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Steam inhalation therapy:

severe scalds as an adverse side effect

Abstract

Background
Steam inhalation therapy is often recommended in the treatment of a common cold. However, it has no proven benefit and may in fact have serious adverse side effects in terms of burn injuries.

Aim
To quantify the human and economic costs of steam inhalation therapy in terms of burn injury.

Design and setting
A prospective database study of all patients admitted to the burn centres (Beverwijk, Groningen, Rotterdam) and the hospital emergency departments in the Netherlands.

Method
Number and extent of burn injuries as a result of steam inhalation therapy were analysed, as well as an approximation made of the direct costs for their medical treatment.

Results
Annually, on average three people are admitted to in one of the Dutch burn centres for burns resulting from steam inhalation therapy. Most victims were children, and they needed skin grafting more often than adults. The total direct medical costs for burn centre and emergency department treatment were €115 500 (£93 000), emotional costs are not reflected.

Conclusion
As steam inhalation therapy has no proven benefit and the number and extent of complications of this therapy in terms of burn injury are significant, especially in children, steam inhalation therapy should be considered a dangerous procedure and not recommended anymore in professional guidelines and patient brochures.

Keywords
burns; children; scalds; steam inhalation.

INTRODUCTION

Steam inhalation is a common home therapy for upper respiratory tract infections. GPs recommend it, and it is included as a recommendation in guidelines and patient brochures issued by societies of GPs, among others, in the Netherlands, US, and UK.[1–5]

However, a Cochrane review (first version 2001, updated in 2006, 2009, 2011)[6] concluded that steam inhalation had not shown any consistent benefits in the treatment of the common cold and therefore it was not recommended in the routine treatment of common cold symptoms. This conclusion was based on six randomised controlled trials (394 trial participants) using heated water vapour in participants with the common cold. However, not only is there no proven benefit, steam inhalation therapy can have severe adverse side effects, such as burn injuries, the usual scenario being overturning the bowl of steaming water, with the water ending up in the person's lap, causing severe scalds in sensitive body areas, such as the lower abdomen and genitals (Figure 1). Case reports[7–12] and a number of patients' series[13–16] have already tried to draw attention to the hazards of steam inhalation therapy. However, unfortunately the practice persists. This study argues that the human and economic costs of the complications of this therapy in terms of burn injury are significant, and, as there is no proven benefit, steam inhalation therapy should not be recommended for the common cold.

METHOD

To clarify the human and economic costs of steam inhalation therapy, the frequency and severity of scalds as a complication of steam inhalation therapy were investigated and the ensuing healthcare costs in the Netherlands. Data from the prospective database of all patients admitted to the three burn centres in the Netherlands (Beverwijk, Groningen, and Rotterdam) were analysed from 1998 to 2007. Data registered include: age, sex, percentage total body surface area burned (% TBSA), location of burn wounds, and cause of accident. From this database the records of all patients admitted with burns due to steam inhalation therapy and selected data of surgery (skin graft), use of bladder catheters, and length of stay were retrieved.

The number of patients with burns related to steam inhalation therapy treated at emergency departments was estimated based on the Injury Surveillance System (LIS) of the Consumer Safety Institute. LIS records the statistics of people treated at the emergency departments of selected hospitals in the Netherlands, injured due to an accident, an act of violence, or self-harm.

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How this fits in

Steam inhalation is a common home therapy for the common cold and recommended by GPs all over the world. Cochrane reviews showed no proven benefits and case reports and patients' series have already tried to draw attention to the risk of burns of steam inhalation therapy. This nationwide study provides the best possible evidence to discourage steam inhalation therapy.

These hospitals form a representative sample of the general and university hospitals in the Netherlands providing a 24-hour accident and emergency service. The number of emergency department cases can be estimated from multiplying the number of emergency department cases registered in LIS by the national number of admissions for injuries divided by the number of admissions for injuries in the LIS hospitals. This is possible for subsets of cases too, provided the numbers are large enough.

All patients with thermal injury due to hot liquid or hot vapour were identified from the 1998–2007 LIS records including one of the following terms in injury scenario; 'steam', 'vapour', or 'steam inhalation'. Excluded were patients with burns caused by industrial or other home accidents (for example, steamers used to remove wallpaper).

Figure 1. 9-year-old boy with 4% total body surface area burn.

An approximation was made of the direct costs for medical treatment (hospital, emergency department) incurred by burn injuries due to steam inhalation therapy. Following established methods[17] real economic costs using the 'top down' approach were calculated, which allocates total hospital costs down to the level of a unit (for example, nursing ward or operating room), resulting in average costs per patient. The financial offices of the burn centres calculated costs of stay and surgery (index year 2008). The average direct medical costs per patient treated at an emergency department and admitted to a hospital after emergency department treatment were based on data from the Dutch Burden of Injury Model (version 2007).[18] Examples of direct medical costs are: emergency transport by ambulance, emergency care, other outpatients' care, hospital treatment (initial as well as re-admission) and aftercare by a GP.

RESULTS

At the burn centres in the Netherlands, 31 patients were admitted with burns caused by steam inhalation therapy in the 1998–2007 period (Table 1). The burns were due to hot water in 29 cases; to the steam itself in two cases. Nineteen (61%) patients were aged <16 years. The average total body surface area burned was 5.8% (standard deviation [SD] 3.6%). In most cases thigh, lower abdomen, and genital area were involved. Fourteen patients, including nine children, needed a bladder catheter. Six patients needed a skin graft; five of them were aged <16 years. The sixth patient was an 82-year-old female. The mean length of stay was 9.8 days (SD 7.4 days).

From the 1998–2007 records of the emergency departments 292 patients with thermal injury due to hot liquid or hot vapour were identified. In 49 patients, the injury was indeed associated with steam inhalation therapy. Seventeen (35%) patients were aged <16 years. Seven patients had been hospitalised, including two children (aged 8 and 11 years). The average length of stay of six patients admitted to a LIS hospital was 6.3 days (range 2–20 days), one patient was admitted to a burn centre. All these patients recovered without the need for skin grafting. These 49 patients however, were not uniformly distributed across the various hospitals participating in LIS. Therefore, a wide margin was used for the national extrapolation of the data (further details can

Table 1. Admissions of patients with scalds due to steam inhalation therapy between 1998–2007

	Burn centre A	Burn centre B	Burn centre C	Total
n	9	13	9	31
Age <16 years	5	9	5	19
TBSA (%)[a]	6.3 (4.0)	6.1 (3.1)	5.1 (3.7)	5.8 (3.6)
Location				
Head/face	1	0	3	4
Upper extremity	4	2	1	7
Trunk (abdomen)	8 (7)	4 (3)	3 (1)	15 (11)
Genital	6	7	3	16
Lower extremity (thigh)	8 (6)	13 (8)	6 (6)	27 (20)
Bladder catheter	6	7	1	14
Surgery	1	3	2	6
Length of stay[a]	9.8 (7.3)	7.7 (5.5)	12.0 (9.7)	9.8 (7.4)

[a]*Mean (SD). TBSA = total body surface area.*

be obtained from the authors). This resulted in an estimate of 40 patients (95% confidence interval [CI] = 30 to 50) per year treated at the emergency departments for burns due to steam inhalation therapy.

The direct costs of stay in a burn centre were set at €1800 (£1450) per day. The average costs for surgical intervention were €900 (£725). Therefore, the cost of burns due to steam inhalation therapy requiring admission to a burn centre was estimated at €55 500 (£44500) per year, based on the average number of admissions (3.1), length of stay (9.8 days), and surgeries (0.6 interventions) per year. The direct medical costs (treatment at the emergency department and hospitalisation), based on the Dutch Burden of Injury Model 2007, varied widely. The mean direct medical costs per accident were €1500 (range €560–7800). Therefore, the mean direct costs per year were €60 000 (£48000) based on 40 patients each year. The total direct medical costs for burn centre and emergency department treatment were €115 500 (£93000).

DISCUSSION

Summary

Annually, on average three people are admitted to a burn centre in the Netherlands for burns resulting from steam inhalation therapy. The study's inventory showed that scalds occurred predominantly in sensitive body areas like lower abdomen and genitals, often necessitating bladder catheterisation. Most victims were children, and children needed skin grafting more often than adults. A possible explanation for deeper burns in children is their thinner skin. A thin skin would also explain why the older patient underwent a skin graft. The total costs of care were substantial, certainly in view of the fact that the injuries were unnecessary.

Strengths and limitations

Regarding the study inventory the following has to be kept in mind. The burn victims from steam inhalation therapy identified are in all probability only part of the total number of patients with steam inhalation therapy burns. In the Netherlands, most people who seek medical help, attend their GP. Lack of central registration of victims of accidents treated by their GP made it impossible to study this group. The cost analysis therefore underestimated the true costs because primary care (by GPs) was not included in the calculations. The study is limited by not being able to include patients treated by their GP. Furthermore, as it is not known how many people with a common cold use steam inhalation therapy, nothing can be said about how often applying steam inhalation therapy results in a burn injury; the risk of burn injury. Last but by no means least, costs were included to put a price on steam inhalation therapy; however, the emotional costs, pain and anxiety of patients and parents or spouses are not reflected this way, and neither are the costs of absenteeism, loss of productivity by patients, and by family and parents caring for the patient.

Comparison with existing literature

Besides case reports[7–12] only four consecutive series have been described so far. Two series only covered several months,[13,15] the other two series covered a more extensive period (years).[14,16] All these series involved only children and specialised burn centres. Barich *et al* identified two children with burns due to steam inhalation therapy out of 23 children (9%) during a 5-month period.[13] Murphy *et al* described seven children (also representing 9% of all children admitted) with burns due to steam inhalation therapy during 6 months.[15] Although only one child required surgery, four children had permanent scarring. Ebrahim *et al* reported on 11 infants (0–2 years) from a total of 193 seen from 1984–1987.[14] Mean length of stay was 14.7 days (range 1–39 days) and four infants underwent surgery. In their series spanning from 2001–2006, Wallis *et al* found 27 children with burns associated with steam inhalation therapy, of which were scalds from hot water spills; and 10 were contact burns from contact with the steamer.[16] Two children underwent skin grafting and four were hospitalised for a long time. From these published studies it is clear that the hazards of steam inhalation therapy are not

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Ethical approval

Medical ethics committee approved this study (ref 2012/047).

Provenance

Freely submitted; externally peer reviewed.

Competing interests

The authors have declared no competing interests.

Consent

The patient's next of kin has provided written consent for the image to be published.

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unrecognised; however, as the reports span four decades, it seems they remain underestimated.

Implications for practice

The hazards of steam inhalation therapy, in terms of burn injury are in the authors' opinion underestimated. The previously cited Cochrane review[6] described undesirable effects of steam inhalation therapy such as irritation and swelling of the nasal mucosa, but did not mention scalds as a complication. With rhinothermy, the method studied to apply heated, humidified air, scalds may be less of a problem, explaining why it was not noticed. However, when using the everyday method with a bowl of boiling water, scalds are a significant problem. Taking a hot shower or holding a child in the bathroom while the hot shower is running to clear sinuses may be a less risky way of prescribing steam inhalation; however its effectiveness is unclear. In various patient brochures recommending steam inhalation therapy there is a warning regarding the risk of scalding,[1–3,5] but apparently this is not enough, and whereas the patient information from the *BMJ* Group does refer to the lack of evidence for steam inhalation therapy, it is not rejected as a treatment option.[19]

The proposition 'there is no harm in trying' does not apply to steam inhalation therapy. As steam inhalation therapy has no proven benefit and the number and extent of complications of this therapy in terms of burn injury are significant, especially in children, steam inhalation therapy should be considered a dangerous procedure and no longer recommended in professional guidelines and patient brochures.

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