

What's Been Going on Around Here?

Norovirus outbreaks
in Philadelphia LTCF

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Objectives

- * Review the clinical and epidemiologic characteristics of norovirus
- * Describe the epidemiology of norovirus outbreaks in Philadelphia long-term care facilities (LTCF)
- * Discuss factors associated with successful control of a norovirus outbreak

Gastroenteritis in LTCF:

Systematic review (1997-2007) of all English language reports of lab-confirmed AGE in LTCF

* Data from 75 reports

- 3000 resident and 1000 staff cases
- 60 fatalities

* All reports of outbreaks (reporting bias)

Common Causes of Gastroenteritis in LTC*

Rotavirus

Norovirus (and other caliciviruses)

Enteric adenovirus

C. difficile colitis

Bacterial enteritis (salmonella, shigella)

* Remember, in 40-50% of cases – no pathogens identified

Gastroenteritis in LTCF: learning from outbreaks

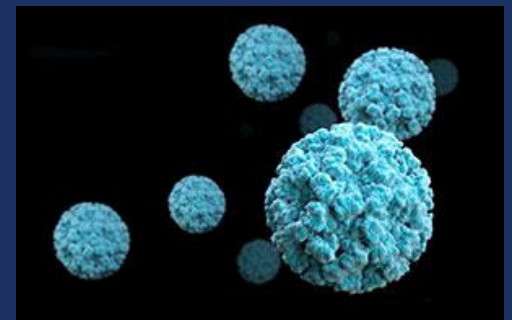
Selected Pathogens		Number (%) of Outbreaks
Bacterial	Salmonella	11 (15%)
	E. coli	6 (8%)
	C. difficile	1 (1%)
	TOTAL BACTERIAL	23 (31%)
Viral	Norovirus	43 (57%)
	Rotavirus	4 (5%)
TOTAL VIRAL		52 (69%)

Outbreaks of Gastroenteritis in LTCF: common mechanisms

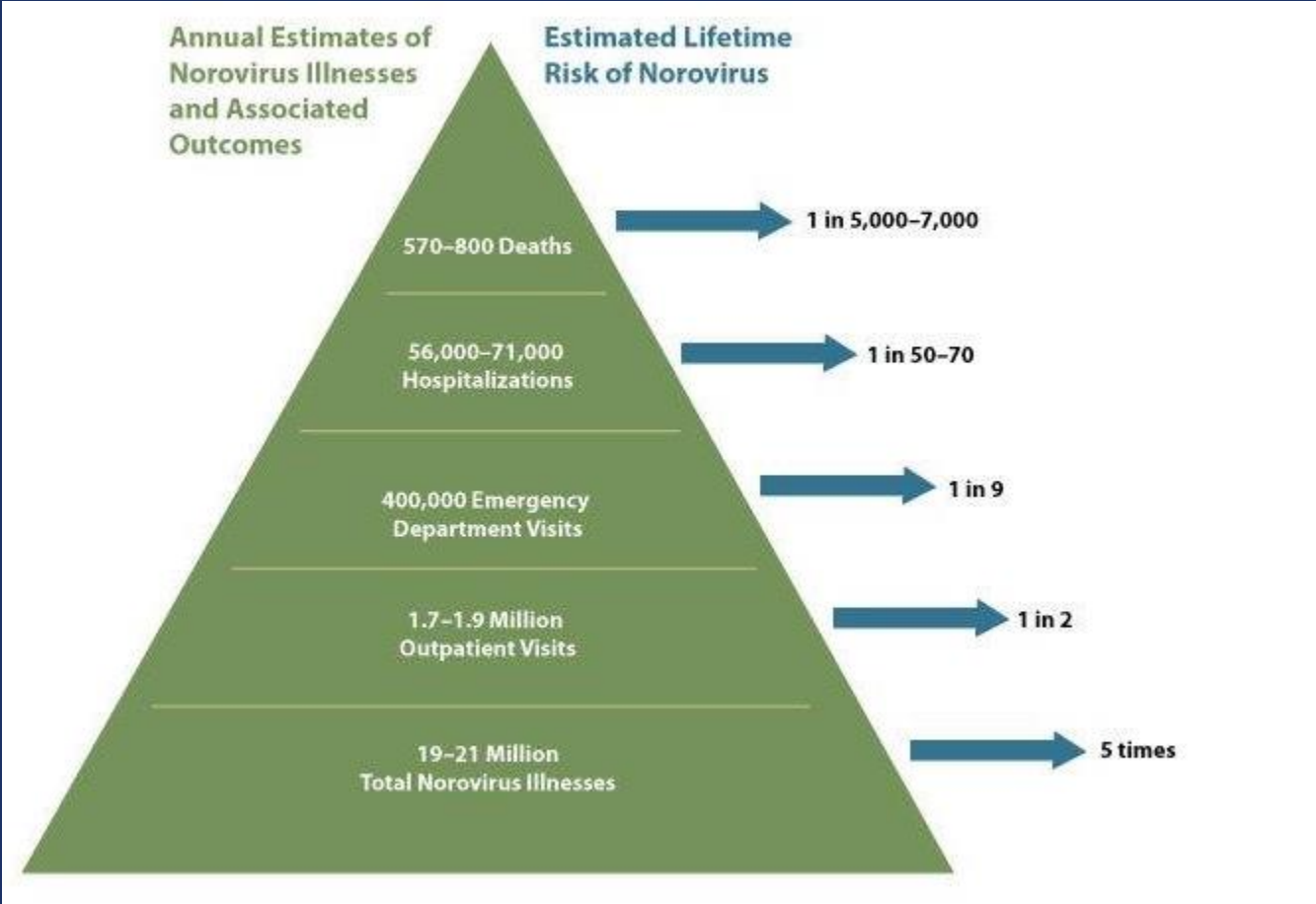
Person-to-person	<ul style="list-style-type: none">- failure to isolate infected residents- staff working when ill- inadequate hand hygiene- visitors
Foodborne	<ul style="list-style-type: none">- cross contamination (eggs!)- shared food (salad bars, plates of cookies)- inadequate training in safe food handling
Environmental contamination	<ul style="list-style-type: none">- ineffective cleaning- inappropriate handling of laundry (staff illness)

Norovirus: key facts

- * Aka. “the stomach flu”
- * Can cause severe disease
- * Sudden onset vomiting +/- diarrhea
 - * Often resolves within 12-48 hrs
- * Can become infected with just ONE viral particle!

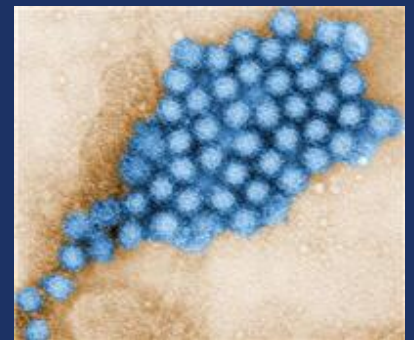


Norovirus: burden of disease

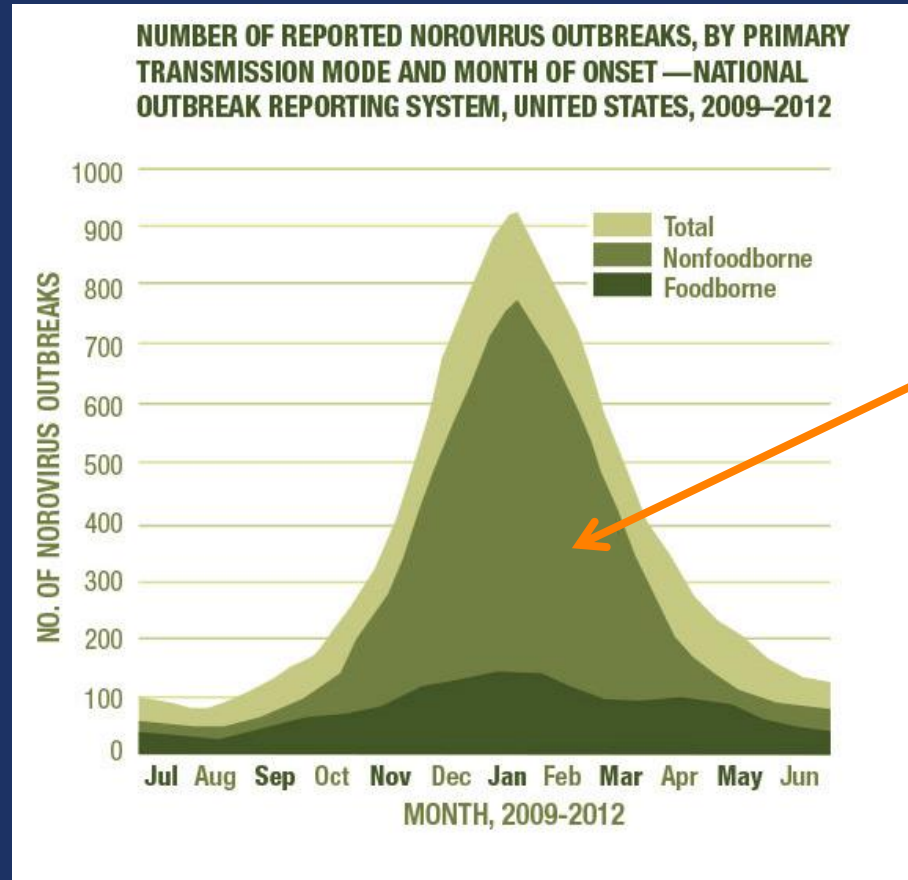


Norovirus Outbreaks

- Leading cause of outbreak-associated AGE
 - Low inoculum
 - Resistant to many disinfectants
- Can occur year round → most common in November-April
- Large outbreaks typically seen in closed or crowded environments
 - Nursing homes
 - Schools/daycare centers
 - Shelters



Nationally Reported Norovirus Outbreaks



3 out of 4 outbreaks occur in LTCF!

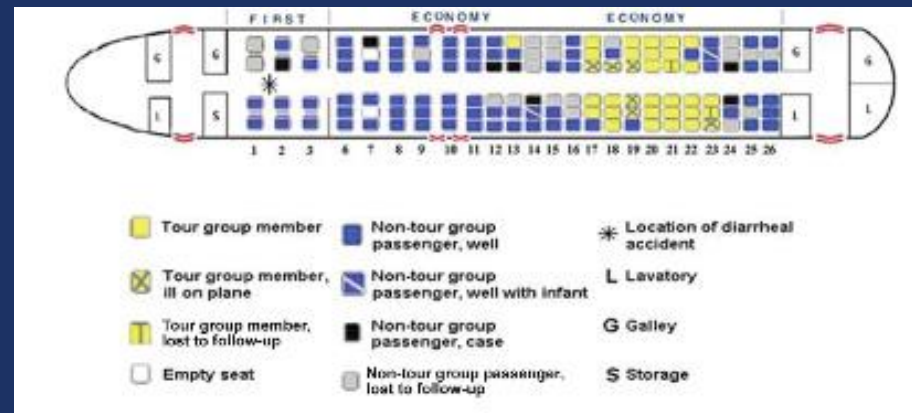
Causes 58% of food-borne illness in U.S.

What we know from non-institutional norovirus outbreaks

- * Numerous secondary cases despite short exposure times
- * Direct or indirect contact primary route of transmission
- * Additional risk through aerosolization of virus from vomitus and mass contamination of shared lavatories
- * Duration of viral shedding may be prolonged (up to 28 days)
- * Nurse understaffing associated with increased risk of endemic and epidemic nosocomial viral infections

Introduction of Norovirus into Confined Areas

- * Flight from Boston to LA, diverted to Chicago due to sudden onset AGE among passengers (flight time 3 hrs)
- * Initial illness among tour members; investigation revealed AGE within 72 hrs among 7 of 85 non-tour passengers (AR 8%)



Transmission: how do you get it and spread it?

Food and drink

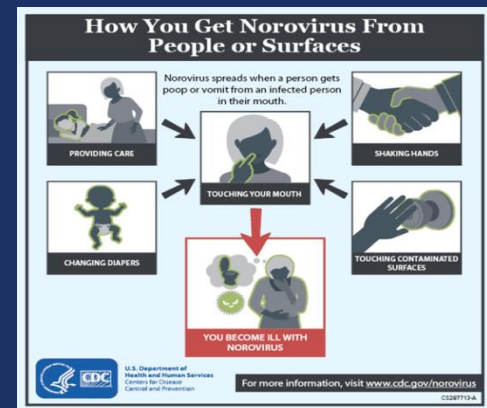
- * Food preparation
- * Sharing of food/drink or utensils

Contact with contaminated surfaces

- * Can live on surfaces for days to weeks
- * Common culprits include frequently touched surfaces like doorknobs, handles, light switches, bathroom sinks and toilets

Aerosols(?)

- * Esp. in small bathrooms
- * Exposure to vomiting



Symptoms of Norovirus

Most common symptoms include:

- * Diarrhea
- * Nausea and vomiting
- * Stomach pains

Symptoms may include:

- * Fever (usually low grade)
- * Headaches and body aches

Usually lasts 1-3 (miserable) days



Norovirus in LTCF

- * Epidemiology mirrors community-onset infections
 - * Seasonality, predominant strains
- * Reports of point source outbreaks as well as sustained person-to-person transmission
- * Issues commonly identified
 - * Inadequate number of hand hygiene stations
 - * Inappropriate glove use
 - * Contaminated kitchen
 - * Staff failure to adhere to sick leave policies

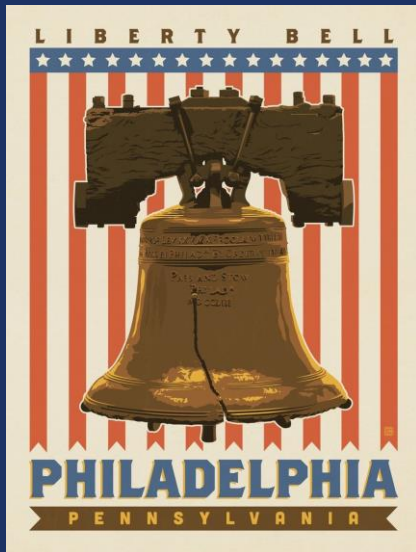
Epidemiological Profiling

Kaplan criteria for norovirus outbreak:

- * Incubation period 24 to 48 hrs
- * Duration of illness 12 to 60 hrs
- * Vomiting >50% of cases
- * Vomiting AND fever >40% of cases
- * Negative for other pathogens

The Philadelphia Story

*Review of norovirus outbreaks
reported to PDPH from long term
care facilities from 2009 – 2018*



$N = 121$



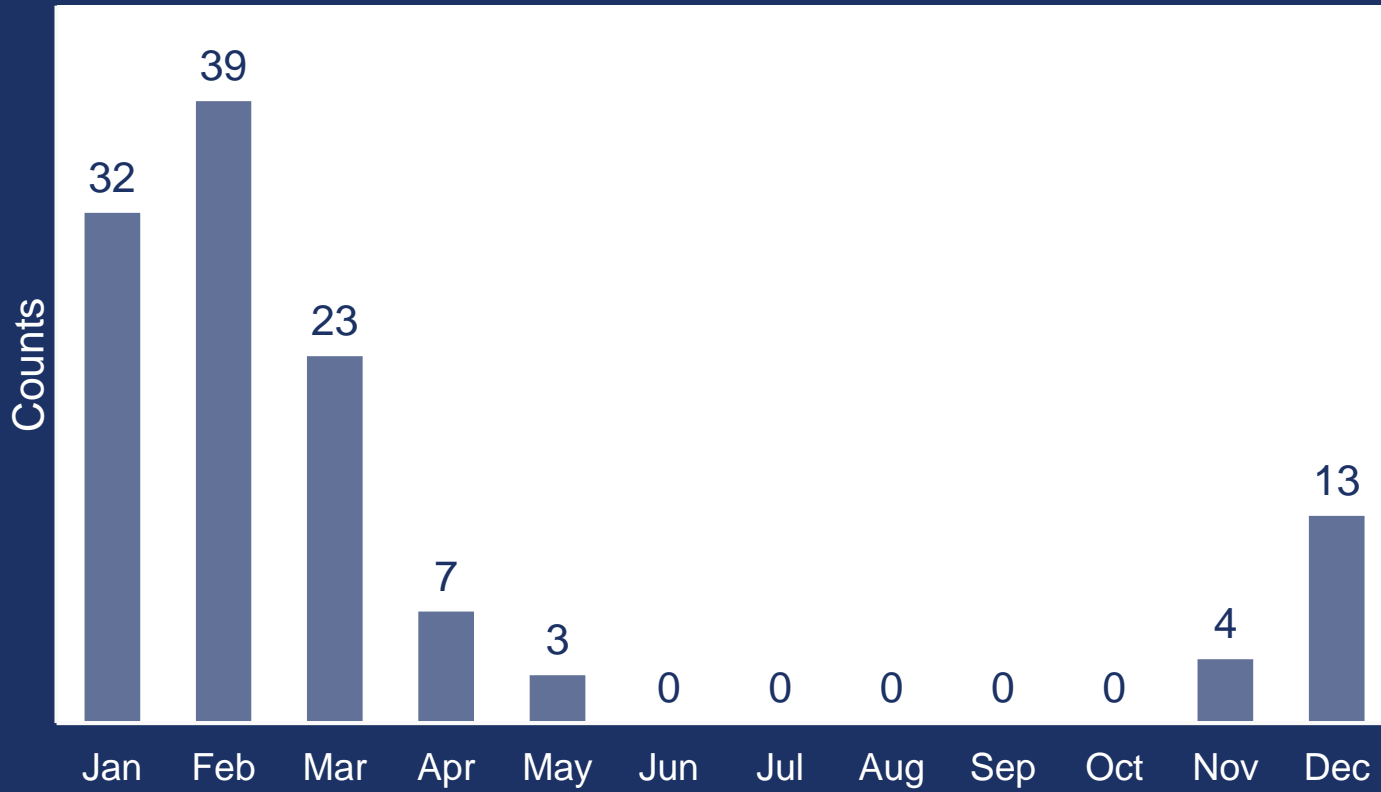


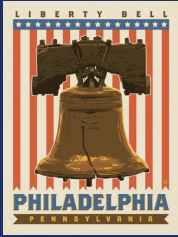
Epidemic Curve





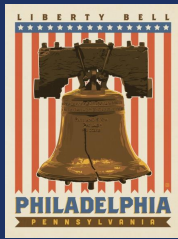
Seasonality





Facility Characteristics

Characteristic	Result (n=49)
Ownership, No. (%)	
Profit	23 (47)
Nonprofit	26 (53)
Facility type, No. (%)	
SNF/NH	39 (80)
Other	10 (20)
No. of beds ^a , median (IQR)	164 (120-206)
No. of reported norovirus outbreaks per facility, median (IQR)	2 (1-3)



Comparing Outbreak to Non-Outbreak Facilities

Characteristic	No. of Outbreaks at Facility		P-Value
	None (n=14)	≥1 (n=34)	
Ownership, No. (%)			
Profit	8 (57)	20 (59)	.915
Nonprofit	6 (43)	14 (41)	
No. of beds, median (IQR)	122 (53-180)	176 (120-226)	.071
Percentage of beds occupied (%), median (IQR)	88 (82-90)	91 (88-95)	.033
CMS nursing home rating^b, mean (95% CI)	2.57 (1.73-3.41)	2.41 (1.94-2.88)	.717
No. of nursing staff hours, med (IQR)			
RN	49 (24-103)	40 (31-46)	.510
LPN/LVN^d	47 (39-53)	55 (44-64)	.055

➤ *Smaller facilities, lower occupancy, less LPN/LVN staff hours*

Characteristics of Philly Outbreaks

Average duration 11 d

Average time to report to PDPH 4 d

Average total number of affected people 33

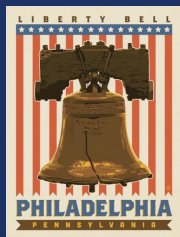
Patients (AR = 17%) 23

Staff (AR = 5%) 8

Complications

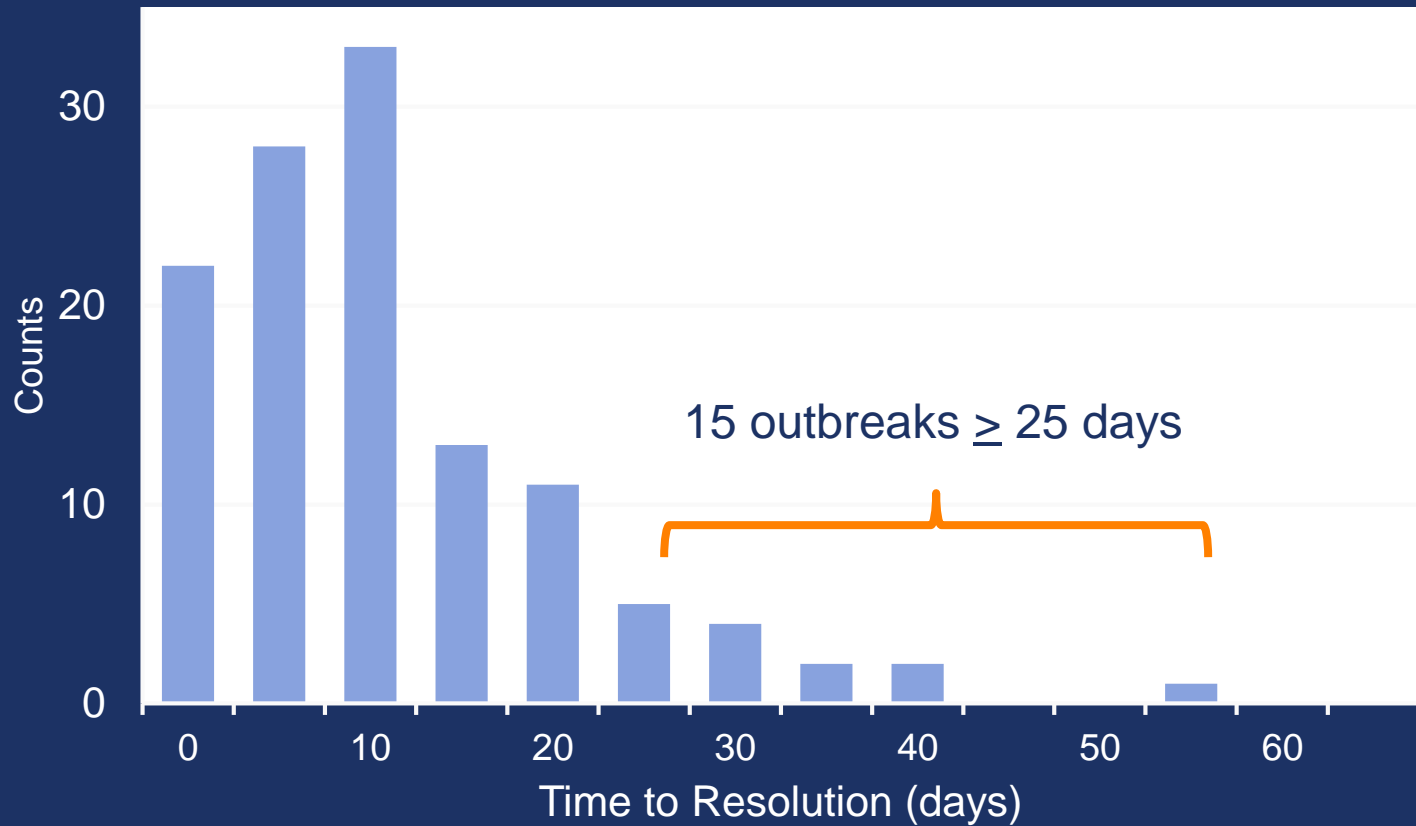
Hospitalizations 35

Deaths 4



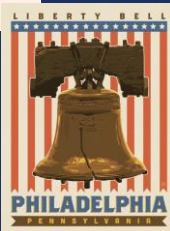


Persistent Outbreaks



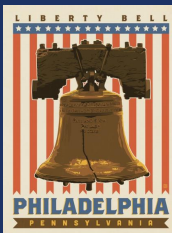
What Worked in Philadelphia?

Characteristic	Outbreak Duration (days)	
	Median	Range
Intervention Implemented, No. (%)		
Education		
Contact precautions		
Enhanced cleaning ^a		
Group restrictions		
Visitor restrictions		
Cohorting		
Admissions restrictions		
Percentage of interventions implemented		



What Worked in Philadelphia?

Characteristic	Outbreak Duration (days)		P-Value
	<25 (n=95)	≥25 (n=15)	
Intervention Implemented, No. (%)			
Education	86 (91)	13 (87)	.645
Contact precautions	86 (91)	13 (87)	.645
Enhanced cleaning ^a	89 (95)	15 (100)	1.000
Group restrictions	89 (94)	13 (87)	.299
Visitor restrictions	70 (74)	10 (67)	.571
Cohorting	39 (41)	2 (13)	.046
Admissions restrictions	67 (71)	13 (87)	.231
Percentage of interventions implemented	86 (71-86)	86 (71-86)	.407



Interrupting norovirus transmission in LTCF

RECOMMENDATIONS:

- * Active surveillance and isolation
- * Use of soap and water for hand hygiene
- * Use of chlorine-based disinfectants

OTHER STRATEGIES TO CONSIDER:

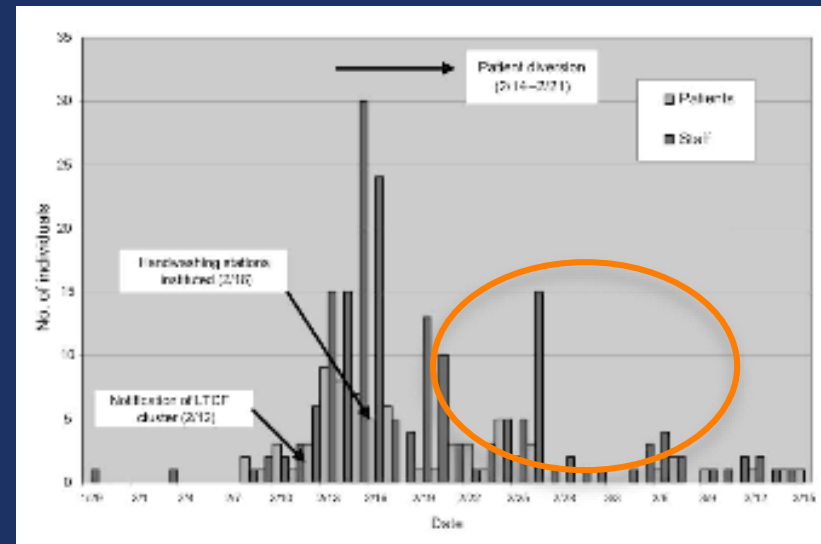
- * Suspend group activities
- * Heighten focus on hand hygiene and environmental disinfection outside of patient care activities/locations
- * ?Mask use for cleaning of vomitus

Controlling a norovirus outbreak

Sustained norovirus outbreak at a 120 bed LTCF attached to VA hospital (71 pts, 187 staff)

Initial control achieved with ...

- * Active surveillance
- * Use of contact precautions for all symptomatic patients
- * Cancellation of group activities
- * Removal of alcohol hand gels
- * Chlorine-based disinfectant
- * Request ill staff “self-quarantine” (stay home for 48 hrs after symptom resolution)





How to End an Outbreak

Characteristic	Outbreak Duration (days)		P-Value
	<25 (n=104)	≥25 (n=17)	
Facility Characteristics			
Ownership, No. (%)			
Profit	55 (53)	12 (71)	.173
Nonprofit	49 (47)	5 (29)	
No. of beds ^a , median (IQR)	176 (125-226)	239 (178-240)	.024
Percentage of beds in shared rooms ^c ,	96 (90-98)	97 (97-97)	.364
Overall nursing home rating ^d , mean (95% CI)	2.53 (2.25-2.8)	1.79 (1.45-2.12)	.001
Outbreak Characteristics			
Staff per patient ratio ^e , median (IQR)	1.3 (1.1-1.6)	1.2 (1.1-1.3)	.183
Staff Attack rate ^f , median (IQR)	4 (0-7)	13 (9-15)	<.001
Reporting delay (days), median (IQR)	4 (2-7)	6 (3-15)	.033

➤ *Smaller facilities, higher CMS rating, and low staff attack rate*

Risk factors for staff infection

- * Outbreak investigation at large Oregon LTCF
 - * Repeated norovirus outbreaks (different serotypes)
- * Factors associated with staff illness

	Attack Rate		Adj RR	CI
Cleaned vomitus	59% vs. 29%	P<0.01	1.6	1.1-2.5
“Always wash hands before eating”	21% vs 31%	0.16	-	-
“Always wash after patient care	36% vs. 35%	0.87	-	-
Employed <4 yrs	58% vs. 35%	P<0.05	1.6	1.0-2.5

Importance of sick leave

Key role of staff in propagation (and possibly initiation) of outbreak

- * No source patient identified
- * Staff illness preceded patient illness
- * Patient illness controlled with isolation protocols
- * Staff illness peaked later than patient illness

Survey of ill staff (102/187, response rate 55%)

- * 26% reported NOT adhering to “self-quarantine”
- * Median duration of symptoms 3 days
- * Median duration of time away from work 2 days

Prevention

ALL:

- * WASH YOUR HANDS!

Hand sanitizer NOT a substitute when ill with GI symptoms (or in contact with an affected person)

- * Do NOT prepare/handle food for others when sick!

Healthcare Workers:

- * Stay home when sick!

- * No shared food

- * Consider extended furlough (up to 48 hrs after symptom resolution)



“GI Illness Precautions”

Patients

- * Wash hands (soap and water) before eating and after toileting
- * Limit group activities*
 - * No eating outside of room
 - * Activities room closed
- * Prevent reintroduction from community
 - * Visitor screening
 - * Visitors to remain in patient room
 - * Restrict visitation

Other issues

- * Chlorine disinfection with extra cleaning of common areas, rooms of symptomatic patients, high touch surfaces
 - * Vomitus or other body fluids must be cleaned ASAP
- * No new admissions

*when ongoing transmission

Treatment

- * No specific care...only supportive care
- * IV rehydration
- * Nitazoxinide has been used to treat norovirus
 - * May shorten duration of symptoms

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B.A. Davis



Norovirus Travel Agency

“Doorknob OK?”

THANKS!