 16 weeks.<sup>17,19</sup> Tsuji et al.<sup>19</sup> observed that discontinuing alarm therapy before 16 weeks failed to improve success (median age 9.2 years), while Kosilov et al.<sup>17</sup> determined that 16-week alarm therapy was associated with greater long-term success in 10–12-year-old children.

When children are failing to show a response to treatment, prolonged use of alarm therapy may be detrimental to long-term success and may have a negative impact on future interventions.<sup>20</sup> In a study of 137 children (mean age 10.1 years), non-responders to 12 weeks of alarm therapy had a 48% chance of success when treatment was repeated within 6-months.<sup>20</sup> The reasons for this later success are unclear, however this finding may inform clinical practice and suggest relapse is not a barrier to long-term success. In a quantitative study of 196 children (mean age 8.8 years) Larsson et al.<sup>21</sup> looked at predictors of alarm therapy response and compliance, data were collected by linking the alarm to a smartphone application. Findings indicated that no reduction in wet nights within the first 4 weeks of treatment, was predictive of poor response to the alarm. Therefore, response to therapy should be reviewed at 4 weeks of treatment and only children responding should continue treatment.<sup>21</sup> If non-responders could be identified early, treatment could be discontinued for a short period of time, reducing the burden of unnecessary treatment and maintain motivation for repeat attempts.<sup>20</sup>

### 3.4 | Age of child

Only one study in the review evaluated alarm intervention within age sub-groups.<sup>17</sup> The results indicate that the 7–9 year old and 10–12 year old groups responded best to treatment (number of dry



nights) but this was only sustained by the 10–12 age group at the 2 month follow-up. The teenagers (13–15 year old) failed to respond to treatment at either time point. Health professionals should consider the impact of age and maturing bladder control mechanisms, when planning care and treatment.

### 3.5 | Overlearning

Overlearning involves taking additional fluids before sleep to over condition the bladder, increasing the desire to urinate and the opportunities to activate the alarm.<sup>3,8</sup> This is often introduced once 14 consecutive dry nights have been achieved, in order to prevent relapse.<sup>8</sup>

A study of 126 children (mean age 7.51 years) demonstrated a success rate of 86.8%, achieving the ICCS marker of 14 consecutive dry nights using alarm therapy.<sup>8</sup> Of those, 90% who then commenced overlearning, achieved an additional 14 consecutive dry nights, suggesting that overlearning can reduce relapse. Participants were required to consume 600 mL of fluid each night. The criteria for this amount is unclear and seems quite a large volume for the younger children involved (age range 5–13 years). The optimal amount of fluid is unclear for health professionals' intent on using this method, as 37% failed to document the volume of fluid consumed before bed.<sup>8</sup>

Kosilov et al.<sup>3</sup> evaluated a lower fluid volume of 100–150 mL before bed, the volume was calculated based on the individual weight in a sample of 294 children (mean age 11.3 years). Kosilov et al.<sup>3</sup> achieved a similar decrease in enuresis (95%) as demonstrated by Robertson et al.,<sup>8</sup> suggesting a lower volume challenge is effective. Both studies suggest that overlearning with additional water before bed, is a safe and effective way to avoid relapse and establish long-term night-time continence.

### 3.6 | Seasonal variation

Finally, one study that met the inclusion criteria for this review, retrospectively examined the impact of the winter season in Japan on treatment.<sup>22</sup> In this study of 67 children (mean age 9.1 years) commencing enuresis alarm treatment in the winter, was associated with failure. Whilst the generalization of this study is limited, the author's suggest it may be associated with parental and school work/holiday schedules. Ideally, the decision when to commence treatment should be in agreement with the family.

## 4 | DISCUSSION

In this review 4 studies included small numbers of participants with non-monosymptomatic enuresis.<sup>4,14,20,21</sup> This mixed sample is consistent with clinical practice whereby children presenting with nocturnal enuresis may have very mild concurrent daytime urinary symptoms especially in children presenting with constipation as a contributing factor to their enuresis. The potential for sample bias in the review

has been reduced by keeping the focus of the review question under the broad umbrella term of nocturnal enuresis. In this review alarm therapy is evaluated as a monotherapy, therefore, the findings and recommendations are not relevant to populations using combined therapy.

Recent ICCS guidance recommend reviewing response to treatment after 6 weeks of therapy.<sup>1</sup> Yet, three studies suggest that 16 week of enuresis alarm is effective.<sup>4,17,19</sup> The dilemma for health professions is to wait and evaluate at either 16, 12 weeks.<sup>20</sup> The inability to identify those children that fail to respond to treatment early, may have detrimental effect on future attempts.<sup>20</sup> Discontinuation of therapy is recommended if the child has not made progress,<sup>1</sup> in order to maintain motivation for repeat treatment within a 6-month period.<sup>20</sup> Further research is recommended to address the literature gaps exploring the benefit of repeat alarm therapy in children.<sup>20</sup>

While bell and pad alarms are associated with greater parental arousal, a significant factor in effective alarm therapy.<sup>15</sup> Clinical judgement should inform the type of device used based on child centred individualized assessment. This review recommends prioritizing support for children and families to minimize impact of common side effects to alarm therapy namely sleep disturbances, feelings of fear and isolation for the child.<sup>13</sup> Additional research is recommended to support the evidence of prolonged treatment on long term success.

A consensus regarding overlearning is not established and many health professions will have concerns advising young children to consume additional fluids prior to bedtime. The two studies included in this review that evaluated this method involved differing amounts, 100–150 mL.<sup>3</sup> Future research is recommended to enhance the validity and reliability of this recommendation and establish more robust guidelines indicating fluid volume and duration of overlearning.

## 5 | CONCLUSION

Factors that impact the effectiveness of the enuresis alarm as a treatment for nocturnal enuresis in children aged 5–17 years have been reviewed within the literature. The aims and objectives of the review were met by identifying factors impacting the child and family, early review of progress to determine duration of therapy, heightening arousal and the introduction of overlearning and daytime training with the alarm as key elements to successful outcomes. Furthermore, duration and timing of overlearning should be explored for their potential to inhibit or optimize response to enuresis alarm therapy. Clinicians need to be mindful of the literature gap examining the lived experience of the child using alarm devices. Investing in wireless devices is recommended to facilitate choice and child centred therapy. Future qualitative research is recommended.

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None.

### CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.



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## REFERENCES

1. Nevés T, Fonseca E, Franco I, et al. Management and treatment of nocturnal enuresis - an updated standardization document from the International Children's Continence Society. *J Pediatr Urol.* 2020;16:10-19.
2. Sarici H, Telli O, Ozgur BC, Demirbas A, Ozgur S, Karagoz MA. Prevalence of nocturnal enuresis and its influence on quality of life in school-aged children. *J Pediatr Urol.* 2016;12:159.
3. Kosilov KV, Loparev SA, Ivanovskaya MA, Kosilova LV. Night diuresis stimulation increases efficiency of alarm intervention. *J Pediatr Urol.* 2015;11:261.
4. Kosilov KV, Geltser BI, Loparev SA, et al. The optimal duration of alarm therapy use in children with primary monosymptomatic nocturnal enuresis. *J Pediatr Urol.* 2018;14:447.
5. Iscan B, Ozkayin N. Evaluation of health-related quality of life and affecting factors in child with enuresis. *J Pediatr Urol.* 2020;16:195.
6. Cobussen-Boekhorst HJL, Van Genugten LJ, Postma J, Feitz WFJ, Kortmann BBM. Treatment response of an outpatient training for children with enuresis in a tertiary health care setting. *J Pediatr Urol.* 2013;9(4):516-520.
7. Haid B, Tekgül S. Primary and secondary enuresis: pathophysiology, diagnosis, and treatment. *Eur Urol Focus.* 2017;3(2-3):198-206.
8. Robertson B, Yap K, Schuster S. Effectiveness of an alarm intervention with overlearning for primary nocturnal enuresis. *J Pediatr Urol.* 2014;10:241-245.
9. Doody O, Bailey ME. Setting a research question, aim and objective. *Nurse Res.* 2016;23(4):19-23.
10. Liberati A, Altman DG, Tetzlaff J, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *Ann Intern Med.* 2009;151:65-94.
11. Caldwell K, Henshaw L, Taylor G. Developing a framework for critiquing health research: an early evaluation. *Nurse Educ Today.* 2011;31:1-7.
12. Bettany-Saltikov J. *How to Do a Systematic Literature Review in Nursing: A Step by Step Guide.* Open University Press; 2016.
13. Caswell N, Kuru K, Ansell D, et al. Patient engagement in medical device design: refining the essential attributes of a wearable, pre-void, ultrasound alarm for nocturnal enuresis. *Pharmaceutical Med.* 2020;34:39-48.
14. Caldwell PHY, Sureshkumar P, Kerr MI, et al. A randomised controlled trial of a code-word enuresis alarm. *Arch Dis Child.* 2016;101:326-331.
15. Peck B, Peck B, Harvey J, et al. Body-worn versus bell-and-pad alarm device for the management of monosymptomatic nocturnal enuresis in children: a randomized controlled trial. *J Wound Ostomy Continence Nurs.* 2020;47:507-512.
16. Watanabe T, Ikeda H, Ono T, Oyake C, Watanabe Y, Fuyama M. Comparison of wireless and wired alarm devices for nocturnal enuresis treatment. *Pediatr Int.* 2022;64:15328-15334.
17. Kosilov KV, Loparev SA, Ivanovskaya MA, Kosilova LV. Sensibility of children of different age groups to alarm intervention for enuresis. *J Nepal Paediatr Soc.* 2015;35:49-56.
18. Kosilov KV, Loparev SA, Kuzina IG, Shakirova OV, Zhuravskaya NS, Lobodenko A. Additional use of alarm systems in wakefulness in the treatment of mono-symptomatic nocturnal enuresis. *J Nepal Paediatr Soc.* 2016;36:8-13.
19. Tsuji S, Suruda C, Kimata T, Kino J, Yamanouchi S, Kaneko K. The effect of family assistance to wake children with monosymptomatic enuresis in alarm therapy: a pilot study. *J Urol.* 2018;199:1056-1060.
20. Hyuga T, Nakamura S, Kawai S, Nakai H. Evaluation of the effectiveness of a short-term treatment and repeat treatment of nocturnal enuresis using an enuresis alarm. *Urology.* 2017;105:153-156.
21. Larsson J, Borgström M, Karanikas B, et al. The value of case history and early treatment data as predictors of enuresis alarm therapy response. *J Pediatr Urol.* 2022;11:1.
22. Shiroyanagi Y, Kim W, Suzuki H, Yamazaki Y. Winter is associated with failure in the alarm treatment of nocturnal enuresis. *J Pediatr Urol.* 2014;10:246-249.

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