

Comment on treatment methods for ethylene glycol intoxication

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To the Editor,

We were very interested in the article by Rietjens *et al.*¹ regarding antidotal therapies utilised in the treatment of ethylene glycol and methanol intoxication. We were especially interested in the cost analysis of ethanol versus fomepizole treatment. In the United States (US), the use of ethanol is rare; either fomepizole or haemodialysis is utilised, with cost often the determining factor in deciding which to use.² At our facility we utilise a cost minimisation method for determining when to use haemodialysis versus fomepizole in minimally symptomatic patients. As an example, assume a theoretical patient: an 18-year-old male, 173 cm, weighing 70 kg. A 14.2 hour half-life for ethylene glycol following administration of fomepizole is assumed³ and this formula, developed by Hirsch, *et al.*⁴ to determine required dialysis time for removal of ethylene glycol to a serum level of 6 mmol/l (37.2 mg/dl) is used:

$$T = [-V \ln (5/A)/0.06k]$$

V = Watson estimate of total-body water in litres (41.25 l)

A = Initial toxin concentration in mmol/l (40.0 mmol/l)

k = 80% dialyser urea clearance in millilitres/minute at the initial observed blood flow rate (152 ml)

We compare medication, procedure, room, laboratory charges and risk of complications based on US national statistics. We assume a cost difference of 5% or less to be equivalent.

We calculated the time required for a serum ethylene glycol level of 180 mg/dl to fall to ≤ 20 mg/dl⁵ to be ~44.6 hours. This would require a total of four doses of fomepizole.⁶ At our hospital, the fomepizole regimen is administered on a general medical floor without telemetry.

Our haemodialysis patient would likewise receive an initial ethylene glycol level and the first dose of fomepizole while awaiting lab results. Per Hirsch,⁴ an initial ethylene glycol level of 180 mg/dl could be dialysed to safe levels with a single 8-hour treatment. The patient would receive two additional fomepizole doses during his haemodialysis therapy.⁷ At our hospital, a patient receiving dialysis would be placed in the intensive care unit.

Thus, the cost per dialysed patient is \$ 15,053.79. With fomepizole only: the cost/patient is \$ 15,657.00. The difference falls within our equivalency range of 5%.

Table 1. Direct cost comparison by category for serum ethylene glycol 180 mg/dl

Cost category (US Dollars)	Fomepizole only	Haemodialysis and fomepizole
Room cost	5998.00 (2x gen-med)	3727.50 (1x ICU)
Medication	9503.64 (x4 1.5 ml vials)	7127.73 (x3 1.5 ml vials)
Labs	156.00 (x3)	104.00 (x2)
Procedure		2801.00
Total	15,657.64	13,760.73

Sznajder *et al.*⁸ note a complication rate during catheterisations of 8.1/100 patients and Klevins *et al.*⁶ report an infection rate of 0.53/100/day. In 2005, inpatient facility and physician costs for haemodialysis catheterisation complications alone reached \$ 12,957.⁹ This adjusts from 2005 to 2013 (the year of our other charge data) to \$ 14,983.28.¹⁰

With an equivalent cost and greater safety associated with the pharmaceutical approach, we recommend fomepizole monotherapy in minimally symptomatic patients with an initial ethylene glycol level < 180 mg/dl. Costs and treatment protocols vary; therefore our level should not be considered a universal guideline for the addition of haemodialysis therapy. Rather, the methods employed in this analysis should be adapted by hospitals to implement cost-effective integration of haemodialysis into the treatment of patients with ethylene glycol poisoning.

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