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Evaluation of Prevention and Control Strategies for Human Noroviruses in Long-Term Care Facilities in South Carolina

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EVALUATION OF PREVENTION AND CONTROL STRATEGIES FOR HUMAN NOROVIRUSES IN LONG-TERM CARE FACILITIES IN SOUTH CAROLINA

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ABSTRACT

Long-term care facilities (LTCF) are the most common setting for human norovirus (HuNoV) outbreaks in United States. We identified presence of prevention and control strategies for HuNoV in LTCF in South Carolina (SC) under non-outbreak conditions. A convenience sample of 26 LTCF was visited and directors were interviewed to determine facility prevention and control practices. A facility audit in one commons area and food preparation area was conducted to assess sanitary conditions. Institutional policies and procedures were collected to determine alignment with Centers for Disease Prevention and Control (CDC) recommendations and to determine readability based on Federal Plain Language Guidelines and Microsoft Word readability statistics. Findings of director interview responses showed presence of gaps in prevention and control practices. Most Directors had little knowledge of proper sanitizing and disinfecting products and reported missing written procedures for cleaning staff/visitor bathrooms. Many used the wrong products for pathogen removal after vomit/fecal events, had no written procedures for cleaning contaminated soft surfaces, did not remove other individuals during clean-up of vomit/fecal episodes, and did not clean a large area surrounding vomit/fecal episodes. Most did not assign specific staff to care for sick; not designate specific toilets for sick during an outbreak. All kitchens and commons areas in participating facilities were in good sanitary condition. However, possible environmental risk factors for HuNoV transmission in commons areas were identified. Most contained upholstered, rather than hard-surface chairs and some had carpeted floors. Quaternary ammonium-based disinfectants were used in most commons areas. Handwashing signage

was not posted in some staff/visitor bathrooms, and a few staff/visitor bathrooms were accessible to residents. Inconsistencies were identified in hand hygiene, outbreak management and environmental sanitation procedures. Most facilities had procedures for hand hygiene but recommendations for handwashing events and duration varied greatly. Few had separate procedures devoted to HuNoV outbreak control. Both hand hygiene and bodily fluid clean-up procedures had low mean scores for readability. Our study results can be used for development of better quality interventions for prevention and control of HuNoV in LTCF.

DEDICATION

I would like to dedicate this manuscript and the work it represents to my parents, Piyadasa Jayasekara and Tikirmenike Herath, who have supported me and given me guidance all the time. I also would like to dedicate this work to my loving husband Kelum M. Randunu who has been a constant encouragement and support to me. I also dedicate this work to my sister, Chandima Jayasekara for her support. I am truly fortunate for having you all in my life.

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CHAPTER ONE

INTRODUCTION

In the U.S. the percentage of persons hospitalized and the case fatality rate for acute gastroenteritis are highest among persons aged ≥50 years, confirming that this age group is at greatest risk of serious illness (McGlauchlen and Vogel, 2003). This subpopulation includes those individuals in late middle age as well as the conventional definition of older adult (>65 years) and certainly includes residents in long-term care facilities (LTCF). Human noroviruses (HuNoV), are one of the major causes of acute gastroenteritis (AGE), in the U.S (Hall et al., 2011). According to the Centers for Disease Control and Prevention (CDC), most HuNoV outbreaks (60%) occur in LTCF (Hall et al., 2014).

Transmission of HuNoV via aerosolized vomit particles, ability to persist on environmental surfaces for long time and resistance to most commonly used disinfections are some of the factors that promote the virus transmission in close settings such as LTCF (Barker, Vipond, & Bloomfield, 2004; Escudero, Rawsthorne, Gensel, & Jaykus, 2012; Marks et al., 2000; Wu et al., 2005). There is evidence that older adults are at increased risk for longer and more severe disease, prolonged virus shedding, and death (Harris et al., 2008; Trivedi et al., 2012; Wu et al., 2005).With increasing outbreaks occurring in LTCF and the potential for more severe disease and even death in this population, the need for targeted intervention of HuNoV infection is apparent.

The goal of this project was to reduce the risk for HuNoV infection among residents in LTCF. The specific objectives to meet this goal were as follows:

1. Conduct a systematic review of the literature to examine published studies that evaluated the effect of infection control training for HuNoV in LTCF.
2. Evaluate presence of prevention and control strategies for HuNoV in LTCF in South Carolina.
3. Identify presence of environmental factors associated with HuNoV transmission in LTCF in South Carolina.
4. Determine the alignment of infection control policies and procedures of LTCF in South Carolina with the Centers for Disease Control and Prevention (CDC) recommendations for prevention and control of HuNoV and to determine readability of policies and procedures based on Federal Plain Language Guidelines and Microsoft Word Readability Statistics.

Findings of this project can be used to develop better, more effective education and training aids for practitioners and other personnel in LTCF which could help preventing future HuNoV outbreaks.

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CHAPTER TWO

THE EFFECTS OF INFECTION CONTROL TRAINING IN LONG-TERM CARE FACILITIES: A SYSTEMATIC LITERATURE REVIEW

INTRODUCTION

Long-term care facilities (LTCF) are the number one setting for human noroviruses (HuNoV) in the United States (Hall et al., 2014). LTCF is a broad term used for a wide range of services designed to meet medical, personal, and social needs in a variety of setting and locations. Examples of LTCF include skilled nursing facilities, nursing homes, assisted living facilities, and continuing care communities. At present, LTCF provide care for two million older adults (Harris-Kojetin, Sengupta, Park-Lee, & Valverde, 2013) which are a high risk population for HuNoV infections with longer and more severe disease, associated with increased hospitalizations and mortality during outbreaks in LTCF (Trivedi et al., 2012). Genogroup II.4 (GII.4) strains of HuNoV, which emerged at the beginning of the decade, have been particularly troublesome in the elderly population and most outbreaks were associated with healthcare settings (Leshem et al., 2013).

Overall, outbreaks in LTCF are difficult to control due to the closed living environment which provides increased person-to-person transmission of HuNoV because of frequent contact of residents with staff and visitors. HuNoV can be introduced into LTCF via infected persons (i.e., resident, staff or visitor) or contaminated foods. Two factors that promote person-to-person transmission in these closed settings are frequent vomiting of infected persons in conjunction with resistance of HuNoV to most commonly used disinfectants. If a person is infected with HuNoV, their vomit/fecal matter likely

contains a high load of infectious viral particles (Caul, 1995; Atmar et al., 2008), and can produce projectile vomiting in which aerosolized virus can readily spread to individuals in close proximity. Additionally, such aerosolization can result in significant virus dispersion and subsequent widespread environmental contamination (Booth 2014). If HuNoV outbreaks occur in LTCF, immediate and aggressive infection control measures are required (Johnston et al., 2007).

Infection control programs which focused on prevention and control of infections in LTCF have identified as important to minimize infection associated hospitalizations and mortality of older adults (Goldrick, 1999; Smith & Rusnak, 1997). Studies that assess infection control practices in LTCF also reported that LTCF wanted educational materials and training for staff regarding infection prevention (Gamage, Schall, & Grant, 2012; Mody, Langa, Saint, & Bradley, 2005); one study included requirement of HuNoV outbreak prevention resources **(**Stachel, Bornschlegel, & Balter, 2012).

Training on infection control is an essential first step in implementing infection control programs in LTCF, yet evidence supporting the efficacy of training has been inconclusive. The CDC has published guidelines for prevention and control of HuNoV gastroenteritis outbreaks based on a systematic literature review of studies focused on HuNoV prevention and control in healthcare settings (MacCannell et al., 2011). The CDC guidelines recommends, providing education to residents, staff and visitors regarding prevention of infection throughout HuNoV outbreak. Further, the guidelines recommend providing educational sessions and resources for prevention and management of HuNoV before an outbreak occurs. However, their literature review reported they were

failed to identify good quality studies that examined the effect of educational measures on the magnitude and duration of HuNoV outbreaks in healthcare settings. Also, they stated they were unable to find studies that evaluated the most effective mode of education in promoting HuNoV prevention and control. This demonstrates that published literature focusing on the effects of infection control training or education or intervention is limited and indicates the presence of a gap in knowledge about the efficacy of infection control training in LTCF. Our aim was to conduct a systematic literature review to examine published studies that evaluated the effect of infection control training for HuNoV in LTCF.

METHODS

Search Strategy

We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guide to conduct our systematic review of published articles that reported on the effects of infection control training in LTCF. A comprehensive literature search was conducted to identify eligible studies published in English. We performed the search using 4 databases, Academic Search Complete (1970-2014), Web of Science (1970-2014), Academic OneFile (1970-2014), and Google Scholar (1970-2014). Academic Search Complete is managed by EBSCO, so all available databases provided by EBSCO were searched simultaneously, such as MEDLINE® and CINAHL®. We conducted our search using the combination of terms outlined in Table 2.1.The reference lists of all relevant articles were then manually searched to locate additional published studies.

Table 2.1. Literature Search Items

Disease word		Infection control word		Training word		Facility word
Norovirus OR "norwalk like virus" OR "acute gastrointestinal illness" OR "acute gastroenteritis" OR "acute diarrhea" OR "intestinal infectious disease" OR "gastroenteritis" OR "communicable disease"	AND	"Infection control" OR "infection prevention" OR "outbreak management"	AND	Training OR education OR "in-class session" OR workshops OR intervention OR "continuing education"	AND	"Long term care" OR "nursing home" OR "assisted living homes" OR "homes for the aged" OR "senior housing" OR "elderly homes" OR "skilled care facilities"

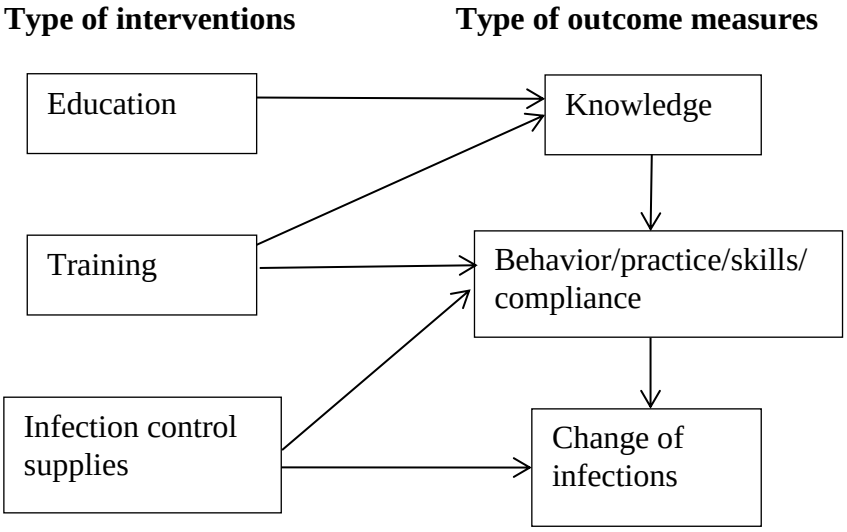
Selection

The title and abstract of each citation was screened using our eligibility criteria and duplicates were removed. Hard copies of all potentially relevant articles were further reviewed based on eligibility criteria. Our eligibility criteria were based on: 1) type of infection, 2) type of training, 3) target population, 4) outcome measure, 5) study design, 6) geographical area 7) English language, and 8) peer reviewed. Studies that provided infection control training for prevention and control of HuNoV, gastroenteritis or communicable diseases were included. Of those, only studies in LTCF that serve older adults were included. Studies in which infection control was provided during outbreak or as part of an outbreak control plan were excluded. Moreover, to be included in our review, knowledge, attitudes, behaviors, practices, or reduction of illness had to be measured as a study outcome. Randomized control and quasi-experiment studies were included in our review. Review articles were excluded; however, the reference lists of review articles were manually searched for additional studies that might have been

missed through our electronic search. Only peer-reviewed articles published in English were included. Full text copies of all eligible studies were obtained to perform an in-depth review.

Concept Map for Infection Control Interventions

Figure 2.1. Relationships between Types of Intervention and Expected Outcome Measures



All eligible articles were screened to identify different types of interventions used and types of measured outcomes. We created a concept map (Figure 2.1) to show the relationship between types of identified interventions and outcome measures that can reasonably be expected to change. We then used this concept map to guide our evaluation of eligible studies.

Quality Assessment

All studies were assessed to determine quality of the methodology by using the Downs and Black Checklist (1998) as it has been recommended as one of the best quality evaluation systems (Deeks et al., 2003). The checklist can be used to conduct systematic reviews of both randomized and non-randomized trials. The checklist consists of 27 items categorized into five sections: 1) reporting (10 items); 2) external validity (3 items); 3) internal validity – bias (7 items); 4) internal validity – confounding (selection bias) (6 items); and 5) power (1 item); the highest possible score is a 28 (Item 5 can earn up to 2 points). Studies were initially evaluated qualitatively (yes/no/unable to determine); the ratings were then converted to a quantitative score (1/0/0). Ratings were averaged to create a quality score for each study.

RESULTS

Search Strategy

Our initial search yielded 773 articles (Figure 2.2). We included 41 potentially eligible studies for full-text review after removing duplicates and screening titles and abstracts according to inclusion criteria. Hand searching the reference list of relevant articles and review articles resulted in 4 additional articles; these were reviewed for eligibility as well. After screening the full text, 38 studies were excluded for the following reasons: inappropriate study design (e.g., outbreak studies) (n=22), no infection control training/education provided (n=4), inappropriate target population (n=3), and inappropriate publication type (n= 9). A total of 7 articles were eligible for our review.

Study Characteristics

All 7 studies were published between 2000 and 2012. Four were from Europe; the remaining three were from the United States, Australia, and Asia, respectively. The number of LTCF in each study ranged from 3 to 111. Two study designs were represented: quasi-experimental (n=4), and randomized control (n=3) (Table 2.2). One study focused on preventing HuNoV infections (Friesma et al., 2009), two on methicillin-resistant *Staphylococcus aureus* (MRSA) (Baldwin et al., 2010; Ho, Tse, & Boost, 2012), one on communicable disease (gastroenteritis and influenza) (Eastwood et al., 2008), and three on multiple sources of infectious disease (gastrointestinal, respiratory, urinary) (Chami et al., 2012; Gopal Rao et al., 2009; Makris, Morgan, Gaber, Richter, & Rubino). Different outcome measures were evaluated across all studies (some studies evaluated more than one) including change in knowledge (n=1), infection control practices (n=4), microbiological measures (e.g., total bacterial count, MRSA prevalence) (n=2) and epidemiological measures (e.g., attack rate, incidence density rate) (n=3).

Quality Assessment

The mean score for Downs and Black quality checklist was 20 of 28 (range 16-27) (Table 2.2). Randomized control trials had higher scores (range=17-27). Most studies clearly addressed bias (mean score of 6), reporting (mean score of 5.8), and external validity (mean score of 5) (Table 2.3). However, most studies not clearly reported confounding (mean score of 3.5). None of the studies reported important adverse events or comprehensive attempt to measure adverse events. Only one study (Baldwin et al., 2010) attempted to use infection control nurse who was independent of researcher and

blinded to allocation of sites to conduct audits in randomly selected 2 sites to minimize measurement bias. Some studies may have undergone data dredging, however, no retrospective unplanned analysis were reported. Of the 7 studies, power analysis was reported in only one study (Baldwin et al., 2010), which was a randomized control trial.

Figure 2.2. Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow chart describing the literature search procedure

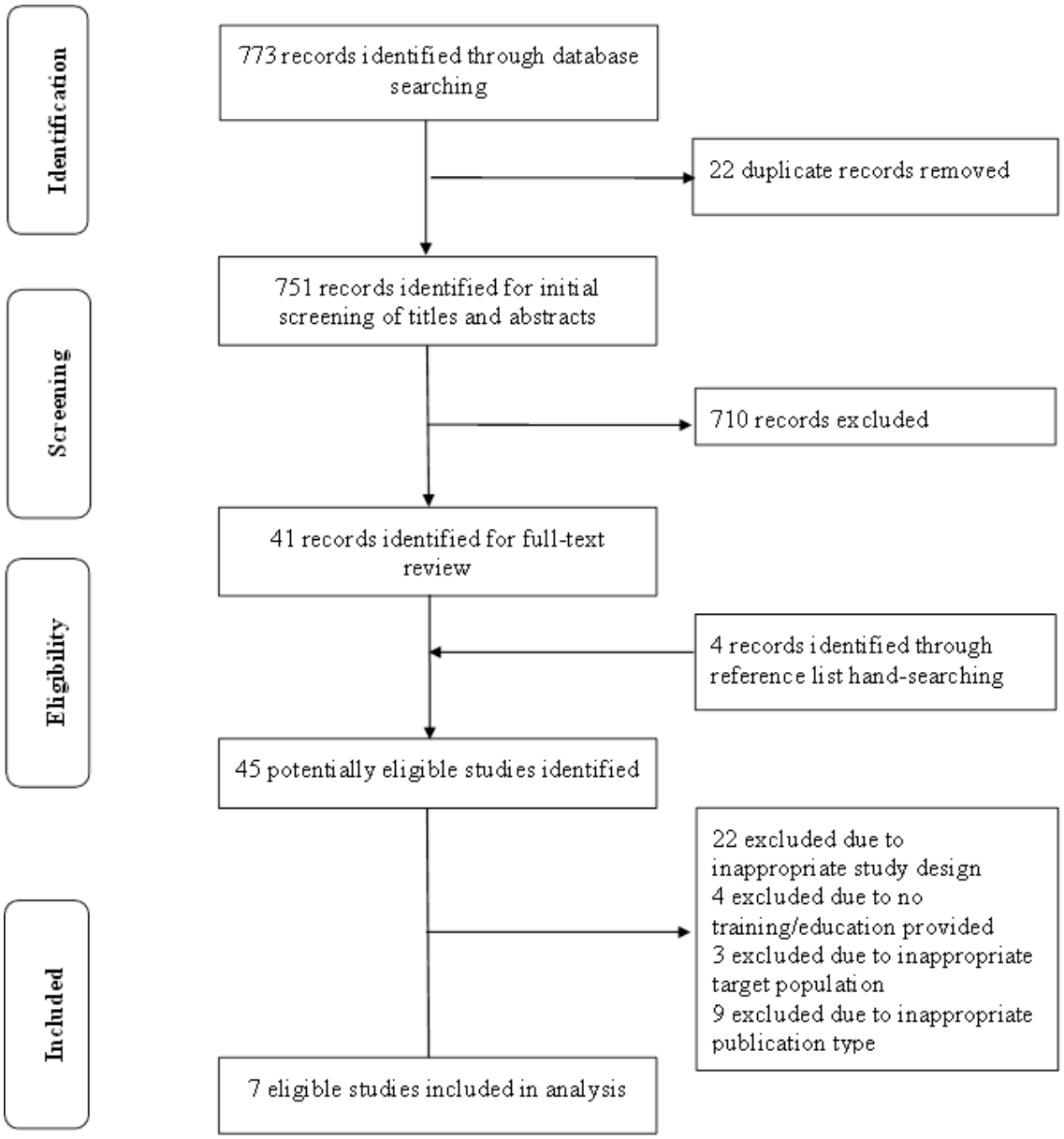


Table 2.2: Summary of Articles Reviewed for the Effects of Infection Control Training in Long-term Care Facilities

Author (Date)	Sample size	Location	Duration of study	Type of intervention	Quality score[a]	Mode of delivery	Data collection method	Data collected	Outcome Measure	Key Findings
QUASI-EXPERIMENTAL STUDIES										
Eastwood (2008)	111	Australia	15 months	• Education	19	• Mailing educational material • Provide web links	Computer assisted telephone interviews	Progress against outbreak readiness criteria	• Changes in practice	• Significant improvement in reported outbreak readiness
Friesma (2009)	49	Europe	12 months	• Education • Training	19	• Assigning protocols • Health service support	Two questionnaires during and after outbreak	• Patient symptoms, duration of illness, and contact with other patients • Total number of infected patients and staff • Implementation of different measures	• Epidemiological measures	• Reduced illness in residents and staff • Little effect on length of outbreak

Author (Date)	Sample size	Location	Duration of study	Type of intervention	Quality score[a]	Mode of delivery	Data collection method	Data collected	Outcome Measure	Key Findings
QUASI-EXPERIMENTAL STUDIES										
Ho (2012)	3	Asia	8 weeks	• Education • Training	16	• Infection control program by intervention group staff	• Questionnaire • Practical assessment form • Microbial samples	• Knowledge • Practical skills • Swabs from staff hands, enteral feed, flow regulators, feeding hub	• Knowledge • Practices • Total bacterial count • Presence of MRSA	• Significant improvement in knowledge and practices in intervention group • Bacterial contaminations significantly lowered • MRSA positive samples decreased
Makris (2000)	8	United States	12 months	• Education • Training • Infection control supplies	17	• Education program by facility staff • Visitations by certified professional to mentor	• Surveillance system data collection (work sheets, weekly line listing)	• Patient demographic information and presence of infection, causative pathogen, body site of infection	Epidemiological measures	• Decrease of infections in test group • No significance difference

Author (Date)	Sample size	Location	Duration of study	Type of intervention	Quality score[a]	Mode of delivery	Data collection method	Data collected	Outcome Measure	Key Findings
EXPERIMENTAL STUDIES										
Baldwin (2010)	32	Europe	12 months	• Education • Training	27	• Infection control education and training by outside professional • Designated facility staff	• Microbial samples (swabs) • Infection control audits	• Presence of MRSA positive samples • Compliance with infection control standards	• MRSA prevalence • Practices	• MRSA prevalence not changed • Mean audit score significantly higher in intervention group
Chami (2012)	50	Europe	5 months	• Education • Training • Infection control supplies	22	Multi-component intervention by designated facility staff	• Web based questionnaire • Individual data using a secure online tool	• Knowledge level and self-perceived compliance • Clinical characteristics of residents	• Epidemiological measure	• No statistically significant change of total infection rates
Gopal Rao (2009)	12	Europe	16 months	• Training • Infection control supplies	17	Training program by designated facility staff	• Structured interviews • Standardized audit tool	• Facility characteristics, infection control organization • Compliance with infection control practices	Practices	• No statistical difference in compliance with practices.

[a] Downs and Black quality score range from 0 to 28

Table 2.3. Quality Assessment Results Based on Downs and Black's Checklist for Measuring Quality

Questions	Total (n=7)
Reporting	
Q1: Is the hypothesis clearly described?	7
Q2: Are outcomes described in Introduction & Methods?	7
Q3: Are in/exclusion criteria clearly described?	6
Q4: Are interventions clearly described?	7
Q5: Are confounders clearly described?	8
Q6: Are the main findings clearly described?	6
Q7: Does the study provide estimates of the random variability in the data for the main outcomes?	6
Q8: Have all important adverse events been reported?	0
Q9: Have the characteristics of patients lost to follow-up been described?	5
Q10: Have actual p-values been reported?	6
External validity	
Q11: Were the subjects asked to participate representative of the source population?	4
Q12: Were those subjects who were prepared to participate representative of the source population?	4
Q13: Intervention was representative of that in use in the source population?	7
Internal validity – bias	
Q14: Did study blind subjects?	7
Q15: Did study blind investigators?	1
Q16: Was "data dredging" clearly reported?	7
Q17: Was follow-up period the same for all subjects?	7
Q18: Were the statistical tests appropriate?	7
Q19: Was compliance with intervention reliable?	6
Q20: Were the main outcome measures used accurate?	7
Internal validity – confounding (selection bias)	
Q21: Were the subjects in different intervention groups recruited from the same population?	6
Q22: Were subjects in different intervention groups recruited over the same period of time?	4
Q23: Were subjects randomized to intervention group?	3
Q24: Was the randomized assignment concealed from both subjects and investigators?	2
Q25: Was there adequate adjustment for confounding in the analyses?	2
Q26: Were losses of subjects to follow-up taken into account?	4
Power	
Q27: Did the study conduct power analysis to calculate the sample size?	1

Type of Interventions

Education is defined as the process of receiving or giving systematic instruction, and transfer knowledge, ideas, concepts, methods, techniques between an educator and a learner and training is defined as the preparation for a professional role and responsibility in public health practice (Public Health online dictionary, 2007). Educational interventions used in studies in our review included providing educational materials, such as written materials (checklists, infection prevention guidelines, fact sheets, posters), electronic media (power point presentations, DVD), infection control protocols and web links. Written material (n=4), electronic media (n=3) were commonly used educational components and protocols (n=1), web links (n=1) were least used in studies in our review. All studies except one (Eastwood et al., 2008) that provided educational components had incorporate with one or more training components. The study done by Eastwood et al., 2008 did not have any training component in their intervention. Studies in our review included training components such as teachings, conduct meetings or discussions, deliver presentations, and practical demonstrations. Most studies used presentations (n=3), discussions (n=3) and practical demonstrations (n=3) as training components in their interventions. Three studies provided infection control supplies in addition to training and education. Those infection control supplies included products such as alcohol-based hand sanitizers, disinfectant sprays, and surface cleaners. In one study (Makris, Morgan, Gaber, Richter, & Rubino, 2000) facilities removed germicidal products that were used and replaced with provided supplies.

Mode of Intervention Delivery

Designated staff (e.g., infection control nurse, senior nurse specialist, and medical doctor) was used to deliver educational and training intervention in most (n=6) studies in our review. Some (n=3) had infection control professionals external to the facility (e.g., certified infection control nurse from public health organization) conducting the training sessions and mentoring but designated staff were responsible for continuing the intervention in their facilities (Baldwin et al., 2010;Friesma et al., 2009; Makris, Morgan, Gaber, Richter, & Rubino, 2000).

The three studies that showed significant improvements after education and training intervention used varying delivery modes; designated staff (Ho, Tse, & Boost, 2012), designated staff and training sessions by external professional (Baldwin et al., 2010) and only offering educational materials to LTCF without any training in Eastwood et al. 2008 study.

Duration of Study

Study durations of reviewed studies varied from 8 weeks to 16 months. Most (n=5) studies used 12 months or more as their study period. Two studies conducted over a longer period (>12 months) reported significant effect on measured outcomes (Eastwood et al., 2008; Baldwin et al., 2010). However, one study that was conducted over a much shorter period (8 weeks), also reported significant effect on measured outcomes (Ho, Tse, & Boost, 2012). However, the two studies conducted over 12 months included three spaced data collection times over the period with each time LTCF were

encouraged and reminded to use provided educational resources (Eastwood et al., 2008) or provided repeat training sessions (Baldwin et al., 2010).

Data Collection Method

Pre- and post-intervention questionnaires were used as data collection method to assess knowledge and practices in most (n=3) studies. Two of those studies used self-administered questionnaires (Friesma et al., 2009; Ho, Tse, & Boost, 2012) and one included computer-assisted telephone interviews using professional interviewers (Eastwood et al., 2008) to collect data. Only two studies reported using an audit tool to collect data on health care worker compliance with infection control practices (Baldwin et al., 2010; Gopal Rao et al., 2009). Audit tool used in those studies was a standardized data collection form where practice was observed and recorded for compliance with infection control standards (e.g., cleanliness of environment, hand decontamination, use of personal protective equipment).

Relationship between Characteristics of Intervention and Expected Outcome Measures

Four studies in our review, showed no significant difference before and after education and training intervention. However, 3 studies showed significant effect on measured outcomes after the intervention (Baldwin et al., 2010; Ho, Tse, & Boost, 2012; Eastwood et al., 2008). Infection control interventions in reviewed studies included education, training, and providing infection control supplies. According to our concept map for relationship between type of intervention and outcome measure, only one study (Ho, Tse, & Boost, 2012) measured the correct outcome measures. In Ho, Tse, & Boost, 2012 study they provided education and training intervention and measured all three

outcome measures (knowledge, practices, and change in rates of infection) to determine the effect of intervention. They reported significant improvement in knowledge and practices after intervention and significant decrease of bacterial contamination in post-test samples. The study done by Eastwood et al. 2008 provided educational intervention and reported significant improvement in practices (e.g., outbreak preparedness practices) in LTCF while in Baldwin et al. 2010 study which provide education and training to intervention group reported significant improvement of practices in intervention group but had no effect on MRSA prevalence. Although those two studies (Baldwin et al., 2010; Eastwood et al., 2008) provide education in their interventions, neither measured change in knowledge according to our concept map.

Two other studies(Chami et al., 2012; Makris, Morgan, Gaber, Richter, & Rubino, 2000) in our review provided intervention included all three components (e.g., education, training, infection control supplies) but they did not measured the correct outcome measures according to our concept map. They only measured epidemiological outcome measures (e.g., total infection rate, incident density rate) without measuring knowledge or practice change as outcome measures and observed no significant changes. Study done by Gopal Rao et al. 2009 used training intervention and measured practices as outcome measure but observed no statistical difference in compliance with infection control practices of facility staff. The study which provide infection control protocols in our review (Friesma et al., 2009) observed poor compliance with assigned protocols by LTCF and ended up measuring effect of individual infection control measures (e.g., refusal of symptomatic visitors, exclusion of ill staff until 48-72 h following recovery) instead

efficacy of assigned protocols. They used epidemiological measures (e.g., attack rates in residents and staff, length of outbreak) as outcome measures. However, the study did not observe significant changes but reported reduced illness in staff and residents by measures targeted reducing the virus spread by aerosols (e.g., wearing masks during handling vomit, removal of exposed food).

DISCUSSION

Our aim was to conduct a systematic literature review to examine published studies that evaluated the effect of infection control training for HuNoV in LTCF. However, our systematic literature search yielded only 7 studies that evaluate infection control training in LTCF indicating a gap in the literature for infection control training programs in LTCF.

Quality Assessment

Our review revealed common flaws in some of the studies; based on the quality assessment checklist. However, some flaws could not be avoided because of the nature of the intervention. For example, study results cannot be generalized due to the non-randomization; however, convenience sampling is the more appropriate method for interventional type studies conducted in LTCF due to high non-participation of facilities in research studies. Inadequate blinding (n=6), or insufficient adjustment of confounders (n=5) were the problems in most studies, therefore results should be interpret cautiously. Our review suggests there is a relationship between infection control training interventions and reduction of infections in LTCF.

Type of Intervention

Our review suggest that providing infection control education and training interventions can improve knowledge (Ho, Tse, & Boost, 2012), compliance with infection control practices (Baldwin et al., 2010; Eastwood et al., 2008; Ho, Tse, & Boost, 2012), and reduce infections (Ho, Tse, & Boost, 2012) in LTCF. Written educational materials (e.g., fact sheets, posters) and electronic media (e.g., power point presentations, DVD) can be used during a training program as a support to teaching and discussion sessions. Use of educational material and electronic media in training programs, could be beneficial in conveying the information to the audience. Also they can serve as reminders which help reinforcing the knowledge gained during training sessions. Several other studies reported effectiveness of education and training programs in hospital settings with significant reduction of intravascular devise associated bloodstream infections in intensive care units as a result of improved infection control practices of healthcare workers after education and training program (Coopersmith et al., 2002; Rosenthal, Guzman, & Pezzotto, 2003).

Mode of Delivery of Intervention

Most studies in our review used designated facility staff to deliver intervention in their facilities. Choosing multidisciplinary team of healthcare professionals from the institution which study took place has reported as a successive strategy by one review study after evaluating education and training interventions focused on prevention of healthcare-associated infections in hospital settings (Aboelela, Stone, & Larson, 2007). In our review, studies selected facility staff such as infection control nurse, director of

nursing, medical doctor as the staff designated to deliver the intervention. Designate staff from their own facilities to deliver education and training interventions could be helpful because easier to deal with facility administration, other staff and residents in their facilities. However, infection control program that involved professional support which external to the facility to conduct training, mentor, or perform auditing may also be important to motivate designated staff to comply with assigned interventions (Chami et al., 2012).

Duration of Study

Study duration might account for some of the effect of the intervention because two studies that were conducted over a longer period (>12 months) reported significant changes (Baldwin et al., 2010; Eastwood et al., 2008). Infection control training programs that conducted over longer period of time with repeated training sessions could provide more exposure time to health care workers to learn, educate and improve their knowledge which can lead to increase compliance with infection control practices. The study done by Baldwin et al. 2010 reported infection control audit score which measured healthcare workers compliance with infection control practices was increased with the time (at 3,6 and 12 month) following the intervention.

Also longer study duration may allow knowledge and practices improvement after education and training intervention to translate into decrease in infections. For example, study done by Chami et al. 2012 which used 5 month follow-up time discussed their failure to identify long-term effects of intervention as due to limited time and budget.

Furthermore, LTCF may need adequate time and personnel to implement the necessary component of assigned infection control interventions (Chami et al., 2012).

Data Collection Method

Most (n=3) studies in our review used self-reported data for their analysis which collected via pre and post surveys. Potential bias could be one limitation of using self-reported data than accessing compliance with practices using direct observations. However, data collection using questionnaire, interviews have been used widely in healthcare related research. Advantages such as been a simple and inexpensive method (Gagné & Godin, 2005; Hawkshead & Krousel-Wood, 2007), easy to administer (Miller & Hays, 2000) and feasibility of using in clinical settings (Hawkshead & Krousel-Wood, 2007), may be some of the factors for wide use of self-reported methods.

Relationship between Types of Intervention and Expected Outcome Measures

In the two studies that indicated significant improvements of reported outcome measures (Baldwin et al., 2010; Ho, Tse, & Boost, 2012), were contained of education and training components while one study (Eastwood et al., 2008) which only offered educational materials also reported significant improvement in outcome measure. However, interventions that provided infection control supplies were not indicated statistically significant change in outcome measure.

Based on Ho, Tse, & Boost, 2012study which measured correct outcome measures according to our concept map, infection control education and training intervention improved healthcare workers knowledge, and improved attitudes towards complying with infection control practices related to enteral feeding procedure in LTCF.

Also Ho, Tse, & Boost, 2012study showed reduction of bacterial contaminations and MRSA positive samples collected from staff hands and surfaces of enteral feeding apparatus indicating that improved knowledge and practices translate into reduction of infections after infection control education and training program. Although knowledge was not measured as an outcome measure of infection control education provided during intervention, Eastwood et al. 2008 and Baldwin et al. 2010 showed significant improvements in infection control practices.

In our review some studies have only measured epidemiological outcome measures (Chami et al., 2012; Makris, Morgan, Gaber, Richter, & Rubino, 2000) after an educational and training intervention and did not observe any significant changes. According to our concept map, it could be better to select knowledge, practice and changes in infections as outcome measures without only selecting one, to assess efficacy of provided infection control intervention programs in LTCF. For example, studies that did not observed significant effect of intervention on reduction of infection could have showed significant effect if they measured improved knowledge and practices as outcome measures. On the other hand, infection rates in LTCF environment can be affected by several other factors such as organizational factors (e.g., limited access to laboratories and delays in diagnosis), admission of new residents into LTCF during intervention, cross-contaminations with non-participated residents, transmission by visitors and staff which can increase the infections (Chami et al., 2012; Ben-David, Mermel, & Parenteau, 2008). If an intervention relies only on change of infections as outcome, study could lead to false interpretations.

Suggestions for Future Research

Based on our review, infection control training programs can be used to improve healthcare worker knowledge, practices and to reduce infections in LTCF. We suggest future studies to consider all possible outcome measures during their analysis of educational and training interventions. Also assessment based on single component or limited number of components may be more appropriate. Future research also need to address randomization, blinding, and confounding as major source of bias and consider calculating a proper sample size using power analysis.

Limitations

In our review we observed a limitation to interpret efficacy of individual education or training component used in the interventions because all 7 studies used combination of several components in their infection control programs in LTCF Multifaceted nature of infection control programs showed as a limiting factor to replicate interventions in several other reviews (Aboelela, Stone, & Larson, 2007; Creedon, 2005).

The variations of study quality are another limitation. Most studies had flaws in methodology such as lack of randomization, lack of blinding. Therefore, results should interpret with caution. Language also serves as a limitation in our review because we only select studies published in English language and may have missed articles not published in English.

CONCLUSIONS

Based on our review we can suggest that infection control education and training programs can be used as an effective method in LTCF for prevention and control of

infections. Educational components such as written materials and electronic media can be used in training sessions for effective delivery of infection control information. Infection control education and training programs conducted over longer period of time with frequent reminders or repeated sessions can be beneficial in reducing infections. Development of better quality education and training programs for LTCF will minimize future HuNoV outbreak situations.

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CHAPTER THREE

PREVENTION AND CONTROL PRACTICES FOR HUMAN NOROVIRUSES IN LONG-TERM CARE FACILITIES IN SOUTH CAROLINA

INTRODUCTION

In the U.S., human noroviruses (HuNoV), the number one cause of acute gastroenteritis (AGE), sicken 21 million people each year (Hall et al., 2011). Transmission occurs directly person-to-person and indirectly via contaminated surfaces or aerosolized vomitus. Long-term care facilities (LTCF), home to two million Americans (Harris-Kojetin, Sengupta, Park-Lee, & Valverde, 2013), are the most common setting for outbreaks (60%) (Hall et al., 2014).

Older adults, who represent most residents living in LTCF, are at high risk for AGE, such as HuNoV infections, because they frequently are immunocompromised or have age-related medical comorbidities (Kirk, Veitch, & Hall, 2010). Moreover, they are at a high risk for complications due to HuNoV infections, such as hospitalization and death (Trivedi et al., 2012). The close living arrangements of older adults in LTCF and their contact with visitors and staff provide many opportunities for direct (person-to-person) and indirect (environmental) transmission of HuNoV.

To date, published studies have evaluated prevention and control strategies for HuNoV in LTCF under outbreak conditions (Anderson, 2009) with other studies assessing the efficacy of infection control practices in LTCF, but not specifically for HuNoV (Stachel, Bornschlegel, & Balter, 2012). Our study aimed to fill a gap in the

literature by determining prevention and control practices for HuNoV in LTCF in South Carolina (SC) under non-outbreak conditions.

METHODS

All methods used in this study were approved by the Clemson University Institutional Review Board (IRB). Informed consent was obtained from all participants before data collection began.

Site Selection

A list of all registered LTCF (N=197) was obtained from the SC Department of Health and Environmental Control website in June 2013. An Internet search was performed to determine whether each facility met our eligibility criteria. Our eligibility criteria included: facilities must offer skilled nursing care, be licensed by the state of SC, operate year round, primarily serve older adults $\geq$60 years, be a residential facility, not provide care only for a specific population such as Alzheimer's patients, and prepare and serve meals in a cafeteria or to individual rooms. After the initial Internet search, 34 LTCF were excluded based on our eligibility criteria.

The 163 eligible facilities were called up to 4 times and asked to participate. Thirty-nine were not interested in participating, 11 stated their corporate offices would not allow participation in research studies, and 78 never responded. Eight stated they were interested but could not schedule a site visit for various reasons. A total of 27 facility visits were performed. One facility only served mentally ill patients, so the final sample for data analysis was 26 LTCF, representing a participation rate of 16% (26/163).

Interviews

Interviews with facility Directors and/or their designees (i.e., infection control nurse, director of nursing, or head of housekeeping) were conducted between July and November 2013. During a 60-minute interview, Directors/designees (hereafter called Directors) answered 44 questions that focused on infection prevention and control practices. Interview questions centered on identifying practices related to prevention (general hygiene and sanitation), control (handling of vomit and fecal matter), and infectious disease control during an outbreak. All questions were based on the U.S. Centers for Disease Control and Prevention (CDC) recommended best practices for healthcare facilities (Hall et al., 2011; MacCannell et al., 2011).Responses were hand-recorded as "yes" or "no" and comments noted. If a Director reported their facility had a written policy or procedure, they were asked to show it to the interviewer. The Director also completed a questionnaire about facility characteristics, worker training, and personal demographics.

Data Management and Analysis

All interview and questionnaire responses were coded and entered into a Microsoft Excel spreadsheet as numeric values. Handwritten comments captured during the interview were categorized into themes, which were then converted to numeric values. Relative frequencies were calculated for categorical variables, and means were calculated for continuous variables using SAS 9.3 for Windows (SAS Institute Inc., Cary, NC). Proportions of responses between for-profit and non-profit facilities were compared using Fisher's Exact Test due to small sample sizes. A significance level of 0.05 was used for all tests of significance.

RESULTS

Our results include a description of facility and Director characteristics based on interview and questionnaire findings. We also present proportions of responses for prevention, control, and infectious disease control practices for non-profit facilities and for-profit facilities to determine if facility type was associated with different practices.

Facility and Director Characteristics

Sixteen (61.5%) Directors identified their facility as a skilled nursing facility, 9 (34.6%) identified it as a continuing care community, 8 (30.7%) as a nursing home, and 3 (11.5%) as an assisted living facility. Nineteen (76%) facilities were reportedly for-profit (corporate or independently owned); only 6 (24%) were non-profit (government or faith-based) institutions. Directors reported an average of 117 staff (range 44-225) (i.e., health care, food service and custodial), 89 residents (range 16-254), and 102 beds (range 30-282) at their facility. All provided training on infectious disease control.

In 5 (20%) facilities, facility directors were interviewed; in fourteen (56%) directors of nursing or infection control nurses. In 6 (24%), both the director and the infection control nurse were interviewed. Sixteen (61.5%) Directors had 1-5 years of experience and 10 (38.4%) had completed an associate's degree or bachelor's degree.

Prevention Practices: General Hygiene and Sanitation

All Directors reported their facility followed a general schedule for cleaning and 18 (69.2%) reported some type of deep cleaning. Thirteen (50%) reported their facility was cleaned during the first shift of the day while 13 (50%) also cleaned during the second or third shifts. For hard, food-contact surfaces, 13 (59.1%) used quaternary

ammonium-based sanitizers, 5 (22.7%) used chlorine-based sanitizers, and 4 (18.2%) used sanitizers with other active ingredients (Table 3.1). For other hard surfaces, 11 (44%) used quaternary ammonium-based sanitizers or disinfectants, 10 (40%) used chlorine-based, and 3 (12%) used sanitizers or disinfectants with other active ingredients. One (4%) reported using both chlorine-based and quaternary ammonium-based sanitizers and disinfectants for other hard, non-food-contact surfaces. Twenty-two (88%) had written procedures for cleaning resident bathrooms, including bedside commodes, but only 1 (4.2%) had a written procedure for cleaning staff/visitor bathrooms.

Table 3.1. General Hygiene and Sanitation at Long-term Care Facilities in South Carolina (N=26)

Characteristics	For-profit facilities			Non-profit facilities			All Facilities[a]		
	n	N[b]	%	n	N[b]	%	n	N[b]	%
Bathroom Cleaning and Laundry									
Written procedures:									
Resident bathrooms	15	18	83.3	6	6	100.0	22	25	88.0
Staff/visitor bathrooms	0	17	0.0	1	6	16.7	1	24	4.2
Washing laundry	17	18	94.4	6	6	100.0	24	25	96.0
Laundry practices									
Laundry rooms separated from other areas	19	19	100.0	6	6	100.0	26	26	100.0
Soiled and non-soiled laundry transported separately	19	19	100.0	6	6	100.0	26	26	100.0
Bleach/other sanitizing agents added to wash cycle	17	18	94.4	6	6	100.0	24	25	96.0
Environmental Sanitation									
Types of sanitizers used on hard, food-contact surfaces									
Quaternary ammonium-based	9	15	60.0	4	6	66.7	13	22	59.1
Chlorine-based	3	15	20.0	1	6	16.7	5	22	22.7
Other	3	15	20	1	6	16.7	4	22	18.2
Types of sanitizers/disinfectants used on other hard surfaces									
Quaternary ammonium-based	9	18	50.0	2	6	33.3	11	25	44.0
Chlorine-based	7	18	38.9	2	6	33.3	10	25	40.0
Other	1	18	5.6	2	6	33.3	3	25	12.0
Personal Hygiene									
Written procedures on:									
Dress code	19	19	100.0	6	6	100.0	26	26	100.0
Fingernail grooming	17	19	89.5	6	6	100.0	24	26	92.3
Jewelry	16	18	88.9	6	6	100.0	23	25	92.0
Hand hygiene practices									
Employees wash hands/use hand sanitizer after certain activities	19	19	100.0	6	6	100.0	26	26	100.0
Employees use hand sanitizer when hand hygiene is not required	19	19	100.0	6	6	100.0	26	26	100.0
Residents wash hands after certain activities	13	18	72.2	4	6	66.7	18	25	72.0

[a] One facility did not indicate the business type.
[b] Sample size varies depending on the number of participants responding to the question.

All reported laundry was washed on site with 9 (36%) washing resident clothing and 16 (64%) also washing linens and mop heads. Across all facilities, laundry rooms were separate from resident rooms, kitchens, and serving and commons areas. When transporting laundry throughout the facility, all reported using covered carts to separate clean and dirty laundry as well as contaminated and non-contaminated laundry. Nearly all (n=24; 96%) reported having written procedures for how to wash laundry. Of those, all required adding a sanitizing agent to the wash cycle, but only 15 (60%) specifically mentioned a sanitizer, such as chlorine bleach.

All reported having a written dress code and allowed employees to arrive to work in their uniform. Nearly all (n=23; 92%) had recommendations on wearing jewelry and fingernail grooming. Hand hygiene of workers after certain activities was required by all, with 18 (72%) identifying activities after which residents needed to wash their hands.

Control Practices: Handling of Vomit/Fecal Matter

Nearly all (n=25; 96.1%) reported vomit and diarrheal episodes occurred outside a bathroom. Most stated that episodes of vomit (n=20; 83.3%) and diarrhea (n=24; 96%) occur most often in resident rooms. Twenty-four (92.3%) reported they had a facility policy on incontinence care, but only 19 (82.6%) had procedures for clean-up of vomit or fecal matter on environmental surfaces (Table 3.2). Of those, 18 (81.8%) had written procedures for cleaning linens contaminated with vomit or feces as well as written procedures for cleaning hard, non-porous surfaces after exposure to vomit or fecal matter. Nearly half (n=12; 48%) had written procedures for cleaning upholstered furniture, carpets, and rugs after exposure to vomit or fecal matter, and 9 (36%) had different

procedures for cleaning bathrooms after vomiting or diarrheal episodes. Eleven (42.3%) reported that other individuals were removed from the room during clean-up of feces and vomit. Eight (30.8%) stipulated a wide area surrounding an episode of vomit/fecal matter be cleaned while 18 (69.2%) cleaned only the vomit/fecal matter episode. Exact dimensions were not provided by any.

Table 3.2. Handling of Vomit/Fecal Matter at Long-term Care Facilities in South Carolina (N=26)

Characteristics	For-profit facilities			Non-profit facilities			All facilities[a]		
	n	N[b]	%	n	N[b]	%	n	N[b]	%
Written procedures for cleaning:									
Soiled resident	17	19	89.5	6	6	100.0	24	26	92.3
Vomit/fecal matter	13	16	81.3	5	6	83.3	19	23	82.6
Contaminated linens/clothing	14	16	87.5	4	5	80.0	18	22	81.8
Contaminated hard surfaces	13	17	76.5	4	6	66.7	18	24	75.0
Contaminated upholstered furniture, carpets, and rugs	7	18	38.9	4	6	66.7	12	25	48.0
Clean-up practices									
Other individuals removed from room during clean-up	9	19	47.4	2	6	33.3	11	26	42.3
Workers and/or residents changed clothes after an episode	15	19	78.9	3	6	50.0	19	26	73.1
Cleaned episode and wider surrounding area during clean-up	5	19	26.3	3	6	50.0	8	26	30.8
Written procedures on:									
Cleaning restrooms after vomiting/diarrheal episodes	6	18	33.3	2	6	33.3	9	25	36.0

[a] One facility did not indicate the business type.
[b] Sample size varies depending on the number of participants responding to the question.

Infectious Disease Control Practices

Twenty-two (84.6%) reported they disallow sick residents in common areas, and 20 (76.9%) disallow healthy residents to visit sick residents (Table 3.3). Only 9 (34.6%) designated specific toilets for sick residents. Nearly all (n=25; 96.2%) excluded sick staff from work, and 8 (30.8%) assigned specific staff members to care for sick residents. Visitors were not allowed to have contact with sick residents in 11 (42.3%) facilities.

All Directors stated employees were required to wear disposable gloves when caring for sick residents. Nearly all (n=24; 92.3%) required employees to wear plastic aprons or cloth gowns, and 19 (73.1%) required wearing masks when caring for sick residents (Table 3.3). Only 9 (34.6%) reported using shoe covers when entering the room of sick residents. Employees at 25 (96.15%) facilities were to remove personal protective equipment before leaving a room and dispose in biohazard (n=13; 50%) or other specified containers (n=15; 50%).

Table 3.3. Gastrointestinal Outbreak Practices at Long-term Care Facilities in South Carolina (N=26)

Characteristics	For-profit facilities			Non-profit facilities			All facilities[a]		
	n	N[b]	%	n	N[b]	%	n	N[b]	%
Practices for handling sick residents									
Not allowed in the commons areas	16	19	84.2	5	6	83.3	22	26	84.6
Isolated from healthy residents	16	19	84.2	5	6	83.3	22	26	84.6
Not allowed visits from healthy residents	14	19	73.7	5	6	83.3	20	26	76.9
Designated to specific toilets	6	19	31.6	3	6	50.0	9	26	34.6
Practices for handling staff									
Sick staff excluded from work	18	19	94.7	6	6	100.0	25	26	96.2
Assign specific staff to only care for sick residents	6	19	31.6	1	6	16.7	8	26	30.8
Practices for handling visitors									
Not allowed to have contact with sick residents	9	19	47.4	2	6	33.3	11	26	42.3
Written procedures on:									
Cleaning and disinfecting during an outbreak	15	19	78.9	5	6	83.0	21	26	81.0
Practices for wearing PPE[c] when caring for sick residents									
Disposable gloves	19	19	100.0	6	6	100.0	26	26	100.0
Apron or gown	18	19	94.7	5	6	83.3	24	26	92.3
Masks	14	19	73.7	4	6	66.7	19	26	73.1
Shoe covers	8	19	42.1	0	6	0.0	9	26	34.6

[a] One facility did not indicate the business type.
[b] Sample size varies depending on the number of participants responding to the question.
[c] Personal protective equipment.

Proportions of Director responses for prevention, control, and infectious disease control practices between for-profit and non-profit facilities were analyzed using Fisher's Exact Test to determine if type of facility was associated with practices. Our results showed no significant differences between reported practices at for-profit versus non-profit facilities.

DISCUSSION

The evidence on how well LTCF prevent and control HuNoV is limited. To our knowledge, this is the first observational study to determine the presence of prevention and control practices for HuNoV in LTCF under non-outbreak conditions.

Prevention Practices: General Hygiene and Sanitation

Our study findings indicated 3 gaps in general cleaning and sanitation practices: 1) improper use of sanitizing and disinfecting products after contamination events, 2) no written procedure for cleaning staff/visitor bathrooms to prevent transmission of HuNoV, and 3) no list of contamination events after which residents should wash hands.

While all Directors reported having general cleaning and sanitation procedures, they did not know the correct products (i.e., sanitizers or disinfectants) for pathogen removal after specific contamination events. Although sanitizers and disinfectants have similar active ingredients, they are very different. Sanitizers only reduce, not eliminate, bacteria on surfaces while disinfectants eliminate fungi, viruses, and bacteria but not necessarily spores (U.S. Environmental Protection Agency, 2012). Because of these differences, sanitizers and disinfectants are used for pathogen removal after different types of contamination events. In kitchens, the 2013 U.S. Food and Drug Administration (FDA) Food Code requires food-contact surfaces be sanitized, not disinfected. However, there are no requirements for which pathogen removal step (sanitization or disinfection) to use on hard, non-food-contact surfaces. For every day sanitation, sanitizers or disinfectants can be used, but disinfectants are preferred because they eliminate a wider range of microorganisms. On the other hand, disinfectants must be used for known

contamination events (i.e., vomiting or diarrheal episodes) and during a HuNoV outbreak.

Although 22 (88%) Directors reported having written procedures on cleaning resident bathrooms, only 1 (4.2%) reported having a written procedure for cleaning staff/visitor bathrooms. HuNoV can be introduced into health-care settings from the community via staff/visitors (Hall et al., 2011). Bathroom surfaces can become contaminated with HuNoV through aerosolization of virus particles after flushing the toilet (Barker & Jones, 2005) as well as touching of surfaces with contaminated hands (Barker, Vipond, & Bloomfield, 2004). Subsequent contact of contaminated bathroom surfaces by healthy individuals could cause infection in that individual which could spread the virus throughout the facility. To prevent HuNoV infections from bathroom surfaces, staff/visitor bathrooms must be cleaned and disinfected with high-level disinfectants. High-level disinfectants eliminate all microorganisms except large numbers of bacterial spores whereas low-level disinfectants only eliminate most vegetative bacteria, some fungi, and some viruses (Rutala, Weber, & Centers for Disease Control, 2008). Because AGE is primarily caused by non-enveloped viruses (Hall et al., 2013), which are highly resistant to disinfection (Sattar, 2007), all bathroom surfaces should be disinfected with high-level disinfectants.

All Directors reported facilities had required activities before or after which workers must wash their hands with 18 (72%) reporting similar recommendations for residents. Contaminated hands of residents can transmit HuNoV to other residents, staff, and visitors or high-touch surfaces, so proper hand hygiene is critical. However, even

health organizations that recommend hand hygiene for staff have minimal to no recommendations for residents. For example, while World Health Organization (WHO) (2009) guidelines recommend residents ask their healthcare provider about his or her hand hygiene practices, there are few recommendations targeting resident practices. Recommending handwashing for bed-bound residents may not be practical, but providing recommendations for other residents to wash their hands after certain contamination events is important in preventing HuNoV transmission in a long-term care setting.

Control Practices: Handling of Vomit and Fecal Matter

We found 5 gaps in practices when handling vomit/fecal matter: 1) no written procedures for cleaning bathrooms after a vomit/fecal episode, 2) use of ineffective products for pathogen removal after a vomit/fecal episode, 3) no written procedures for cleaning contaminated soft surfaces, 4) not removing other individuals during clean-up of a vomit/fecal episode, and/or 5) not cleaning a large area surrounding a vomit/fecal episode.

First, only 9 (36%) Directors reported having different written procedures for cleaning bathrooms after a vomit/fecal episode versus general bathroom cleaning and sanitation procedures. Persons infected with HuNoV can produce large volumes of diarrhea and/or vomit containing high levels of virus particles that can contaminate bathroom surfaces directly or indirectly via aerosolization of viral particles after flushing the toilet (Atmar et al., 2008; Barker & Jones, 2005; Caul, 1995). Pathogen removal products (sanitizers or disinfectants) used after cleaning may not be effective against HuNoV which could cause others contacting contaminated bathroom surfaces to become

infected spreading the virus further. To eliminate HuNoV, the CDC recommends using sodium hypochlorite (chlorine bleach) at a concentration of 1000-5000 ppm. (Hall et al., 2011). Failure to effectively eliminate HuNoV after a vomit/fecal episode could cause an outbreak or could prolong an already occurring outbreak.

Additionally, only 10 (40.0%) Directors reported using chlorine-based products for pathogen removal from hard surfaces. Eleven (44.0%) reported using quaternary ammonium-based products and 3 (12%) used products with other active ingredients. While quaternary ammonium-based products and other non-chlorine-based products can be used for general cleaning and sanitizing, they might not be effective against HuNoV (Barker, Vipond, & Bloomfield, 2004) so should not be used to disinfect after vomit/fecal episodes. To achieve proper disinfection against HuNoV, the CDC recommends using sodium hypochlorite (chlorine bleach) at a concentration of 1000-5000 ppm on hard surfaces (Hall et al., 2011). One reason most facilities did not use chlorine bleach could be that chlorine-based products are corrosive chemicals not allowed in LTCF by the Occupational Safety and Health Administration (OSHA) unless the facility has a properly installed eye wash station (Occupational Safety and Health Standards, 1998). Presumably, many facilities do not have an eye wash station due to cost restrictions. Instead, facilities may have used quaternary ammonium-based products because they believe they are less harmful. However, quaternary ammonium-based products are also corrosive chemicals (International Programme on Chemical Safety, 1996), so if used, an eye wash station must be installed per OSHA regulations.

Although eighteen (75%) Directors reported they had written procedures for cleaning hard surfaces contaminated with vomit/fecal matter, written procedures for cleaning non-launderable soft surfaces, such as carpets, rugs, and upholstered furniture, were not available in 13 (52%) facilities. After a vomit/fecal episode, surrounding surfaces, including soft surfaces, can become contaminated, so proper procedures for cleaning contaminated soft surfaces are important. When HuNoV attach to soft surfaces, they are difficult to eliminate (Cheesbrough, Green, Gallimore, Wright, & Brown, 2000), and chlorine bleach, which is recommended for eliminating HuNoV from hard surfaces, may damage or discolor the material of soft surfaces. CDC recommends that vomit/fecal matter be removed from upholstery or carpet immediately using a manufacturer-approved cleaning agent followed by steam cleaning, but the efficacy of this practice at eliminating HuNoV has not been proven (MacCannell et al., 2011). It is also not practical to use hard surface furniture and hard floors in all areas of LTCF as older adults need a more comfortable and home-like environment. It is best to use easy-to-clean vinyl upholstered furniture or furniture with removable cushions to minimize transmission of HuNoV.

Nearly half (n=12; 46.1%) reportedly do not remove other individuals from the room during clean-up of a vomit or diarrheal episode. Exposure to a vomiting episode increases the risk of getting a HuNoV infection (Schmid et al., 2005). One way vomiting increases the risk of HuNoV infection is by producing aerosolized particles (Booth, 2014). Similarly, the cleaning process might also cause vomit/fecal particles to become aerosolized due to agitation. Aerosolized particles can be ingested by individuals in the

surrounding area (Hall et al., 2011), so removing other individuals from the room during cleaning is recommended to prevent transmission of viruses (MacCannell et al., 2011).

Another gap in practices was that 18 (69.2%) Directors reported they clean only the vomit/fecal episode. Splatter and droplets from projectile vomiting could contaminate a large area. However, there is a lack of scientific evidence on exactly how large of an area can become contaminated. To control virus transmission, LTCF should clean as wide of an area as possible surrounding a vomit/fecal episode.

Infection Control Practices

When a HuNoV outbreak occurs, it is critical to quickly implement infection control practices to limit the spread of the virus throughout the facility and decrease the duration of the outbreak. We identified 4 gaps in infection control practices that could lead to prolonged HuNoV outbreak situations: 1) not designating specific toilets for sick residents, 2) not assigning specific staff to sick residents, 3) not restricting visitors, and 4) not wearing shoe covers during an outbreak.

Sixteen (61.5%) Directors reported they did not designate specific toilets for sick residents during an outbreak. Presence of shared toilet spaces could increase the risk of HuNoV transmission. Studies have shown that toilet surfaces can easily become contaminated by aerosolized particles after flushing (Barker & Jones, 2005), and other bathroom surfaces may become contaminated by contact with contaminated hands (Barker, Vipond, & Bloomfield, 2004). Designating separate toilets for sick and healthy residents could minimize transmission of HuNoV via contaminated toilet surfaces by

decreasing the opportunities for healthy residents to have contact with potentially contaminated surfaces.

A total of 18 (69.3%) Directors stated they did not designate specific staff to care only for sick residents. The CDC recommends assigning specific staff to care for sick residents during a HuNoV outbreak in healthcare settings because staff may spread HuNoV from sick residents to healthy residents through person-to-person contact (MacCannell et al., 2011). Several studies on HuNoV outbreaks suggested that staff likely facilitated the spread of an infection among residents and coworkers. One study suggested staff spread HuNoV from residents on the second floor, where the outbreak began, to residents on the first floor especially residents who were physically debilitated (Marx et al., 1999). Assigning specific staff to care only for sick residents could minimize rapid transmission of viruses from sick to healthy residents by decreasing the chances that staff's hands and clothing become contaminated and subsequently infect healthy residents or contaminate fomites in healthy resident's rooms.

Fifteen (57.7%) reported they did not have policies restricting visitors during an outbreak but encouraged them to limit visitations; however, Directors never reported whether "limit" referred to length of visits or frequency of visits. Also, Directors stated it was difficult to restrict visitations because residents want their relatives to visit them when they are sick. However, the CDC recommends restricting non-essential visitors from affected areas during an outbreak (MacCannell et al., 2011) to control person-to-person HuNoV transmission as a precaution. Additionally, the CDC recommends screening and excluding visitors with symptoms consistent with a HuNoV infection

(MacCannell et al., 2011) to prevent additional introduction of viruses from the community to long-term care residents.

Nineteen (73.1%) reported that employees wore gloves, gowns, and masks as personal protective equipment, but only a few reported that workers wore shoe covers when entering a sick resident's room. The floor of a HuNoV infected resident's room can become contaminated with vomit/fecal matter particles via splatter and droplets (Booth, 2014), and workers shoes could transmit virus particles from that room to other areas. Wearing shoe covers and removing them before leaving the room could prevent introduction of viruses to other areas.

Limitations

We used a convenience sample of LTCF in SC for this qualitative study instead of a randomized selection of facilities, so our findings are not generalizable to all LTCF in SC. A convenience sample was used because we could only include facilities willing to participate in the study. The length of visits could also have been a limitation. On-site visits took 2-3 hours for all data collection. Some Directors might not have taken the time to find out answers to questions they were unsure of or included staff that might have been better able to answer those questions because they did not want to interrupt essential facility activities more than necessary.

Furthermore, studies have shown that self-reporting of practices is not always accurate (Al-Wazzan et al., 2011). Because the intent of the interviews was to have Directors self-report facility practices, better practices for prevention and control may have been reported than what actually occurs in facilities.

CONCLUSIONS

As LTCF are the number one setting for HuNoV outbreaks in the U.S., the best way to prevent outbreaks in these settings is to follow proper prevention and control practices that prevent the transmission of HuNoV. LTCF in SC were not in compliance with CDC recommended practices for preventing and controlling HuNoV. Specific gaps in practices in prevention practices included no knowledge of sanitizing and disinfecting products, no written procedures for cleaning staff/visitor bathrooms, and not identifying contamination events after which residents should wash their hands. Gaps in control practices consisted of no written procedures for cleaning bathrooms after a vomit/fecal episode, use of wrong products for pathogen removal after a vomit/fecal episode, no written procedures for cleaning contaminated soft surfaces, not removing other individuals during clean-up of a vomit/fecal episode, and not cleaning a large area surrounding a vomit/fecal episode. Infection control practices during an outbreak included gaps in not designating specific toilets for sick residents, not assigning specific staff to sick residents, not restricting visitors, and not wearing shoe covers during an outbreak.

Outbreaks of HuNoV will continue to occur in LTCF if these gaps in prevention and control practices are not addressed. One way to ensure best practices are being followed is to have accurate and up-to-date policies and procedures in facilities. However, the presence of policies and procedures alone is not sufficient to improve practices. Providing evidence-based, practical education or training for practitioners and other personnel in LTCF is also critical in preventing future outbreaks.

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CHAPTER FOUR

ENVIRONMENTAL FACTORS ASSOCIATED WITH HUMAN NOROVIRUS TRANSMISSION IN LONG-TERM CARE FACILITIES IN SOUTH CAROLINA

INTRODUCTION

Human noroviruses (HuNoV) are the number one cause of acute gastroenteritis in the U.S. presumably because of their low infectious dose (18-100 viral particles), environmental stability, and multiple transmission modes (Hall et al., 2011; Teunis et al., 2008). Long-term care facilities (LTCF), home to over two million Americans, are the number one setting for HuNoV outbreaks (60%) (Hall, Wikswo, Pringle, Gould, & Parashar, 2014). Older adults (≥65 years), who represent most residents in LTCF, are known to be at high risk for HuNoV infections as well as HuNoV-associated deaths (Hall et al, 2013; Trivedi et al., 2012).

Environmental factors (e.g., factors that affect cleanliness and condition of the environment) can promote HuNoV transmission and may contribute to the large number of HuNoV outbreaks in LTCF. For example, HuNoV has been shown to persist on surfaces for up to 42 days demonstrating the importance of routine disinfection of surfaces (Escudero, Rawsthorne, Gensel, & Jaykus, 2012). To exacerbate this problem, HuNoV are also resistant to many disinfectants, such as quaternary ammonium-based products. The best disinfectant for elimination of HuNoV is a 1000-5000 ppm chlorine bleach solution (Hall et al., 2011), but it is not commonly used as it is an injurious corrosive substance. Furthermore, contaminated and improperly treated environmental surfaces, particularly soft surfaces (e.g., upholstered furniture and carpets), can serve as

an exposure source of HuNoV to residents and staff (Lopman, Hall, Curns, & Parashar, 2011).

This study aimed to identify environmental factors associated with HuNoV transmission in LTCF in South Carolina (SC). The U.S. Centers for Disease Control and Prevention (CDC) has recommended future research on healthcare-focused risk factors for HuNoV, thus our study findings could add to that body of literature (MacCannell et al., 2011).

METHODS

Our study protocol was approved by the Clemson University Institutional Review Board (IRB). Informed consent was obtained from facility directors or their designee before the site visits were conducted.

Site Selection

A list of all registered LTCF (N=197) in the state of SC was obtained from the SC Department of Health and Environmental Control website in June 2013. To be eligible for the study, facilities had to offer skilled nursing care; be licensed by the state of SC; operate year-round; primarily serve older adults ≥60 years; be a residential facility; not provide care for a specific population (e.g., Alzheimer's patients); and prepare and serve meals onsite. An Internet search was performed to determine facility eligibility, and 34 facilities were excluded based on our eligibility criteria.

The 163 eligible facilities were called and asked to participate. Thirty-nine (39) were not interested in participating; 11 stated their corporate offices would not allow participation in research studies; and 78 were called 4 times but never responded. Eight

stated interest, but visits could not be scheduled for various reasons. A total of 27 site visits were conducted. One facility that was visited only served mentally-impaired patients, so their data was not included in our final analysis. The final sample included 26 LTCF, representing a participation rate of 16% (26/163).

Facilities that agreed to participate were sent an email confirmation letter that included time and date of the scheduled visit. Facility contacts were asked to reply to the email agreeing to the terms in the confirmation letter. Confirmation messages were submitted to the Clemson University IRB for approval before visits were conducted.

Data Collection

Site visits were conducted from July 2013 to November 2013. A confirmation phone call was made 1-2 days prior to each visit. Facilities were assigned a unique identification number to maintain confidentiality of data. Two trained data collectors conducted audit activities in one commons area where residents congregate (e.g., TV room, lobby) and the main kitchen. The commons area was selected because we believe congregating in an area can promote HuNoV transmission by person-to-person contact or contact with contaminated environmental surfaces. The kitchen may also be important in pathogen dissemination because food could become contaminated from contact with infected food workers or contaminated surfaces.

Two audit forms, in checklist format, were developed to assess the environmental sanitation of one commons area and the main kitchen. For each audit form, data collectors checked “yes” for compliance, “no” for non-compliance, or “N/A” for “not applicable” and had additional space for notes. The commons area form had 26 items

covering 7 factors, and the kitchen form had 18 items covering 8 factors (Table 4.1). The concentration of sanitizer solutions was measured using appropriate sanitizer test kits: Precision Laboratories chlorine strips (Bailey's Test Strips and Thermometers, LLC, Lodi, NJ) or Hydrion QT-10 quaternary ammonium test strips (Noble Chemical, Inc., Lancaster, PA).

Data collectors also administered a questionnaire to facility directors (or their designees) during the visit. The Director Questionnaire assessed facility characteristics, director/designee characteristics, and worker training.

Data Management and Analysis

All data were entered into Microsoft Excel spreadsheets. Categorical observations (yes/no responses) were converted to numeric values and comments were organized by themes before conversion to numeric values. A research team member checked all data for accuracy. Relative frequencies for categorical variables and means for quantitative variables were calculated using SAS 9.3 for Windows (SAS Institute Inc., Cary, NC). Proportions of responses between for-profit and non-profit facilities were also compared using Fisher’s Exact Test, which was used because of the small sample size. A significance level of 0.05 was used for all tests of significance.

Table 4.1. Summary of Audit Forms Used to Assess Commons Areas and Kitchens at 26 Long-term Care Facilities in South Carolina

Audit Form	Factors
Commons Area (26 items)	Appearance of providers (2 items)
	Appearance of residents (1 item)
	Cleanliness and condition of items (7 items)
	Cleanliness of trash cans (3 items)
	Presence of hand sanitizer stations (2 items)
	Cleaning of commons area (3 items)
	Cleanliness and condition of one staff/visitor bathroom (8 items)
Kitchen (18 items)	Cleanliness and condition of equipment (4 items)
	Set-up of three-compartment sink (3 items)
	Maintenance of dish machine (2 items)
	Type of sanitizing solution used (2 items)
	Set-up of handwashing sinks (1 item)
	Worker hygiene (4 items)
	Presence of measuring devices (1 items)
	Certified food protection managers (1 item)

RESULTS

Facility Characteristics and Training

Sixteen (61.5%) facilities identified as skilled nursing facilities while 9 (34.6%) identified as continuing care communities, 8 (30.7%) nursing homes, and 3 (11.5%) as assisted living facilities. Participating facilities had a mean of 117 staff (range 44-225) (i.e., health care, food service, custodial), 89 residents (range 16-254), and 102 beds (range 30-282). Nineteen (76%) were for-profit (corporate or independently owned) and 6 (24%) non-profit organizations (government or faith-based). Facilities provided new employee training in infectious disease control (n=26; 100%), hygiene practices (n=25; 96.3%), sanitation practices (n=24; 92.3%), or food safety (n=21; 80.8%) (Table 4.2).

Table 4.2. Provision of Infectious Disease Control, Hygiene, Sanitation, and Food Safety Training at 26 Long-term Care Facilities in South Carolina

Characteristics	For-profit facilities (n=19)		Non-profit facilities (n=6)		All facilities[a] (N=26)	
	n	%	n	%	n	%
Types of training for new employees[b]						
Infectious disease control	19	100.0	6	100.0	26	100.0
Hygiene practices	18	94.7	6	100.0	25	96.2
Sanitation practices	19	100.0	5	83.3	24	92.3
Food safety	15	78.9	6	100.0	21	80.8
Provider of employee training[b]						
Other workers from the facility	15	78.9	4	66.7	20	76.9
Trainer from corporate office	7	36.8	0	0.0	7	26.9
Other source (on-line training)	4	21.1	2	33.3	6	23.1
Cooperative Extension services	2	10.5	0	0.0	2	7.7
Private organization or consultant	2	10.5	0	0.0	2	7.7
State or local regulatory agency	2	10.5	0	0.0	2	7.7

[a] One facility did not indicate the business type.
[b] Multiple answers could be selected.

Commons Area Audit

All commons areas had furniture, carpets, floors, and trash cans that appeared clean and in good condition (Table 4.3). Many (n=20; 76.9%) had upholstered chairs, and 11 (42.3%) hard-surface chairs. Most (n=23; 88.4%) had hard-surface floors (56.5% tile, 30.4% wood, and 13% linoleum) while 5 (19.2%) had carpet. Of those with hard-surface floors, 2 (7.6%) also had carpet (e.g., wood floor surrounded by carpet). Hand sanitizer stations (mean 1; range 0-3) were in 16 (61.5%) commons area with over half (n=14; 87.5%) using alcohol-based sanitizers. Facilities had a mean of 2 (range 1-7) mop sinks. Six (25%) facilities reported using chlorine bleach to disinfect surfaces in commons areas while 7 (29.1%) used quaternary ammonium. Nine (37.5%) used both.

Table 4.3. Results for the Commons Area Audit of 26 (19 For-profit and 6 Non-profit) Long-term Care Facilities in South Carolina

Characteristics	For-profit facilities			Non-profit facilities			All facilities[a]		
	n	**N**[b]	**%**	**n**	**N**[b]	**%**	**n**	**N**[b]	**%**
Providers									
Providers well groomed	13	13	100.0	4	4	100.0	17	17	100.0
Providers in good health	13	13	100.0	3	3	100.0	16	16	100.0
Residents									
Residents in good health	17	17	100.0	2	2	100.0	20	20	100.0
Furniture clean and in good condition									
Upholstered chairs	16	16	100.0	3	3	100.0	20	20	100.0
Hard-surface chairs	6	6	100.0	4	4	100.0	11	11	100.0
Tables	19	19	100.0	6	6	100.0	26	26	100.0
Carpets	5	5	100.0	0	0	0.0	5	5	100.0
Hard-surface floors	16	16	100.0	6	6	100.0	23	23	100.0
Wheel chairs	15	15	100.0	3	3	100.0	19	19	100.0
Trash cans									
Trash cans clean	13	13	100.0	5	5	100.0	18	18	100.0
Trash cans plastic-lined	13	13	100.0	5	5	100.0	18	18	100.0
Trash cans hands-free	9	13	69.2	5	5	100.0	14	18	77.7
Hand sanitizer stations									
Hand sanitizer stations present	11	19	57.9	5	6	83.3	16	26	61.5
Staff and visitor bathrooms									
Overall clean and toilet clean	19	19	100.0	6	6	100.0	26	26	100.0
Handwash sink accessible to residents	4	18	22.2	3	6	50.0	7	25	28.0
Equipped with warm water	18	19	94.7	6	6	100.0	25	26	96.2
Soap available	19	19	100.0	6	6	100.0	26	26	100.0
Appropriate drying device	19	19	100.0	6	6	100.0	26	26	100.0
Handwashing signage posted	12	19	63.2	4	6	66.6	16	26	61.5
Hand sanitizer available	3	19	15.7	0	6	0.0	4	26	15.4

[a] One facility did not indicate the business type.
[b] Sample size varies depending on the number of facilities with each item present.

In each facility, the director/designee selected one staff/visitor bathroom to be audited. All 26 (100%) bathrooms were clean and in good repair (Table 4.3). In 7 (28%),

the handwashing sink was accessible to residents. Handwashing sinks were equipped with warm water, soap, and single-use paper towels in 25 (96.2%). In 13 (54.1%) bathrooms, antimicrobial soap was available while 11 (45.8%) had plain soap. Four (15.4%) had hand sanitizer (all alcohol-based) available near sinks. Handwashing signage was posted in 16 (61.5%) bathrooms with 9 (56.2%) displaying "wash your hands" and procedures on how to wash hands and 5 (31.2%) only displaying the message "wash your hands."

Kitchen Audit

All work tables (mean 3; range 1-6), cutting boards (mean 7; range 4-29), and preparation sinks (mean 2; range 1-4) were clean, free of food debris, and in good repair (Table 4.4). Twenty-one (80.7%) facilities color-coded cutting boards for different food types (e.g., meat, poultry, fruits, and vegetables). All (100%) had a three-compartment sink adequately set up, and food was not prepared in the sink.

Handwashing sinks in all kitchens were properly outfitted with warm water and soap, and nearly all (n=25; 96.2%) had paper towels for drying hands (Table 4.4). More used antimicrobial soap (n=18; 72%) than plain soap (n=7; 28%). Twenty-two (84.6%) did not have hand sanitizer located near the handwashing sink. Handwashing signage was posted near the handwashing sink in 22 (84.6%), with all signage including step-by-step procedures and reminders of the importance of proper hand washing. All food workers observed wore clean clothes and gloves when preparing food. In 25 (96.2%) facilities workers wore hair restraints and in 23 (88.4%) workers had no jewelry on hands or forearms.

Only 3 (11.5%) facilities used chlorine bleach to sanitize kitchen surfaces while most (n=23; 88.4%) used quaternary ammonium. When sanitizing solution was present in the three-compartment sink (n=18), 15 (83.3%) were at proper concentration levels (chlorine bleach at 50-99 ppm or quaternary ammonium at 200-400 ppm (U.S. Food and Drug Administration, 2014)). In 18 (81.8%) facilities, food workers were ServSafe® certified with a mean of 2 food safety certified workers per facility.

Results for proportions of responses in for-profit versus non-profit facilities were compared using Fisher's Exact Test. No significant difference was found between for-profit and non-profit facilities for any items in the commons area or kitchen.

Table 4.4. Results for the Kitchen Audit of 26 (19 For-profit and 6 Non-profit) Long-term Care Facilities in South Carolina

Characteristics	For-profit facilities			Non-profit facilities			All facilities[a]		
	n	N[b]	%	n	N[b]	%	n	N[b]	%
Equipment Clean and in Good Repair									
Work tables	19	19	100.0	6	6	100.0	26	26	100.0
Cutting boards	19	19	100.0	6	6	100.0	26	26	100.0
Preparation sinks	19	19	100.0	6	6	100.0	26	26	100.0
Three-compartment sink	19	19	100.0	6	6	100.0	26	26	100.0
Dish machine									
Low temperature dish machine in use	7	19	37.0	1	6	16.6	8	26	30.7
High temperature dish machine in use	12	19	63.0	5	6	83.3	18	26	69.2
Handwashing sink									
Warm water available	19	19	100.0	6	6	100.0	26	26	100.0
Soap available	19	19	100.0	6	6	100.0	26	26	100.0
Appropriate drying device	18	19	94.7	6	6	100.0	25	26	96.2
Hand sanitizer available	3	18	16.6	0	6	0.0	3	25	12.0
Handwashing signage posted	17	19	89.4	4	6	67.0	22	26	84.6
Worker Hygiene									
Wearing clean clothes	19	19	100.0	6	6	100.0	26	26	100.0
Wearing hair restrains	18	19	94.7	6	6	100.0	25	26	96.2
Wearing gloves	14	14	100.0	6	6	100.0	21	21	100.0
Not wearing jewelry	18	19	94.7	5	6	83.3	23	26	88.4
Food preparation variables									
Type of sanitizing solution:									
Chlorine bleach	2	19	10.5	1	6	16.6	3	26	11.5
Quaternary ammonium	17	19	89.4	5	6	83.3	23	26	88.4
Proper sanitizer concentration	10	11	90.9	4	6	66.6	15	18	83.3
Food safety certification	18	19	94.7	6	6	100.0	25	26	96.2

[a] One facility did not indicate the business type.
[b] Sample size varies depending on the number of facilities with each item present.

DISCUSSION

HuNoV outbreaks in LTCF are associated with increased hospitalization and mortality of residents, disruption of normal facility routine, and increased expenses for infection control (Lopman et al., 2011; Said, Perl, & Sears, 2008; Trivedi et al., 2012). We aimed to assess presence of environmental factors that promote transmission of HuNoV.

Commons Area

Surfaces of furniture, floors, and trash cans were visibly clean and in good condition (i.e., without dirt, damage, or wear) in commons areas at all facilities. Not surprisingly, 20 (76.9%) commons areas had upholstered chairs rather than hard-surface chairs presumably to create a home-like environment for residents. Also, 5 (19.2%) had carpeting. Soft surfaces, such as carpeting and upholstered furniture, could be an indirect source of HuNoV in LTCF. If there is a vomiting/diarrheal episode in a commons area, nearby upholstered furniture and carpets could become contaminated with HuNoV as infected persons can produce projectile vomiting which may contaminate a large area (7.8 m^2 (25.6 ft^2)) with aerosolized particles (Booth, 2014). Moreover, published evidence suggests soft furnishings and carpets contaminated by vomit contribute to HuNoV outbreaks (Cheesbrough, Green, Gallimore, Wright, & Brown, 2000; Evans et al., 2002). At present, there are no recommendations for disinfecting soft surfaces contaminated with HuNoV. The most effective disinfectant against HuNoV, sodium hypochlorite (chlorine bleach), often is not used because it can destroy soft surfaces. The least damaging method to clean vomit/fecal matter from upholstery or carpet is steam

cleaning, but its efficacy at eliminating HuNoV has not been proven (MacCannell et al., 2011). Although it is easier to clean and disinfect hard-surface furniture and hard floors, using hard-surfaces in all areas of a facility is not practical as older adults need a more comfortable environment. It is best to use removable cushions or easy-to-clean vinyl upholstered furniture to minimize HuNoV transmission. However, if carpets or rugs become contaminated with vomit/fecal matter, immediate cleaning as recommended could reduce the risk (MacCannell et al., 2011).

We also found more facilities use quaternary ammonium-based products (n=7; 29.1%) than chlorine bleach (n=6; 25%) to disinfect surfaces. Quaternary ammonium is not effective against HuNoV at any concentration level (Barker et al., 2004; Tung, Macinga, Arbogast, & Jaykus, 2013). Instead, chlorine bleach at a concentration of 1000-5000 ppm should be used to eliminate HuNoV (Hall et al., 2011). Additionally, the Occupational Safety and Health Administration (OSHA) requires facilities to have a properly installed eye wash station when using *"injurious corrosive materials"* (Occupational Safety and Health Standards, 1998). Many facilities may use quaternary ammonium-based products instead of chlorine bleach because they think quaternary ammonium-based products are not corrosive so do not need an eye wash station. However, both chlorine bleach and quaternary ammonium-based products are considered corrosive (International Programme on Chemical Safety, 1996).

Staff/visitor bathrooms in all facilities were clean and handwashing sinks were equipped with warm water, soap, and an appropriate drying device, but 10 (38.4%) had no handwashing signage. Hand hygiene is an important preventive method for HuNoV,

and handwashing signage could prompt hand hygiene behaviors of staff/visitors. This is supported by one outcome-based study conducted on a university campus that suggested descriptive handwashing signage might improve hand hygiene behaviors of restroom patrons (Davis, Fante, & Jacobi, 2013). Furthermore, use of visual prompts to change behavior was reported to be effective in several studies but none were conducted in a healthcare setting (Clayton & Blaskewicz, 2012; Sussman & Gifford, 2012).

A total of 7 (28%) staff/visitor bathrooms were accessible to residents. Staff/visitor bathrooms can easily become contaminated with HuNoV because large numbers of people use them throughout the day. Bathroom surfaces, such as toilet seats and flush handles, can become contaminated after use by an infected staff/visitor through aerosolization after flushing (Barker & Jones, 2005). Door handles and sink faucets can also become contaminated via contaminated hands (Barker et al., 2004). Restricting residents' access to staff/visitor bathrooms could limit HuNoV transmission to residents via contaminated bathroom surfaces. Additionally, staff/visitor bathrooms should be cleaned and disinfected several times a day to minimize the potential spread of HuNoV.

Kitchen

Most (70%) foodborne HuNoV infections are attributed to infected food workers who directly contaminate food or surfaces (Hall et al., 2014). In our study, food workers appeared to be healthy and wearing appropriate clothing (e.g., clean clothes, gloves, hair restraints). Additionally, the CDC suggests washing hands with soap and running water for 20 seconds as the most effective way to reduce HuNoV on hands (Hall et al., 2011). In all kitchens, handwashing sinks were adequately set up (i.e., equipped with warm

water, soap, an appropriate drying device, and handwashing signage) which can facilitate proper handwashing by food workers.

The cleanliness and condition of kitchen surfaces is important because surfaces can be a source of pathogens if they are not cleaned and sanitized properly. Kitchen surfaces in good condition are important because cracks and damage on surfaces could trap food residues, and presence of food residues can increase HuNoV's survivability and resistance to chlorine bleach (Takahashi, Ohuchi, Miya, Izawa, & Kimura, 2011). Kitchen equipment (e.g., preparation sinks and three-compartment sinks) and food-contact surfaces (e.g., cutting boards and work tables) were clean and in good condition in all kitchens visited.

Most (n=23; 88.4%) facilities used quaternary ammonium-based products to sanitize kitchen surfaces, while 3 used chlorine bleach. Sanitizers are important to reduce bacterial pathogens but do not eliminate viruses including HuNoV (U.S. Environmental Protection Agency, 2012). During day-to-day activities, use of sanitizers might not be a problem. However, if a vomiting episode occurs in the kitchen, it is important to use a disinfectant, not a sanitizer. The 2013 U.S. Food and Drug Administration's Food Code (2014), which the state of SC has adopted, requires food establishments to have a plan for employees to follow in the case of a vomit/fecal episode. However, the regulations do not list proper personal protective equipment that must be worn during cleaning, procedures for cleaning up the organic matter (vomit/feces) before disinfection, disinfectant products to use, or area around the episode to clean. This lack of detailed guidelines may result in

many approaches to vomit/fecal matter clean-up, which may or may not effectively eliminate HuNoV.

Finally, most facilities participating in our study were for-profit businesses. We believe for-profit businesses have more resources to run the operation and implement infection control guidelines. However, we did not find any significant differences between for-profit and non-profit facilities for sanitary conditions in both the commons areas and kitchens. This may be due to the small sample sizes of the two facility types.

Limitations

This study had several limitations. First, visits were only conducted with a convenience sample of 26 LTCF in SC. Thus, study findings are not generalizable to all LTCF. Additionally, site visits were announced. Therefore, participants may not have behaved as they would normally. Also, the staff/visitor bathroom was not selected randomly, but by the director/designee at each site.

CONCLUSIONS

Presence of environmental factors that promote HuNoV transmission might be one reason for the large number of outbreaks in LTCF. We identified upholstered furniture and carpets, which are difficult to disinfect, as risk factors in commons areas of visited LTCF. Use of quaternary ammonium-based products, which are ineffective against HuNoV, to disinfect the commons areas of many facilities is another point of concern. Additionally, because some staff/visitor bathrooms were accessible to residents, they could serve as a HuNoV exposure source for residents. Furthermore, handwashing signage was not posted in some staff/visitor bathrooms, which could prompt staff/visitors

to wash their hands. These environmental factors could facilitate HuNoV transmission and result in outbreaks in LTCF in SC. HuNoV outbreaks will continue to occur in LTCF if environmental risk factors are not addressed resulting in costly hospitalization visits and even death for residents.

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CHAPTER FIVE

PREVENTING AND CONTROLLING HUMAN NOROVIRUSES IN SOUTH CAROLINA LONG-TERM CARE FACILITIES: AN ANALYSIS OF INSTITUTIONAL POLICIES AND PROCEDURES

INTRODUCTION

Long-term care (LTCF) facilities, home for two million Americans, are an ideal environment for the spread of acute gastroenteritis (AGE) (Harris-Kojetin, Sengupta, Park-Lee, & Valverde, 2013). The close living arrangements and frequent contact between residents, staff, and visitors facilitate the spread of enteric pathogens (Kirk, Veitch, & Hall, 2010; Strausbaugh, Sukumar, & Joseph, 2003). Older adults, who represent a large proportion of LTC facility residents, are highly susceptible to AGE due to comorbidities, declining immunity, and lowered body defenses (McGlauchlen and Vogel, 2003).

LTC facilities are the most common setting for human noroviruses (HuNoV) outbreaks (60%), a leading cause of AGE in the U.S. (Hall et al., 2014). To prevent HuNoV outbreaks in LTCF, evidence-based prevention and control guidelines are needed with institutional policies and procedures as a source for such guidelines. Policies and procedures can guide and influence decisions thus improving consistency of actions informed by laws and regulations, standards of best practice, and institutional executive decisions. Moreover, to be effective, policies and procedures should include accurate and current information and be easy to comprehend (O'Donnell and Vogenberg, 2012).

We hypothesize inclusion of strategies to prevent and control HuNoV in most LTC facility policies and procedures is limited. The purpose of our study was: (1) to determine alignment of policies and procedures from a sample of LTCF in South Carolina (SC) with Centers for Disease Control and Prevention (CDC) recommendations for prevention and control of HuNoV and (2) to determine readability of policies and procedures based on Federal Plain Language Guidelines and Microsoft Word Readability statistics.

METHODS

All materials and methods used in this study were approved by the Clemson University Institutional Review Board (IRB). Informed consent was obtained before data collection began.

Selection of Institutional Procedures

Institutional policies and procedures (hereafter referred to as procedures) related to the prevention and control of HuNoV were requested from 26 LTCF in SC during site visits conducted as part of a larger study. Requested procedures included: (1) hand hygiene, (2) HuNoV outbreak management, (3) general cleaning and sanitation, (4) clean-up of bodily fluids, (5) dress code, and (6) laundry. Facilities that did not provide procedures during the site visit were contacted up to three times by phone. Only 24 of 26 LTCF visited provided procedures. One facility did not provide copies because the corporate office would not allow them to do so; the other never sent copies for unknown reasons.

Coding Manual

A two-part coding manual was created to analyze collected procedures (Table 5.1). Part 1 determined alignment of procedures' content with two CDC guidance documents (Hall et al., 2011; MacCannell et al., 2011), and included 6 distinct categories (85 items). The first 4 categories (i.e., hand hygiene, outbreak management, general cleaning and sanitation, and bodily fluid clean-up) are documented strategies to prevent and control HuNoV infections (Hall et al., 2011). Procedures on dress code and laundry were also included because worker hygiene and handling of contaminated laundry can help prevent the spread of HuNoV. Part 2 (26 items) determined readability scores for hand hygiene and bodily fluid clean-up procedures based on the Federal Plain Language Guidelines (www.plainlanguage.gov).

Table 5.1. Summary of Coding Manual Used for Analysis of Policies and Procedures in Long-term Care Facilities in South Carolina

	Categories
Part 1: Content of Procedures (85 items)	1. Hand hygiene (11 items) 2. Outbreak management (20 items) 3. General cleaning and sanitation (14 items) 4. Bodily fluid clean-up (13 items) 5. Dress code (11 items) 6. Laundry (12 items)
Part 2: Federal Plain Language Readability (26 items)	1. Organization of the document (3 items) 2. Verb usage (5 items) 3. Noun and pronoun usage (2 items) 4. Other word issues (5 items) 5. Sentence organization (2 items) 6. Paragraph organization (4 items) 7. Aids to clarity (5 items)

A coding sheet corresponding to the coding manual was created on SurveyMonkey®. The coding manual and sheet were piloted by 2 trained coders using procedures from 2 LTCF. After piloting, the coding manual and sheet were modified. Two trained coders independently coded procedures for all facilities (N=24). A third coder reconciled differences.

Data Analysis

All categorical responses were converted to numeric values for statistical analysis. The number of facilities in compliance with items in Part 1 of the coding manual was determined. Readability was analyzed using two methods. First, a total score was calculated based Part 2 of the coding manual. Descriptive statistics (mean, standard deviation, and range) were calculated using Microsoft Excel for 6 of the 7 Federal Plain Language categories. One category (paragraph organization) was analyzed separately only for those procedures written in paragraph form. Secondly, procedures were scanned then converted into an editable document using Adobe Acrobat. Microsoft Word 2010 was used to generate two readability statistics – Flesch Reading Ease and Flesch-Kincaid Reading Level. Descriptive statistics (mean, standard deviation, and range) were then calculated.

RESULTS AND DISCUSSION

The number of stand-alone procedures collected (independent document that covers procedures for one prevention or control strategy) are in Table 5.2. Some facilities provided procedures that addressed multiple strategies in the same document. The number of procedures provided by a LTC facility ranged from 1-15.

Table 5.2. Number of Stand-alone Policies and Procedures Collected from 24 Long-term Care Facilities in South Carolina

Procedure category	n	%
Hand hygiene	21	87.5
Outbreak management	11	45.8
General cleaning and sanitation	13	54.1
Bodily fluid clean-up	11	45.8
Dress code	12	50.0
Laundry	18	75.0

Hand Hygiene

Most facilities (n=21; 87.5%) required hands be washed with soap and water, but detail varied greatly. Fourteen (58.3%) described when and how to wash hands and use hand sanitizers with 3 including diagrams showing handwashing steps. Others (n=7; 29.1%) only mentioned handwashing steps or when to wash hands. Addressing proper handwashing is critical as improper handwashing may not remove microbial contaminants (Bloomfield, Aiello, Cookson, O'Boyle, & Larson, 2007), and contaminated hands could spread HuNoV to healthy persons and/or environmental surfaces (Barker, Vipond, & Bloomfield, 2004).

Length of handwashing also varied. Fifteen (62.5%) facilities required hands be washed for ≥20 seconds, 8 (33.3%) for ≥15 seconds, and 7 (29.1%) for 10-15 seconds. Furthermore, the length of handwashing (n=6; 25%) varied across procedure categories from the same facility (e.g., hand hygiene versus environmental sanitation). In some facilities (n=3; 12.5%) handwashing length even varied within the same stand-alone procedure (e.g., step-by-step written procedures mentioned one duration while a diagram showing handwashing steps suggested a different duration). Physical removal not

inactivation reduces numbers of viral particles on hands, so washing hands for an appropriate length of time is essential (Sickbert-Bennett et al., 2005). Rubbing hands during washing can remove 0.5-1.5 logs of HuNoV (Liu et al., 2010). One plausible reason for the inconsistency in length of handwashing is there are no uniform guidelines for handwashing duration. For example, the U.S. Food and Drug Administration (FDA) Food Code recommends washing hands for 10-15 seconds (FDA, 2013), while the CDC "Guidelines for Hand Hygiene in Health-Care Settings" (2002) recommends washing for ≥15 seconds. Yet, in their HuNoV outbreak management guidelines (Hall et al., 2011), the CDC recommends washing hands for 20 seconds.

Hand sanitizers were listed as an alternative to handwashing when hands are not visibly soiled in most (n=19; 79.1%) facilities. The efficacy of hand sanitizers against HuNoV depends on product formulation (Kampf, Grotheer, & Steinmann, 2005; Lages, Ramakrishnan, & Goyal, 2008; Liu, Yuen, Hsiao, Jaykus, & Moe, 2010; Macinga et al., 2008; Park et al., 2010) with only a few formulations of alcohol-based hand rubs achieving significant reduction of the virus (Liu, Yuen, Hsiao, Jaykus, & Moe, 2010; Park et al., 2010; Tung, Macinga, Arbogast, & Jaykus, 2013). Since there is such a variation in efficacy of hand sanitizers against HuNoV, it is best for individuals in LTCF to wash hands instead of using hand sanitizers when there is a possibility that hands have been contaminated by bodily fluids.

Nearly all (n=22; 91.6%) facilities listed contamination events that should prompt handwashing. Not surprisingly, 22 (91.6%) required hands be washed when soiled with bodily fluids and after removing gloves. However, few required handwashing after

changing bed pans or resident briefs (n=5; 20.8%); before and after feeding residents (n=6; 25%); after contact with inanimate surfaces of resident surroundings (n=8; 33.3%); and when moving from one resident to another (n=1; 4.1%) all of which provide opportunities for contamination of hands (Hall et al., 2011; MacCannell et al., 2011). Given the many tasks in which staff hands could become contaminated, it is critical that the types of contamination events requiring handwashing be expanded to include events where hands could possibly be contaminated with bodily fluids.

Outbreak Management

Less than half (n=11; 45.8%) had stand-alone procedures for infection control during outbreaks of HuNoV or AGE. Two (8.3%) provided *Clostridium difficile* outbreak management procedures, which LTC facility Directors stated were also used during a HuNoV outbreak situation. Two facilities (8.3%) used fact sheets on HuNoV outbreaks authored by the CDC or Occupational Safety and Health Administration as their outbreak management policy. HuNoV and other non-enveloped enteric viruses can persist on surfaces for long periods (Escudero, Rawsthorne, Gensel, & Jaykus, 2012) and can be much more resistant to disinfection than bacteria and enveloped viruses (Sattar, 2007), so it is important to have outbreak management procedure specifically designed for these type of viruses. LTCF lacking proper procedures for HuNoV outbreak management could have a challenging time controlling viral transmission to residents and staff and, therefore, could have prolonged outbreaks.

Twelve (50%) had procedures for isolating or cohorting sick residents, and only 4 (16.6%) had recommendations on ceasing the transfer of sick residents between wards or

other facilities. HuNoV are extremely contagious because of their relatively low infectious dose (Atmar et al., 2008) and can easily be transmitted from person-to-person and from contaminated environmental surfaces (Hall et al., 2011). Residents with a HuNoV infection must be placed in a single occupancy room or cohorted from healthy residents to minimize viral transmission during an outbreak (MacCannell et al., 2011). For example, a study by Johnston et al. (2007) found that psychiatric patients at a tertiary care hospital had a significantly higher attack rate (19%) than patients in the coronary care unit (5%). The authors hypothesized that this difference in attack rate was due to the fact that psychiatric patients were encouraged to participate in group activities which offered greater opportunity for transmission of HuNoV. On the other hand, coronary care patients were in private rooms with little opportunity for viral transmission to other patients.

Few (n=7; 26.1%) had detailed procedures on exclusion of sick staff during an outbreak. Only 2 (8.3%) required exclusion until 48-72 hours after resolution of symptoms; others did not mention a specific time. Four (16.6%) had procedures that required assigning specific staff to care for sick residents. HuNoV can be shed in feces even after symptoms are resolved (Atmar et al., 2008), so sick staff should be excluded for at least 48 hours following recovery (Hall et al., 2011; MacCannell et al., 2011). Multiple studies have reported staff as a major source of HuNoV transmission within a LTC facility (Marx et al., 1999; Cooper & Blamey, 2005) as well as across multiple LTCF (Nguyen & Middaugh, 2012). Additionally, Vivancos et al. (2010) showed that outbreaks where staff was excluded for 72 hours had lower overall attack rates than those

where staff was only excluded for 48 hours due to reduced numbers of cases among staff rather than among residents.

Not surprisingly, few had procedures for screening (n=3; 12.5%), excluding (n=1; 4.1%), restricting (n=6; 25%), or communicating with (n=5; 20.8%) visitors about HuNoV during an outbreak. During a HuNoV outbreak, visitors should be screened for AGE symptoms, and those with symptoms should not be allowed to enter the facility as a means to prevent further introduction of HuNoV to the facility (MacCanell et al., 2011). Furthermore, restricting visitors from entering the facility during an outbreak could prevent subsequent spread within the facility. A study by Gallimore et al. (2008) found that environmental surfaces associated parents of hospital patients were more often contaminated with HuNoV than environmental surfaces associated with staff. The authors hypothesized that this indicated that parents were less likely to wash their hands than staff. Not excluding visitors could cause further spread of a HuNoV outbreak. If excluding visitors is not feasible, visitors should be educated about the outbreak and control strategies such as increased hand hygiene (MacCannell et al., 2011).

General Cleaning and Sanitation

Over half (n=13; 54.1%) of facilities provided stand-alone procedures for general cleaning and sanitation, but some (n=7; 29.1%) mentioned cleaning and sanitation of surfaces in other procedures, such as infection control, outbreak management, and laundry. Environmental surfaces play a major role in HuNoV transmission because HuNoV can persist on hard, non-porous surfaces for long periods (Escudero, Rawsthorne,

Gensel, & Jaykus, 2012). Proper cleaning and sanitation procedures are required to interrupt environmental HuNoV transmission.

Twenty (83.3%) facilities required cleaning before pathogen removal (sanitizing or disinfecting) from surfaces but did not provide instructions on how to clean. Organic matter on surfaces can reduce the effectiveness of sanitizers and disinfectants (Barker, Vipond, & Bloomfield, 2004; Park et al., 2011), so surfaces must be properly cleaned before sanitizing or disinfecting. On the other hand, a few (n=3; 12.5%) mentioned cleaning surfaces with soap and water but did not mention a pathogen removal step (sanitizing or disinfecting) after cleaning. Cleaning with soap and water alone will not eliminate HuNoV from contaminated surfaces (Barker, Vipond, & Bloomfield, 2004). To achieve proper elimination of HuNoV, contaminated surfaces must be cleaned before beginning pathogen removal.

Ten facilities (n=10; 41.66%) had procedures for sanitizing surfaces, 20 (83.33%) had disinfecting procedures, and 9 (37.5%) had both. However, the terms "sanitizing" and "disinfecting" were often misused and in some procedures (n=5; 20.8%), they were even used interchangeably. Both sanitizers and disinfectants are antimicrobial products regulated by the U.S. Environmental Protection Agency (EPA). Although their active ingredients might be similar, major differences exist between them. Sanitizers reduce but do not eliminate bacterial populations from a surface whereas disinfectants eliminate fungi, viruses, and bacteria (EPA, 2012a). Sanitizers are generally used on food-contact and soft surfaces (EPA, 2012a; EPA 2012c; EPA 2014c) while disinfectants are used on hard, non-food-contact surfaces and any surface (food-contact or non-food-contact)

contaminated with bodily fluids (Hall et al., 2011; EPA 2014c; EPA 2014b). However, to achieve proper elimination of HuNoV from environmental surfaces, disinfectants need to be used not sanitizers (Barker, Vipond, & Bloomfield, 2004; Hall et al., 2011). Appropriate terminology in cleaning and sanitation policies and procedures is critical to ensure elimination of HuNoV.

Only 9 facilities (37.5%) had procedures for both sanitizing and disinfecting. The type of pathogen removal step used depends on the type of contamination event. Many different types of contamination events occur in LTCF, so both sanitizing and disinfecting procedures should be included in facility procedures. Sanitization of surfaces may be sufficient for day-to-day sanitation activities, but a disinfectant should be used on contaminated or potentially contaminated surfaces. For example, bathroom surfaces are likely to become contaminated with many types of enteric pathogens by aerosolization of particles after flushing the toilet (Barker & Jones, 2005) or by contaminated hands of persons after using the bathroom (Barker, Vipond, & Bloomfield, 2004). Because of the high probability of bathroom surfaces being contaminated they should be disinfected not sanitized.

Many facilities did not include the proper pathogen removal step for high-touch surfaces. A few (n=8; 33.3%) facilities had cleaning and sanitation procedures that suggested focusing on high-touch surfaces, such as door knobs and hand rails. However, those procedures recommended "cleaning" high-touch surfaces, not disinfecting. Routine cleaning and disinfection of frequently touched environmental surfaces in healthcare facilities is recommended (Hall et al., 2011; Otter, Yezli, & French, 2011). An outbreak

of HuNoV at a veterans LTC facility showed that high-touch surfaces in sick residents' surroundings (e.g., bedrails and bedside table) as well as high-touch surfaces not in close proximity to sick residents (e.g., elevator call button in the basement used by staff only) can become contaminated with HuNoV (Wu et al., 2005), so these surfaces should be disinfected not sanitized.

Disinfectants can include different active ingredients (e.g., chlorine compounds, quaternary ammonium compounds, iodophor compounds, alcohol, phenolic compounds), but most of them are not effective against HuNoV or might not be effective if used at the wrong concentration (Barker, Vipond, & Bloomfield, 2004; Girad et al., 2010; Tung, Macinga, Arbogast, & Jaykus, 2013). The type of disinfectant mentioned in cleaning and sanitation procedures varied among facilities; twelve (50%) recommended chlorine bleach, 11 (45.8%) recommended an EPA-registered disinfectant, and 7 (29.2%) recommended both. Of those that recommended using chlorine bleach, only 7 (29.1%) required using chlorine bleach at a concentration of 5000 ppm, and 5 (20.8%) required a concentration of 1000 ppm. Others only required concentrations as low as 100 ppm (n=4; 16.6%). The CDC recommends using chlorine bleach at a concentration of 1000-5000 ppm or another EPA-registered product effective against HuNoV to interrupt transmission via contaminated surfaces (Hall et al., 2011). Only disinfectants, used at the proper concentration, can disrupt environmental HuNoV transmission.

Bodily Fluid Clean-Up

Eleven (45.8%) facilities provided stand-alone procedures on cleaning up bodily fluids; four others (16.6%) included bodily fluid clean-up procedures in other procedures,

such as housekeeping and infection control. All procedures (n=15) focused on bodily fluid clean-up and not specifically on vomit and fecal matter. After a vomit/fecal episode, stricter cleaning and disinfecting procedures are required as the vomit/fecal matter of persons with HuNoV contain high numbers of viral particles (Atmar et al., 2008; Caul, 1995).

None had procedures that included cleaning bodily fluid contaminated surfaces with soap and water before disinfection. Initial cleaning of vomit/feces and other organic matter from surfaces is needed to achieve effective disinfectant activity (Barker, Vipond, & Bloomfield, 2004, Park et al., 2011). If contaminated surfaces are not properly disinfected, HuNoV can be transmitted into other areas of the facility, placing more residents at risk.

Fifteen (62.5%) facilities included disinfection in their bodily fluid clean-up procedures. Thirteen (54.1%) recommended use of chlorine bleach to disinfect and 7 (29.1%) an EPA-registered disinfectant. Concentration levels for using chlorine bleach to disinfect varied. Five (20.8%) mentioned using a solution 5000 ppm, and 3 (12.5%) mentioned using a solution diluted between 500 ppm-5000 ppm. Four (16.6%) mentioned disinfecting with a 500 ppm chlorine solution for small spills (<10 ml) and, for larger spills (>10 ml), using a 5000 ppm chlorine solution to "clean" the spill first then disinfect with a 500 ppm chlorine solution. However, small volumes of bodily fluids (<10 ml) can contain sufficient infectious particles to cause illness. For example, vomit from a person infected with HuNoV can contain an estimated 10^6 viral particles/ml (Caul, 1995). When disinfecting surfaces after a vomiting or diarrheal event, CDC recommends using

chlorine bleach at 1000 ppm on hard, non-porous surfaces and 5000 ppm on porous surfaces (e.g., wooden floors) (Somerset (NJ) County, Department of Health et al., 2012). Also, one experimental study showed that projectile vomiting can contaminate a large area with aerosolized vomit particles and suggests cleaning at least 7.8 m^2 (~25 ft^2) to achieve full decontamination (Booth, 2014). Without proper cleaning and disinfection of bodily fluid episodes as well as a wide area surrounding episodes HuNoV outbreaks can become prolonged. For example, a HuNoV outbreak at a hotel lasted 2 months after infection control measures were implemented including cleaning, but not disinfecting, of surfaces contaminated with vomit (Cheesbrough, Green, Gallimore, Wright, & Brown, 2000).

Not all facilities required staff to wear personal protective equipment when cleaning up bodily fluids – 15 (62.5%) required gloves, 12 (50%) a gown, 10 (41.6%) a mask, and 9 (37.5%) shoe covers. CDC recommends wearing at a minimum a gown and gloves upon entry to areas contaminated with vomit or feces and wearing a mask, eye protection, or a face shield when caring for a person who is vomiting (MacCannell et al., 2011). Not wearing a face mask could result in employees getting infected with HuNoV due to inhalation of aerosolized particles. In fact, Friesma et al. (2009) reported that wearing a face mask when in contact with vomit significantly decreased attack rates of staff.

Dress Code

Twelve (50%) facilities provided stand-alone procedures for worker dress code and 11 (45.8%) had their dress code requirements listed in an employee handbook not

part of any procedures. Nearly all (n=23; 95.8%) required worker clothing be clean and neat and 21 (87.5%) had requirements on wearing jewelry, with types of jewelry allowed to be worn varying. Eight (33.3%) allowed workers to wear a wedding set/engagement ring and 5 (20.8%) a watch. Few facilities allowed other rings (n=4; 16.6%), a plain wedding band only (n=2; 8.33%), stud earrings (n=2; 8.33%), a necklace (n=1; 4.16%), and a bracelet (n=1; 4.16%). Most (n=20; 83.3%) required workers to keep fingernails trimmed and maintained with 12 (50%) disallowing artificial fingernails and 7 (29.1%) fingernail polish. Worker clothes contaminated after taking care of a child sick with AGE were the likely source of infection for hospital staff and patients in one HuNoV outbreak (Lo et al., 1994). Moreover, rings and other jewelry can increase microbial counts on hands (Salisbury et al., 1997), and microorganisms can be trapped in long, polished, chipped, or artificial fingernails possibly leading to a HuNoV outbreak (Lane, Scarborough, & Park, 2001).

Laundry

Eighteen (75%) facilities had written procedures for separating laundry contaminated with bodily fluids from other laundry with 16 (66.6%) requiring careful handling and no agitation. Ten (41.6%) required laundry be washed in water 151-200°F (66-93°C), and 11 (45.8%) required a sanitizing agent be added during washing. Of the 11 requiring addition of a sanitizing agent, all required adding chlorine bleach, 2 (8.3%) quaternary ammonium, and 1 (4.1%) an EPA-registered disinfectant. Among facilities that recommended using chlorine as a sanitizing agent, 2 (8.3%) listed concentrations of 50-150 ppm and 1 (4.1%) listed concentrations >200 ppm. Contaminated textiles and

fabrics can be a source of enteric viruses in healthcare settings (Borg and Portelli, 1999; Keefe, 2004), so soiled laundry should be separated from unsoiled laundry throughout the laundry process including storing, transporting, and washing. The CDC recommends handling soiled laundry with minimum agitation because infectious particles can become aerosolized and disperse into surrounding areas (MacCannell et al., 2011). It is recommended to use hot water for washing (160°F (71°C) for a minimum of 25 minutes) and 50-150 ppm chlorine bleach as a sanitizer during the bleach cycle (Sehulster et al., 2004) to effectively destroy enteric viruses (Gerba & Kennedy, 2007). However, most did not include proper temperature and sanitizing agents for washing. Without proper handling and washing procedures for contaminated laundry, HuNoV could be transmitted to laundry staff exacerbating an outbreak.

Readability of Hand Hygiene and Bodily Fluid Clean-up Procedures

Mean total readability scores based on Federal Plain Language Guidelines for hand hygiene and bodily fluid clean-up procedures were 20 and 18, respectively, out of a maximum of 28 (Tables 5.3 and 5.4). The scores were low for both sets of procedures for verb usage, noun and pronoun usage, and aids to clarity (e.g., examples, lists, tables). Federal Plain Language Guidelines suggest using present tense, active verbs, using pronouns to speak directly to readers, and using examples, lists, tables, and illustrations to make documents easier to read. Using present tense, active verbs make procedures more direct and clarifies who is responsible for an activity. Using examples helps readers understand what is written, and using lists and tables breaks text up into chunks that make

learning easier (www.plainlanguage.gov). These points make procedures easier to understand and therefore put into practice.

Table 5.3. Readability Scores and Word Readability Statistics for Hand Hygiene Policies and Procedures in Long-term Care Facilities in South Carolina (N=21)

Category	Maximum possible score	Mean score	Standard Deviation	Range
Federal Plain Language Guidelines				
Organization of the policy	4	3.2	0.7	2-4
Word usage				
Verbs	6	3.4	0.7	2-4
Nouns and pronouns	4	2.2	0.8	1-3
Other word issues	6	5.1	1.3	2-6
Sentence usage	2	1.7	0.5	1-2
Aids for clarity	6	4.1	1.0	3-6
Total	**28**	**20**	**1.7**	**15-22**
Word Readability Statistics				
Flesch Reading Ease	~120	50	11.2	39-80
Flesch-Kincaid Grade Level	-	9	2	4-12

Mean Flesch Reading Ease score was 50 of 120 for hand hygiene procedures and 51 of 120 for bodily fluid clean-up procedures (Tables 3 and 4). The higher a Flesch Reading Ease score is the easier it is to read, and scores between 51-59 are considered "fairly difficult" to read (Flesch, 1948; Farr et al., 1951). Inversely, the higher the Flesch-Kincaid grade level the more difficult to read it is (Kincaid et al., 1975). In the U.S., the average reading level is the 9th grade (Kirsh et al., 2002). Both hand hygiene and bodily fluid clean-up procedures were at a 9th grade reading level. Based on our findings, hand hygiene and bodily fluid clean-up procedures in LTC facilities in SC are not easy to read and understand. Even though procedures may contain proper information, they may not

help to prevent HuNoV transmission if they are not easy to read and understand by the employees expected to follow them.

Table 5.4. Readability Scores and Word Readability Statistics for Bodily Fluid Clean-up Policies and Procedures in Long-term Care Facilities in South Carolina (N=11)

Category	Maximum possible score	Mean score	Standard Deviation	Range
Federal Plain Language Guidelines				
Organization of the policy	4	2.4	0.8	2-4
Word usage				
Verbs	6	3.1	1	2-4
Nouns and pronouns	4	1.7	0.7	1-3
Other word issues	6	5.5	0.7	4-6
Sentence usage	2	1.4	0.5	1-2
Aids for clarity	6	3.9	1	3-5
Total	**28**	**18**	**2.8**	**15-22**
Word Readability Statistics				
Flesch Reading Ease	~120	51	6	43-60
Flesch-Kincaid Grade Level	-	9	~1	7-11

LIMITATIONS

We analyzed a convenience sample of procedures collected from 26 LTC facilities in SC, so our findings cannot be generalized to all LTCF in SC. However, in order to get the largest proportion of facility participation, we called all registered LTCF in SC. We sent a list of requested procedures to be collected to each facility before their site visit in an attempt to make it easier to collect procedures the day of the site visit. However, most facilities had not gathered requested procedures before the visit and spent an extended amount of time trying to locate the procedures. We also could not forcibly collect their procedures, so we had to be satisfied with what each facility provided.

Nevertheless, we feel confident about our accurate coding of the collected procedures to provide an insight into prevention and control procedures against HuNoV in LTCF in SC.

CONCLUSIONS

As 60% of HuNoV outbreaks in the U.S. occur in LTCF, the best way to prevent and control outbreaks in these setting is having institutional procedures that contain clear information aligned with CDC recommendations. Inconsistencies with the CDC recommendations were identified in hand hygiene, outbreak management, and environmental sanitation procedures. Forty-two percent of facilities' (n=10) hand hygiene procedures lacked descriptions of when and how to wash hands, and length of handwashing varied greatly across, and even within, procedures. Also, few required handwashing after events that could potentially contaminate hands with bodily fluids, such as after changing bed pans or resident briefs and after contact with inanimate surfaces of resident surroundings. Most LTCF lacked separate procedures for HuNoV outbreak management. However, even in the facilities that had separate procedures on outbreak management, most focused on environmental cleaning and disinfection and only briefly mentioned handling of residents, staff, and visitors. Only 9 facilities had procedures for both sanitizing and disinfecting of environmental surfaces. However, many did not include the proper pathogen removal step (disinfection) for high-touch surfaces. Without accurate procedures for preventing and controlling HuNoV in LTCF, outbreaks could continue to occur which could have large economic implications as well as an impact of the livelihood and well-being of facility residents.

This study shows hand hygiene and bodily fluid clean-up procedures were not easy to read based on Federal Plain Language Guidelines and Microsoft Word's Readability statistics. Improvements are required to enhance readability of hand hygiene and bodily fluid clean-up procedures in LTC facilities in SC. Procedures that are easy to understand and well aligned with CDC recommendations could prevent future HuNoV outbreaks and help provide better quality care for older adults living in LTCF.

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CHAPTER SIX

CONCLUSIONS

Most LTCF in our sample were not in compliance with CDC recommended practices for preventing and controlling of HuNoV and gaps were identified in their prevention and control practices. Presence of environmental factors that could facilitate HuNoV transmission in commons areas in LTCF was identified. If these gaps in infection prevention and control practices and environmental risk factors are not addressed, outbreaks of HuNoV will continue to occur in LTCF. It is critical to provide evidence-based, practical education or training for practitioners and other personnel to prevent future outbreaks. Institutional procedures that are easy to understand and well aligned with CDC recommendations could improve practices of staff and will help to minimize future outbreaks.

APPENDICES

Appendix A

Downd and Black Checklist

Appendix

Checklist for measuring study quality

Reporting

1. *Is the hypothesis/aim/objective of the study clearly described?*

yes	1
no	0

2. *Are the main outcomes to be measured clearly described in the Introduction or Methods section?*
   If the main outcomes are first mentioned in the Results section, the question should be answered no.

yes	1
no	0

3. *Are the characteristics of the patients included in the study clearly described ?*
   In cohort studies and trials, inclusion and/or exclusion criteria should be given. In case-control studies, a case-definition and the source for controls should be given.

yes	1
no	0

4. *Are the interventions of interest clearly described?*
   Treatments and placebo (where relevant) that are to be compared should be clearly described.

yes	1
no	0

5. *Are the distributions of principal confounders in each group of subjects to be compared clearly described?*
   A list of principal confounders is provided.

yes	2
partially	1
no	0

6. *Are the main findings of the study clearly described?*
   Simple outcome data (including denominators and numerators) should be reported for all major findings so that the reader can check the major analyses and conclusions. (This question does not cover statistical tests which are considered below).

yes	1
no	0

7. *Does the study provide estimates of the random variability in the data for the main outcomes?*
   In non normally distributed data the inter-quartile range of results should be reported. In normally distributed data the standard error, standard deviation or confidence intervals should be reported. If the distribution of the data is not described, it must be assumed that the estimates used were appropriate and the question should be answered yes.

yes	1
no	0

8. *Have all important adverse events that may be a consequence of the intervention been reported?*
   This should be answered yes if the study demonstrates that there was a comprehensive attempt to measure adverse events. (A list of possible adverse events is provided).

yes	1
no	0

9. *Have the characteristics of patients lost to follow-up been described?*
   This should be answered yes where there were no losses to follow-up or where losses to follow-up were so small that findings would be unaffected by their inclusion. This should be answered no where a study does not report the number of patients lost to follow-up.

yes	1
no	0

10. *Have actual probability values been reported(e.g. 0.035 rather than <0.05) for the main outcomes except where the probability value is less than 0.001?*

yes	1
no	0

External validity

All the following criteria attempt to address the representativeness of the findings of the study and whether they may be generalised to the population from which the study subjects were derived.

11. *Were the subjects asked to participate in the study representative of the entire population from which they were recruited?*
    The study must identify the source population for patients and describe how the patients were selected. Patients would be representative if they comprised the entire source population, an unselected sample of consecutive patients, or a random sample. Random sampling is only feasible where a list of all members of the relevant

population exists. Where a study does not report the proportion of the source population from which the patients are derived, the question should be answered as unable to determine.

yes	1
no	0
unable to determine	0

12. *Were those subjects who were prepared to participate representative of the entire population from which they were recruited?*
The proportion of those asked who agreed should be stated. Validation that the sample was representative would include demonstrating that the distribution of the main confounding factors was the same in the study sample and the source population.

yes	1
no	0
unable to determine	0

13. *Were the staff, places, and facilities where the patients were treated, representative of the treatment the majority of patients receive?*
For the question to be answered yes the study should demonstrate that the intervention was representative of that in use in the source population. The question should be answered no if, for example, the intervention was undertaken in a specialist centre unrepresentative of the hospitals most of the source population would attend.

yes	1
no	0
unable to determine	0

Internal validity - bias

14. *Was an attempt made to blind study subjects to the intervention they have received ?*
For studies where the patients would have no way of knowing which intervention they received, this should be answered yes.

yes	1
no	0
unable to determine	0

15. *Was an attempt made to blind those measuring the main outcomes of the intervention?*

yes	1
no	0
unable to determine	0

16. *If any of the results of the study were based on "data dredging", was this made clear?*
Any analyses that had not been planned at the outset of the study should be clearly indicated. If no retrospective unplanned subgroup analyses were reported, then answer yes.

yes	1
no	0
unable to determine	0

17. *In trials and cohort studies, do the analyses adjust for different lengths of follow-up of patients, or in case-control studies, is the time period between the intervention and outcome the same for cases and controls ?*
Where follow-up was the same for all study patients the answer should yes. If different lengths of follow-up were adjusted for by, for example, survival analysis the answer should be yes. Studies where differences in follow-up are ignored should be answered no.

yes	1
no	0
unable to determine	0

18. *Were the statistical tests used to assess the main outcomes appropriate?*
The statistical techniques used must be appropriate to the data. For example non-parametric methods should be used for small sample sizes. Where little statistical analysis has been undertaken but where there is no evidence of bias, the question should be answered yes. If the distribution of the data (normal or not) is not described it must be assumed that the estimates used were appropriate and the question should be answered yes.

yes	1
no	0
unable to determine	0

19. *Was compliance with the intervention/s reliable?*
Where there was non compliance with the allocated treatment or where there was contamination of one group, the question should be answered no. For studies where the effect of any misclassification was likely to bias any association to the null, the question should be answered yes.

yes	1
no	0
unable to determine	0

20. *Were the main outcome measures used accurate (valid and reliable)?*

For studies where the outcome measures are clearly described, the question should be answered yes. For studies which refer to other work or that demonstrates the outcome measures are accurate, the question should be answered as yes.

yes	1
no	0
unable to determine	0

Internal validity - confounding (selection bias)

21. *Were the patients in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited from the same population?*
For example, patients for all comparison groups should be selected from the same hospital. The question should be answered unable to determine for cohort and case-control studies where there is no information concerning the source of patients included in the study.

yes	1
no	0
unable to determine	0

22. *Were study subjects in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited over the same period of time?*
For a study which does not specify the time period over which patients were recruited, the question should be answered as unable to determine.

yes	1
no	0
unable to determine	0

23. *Were study subjects randomised to intervention groups?*
Studies which state that subjects wererandomised should be answered yes except where method of randomisation would not ensure random allocation. For example alternate allocation would score no because it is predictable.

yes	1
no	0
unable to determine	0

24. *Was the randomised intervention assignment concealed from both patients and health care staff until recruitment was complete and irrevocable?*
All non-randomised studies should be answered no. If assignment was concealed from patients but not from staff, it should be answered no.

yes	1
no	0
unable to determine	0

25. *Was there adequate adjustment for confounding in the analyses from which the main findings were drawn?*
This question should be answered no for trials if: the main conclusions of the study were based on analyses of treatment rather than intention to treat; the distribution of known confounders in the different treatment groups was not described; or the distribution of known confounders differed between the treatment groups but was not taken into account in the analyses. In non-randomised studies if the effect of the main confounders was not investigated or confounding was demonstrated but no adjustment was made in the final analyses the question should be answered as no.

yes	1
no	0
unable to determine	0

26. *Were losses of patients to follow-up taken into account?*
If the numbers of patients lost to follow-up are not reported, the question should be answered as unable to determine. If the proportion lost to follow-up was too small to affect the main findings, the question should be answered yes.

yes	1
no	0
unable to determine	0

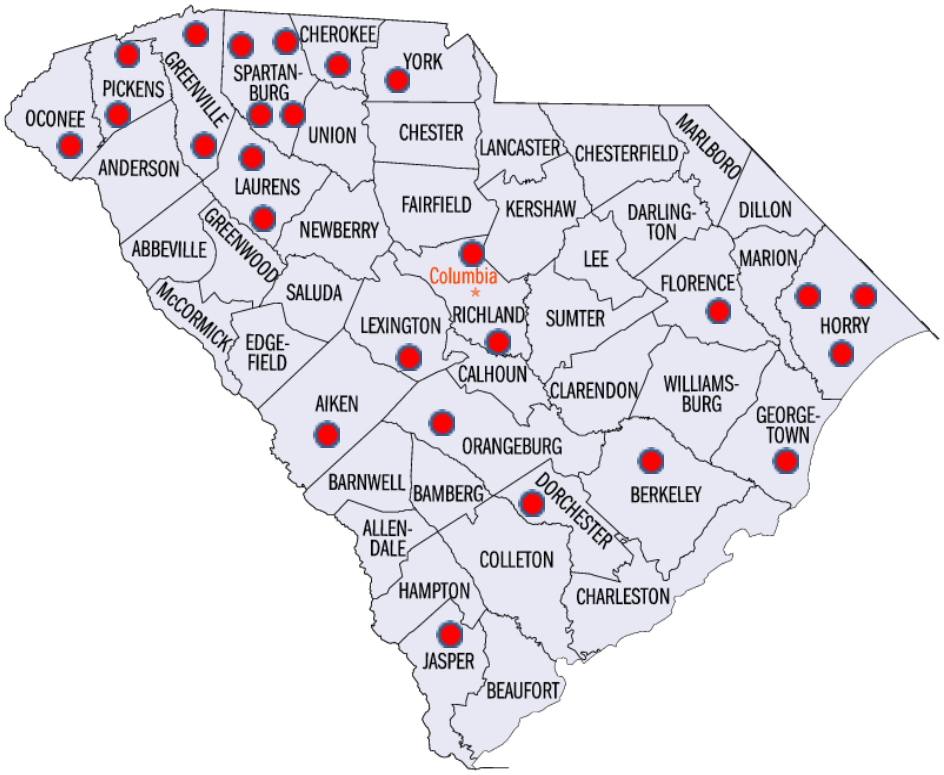
Power

27. *Did the study have sufficient power to detect a clinically important effect where the probability value for a difference being due to chance is less than 5%?*
Sample sizes have been calculated to detect a difference of x% and y%.

	Size of *smallest* intervention group	
A	$<n_1$	0
B	n_1–n_2	1
C	n_3–n_4	2
D	n_5–n_6	3
E	n_7–n_8	4
F	n_8+	5

Appendix B

Distribution of Site Visits in South Carolina



Appendix C

Director Questionnaire

FACILITY CHARACTERISTICS

1. Which best describes your facility? (Select all that apply.)

   - ☐ Assisted-living facility
   - ☐ Continuing care community
   - ☐ Nursing home
   - ☐ Skilled nursing facility
   - ☐ Other

2. Which best describes your facility's business classification? (Select only one.)

   - ☐ Corporate
   - ☐ Faith-based
   - ☐ Government run
   - ☐ Independently owned and operated
   - ☐ Other non-profit organization
   - ☐ Other

3. How many people work in this facility? Include full-time, part-time, and volunteer staff.

CATEGORY	NUMBER
Health Care	
Administrative (e.g. directors and supervisors)	
Staff (e.g. nurses and aides)	
Foodservice	
Administrative (e.g. directors and supervisors)	
Staff (e.g. cooks, dishwashers, food servers)	
Custodial and Maintenance	
Administrative (e.g. directors and supervisors)	
Staff (e.g. housekeeper and maintenance workers)	
Other	
TOTAL	

4. How many total beds are available in your facility? _____ beds

5. How many residents are currently living at your facility? _____ residents

6. Do residents share a bedroom? ____ Yes ____ No ____ Some
   If some, how many shared rooms are in the facility? _____ rooms
   In shared rooms, how many residents are there per room? _____ residents
   In shared rooms, are there barriers (e.g. curtains, etc.) between living quarters?____ Yes ____ No

7. Do residents share a bathroom (not including common area bathrooms)?___Yes____ No ____ Some

   If some, how many shared bathrooms are in the facility? ___ bathrooms

   In shared bathrooms, how many residents are there per bathroom? ___residents

8. Are residents allowed to bring their own belongings to the facility?____ Yes ____ No
   If yes, what types of items are they allowed bring?

9. Which shared resident care items are commonly transferred from room to room? (Select all that apply.)
   - ☐ Blood glucose meters
   - ☐ Blood pressure cuffs
   - ☐ INR meters
   - ☐ IV and tube feeding poles
   - ☐ Lifts
   - ☐ Meal trays
   - ☐ Medication carts
   - ☐ Oxygen concentrators
   - ☐ Portable phones
   - ☐ Stethoscopes
   - ☐ Thermometers
   - ☐ Treatment carts
   - ☐ Weight scales
   - ☐ Wheelchairs
   - ☐ Other

WORKER TRAINING

10. For which of the following do ***new*** employees receive training, such as a class or on-the-job training? (Select all that apply.)

    - ☐ Food safety
    - ☐ Hygiene practices
    - ☐ Infectious disease control
    - ☐ Sanitation practices
    - ☐ None of the above (Go to question 12)

11. Who provides employee training? (Select all that apply.)

    - ☐ Cooperative Extension Service
    - ☐ Other workers from the facility
    - ☐ Private organization or consultant

- ☐ State or local regulatory agency
- ☐ Trainer from your facility's corporate office

DIRECTOR INFORMATION

12. What is your gender?

    - ☐ Male
    - ☐ Female

13. How many years have you been the Director of this facility? (Select only one.)

    - ☐ Less than 1 year
    - ☐ 1–5 years
    - ☐ 6–10 years
    - ☐ 11–15 years
    - ☐ More than 15 years

14. What is the highest level of school you have completed/degree received? (Select only one.)
    - ☐ Less than High School
    - ☐ High School/GED
    - ☐ Some college
    - ☐ Associate's degree (2-year college)
    - ☐ Bachelor's degree (BA, BS)
    - ☐ Master's degree (e.g. MA, MS, MEng, MEd, MSW, MBA)
    - ☐ Professional degree (e.g. MD, DDS, DVM, LLB, JD)
    - ☐ Doctorate degree (e.g. PhD, EdD)

Appendix D

Director Interview
Part 1 – Prevention Strategies: General Hygiene and Sanitation

Do you have a policies and procedures manual that covers the entire facility? Yes/No
If no, are there policies and procedures for specific departments? Which ones?

GENERAL CLEANING AND SANITIZING ACTIVITIES (Ask in a conversational manner)			
1. How often is the facility cleaned? (common areas, patient rooms, kitchen, other)			
2. During what time of the day does cleaning usually occur?			
BATHROOMS AND LAUNDRY	**RESPONSE**		**COMMENTS – If yes, ask what the written procedure is and ask to see it.**
3. Do you have written procedures for cleaning residents' bathrooms, including bedside commodes?	YES	NO	
4. Do you have a separate written procedure for cleaning staff/visitor bathrooms?	YES	NO	
5. Do you wash laundry at the facility? If yes, what do you wash? If no, where is laundry washed?	YES	NO	
6. Are laundry rooms separate from residents' rooms, kitchen, serving and common areas? Where are they located? *Note: Indicate location on facility map.*	YES	NO	
7. How is laundry transported throughout the facility?			
8. Do you have written procedures for how laundry is to be washed?	YES	NO	
9. Is bleach or any other sanitizing agent added to laundry during the wash or rinse cycle? If yes, what amount is added and at what concentration?	YES	NO	

SANITIZING AGENTS FOR HARD SURFACES	COMMENTS		
10. Which sanitizers do you use on hard, food-contact surfaces? At what concentration?			
11. Which sanitizers or disinfectants do you use on other hard surfaces? At what concentration?			
12. Do you use test kits to measure sanitizer strength? If yes, could you show me the kit?	YES	NO	
PERSONAL HYGIENE	**RESPONSE**		**COMMENTS – If yes, ask what the written procedure is and ask to see it.**
13. Is there a written dress code for all workers?	YES	NO	
14. Do employees arrive in their uniform or do they change at work?	YES	NO	
15. Do you have a written facility policy on fingernail grooming?	YES	NO	
16. Do you have a written facility policy on wearing jewelry?	YES	NO	
17. Are workers required to wash their hands/use hand sanitizer after certain activities?	YES	NO	
18. Are there recommended activities after which residents should wash their hands?	YES	NO	
19. Do workers use hand sanitizer throughout the day at times when hand hygiene is not necessarily required?	YES	NO	

NOROVIRUSES IN LONG-TERM CARE -- Director Interview
Part 2 – Control Strategies: Handling of Vomit and Fecal Matter

HANDLING OF VOMIT/FECAL MATTER	RESPONSE		COMMENTS – If yes, ask what the written procedure is and ask to see it.
1. How often do residents make it to the bathroom to vomit? How often do vomiting episodes occur outside of bathrooms? Where do they occur most?			
2. How often do diarrheal episodes occur outside of bathrooms? Where do they occur most?			
3. Do you have a written facility policy for how to clean soiled residents?	YES	NO	
4. Do you have a written facility policy for how to clean up fecal matter or vomit? Are gloves worn?	YES	NO	
5. Are other individuals removed from the room during clean-up of feces and vomit?	YES	NO	
6. Do workers and/or residents change clothes after a vomit or fecal episode?	YES	NO	
SURFACES EXPOSED TO VOMIT OR FECAL MATTER	**RESPONSE**		**COMMENTS – If yes, ask what the written procedure is and ask to see it.**
7. How wide of an area is cleaned after a vomit/fecal episode? (episode only or surrounding environment)			
8. Do you have a written facility policy for cleaning vomit or feces contaminated linens, clothing, and other items that can be machine washed?	YES	NO	
9. Do you have a written facility policy for cleaning up hard, non-porous surfaces after they have been exposed to vomit or fecal matter? Are there different procedures for different types of surfaces?	YES	NO	

10. Do you have written facility policy for cleaning upholstered furniture, carpets and rugs?	YES	NO	
11. Do you have different procedures for cleaning restrooms after a vomiting or diarrheal episode?	YES	NO	

NOROVIRUSES IN LONG-TERM CARE -- Director Interview
Part 3 – Infectious Disease Control Strategies

OUTBREAK RESPONSE – *When one or more residents are sick with a gastrointestinal illness:*	**RESPONSE**		**COMMENTS**
1. Do you allow sick residents in the commons areas?	YES	NO	
2. Are sick residents isolated from healthy residents?	YES	NO	
3. Do you allow healthy residents to visit sick residents?	YES	NO	
4. Do you assign specific staff members to only care for sick residents?	YES	NO	
5. Do you allow visitors to have contact with sick residents?	YES	NO	
6. Do you designate specific toilets for sick residents?	YES	NO	
7. Do you let sick staff come to work?	YES	NO	
8. Do you have different cleaning and disinfecting procedures during an outbreak?	YES	NO	

DURING AN OUTBREAK DO YOUR EMPLOYEES:	RESPONSE		COMMENTS
9. Wear personal protective equipment such as, plastic aprons or cloth gowns when caring for sick residents?	YES	NO	
10. Wear disposable gloves when caring for sick residents?	YES	NO	
11. Wear masks when caring for sick residents?	YES	NO	
12. Wear shoe covers when entering the room of a sick resident?	YES	NO	
13. Do employees remove personal protective equipment such as aprons and gloves before leaving a room?	YES	NO	
14. Where do employees dispose of these items? (Trash can or biohazard?)			

Appendix E

Facility Survey

(Commons Area)

COMMONS AREA (where residents congregate)			
PROVIDERS	**Response**		**Comments**
1. Workers well groomed	Yes	No	
2. Workers in visible good health	Yes	No	
RESIDENTS	**Response**		**Comments**
3. Residents in visible good health	Yes	No	
GENERAL CLEANLINESS The following are clean and in good condition:	**Response**		**Comments**
4. Upholstered chairs (Number _____)	Yes	No	
5. Hard surface chairs (Number _____)	Yes	No	
6. Tables (Number _____)	Yes	No	
7. Carpets *Note locations on Facility Map.*	Yes	No	
8. Hard surface floors	Yes	No	Types:
9. Wheel chairs visibly clean	Yes	No	
10. Other (Specify)	Yes	No	
TRASH CANS (Number _____)	**Response**		**Comments**
11. All trash cans clean	Yes	No	
12. All trash cans are plastic-lined	Yes	No	
13. All trash cans are hands-free	Yes	No	
HAND SANITIZER	**Response**		**Comments**
14. Hand sanitizer stations (Number _____) *Note locations on Facility Map.*	Yes	No	
15. Type of hand sanitizer used	Brand and Active Ingredient		
BATHROOM (accessible to staff and visitors)	**Response**		**Comments**
16. Clean and in good repair overall	Yes	No	
17. Toilets clean and in good repair	Yes	No	
18. Handwash sinks accessible to residents	Yes	No	
19. Warm water	Yes	No	
20. Soap	Yes	No	Type:
21. Appropriate drying device (single-use towels or hot air)	Yes	No	Type of device:
22. Handwashing signage posted	Yes	No	Describe sign:
23. Hand sanitizer available at or near handsinks	Yes	No	Brand and Active Ingredient:

CLEANING
24. Number of mop sinks (Number _____) *Note locations on Facility Map.*
25. Detergent used to clean hard surfaces:
26. Disinfectant used and Concentration:

NOROVIRUSES IN LONG-TERM CARE: Facility Survey – Part 2 (Food Preparation)

FOOD PREPARATION AREA				
EQUIPMENT (clean and in good repair):	**Compliance**			**Comments**
27. Refrigerator(s) (Number_____)	Yes	No	N/A	Temperature:
28. Work table(s) (Number _____)	Yes	No	N/A	
29. Cutting boards (Number _____)	Yes	No	N/A	
30. Preparation sinks (Number _____)	Yes	No	N/A	
31. Other _____	Yes	No	N/A	
THREE-COMPARTMENT SINK (Number_____)	**Compliance**			**Comments**
32. Three-compartment sink adequately set-up	Yes	No	N/A	
33. Food not prepared in three-compartment sink	Yes	No	N/A	
34. Dishes not washed in food preparation sinks	Yes	No	N/A	
DISHMACHINE (Number _____)	**Compliance**			**Comments**
35. Low-temperature dish washer machine	Yes	No	N/A	ppm:
36. High-temperature dish washer machine	Yes	No	N/A	
SANITIZING SOLUTION	**Compliance**			**Comments**
37. Types of sanitizing solutions used □ Bleach □ Quaternary Ammonia □ Iodine				Brand:
38. Proper concentration	Yes	No	N/A	ppm:
HANDWASHING SINKS (Number _____)	**Response**			**Comments**
39. Properly outfitted with:				
a. Warm water	Yes	No		
b. Soap (Circle one: plain or antimicrobial)	Yes	No		Type: Brand:
c. Hand sanitizer	Yes	No		Brand and Active Ingredient:
d. Approved drying device	Yes	No		Specify:
e. Hand washing signage	Yes	No		Describe sign:

WORKERS (Number _____)	Response		Comments
40.Wearing clean clothes	Yes	No	
41.Wearing hair restraints	Yes	No	
42.Using gloves when needed	Yes	No	
43.No jewelry on hands and forearms	Yes	No	
MEASURING DEVICES	**Response**		**Comments**
44.Food thermometer (Number _____)	Yes	No	Type:
45.Sanitizer test kits (Number _____)	Yes	No	Type:
CERTIFICATION	**Response**		**Comments**
46.Food Safety Certification	Yes	No	Type:
OTHER COMMENTS:			

Appendix F

Long-Term Care Procedures Content Analysis – Coding Manual

Identifying Information

#	Question	Response Options	Operational Definition	Methodology
01	Name of the Coder		Name of the coder	Coders assign arbitrarily
02	Facility ID number	Provided, please verify	Facility ID as it appears on data collection documents	Coders assign arbitrarily

Hand Hygiene

#	Question	Response Options	Operational Definition	Methodology
03	Is there a stand-alone hand hygiene policy?	0. Uncertain 1. Yes 2. No	If there is a stand-alone statement of intent describing hand hygiene procedures, the answer must be yes.	Coders determine whether there is a discrete policy on hand hygiene.
04	Is the hand hygiene policy labeled "policy"?	0. Uncertain 1. Yes 2. No 3. No hand hygiene policy	If there is a hand hygiene policy, is the policy actually labeled as "policy"?	Coders determine whether the hand hygiene policy is labeled "policy".
05	Are there detailed, written steps on hand hygiene?	0. Uncertain 1. Yes 2. No 3. No hand hygiene procedures	If there are detailed, written instructions on hand washing or using hand sanitizer, the answer must be yes.	Coders determine whether there are detailed procedures on any type of hand hygiene.
06	Are the detailed, written steps for hand hygiene labeled "procedures"?	0. Uncertain 1. Yes 2. No 3. No hand hygiene procedures	If there are detailed, written instructions on hand hygiene, are they labeled "procedure"?	Coders determine whether the written hand hygiene instructions labeled "procedures".
07	Which documents contain detailed, written steps for hand hygiene?	0. Bathroom Cleaning 1. General cleaning/ Housekeeping 2. Laundry 3. Dress Code 4. Fingernail grooming 5. Jewelry	List all documents that include a procedure for hand washing or using hand sanitizer.	Coders determine all of the documents that include procedures on hand hygiene.

		6. Hand Hygiene 7. Body Fluid Clean-up 8. Incontinence Care 9. Infection Control 10. Outbreak Management 11. Personal Protective Equipment 12. No hand hygiene procedures 13. Other, please specify		
08	What is the recommended duration for hand washing?	0. Uncertain 1. Less than 10 seconds 2. 10-15 seconds 3. 16-19 seconds 4. 20 seconds or more 5. Time not suggested 6. No hand hygiene procedures 7. Other, please specify	Amount of time the procedure recommends for each hand washing session.	Coders determine procedure's recommended time for each hand washing session.
09	What type of soap is recommended?	0. Uncertain 1. Does not specify 2. Plain soap (not antibacterial/ antimicrobial) 3. Antibacterial (not antimicrobial) 4. Liquid 5. Bar 6. Foam 7. Powder 8. None 9. No hand hygiene procedures 10. Other, please specify	If the procedure recommends any type of soap, list all soaps it recommends.	Coders determine whether the procedure suggests using soap to wash hands and selects the soaps suggested.
10	What type of drying device is recommended?	0. Uncertain 1. Paper towels 2. Cloth towels 3. Heated-air hand dryer 4. Does not specify 5. None 6. No hand hygiene procedures 7. Other, please	If the procedure recommends any type of hand drying device, list all drying devices suggested.	Coders determine whether a specific drying device is recommended and select which specific drying devices are suggested.

		specify		
11	When is hand washing recommended?	1. Uncertain 2. When workers arrive for the day 3. After breaks 4. When hands are soiled with bodily fluids 5. When moving from one resident to another 6. Before handling an invasive device for resident care 7. When moving from a contaminated body site to another body site 8. Before eating or handling food 9. After eating or handling food 10. Before touching a resident 11. After touching a resident 12. Before feeding a resident 13. After feeding a resident 14. Before giving medication 15. After giving medication 16. Before applying a medical ointment or cream 17. After applying a medical ointment or cream 18. Before changing bed pans or resident briefs 19. After changing bed pans or resident briefs 20. After using the toilet or helping a resident use the toilet 21. After coughing,	Mark all events in the procedure when workers must wash their hands	Coders determine whether the procedure suggests hand washing at specific events and mark all of the events that are mentioned. Exact language is not necessary and coders must interpret the intent of the document.

		sneezing, using a handkerchief or tissue, or using tobacco 22. After contact with inanimate surfaces and objects in a resident's surroundings 23. After removing gloves 24. After handling animals or cleaning up animal waste 25. After cleaning or handling garbage 26. After using chemicals 27. None 28. No hand hygiene procedures 29. Other, please specify		
12	Are hand sanitizers mentioned?	0. Uncertain 1. Yes 2. No 3. No hand hygiene procedures	If hand sanitizers are mentioned once in the procedure, the answer must be yes.	Coders determine whether the procedure mentions hand sanitizers in any context.
13	Does it state that hand sanitizers are an acceptable alternative to hand washing?	0. Uncertain 1. Yes 2. No 3. Hand sanitizer not mentioned 4. No hand hygiene policy	If the procedure suggests that hand sanitizers can be used instead of hand washing, the answer is yes.	Coders determine whether the procedure suggests that hand sanitizers are an acceptable alternative to hand washing.

Outbreak Management

#	**Question**	**Response Options**	**Operational Definition**	**Methodology**
14	Is there a stand-alone outbreak management policy?	0. Uncertain 1. Yes 2. No	If there is a stand-alone statement of intent describing procedures on control measures to use during an outbreak, the answer must be	Coders determine whether there is a discrete outbreak management policy. Exact

			yes.	language is not necessary and coders must interpret the intent of the document.
15	Is the outbreak management policy labeled "policy"?	0. Uncertain 1. Yes 2. No 3. No outbreak management policy	If there is an outbreak management policy, is the policy actually labeled as "policy"?	Coders determine whether the outbreak management policy is labeled "policy".
16	What disease does the outbreak management policy focus on?	0. Uncertain 1. Norovirus 2. Clostridium difficile 3. Gastroenteritis 4. Does not specify 5. No outbreak management policy 6. Other, please specify	If there is an outbreak management policy, list all of the diseases that it covers.	Coders determine whether a specific disease is covered by the outbreak management policy and select which specific diseases are covered.
17	Are there detailed, written steps for isolating or cohorting sick residents?	0. Uncertain 1. Yes 2. No 3. No outbreak management policy	If there are detailed, written instructions on separating sick residents from others to prevent the spread of infectious diseases, the answer must be yes.	Coders determine whether there are detailed steps on isolating or cohorting of sick residents.
18	Which documents contain detailed, written steps on isolating or cohorting sick residents?	0. Bathroom Cleaning 1. General cleaning/ Housekeeping 2. Laundry 3. Dress Code 4. Fingernail grooming 5. Jewelry 6. Hand Hygiene 7. Body Fluid Clean-up 8. Incontinence Care 9. Infection Control 10. Outbreak Management 11. Personal Protective Equipment 12. No isolation or cohorting procedures 13. Other, please specify	List all documents that include a procedure on separating sick residents from others to prevent the spread of infectious diseases.	Coders determine all of the documents that include procedures on isolating or cohorting sick residents.
19	Are there detailed, written	0. Uncertain 1. Yes	If there are detailed, written instructions on	Coders determine

	steps for assigning specific staff to care for sick residents?	2. No 3. No outbreak management policy	assigning specific staff to care for sick residents, the answer must be yes.	whether there are detailed procedures on assigning specific staff to care for sick residents.
20	Which documents contain detailed, written steps on assigning specific staff to care for sick residents?	0. Bathroom Cleaning 1. General cleaning/ Housekeeping 2. Laundry 3. Dress Code 4. Fingernail grooming 5. Jewelry 6. Hand Hygiene 7. Body Fluid Clean-up 8. Incontinence Care 9. Infection Control 10. Outbreak Management 11. Personal Protective Equipment 12. No procedure on assigning specific staff to sick residents 13. Other, please specify	List all documents that include detailed, written steps on assigning specific staff to care for sick residents.	Coders determine all of the documents that include detailed, written steps on assigning specific staff to care for sick residents.
21	Are there detailed, written steps for ceasing the transfer of sick residents between wards or to other facilities?	0. Uncertain 1. Yes 2. No 3. No outbreak management policy	If there are detailed, written instructions on not transferring sick residents between wards or to other facilities, the answer must be yes.	Coders determine whether there are detailed procedures on ceasing the transfer of sick residents between wards or to other facilities.
22	Which documents contain detailed, written steps on ceasing the transfer of sick residents?	0. Bathroom Cleaning 1. General cleaning/ Housekeeping 2. Laundry 3. Dress Code 4. Fingernail grooming 5. Jewelry 6. Hand Hygiene 7. Body Fluid Clean-up 8. Incontinence Care 9. Infection Control 10. Outbreak Management 11. Personal Protective Equipment 12. No procedure on	List all documents that include detailed, written steps on not transferring sick residents between wards or to other facilities.	Coders determine all of the documents that include procedures on not transferring sick residents between wards or to other facilities.

		ceasing the transfer of sick residents 13. Other, please specify		
23	Are there detailed, written steps for excluding visitors during an outbreak?	0. Uncertain 1. Yes 2. No 3. No outbreak management policy	If there are detailed, written instructions on excluding visitors during an outbreak, the answer must be yes.	Coders determine whether there are detailed procedures on excluding visitors during an outbreak.
24	Which documents contain detailed, written steps on excluding visitors during an outbreak?	0. Bathroom Cleaning 1. General cleaning/ Housekeeping 2. Laundry 3. Dress Code 4. Fingernail grooming 5. Jewelry 6. Hand Hygiene 7. Body Fluid Clean-up 8. Incontinence Care 9. Infection Control 10. Outbreak Management 11. Personal Protective Equipment 12. No visitor exclusion procedures 13. Other, please specify	List all documents that include detailed, written steps on excluding visitors during an outbreak.	Coders determine all of the documents that include procedures on excluding visitors during an outbreak.
25	Are there detailed, written steps for restricting visitors during an outbreak?	0. Uncertain 1. Yes 2. No 3. No outbreak management policy	If there are detailed, written instructions on restricting visitors during an outbreak, the answer must be yes.	Coders determine whether there are detailed procedures on restricting visitors during an outbreak.
26	Which documents contain detailed, written steps on restricting visitors during an outbreak?	0. Bathroom Cleaning 1. General cleaning/ Housekeeping 2. Laundry 3. Dress Code 4. Fingernail grooming 5. Jewelry 6. Hand Hygiene 7. Body Fluid Clean-up 8. Incontinence Care 9. Infection Control 10. Outbreak Management 11. Personal Protective Equipment	List all documents that include detailed, written steps on restricting visitors during an outbreak.	Coders determine all of the documents that include procedures on restricting visitors during an outbreak.

		12. No visitor restriction procedures 1. Other, please specify		
27	Are there detailed, written steps for screening visitors for symptoms of illness before allowing them into the facility?	0. Uncertain 1. Yes 2. No 3. No outbreak management policy	If there are detailed, written instructions on screening visitors for symptoms of illness before allowing them into the facility, the answer must be yes.	Coders determine whether there are detailed procedures on screening visitors for symptoms of illness before allowing them into the facility.
28	Which documents contain detailed, written steps for screening visitors for symptoms of illness?	0. Bathroom Cleaning 1. General cleaning/ Housekeeping 2. Laundry 3. Dress Code 4. Fingernail grooming 5. Jewelry 6. Hand Hygiene 7. Body Fluid Clean-up 8. Incontinence Care 9. Infection Control 10. Outbreak Management 11. Personal Protective Equipment 12. No procedure on screening visitors for symptoms of illness 13. Other, please specify	List all documents that include detailed, written steps on screening visitors for symptoms of illness before allowing them into the facility.	Coders determine all of the documents that include procedures on screening visitors for symptoms of illness before allowing them into the facility.
29	Are there detailed, written steps for communicating with visitors during an outbreak?	0. Uncertain 1. Yes 2. No 3. No outbreak management policy	If there are detailed, written instructions on communicating with visitors during an outbreak, the answer must be yes.	Coders determine whether there are detailed procedures on communicating with visitors during an outbreak.
30	Which documents contain detailed, written steps for communicating with visitors during an outbreak?	0. Bathroom Cleaning 1. General cleaning/ Housekeeping 2. Laundry 3. Dress Code 4. Fingernail grooming 5. Jewelry 6. Hand Hygiene 7. Body Fluid Clean-up 8. Incontinence Care	List all documents that include detailed, written steps on communicating with visitors during an outbreak.	Coders determine all of the documents that include procedures on communicating with visitors during an outbreak.

		9. Infection Control 10. Outbreak Management 11. Personal Protective Equipment 12. No procedures for communicating with visitors during an outbreak 13. Other, please specify		
31	Are there detailed, written steps for excluding sick staff?	0. Uncertain 1. Yes 2. No 3. No outbreak management policy	If there are detailed, written instructions on excluding sick workers, the answer must be yes.	Coders determine whether there are detailed procedures on excluding sick workers.
32	Which documents contain detailed, written steps for excluding sick staff?	0. Bathroom Cleaning 1. General cleaning/ Housekeeping 2. Laundry 3. Dress Code 4. Fingernail grooming 5. Jewelry 6. Hand Hygiene 7. Body Fluid Clean-up 8. Incontinence Care 9. Infection Control 10. Outbreak Management 11. Personal Protective Equipment 12. No staff exclusion procedure 13. Other, please specify	List all documents that include detailed, written steps on excluding sick staff.	Coders determine all of the documents that include procedures on excluding sick staff.
33	When are workers allowed to return to work after being sick?	0. Uncertain 1. After resolution of symptoms 2. 24 hours after resolution of symptoms 3. 48 hours after resolution of symptoms 4. 48-72 hours after resolution of symptoms 5. None 6. No staff exclusion procedure 7. Other	If the steps for excluding sick staff include duration, how long after being sick are workers allowed to return to work.	Coders determine how long after being sick the exclusion procedures allow workers to return to work.

Environmental Sanitation:

General Cleaning and Sanitation

#	Question	Response Options	Operational Definition	Methodology
34	Is there a stand-alone cleaning/ sanitation policy?	0. Uncertain 1. Yes 2. No	If there is a stand-alone statement of intent describing procedures on how to clean, sanitize, or disinfect, the answer must be yes.	Coders determine whether there is a stand-alone cleaning/sanitation policy. Exact language is not necessary and coders must interpret the intent of the document.
35	Is the cleaning/ sanitation policy labeled "policy"?	0. Uncertain 1. Yes 2. No 3. No cleaning/ sanitation policy	If there is a cleaning/sanitation policy, is the policy actually labeled as "policy"?	Coders determine whether the cleaning/sanitation policy is labeled "policy".
36	Are there detailed, written steps for cleaning surfaces with soap and water?	0. Uncertain 1. Yes 2. No 3. No cleaning/ sanitation policy	If there are detailed, written instructions on cleaning surfaces with soap and water, the answer is yes.	Coders determine whether there is a procedure on cleaning surfaces with soap and water.
37	Which documents contain detailed, written steps for cleaning surfaces with soap and water?	0. Bathroom Cleaning 1. General cleaning/ Housekeeping 2. Laundry 3. Dress Code 4. Fingernail grooming 5. Jewelry 6. Hand Hygiene 7. Body Fluid Clean-up 8. Incontinence Care 9. Infection Control 10. Outbreak Management 11. Personal Protective Equipment 12. No procedure for cleaning surfaces with soap and water	List all documents that include detailed, written steps on cleaning surfaces with soap and water.	Coders determine all of the documents that include procedures on cleaning surfaces with soap and water.

		13. Other, please specify		
38	Are there detailed, written steps for sanitizing surfaces?	0. Uncertain 1. Yes 2. No 3. No cleaning/ sanitation policy	If there are detailed, written instructions on sanitizing surfaces, the answer is yes.	Coders determine whether there is a procedure on sanitizing surfaces.
39	Which documents contain detailed, written steps for sanitizing surfaces?	0. Bathroom Cleaning 1. General cleaning/ Housekeeping 2. Laundry 3. Dress Code 4. Fingernail grooming 5. Jewelry 6. Hand Hygiene 7. Body Fluid Clean-up 8. Incontinence Care 9. Infection Control 10. Outbreak Management 11. Personal Protective Equipment 12. No sanitizing procedure 13. Other, please specify	List all documents that include detailed, written steps on sanitizing surfaces.	Coders determine all of the documents that include procedures on sanitizing surfaces.
40	Are there detailed, written steps for disinfecting surfaces?	0. Uncertain 1. Yes 2. No 3. No cleaning/ sanitation policy	If there are detailed, written instructions on disinfecting surfaces, the answer is yes.	Coders determine whether there is a procedure on disinfecting surfaces.
41	Which documents contain detailed, written steps for disinfecting surfaces?	0. Bathroom Cleaning 1. General cleaning/ Housekeeping 2. Laundry 3. Dress Code 4. Fingernail grooming 5. Jewelry 6. Hand Hygiene 7. Body Fluid Clean-up 8. Incontinence Care 9. Infection Control 10. Outbreak Management 11. Personal Protective Equipment 12. No disinfecting procedure 13. Other, please specify	List all documents that include detailed, written steps on disinfecting surfaces.	Coders determine all of the documents that include procedures on disinfecting surfaces.
42	Is cleaning before sanitizing/	0. Uncertain 1. Yes 2. No	If the sanitizing/disinfecting steps suggest cleaning	Coders determine whether the

	disinfecting surfaces mentioned?	3. No sanitizing/ disinfecting procedure	surfaces before applying the sanitizer/disinfectant, the answer is yes.	sanitizing/disinfecting procedure suggests cleaning surfaces before sanitizing/disinfecting them.
43	What type of sanitizer is suggested?	0. Uncertain 1. Chlorine bleach 2. Quaternary ammonia 3. Iodine/iodophor 4. Alcohol 5. Glutaraldehyde 6. Hydrogen peroxide 7. Phenolic compound 8. EPA registered disinfectant 9. None 10. Does not specify 11. No sanitizing procedure 4. Other, please specify	If the procedure recommends any type of sanitizer, list all sanitizers that it recommends.	Coders determine whether the procedure suggests using a type of sanitizer and selects the type(s) of sanitizer(s) to be used. Some interpretation may be required.
44	If bleach is used as a sanitizer, what concentration is stated?	0. Uncertain 1. Less than 50 ppm 2. 50-249 ppm 3. 250-449 ppm 4. 450-649 pm 5. 650-849 ppm 6. 850-1049 ppm 7. More than 1050 ppm 8. None 9. No sanitizing procedure 10. Other	If the procedure recommends using a certain concentration of bleach solution to sanitize, list the concentration stated.	Coders determine whether the procedure suggests using a certain concentration of bleach solution to sanitize and lists the concentration stated.
45	What type of disinfectant is suggested?	0. Uncertain 1. Chlorine bleach 2. Quaternary ammonia 3. Iodine/iodophor 4. Alcohol 5. Glutaraldehyde 6. Hydrogen peroxide 7. Phenolic compound 8. EPA registered disinfectant 9. None 10. Does not specify 11. No disinfecting procedure 12. Other	If the procedure recommends any type of disinfectant, list all disinfectants that it recommends.	Coders determine whether the procedure suggests using a type of disinfectant and selects the type(s) of disinfectant(s) to be used. Some interpretation may be required.

46	If bleach is used as a disinfectant, what concentration is stated?	0. Uncertain 1. Less than 50 ppm 2. 50-249 ppm 3. 250-449 ppm 4. 450-649 pm 5. 650-849 ppm 6. 850-1049 ppm 7. More than 1050 ppm 8. None 9. No disinfecting procedure 0. Other, please specify	If the procedure recommends using a certain concentration of bleach solution to disinfect, list the concentration stated.	Coders determine whether the procedure suggests using a certain concentration of bleach solution to disinfect and lists the concentration stated.
47	Does the procedure suggest paying extra attention to cleaning and sanitizing/ disinfecting high-touch surfaces?	0. Uncertain 1. Yes 2. No 3. No cleaning/ sanitation policy	If there are detailed, written instructions on paying particular attention to cleaning and sanitizing/disinfecting high-touch surfaces (door knobs, hand rails, etc.), the answer is yes.	Coders determine whether there is a procedure on paying particular attention to cleaning and sanitizing/disi nfecting high-touch surfaces.

Environmental Sanitation:

Cleaning-up Bodily Fluids

#	Question	Response Options	Operational Definition	Methodology
48	Is there a stand-alone policy for cleaning up bodily fluids?	0. Uncertain 1. Yes 2. No	If there is a stand-alone statement of intent describing procedures on cleaning up blood, vomit, fecal matter or urine, the answer is yes.	Coders determine whether there is a stand-alone policy for cleaning up bodily fluids.
49	Is the body fluid clean-up policy labeled "policy"?	0. Uncertain 1. Yes 2. No 3. No body fluid clean-up policy	If there is a body fluid clean-up policy, is the policy actually labeled as "policy"?	Coders determine whether the body fluid clean-up policy is labeled "policy".
50	Are there detailed, written steps for cleaning up bodily fluids?	0. Uncertain 1. Yes 2. No 3. No bodily fluid clean-up policy	If there are detailed, written instructions on cleaning up blood, vomit, fecal matter or urine, the answer is yes.	Coders determine whether there are detailed procedures on cleaning up bodily fluids.

51	Are the detailed, written steps for bodily fluid clean-up labeled "procedures"?	0. Uncertain 1. Yes 2. No 3. No procedures on cleaning up bodily fluids	If there are detailed, written instructions on bodily fluid clean-up, are they labeled "procedure"?	Coders determine whether the written bodily fluid clean-up instructions are labeled "procedures".
52	Which documents contain detailed, written steps for cleaning up bodily fluids?	0. Bathroom Cleaning 1. General cleaning/ Housekeeping 2. Laundry 3. Dress Code 4. Fingernail grooming 5. Jewelry 6. Hand Hygiene 7. Body Fluid Clean-up 8. Incontinence Care 9. Infection Control 10. Outbreak Management 11. Personal Protective Equipment 12. No procedure on cleaning up bodily fluids 13. Other, please specify	List all documents that include detailed, written steps on cleaning up bodily fluids.	Coders determine all of the documents that include procedures on cleaning up bodily fluids.
53	What types of personal protective equipment are recommended for cleaning up bodily fluids?	0. Uncertain 1. Gloves 2. Mask 3. Gown 4. Hair cover 5. Shoe covers 6. None 7. No procedure on cleaning up bodily fluids 8. Other, please specify	If the procedure suggests using any type of personal protective equipment (gloves, gown, mask, hair cover, shoe covers) to clean-up bodily fluids, then list the types of PPE recommended.	Coders determine whether the procedure suggests using personal protective equipment while cleaning up bodily fluids and lists the types of PPE recommended.
54	Does the procedure include washing surfaces contaminated with bodily fluids using soap and water?	0. Uncertain 1. Yes 2. No 3. No procedure on cleaning up bodily fluids	If the procedure includes cleaning the contaminated surface with soap and water, the answer is yes.	Coders determine whether the procedure suggests cleaning contaminated surfaces with soap and water.
55	Does the procedure include	0. Uncertain 1. Yes 2. No	If the procedure suggests sanitizing surfaces	Coders determine whether the

	sanitizing surfaces contaminated with bodily fluids?	3. No procedure on cleaning up bodily fluids	contaminated with bodily fluids after cleaning, the answer is yes.	procedure suggests sanitizing surfaces contaminated with bodily fluids after cleaning
56	What type of sanitizer is suggested?	0. Uncertain 1. Chlorine bleach 2. Quaternary ammonia 3. Iodine/iodophor 4. Alcohol 5. Glutaraldehyde 6. Hydrogen peroxide 7. Phenolic compound 8. EPA registered disinfectant 9. None 10. Does not specify 11. No sanitizing procedure 12. No procedure on cleaning up bodily fluids 13. Other, please specify	If the body fluid clean-up procedure recommends any type of sanitizer, list all sanitizers that it recommends.	Coders determine whether the body fluid clean-up procedure suggests using a type of sanitizer and selects the type(s) of sanitizer(s) to be used. Some interpretation may be required.
57	If bleach is used as a sanitizer, what concentration is stated?	0. Uncertain 1. Less than 100 ppm 2. 100-499 ppm 3. 500-999 ppm 4. 1000-1999 ppm 5. 2000-2999 ppm 6. 3000-3999 ppm 7. 4000-4999 ppm 8. More than 5000 ppm 9. None 10. No sanitizing procedure 11. No procedure on cleaning up bodily fluids 12. Other, please specify	If the bodily fluid clean-up procedure recommends using a certain concentration of bleach solution to sanitize, list the concentration stated.	Coders determine whether the bodily fluid clean-up procedure suggests using a certain concentration of bleach solution to sanitize and lists the concentration stated.
58	Does the procedure include disinfecting surfaces contaminated with bodily fluids?	0. Uncertain 1. Yes 2. No 3. No procedure on cleaning up bodily fluids	If the bodily fluid clean-up procedure suggests disinfecting contaminated surfaces after cleaning, the answer is yes.	Coders determine whether the bodily fluid clean-up procedure suggests disinfecting after cleaning.

59	What type of disinfectant is suggested?	0. Uncertain 1. Chlorine bleach 2. Quaternary ammonia 3. Iodine/iodophor 4. Alcohol 5. Glutaraldehyde 6. Hydrogen peroxide 7. Phenolic compound 8. EPA registered disinfectant 9. None 10. Does not specify 11. No disinfecting procedure 12. No procedure on cleaning up bodily fluids 13. Other, please specify	If the body fluid clean-up procedure recommends any type of disinfectant, list all disinfectants that it recommends.	Coders determine whether the body fluid clean-up procedure suggests using a type of disinfectant and selects the type(s) of disinfectant(s) to be used. Some interpretation may be required.
60	If a bleach solution is used as a disinfectant, what concentration is stated?	0. Uncertain 1. Less than 100 ppm 2. 100-499 ppm 3. 500-999 ppm 4. 1000-1999 ppm 5. 2000-2999 ppm 6. 3000-3999 ppm 7. 4000-4999 ppm 8. More than 5000 ppm 9. None 10. No disinfecting procedure 11. No procedure on cleaning up bodily fluids 12. Other, please specify	If the bodily fluid clean-up procedure suggests using a certain concentration of bleach to disinfect, list the concentration stated.	Coders determine whether the bodily fluid clean-up procedure suggests using a certain concentration of bleach solution to disinfect and lists the concentration stated.

Personal Hygiene

#	**Question**	**Response Options**	**Operational Definition**	**Methodology**
61	Is there a stand-alone policy on dress code?	0. Uncertain 1. Yes 2. No	If there is a stand-alone statement of intent describing procedures on what to wear while working in the facility, the answer must be yes.	Coders determine whether there is a stand-alone policy for any type of dress code.
62	Is the dress code policy labeled "policy"?	0. Uncertain 1. Yes 2. No 3. No dress code	If there is a policy on dress code, is the policy actually labeled as "policy"?	Coders determine whether the dress code policy is labeled "policy".

63	Does the dress code require workers' clothing to be clean and neat?	0. Uncertain 1. Yes 2. No 3. No dress code	If the dress code requires workers' clothing to be clean and neat in appearance, the answer is yes.	Coders determine whether the dress code requires workers' clothing to be clean and neat.
64	Are there requirements for wearing jewelry?	0. Uncertain 1. Yes 2. No 3. No dress code	If there are detailed, written requirements on what type of jewelry is allowed while working in the facility, the answer must be yes.	Coders determine whether there are detailed requirements for wearing jewelry.
65	Which documents contain requirements for wearing jewelry?	0. Bathroom Cleaning 1. General cleaning/ Housekeeping 2. Laundry 3. Dress Code 4. Fingernail grooming 5. Jewelry 6. Hand Hygiene 7. Body Fluid Clean-up 8. Incontinence Care 9. Infection Control 10. Outbreak Management 11. Personal Protective Equipment 12. No requirements on jewelry 13. Other, please specify	List all documents that include requirements for wearing jewelry.	Coders determine all of the documents that include requirements for wearing jewelry.
66	What types of jewelry are allowed to be worn?	0. Uncertain 1. Plain wedding band only 2. Wedding set/ engagement ring 3. Other rings 4. Watch 5. Stud earrings only 6. Other earrings 7. Necklace 8. Bracelet 9. None 10. No requirements on jewelry 11. Other	If jewelry is allowed to be worn, then list all types allowed.	Coders determine whether wearing jewelry is allowed and selects the types allowed.

67	Are there detailed, written steps for fingernail grooming?	0. Uncertain 1. Yes 2. No 3. No dress code	If there are detailed, written instructions on fingernail grooming, the answer must be yes.	Coders determine whether there are detailed procedures for fingernail grooming.
68	Which documents contain detailed, written steps for fingernail grooming?	0. Bathroom Cleaning 1. General cleaning/ Housekeeping 2. Laundry 3. Dress Code 4. Fingernail grooming 5. Jewelry 6. Hand Hygiene 7. Body Fluid Clean-up 8. Incontinence Care 9. Infection Control 10. Outbreak Management 11. Personal Protective Equipment 12. No fingernail grooming procedure 13. Other, please specify	List all documents that include detailed, written steps for fingernail grooming.	Coders determine all of the documents that include procedures for fingernail grooming.
69	Does the procedure require workers to keep their fingernails trimmed and maintained?	0. Uncertain 1. Yes 2. No 3. No fingernail grooming procedure	If the procedure requires workers to keep their fingernails trimmed, filed, and maintained so the edges are cleanable and not rough, the answer is yes.	Coders determine whether the procedure requires workers to keep their fingernails trimmed and maintained.
70	Are workers allowed to wear fingernail polish?	0. Uncertain 1. Yes 2. No 3. No fingernail grooming procedure	If the procedure allows workers to wear fingernail polish, the answer is yes.	Coders determine whether the procedure allows workers to wear fingernail polish.
71	Are workers allowed to wear artificial fingernails?	0. Uncertain 1. Yes 2. No 3. No fingernail	If the procedure allows workers to wear artificial fingernails, the answer is yes.	Coders determine whether the procedure

		grooming procedure		allows workers to wear artificial fingernails.

Laundry

#	Question	Response Options	Operational Definition	Methodology
72	Is there a stand-alone laundry policy?	0. Uncertain 1. Yes 2. No	If there is a stand-alone statement of intent describing procedures on how to handle and wash laundry, the answer must be yes.	Coders determine whether there is a discrete policy for any type of laundry.
73	Is the laundry policy labeled "policy"?	0. Uncertain 1. Yes 2. No 3. No laundry policy	If there is a policy on laundry, is the policy actually labeled as "policy"?	Coders determine whether the laundry policy is labeled "policy".
74	Are there detailed, written steps for separating laundry soiled by bodily fluids from all other laundry?	0. Uncertain 1. Yes 2. No 3. No laundry policy	If there are detailed, written steps for separating laundry soiled with bodily fluids from all other laundry, the answer must be yes.	Coders determine whether there are detailed, written steps for separating laundry soiled with bodily fluids from all other laundry.
75	Which documents contain detailed, written steps for separating soiled laundry from other laundry?	0. Bathroom Cleaning 1. General cleaning/ Housekeeping 2. Laundry 3. Dress Code 4. Fingernail grooming 5. Jewelry 6. Hand Hygiene 7. Body Fluid Clean-up 8. Incontinence Care 9. Infection Control 10. Outbreak Management 11. Personal Protective Equipment 12. No laundry policy 13. Other, please specify	List all documents that include detailed, written steps for separating soiled laundry for all other laundry.	Coders determine all of the documents that include procedures for separating soiled laundry.

76	What types of PPE are recommended when handling soiled laundry?	0. Uncertain 1. Gloves 2. Mask 3. Gown 4. Hair cover 5. Shoe covers 6. None 7. No laundry policy 8. Other, please specify	If the procedure suggests staff wear appropriate personal protective equipment while handling soiled laundry, list all the types recommended.	Coders determine whether the procedure suggests staff wear appropriate personal protective equipment when handling soiled laundry and list the types recommended.
77	Does the procedure require handling soiled laundry carefully, without agitation?	0. Uncertain 1. Yes 2. No 3. No laundry policy	If the procedure requires staff to handle soiled laundry carefully and without agitation, the answer is yes.	Coders determine whether the procedure requires staff to handle soiled laundry carefully and without agitation.
78	Are there detailed, written steps on how to wash laundry?	0. Uncertain 1. Yes 2. No 3. No laundry policy	If there are detailed, written instructions on washing laundry, the answer must be yes.	Coders determine whether there are detailed procedures on washing laundry.
79	Which documents contain detailed, written steps on how to wash laundry?	0. Bathroom Cleaning 1. General cleaning/ Housekeeping 2. Laundry 3. Dress Code 4. Fingernail grooming 5. Jewelry 6. Hand Hygiene 7. Body Fluid Clean-up 8. Incontinence Care 9. Infection Control 10. Outbreak Management 11. Personal Protective Equipment 12. No procedure on how to wash laundry 13. Other, please specify	List all documents that include detailed, written steps for how to wash laundry.	Coders determine all of the documents that include procedures for how to wash laundry.

80	What temperature does the procedure recommend?	0. Uncertain 1. Less than 50°F(°10C) 2. 51-100°F (10.5-37.8°C) 3. 101-150°F (38.3-65.5°C) 4. 151-200°F (66.1-93.3°C) 5. More than 201°F(93.9°C) 6. None 7. No procedure on how to wash laundry 8. Other, please specify	Temperature that the procedure recommends for washing laundry.	Coders determine whether a temperature is recommended for washing laundry, and if so, what temperature is recommended.
81	Does the procedure suggest adding a sanitizing agent?	0. Uncertain 1. Yes 2. No 3. No procedure on how to wash laundry	If the procedure suggests adding a sanitizing agent to the wash or rinse cycles, the answer must be yes.	Coders determine whether the procedure suggests adding a sanitizing agent to the wash or rinse cycles.
82	What type of sanitizing agent is suggested?	0. Uncertain 1. Chlorine bleach 2. Quaternary ammonia 3. Iodine/iodophor 4. Alcohol 5. Glutaraldehyde 6. Hydrogen peroxide 7. Phenolic compound 8. EPA registered disinfectant 9. None 10. Does not specify 12. No procedure on how to wash laundry 13. Other, please specify	If the laundry washing procedure recommends any type of sanitizing agent, list all agents that it recommends.	Coders determine whether the laundry washing procedure suggests using sanitizing agent and selects the type(s) of agent(s) to be used. Some interpretation may be required.
83	If the procedure recommends adding bleach, what concentration is suggested?	0. Uncertain 1. Less than 49 ppm 2. 50-150 ppm 3. More than 151 ppm 4. None 5. No procedure on how to wash laundry 6. Other, please specify	If the procedure suggests adding bleach to the wash or rinse cycles, then list the concentration is suggested.	Coders determine whether the procedure suggests adding bleach to the wash or rinse cycles, and at what concentration.

Readability

#	Question	Response Options	Operational Definition	Methodology
84/ 110	Does the policy address one person instead of a group of people?	0. Uncertain 1. Yes 2. No 3. No policy 4. Comments	If the policy addresses an individual rather than a group, the answer is yes. This is achieved by using singular verbs instead of plural and by addressing the reader directly instead of using "his or her" or "he or she".	Coders determine whether the policy addresses one person rather than a group.
85/ 111	Does the policy use useful headings that accurately reflect the information that follows them?	0. Uncertain 1. Yes 2. No 3. No headings 4. No policy 5. Comments	If the policy breaks the narrative up by using useful headings that accurately reflect the materials that follows them, the answer is yes.	Coders determine whether the policy uses useful headings that accurately reflect the material that follows them to break up the narrative.
86/ 112	Is the policy written in short sections?	0. Uncertain 1. Yes 2. No 3. No policy	If the policy is broken up into short sections rather than one long block of writing, the answer is yes.	Coders determine whether the policy is broken up into short sections rather than one long block of writing.
87/ 113	Does the policy use active voice?	0. Uncertain 1. Yes 2. No 3. No policy 4. Comments	If the subjects of sentences perform the action expressed in the verb, the answer is yes. Usually in active sentences the subject (person or agency) comes before the verb. Ex: *The company* polluted the lake. NOT: *The lake* was polluted by the company.	Coders determine whether the subjects in sentences are performing the action expressed by the verb.

88/ 114	Does the policy use present tense verbs?	0. Uncertain 1. Yes 2. No 3. No policy 4. Comments	If the policy uses present tense verbs to make the policy more direct and forceful, the answer is yes. Ex: These sections *tell* you how to meet the requirements. NOT: These sections *describe types* of information *that would satisfy* the application requirements.	Coders determine whether the policy uses present tense verbs.
89/ 115	Does the policy avoid hidden verbs?	0. Uncertain 1. Yes 2. No 3. No policy 4. Comments	If the policy avoids using verbs converted into nouns such as those ending in -ment, -tion, -sion, and -ance which are often linked to verbs such as achieve, effect, give, have, make, reach, and take, the answer is yes. Ex: you *must apply* in writing before you file your tax return. NOT: you *must make an application* in writing before you file your tax return.	Coders determine whether the policy avoids using hidden verbs.
90/ 116	Does the policy use "must" to indicate requirements?	0. Uncertain 1. Yes 2. No 3. No policy	If the policy uses "must", "require", or "shall" to indicate something is required, the answer is yes.	Coders determine whether the policy uses "must" to indicate when something is required.
91/ 117	Does the policy use contractions when appropriate?	0. Uncertain 1. Yes 2. No 3. No contractions 4. No policy	If the policy uses contractions instead of the full form of words, the answer is yes.	Coders determine whether the policy use contractions instead of the full form of words.

92/ 118	Does the policy use pronouns to speak directly to the reader?	0. Uncertain 1. Yes 2. No 3. Implied "you" 4. No policy	If the policy uses pronouns such as "you" to address the reader or "we" to refer to the facility, the answer is yes.	Coders determine whether the policy is using pronouns to help the audience picture themselves in the text.
93/ 119	Does the policy use abbreviations correctly and sparingly?	0. Uncertain 1. Yes 2. No 3. No abbreviations 4. No policy 5. Comments	If the policy avoids using abbreviations that aren't defined and refers to the abbreviation consistently, the answer is yes.	Coders determine whether the policy uses abbreviations correctly and sparingly.
94/ 120	Does the policy use short, simple words?	0. Uncertain 1. Yes 2. No 3. No policy 4. Comments	If the policy uses familiar or frequently used words over unusual or obscure words, single words over many vague words, and short words over long words, the answer is yes.	Coders determine whether the policy uses short, simple words instead of obscure words.
95/ 121	Does the policy omit unnecessary words?	0. Uncertain 1. Yes 2. No 3. No policy 4. Comments	If the policy avoids using unnecessary words such as prepositions ("of", "to", "on", etc.), redundant words, excess modifiers (absolutely, actually, completely, really, quite, totally, and very), and doublets and triplets (repeating the same concept by using different words that mean the same thing), the answer is yes.	Coders determine whether the policy omits unnecessary words.
96/ 122	Does the policy minimize definitions?	0. Uncertain 1. Yes 2. No 3. No definitions 4. No policy 5. Comments	If the policy uses as few definitions as possible, defines words where they are used, and puts definition sections at the beginning or end of the policy, the answer is yes.	Coders determine whether the policy minimizes the use of definitions.

97/ 123	Does the policy use terms consistently?	0. Uncertain 1. Yes 2. No 3. No policy	If the policy uses terms consistently for a specific thought or object and avoids using synonyms, the answer is yes.	Coders determine whether the policy is using terms consistently.
98/ 124	Does the policy avoid using technical jargon?	0. Uncertain 1. Yes 2. No 3. No policy 4. Comments	If the policy avoids using unnecessarily complicated, technical language, the answer is yes.	Coders determine whether the policy uses unnecessarily complicated technical jargon.
99/ 125	Does the procedure use short sentences?	0. Uncertain 1. Yes 2. No 3. No policy	If the policy expresses only one idea in a sentence and avoids using long, complicated sentences, the answer is yes.	Coders determine whether the policy uses short, uncomplicated sentences.
100/126	Does the policy avoid double negatives?	0. Uncertain 1. Yes 2. No 3. No policy 4. Comments	If the policy avoids using double negatives and exceptions to exceptions, the answer is yes. When writing a sentence containing two negatives, they cancel each other out. Your sentence sounds negative, but is actually positive.	Coders determine whether the policy avoids using double negatives.
101/127	Do the paragraphs in the policy have topic sentences?	0. Uncertain 1. Yes 2. No 3. No paragraphs 4. No policy 5. Comments	If the paragraphs in the policy have topic sentences that tell the reader what they are going to read about, the answer is yes.	Coders determine whether the paragraphs in the policy have topic sentences.
102/128	Do the paragraphs in the policy use transition words?	0. Uncertain 1. Yes 2. No 3. No paragraphs 4. No policy 5. Comments	If the paragraphs in the policy use transition words that tell the audience whether the paragraph expands on the paragraph before, contrasts with it, or takes a completely different direction, the answer is yes.	Coders determine whether the paragraphs in the policy use transition words.

103/129	Does the policy use short paragraphs?	0. Uncertain 1. Yes 2. No 3. No paragraphs 4. No policy 5. Comments	If the policy uses short paragraphs of less than eight sentences, the answer is yes.	Coders determine whether the policy uses short paragraphs.
104/130	Do the paragraphs in the policy cover only one topic?	0. Uncertain 1. Yes 2. No 3. No paragraphs 4. No policy 5. Comments	If the paragraphs in the policy only cover one topic, the answer is yes.	Coders determine whether the paragraphs in the policy only cover one topic.
105/131	Does the policy use examples?	0. Uncertain 1. Yes 2. No 3. No policy	If the policy uses examples to clarify complex concepts, the answer is yes.	Coders determine whether the policy uses examples to clarify concepts.
106/132	Does the policy use lists?	0. Uncertain 1. Yes 2. No 3. No policy	If the policy uses vertical lists to highlight levels of importance, help the reader understand the order in which things happen, and clarify chronological order, the answer is yes.	Coders determine whether the policy uses vertical lists to highlight a series of requirements in a visually clear way.
107/133	Does the policy use tables?	0. Uncertain 1. Yes 2. No 3. No policy	If the policy uses tables to make complex ideas easier to understand, the answer is yes.	Coders determine whether the policy uses tables to make ideas more clear.
108/134	Does the policy use bold or italics to highlight important concepts?	0. Uncertain 1. Yes 2. No 3. No policy	If the policy uses bold or italics to make important concepts stand out but avoids capitalizing and underlining sentences, the answer is yes.	Coders determine whether the policy uses bold or italics to highlight important concepts.

109/135	Does the policy minimize cross-references?	0. Uncertain 1. Yes 2. No 3. No cross-references 4. No policy 5. Comments	If the policy minimizes the use of cross-references, the answer is yes.	Coders determine whether the policy minimizes the use of cross-references.

Appendix G

Readability Score Sheet Based on Plain Language Recommendations

#	Question	Readability Score	Plain language recommendation
	Organization (sub score = 4)		
1	Does the policy address one person instead of a group of people?	Yes = 2 Both = 1 No = 0	When you are writing speak to the one person who is reading it. It's more economical and has a greater impact.
	Does the policy use headings?	Yes= continue with question 2 No=0	
2	Does the heading that accurately reflects the information that follows them?	Yes = 1 No = 0	An effective way to reveal your document's organization is to use lots of useful headings.
3	Is the policy written in short sections?	Yes = 1 No = 0	Short sections break up material so it appears easier to comprehend.
	Verbs (sub score = 6)		
4	Does the policy use active voice?	Yes = 1 No = 0	Active voice makes it clear who is supposed to do what. It eliminates ambiguity about responsibilities.
5	Does the policy use present tense verbs?	Yes = 1 No = 0	The simplest and strongest form of a verb is present tense. A document written in the present tense is more immediate and less complicated.
6	Does the policy avoid hidden verbs?	Yes = 1 No = 0	Use the strongest, most direct form of the verb possible.
7	Does the policy use “must” to indicate requirements?	Yes = 1 No = 0	The word "must" is the clearest way to convey to your audience that they have to do something. Besides being outdated, "shall" is imprecise.
8	Does the policy use contractions when appropriate?	Yes = 2 No = 1 No contraction s= 0	"Write as you talk" is a common rule of writing readably, and the best way to do that is to use contractions. Use contractions with discretion.
	Nouns and Pronouns (sub score = 4)		

9	Does the policy use pronouns to speak directly to the reader?	Yes = 2 Implied “you” = 1 No = 0	Pronouns help the audience picture themselves in the text and relate better to your documents. More than any other single technique, using "you" pulls users into your document and makes it relevant to them.
10	Does the policy use abbreviations correctly and sparingly?	No abbreviations = 2 Yes = 1 No = 0	Find a simplified name for the entity you want to abbreviate. This gives readers meaningful content that helps them remember what you're talking about.
	Other Word Issues (sub score = 6)		
11	Does the policy use short, simple words?	Yes = 1 No = 0	Encourage writers to be more simple and direct in their style.
12	Does the policy omit unnecessary words?	Yes = 1 No = 0	Omit information that the audience doesn't need to know.
13	Does the policy minimize definitions?	No definitions = 2 Yes = 1 No = 0	We have ONE rule for dealing with definitions: use them rarely.
14	Does the policy use terms consistently?	Yes = 1 No = 0	You will confuse your audience if you use different terms for the same concept.
15	Does the policy avoid using technical jargon?	Yes = 1 No = 0	When we say not to use jargon, we're not advocating leaving out necessary technical terms, but we are saying to make sure your other language is as clear as possible.
	Sentences (sub score = 2)		
16	Does the procedure use short sentences?	Yes = 1 No = 0	Shorter sentences are also better for conveying complex information; they break the information up into smaller, easier-to-process units.
17	Does the policy avoid double negatives?	Yes = 1 No = 0	When we write in the negative, we place another stumbling block in audience's way and make it more difficult for them to understand us. Find a positive word to express your meaning.
	Paragraphs (sub score = 4)		

	Does the policy have paragraphs?	Yes = Continue to question 18 No = Skip to question 22	If the policy has one/more paragraphs answer is "yes". If answer is "yes" continue with below 4 questions.
18	Do the paragraphs in the policy have topic sentences?	Yes = 1 No = 0	Establish a context for your audience before you provide them with the details. A good topic sentence draws the audience into your paragraph.
19	Do the paragraphs in the policy use transition words?	Yes = 1 No = 0	A topic sentence may provide a transition from one paragraph to another.
20	Does the policy use short(less than eight sentence) paragraphs?	Yes = 1 No = 0	Long paragraphs discourage your audience from even trying to understand your material. Short paragraphs are easier to read and understand.
21	Do the paragraphs in the policy cover only one topic?	Yes = 1 No = 0	Limit each paragraph or section to one topic to make it easier for your audience to understand your information.
	Other Aids to Clarity (sub score = 6)		
22	Does the policy use examples?	Yes = 1 No = 0	Examples help you clarify complex concepts, even in regulations. They are an ideal way to help your readers.
23	Does the policy use lists?	Yes = 1 No = 0	Vertical lists highlight a series of requirements or other information in a visually clear way.
24	Does the policy use tables?	Yes = 1 No = 0	Tables help your audience see relationships that are often times hidden in dense text.
25	Does the policy use bold or italics to highlight important concepts?	Yes = 1 No = 0	Use bold and italics to make important concepts stand out.
26	Does the policy minimize cross-references?	No cross-references = 2 Yes = 1 No = 0	Nothing is more annoying than coming upon cross-references in reading material. Cross-references frustrate any attempt to write clearly and simply.