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Background. Patient movement between hospitals, nursing homes (NH), and long-term acute care facilities (LTACs) contributes to MDRO spread. SHIELD OC is a regional decolonization collaborative among adult facilities with high patient sharing designed to reduce countywide MDRO prevalence. We report pre- and post-intervention MDRO colonization prevalence.

Methods. Decolonization included chlorhexidine bath (CHG) (4% liquid or 2% cloth) and twice-daily nasal swab 10% povidone-iodine (PI). LTAC and NH used CHG for all baths and PI 5 days on admission and Monday-Friday every other week. Patients in contact precautions (CP) at hospitals had daily CHG and 5-days PI on admission. Point-prevalence screening for MRSA, VRE, ESBL, and CRE using nares, axilla/groin, and peri-rectal swabs was conducted pre-intervention (September 2016-March 2017) and post-intervention (August 2018-April 2019); 50 random LTAC and 50 CP hospitalized patients were sampled; for NH up to 50 were sampled at baseline and all residents post-intervention. Raw impact of the intervention was assessed by the average change in colonization prevalence, with each facility carrying equal weight. Generalized linear mixed models (GLM) stratified by facility type were used to assess the impact on MDRO colonization when clustering by facility.

Results. Across 35 facilities (16 hospitals, 16 NHs, 3 LTACs), the overall MDRO prevalence was reduced 22% in NHs (OR 0.58, $P < 0.001$), 34% LTACs (OR = 0.27, $P < 0.001$), and 11% CP patients (OR = 0.67, $P < 0.001$, Table 1). For MRSA, raw reductions were 31% NHs (OR = 0.58, $P < 0.001$), 39% LTACs (OR = 0.51, $P = 0.01$), and 3% CP patients (OR = 0.88, $P = NS$). For VRE, raw reductions were 40% NHs (OR = 0.62, $P = 0.001$), 55% LTACs (OR = 0.26, $P < 0.001$), and 15% CP patients (OR = 0.67, $P = 0.004$). For ESBLs, raw reductions were 24% NHs (OR = 0.65, $P < 0.001$), 34% LTACs (OR = 0.53, $P = 0.01$), and 26% CP patients (OR = 0.64, $P < 0.001$). For CRE, raw reductions were 24% NHs (OR = 0.70, $P = NS$), and 23% LTACs (OR = 0.75, $P = NS$). CRE increased by 26% in CP averaged across hospitals, although patient-level CRE declined 2.4% to 1.8% (OR = 0.74, $P = NS$).

Conclusion. MDRO carriage was common in highly inter-connected NHs, LTACs and hospitals. A regional collaborative of universal decolonization in long-term care and targeted decolonization of CP patients in hospitals led to sizeable reductions in MDRO carriage.

	Patients Swabbed	Any MDRO	MRSA	VRE	ESBL	CRE
Nursing Homes: Pre-Intervention (N=16)*						
Nares	800	30%	30%			
Axilla/Groin	800	46%	31%	9%	21%	2%
Peri-Rectal	800	52%	26%	14%	31%	1%
All Body Sites	800	64%	43%	16%	34%	2%
Nursing Homes: Post-Intervention (N=16)*						
Nares	1451	25%	25%			
Axilla/Groin	1451	25%	13%	3%	12%	1%
Peri-Rectal	1451	34%	11%	6%	22%	1%
All Body Sites	1451	60%	30%	9%	26%	2%
Relative Reduction	-	-22%	-31%	-40%	-24%	-24%
Long Term Acute Care Hospitals: Pre-Intervention (N=3)						
Nares	150	23%	23%			
Axilla/Groin	150	61%	17%	37%	27%	7%
Peri-Rectal	150	73%	19%	52%	35%	7%
All Body Sites	150	80%	33%	55%	39%	9%
Long Term Acute Care Hospitals: Post-Intervention (N=3)						
Nares	150	17%	17%			
Axilla/Groin	150	24%	8%	9%	12%	3%
Peri-Rectal	150	45%	7%	25%	22%	7%
All Body Sites	150	53%	20%	28%	25%	7%
Relative Reduction	-	-34%	-39%	-56%	-24%	-23%
Hospitals (Contact Precautions Only): Pre-Intervention (N=15)**						
Nares	740	30%	30%			
Axilla/Groin	740	33%	14%	14%	13%	1%
Peri-Rectal	740	49%	14%	24%	24%	2%
All Body Sites	740	64%	36%	25%	27%	2%
Hospitals (Contact Precautions Only): Post-Intervention (N=15)**						
Nares	667	31%	31%			
Axilla/Groin	667	24%	14%	7%	7%	2%
Peri-Rectal	667	39%	12%	20%	18%	2%
All Body Sites	667	67%	36%	21%	20%	3%
Relative Reduction	-	-11%	-3%	-16%	-26%	28%

*Random sample of 50 residents per NH for pre-intervention, all residents sampled in post-intervention point prevalence
 ** All patients on contact precautions until 50 patients sampled
 †Post-intervention hospital results are interim (4 hospitals with partial data)

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894. Universal Decolonization in Nursing Homes: Effect of Chlorhexidine and Nasal Povidone-Iodine on Prevalence of Multi-Drug-Resistant Organisms (MDROs) in the PROTECT Trial

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Background. The prevalence of MDROs in nursing homes (NH) is much higher than that of hospitals. Decolonization to reduce the reservoir of MDRO carriage in NH residents may be a strategy to address MDRO spread within and among healthcare facilities.

Methods. PROTECT is an 18-month cluster randomized trial of 1:1 universal decolonization vs. routine care in 28 NHs in California. Decolonization consists of chlorhexidine (CHG) bathing plus twice daily nasal iodophor on admission and Monday-Friday biweekly. We assessed pre- vs. post-intervention MDRO prevalence by sampling 50 randomly selected residents at each NH as an outcome unrelated to the trial's primary intent (infection, hospitalization reduction). NH residents had nasal swabs cultured for methicillin-resistant *S. aureus* (MRSA), and skin (axilla/groin) swabs taken for MRSA, vancomycin-resistant *Enterococcus* (VRE), extended-spectrum β -lactamase producers (ESBL), and carbapenem-resistant Enterobacteriaceae (CRE). Generalized linear mixed models (GLM) assessed the difference in differences of MDRO prevalence using an arm by period interaction term, clustering by NH.

Results. Four NHs dropped from the trial. Among the 24 NHs that remained, MDRO colonization at baseline was 49.4% and 47.5% of residents in control ($N = 650$) vs. decolonization ($N = 550$) NHs, with no difference in MRSA, VRE, ESBL, and CRE (Table 1). Among remaining NHs, decolonization was associated with 28.8% raw decrease in MDRO prevalence in decolonization sites (GLM OR = 0.51, $P < 0.001$), 24.3% raw decrease in MRSA (OR = 0.66, $P = 0.03$), 61.0% raw decrease in VRE (OR = 0.17, $P < 0.001$), and 51.9% raw decrease in ESBL (OR = 0.40, $P < 0.001$). CRE increased, but numbers were small (Control arm: 10 in baseline, 4 in intervention; intervention arm: 1 in baseline, 2 in intervention, $P = NS$).

Conclusion. Universal NH decolonization with CHG bathing and nasal iodophor resulted in a marked decrease in Gram-positive and Gram-negative MDRO prevalence. This decrease may lower MDRO acquisition, infection, and antibiotic use within NHs, as well as regional MDRO spread to other healthcare facilities.

Table 1

	Any MDRO	Any MRSA	Nasal MRSA	Skin MRSA	Any VRE	Any ESBL	Any CRE
Baseline Point Prevalence							
Routine Care NHs	47.5%	35.5%	28.7%	22.4%	8.5%	15.8%	0.2%
Decolonization NHs	49.4%	38.9%	30.3%	27.2%	5.7%	16.2%	1.5%
End Intervention Point Prevalence							
Routine Care NHs	31.3%	24.2%	21.3%	11.1%	2.2%	9.3%	0.4%
Decolonization NHs	46.8%	36.0%	26.8%	24.3%	4.9%	17.8%	0.6%
Relative Change							
Routine Care NHs	-5.3%	-7.5%	-11.6%	-10.7%	-13.5%	10.5%	-60.0%
Decolonization NHs	-34.1%	-31.8%	-25.9%	-50.4%	-74.5%	-41.4%	100.0%

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895. Impact of Measurement and Results Feedback of Chlorhexidine Gluconate (CHG) Skin Concentrations in Medical Intensive Care Unit (MICU) Patients Receiving CHG Bathing

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Background. Higher CHG skin levels may be needed to adequately control infection and transmission of pathogens in the ICU. We assessed whether measurement and feedback of patient CHG skin concentrations could improve CHG bathing quality and identified factors associated with higher CHG skin concentrations.

Methods. We conducted 6 one-day surveys from January 2018 to February 2019 in 7 academic hospital MICUs with established daily CHG bathing. Adults admitted >1 day were assessed for CHG skin levels with a semi-quantitative colorimetric assay using swabbed 25 cm² areas of anterior neck, axilla, and inguinal skin. Prior to survey 4, results from the first 3 surveys (baseline) were reported to ICU leadership and front-line staff to retrain and reeducate on bathing technique. Feedback of results from prior surveys also occurred before surveys 5 and 6. For statistical analysis, mixed-effects models accounted for clustering of CHG measurements within patients and ICUs. We categorized CHG product type as "cloth" for no-rinse 2% CHG-impregnated cloth and "liquid" for 4% CHG liquid or foam.

Results. In total, 681 of 704 (97%) patients were enrolled. Three ICUs used CHG cloth, 3 ICUs used CHG liquid, and 1 ICU switched from liquid to cloth after the second survey. Median CHG skin concentrations were higher in both the baseline and feedback period for institutions using CHG cloth, as compared with liquid (table). Across all time points, axillary and inguinal regions had higher skin CHG concentrations than the neck (median 39.1, 78.1, 19.5 µg/mL, respectively, $P < 0.001$). After controlling for age, mechanical ventilation, presence of a central venous catheter, body site, and hours since last CHG bath, institutions that used CHG cloth had a 3-fold increase in adjusted CHG skin concentrations in the feedback period compared with the baseline period ($P = 0.001$, Figure). There was no significant change in CHG skin concentrations from baseline to feedback period for institutions that used liquid CHG.

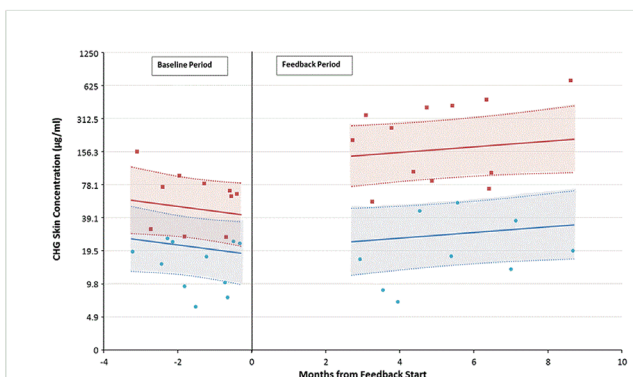
Conclusion. CHG skin concentrations on MICU patients receiving daily CHG bathing varied by body site and CHG product type. The use of CHG cloth was associated with higher CHG skin levels, compared with CHG liquid. For ICUs using CHG cloth, feedback of CHG skin concentration results to ICU staff improved CHG bathing quality.

Table: Unadjusted Median Chlorhexidine Gluconate (CHG) Skin Concentration Measurements on Medical Intensive Care Patients during Baseline and Feedback Period

CHG Bathing Method	Median CHG Skin Concentration, µg/ml (IQR)		P-value
	Baseline Period	Feedback Period	
2% CHG cloth	78 (9.8-312.5)	312.5 (39.1-1250)	0.001
4% CHG liquid/foam	9.8 (0-39.1)	19.5 (2.5-78.1)	0.74

Note: Total skin swabs obtained = 2,011 (cloth: 1,134; liquid/foam: 877). Table P-values represents differences in CHG skin concentrations between baseline and feedback period by CHG bathing method, as determined using mixed effects models. Median skin concentrations for 2% CHG cloth were higher than 4% CHG liquid/foam during both baseline and feedback periods ($P=0.01$).

Figure: Modeled Chlorhexidine Gluconate (CHG) Skin Concentration Measurements on Medical Intensive Care (MICU) Patients during Baseline and Feedback Period



Note. Total number of patients = 681. CHG skin concentrations expressed in medians (solid line) and 95% confidence intervals (dotted lines) with three body sites (neck, axilla, inguinal region) combined. Red squares represent MICUs that used 2% CHG cloth and blue circles represent those that used 4% liquid or foam for daily patient bathing. The first 3 surveys occurred prior to education and retraining (baseline period), followed by surveys 4-6 during which active bathing education and retraining occurred (feedback period). Month 0 corresponds to the time when the first set of CHG skin concentration results was made available to each institution for MICU feedback.

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896. A Safe, More Cost-Effective Protocol: Universal Decolonization vs. MRSA Screening and Contact Precautions

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Background. A trial of universal decolonization (alcohol-based nasal antiseptic plus chlorhexidine gluconate bathing) was instituted for 12 months, in a 536-bed short-term acute care hospital, as a replacement for nasal screening, contact precautions (CP) and decolonization of methicillin-resistant *Staphylococcus aureus* (MRSA)-colonized patients. The impact on the rate of MRSA bacteremia and costs associated with nasal screening tests, isolation, and gown use was assessed.

Methods. Prior to the universal decolonization trial, patients at high-risk for MRSA colonization were screened using a nasal polymerase chain reaction (PCR) test, and those that tested positive were decolonized with 5 days of mupirocin nasal ointment and daily CHG bathing, and were placed in CP. Starting in April 2018, a universal decolonization protocol was instituted for all hospitalized patients, with a twice-daily alcohol-based nasal antiseptic (in place of mupirocin), and daily bathing with CHG foam soap (in place of CHG cloths). Nasal screening of high-risk patients, targeted decolonization and CP for MRSA-colonized patients, was discontinued during the 12-month universal decolonization trial period. Outcome measures for the trial included MRSA bacteremia per National Healthcare Surveillance Network (NHSN) multi-drug-resistant organism (MDRO) Lab ID definition, isolation day count, utilization of gowns, and nasal screening tests with estimated costs associated. Measures for the 12-month trial period were compared with those of the prior 12-month period, i.e., April 2017–March 2018.

Results. Compared with prior 12-month period, during the universal decolonization trial, there was a 42% reduction in isolation days (\$118/day), a 74% reduction in nasal PCR tests (\$36/each), and an 11% decrease in the monthly use of gowns (\$12/each). The total cost avoidance (after accounting for the cost of the alcohol-based nasal antiseptic and CHG soap) was \$1,394,685. There was no statistical change in the MRSA bacteremia rate (0.067 to 0.070) per 1,000 patient-days.

Conclusion. Replacement of nasal screening, decolonization, and CP for colonized MRSA patients with universal decolonization, using twice daily alcohol-based nasal antiseptic paired with daily CHG bathing, was found to be a safe and cost-saving protocol.

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897. Prevalence of *Candida auris* at Body Sites, Characterization of Skin Microbiota, and Relation of Chlorhexidine Gluconate (CHG) Skin Concentration to *C. auris* Detection Among Patients at a High-Prevalence Ventilator-Capable Skilled Nursing Facility (vSNF) with Established CHG Bathing

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Background. vSNF patients are at high risk of colonization and infection with *C. auris*. CHG bathing has been used as an intervention to reduce nosocomial transmission of multi-drug-resistant organisms, but its effect on *C. auris* is unclear.

Methods. We studied a 70-bed ventilator ward in a 300-bed vSNF in Chicago, IL with a high prevalence of *C. auris* and established CHG bathing. Swab samples were collected from patients for culture, microbiome analysis, and CHG skin concentration testing (Table 1).

Results. We collected 2,467 samples (950 culture, 950 microbiome, 567 CHG) from 57 patients during 2 surveys conducted January–March 2019. Forty-six (81%) patients had *C. auris* cultured from ≥1 body site. Mean (±SD) age was 59 (±14) years, 40% were women, 70% were African American, mean (±SD) Charlson score was 3 (±2). Patients colonized with *C. auris* were more likely to be mechanically ventilated (50% vs. 0%, $P < 0.001$), have a gastrostomy tube (78% vs. 27%, $P < 0.001$) or have urinary catheter (72% vs. 23%, $P = 0.01$) than noncolonized patients. Frequency of *C. auris* isolation varied among 10 body sites tested ($P < 0.001$); colonization of anterior nares (41%) and hands (40%) was detected most often (Figure 1). By ITS1 analysis, all isolates were members of the *C. auris* South American clade. Skin microbiome sequencing confirmed culture Results. While *Malassezia* is the dominant genera observed in healthy volunteers and patients in this vSNF, *C. auris* was observed to dominate the fungal community of multiple skin sites, including nares, hands, inguinal, toe web (Figure 2). Other *Candida* spp. were also identified on the skin of patients in the current study, but at lower relative abundance. CHG was detected on skin of 52 (91%) patients (median CHG concentration 19.5 µg/mL; IQR 4.9–78.1 µg/mL). In a mixed-effects model controlling for body site and multiple measurements per patient, odds of *C. auris* detection by culture were less at CHG concentrations ≥625 µg/mL than at lower concentrations (Figure 3; OR 0.25, 95% CI: 0.10–0.66; $P = 0.005$).

Conclusion. Frequent *C. auris* colonization of vSNF patients' anterior nares and hands suggests that nasal decolonization and patient hand hygiene are potential options to reduce *C. auris* transmission. High concentrations of CHG may be needed to suppress *C. auris* on skin.