

## Head Lice Treatment Costs and the Impact on Managed Care

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### **Abstract**

The number of head lice infestations occurring annually in the United States is estimated at 6 million to 12 million. Although a formal economic analysis of head lice treatments has not been conducted, the direct cost of treatment can be roughly estimated by considering the costs of pediculicides and taking into consideration that patients may self-treat up to 5 times before seeking medical care. Added to the direct costs of treatment are indirect costs because of lost school days and lost productivity and wages of parents who must stay home to care for children who are sent home from schools that employ no-nit policies.

The cost of head lice infestation is tied to diagnostic and treatment practices. Research suggests that head lice infestations are frequently misdiagnosed. In addition, over-the-counter treatments are often used incorrectly. The combination of misdiagnosis and improper treatment has contributed to decreased efficacy of pediculicides. This, in turn, further contributes to ineffective treatment and the necessity for retreatment and related increases in costs. Lindane, a prescription pediculicide, is associated with serious safety concerns and is now recommended for use in selected populations only when conventional treatment fails. Malathion 0.5% is the only prescription pediculicide that is considered to be safe and effective with no decrease in efficacy over time.

Managed care organizations, in collaboration with school nurses and other healthcare providers, are working to promote more accurate diagnosis and proper use of pediculicides. The objectives of these efforts are to make the treatment of head lice more effective and ultimately to lower the cost of treatment by introducing better options early on.

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### **Direct and Indirect Costs**

The associated direct and indirect costs of treatment infestations in the United States is estimated to be hundreds of millions of dollars per year.<sup>1-3</sup> With an annual rate of up to 12 million infestations in the United States,

the costs associated with head lice infestation were estimated at \$367 million over a decade ago.<sup>1,4</sup> Increased prevalence of infestations among the primary age group affected, children 3 to 12 years old, is likely to raise costs further.

Contributors to the cost of care include the direct costs of treatment and several indirect costs that are more difficult to quantify. Direct costs include the actual cost of pediculicides or other treatments for control of head lice. Most over-the-counter (OTC) products recommend 2 applications, but some data suggest that patients self-treat an average of 5 times before seeking care from a healthcare provider, increasing the number of OTC products purchased in an attempt to eradicate an infestation.<sup>5</sup>

Indirect costs include lost school and work days when a child is sent home because of an infestation. A young child who is not allowed in the classroom because of no-nit or zero-tolerance policies must be cared for, often by a parent or guardian who is missing work. The potential lost wages and productivity are difficult to accurately assess but may be significant. One source suggests that lost wages alone may average \$2720.<sup>3</sup> Parents or guardians who cannot miss work may have to hire a babysitter, which represents additional costs of care. Beyond the impact on families, school absenteeism because of infestations may result in lost funding. No-nit policies contribute to absenteeism by promoting mandatory exclusion of children who are found to have nits. The least quantifiable indirect costs are associated with unnecessary and improper treatment, resulting in inadequate control of lice. This may occur because of incorrect diagnosis by a healthcare provider or because a parent who has heard of an infestation within the school treats the child

**Table 1.** Homeopathic Treatments

Methods and Products	Attributes
Manual removal: Wet combing	Wet combing procedure: Wet hair with water and conditioner. Use a magnifier and fine-toothed comb to identify and remove lice and nits. Must be done every 3 to 4 days for at least 2 weeks. Generally considered ineffective when used alone.
Homeopathic products: Herbal shampoo	Contains extracts of paw paw, thymol, and tea tree oil. May cause allergic dermatitis. Early studies demonstrated efficacy. <sup>8</sup> Well-controlled studies are needed.
“Natural” products	Like other unregulated natural products, may include any ingredient. Sodium chloride 10% is used in some homeopathic shampoos. May cause stinging upon application; use with caution around eyes and mucous membranes. Efficacy is unproved.
Occlusive agents	Occlusive agents, including petrolatum, olive oil, mayonnaise, margarine, etc, are believed to slow lice down, making identification and removal easier. There is no evidence that these products suffocate lice, as is commonly believed, and they have no pediculicidal or ovicidal effects.
Diluted vinegar	Diluted vinegar is recommended to loosen the “glue” that holds nits to the hair shaft. There is no medical literature to support the use of vinegar to loosen nits.
Kerosene or gasoline	This folk remedy should never be used due to flammability and extreme hazard.

preventively, even in the absence of lice or nits. Improper or unnecessary treatments are direct contributors to increasing treatment failures with pediculicides. This situation is similar to the emerging resistance to antibiotics that are improperly or unnecessarily prescribed.

**Effects of “Nonmanaged” Approach to Care**

In a study of head lice diagnosis and management accuracy, samples of material that were considered by healthcare professionals and the public to verify evidence of lice or nits were shown to contain a large propor-

tion of materials that were not indicative of infestation.<sup>6</sup> Only 53% of materials submitted as proof of infestation contained lice or nits, suggesting that about half of all diagnoses by this group were potentially inaccurate. Notably, among children attending schools with no-nit policies, 73% were identified as having lice infestation, but only 39% of the samples from these children contained material that supported a diagnosis of head lice. A comparison of results from schools with and without no-nit policies found that children who were lice-free were erroneously excluded from class more frequently than children with active infestations. These poor results confirm the need for a managed approach to care that promotes accurate diagnosis and appropriate treatment.

**Treatment Options**

Topical treatments include manual removal (wet combing), homeopathic remedies, and OTC and prescription pediculicides. Wet combing and homeopathic remedies are described in **Table 1**. People who are concerned about side effects associated with pediculicides often promote these options, but they are largely unproved or ineffective.<sup>7</sup> Homeopathic remedies generally are not promoted as pediculicidal or ovicidal, although many laypersons believe incorrectly that applying occlusive agents, for example, will smother lice.<sup>7</sup> Some products are promoted for “removing” lice and nits, such as paw paw herbal shampoo and diluted vinegar.<sup>8</sup> Because homeopathic products are unregulated and therefore do not have to be tested before being marketed, their ingredients and concentrations can vary substantially. Also, despite claims of “natural” ingredients, they may still produce local side effects, such as burning or irritation, and some cause systemic toxicity if ingested. The paradox of increasing popularity and consumer promotion of these unproved approaches to lice control illustrates the need for guidance by healthcare professionals for effective treatment of infestations.

Pediculicides that are available in OTC formulations include pyrethrin and permethrin. Piperonyl butoxide is also contained in pyrethrin products. Pyrethrin is generally

considered to be safe, although it may cause mild skin irritation. Pyrethrin product labeling warns against possible allergic reactions in patients with ragweed allergies, but there are no reports in the medical literature of this type of reaction with the topical formulation of pyrethrin.<sup>4</sup> However, topical pyrethrin products should not be used by patients who are allergic to chrysanthemums.

Permethrin, a synthesized product related to pyrethrin, is available in a 1% rinse for patients and in a 0.5% spray for inanimate objects. Unlike pyrethrin, permethrin does not cause allergic reactions, although it may cause skin irritation. This product can be used for children older than 1 month, so it is considered to be relatively safe. Both permethrin and pyrethrin are pediculicidal but not ovicidal, although resistance to each product has been reported.<sup>5</sup> Both products require a second treatment 7 to 10 days after the first to kill newly hatched lice.

As described in the article in this supplement titled, "Clinical Update on Resistance and Treatment of *Pediculosis capitis*," resistance to OTC pediculicides is an increasing problem. Resistance, along with inaccurate diagnosis and reliance on self-treatment, often results in overuse of permethrin and pyrethrin OTC products. This, in turn, leads to more resistance and less effective treatment options over time, as well as increased costs of treatment. Resistance has occurred with some prescription products, too, underscoring the need for a more structured and supervised approach to care.

**Managed Care Approach.** The managed care approach to increasing the efficacy of treatment while reducing the risk for resistance involves promoting appropriate use of OTC and prescription pediculicides. Topical prescription products include permethrin 5%, malathion, and lindane. Ivermectin, an oral medication, is used clinically, although it has not been approved by the Food and Drug Administration (FDA) for the treatment of head lice. Prescription products and their attributes are presented in **Table 2**.

Permethrin 5%, which is not indicated for the treatment of head lice, is sometimes used after treatment failure with permethrin 1%. If treatment failure occurs due to resis-

**Table 2.** Prescription Pediculicides

Treatment	Attributes
Permethrin 5%	Topical cream applied to hair. Not indicated for the treatment of head lice but is often used after failure of permethrin 1%. Pediculicidal but not ovicidal.
Malathion	Highly effective pediculicide and ovicide. No documented product resistance to date. Very time effective; application time in labeling is longer than needed to kill lice and eggs. Has residual effects and is flammable. Side effects include skin irritation and possible respiratory depression with overdose (none reported to date). No known human topical toxicity has been reported. <sup>10</sup> Pregnancy category B. Not for children less than 6 years old.
Lindane	Once highly effective but now has high rates of resistance. <sup>5</sup> FDA Public Health Advisory issued, restricting use. Extensive warnings in the product labeling associated with high risk of seizure and other neurotoxic effects. Possibly associated with deaths. Lindane should not be used to treat children. Generally not prescribed by managed care organizations.
Systemic drugs	The most commonly used product is ivermectin 200 mcg/kg administered orally. Effective pediculicide, but not ovicidal. Second treatment is recommended after 7 to 10 days. No resistance reported to date. Safe but should not be given to children under 15 kg. Used after failure with topical pediculicides.

tance to the lower concentration, however, the 5% concentration may not be effective either.<sup>9</sup>

Malathion has both pediculicidal and ovicidal effects and has been shown to kill lice within minutes, although the package labeling still lists an application time of 8 to 12 hours.<sup>5</sup> Flammability is a risk consideration, particularly when malathion is used to treat children. But no cases of burns associated with malathion have been reported to date, and it should be noted that other commonly used products are also flammable, such as most topical wart medications. Caregivers applying malathion to a child should follow label instructions in avoiding heat sources and should never smoke near the product. Among the public, a primary concern about malathion is whether it poses a risk of toxicity. This concern appears to be based on assumptions that low-concentration

malathion for topical application carries the same risk as agricultural-grade malathion used as a pesticide. There are substantial differences in the malathion products produced for human use versus agricultural use products. The malathion concentration in the pediculicide is lower than that associated with systemic toxicity, unlike the significantly higher concentrations of malathion associated with inhalation toxicity. No case of toxicity associated with topical malathion used as a pediculicide has been reported after decades of human use.<sup>10</sup> Based on its safety and effectiveness, malathion is a key choice in the managed care environment, particularly for generalized infestation, for most age groups. An additional advantage in using malathion is that the patient does not have to undergo multiple applications over 2 weeks to eradicate lice and eggs.

Lindane, formerly marketed under the brand name Kwell, was once a mainstay of prescription pediculicides, but it is now reserved as alternative therapy among selected patients with intractable infestations that have not responded to conventional treatments. Lindane is now disallowed for human use in California and in several countries outside the United States because it is associated with significant neurotoxicity in humans. The FDA has added warnings to the product labeling about the risk of seizure and neurotoxicity associated with lindane and has established restrictions for its use.<sup>11</sup> Lindane should not be used to treat children or small adults (<50 kg). Patients who have a lowered seizure threshold should not be treated with lindane, which is capable of inducing seizures. Lindane also should not be used to treat pregnant women because of the potential neurotoxic effects to an infant at the time of delivery. Immunosuppressed patients should not be treated with lindane unless their neurological status has been carefully evaluated. Lindane is acutely toxic; accidental ingestion of just 15 mL may be lethal. Lindane ingestion following a fatty meal increases the risk of neurotoxicity, since lipids enhance lindane exit from the gastrointestinal tract to the central nervous system. Deaths associated with lindane toxicity have been reported. Physicians who prescribe lindane should keep in mind that

the patient is receiving a container with a potentially lethal dose if accidentally ingested. For these reasons, managed care organizations generally should restrict the use of lindane. If lindane must be used, the pharmacist should, according to product labeling, include a maximum of 60 mL per adult patient and perhaps 30 mL for small children. Lindane is offered in 30- and 60-mL packages. The pharmacist should dispense only the quantity needed for a single treatment and should watch for repeat dispensing to an individual patient. By law, patients must be given a Medication Guide when lindane is dispensed to promote safe use of the product. Given the extensive safety concerns about lindane and the relatively high rate of resistance to the product, it should be used only in very selective cases.

If a patient cannot use a topical pediculicide, oral medication may be offered. The most commonly prescribed oral agent is ivermectin, an anthelmintic agent used to treat intestinal parasites and onchocerciasis. Ivermectin is not approved by the FDA for the treatment of head lice but is a highly effective pediculicide when administered at a dose of 200 mcg/kg. It does not provide ovicidal effects, however, so a second dose generally is necessary in 7 to 10 days. Compliance with ivermectin is high due to its simple dosing regimen. No resistance has been reported to date. Ivermectin is considered relatively safe and well tolerated, but it should not be administered to children weighing less than 15 kg. Ivermectin is rated as a pregnancy category C agent, so physicians should weigh risks versus benefits when deciding whether to administer it to pregnant women. From a managed care standpoint, ivermectin is an appropriate option after treatment failure with topical pediculicides or with a particularly intractable infestation.

#### Costs of Treatment

The cost of head lice control can be a factor in selecting a treatment regimen. **Table 3** presents costs of complete treatment for both OTC and prescription products. As expected, OTC products are generally less expensive in terms of direct costs, although patients who have an insurance copay may obtain prescription products for less. Indirect costs are

**Table 3.** Costs of OTC and Prescription Treatments

Active Ingredient	Brand Name	Costs to Treat*
<b>OTC</b>		
Permethrin 1%	Nix <sup>®</sup> Crème Rinse, 4 oz	\$30
Pyrethrin + piperonyl butoxide	RID <sup>®</sup> shampoo, 8 oz	\$15
Natrum muriaticum 1× (sodium chloride 10%)	Lice Freee! <sup>®</sup> hair gel, 8 oz	\$17
Dimethicone	RID <sup>®</sup> Pure Alternative Lice & Egg removal system, 4 oz	\$30
<b>Prescription</b>		
Permethrin 5% topical	Generic 60 g cream	\$35
Malathion 0.5% topical	OVIDE <sup>®</sup> 59 mL	\$85
Lindane shampoo	Generic 60 mL	\$87
Ivermectin oral, 8 tablets	Stromectol 3 mg	\$52

OTC indicates over-the-counter drugs.

\*Based on average number of applications to complete effective treatment.

Sources: www.drugstore.com; Target Retail Pharmacy, Overland Park, Kan.

not factored in, however. For example, although a course of treatment with permethrin 1% may cost \$30, compared with \$46 for malathion, the time associated with the recommended repeat treatment with permethrin translates into an additional indirect cost. In a nonmanaged care environment, patients may use OTC products incorrectly, resulting in repetitive treatment and potentially much higher total direct costs for treatment.

### Conclusion

Lice infestation is increasing, partly because of better reporting, but more significantly as a result of documented increases in resistance to pediculicides. Parents are frustrated by the lack of efficacy of OTC products and are concerned about repeated exposure of their children to pediculicides. In response, many have begun to use homeopathic remedies, believing that these will control infestations effectively and more safely than medication. Unfortunately, these remedies are largely unproven.

A significant contributor to the increase in resistance is unnecessary and improper use of pediculicides. Managed care, in coordination with school nurses and other trained professionals, can offer much-needed guidance about the proper use of both OTC and prescription products for the treat-

ment of head lice. A managed care approach to treatment would limit the use of OTC applications to the recommended 2 applications and emphasize correct application procedures, in contrast to the 4 or 5 applications often used by patients. Using a managed care approach, physicians could quickly identify resistant cases and move forward with prescription products. Most important, managed care physicians can evaluate specific cases on an individual basis and initially determine the correct eradication method. Currently, malathion is the first-line treatment of choice among managed care organizations. This controlled approach to care can improve treatment efficacy, reduce resistance, and promote cost effectiveness.

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