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## Major Article

## Remote infection control assessments in long-term care facilities during COVID-19 pandemic in Texas, 2020



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## Key Words:

SARS-CoV-2  
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**Background:** The Texas Department of State Health Services (DSHS) Healthcare Safety Unit (HCSU) conducts remote infection control assessments (tele-ICARs) in long-term care facilities (LTCFs) to evaluate COVID-19 infection prevention and control (IPC) knowledge and practices using a standardized assessment tool. Tele-ICARs are used to gauge different IPC measures specific to SARS-CoV-2 and are either proactive—conducted prior to identified cases—or responsive to an outbreak, which is defined as a new SARS-CoV-2 infection in any staff or any facility-onset infection in a resident. State and local partners use findings from the assessments to aid LTCFs by providing targeted and timely resources and support to mitigate identified gaps.

**Methods:** Data from tele-ICARs conducted between March 1 and October 30, 2020 were analyzed to assess major gaps across LTCF types. A major gap was defined as 10% or more of facilities not satisfying a specific IPC measure, excluding missing data. Gaps were also assessed by tele-ICAR type: proactive or responsive. Fisher's exact tests and univariate logistic regression were used to characterize significant associations between major IPC gaps and LTCF or tele-ICAR type.

**Results:** DSHS conducted tele-ICARs in 438 LTCFs in Texas during 8 months; 191 were nursing homes/skilled nursing facilities (NH/SNFs), 206 were assisted living facilities (ALFs) and 41 were other settings. Of the assessments, 264 were proactive and 174 responsive. Major gaps identified were: (1) 22% did not have a preference for alcohol-based hand sanitizer (ABHS) over soap and water; (2) 18.1% were not aware of the contact time for disinfectants in use; (3) 17.9% had not stopped resident communal dining; (4) 16.8% did not audit hand hygiene and PPE compliance; and (5) 11.8% had not stopped inter-facility group activities and extra-facility field trips. When restricting analyses to proactive tele-ICARs, one additional gap was identified: 11.1% of facilities lacked a dedicated space to care for or cohort residents with confirmed SARS-CoV-2 infection. Significantly more ALFs than NH/SNFs had not suspended resident communal dining ( $P < .001$ ) nor identified a dedicated space to cohort residents with confirmed SARS-CoV-2 infection ( $P < .001$ ). Significantly more LTCFs that received a responsive ICAR compared to a proactive ICAR reported a preference for ABHS over soap and water ( $P = .008$ ) and reported suspending communal dining ( $P < .001$ ) and group activities ( $P < .001$ ). Also, significantly more LTCFs that received a responsive ICAR compared to a proactive ICAR had identified a dedicated space to cohort residents with confirmed SARS-CoV-2 ( $P = .009$ ).

**Conclusions:** Increased facility education and awareness of federal and state guidelines for group activities and communal dining is warranted in Texas, emphasizing the importance of social distancing for preventing the transmission of SARS-CoV-2 in LTCFs, particularly ALFs. CDC recommendations for ABHS versus hand washing should be emphasized, as well as the importance of monitoring and auditing HCP hand hygiene and PPE compliance. Facilities may benefit from additional education and resources about disinfection, to ensure proper selection of disinfectants and understanding of the contact time required for efficacy. Analysis by tele-ICAR type suggests facilities may benefit from identifying space for dedicated COVID-19 units in advance

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of an outbreak in their facility. Conducting tele-ICARs in LTCFs enables public health agencies to provide direct and individualized feedback to facilities and identify state-wide opportunities for effective interventions in response to SARS-CoV-2.

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Residents of long-term care facilities (LTCF) are more vulnerable to infectious disease than the general population because of their older age and/or health status, and the fact that they live in congregate settings.<sup>1</sup> Different types of LTCFs include nursing homes and skilled nursing facilities (NH/SNF), assisted living facilities (ALF), independent living facilities (IL), state-supported living centers (SSLC), psychiatric hospitals (PH), ventilator-capable skilled nursing facilities, and intermediate care facilities for individuals with an intellectual disability (ICF-IID).

Gaps in infection prevention and control (IPC) in the LTCF context are well documented and include lack of knowledge of proper sanitizing and disinfecting products, insufficient hand hygiene policies, lack of written procedures for cleaning and disinfection, failure to designate staff or areas to care for residents with a known infection, failure to restrict visitors during an outbreak,<sup>2</sup> and a lack of IPC leadership (Gamage et al., 2012; Donlon et al., 2013).<sup>3,4</sup>

Notably, a 2020 US Government Accountability Office performance audit found that deficiencies in IPC were widespread and persistent in American nursing homes prior to the COVID-19 pandemic. In fact, IPC deficiencies were the most common type of deficiency in nursing homes cited by state surveyors, with 82% of all surveyed NH/SNF having an IPC deficiency cited in one or more years from 2013 to 2017 (GAO, 2020).<sup>5</sup>

The Centers for Medicare & Medicaid Services (CMS) oversees approximately 15,500 nursing homes and ensures these facilities meet federal quality standards. CMS partners with state survey agencies to monitor compliance with federal standards. In 2016, CMS mandated the establishment and maintenance of IPC programs in nursing homes, including the designation of one or more individuals as the facility's infection preventionist (IP), with a phased implementation from 2016 to 2019.<sup>6</sup>

The 2014 to 2016 Ebola outbreak and related US hospital preparedness activities helped to underscore the critical importance of public health Healthcare Associated Infections/Antimicrobial Resistance (HAI/AR) programs in addressing emerging infectious disease threats. Ebola preparedness activities were a catalyst for the Centers for Disease Control and Prevention (CDC) to develop a new IPC tool called the Infection Control Assessment & Response (ICAR) tool. ICARs for Ebola preparedness were conducted onsite to support healthcare facilities, including nursing homes that traditionally lack infection control expertise and represent a core competency and critical element of HAI/AR programs.<sup>7</sup> Infection control assessments using the ICAR tool represent a systematic way to assess a facility's IPC practices and identify gaps, enabling public health departments to provide guidance and recommendations to mitigate those gaps.

The ICAR tools were quickly adopted as part of the US COVID-19 response and modified into a remote ICAR (tele-ICAR) to increase outreach to facilities and public health capacity as the pandemic intensified. Remote ICARs by telephone and video proved to be efficient methods of assessing IPC interventions in New York SNFs, reaching an estimated 4 times as many facilities as on-site visits in a similar time frame.<sup>8</sup>

## TEXAS DEPARTMENT OF STATE HEALTH SERVICES COVID-19 RESPONSE

Texas has 254 counties and more hospitals and nursing homes than any other US state. The Texas Department of State Health

Services (DSHS) is divided into 8 public health regions (PHRs) which serve and have jurisdiction over Texas counties or cities without their own local health department. Prior to the COVID-19 pandemic, each PHR was assigned one epidemiologist with expertise in healthcare-associated infections (HAI epidemiologist) to provide IPC guidance to healthcare facilities. The need for IPC guidance quickly increased during the pandemic thus DSHS hired three additional HAI epidemiologists and contracted IPs to increase the state's HAI response capacity.

As part of the COVID-19 response, DSHS HAI epidemiologists and IPs conducted tele-ICARs to evaluate COVID-19 IPC knowledge and practices using a standardized assessment tool. IPC domains assessed in the context of COVID-19 in LTCF include: visitor restrictions; education, monitoring, and screening of healthcare personnel; education, monitoring, screening, and cohorting of residents; the availability of personal protective equipment (PPE) and other supplies; infection prevention and control practices; and communication (see Appendix for full list of measures included in the tele-ICAR tool). Each of these areas are critical to the success of an LTCF IPC program, which is designed and implemented to protect vulnerable LTCF residents from infectious disease.

Tele-ICARs were either proactive—conducted prior to identified cases in a facility—or responsive to an outbreak. Per CMS, an outbreak is defined as a new SARS-CoV-2 infection in any staff or any facility-onset infection in a resident (CMS 2020).<sup>9</sup> State and local partners use findings from the assessments to aid LTCFs by providing targeted and timely resources and support to mitigate identified IPC gaps, in turn preventing COVID-19 morbidity and mortality in LTCF resident populations.

The goals of this study were to use ICAR data to (1) investigate whether any differences exist between how different types of LTCFs adopted COVID-19 IPC measures; (2) assess whether there were any differences between ICAR type; and (3) determine how Texas DSHS should focus COVID-19 IPC education efforts for LTCFs.

To our knowledge, the literature contains few reports of the use of ICAR tools by public health departments to assess IPC in LTCFs. This study identifies major gaps in IPC practices that can be used to effectively direct public health support to LTCFs in the context of a global pandemic.

## METHODS

### Data and analyses

All Tele-ICARs conducted by HAI epidemiologists and IPs using the standardized tool between March 1 and October 30, 2020 were included in this study. Texas DSHS offered proactive tele-ICARs to LTCF within DSHS PHR jurisdictions that were not experiencing COVID-19 cases in an attempt to bolster IPC practices and pandemic preparedness. Texas DSHS offered responsive tele-ICARs to LTCFs that, as required, reported COVID-19 cases to the state, with the goal to contain and control COVID-19 outbreaks in those facilities. Participation in ICARs was voluntary; as such, not all LTCFs that were offered participated in the assessments, which were nonregulatory. ICARs were conducted over telephone with an average call duration lasting between 1 and 3 hours. ICARs were typically conducted with the facility administrator with other staff present as available and appropriate, including the Director and Assistant

Director of Nursing and/or the facility's designated IP. Within 2 weeks after each ICAR, DSHS prepared and emailed summary reports including recommendations and guidance to LTCFs. After responsive ICARs, DSHS maintained follow-up communication for at least 28 days since the facility's last COVID-19 case (2 incubation periods). When warranted, tele-ICARs were followed by onsite assessments.

Data from tele-ICARs were analyzed to assess major gaps across 6 LTCF types: NH/SNF, ALF, ICF-IID, IL, PH, and SSLC. A major gap was defined as 10% or more of facilities not satisfying a specific IPC measure, excluding missing data. Gaps were also assessed by tele-ICAR type: proactive or responsive.

For each IPC measure for which a major gap was identified across LTCF types, a Fisher's exact test was used to assess for an association between the measure and LTCF facility type as well as between the measure and tele-ICAR type. Fisher's exact test was chosen as an appropriate test given that the expected value for some cells does not satisfy the chi-square test assumption of five or higher (the cells for some facility type-response combinations have an expected frequency <5). An association was considered significant for 2-sided *P*-values ≤ .05.

When a significant association was identified between LTCF type and an IPC measure, a 2 × 2 Fisher's exact test was computed for each pairwise combination to identify which LTCF type was associated with the measure and to characterize the relationship. The combination of LTCF types and significant IPC measures identified in the overall Fisher's exact test resulted in 15 possible pairs. Testing each possible pair presented the statistical problem of multiple comparisons, in which the simultaneous testing of a large group of hypotheses can produce misleading results. The problem of multiple comparisons was corrected with a Bonferroni correction, which lowers the *P*-value threshold to account for the increased risk of a type I error when conducting multiple tests simultaneously. After applying the Bonferroni correction (0.05/15), an association was considered significant for 2-sided *P*-values < .003.

When a significant association was identified between tele-ICAR type and an IPC measure, logistic regression models were used to further characterize the relationship. SAS Studio 5.2, SAS Viya V.03.05 was used for all analyses.

**Table 2**  
Association between LTCF type and IPC measure

Facility type	ABHS <sup>1</sup> (N = 420)	Contact time <sup>2</sup> (N = 418)	Dining <sup>3</sup> (N = 411)	Auditing <sup>4</sup> (N = 399)	Group activities <sup>5</sup> (N = 407)	Cohorting <sup>6</sup> (N = 410)
Nursing home/ Skilled nursing facility	Y 140 N 43	Y 154 N 33	Y 174 N 17	Y 158 N 28	Y 175 N 13	Y 182 N 6
Assisted living	Y 155 N 43	Y 153 N 39	Y 141 N 50	Y 140 N 35	Y 161 N 29	Y 162 N 26
ICF-IID	Y 25 N 6	Y 30 N 1	Y 17 N 3	Y 29 N 1	Y 17 N 3	Y 26 N 1
Independent living	Y 2 N 1	Y 1 N 2	Y 2 N 1	Y 1 N 2	Y 2 N 1	Y 3 N 0
Psychiatric hospital	Y 1 N 0	Y 1 N 0	Y 0 N 2	Y 1 N 0	Y 0 N 2	Y 1 N 0
State supported living center	Y 4 N 0	Y 3 N 1	Y 4 N 0	Y 3 N 1	Y 4 N 0	Y 3 N 0
<b>P-value</b>	.87	.04*	<.001***	.03*	.002**	.006**

Analyses adjusted for exclusion of cases with missing data or those deemed not applicable, for which n < 438.

*P*-values are derived from two-sided Fisher's exact test:

\**P* ≤ .05.

\*\**P* ≤ .01.

\*\*\**P* ≤ .001. Y = Yes; N = No.

<sup>1</sup>Preference for alcohol-based hand sanitizer (ABHS) over soap and water.

<sup>2</sup>Awareness of contact time for disinfectants in use.

<sup>3</sup>Stopped resident communal dining.

<sup>4</sup>Auditing of hand hygiene and PPE compliance.

<sup>5</sup>Stopped inter-facility group activities and extra-facility field trips.

<sup>6</sup>Dedicated space to care for or cohort residents with confirmed SARS-CoV-2 infections.

**Table 1**  
Major infection prevention and control gaps identified in LTCF

IPC gap	Percent of LTCF with IPC gap
No preference for ABHS over soap and water	21.7
Lack of knowledge of disinfectant contact time	18.1
No cessation of resident communal dining	17.8
No auditing of hand hygiene and PPE compliance	16.8
No cessation of group activities and field trips	11.8
Lack of dedicated space for cohorting residents*	11.1

\*Facilities that received proactive tele-ICARs only.

## RESULTS

DSHS conducted 439 tele-ICARs in 428 unique LTCFs in Texas during the 8 months studied; 191 were nursing homes, 206 were assisted living facilities and 41 were other settings. Of the assessments, 264 were proactive and 174 responsive. Major gaps identified from both proactive and responsive tele-ICARs were: (1) 21.7% did not have a preference for alcohol-based hand sanitizer (ABHS) over soap and water; (2) 18.1% were not aware of the contact time for disinfectants in use; (3) 17.8% had not stopped resident communal dining; (4) 16.8% did not audit hand hygiene and PPE compliance; and (5) 11.8% had not stopped inter-facility group activities and extra-facility field trips. When restricting analyses to proactive tele-ICARs, one additional gap was identified: 11.1% of facilities lacked a dedicated space to care for or cohort residents with confirmed COVID-19 infections (Table 1). No additional gaps were identified for responsive tele-ICARs.

### Major infection prevention and control gaps in long-term care facilities

#### Associations between LTCF type and IPC measure

LTCF type was found to be significantly associated with 5 IPC measures related to SARS-CoV-2 (Table 2): whether the facility was aware of disinfectant contact time (*P* = .04); whether the facility had a dedicated space to care for SARS-CoV-2-positive residents (*P* = .006); whether the facility had stopped communal dining (*P* < .001); whether hand hygiene and PPE compliance were audited (*P* = .03); and whether the facility had stopped interfacility group activities and field trips outside of the facility (*P* = .002). The only

major gap identified in the initial analysis for which facility type was not significantly associated is whether the facility had a preference for ABHS over soap and water ( $P = .87$ ).

Tables S1-5 (see Supplemental Tables) summarize the results of  $2 \times 2$  Fisher's exact tests that were computed for each facility type pairwise combination for the five IPC measures with significant associations (Table 2). No significant associations were identified between LTCF type and awareness of disinfectant contact time, after the Bonferroni correction was applied to the p-values (Table S1).

Out of the 191 ALFs for which data were available, 50 (26.2%) had not stopped communal dining for residents at the time of the assessment. Of the 191 NH/SNFs for which data were available, only 17 (8.9%) had not stop resident communal dining. This difference was statistically significant after correcting for multiple comparisons ( $P < .001$ ; Table S2).

No significant associations were identified between LTCF type and auditing of compliance for hand hygiene and PPE, after the Bonferroni correction was applied to the P-values (Table S3). No significant associations were identified between LTCF type and the suspension of inter-facility group activities and field trips, after the Bonferroni correction was applied to the P-values (Table S4).

Of the 188 ALFs for which data were available, 26 (13.8%) did not identify a dedicated space to cohort residents with confirmed COVID-19. Of the same number of NH/SNFs for which data were available, only 6 (3.2%) had not identified a dedicated space to care for and cohort COVID-19 positive residents. This difference was statistically significant after correcting for multiple comparisons ( $P < .001$ ; Table S5). These analyses included facilities with both proactive and responsive assessments.

*Associations between assessment type and IPC measures*

Remote infection control assessment type was found to be associated with 4 out of the 6 IPC measures initially identified as a gap related to facility management of SARS-CoV-2 (Table 3). Of the 257 LTCFs for which data were available and that received a proactive ICAR, 189 (73.5%) had a preference for ABHS over soap and water, compared to 138 of 163 (84.7%) facilities that received a responsive ICAR ( $P = .008$ ). Significantly more LTCFs that received a responsive ICAR reported following this aspect of CDC hand hygiene guidance during the pandemic.

Of the 241 LTCFs for which data were available and that received a proactive ICAR, 185 (76.8%) had stopped resident communal dining compared to 153 of 170 (90.0%) facilities that received a responsive ICAR ( $P < .001$ ). Significantly more LTCFs that received a responsive ICAR reported following this aspect of CMS guidance for resident physical distancing.

**Table 3**  
Association between remote assessment type and IPC measure

Remote Infection Control Assessment type	ABHS <sup>†</sup> (N = 420)	Contact time <sup>‡</sup> (N = 418)	Dining <sup>¶</sup> (N = 411)	Auditing <sup>  </sup> (N = 399)	Group activities <sup>§</sup> (N = 407)	Cohorting <sup>††</sup> (N = 410)
Proactive	Y 189 N 68	Y 213 N 40	Y 185 N 56	Y 198 N 39	Y 201 N 39	Y 218 N 27
Responsive	Y 138 N 25	Y 129 N 36	Y 153 N 17	Y 134 N 28	Y 158 N 9	Y 159 N 6
<b>P-value</b>	.008**	.12	<.001***	.89	<.001***	.009**

Analyses adjusted for exclusion of cases with missing data or those deemed not applicable, for which  $n < 438$ .

P-values are derived from two-sided Fisher's exact test.

\* $P \leq .05$ .

\*\* $P \leq .01$ .

\*\*\* $P \leq .001$ . Y = Yes; N = No.

<sup>†</sup>Preference for alcohol-based hand sanitizer (ABHS) over soap and water.

<sup>‡</sup>Awareness of contact time for disinfectants in use.

<sup>¶</sup>Stopped resident communal dining.

<sup>||</sup>Auditing of hand hygiene and PPE compliance.

<sup>§</sup>Stopped inter-facility group activities and extra-facility field trips.

<sup>††</sup>Dedicated space to care for or cohort residents with confirmed SARS-CoV-2 infections.

Of the 240 LTCFs for which data were available and that received a proactive ICAR, 201 (83.8%) had stopped group activities and field trips compared to 158 of 167 facilities (94.6%) that received a responsive ICAR ( $P < .001$ ). Significantly more LTCFs that received a responsive ICAR reported following this aspect of CMS guidance for resident physical distancing.

Of the 245 facilities for which data were available and that received a proactive ICAR, 218 (89.0%) had identified a dedicated space for cohorting COVID-19 positive residents, compared to 159 of 165 (96.4%) facilities that received a responsive ICAR ( $P = .009$ ). Significantly more LTCFs that received a responsive ICAR reported following CDC guidance about resident cohorting in the context of an outbreak.

Univariate logistic regression confirms that facilities that received a proactive ICAR were less likely than those that received a responsive ICAR to have had a preference for ABHS over soap and water, to have stopped communal dining and group activities, and to have identified a dedicated space for the cohorting of SARS-CoV-2 positive residents (Table 4). The odds that a facility preferred ABHS were 0.5 lower for facilities that received a proactive ICAR compared to facilities that received a responsive ICAR. The odds that a facility stopped communal dining, stopped group activities, and dedicated a space for cohorting residents were 0.37, 0.29, and 0.31 lower, respectively, compared to facilities that received a responsive ICAR.

**DISCUSSION**

Residents of LTCFs are often more vulnerable to infectious disease than the general population due to their advanced age, multiple comorbidities, and living in close proximity.<sup>10</sup> In addition, deficiencies in IPC practices were widespread in US NH/SNF even prior to the COVID-19 pandemic. Typical barriers and challenges to implementing optimal IPC practices were compounded in the context of the pandemic; as such public health had to adapt and employ tools outside of the scope of traditional public health investigations and response. Rather than the traditional on-site ICAR, assessments were conducted remotely. Using data from 439 tele-ICARs conducted in LTCFs, this study assessed the largest gaps in IPC practices in Texas LTCFs during the first 8 months of the pandemic (defined as March 1–October 30, 2020).

During the same months, DSHS HAI epidemiologists and IPs conducted 108 on-site ICARs, of which 26 were proactive and 82 responsive. Similar to the estimate provided by Ostrowsky et al. in New York, Texas DSHS was able to reach approximately 4 times as many

**Table 4**  
Univariate logistic regression of ICAR type on IPC measure

	Coefficient (standard error)	Odds-ratio (confidence interval)	P-value
IPC measure			
Preference for ABHS	−0.69 (0.26)	0.50 (0.30–0.84)	.008**
Stop communal dining	−1.01 (0.30)	0.37 (0.21–0.66)	<.001***
Stop group activities	−1.23 (0.38)	0.29 (0.14–0.62)	.001**
Dedicated space for cohorting	−1.19 (0.46)	0.31 (0.1–0.8)	.01*

Univariate logistic regression modeling probability that IPC measure was reported “Yes” for proactive ICARs, with responsive ICAR category as a reference.

\* $P \leq .05$ .

\*\* $P \leq .01$ .

\*\*\* $P \leq .001$ .

LTCFs with remote assessments compared to on-site visits in the same time frame.<sup>8</sup>

Conducting on-site rather than remote assessments is recognized as more beneficial in some instances because in-person assessments are not prone to the same technical limitations that may limit remote ICARs and in-person ICARs typically permit the HAI epidemiologists and IPs to visualize more of the facility’s IPC practices.<sup>11</sup>

However, Texas DSHS HAI epidemiologists and IPs were still able to identify significant gaps in the facilities’ IPC practices via tele-ICARs. Tele-ICAR data were successfully used to provide LTCFs with tailored recommendations in real-time to mitigate identified gaps and protect their residents, staff, and communities. Also, remote assessments proved to have several benefits compared to on-site assessments, including promoting physical distancing to reduce exposure to COVID-19 to HAI epidemiologists and IPs (and vice versa to LTCFs) and eliminating drive-time to the facilities resulting in reduction of cost and increased productivity of the HAI epidemiologists and IPs. The tele-ICAR tool also proved to be easily adaptable in response to evolving COVID-19 IPC guidance (Ostrowsky et al., 2021).<sup>8</sup>

#### Major IPC gaps

The major IPC gaps identified in this study are in alignment with the findings of a systematic review of the causes of outbreaks in LTCFs, which identified inadequate hand hygiene and decontamination as common IPC gaps leading to transmission of infections.<sup>12</sup> Similarly, in the present study, the most common IPC gap identified across LTCF types was the lack of a preference for ABHS over soap and water (21.7%). CDC recommends that healthcare workers preferentially use ABHS in most clinical situations because ABHS are the most effective products for reducing the number of germs on the hands of healthcare providers.<sup>13</sup> However, in non-healthcare settings, CDC recommends the use of soap and water rather than hand sanitizer whenever possible<sup>14</sup>; this difference in recommendation between community and healthcare settings may contribute to the knowledge gap that LTCFs have on hand hygiene recommendations. The differences in recommendations for hand hygiene in the community versus healthcare setting is an area where Texas DSHS can focus education.

The second most common IPC gap identified across LTCF types was the lack of knowledge of contact times for disinfectants in use by LTCF housekeeping and nursing staff, with 18.1% of LTCFs reporting they were unaware of this critical IPC measure. Some disinfectant products have contact times up to 10 minutes, which may be impractical and difficult to abide by in a fast-moving crisis setting such as the COVID-19 pandemic in LTCFs. In the event that more efficient products with activity against SARS-CoV-2 cannot be obtained, some suggest a need for hazard communication regarding the extent to which disinfection may still be effective for infection prevention.<sup>15</sup>

Another challenge presented in the context of the pandemic in 2020 was a shortage of supplies. In a national assessment of the availability of PPE and IPC supplies during the first month of the pandemic, the Association for Professionals in Infection Control and Epidemiology COVID-19 task force found that fewer than half of facilities had sufficient disinfection supplies.<sup>16</sup> LTCFs had to purchase whichever effective disinfectants they could find, then retrain all staff the new manufacturer’s instructions for use, including contact time.

#### Associations between facility type and IPC measures

ALFs are designed to be a residence for individuals that need some assistance with their activities of daily living, but do not need total care such as in the NH/SNF setting. Some ALFs offer kitchenettes in their resident’s rooms, whereas NH/SNFs do not. Due to the higher level of independence in the ALF population, it is easier to accomplish physical distancing and adherence to source control during communal dining, which may be one reason ALFs did not suspend communal dining as often as NH/SNFs did.

Another reason why significantly more NH/SNFs than ALFs suspended communal dining may be the distinction in CDC recommendations for each facility type. At the beginning of the COVID-19 pandemic, the CDC recommended that nursing homes “Cancel all group activities and communal dining.”<sup>17</sup> This language appeared in CDC’s guidance from the period before or by April 3, 2020 until June 25, 2020, when verbiage was added to include considerations for when restrictions could be relaxed: “Allowing communal dining and group activities for residents without COVID-19, including those who have fully recovered while maintaining social distancing, source control measures, and limiting the numbers of residents who participate.” In the CDC COVID-19 guidelines for ALFs, canceling communal dining was worded less strongly, with the following statement appearing from the period before or by April 16, 2020 and not updated after May 29, 2020: “Instead of communal dining, consider delivering meals to rooms, creating a “grab n’ go” option for residents, or staggering mealtimes to accommodate social distancing while dining (eg, a single person per table).”<sup>18</sup>

Our data captured another significant difference in pandemic preparedness and response between ALFs and NH/SNFs: significantly more ALFs than NH/SNFs failed to designate a location in their facility for cohorting residents confirmed to have COVID-19.

Since it is much more common to have double/multiple occupancy rooms in NH/SNFs than in ALFs, creating a cohort unit in NH/SNFs was a recommended strategy to prevent transmission between discordant roommates (one positive, one negative). ALF residents often bring in personal furniture to their rooms which are viewed as more “apartment-like” than NH/SNF rooms.<sup>19</sup> Although there is still a benefit to creating a COVID-19 cohort unit in ALFs (ie, residents could be more easily cared for by dedicated staff), it was not always necessary if the facility had all private rooms and isolation could be accomplished without moving residents.

#### Associations between assessment type and IPC measures

The observed differences between IPC measures for proactive and responsive ICARs could simply be related to the fact that responsive ICARs were conducted for facilities that were already experiencing an outbreak; it makes sense that these facilities were more likely to have sought and followed CDC guidance before they reached the stage of DSHS assistance because they were in urgent need. Facilities that were in outbreak status while receiving an ICAR had already taken the necessary steps to isolate/cohort and keep residents physically distanced in an attempt to stop transmission.

## Limitations

ICARs were conducted by multiple DSHS HAI epidemiologists and IPs in a subset of Texas LTCFs. There was no inter-rater reliability performed to determine consistency of how the questions were asked and answers recorded. However, all DSHS HAI epidemiologists and IPs received the same training and used the same tool, standardizing ICAR assessments across LTCFs statewide and enabling comparability of results. Findings from these data are not generalizable to other facility types nor outside of Texas. Yet, other states and public health jurisdictions may benefit from utilizing a similar approach to assess and mitigate IPC gaps in LTCFs in their jurisdiction. Another important limitation is that there was no systematic evaluation of tele-ICAR outcomes; this assessment was not feasible in the context of the ongoing public health emergency but should be investigated for future work.

Fisher's exact and the Bonferroni correction are both conservative tests; as such, they increase the probability of missing true associations, yet substantially decrease the probability of falsely identifying an association where none exists. The combination of conservative statistical tests and low sample sizes for some facility types, which reduce power, suggests that some significant associations may not have been detected. Also, as mentioned previously, due to the lack of onsite and visual assessment during a tele-ICAR, the deficiencies in IPC reported verbally likely underestimate the true degree of IPC gaps in a given facility. Still, our analyses generated some important findings.

## CONCLUSIONS

Conducting tele-ICARs, during the COVID-19 pandemic, yielded important actionable public health knowledge about IPC in LTCFs that would not have been gleaned otherwise. Increased facility education and awareness of federal and state guidelines for group activities and communal dining is warranted in Texas, emphasizing the importance of physical distancing for preventing the transmission of SARS-CoV-2 in LTCF. CDC recommendations for ABHS versus hand washing should be emphasized, as well as the importance of monitoring and auditing healthcare personnel hand hygiene and PPE compliance. Facilities may benefit from additional education and resources about disinfection, to ensure proper selection of disinfectants and understanding of the contact time required for efficacy. Analysis by tele-ICAR type suggests facilities may benefit from identifying space for dedicated COVID-19 units in advance of an outbreak in their facility. Conducting tele-ICARs in LTCFs enables public health agencies to provide direct and individualized feedback to facilities and identify state-wide opportunities for effective interventions in response to SARS-CoV-2.

Education and outreach related to certain IPC measures appear to be more important for some LTCF types more than others; this analysis can help target limited public health resources to the facilities most in need. In addition, conducting a large number of remote ICARs has contributed to the state's pandemic preparedness in tangible ways: (1) DSHS strengthened relationships and communication with LTCFs and stakeholders; (2) the agency developed emergency contract hiring, onboarding, and training procedures to rapidly increase response capacity; and (3) state leadership enhanced interoperability in an emergency context to support and improve IPC practices to protect the state's vulnerable LTCF residents.

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## SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at <https://doi.org/10.1016/j.ajic.2022.07.007>.

## APPENDIX

Texas DSHS Infection Control Assessment and Response (ICAR) Tool Domains and Measures

### Visitor restrictions

- Facility restricts all visitations except for certain compassionate care situations, such as end-of-life situations.
- Decisions about visitation are made on a case-by-case basis.
- Potential visitors are screened prior to entry for fever or symptoms of COVID-19. Those with symptoms are not permitted to enter the facility.
- Visitors that are permitted inside must wear a cloth face covering while in the building and restrict their visit to the resident's room or other location designated by the facility. They are also reminded to frequently perform hand hygiene.
- Non-essential personnel including volunteers and non-medical service providers (eg, salon, barbers) are restricted from entering the building.
- Facility has sent a communication (eg, letter, email) to families advising them that no visitors will be allowed in the facility except for certain compassionate care situations, such as end-of-life, and that alternative methods for visitation such as video conferencing will be made available by the facility.
- Facility has provided alternative methods for visitation such as video conferencing for residents.
- Facility has posted signs at entrances to the facility advising that no visitors may enter the facility.

### Education, monitoring, and screening of healthcare personnel

- Facility has provided education and refresher training to HCP (including consultant personnel).
- Facility monitors HCP adherence to recommended IPC practices.
- Any changes to usual policies/procedures in response to PPE.
- Facility is aware of staffing needs and has a plan in the event of staffing shortages.
- Facility has implemented universal use of facemasks or cloth face coverings for HCP (for source control) while in the facility.
- Facility has provided staff with education to use facemask or respirator if more than source control is required.
- All HCP are reminded to practice social distancing when in break rooms and common areas.
- All HCP (including ancillary staff such as dietary and housekeeping and consultant personnel) are screened at the beginning of their shift for fever and symptoms of COVID-19 (actively records their temperature and documents absence of shortness of breath, new or change in cough, sore throat, and muscle aches).
- Facility keeps a list of symptomatic HCP.

### Education, monitoring, screening, and cohorting of residents

- Facility has provided education to residents.
- Facility assesses residents for fever and symptoms of COVID-19 (shortness of breath, new or change in cough, sore throat, muscle aches) upon admission and at least daily throughout their stay in the facility. Residents with suspected COVID-19 are immediately placed in appropriate Transmission-Based Precautions.
- Facility keeps a list of symptomatic residents.
- Facility has stopped group activities inside the facility and field trips outside of the facility.
- Facility has stopped communal dining.
- Residents are encouraged to remain in their rooms.
- Facility bundles resident care and treatment activities to minimize entries into resident rooms, for example, by having clinical staff clean and disinfect high-touch surfaces when in a room.
- The facility monitors ill residents at least 3 times daily including evaluating symptoms, vital signs, oxygen saturation via pulse oximetry to identify and quickly manage clinical deterioration.
- Facility has dedicated a space in the facility to care for residents with confirmed COVID-19. This could be a dedicated floor, unit, or wing in the facility or a group of rooms at the end of the unit that will be used to cohort residents with COVID-19.
- Facility has dedicated a team of primary HCP staff to work only in this area of the facility.
- Facility has a plan for how residents in the facility who develop COVID-19 will be handled (eg, transfer to single room, prioritize for testing, transfer to COVID-19 unit if positive).
- Facility has a plan for managing new admissions and readmissions whose COVID-19 status is unknown.
- Facility uses all recommended PPE for the care of all residents on affected units (or facility wide depending on the situation).

### Availability of personal protective equipment (PPE) and other supplies

- Facility has assessed current supply of PPE and other critical materials (eg, alcohol-based hand sanitizer, EPA-registered disinfectants, tissues).
- If PPE shortages are identified or anticipated, facility has engaged their health department and/or healthcare coalition for assistance.
- Facility has implemented measures to optimize current PPE supply.
- PPE is available in resident care areas including outside resident rooms (see Tele-ICAR tool for list).
- EPA-registered, hospital-grade disinfectants with an emerging viral pathogens claim against SARS-CoV-2 are available to allow for frequent cleaning of high-touch surfaces and shared resident care equipment.
- Tissues and trash cans are available in common areas and resident rooms for respiratory hygiene and cough etiquette and source control.

### Infection prevention and control practices

- HCP perform hand hygiene in the following situations: (see Tele-ICAR tool for list).
- Facility has preference for alcohol-based hand sanitizer over soap and water.
- HCP wear the following PPE when caring for residents with suspected or confirmed COVID-19 (see Tele-ICAR tool for list).
- PPE are removed in a manner to prevent self-contamination and hand hygiene is performed.

- Hand hygiene supplies are available in all resident care areas. Alcohol-based hand sanitizer\* with 60–95% alcohol is available in every resident room and other resident care and common areas.
- Hand hygiene and PPE compliance are audited.
- Nondedicated, nondisposable resident care equipment is cleaned and disinfected after each use.
- EPA-registered, hospital-grade disinfectants with an emerging viral pathogens claim\* against SARS-CoV-2 are available to allow for frequent cleaning of high-touch surfaces and shared resident care equipment.
- Name of EPA-registered disinfectant used in facility:
- Facility is aware of the contact time for the EPA-registered disinfectant and shares this information with HCP.
- EPA-registered disinfectants are prepared and used in accordance with label instructions.

### Communication

- Facility notifies the health department about any of the following: (see Tele-ICAR tool for list)
- Facility has process to notify residents, families, and staff members about COVID-19 cases occurring in the facility.
- Facility communicates information about known or suspected residents with COVID-19 to appropriate personnel (eg, transport personnel, receiving facility) before transferring them to healthcare facilities such as dialysis and acute care facilities.

### References

1. Nanduri S, Pilishvili T, Derado G, et al. Effectiveness of Pfizer-BioNTech and Moderna vaccines in preventing SARS-CoV-2 infection among nursing home residents before and during widespread circulation of the SARS-CoV-2 B.1.617.2 (Delta) Variant – National Healthcare Safety Network, March 1–August 1, 2021. *MMWR*. 2021;70:1163–1166.
2. Leone CM, Jayasekara L, Sharp J, Fraser A. Prevention and control practices for human noroviruses in long-term care facilities in South Carolina. *Amer J Infect Control*. 2015;43:1276–1280.
3. Gamage B, Schall V, Grant J. Identifying the gaps in infection prevention and control resources for long-term care facilities in British Columbia. *Amer J Infection Control*. 2012;40:150–154.
4. Donlon S, Roche F, Byrne H, Dowling S, Cotter M, Fitzpatrick F. A national survey of infection control and antimicrobial stewardship structures in Irish long-term care facilities. *Amer J Infection Control*. 2013;41:554–557.
5. United States Government Accountability Office. *Infection Control Deficiencies Were Widespread and Persistent in Nursing Homes Prior to COVID-19 Pandemic*. Washington, DC: GAO-20-576R Nursing Home Infection Control; 2020.
6. Medicare and Medicaid Programs Reform of Requirements for Long-Term Care Facilities. 81 FR 68688 42 CFR §483.80 Infection control. 10/04/2016.
7. Franklin SM, Crist MB, Perkins KM, Perz JF. Outbreak response capacity assessments and improvements among public health department health care-associated infection programs—United States, 2015–2017. *Wolters Kluwer Health*. 2020;00:1–10.
8. Ostrowsky BE, Weil LM, Olaisen RH, et al. Real-time virtual infection prevention and control assessments in skilled nursing homes, New York, March 2020 – A pilot project. *Infect Control Hosp Epidemiol*. 2022;43:351–357.
9. Interim Final Rule (IFC), CMS-3401-IFC, additional policy and regulatory revisions in response to the COVID-19 public health emergency related to Long-Term Care (LTC) facility testing requirements. Centers for Medicare & Medicaid Services, Department of Health & Human Services; 2020. Accessed December 8, 2021. <https://www.cms.gov/files/document/qso-20-38-nh-revised.pdf>.
10. Childs A, Zullo AR, Joyce NR, et al. The burden of respiratory infections among older adults in long-term care: a systematic review. *BMC Geriatr*. 2019;19:210.
11. National Center for Immunization and Respiratory Diseases (NCIRD), Division of Viral Diseases, Centers for Disease Control and Prevention (2021) Infection prevention and control assessment tool for nursing homes preparing for COVID-19. Accessed December 15, 2021. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/assessment-tool-for-nursing-homes.html>.
12. Lee MH, Lee GA, Lee SH, Park YH. A systematic review on the causes of the transmission and control measures of outbreaks in long-term care facilities: back to basics of infection control. *PLoS One*. 2020;15: e0229911.
13. Centers for Disease Control and Prevention (2021) Hand hygiene in healthcare settings, clean hands count for healthcare providers. Accessed December 8, 2021. <https://www.cdc.gov/handhygiene/providers/index.html>.
14. Centers for Disease Control and Prevention (2020) Show me the science – when & how to use hand sanitizer in community settings. Accessed October 8, 2021. <https://www.cdc.gov/handwashing/show-me-the-science-hand-sanitizer.html>.

15. Quinn MM, Henneberger PK, and members of the National Institute for Occupational Safety and Health (NIOSH), National Occupational Research Agenda (NORA) Cleaning and Disinfecting in Healthcare Working Group. Cleaning and disinfecting environmental surfaces in health care: toward an integrated framework for infection and occupational illness prevention. *Amer J Inf Control*. 2015;43:424–434.
16. Rebmann T, Vassallo A, Holdsworth JE. Availability of personal protective equipment and infection prevention supplies during the first month of the COVID-19 pandemic; a national study by the APIC COVID-19 task force. *Amer J Infection Control*. 2021;49:434–437.
17. Centers for Disease Control and Prevention. Interim infection prevention and control recommendations to prevent SARS-CoV-2 spread in nursing homes for nursing homes & long-term care facilities. Internet Archive. 2020. Accessed July 22, 2021. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/long-term-care.html>.
18. Centers for Disease Control and Prevention. Considerations for preventing spread of COVID-19 in assisted living facilities. Internet Archive. 2020. Accessed July 22, 2021. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/assisted-living.html>.
19. Cutler LJ. Physical environments of assisted living: research needs and challenges. *Gerontologist*. 2007;47(Special Issue III):68–82.