TriService Nursing Research Program Final Report Cover Page

Sponsoring Institution	TriService Nursing Research Program
Address of Sponsoring Institution	4301 Jones Bridge Road Bethesda MD 20814
USU Grant Number	HU0001-16-1-TS11
USU Project Number	N16-P07
Title of Research Study or Evidence-Based Practice (EBP) Project	Identifying Infectious Contamination of Military Uniform in a Hospital Setting
Period of Award	01 July 2016 – 30 June 2019
Applicant Organization	The Geneva Foundation
Address of Applicant Organization	917 Pacific Ave, Suite 600, Tacoma WA 98402

Signatures

PI Signature	Gordon F. West LTC, AN	Date	9 May 2019
Mentor Signature	Betty K. Gu PhD	Date	9 May 2019

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Abstract

Purpose: Determine whether the military uniform may be a risk factor in the chain of infection of hospital-acquired infections.

Design: Randomized, experimental crossover design.

Methods: Participants were sampled on two days, donning either their personally-owned/ military uniform or hospital-laundered scrubs. Participants were sampled upon arrival, 4 hours, and 8 hours into their shift. Sampling was performed via impression of replicate organism detection and counting plates for 5 seconds on each of the following locations: sleeve cuff of the dominant hand, waist line pocket dominant side, front abdominal area, lower back area, and the volar surface of both wrists. Plates were incubated for 24 hours and enumeration was performed by automatic colony counter. Participants were verbally surveyed for demographic information, information regarding hand hygiene, laundering habits, and perceptions about the hygienic barriers of the military uniform.

Sample: Inpatient (126) and outpatient (64) military healthcare professionals (RN, LPN, APRN, medics) who provide direct patient care.

Analysis: Repeated measure, mixed-effects models were developed to assess colony forming units (CFUs) from the 2-period, 2-factor crossover design. Separate models were run at each sampling location to assess CFU differences between personal/military uniforms and hospital-provided scrubs.

Findings: Bacterial contamination of military/personal uniforms was 2-3 times greater than hospital-laundered scrubs, which accumulate bacteria gradually throughout the day. Differences in bacterial colonization were not correlated with time since last uniform laundering, hand hygiene frequency, or age of participant.

Implications for Military Nursing: Personally-owned uniforms are more likely to be colonized by bacterial specimens compared to hospital-laundered scrubs and thus pose a greater risk for bacterial transmission in both inpatient and outpatient settings. More work is needed to understand behavioral risk factors for colonization but it is likely that policies conducive to daily laundering of the uniform and increased hand hygiene may reduce rates of hospital-acquired infections.

TSNRP Research Priorities that Study or Project Addresses

Primary Priority

Force Health Protection:	☐ Fit and ready force ☐ Deploy with and care for the warrior ☐ Care for all entrusted to our care
Nursing Competencies and Practice:	☒ Patient outcomes ☐ Quality and safety ☐ Translate research into practice/evidence-based practice ☐ Clinical excellence ☐ Knowledge management ☐ Education and training
Leadership, Ethics, and Mentoring:	☐ Health policy ☐ Recruitment and retention ☐ Preparing tomorrow's leaders ☐ Care of the caregiver
Other:	☐

Secondary Priority

Force Health Protection:	☐ Fit and ready force ☐ Deploy with and care for the warrior ☐ Care for all entrusted to our care
Nursing Competencies and Practice:	☐ Patient outcomes ☒ Quality and safety ☒ Translate research into practice/evidence-based practice ☒ Clinical excellence ☐ Knowledge management ☐ Education and training
Leadership, Ethics, and Mentoring:	☐ Health policy ☐ Recruitment and retention ☐ Preparing tomorrow's leaders ☐ Care of the caregiver
Other:	☐

Progress Toward Achievement of Specific Aims of the Study or Project

Findings related to each specific aim, research or study questions, and/or hypothesis:

Specific Aim 1. Compare the degree of bacterial contamination of the military uniform to surgical scrubs in nurses working in an inpatient setting (bacterial contamination will be sampled on arrival and after four and eight hours of use).

As of 15 February 2018 all inpatient sampling was completed. Data analysis was performed by the research team as led by the consulting statistician. Data analysis was completed by 16 March 2018 and manuscript preparation was completed and submitted for publication to Infection Control and Hospital Epidemiology on 27 April 2018. On 1 June 2018, reviewer's responses required significant revisions to the manuscript. These revisions were completed and the manuscript was re-submitted by 19 June 2018. The manuscript was cleared and e-published ahead of print on 29 Aug 2018 in the journal Infection Control and Hospital Epidemiology (West et al, 2018). In general, our specific aim was answered and we were able to characterize significantly lower colony-forming bacteria in surgical scrub-wearers over military uniform wearers across all uniform regions sampled (abdominal, back, sleeve cuff, and waist pocket region) and across all time points sampled (arrival, 4 hours, and 8 hours) as shown in Figure 1. These primary findings support the study hypothesis that military uniforms worn in direct patient care in the inpatient setting pose a significantly greater bioburden than hospital-regulated scrubs.

Key Results:

Inpatient active duty military uniforms are significantly more colonized by bacteria than hospital-provided scrubs. Bacterial accumulation (8 hours) is distinctively time-dependent in hospital-scrubs but not military uniforms.

Implication: Higher bacterial burden may increase health risks of vulnerable patients and increase nosocomial transmission.

Conclusion: Military uniforms are a significant reservoir of bacteria (considerably more than hospital-attire) and should be re-evaluated as acceptable wear during direct patient care.

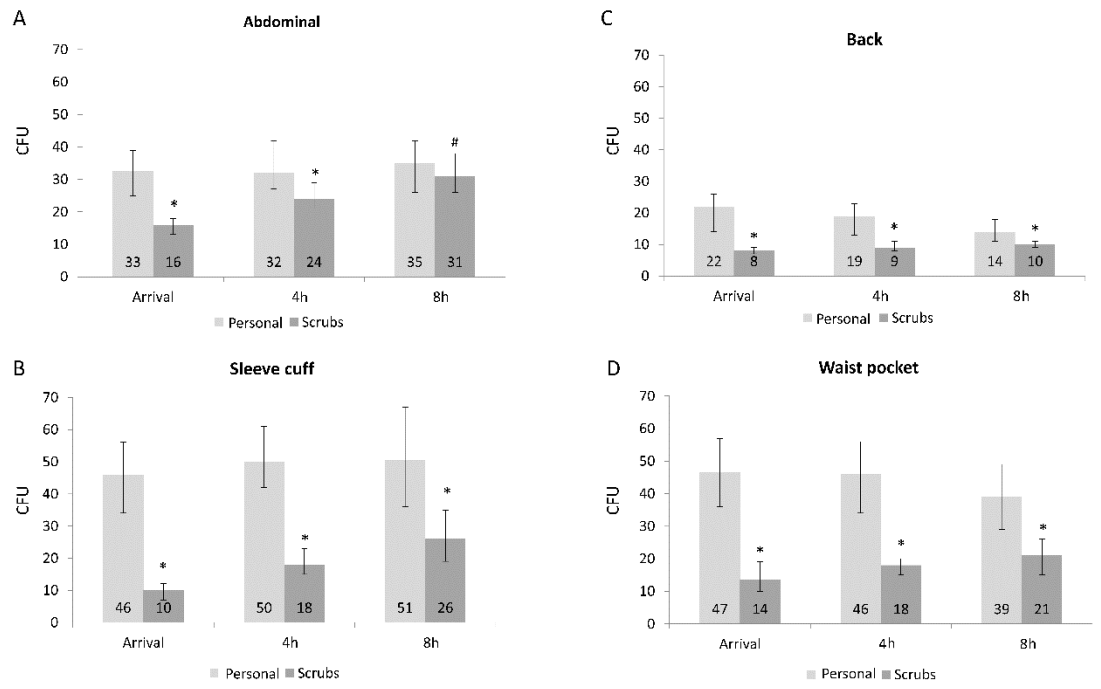

Figure 1: Median CFUs of different nursing uniforms over time
CFU: colony forming unit; results expressed as medians. A. results observed at abdominal site. B. results observed at the sleeve cuff of the participant's dominant arm. C. results observed at the back of the uniform. D. results observed at the waist pocket of the participant's dominant arm side. *p <0.001 between personally-owned uniform and hospital scrubs; #p<0.05 between personally-owned uniform and hospital scrubs. N=124.

Specific Aim 2. Compare the degree of bacterial contamination of the military uniform to surgical scrubs in nurses working in an outpatient setting (bacterial contamination will be sampled on arrival and after four and eight hours of use).

As of 15 February 2018 all outpatient sampling was completed. Data analysis was performed by the research team as led by the consulting statistician. Data analysis was completed by 24 April 2018 and manuscript preparation was completed and submitted for publication to Journal of Emergency Nursing on 7 May 2018. We received reviewer feedback from the journal and made revisions according to the reviewer's comments. The manuscript was e-published ahead of print on 17 Dec 2018 in the Journal of Emergency Nursing (West, et al 2019). In general, our specific aim was answered and we were able to characterize significantly lower colony-forming bacteria in surgical scrub-wearers over personal uniform wearers (either civilian personal uniforms or military personal uniforms) across all uniform regions sampled (abdominal, back, sleeve cuff, and waist pocket region) and across all time points sampled (arrival, 4 hours, and 8 hours) as shown in Figure 2.

Compared with inpatient trends, scrub-wearers in either inpatient/outpatient demonstrated a relatively similar gradual accumulation of bacteria over an eight hour shift. On the other hand, military/personal outpatient uniforms were significantly more contaminated (2-7 fold depending

on the uniform region sampled) in the outpatient wards from arrival to the eight hour sampling point. These primary findings support the study hypothesis that military (or personal) uniforms worn in direct patient care in the outpatient setting pose a significantly greater bioburden than hospital-regulated scrubs.

Key Results:

Outpatient active duty military (and civilian-personally owned) uniforms are significantly more colonized by bacteria than hospital-provided scrubs. Bacterial accumulation (4 hours) is distinctively time-dependent in hospital-scrubs but not personal (military and civilian) uniforms.

Implication: Higher bacterial burden of personal uniforms (military and civilian) may increase health risks of vulnerable patients and increase nosocomial transmission.

Conclusion: Personal (military and civilian) uniforms are a significant reservoir of bacteria (considerably more than hospital-attire) and should be re-evaluated as acceptable wear during direct patient care in an outpatient setting.

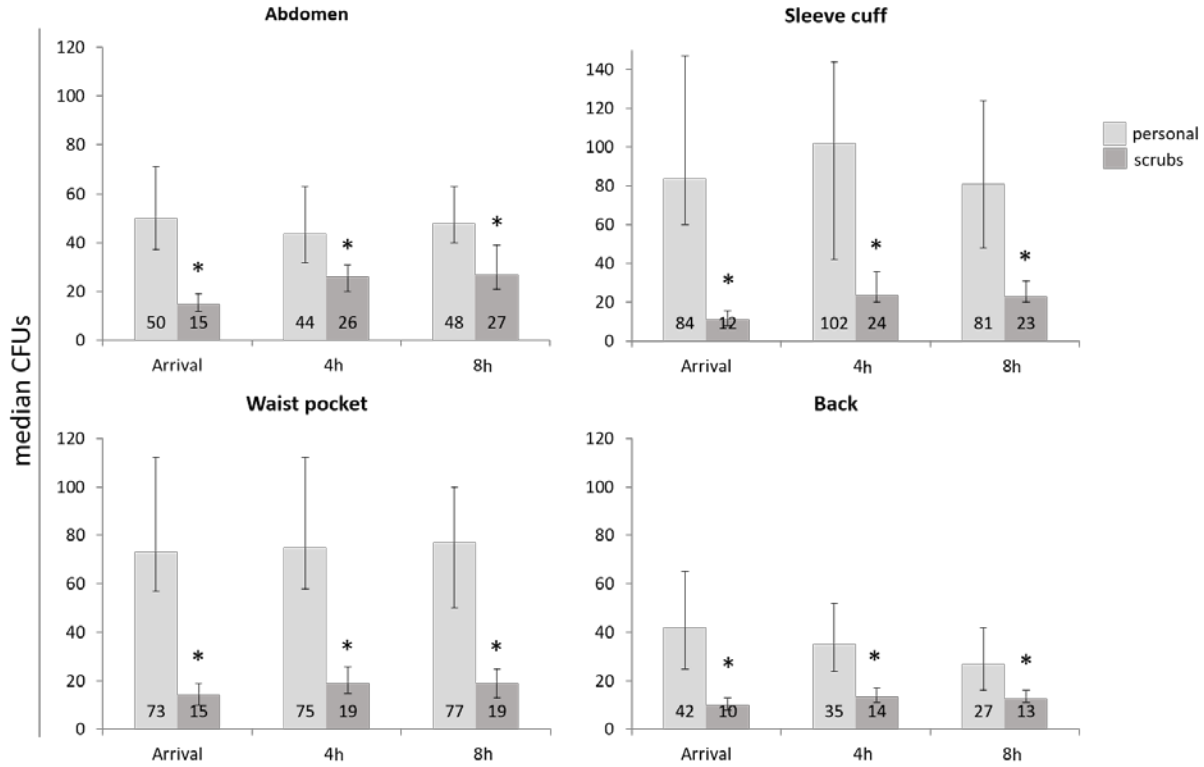

Figure 2. Colonization of nursing staff according to uniform type: “Personal” included any type of military service uniform or civilian’s personal scrubs; “Scrubs” included hospital-provided scrubs only; CFU=colony forming units (per 25cm^2); *p≤0.005 compared to personal uniform. N=56.

Specific Aim 3. Describe the laundering practices of nurses who wear a military uniform to work (frequency of washing method of cleaning).

As of 15 February 2018 all survey of laundering practices was completed. Data analysis was performed by the research team as led by the consulting statistician. Data analysis was completed by 16 March 2018 and was originally written into the inpatient results manuscript submitted for publication to Infection Control and Hospital Epidemiology on 27 April 2018. On 1 June 2018, reviewer's responses revealed significant concerns with our presentation of self-reported laundering habits, leading us to remove this discussion from the manuscript. In general, our specific aim was addressed and we found that staff who wash their uniforms daily present fewer bacteria at all sites than staff who do not wash daily, though this observation was only statistically significant at the cuff site when both inpatient and outpatient data were pooled.

Key Result:

Neither inpatient military uniforms nor outpatient military uniforms demonstrate a laundry-associated difference in bacterial abundance. When pooled together, the sleeve cuff does demonstrate a significant increase in bacteria based on frequency of uniform laundering.

Implication: In large samples, laundering frequency is likely associated with bacteria abundance of a military uniform.

Conclusion: Laundering frequency is mildly related to bacterial abundance on military hospital uniforms and presents an opportunity for risk-reduction of bacterial transmission. Self-reported laundering habits should be more empirically surveyed in future research. Many respondents seemed unaware of exactly how they wash their uniform (temperature setting, wash load setting) and also did not seem to have accurate recall of dryer settings (temperature, duration). Comparisons of personal laundering methods to commercial laundering suggests differences in wash temperature, detergent, and drying temperature could be explored to determine if personally owned uniforms washed in a similar manner have lower bacteria on arrival to work. Of note, the instructions for washing the military uniform do not recommend laundering these garments in a fashion similar to hospital laundering procedures, as they may result in accelerated damage or wear of the uniform.

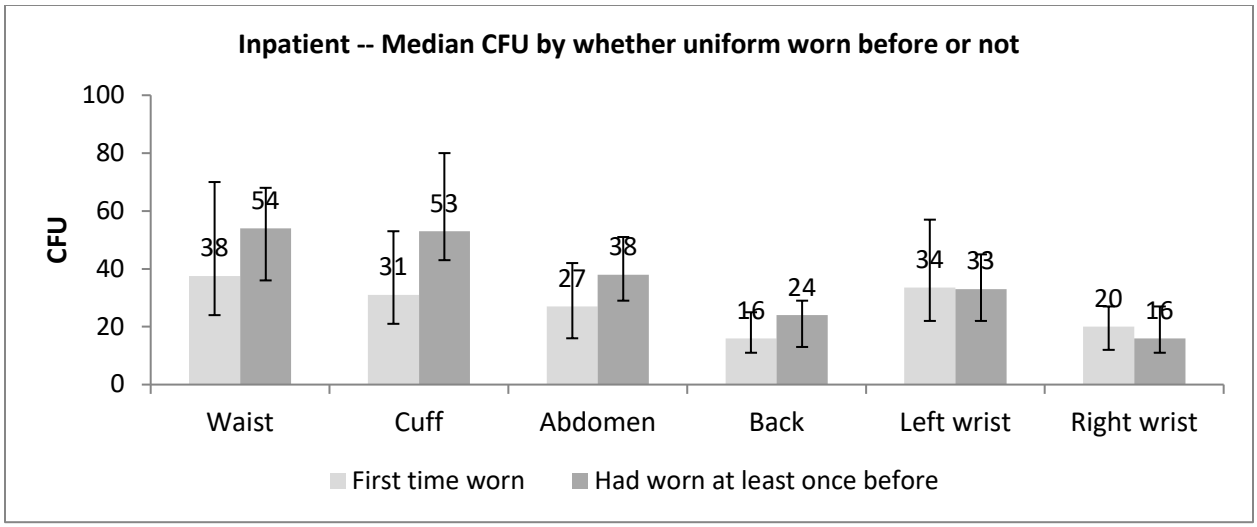

Figure 3. Colonization of nursing staff uniforms according to uniform cleanliness in an inpatient setting: Uniforms were dichotomized into those freshly washed prior to sampling versus those reported as previously worn without laundering. CFU=median colony forming units (per 25cm^2) of abdominal, waist, back, and cuff sites. N=124.

Specific Aim 4. Describe and compare the hand washing practices of nurses who wear a military uniform to those who wear surgical scrubs (frequency of alcohol based hand washing compared to soap and water, removal of long sleeves prior to washing hands, method used to clean wrist and lower arms).

As of 15 February 2018 all survey of hand washing practices was completed. Data analysis was performed by the research team as led by the consulting statistician. Data analysis was completed by 12 April 2018 and manuscript preparation was completed and submitted for publication to Journal of Hospital Infections on 27 April 2018. The paper was accepted for publication formally, on 15 May 2018, with electronic availability as of 22 May 2018. In general, our specific aim was answered and we were able to characterize significant differences in the hand hygiene patterns of inpatient versus outpatient nursing staff as well as military versus civilian nursing staff (Table 1). Additionally, we concluded the donning of the active duty military uniform played a particular role as a deterrent against hand hygiene with soap and water as reported by the staff themselves (Figure 4). This effect was identified as a factor of sleeve length predominantly (67%).

Key Result:
There was a 40% reduction in the number of hand hygiene events per patient hour in the outpatient wards compared to the inpatient wards. There was also a 40% reduction in hand hygiene events performed by military nursing staff compared to civilians in the outpatient unit. A majority of military participants identified sleeve length as a contributing factor.

Implication: There are unit related (inpatient versus outpatient) and role-related (military versus civilian) differences contributing to hand hygiene frequency that cannot be explained by age. Military uniforms may exacerbate low adherence to hand hygiene policies.

Conclusion: Unit and role-related military organizational factors may impact adherence to hand hygiene standards and should be considered as nosocomial infection risk-reduction strategies.

Table 1. Hand Washing Frequency of Inpatient and Outpatient Military and Civilian Nursing Staff in a Military Hospital

	Inpatient		Outpatient		Outpatient military		Outpatient civilian	
	n	%	n	%	n	%	n	%
Handwashing frequency - M								
1-5	20	17	15	27	13	37	2	10
6-10	58	49	26	46	16	46	10	48
11-20	34	29	12	21	4	11	8	38
>20	7	6	3	5	2	6	1	5
mean (std)	11.2 (7.6)		10.8 (8.3)		9.4 (8.9)		13.3 (6.6)	
median (IQR)	10 (7-14)		10 (5-15) †		6 (5-10)		10 (10-15) ‡	
Handwashing frequency - S								
1-5	22	18	14	25	12	34	2	10
6-10	48	40	22	39	12	34	10	48
11-20	40	34	17	30	9	26	8	38
>20	9	8	3	5	2	6	1	5
mean (std)	12.2 (9.3)		11.0 (8.0)		9.5 (8.3)		13.4 (6.9)	
median (IQR)	10 (6-15)		10 (5-15) †		6 (4-12)		10 (10-15)	

*Adjusted for age.
† p<0.05 inpatient vs. outpatient (military)
‡ p<0.05 military vs. civilian (outpatient)

Mean and median handwashing frequencies were summarized based on self -reported estimates per patient hour. Data expressed as number of participants reporting in either category as well as percentage of total respondents. Survey of handwashing frequency was performed twice in either personal (including military) or hospital-provided uniform in order to gauge repeatability. P-values highlighted in red represent statistically significant differences of the median. Data was analyzed for statistical significance as is and adjusted for differences in age.

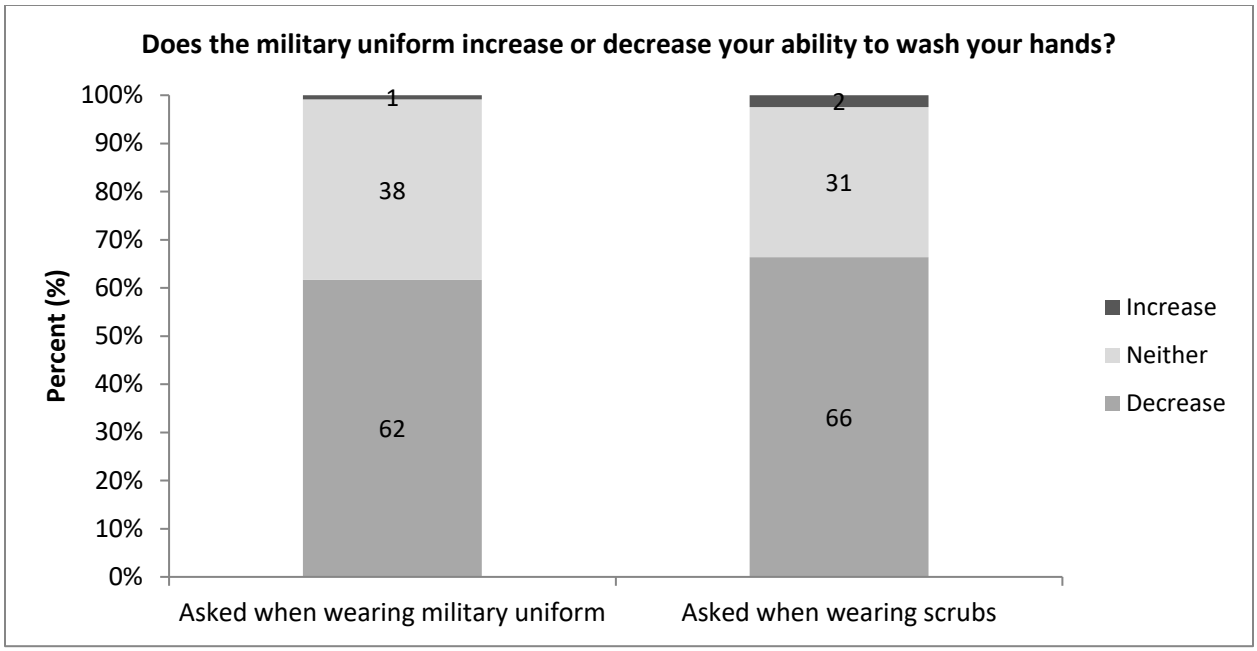

Figure 4. The Active Duty Military Uniform as a Deterrent of Hand Washing
Graphs indicate percentage of the total study participants who indicated the following response to the inquiry of the military uniform as a deterrent to hand washing: legend displays color and corresponding answer. Bars represent answers collected during the wear of different uniform types.

Relationship of current findings to previous findings**:**

The attire of healthcare personnel has been proposed as a vector of infectious organisms (Haun et al 2016; Gralton et al 2015). Evidence suggests significant colonization across diverse uniform types (lab coats, scrubs, others) (Abu Radwan et al 2017; Wiener-Well et al 2011). Our study confirms high rates of uniform colonization throughout the shift, particularly on personally-owned military and civilian attire. This study also revealed that a substantial number (nearly 43%) of participants wear uniforms consecutively without laundering, a practice illuminated by previous literature and associated with increased risk of nosocomial infection (Krueger et al 2012). In line with another published report, the finding that long sleeves increased the likelihood of contact-related contamination and decreased the adequacy of handwashing (Weber et al 2012) was indirectly supported by our finding that sleeve cuffs were consistently more contaminated than other uniform regions and that over two thirds of military staff report long-sleeves as a barrier to hand hygiene. This was further corroborated by the finding that civilians perform hand hygiene significantly more than military staff (4 times more per hour), though it is important to note that this may not entirely be due to uniform-related factors. Future work assessing hand hygiene should control for the role of the nurse (direct patient care vs charge nurse) and other factors such as nurse workload and exposure of staff to contact precaution patients.

Effect of problems or obstacles on the results:

Research coordinators were exchanged around the middle of the study; while this could have impacted sampling procedures and introduced some variability, overall data did not demonstrate variability that could be attributed to the change in coordinators.

Repeat sampling of uniforms at the same locations throughout the day via contact plates (impression of the plates essentially sucks up bacteria similar to an adhesive) was thought to have possibly "removed" some of the initial bacterial colonization throughout subsequent sampling events. While this was not at all observed during scrubs sampling by the same method (time-course displayed accumulating bacteria throughout the day), military and personal civilian uniforms did not display the predicted accumulation of bacterial colonization throughout the day. On the other hand, there were no downward trends in the bacterial count of military/personal uniforms that would support the notion that bacteria were sequentially "removed" from the uniform by repeat sampling. Rather, military and personal civilian uniforms revealed high colony counts that remained relatively unchanged throughout the day. While we cannot be certain whether this phenomena was the result of differences in the uniform fabrics, the initial cleanliness of the uniform (on arrival), or other unknown factors, we do not believe there is evidence that repeat sampling with contact plates skewed the final results. As the uniforms where not marked it is highly unlikely that uniforms were sampled in exactly the same spot overtime.

An early and persistent obstacle in this study was the abundance of false positive "MRSA" detection, which was ultimately attributed to faulty chromogenic screening plates. Fortunately, we had the ability to verify MRSA suspect colonies with state-of-the art clinical identification technology, which led us to discover the false positives. After exhaustive microbiological identification, only two cases of MRSA colonization and two cases of VRE colonization were confirmed overall, much lower than others have reported in the literature (Wiener-Well et al 2011). As these other authors rely on similar plates it is unclear if these elevated rates reported in the literature represent actual MRSA or potential false positives. We diligently attempted to report our testing of these commonly used MRSA screening plates but were unable to find a journal interested in publishing those findings. Likely, the low validation of MRSA on uniforms had something to do with the fact that only one of the multiple samples were obtained from each uniform on each day (18) were screened for pathogenic contamination. As it was not feasible to screen each sample for MRSA/VRE, we focused on the 8hr cuff sample as we believed it would yield the highest colonization and therefore the largest chance for detection of the pathogens. However, in omitting all other samples, we likely lowered the chances of detecting real MRSA/VRE. In future studies, if MRSA and VRE identification is a primary aim, MRSA/VRE screening agars are now commercially available as contact plates. Because the primary aim of this study was enumeration of total colonization of the uniforms, we don't believe that the false positive obstacle was detrimental to the primary aims of the study, though they do reduce the immediate clinical impact of the study.

Limitations:

Measures of behavioral factors such as uniform laundering and hand hygiene were collected by self-reported measures, which by nature lend themselves to reporting bias. It is possible that staff may have overestimated their performance of hand hygiene or uniform cleanliness. In the future, objective measures should be considered.

Our comparison of military and civilian uniforms/behaviors may be skewed by the fact that civilians operate in a military medical facility and may not accurately represent civilian behavior at civilian institutions. Additionally, we reported age and experience differences between civilian and military personnel which may have introduced some variability into our comparison. In the future a truly age and experience-matched assessment should be undertaken in the evaluation of military versus civilian infection control practices. Additionally, any comparison should also control for the role of the nurse sampled. Many settings within our facility have experienced (older) civilian nurses who tend to work primarily in direct patient care roles. At the same time, military nurses as they gain experience tend to transition to charge nurse roles that often involve a lower number of assigned patients to provide direct care to while they oversee and assist with the management of the unit. However, since evaluating military versus civilian behaviors was not our primary goal, we do not believe these differences in the demographics impacted the key findings of the study.

Conclusion:

Military uniforms are significant reservoirs of bacteria compared to hospital-laundered scrubs and should be re-evaluated as acceptable wear for active duty soldiers who provide direct patient care. This question had not been previously addressed in the infection prevention literature and was thereby illuminated as a source for practice improvement in this study. Personal civilian uniforms were additionally characterized as high reservoirs for bacterial colonization compared to hospital-laundered scrubs, suggesting that the phenomenon was likely not a factor of the active duty uniform but rather behavioral practices such as home laundering practices, general hygiene, environmental exposures outside the clinic, institutional culture of hygiene, etc. Evidence for this comes from the observation that bacterial counts detected on arrival were dramatically higher than freshly-laundered hospital scrubs, suggesting that either home-laundering is suboptimal to industrial laundering practice or that environmental exposures from the home to the hospital are more significant than currently considered. However, more investigation is required to corroborate and identify these factors explicitly. These findings suggest that hospital policies regarding acceptable clinical attire for both military and civilian employees providing direct patient care should be re-evaluated as bacterial accumulation is a risk factor for infection transmission. Additionally, through this study we conclude that unit and role-related military organizational factors may impact adherence to hand hygiene standards and should be regarded as nosocomial infection risk-reduction strategies, specifically, policies regarding the wear of long-sleeved active duty tops (or long-sleeved sweaters/jackets for civilian personnel).

Significance of Study or Project Results to Military Nursing

The results from this study support the need to reassess the choice of uniforms worn while providing direct patient care. On an annual basis the costs associated with HAIs is estimated to exceed $20B and needlessly endanger 90K patients. In the immediate future we do not anticipate research that will establish a clear link to the source of bacteria on a uniform causing a HAI. Despite this lack of a clear cause and effect link, there is a growing body of literature that demonstrates that uniforms can harbor infectious agents and can serve as a source for cross-contamination. Given the fact that the typical HAI now costs nearly $20K and is no longer reimbursed by the Centers for Medicaid and Medicare most facilities would likely offset the costs associated with this change by a reduction in HAIs.

The findings in the study clearly demonstrate that the military uniform (and civilian owned uniforms) contain significantly more bacteria than hospital laundered scrubs. As such, all aspects of nursing to include management and policy should aim to decrease this risk for cross-contamination by advocating for direct care professionals to wear hospital laundered scrubs. To date, numerous other countries have adopted policies requiring hospitals to provide staff with access to freshly laundered attire or in-house laundering services.

The findings from our hand-hygiene assessment also clearly indicate that the long sleeve nature of the military uniform hinders the ability of staff to perform hand hygiene with soap and water. While alcohol rubs are a frequent and effective source for hand sanitation, residue can build up over continued use and requires hand hygiene with soap and water. Washing with soap and water is also preferable in cases of exposure to spore forming bacteria. It is critical then that staff don uniforms that allow easy access to the hands, including the lower wrists which are often obstructed by long sleeves. Finally, splashing water on sleeve cuffs during hand washing may cause a discomfort and more importantly, increase the survivability and transfer of bacteria. As such, sleeve length should be specifically considered among discussions of the military uniform in direct care settings.

Our findings also revealed that both active duty and personal civilian work attire arrive at the hospital significantly more contaminated than clean, hospital-owned uniforms, and that nearly 43% of staff (military and civilian) report wearing a uniform more than once without laundering, a known risk factor for the spread of pathogenic organisms. In contrast, hospital-owned scrubs are strictly regulated for on-site wear only (dirty bins are contained in special rooms), are uniformly cleaned through an industrial service, and are stored in temperature-controlled, covered environments to minimize exposure. How active duty uniforms/personal scrubs become so contaminated prior to the beginning of the work day remains to be specifically answered. However, from a military standpoint, the relatively high cost of the active duty uniform may limit the availability of clean attire for staff on any given day. The majority of staff at this facility tend to work three to four 12 hour shifts consecutively, minimizing their ability to launder these uniforms until they have a day off. Hence, to wear a clean uniform daily they would need to own at least four sets of uniforms. It is also common for active duty nursing staff to be required to step away from the direct care role to tend to administrative tasks (command meetings, training, etc.) throughout the workday, permitting the transfer of bacteria accumulated at the point of care to other parts of the hospital. These organizational factors should be considered by policy-makers as a contribution to the chain of infection within the military medical facility.

Previously, no published work has studied the military nursing population from an infection prevention standpoint nor identified military-organizational risk factors which may increase the spread of healthcare-associated infections. While our study was not exclusive to military nursing staff (as civilian employees make up an integral part of the clinical workforce in a military healthcare facility), it uncovered the active duty and personal work uniform as a significant bacterial reservoir. In turn, this research highlighted that the long-sleeved duty top may act as a barrier to hand hygiene. This barrier was represented in the 40% decrease in hand hygiene performed by military versus civilian staff in identical environments and was similarly corroborated by the finding that the sleeve cuffs of the military uniforms exhibited the highest number of bacterial colonies overall. However, since military policy at our facility currently allows for the wear of military short-sleeved scrub tops in the clinic as well, it will be important for a future study to empirically validate the reported burden of long versus short-sleeved military tops on hand hygiene rates.

While this research was conducted at only one military facility, the findings are likely generalizable across all military settings. Regardless of the uniform sampled in this study, uniforms from home had significantly more bacteria that hospital laundered scrubs. With regards to quality, the current study had some limitations which included reliance on self-reported data. Additionally, we did not capture data on the personally owned uniform characteristics (sleeve length, actual military uniform vs. scrub top alternative) nor did we record the dominant hand of the participant. Finally, we had some laboratory limitations that limited our ability to positively identify MRSA and VRE in a cost effective and reliable manner.

Future work could focus on exploring the rational for the high number of bacteria on the personally owned uniform when individuals arrive to work. Given the nature of military healthcare, laundering of all staff uniforms is unlikely regardless of costs limitations. Alternative methods to reduce bacteria on hospital uniforms such as ultraviolet light disinfection could therefore also be explored to determine whether, in a field setting, staff could rapidly and easily decontaminate military tops via UV-C (germicidal) light exposure to reduce the bacterial burden and, subsequently, the risk of their uniform serving as a vector for the spread of pathogenic bacteria to the patients we care for.

Changes in Clinical Practice, Leadership, Management, Education, Policy, and/or Military Doctrine that Resulted from Study or Project

At the facility level, cost limitations have unfortunately prevented the transition of all direct care nurses to wearing hospital provided scrubs. In working with inpatient nursing leadership we have been able to pilot the change in practice on one medical surgical unit. We are currently assessing this pilot unit to determine changes in HAIs within this specific unit and hope to use findings from this pilot to expand the wear of hospital scrubs to other areas of the hospital. Additionally, the findings from this study were briefed at a monthly phone DHA infection control representative meeting. Unfortunately, we are unaware of any changes in practice this discussion may have had. This information has been presented at numerous military conferences with lots of interest that hopefully spurred changed within other organizations. If we are made aware of specific changes made as a result of this work we will engage with TSNRP to ensure they are aware.

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Summary of Dissemination

Type of Dissemination	Citation	Date and Source of Approval for Public Release
Publications		
	West GF, Resendiz M, Lustik MB, Nahid MA. Bacterial Contamination of Military and Civilian Uniforms in an Emergency Department. J Emergency Nursing. 2019 Mar;45(2):169-177.e1. doi: 10.1016/j.jen.2018.10.005. Epub 2018 Dec 17.PMID:30573161	7 May 2018. Tripler Army Medical Center Publication/Presentation Clearance
	West GF, Resendiz M, Lustik MB, Nahid MA. Comparing colony-forming units in inpatient nurses: Should military nurses who provide patient care wear hospital-provided scrubs? Infect Control Hospital Epidemiology. 2018 Nov;39(11):1316-1321. doi: 10.1017/ice.2018.212. Epub 2018 Aug 29. PMID: 30156175	27 April 2018. Tripler Army Medical Center Publication/Presentation Clearance
	West GF, Resendiz M, Lustik MB. Assessing hand hygiene attitudes of inpatient nursing personnel in a US military hospital. J Hospital Infect. 2018 Oct;100(2):214-217. doi: 10.1016/j.jhin.2018.05.012. Epub 2018 May 22. PMID: 29800591	27 April 2018. Tripler Army Medical Center Publication/Presentation Clearance
Podium Presentations	West, G.F. Comparing bacterial growth on hospital uniforms. Leadership in Action. American Organization of Nurse Executives Conference. Honolulu, HI. 2-3 NOV2017	29 Sept 2017. Tripler Army Medical Center Publication/Presentation Clearance
	West, G.F. Identifying infectious contamination of military uniforms in a hospital setting. TSNRP Dissemination Course, San Antonio, TX. 30 April-3 May 2018	29 Sept 2017. Tripler Army Medical Center Publication/Presentation Clearance

	West, G.F. Describing bacterial content on inpatient nursing uniforms, Sigma Theta Tau International Conference, Melbourne Australia. 19-23 July 2018.	29 May 2018. Tripler Army Medical Center Publication/Presentation Clearance
	West, G.F., Resendiz, M., Lustik, M., Horseman, T. Bacterial contamination of military and civilian uniforms in an emergency department. TSNRP Dissemination Course, San Diego, CA. 30 April-3 May 2019	29 Sept 2017. Tripler Army Medical Center Publication/Presentation Clearance
Poster Presentations	West, G.F., Resendiz M, Lustik M, and Nahid, M. Comparing bacterial growth on inpatient nursing hospital uniforms. Leadership in Action. American Organization of Nurse Executives Conference. Honolulu, HI. 2-3 Nov 2017	29 Sept 2017. Tripler Army Medical Center Publication/Presentation Clearance
	West, G.F., Resendiz M, Lustik M, and Nahid, M. Identifying infectious contamination of military uniforms in a hospital setting. TSNRP Dissemination Course, San Antonio, TX. 30 April-3 May 2018	29 Sept 2017. Tripler Army Medical Center Publication/Presentation Clearance
	West, G.F., Resendiz M, Lustik M, and Nahid, M. Identifying infectious contamination of military uniforms in a hospital setting. Academy of Medical-Surgical Nurses Annual Convention, Lake Buena Vista, FL. 11-16 September 2018.	27 April 2018. Tripler Army Medical Center Publication/Presentation Clearance
	West, G.F. Resendiz, M. Bacterial contamination of military and civilian uniforms in an Emergency Department, Army Nurse Corp Association, San Antonio, TX. 13 October 2018.	29 May 2018. Tripler Army Medical Center Publication/Presentation Clearance
Media Reports	ANC Newsletter: Uniform wear while providing direct patient care- is it time to change? 6 June 2018	27 April 2018. Tripler Army Medical Center Publication/Presentation Clearance

Other	Defense Health Agency: Infection prevention control work group meeting. [Quarterly Teleconference Report] Honolulu, HI	N/A

Reportable Outcomes

Reportable Outcome	**Detailed Description**
Applied for Patent	none
Issued a Patent	none
Developed a cell line	none
Developed a tissue or serum repository	none
Developed a data registry	none

Recruitment and Retention Table

Recruitment and Retention Aspect	**Number**
Subjects Projected in Grant Application	190
Subjects Available	207
Subjects Contacted or Reached by Approved Recruitment Method	207
Subjects Screened	207
Subjects Ineligible	0
Subjects Refused	17
Human Subjects Consented	190
Subjects Who Withdrew	0
Subjects Who Completed Study	175
Subjects With Complete Data	151
Subjects with Incomplete Data	24

Demographic Characteristics of the Sample

Characteristics-Inpatient	
Age (yrs)	27.2 ±5.5
Women, n (%)	60 (48%)
Men, n (%)	64 (52%)
Experience, months	
Mean (SD)	29.5 (23)
Median (IQR)	27 (13-36)
Department	
Medical/Surgical, n (%)	102 (81%)
Maternal child, n (%)	20 (16%)
Pediatric, n (%)	4 (3%)
Characteristics-Outpatient	
Age (yrs)	32.8 ±9.7
Women, n (%)	29 (55 %)
Men, n (%)	24 (45%)
Experience, months	
Mean (SD)	106 (91)
Median (IQR)	84 (48-135)
No. times uniform worn previously n, (%)	
0	30 (57%)
1	13 (25%)
2	6 (11%)
3-5	4 (8%)
Service Component	
Military, n (%)	31 (58.5%)
Civilian, n (%)	22 (41.5%)

Program Budget Summary Report

Company: The Geneva Foundation | Period Start Date: 7/1/2016 | **Current Fringe Rate:** 35.50%
User: Tappero, Elyssa | Period End Date: 6/30/2019 | **Current G&A Rate:** 19.80%

Contract: 10467 - Identifying Infectious Contamination
Award Amount: 358,800.00
Total Estimated: 358,800.00
Total Funded: 358,800.00

Contract PoP: 7/1/2016 - 6/30/2019
Customer: TRISERVICE NURSING RESEARCH PROGRAM
Customer Contract ID: HU0001-16-1-TS11
Contract Manager: Robinson, Kathleen

Category	Budget	Period	Cumulative	Commitments	Cumul. + Commit.	Remaining Balance
Direct Expenditures						
Personnel						
Personnel Salary & Wages	164,326.60	120,900.05	120,900.05	0.00	120,900.05	43,426.55
Fringe Benefits (Burden)	0.00	42,782.02	42,782.02	0.00	42,782.02	-42,782.02
Total Personnel	**164,326.60**	**163,682.07**	**163,682.07**	**0.00**	**163,682.07**	**644.53**
Non-Personnel						
Equipment	0.00	0.00	0.00	0.00	0.00	0.00
Travel	10,573.98	10,573.98	10,573.98	0.00	10,573.98	0.00
Supplies	96,249.43	96,249.43	96,249.43	0.00	96,249.43	0.00
Other	28,849.99	28,849.99	28,849.99	0.00	28,849.99	0.00
Consultant	0.00	0.00	0.00	0.00	0.00	0.00
Subcontractor	0.00	0.00	0.00	0.00	0.00	0.00
Total Non-Personnel	**135,673.40**	**135,673.40**	**135,673.40**	**0.00**	**135,673.40**	**0.00**
Total Direct Expenditures	**300,000.00**	**299,355.47**	**299,355.47**	**0.00**	**299,355.47**	**644.53**
Indirect Expenditures						
G&A Burden	58,800.00	59,163.11	59,163.11	0.00	59,163.11	-363.11
Other Indirect Costs	0.00	0.00	0.00	0.00	0.00	0.00
Total Indirect Expenditures	**58,800.00**	**59,163.11**	**59,163.11**	**0.00**	**59,163.11**	**-363.11**
Total Dir. + Indir. Expenditures	**358,800.00**	**358,518.58**	**358,518.58**	**0.00**	**358,518.58**	**281.42**
Fee Amount	0.00	0.00	0.00	0.00	0.00	0.00
Total Expenditures + Fee	**358,800.00**	**358,518.58**	**358,518.58**	**0.00**	**358,518.58**	**281.42**

Report Date: 7/2/2019