

Pa Patient Saf Advis 2018 Jun;15(2).

Combat Norovirus Infections in Long-Term Care Facilities

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Abstract

New Criteria, Same Norovirus Concerns


New criteria allow more accurate distinction between norovirus and other causes of gastroenteritis.

The infographic features a central cluster of blue, textured spheres representing norovirus particles. Surrounding these are six overlapping circles, each containing a concern: 'Financial/operational burden', 'Lost revenue from temporary closures', 'Additional cleaning expenses', 'Additional healthcare supplies', 'Inability to manage infected patients/residents', and 'Staff sick leave and overtime'. To the right is a blue toolbox with a lid labeled 'Patient Safety Topic: Norovirus'. The toolbox contains several drawers labeled: 'Preparedness Checklist', 'Prevention and Control Training', 'Webinar', 'Advisory articles', and 'Outcome and Process Measures Worksheet'.

41.3%

Norovirus is responsible for of gastroenteritis events in Pennsylvania long-term care facilities.*

* Events as reported to the Pennsylvania Patient Safety Authority July 2014 through June 2017.
 Pa Patient Saf Advis 2018 Jun;15(2). http://patientsafety.pa.gov/ADVISORIES/Pages/201806_NorovirusUpdate.aspx.
 Norovirus Patient Safety Topic: <http://patientsafety.pa.gov/pst/Pages/Norovirus/hm.aspx>



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Norovirus causes up to 21 million cases of acute gastroenteritis and about 800 deaths annually in the United States. Older adults in long-term care (LTC) facilities are particularly at risk. The Pennsylvania Patient Safety Authority analyzed norovirus cases reported by LTC facilities during the three most recent norovirus seasons. Reports to the Authority showed that norovirus events comprised more than 40% of all gastrointestinal infections. The norovirus outbreak rate varied by region within the state, but with the exception of the Northcentral region in academic year 2016, all regions reported infections in each of the three years studied. In the timeframe analyzed, Pennsylvania LTC facilities reported an increased number of norovirus events from November through March—the typical norovirus season. This shows that norovirus infection control continues to be problematic in Pennsylvania LTC facilities, indicating a need to implement improved prevention and control strategies.

Introduction

According to the Centers for Disease Control and Prevention (CDC), norovirus causes up to 21 million cases of acute gastroenteritis and results in about 800 deaths annually in the United States. Older adults in long-term care (LTC) facilities are particularly at risk. In a recent study, CDC found that among nursing home patients in three states, hospitalization and death rates increased by 10% during norovirus outbreaks. Also, the risk for hospitalization and death among patients 90 years of age or older increased by 20% to 30% during norovirus outbreaks.^{1,2}

In LTC settings, most outbreaks are caused by person-to-person transmission, because of the high levels of personal contact in close spaces. Also, the hygiene of some residents, such as those who are physically or mentally impaired, may be inadequate.³ From an administrative viewpoint, norovirus outbreaks in healthcare facilities often result in significant financial and operational burdens.⁴ In 2010, the Pennsylvania Patient Safety Authority published an article about controlling the annual threat of norovirus gastroenteritis outbreaks, accompanied by a toolkit.⁴ Available data was limited at the time because norovirus infection was not reported in Pennsylvania as a distinct subcategory of gastrointestinal (GI) infections.

In April 2014, in accord with changes to national standards,⁵ the Authority revised the LTC criteria for identifying and reporting gastroenteritis. The revision included a new gastroenteritis subcategory that allows detailed surveillance and reporting of norovirus cases separate from other causes of gastroenteritis within the Pennsylvania Patient Safety Reporting System (PA-PSRS).

This first report since the standards were revised takes a fresh look at the incidence of norovirus gastroenteritis in Pennsylvania LTC facilities. The new criterion allows analysis of the number of cases and outbreaks of norovirus as a subset of overall GI infections.

Methods

Authority analysts queried the PA-PSRS database for GI infection reports for the three most recent academic years (AYs), AY2015 through AY2017 (July 2014 through June 2017). Analysts compared the proportion of norovirus events to other causes of GI infections by year and month, as reported to the Authority, and the number of outbreaks by year and month by regions (based on the Pennsylvania Department of Health's Public Health Districts).

A norovirus outbreak as defined by CDC is an occurrence of two or more similar illnesses characterized by staff and/or residents having vomiting and/or diarrhea within 48 hours, resulting from a common exposure that is either suspected or laboratory-confirmed to be caused by norovirus.^{6,7}

Rates calculated for analytic comparisons used incidence per 1,000 resident days, as reported through PA-PSRS.

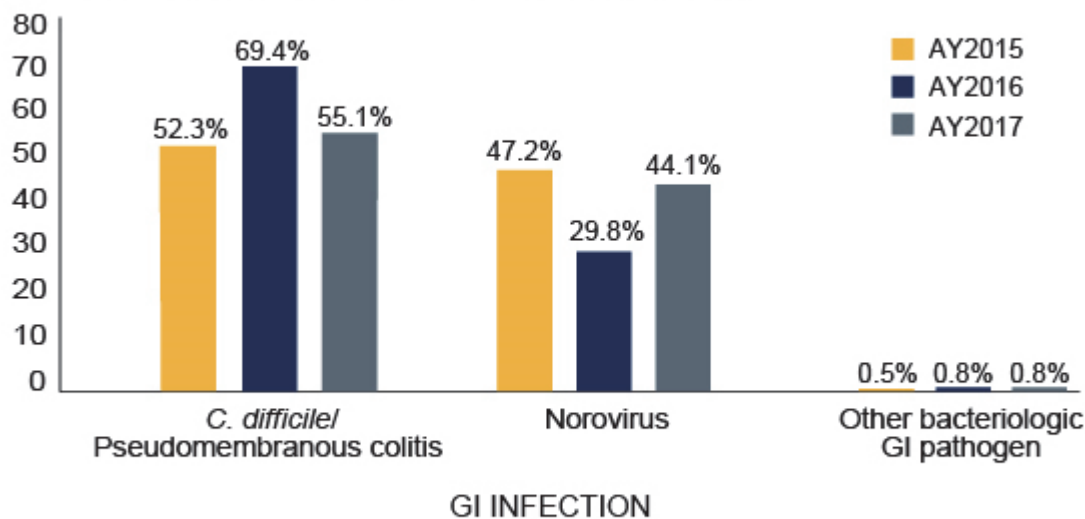
Results

Event Seasonality

Of the 11,532 records of GI infections returned, 4,761 (41.3%) were categorized as norovirus events, compared with 6,682 (57.9%) classified as *Clostridium difficile* infection, 81 (0.7%) classified as other bacteriologic GI pathogens, and 8 (0.1%) classified as *Pseudomembranous colitis*. Figure 1 shows the percentages of types of infections over the three years. For two-thirds of the months analyzed in this time period, *C. difficile* was the GI infection reported most often through PA-PSRS. However, norovirus events comprised the majority of GI infections for 12 of 36 months in three clusters of consecutive months concurrent with what is commonly considered the norovirus season (Figure 2). These three clusters accounted for 87.5% of all norovirus reports over the three-year period. Also of note are the seasonal spikes of monthly norovirus rates as compared to relatively stable monthly rates of other GI infections (Figure 3).

Figure 1. Percentage of GI Infection Reports by Type, Academic Years 2015 through 2017

PERCENTAGE OF ANNUAL GI INFECTION REPORTS

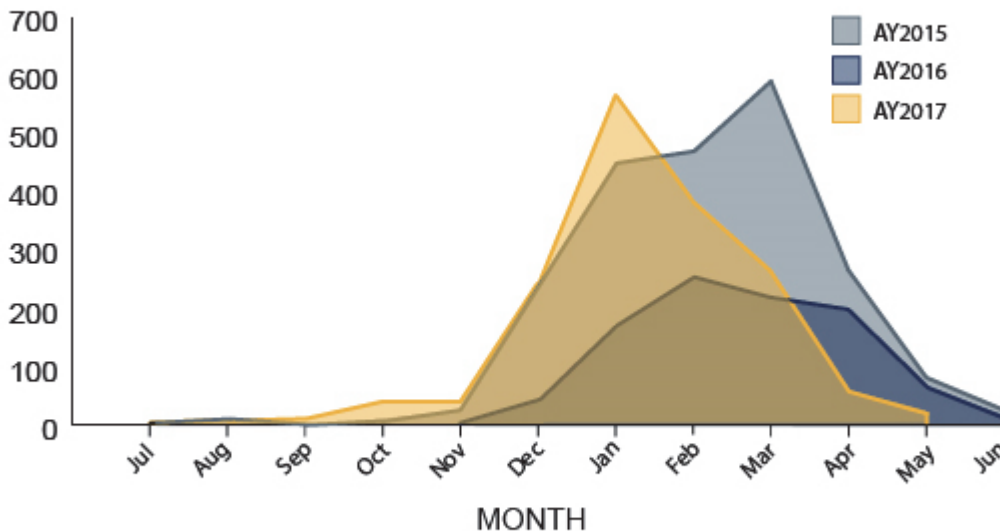


Note: Data reported through the Pennsylvania Patient Safety Reporting System by long-term care facilities. Academic years are for the 12 months ended June 30 of each year. Totals may not equal 100% because of rounding. AY, Academic year; *C. difficile*, *Clostridium difficile*; GI, gastrointestinal.

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Figure 2. Number of Norovirus Infection Reports, Academic Years 2015 through 2017

NUMBER OF NOROVIRUS INFECTION REPORTS

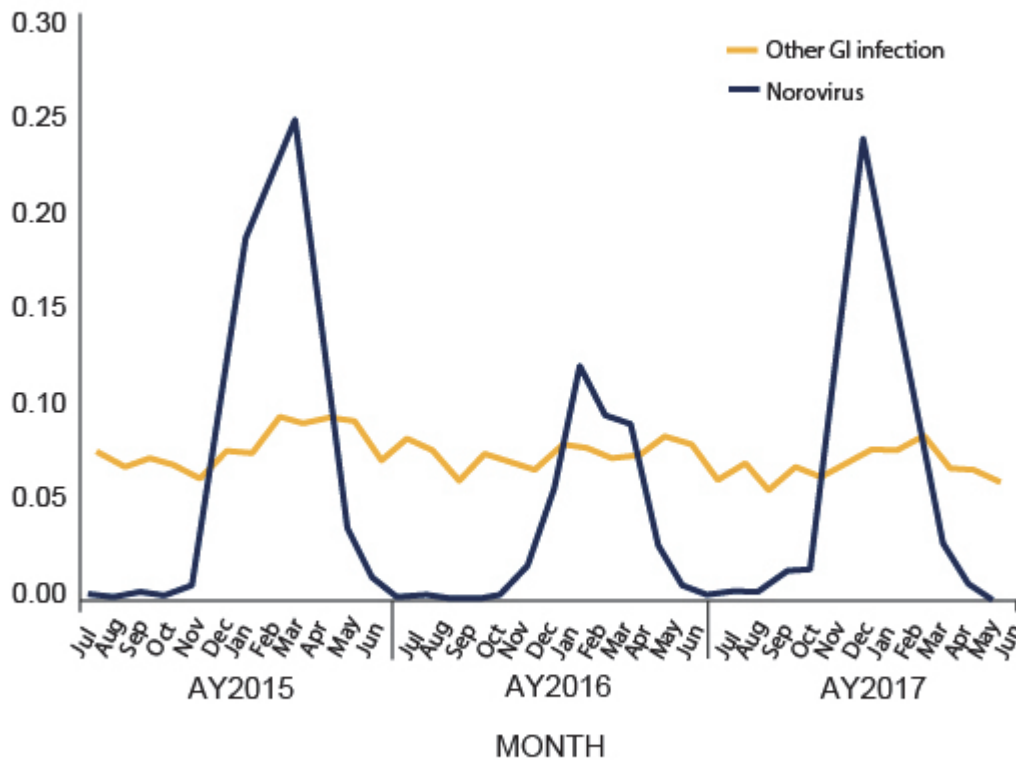


Note: Academic years are for 12 months ended June 30 of each year. Data reported through the Pennsylvania Patient Safety Reporting System by long-term care facilities. AY, Academic year.

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Figure 3. Norovirus versus Other Gastrointestinal Infection Rates for Academic Years 2015 through 2017

NOROVIRUS AND GI INFECTION RATE (1,000 RESIDENT DAYS)



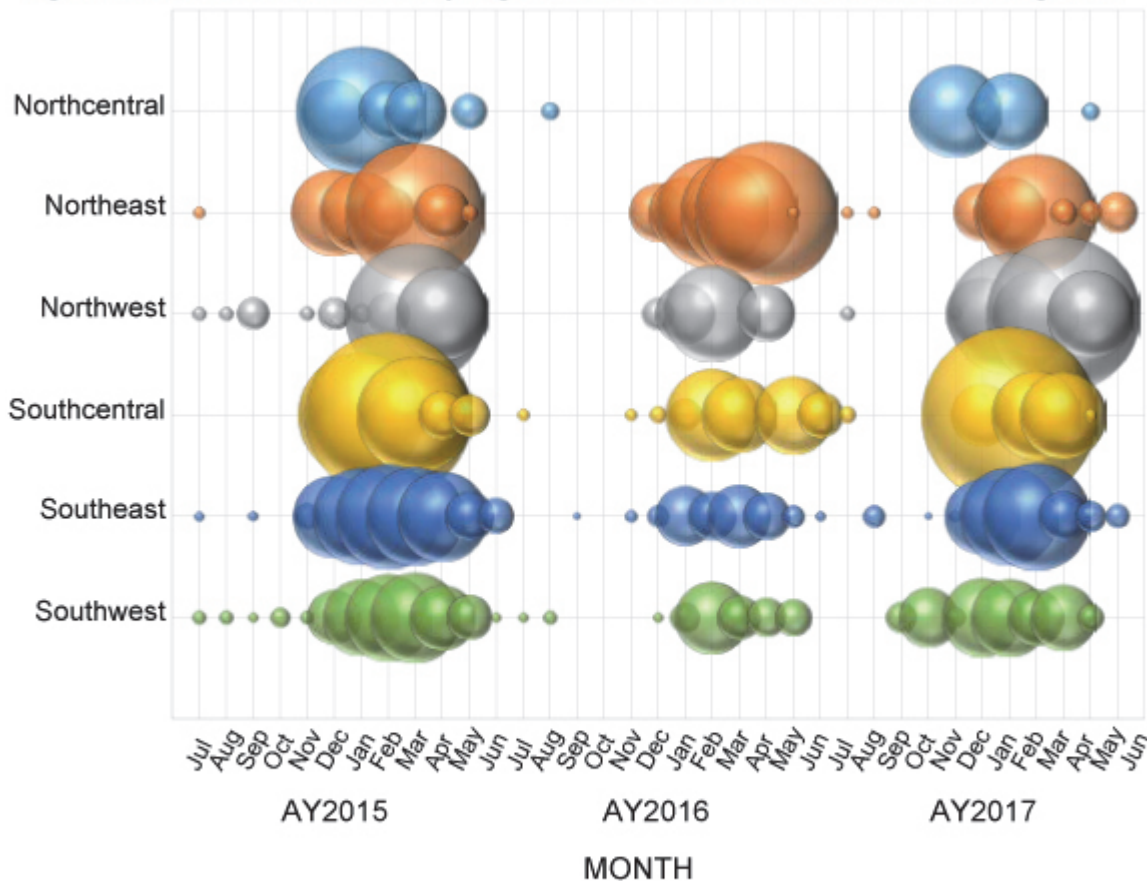
Note: Academic years are for the 12 months ended June 30 of each year. Data reported through the Pennsylvania Patient Safety Reporting System by long-term care facilities. AY, Academic year, GI, gastrointestinal.

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Events by Pennsylvania Region

The timing and magnitude of event clusters varied among facilities, as shown when grouped by Pennsylvania region (Figure 4). Each region had different monthly peaks, demonstrating that although events are seasonal, variability exists by region. Table 1 shows peak norovirus periods and rates for the Authority's six state regions.

Figure 4. Norovirus Infection Rates by Region and Month for Academic Years 2015 through 2017



Note: Rates calculated from norovirus event and resident days as reported through the Pennsylvania Patient Safety Reporting System by long-term care facilities; the size of the bubble is proportional to the rate represented. Academic years are for the 12 months ended June 30 of each year. AY, Academic year.

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Table 1. Regional Peak Outbreak Rates, by Region, Academic Years 2015 through 2017

Region	Peak Month and AY	Peak Rate*	Average Rate, AY15–AY17*
Northcentral	January 2014	0.37	0.03
Northeast	April 2015	0.44	0.07
Northwest	March 2016	0.51	0.07
Southcentral	January 2016	0.67	0.08
Southeast	February 2016	0.25	0.06
Southwest	March 2014	0.18	0.04

Note: Academic years are for the 12 months ended June 30 of each year.

AY, Academic year.

* Rate calculated by number of norovirus reports per 1,000 resident days.

Outbreaks

Of 222 LTC facilities reporting norovirus, 183 (82.4%) had norovirus clusters that met CDC's definition of an outbreak. These 364 outbreaks encompassed 4,564 (of 4,761, 95.9%) of the reported norovirus events in this period (Table 2). The longest outbreak was reported over the course of 27 days and included 138 cases. The most concentrated outbreak included 86 cases reported over two days. Eighty-three LTC facilities (37.4%) had multiple outbreaks; 37 (16.7%) had three or more outbreaks over the three-year period.

Table 2. Norovirus Outbreaks and Cases in Long-Term Care Facilities with Outbreaks, Academic Years 2015 through 2017 (n = 183)

	Outbreaks*	Number of Cases Associated with Outbreaks	Percentage of Cases Associated with Outbreaks (N = 4,761 Norovirus Events)
Maximum	16	184	100%
Minimum	1	2	33.3%
Mean	1.99	24.94	94.5%
Median	1	18	100%
Total	364	4,564	95.9%

Note: Academic years are for the 12 months ended June 30 of each year.

* From facilities determined to have at least one outbreak.

Discussion

Analysis revealed that norovirus infections comprise 4,761 (41.3%) of gastroenteritis events in LTC facilities in Pennsylvania, with most events occurring during the winter. No substantial decline was evident in norovirus events reported through PA-PSRS in the three most recent norovirus seasons.

This suggests that prevention and control of norovirus gastroenteritis outbreaks continues to be problematic in Pennsylvania LTC facilities.

The symptoms of vomiting and diarrhea are self-limiting and, for most people, resolve within a few days, but these symptoms can be deadly for the older population.⁴ There is currently no U.S. Food and Drug Administration approved vaccine or cure for norovirus. Recent advances enabling development of human norovirus in the laboratory setting show potential to contribute to vaccine research and targeted treatment methods.⁸

Authority findings are consistent with CDC data demonstrating that norovirus infections are most common in winter but can occur at any time during the year. According to the CDC, from August 1, 2017, through February 12, 2018, there were 775 norovirus outbreaks reported by nine participating states. During the same period in the previous year, 770 norovirus outbreaks were reported to the CDC by these states. The number of outbreaks reported to the CDC in the 2017-2018 norovirus season to date is above the range reported during the same period over the previous seven years.⁹

Healthcare facilities may be unprepared to manage large numbers of infected residents. Unchecked norovirus outbreaks can be prolonged, sometimes lasting months. Costs include indirect and direct costs related to staff call-outs, sick leave, and overtime, as well as the costs of additional healthcare cleaning expenses and supplies, such as linens, commodes, bleach, sanitizers, mops, gloves, and gowns. Healthcare facilities may experience financial losses when temporarily closing units or buildings until the outbreak can be controlled or otherwise runs its course.

When new strains of the virus are circulating, norovirus infections can increase by 50%.¹⁰

According to 2013 research by Green, "Since 2002, new GII.4 variants have emerged every 2 to 3 years resulting in epidemics."¹¹ Cannon research shows that "between September 2013 and August 2016 . . . GII.4 Sydney viruses caused 58% of outbreaks."⁹ Of the seven main genotypes, four of which infect humans, 49% of the confirmed norovirus outbreaks submitted to CDC from September 1, 2017, through May 31, 2018, were genogroup GII.P16-GII.4 Sydney.¹² This comparison of genetic sequencing data with existing sequences contributes to continued efforts to identify trends in norovirus disease outbreaks and preventive measures.¹³

The best method to control norovirus is to have a preseason plan in place, in which all members of the multidisciplinary team are clear about their roles in prevention, control, and quality improvement measures. The Authority offers a free, online Patient Safety Topic about norovirus. Implemented by a facility's team prior to norovirus season, these tools enable effective preparation, including strategies to prevent widespread outbreak and evaluation of the effectiveness of process and outcome measures. The updated Norovirus Patient Safety Topic includes a concise slide presentation with "train the trainer" notes for staff education.

Pennsylvania Patient Safety Authority Norovirus Preseason Preparedness and Outbreak Control Toolkit

Controlling the Annual Threat of Norovirus Gastroenteritis Outbreaks

This *Pennsylvania Patient Safety Advisory* article presents evidence-based strategies to modify risk factors for outbreaks, including how to prepare for norovirus season, ensure basic outbreak control measures, use enhanced precautions, and conduct leadership and post-outbreak activities.

http://patientsafety.pa.gov/ADVISORIES/Pages/201012_141.aspx (/ADVISORIES/Pages/201012_141.aspx)

Norovirus Prevention and Response Recorded Webinar

Designing a Norovirus Prevention and Rapid Response Program: An Evidence-Based Approach.

<https://www.youtube.com/watch?v=ud3S9b3zJRA&t=4s> (<https://www.youtube.com/watch?v=ud3S9b3zJRA&t=4s>)

Norovirus Preparedness Checklist

This sample checklist is designed to help facilities assess facility-specific preparedness plan activities, basic precautions, enhanced precautions, and outcome and process measures.

<http://patientsafety.pa.gov/pst/Pages/Norovirus/checklist.aspx> (/pst/Pages/Norovirus/checklist.aspx)

Acute Gastroenteritis Outbreaks Case Log

Facilities can use this sample log to determine common factors about acute gastroenteritis outbreaks and collect information in a timely, reliable, and organized fashion. [http://patientsafety.pa.gov/pst/Pages/Norovirus/log.aspx \(/pst/Pages/Norovirus/log.aspx\)](http://patientsafety.pa.gov/pst/Pages/Norovirus/log.aspx (/pst/Pages/Norovirus/log.aspx))

Norovirus Preparedness: Outcome and Process Measures Worksheet

This sample worksheet can be used for documenting facility-specific process and outcome measures associated with norovirus. [http://patientsafety.pa.gov/pst/Pages/Norovirus/measures.aspx \(/pst/Pages/Norovirus/measures.aspx\)](http://patientsafety.pa.gov/pst/Pages/Norovirus/measures.aspx (/pst/Pages/Norovirus/measures.aspx))

Norovirus Preparedness and Control Video

Norovirus preparedness and controlling the annual threat of a norovirus outbreak. [https://www.youtube.com/watch?v=2979jsf0SNc&t=40s \(https://www.youtube.com/watch?v=2979jsf0SNc&t=40s\)](https://www.youtube.com/watch?v=2979jsf0SNc&t=40s (https://www.youtube.com/watch?v=2979jsf0SNc&t=40s))

Train the Trainer PowerPoint Slides—NEW!

This short training program for clinicians is accompanied by train-the-trainer notes. [http://patientsafety.pa.gov/pst/Pages/Norovirus/training.aspx \(/pst/Pages/Norovirus/training.aspx\)](http://patientsafety.pa.gov/pst/Pages/Norovirus/training.aspx (/pst/Pages/Norovirus/training.aspx))

Stop the Spread of Norovirus Poster (for Clinicians)

Norovirus is a highly contagious virus and the principal cause of worldwide acute gastroenteritis epidemics in all age groups. This poster can help ensure healthcare facilities and their staff are better equipped to respond to norovirus. [http://patientsafety.pa.gov/pst/Pages/Norovirus/norovirus_clinicians.aspx \(/pst/Pages/Norovirus/norovirus_clinicians.aspx\)](http://patientsafety.pa.gov/pst/Pages/Norovirus/norovirus_clinicians.aspx (/pst/Pages/Norovirus/norovirus_clinicians.aspx))

Stop the Spread of Norovirus Poster (for Patients)

Norovirus is a highly contagious gastrointestinal infection, also referred to as the "stomach flu." This poster can help patients protect themselves. [http://patientsafety.pa.gov/pst/Pages/Norovirus/norovirus_patients.aspx \(/pst/Pages/Norovirus/norovirus_patients.aspx\)](http://patientsafety.pa.gov/pst/Pages/Norovirus/norovirus_patients.aspx (/pst/Pages/Norovirus/norovirus_patients.aspx))

Conclusion

LTC facilities continue to struggle with annual norovirus outbreaks, despite the existence of accessible state and national resources for prevention and control of this very contagious viral infection. Considering the severe contagiousness and annual onset of norovirus, healthcare facilities are encouraged to implement strategies to help their multidisciplinary teams control initial norovirus cases before they result in an outbreak next season. The Authority encourages LTC facilities to access the Authority Patient Safety Topic on norovirus, which houses all the tools, and select a multidisciplinary team to implement the accompanying strategies to develop a strong preseason prevention and control program.

Notes

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