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## Reduction in Acute Gastroenteritis among Military Trainees: Secondary Effects of a Hygiene-based Cluster-Randomized Trial for Skin and Soft Tissue Infection Prevention

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### Abstract

Military personnel in congregate settings are at increased risk for acute gastroenteritis.<sup>1,2</sup> Personal hygiene (eg, frequent hand washing, hand sanitizers, etc.) remains a central strategy. A skin and soft tissue infection (SSTI) prevention trial was conducted among military trainees.<sup>3</sup> Trainees were randomized to 1 of 3 groups with incrementally increasing education- and hygiene-based measures. The principal components were promotion of hand washing in addition to a once-weekly application of a chlorhexidine-based body wash. Herein, we report the trial's impact on acute gastroenteritis.

### METHODS

We conducted a cluster-randomized SSTI prevention trial among military trainees at Fort Benning, Georgia.<sup>3</sup> Platoons, rather than individual trainees, were the units of randomization. The population was all male, 17–42 years old, and in good physical condition.

Each of 3 study groups (standard, enhanced standard, and chlorhexidine) had ~10,000 trainees. Each group received incrementally increasing hygiene measures.<sup>3</sup> Standard group trainees received a briefing on SSTI prevention upon entry. Enhanced standard group trainees received standard group components in addition to supplemental materials (ie, a pocket card and posters in the barracks). The chlorhexidine group trainees received

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enhanced standard group components in addition to a chlorhexidine-based body wash (Hibiclens®, Mölnlycke Health Care, Norcross, GA). Trainees were instructed to use the wash once weekly for the entire training period. All patients sought care at a single outpatient clinic.

As a predefined secondary objective, we reviewed electronic medical records for medically attended outpatient cases of acute gastroenteritis that occurred during the trial. The case definition was any occurrence of the following symptom- or disease-specific codes specified in the *International Classification of Disease, 9<sup>th</sup> Revision, Clinical Modification* (ICD-9): 003.0, 003.9, 004, 005, 005.0, 005.89, 005.9, 008.0–008.8, 009.0–009.3, 535.0, 558.9, 787.01, 787.03, 787.91, and 787.99. Data abstractors were blinded to study group assignment.

Rate calculations were restricted to the first acute gastroenteritis episode and were defined as the number of cases per 1,000 person-weeks. Binomial distributions were used to generate 95% confidence intervals (CIs). Rate ratios (RRs) were compared using Fisher's exact test.

Statistical analyses were performed using Microsoft Excel (Microsoft Corporation, Redmond, WA), Stata® 12.1 (Stata-Corp, College Station, TX), and OpenEpi.

## RESULTS

Among 30,209 trainees (411,491 person-weeks), we identified 780 cases of acute gastroenteritis, 282 (36.2%) in the standard group, 238 (30.5%) in the enhanced standard group, and 260 (33.3%) in the chlorhexidine group (Table). The overall acute gastroenteritis rate was 2.70 (95% CI: 2.52, 2.90) cases per 1000 person-weeks. By study group, acute gastroenteritis rates per 1,000 person-weeks were 2.30 in the standard group (95% CI: 2.04–2.59), 1.62 (95% CI: 1.42–1.83) in the enhanced standard group, and 1.91 in the chlorhexidine group (95% CI: 1.68–2.15). Compared with the standard group, acute gastroenteritis rates were lower in both the enhanced standard group (RR: 0.70; 95% CI: 0.59–0.84) and the chlorhexidine group (RR: 0.83; 95% CI: 0.70, 0.98). Acute gastroenteritis rates did not differ between the enhanced standard group and the chlorhexidine group (RR: 0.85; 95% CI: 0.71–1.01).

Acute gastroenteritis rates were highest in winter. By season, the ratios of the enhanced standard group rate to the standard group rate were as follows: summer (RR: 0.65, 95% CI: 0.49–0.87), fall (RR: 0.69, 95% CI: 0.50–0.94), winter (RR: 1.31, 95% CI: 0.87–1.99), and spring (RR: 0.35, 95% CI: 0.21–0.56). The ratios of the chlorhexidine group rate to the standard group rate did not differ by season, with the exception of spring (RR: 0.51, 95% CI: 0.33–0.76).

The most common code was diarrhea ( $n = 256$ ; 30.9%). The proportion coded as diarrhea was higher in the chlorhexidine group ( $P = .04$ ). Other frequent diagnoses were nausea with vomiting (24.6%), other and unspecified noninfectious gastroenteritis and colitis (21.5%), and vomiting alone (14.7%). Diagnoses did not differ by group.

## DISCUSSION

In this field-based trial, promotion of education- and hygiene-based components failed to prevent SSTIs.<sup>3</sup> However, we did observe a reduction in acute gastroenteritis, suggesting that routine reinforcement of personal hygiene may prevent enteric disease among military personnel.

Mott et al<sup>4</sup> supplied military trainees with alcohol-based hand sanitizers and observed a 48% reduction in acute gastroenteritis. In a community-randomized trial,<sup>5</sup> a 53% reduction in diarrhea among children was observed in households receiving soap and hand-washing education. Unlike these studies, there did not appear to be a protective effect attributable to the agent (ie, chlorhexidine) alone. Rather, frequent hand washing likely interrupted the transmission of enteric pathogens and prevented secondary cases.

This study was conducted in the context of a randomized controlled trial that lasted 20 months and utilized clinic-based records. Because care was provided at a single clinic, we were able to capture all study-relevant data. We are aware of several limitations to our study. We only identified medically attended outpatient cases. We may have missed cases of those who did not seek care and those who may have presented directly to the hospital. We were not able to identify etiologic agents or noninfectious causes of illness. Lastly, we were not able to measure the frequency of hygiene practices, and it is possible that other factors accounted for the observed reduction in rates.

Promotion of personal hygiene among military trainees was associated with a reduction in acute gastroenteritis. Routine application of these measures, especially hand hygiene, may reduce rates of diarrheal disease and other infectious diseases (eg, acute respiratory infection) that are common to congregate military populations.<sup>4,6</sup>

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**Table 1**

Incidence and Case Characteristics of Acute Gastroenteritis among U.S. Army Trainees in a Cluster-Randomized Trial of Personal-Hygiene–based Measures

	Study Group		
	Standard n = 282	Enhanced Standard n = 238	Chlorhexidine n = 260
Incidence density (95% CI) <sup>a</sup>	2.30 (2.04–2.59)	1.62 (1.42–1.83)	1.91 (1.68–2.15)
Rate ratio (95% CI) <sup>b</sup>		0.70 (0.59–0.84)	0.83 (0.70–0.98)
Time from training start to first acute gastroenteritis episode			
Mean (SD), d	46.0 (24.3)	48.6 (25.5)	47.8 (24.7)
Day range	1–94	1–96	3–94
No. (%) of participants with >1 visit for acute gastroenteritis	49 (17.4)	35 (14.7)	25 (9.6)

NOTE. CI: confidence interval; SD: standard deviation. The standard group received an information brief upon start of training to recognize skin and soft tissue infections (SSTIs) and to encourage personal hygiene practices. The enhanced standard group received the components of the standard group plus a SSTI prevention information pocket card and hygiene education posters in the barracks. The chlorhexidine group received the components of the enhanced standard group plus chlorhexidine-based body wash.

<sup>a</sup>Rates are the number of cases per 1,000 person-weeks.

<sup>b</sup>Standard group as reference.