



A Retrospective Health Economic Analysis of a Stable Hypochlorous Acid Preserved Wound Cleanser* versus 0.9% Saline Solution as Instillation for Negative Pressure Wound Therapy in Serious and Infected Wounds

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INTRODUCTION

Negative pressure wound therapy (NPWT), first described in the mid 1990's, now has a major role in the management of many different types of wounds. Depending on the indication, NPWT is often combined with instillation therapy. The combination of NPWT, instillation liquid and dwell time has been shown to accelerate healing in certain types of wound and decrease wound bioburden. This combination may also reduce the number of necessary visits to the operating room (OR) for debridement and shorten length of hospital stay (LOS).

Among the materials used for instillation, a specific, stable solution of 300 ppm hypochlorous acid preserved wound cleanser* (HAPWC) has previously been shown to be non-cytotoxic and non-irritating. HAPWC also has antimicrobial preservative properties for safe use and storage⁹. A study was conducted to assess whether the use of this HAPWC, as the irrigating medium would improve clinical results when compared to 0.9% sodium chloride solution (NaCl). The reduction in necessary OR debridements and shortened LOS was analyzed from a health economic perspective.

METHODOLOGY

This study was approved by the IRB. We conducted a retrospective chart analysis of 27 serious and/or infected skin wounds in 24 patients, who were treated between December 2015 and December 2017. The wounds were of complex etiologies, including:

- necrotizing fasciitis, infected surgical wounds,
- trauma, fasciotomies after compartment syndrome,
- pressure injuries, and vascular ulcers.

Major infections and/or necrosis were treated with aggressive surgical debridement before NPWT was initiated and NPWT itself was part of an overall holistic treatment program that included antibiotic therapy when wounds were infected. Data used for the analysis included patient demographics (i.e., age, sex, comorbidities), specific wound characteristics such as size, location, etiology, OR time.

MATERIALS

Instillation solutions: HAPWC or 0.9% NaCl solutions

Volume of solution: determined by wound size

Dwell time, per our institution protocol: 10 minutes, followed by irrigation every four hours of NPWT.

Pressure setting: -125mmHg

Dressing changes : every 2-3 days, depending on the wound

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	HAPWC	NaCl
# of Patients (M/F)	17 (13/4)	7 (6/1)
Average age	49.7	36.1
# of wound (%)	19	8
Fasciotomy	5 (26.3)	4 (50)
Post-traumatic wound	4 (21.1)	2 (22.2)
Infected surgical wound	5 (26.3)	1 (11.1)
Necrotizing wound	3 (15.8)	
Pressure injury/ulcer	1 (5.3)	1 (11.1)
Vascular insufficiency ulcer	1 (5.3)	
Average size (cm ³)	304.6	174.9
Location (%)		
Lower extremity	8 (42.1)	5 (62.5)
Upper extremity	2 (10.5)	1 (0.13)
Abdomen	5 (26.3)	1 (0.13)
Perineum/Sacrum	4 (21.1)	1 (0.13)

	HAPWC	NaCl
Medical history	Number of patients (%)	Number of patients (%)
Smoking	1 (5.9)	4 (42.9)
Intravenous drug abuse	2 (11.8)	1 (14.3)
Diabetes	4 (23.5)	1 (14.3)
Other comorbid medical conditions	4 (23.5)	0

	HAPWC	NaCl
Trips to operating room, avg. (SD)	3.3 (2.3)	4.1 (2.0)
NPWT with instill, days, avg. (SD)	7.2 (5.2)	8.6 (2.9)
Time to wound closure (days), avg. (SD)	19.4 (9)	22.5 (18)
Length of stay (days), avg. (SD)	24.3 (16.6)	37.9(53.7)

SD: standard deviation

DATA ANALYSIS / RESULTS

LOS, the number of procedures requiring the OR, and days to wound closure were evaluated using the Student's t-test, with a significance threshold of the one-tailed test of p<0.05.

Eight wounds were treated with NaCl and 19 wounds used HAPWC as the irrigation medium. Demographical data and wound characteristics are listed in Table I. The average number of comorbid diseases per patient was 3.3 in the HAPWC group versus 1.7 in the NaCl group. Hypertension and diabetes mellitus were the most common comorbidities while intravenous drug abuse and the use of tobacco also had a high prevalence (Table II).

No statistical significance was reached because of the limited number of wounds in the study, but wounds treated with HAPWC vs. NaCl showed a trend towards fewer treatments in the OR (i.e., for debridement, 3.3 vs. 4.1) and a shorter LOS (24.3 vs. 37.9, days) (Table III).

Health Economic Analysis: In the US, medical interventions are assigned a CPT (Current Procedural Terminology) code. For wound debridement, a series of different CPT codes can be used, depending on size of the wound to be debrided, depth, type of debridement, etc. The cost to Medicare for CPT 11042 debridement (the simplest form and type of debridement (subcutaneous tissue [includes epidermis and dermis, if performed]) is \$120 on average. Thus, for the HAPWC treated wounds the minimum cost of debridement has been (\$396) and for NaCl this was \$492, an increase of \$96 (24%).

Surgical debridement costs to the hospital, including every factor impacting costs of the procedure, are discussed in another database. The Orlando Health Transparency guide shows the cost of debridement as \$2,525. Thus, debridement for HAPWC-treated wounds (\$8,332) costs \$2020 (24%) less than for NaCl-treated wounds (\$10,352).

Using 2016 Kaiser Health data (average daily hospital cost, *excluding* all interventions: \$2052) the cost of treatment associated with HAPWC instillation translates to \$49,864 and the cost of NaCl instill to \$77,771, per patient on average, a difference of \$27,907 or 56% more for treatment with NaCl.

When using the AHRQ 2012 benchmark these differences are even more evident. The AHRQ 2012 data indicate an average daily cost of hospital stay, *including* all interventions, of \$10,400. Using this AHRQ cost of per day hospital stay benchmark, using HAPWC, the treatment cost translates to \$252,720 vs. NaCl related costs of \$394,000: in these calculations, using NaCl is \$141,280 (+56%) more expensive per patient being treated for complex and/or infected wounds. The small difference in the cost of saline solution versus hypochlorous acid solution is minimal in comparison to the global treatment-related cost savings associated with the HAPWC solution. This holds true whether one uses the Kaiser or the AHRQ cost databases for daily hospital stay. These findings are presented in Figure 1.

CONCLUSION

The use of NPWT with a specific, stable solution of 300 ppm hypochlorous acid preservative (HAPWC) as the irrigant was shown to :

- ✓ reduce the number of visits to the OR,
- ✓ lead to faster wound closure,
- ✓ and have a significant impact to the LOS

in comparison with 0.9% saline solution, despite of the fact that the HAPWC-treated wounds were larger on average and the patients were older. Thus, in our study, the use of HAPWC leads to an impressive reduction of the overall cost of treatment.

Trademarked items:

* Vashe® Wound Solution, Urgo Medical North America, Fort Worth, Texas, USA

DISCLOSURES

This work was produced with support from Urgo Medical North America.

