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Original Study

A Mixed Methods Study Into COVID-19 and Influenza Outbreak Management in Nursing Homes: The Challenge of Seeking Balance Between Infection Prevention and Well-being

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A B S T R A C T

Objectives: Throughout the COVID-19 pandemic, public debate arose regarding the proportionality of infection prevention and control (IPC) measures in nursing homes (NHs), as these measures negatively impacted residents' well-being. To be better prepared for future outbreaks and pandemics, we need a deeper understanding of how NHs manage COVID-19 or influenza outbreaks, and which considerations are being made to balance IPC and well-being.
Design: Mixed-methods study.
Setting and Participants: Fourteen Dutch NH organizations (176 NH locations) where COVID-19 or influenza outbreaks occurred during winter 2022-2023 were included.
Methods: We monitored the progression and management of 24 outbreaks by administering weekly questionnaires. Heterogeneous sampling was used to select 7 outbreaks for extensive monitoring, including epidemiologic data collection on the resident level and outbreak management evaluation through qualitative interviews (n = 7). Quantitative data were used for descriptive analysis (all outbreaks) and the generation of epidemiologic curves (extensively monitored outbreaks). Qualitative

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interview data were used to deepen our understanding of the considerations and adjustments made to IPC strategies by NH staff.
Results: We observed differences in IPC measures taken between NH organizations, but also within NH organizations, as IPC protocols were often customized to fit specific units, residents, or situations during outbreaks. Staff consistently considered the impact of IPC measures on residents against their beliefs about the effectiveness of measures, which occasionally led them to deviate from their IPC strategy in favor of residents' well-being.
Conclusion and Implications: The current study provides an understanding of how COVID-19 and influenza outbreaks were managed, how NH staff considered the impact and effectiveness of measures, and consequently, how IPC strategies were gradually adjusted during outbreaks. Acknowledging that although the majority of NH staff consistently recognize the need to tailor IPC measures, they inconsistently apply such customization in practice, which may help NH organizations better prepare for future outbreaks.

During the COVID-19 pandemic, national guidelines instructed nursing homes (NHs) to implement infection prevention and control (IPC) measures to safeguard residents, often provoking ethical tensions between safety and well-being.[1-3] Generally, these IPC measures included personal protective equipment (PPE), extra hygiene measures, social distancing, limiting social contacts, testing, visitor regulations, (single) room isolation of residents, and grouping infected residents through cohorting.[1,2,4] Emerging evidence suggests that these IPC measures may have a negative impact on residents' physical and mental well-being.[3,5-7] Consequently, NH staff often faced ethical dilemmas between the safety and well-being of residents, and by prioritizing the latter, NHs occasionally chose to disregard the nationally advised IPC policy.[8-11]

Such ethical dilemmas sparked public debate, and the proportionality of IPC measures in NHs came under scrutiny.[7,12-14] Scrutiny was especially intensified when COVID-19 mortality and morbidity decreased because of national vaccination campaigns, natural immunity, and the emergence of less virulent SARS-CoV-2 variants.[15,16] Although societal IPC measures were largely relaxed, NHs continued to apply them to manage ongoing COVID-19 and reemerging influenza outbreaks.[17-19] In response, NHs sought to improve the proportionality of their IPC strategies by integrating resident-centered decision making and by making residents' well-being an even more prominent determinant in IPC measure considerations.[7,9,12,20]

However, earlier research already suggested that staff favoring decisions for well-being were not always adequately informed on IPC, which raises the question of how they weigh residents' safety against their well-being.[8,11,21] Whereas numerous studies describe the dilemmas NH staff experience during outbreak management, little is known about how considerations on IPC measures are made and, ultimately, how these considerations affect the implemented IPC strategy.[22-25] Gaining an understanding of the rationale behind these considerations could help NHs to prepare for future outbreaks of respiratory viral infections.[9,12] Therefore, this mixed-methods study assessed which IPC measures were taken to manage COVID-19 and influenza outbreaks, which considerations were made on the well-being of residents, and consequently how IPC strategies were adjusted.

Methods

Study Design

This outbreak monitoring study is part of the "COVID-19 and Influenza: Appropriate measures to prevent and control Outbreaks" (CIAO) project, which focuses on (1) NH organizations' preparedness for outbreaks, (2) the execution of IPC strategies (current study), and (3) support for IPC measures among NH residents, their relatives, and health care professionals. In the current mixed-methods study, we combined quantitative and qualitative data during the prospective monitoring of COVID-19 and influenza outbreaks during the pandemic end stage. We monitored outbreaks through weekly questionnaires and extensively monitored a subset of outbreaks through descriptive epidemiology, visualization in epidemic curves, and qualitative interviews to reflect on the outbreak management.

Participants

Recruitment of NH organizations

All 104 NH organizations affiliated with one of the 7 Academic Collaborative Centers Older Adults in the Netherlands were invited to participate in the CIAO study. Ultimately, 32 organizations agreed to take part in the first study pillar, of which 15 organizations consented to also participate in the second study pillar, that is, the current outbreak monitoring study. A flow chart of inclusions and characteristics of the NH organizations included in both study pillars can be found in Supplementary Material S1.

Inclusion of outbreaks for monitoring through questionnaires

To be included, outbreaks had to comply with this study's definition of at least 2 newly confirmed cases of COVID-19 or influenza (by polymerase chain reaction or rapid antigen test) within 1 NH unit, in accordance with the outbreak definition of the National Institute for Public Health and the Environment (RIVM).[26] Based on our previous research, we assumed that infection prevention and control (IPC) strategies would be similar within the same NH organization.[9] For feasibility reasons, we therefore limited the inclusion to a maximum of 2 outbreaks per NH organization, each occurring at different NH locations within that organization. During the second week of the study, 1 NH organization withdrew from the study because it stopped testing residents entirely.

After inclusion for the outbreak monitoring, a location representative [eg, location manager, infection control practitioner (ICP), or (quality) nurse] was appointed by the NH organization as a weekly questionnaire respondent.

Selection of outbreaks for extensive monitoring including interviews

From the monitored outbreaks, a subset of outbreaks was included in the extensive outbreak monitoring. Three outbreaks were selected conveniently in chronologic order of occurrence to enable quick scheduling of the qualitative interviews, whereas 7

were purposively selected to create variation in virus type, outbreak, and organization size, region, and type of care (eg, psychogeriatric, somatic, or geriatric rehabilitation). Ultimately, 3 organizations withdrew because of the time demand of 90 minutes for the interviews.

Finally, for each extensively monitored outbreak, the NH location was asked to recruit 2 to 4 NH staff members, who were involved in the implementation (eg, older adult care physicians, ICP) and execution (eg, nurses, certified nursing assistants) of the IPC measures during the outbreaks, for a qualitative interview.

Setting

Various guidelines for managing COVID-19 in NHs existed and were used at the time of the CIAO study (December 2022–April 2023). The National Coordination for Infectious Disease Control guideline for COVID-19 by the RIVM (2022), which formed the national framework for infection control, recommended continued use of PPE (including FFP2 masks for staff), visitor restrictions, and isolation protocols for infected residents, with isolation periods shortened as immunity increased.[26] A guideline by the national organization representing nurses (V&VN) (2021), a professional resource for health care workers, emphasized FFP2 mask usage in high-risk settings and recommended testing for visitors and staff during outbreaks.[27] Treatment guidelines for COVID-19 by VERSENSO (association of geriatric specialists) (2023) supported these measures, specifically recommending isolation, vaccination, and targeted testing for both staff and residents.[28]

Even as national measures were scaled down in 2023, the V&VN (2023) explicitly advised maintaining these precautions to protect vulnerable clients.[29] They stressed that despite the easing of broader restrictions, it was crucial to continue protecting older residents and other vulnerable groups by keeping infection control measures in place, especially in NHs. By the spring of 2023, self-testing was encouraged for both residents and staff during outbreaks, marking the gradual end of widespread routine testing in NHs.[30]

At the time of this study, when government regulations were mostly lifted and guidelines were somewhat contradictory, NH organizations demonstrated varied levels of preparedness for respiratory viral outbreaks and commonly relied on organization-wide IPC committees to develop organization-wide IPC strategies.[9]

Materials

For the outbreak monitoring, one researcher (I.H.) developed the questionnaire, which was critically reviewed by the whole study team and revised accordingly (Supplementary Material S2). The questionnaire included questions on location, unit, and outbreak characteristics, which only had to be answered once. The remaining questions, on the outbreak progression and the IPC measures taken, were answered weekly.

For the extensive monitoring, a fillable table for the collection of epidemiologic data was created by a clinical microbiologist (S.K.). This table included the following columns: residents' unit (defined as the smallest space wherein all residents shared sanitation), corresponding type of care, date of test and positive test results for COVID-19 or influenza, date of symptoms onset, and respiratory symptoms (yes/no).

Finally, for the qualitative interviews as part of the extensive monitoring, the study team developed a semistructured interview guide, which included questions on which IPC measures were installed, which adjustments were made, and why. More detailed information on the qualitative interviews and interview guide is described elsewhere.[31]

Procedures

From February 8, 2023, till April 5, 2023, all COVID-19 and influenza outbreaks in the 14 participating NH organizations were registered and 24 outbreaks were monitored. To monitor outbreaks, one researcher (I.H.) administered weekly questionnaires by telephone with the location representatives or weekly received the questionnaires on paper from the location representatives.

Additionally, for the extensive monitoring, epidemiologic data of residents were collected on the fillable table by NH staff on the location. The epidemiologic data were pseudonymized, secured, and then shared with an ICP (BT).

The interviews were held online during working hours using Microsoft Teams (version 1.6.00.24078) between March 28, 2023, and May 17, 2023.

Data Analysis

Questionnaire data of the 24 monitored outbreaks, accounting for 42 outbreak units, were used to conduct descriptive analyses to gain insight into differences in outbreak management between outbreak types as well as between types of care provided. First, all 42 outbreak units were grouped by outbreak type (eg, COVID-19, influenza, or mixed). Then, all units were categorized based on the type of provided care: (1) psychogeriatric (PG) units for dementia care, (2) somatic units for physical conditions, (3) geriatric rehabilitation (GR) units for recovery and functional improvement after illness or surgery, and short-term residential care units, and (4) mental health care and mixed PG/somatic care units.[32,33] Continuous variables were reported as mean (SD) or median (IQR), and categorical variables as number (n) and percentage (%). Statistical analyses were conducted using IBM software SPSS, version 28.0 (IBM Corp).

To visualize the extensively monitored outbreaks, the epidemiologic data were used for the generation of epidemic curves in Rstudio (2023.12.1) by a clinical microbiologist (S.K.). Then, the questionnaire data were used to add the IPC measures taken to each corresponding epidemic curve.

Finally, to better understand the considerations underlying outbreak management, we conducted a comparative analysis inspired by the framework method for qualitative data analysis.[34] Interview transcripts were read closely and systematically categorized by type of outbreak measure, then organized into a matrix to enable cross-case comparison. For each outbreak, we examined who made decisions and how these were made for each IPC measure. This approach allowed us to compare not only the outbreaks but also the decision-making processes of outbreak teams or individuals in charge, highlighting the diversity of responses across outbreaks. Quotes from the interviews were forward- and backward-translated from Dutch to English to ensure and verify the accuracy and quality of the translation.

Table 1
Questionnaire and Interview Participants

	Questionnaires (n = 21)	Interviews (n = 22)
Infection control practitioner (ICP)	3	2
Quality officer	1	0
Elderly care physician (ECP)	0	5
Manager or team lead	10	4
Quality nurse or advanced practice nurse	5	2
Nurse	2	5
Certified nursing assistant (CNA)	0	3
Physician assistant	0	1

Table 2
Characteristics of the Study Sample

	Total Outbreaks (n = 24)	COVID-19 Outbreaks (n = 17)	Influenza Outbreaks (n = 4)	Mixed Outbreaks (n = 3)
Outbreak characteristics (n = 24)				
Average (SD) outbreak duration, d	13.4 (8.3)	13.3 (8.2)	15.8* (10.8)	11 (0.8)
Median number (IQR) of units affected by outbreak	1 (1-2)	1 (1-2)	1.5 (1-2.3)	1 (1-3)
Number (%) of outbreaks wherein residents deceased	5 (21)	4 (24)		1 (33)
Average (SD) attack rate per unit, %	34 (0.2)	35 (0.2)	25 (0.03)	42 (0.3)
Location characteristics (n = 24)				
Total number of residents, n (%)				
<30	2 (8)	1 (6)	1 (25)	
30-75	7 (29)	7 (41)		
75-150	12 (50)	6 (35)	3 (75)	3 (100)
150-225	2 (8)	2 (12)		
>225	1 (24)	1 (6)		
Total number of NH professionals, n (%)				
<75	4 (17)	2 (12)	2 (50)	
75-150	7 (29)	7 (41)		
150-225	6 (25)	4 (17)	1 (25)	1 (33)
>225	7 (29)	4 (24)	1 (25)	2 (66)
Unit characteristics (n = 42)	Total outbreak units (n = 42)	Total COVID-19 outbreak units (n = 28)	Total influenza outbreak units (n = 7)	Total mixed outbreak units (n = 7)
Type of care per unit, n (%)				
Psychogeriatric	25 (60)	18 (64)	5 (63)	3 (43)
Somatic	7 (17)	4 (14)	2 (29)	3 (43)
Geriatric rehabilitation care and short-term residential care	6 (14)	5 (18)		1 (14)
Other	4 (10)	1 (4)		
Vaccination rate against the outbreak virus of residents†, n (%)				
<80%	7 (17)	1 (4)		6 (86)
80%-85%	4 (10)	4 (14)		
85%-90%	1 (2)	1 (4)		
90%-95%	6 (14)	6 (21)		
>95%	22 (52)	14 (50)	7 (100)	1 (14)
n/a	2 (5)	2 (7)		

*Average has been calculated for 3 of 4 influenza outbreaks. For 1 influenza outbreak, the exact duration of the outbreak is unknown as during 33 days, 3 sequential outbreaks (influenza, Noro virus, and SARS-CoV2) occurred at this NH location. Because of the continued IPC measures and the decision not to test anymore residents after influenza infection was established, the exact end date of the Influenza outbreak remains unconfirmed.
†National COVID-19 Vaccination Campaign started in September 2022.

Ethical Considerations

The Medical Ethics Review Committee of the Amsterdam University Medical Center reviewed the study protocol and confirmed that the study does not fall under the scope of the Medical Research Involving Human Subjects Act (reference no. 2022.0801). Written informed consent was obtained from all participating NH staff members, and an opt-out procedure was applied for the collection of epidemiologic data from residents.

Results

In 14 NH organizations, 70 outbreaks were reported, of which 24 outbreaks were monitored through questionnaires with 21 different location representatives (Table 1). These outbreaks (17 COVID-19; 4 influenza; 3 mixed) lasted on average 13.4 days (SD 8.3) (Table 2). In 5 of the 24 outbreaks (21%), 1 or more residents passed. The median number of units affected per outbreak was 1 (IQR 1-2), ranging from 1 to 7. A total of 42 units were affected during these 24 outbreaks, of which the majority were units for psychogeriatric care (26/42; 62%).

IPC Measures

We identified 5 categories of IPC measures (testing, isolation, PPE, visitor restrictions and cancelation of group activities) and quantified their implementation across the 42 outbreak units (Table 3). Key findings are detailed below and illustrated in Figure 1, including the substantial variation in outbreak management practices observed between NH organizations. Notably, differences were most pronounced between somatic and psychogeriatric units, sometimes even within the same outbreak location.

Residents with symptoms were tested for either SARS-CoV2 or influenza in all outbreak units (42/42; 100%). Most COVID-19 (20/28; 71%) and influenza units (5/7; 71%) used rapid antigen tests for SARS-CoV-2, often followed by polymerase chain reaction testing for SARS-CoV-2 and/or influenza if the antigen test was negative. A smaller proportion (12/42; 29%) conducted immediate polymerase chain reaction testing for SARS-CoV-2 and/or influenza.

Room isolation of suspected or confirmed residents was applied in 60% of outbreak units (25/42). A comparison between the different types of care provided showed that room isolation was always applied at somatic units (7/7; 100%) and at one-third of the PG units (9/25; 36%). At PG units, cohorting was the most commonly installed isolation measure (15/25; 60%).

Unit-wide PPE measures for NH staff were implemented in 60% of units (25/42), where either only facemasks were mandatory (13/42; 31%) or full PPE (ie, clean gloves, isolation gown, facemask, and in some cases face shield or goggles) had to be worn (12/42; 29%). Compared with influenza units (3/7; 43%) and mixed outbreak units (2/7; 29%), unit-wide PPE measures were more frequently installed on COVID-19 units (20/28; 71%). PPE measures also varied by care

Table 3
Quantification of Infection Prevention and Control Measures That Were Installed During COVID-19 and Influenza Outbreaks in NHs on Specific Care Units

Unit-Level Policy (n = 42)	Total (n = 42)	COVID-19 (n = 28)	Influenza (n = 7)	Mixed (n = 7)	PG Care (n = 25)	Somatic Care (n = 7)	GR/PS Care (n = 6)	Other (n = 4)
Testing policy residents								
Symptom-based with PCR test	12 (29)	8 (29)	2 (29)	2 (29)	7 (28)	2 (29)	4 (67)	0 (0)
Symptom-based with self-test followed by PCR test in case of negative self-test outcome	30 (71)	20 (71)	5 (71)	5 (71)	18 (72)	5 (71)	2 (33)	4 (100)
Enhanced unit or location wide screening	5 (12)	5 (18)	0 (0)	0 (0)	5 (20)	0 (0)	0 (0)	0 (0)
Additional testing for contact tracing	2 (5)	2 (7)	0 (0)	0 (0)	2 (8)	0 (0)	0 (0)	0 (0)
Isolation of confirmed/suspected residents								
Only (single) room isolation	25 (60)	15 (54)	3 (43)	7 (100)	9 (36)	7 (100)	5 (83)	4 (100)
Only cohort isolation	10 (24)	7 (25)	3 (43)	0 (0)	10 (40)	0 (0)	0 (0)	0 (0)
(Single) room isolation first, then cohort isolation	6 (15)	5 (18)	1 (14)	0 (0)	5 (20)	0 (0)	1 (17)	0 (0)
No isolation	1 (2)	1 (4)	0 (0)	0 (0)	1 (4)	0 (0)	0 (0)	0 (0)
Personal protective equipment (PPE) for NH staff								
Any PPE only within 1.5 m of infected resident	17 (40)	8 (29)	4 (57)	5 (71)	7 (28)	5 (71)	3 (50)	3 (75)
Facemask on entire unit, additional PPE only within 1.5 m of infected resident	13 (31)	11 (39)	0 (0)	2 (29)	7 (28)	2 (29)	3 (50)	1 (25)
All PPE on entire unit	12 (29)	9 (32)	3 (43)	0 (0)	11 (44)	0 (0)	0 (0)	0 (0)
Regulating number of visitors (yes)	14 (33)	12 (43)	1 (14)	1 (14)	8 (32)	2 (29)	4 (66)	0 (0)
Canceling communal dining and/or group activities								
Exclusion of infected residents	19 (45)	9 (32)	5 (71)	5 (71)	10 (40)	3 (43)	2 (33)	3 (75)
Cancelation for all residents	22 (52)	18 (64)	2 (29)	2 (29)	15 (60)	4 (57)	3 (50)	1 (25)
Prophylaxis for infected residents (yes)	7 (17)	N/A	1 (14)	6 (86)	4 (16)	2 (29)	1 (17)	0 (0)

N/A, Not available; PCR, polymerase chain reaction.
Data are expressed as n (%).

type: in most somatic units (5/7; 71%), PPE was mandatory only within 1.5 m of infected residents, whereas the majority of PG units (18/25; 72%) installed unit-wide facemasks (7/18; 39%) or unit-wide full PPE (11/18; 61%).

Group activities were canceled in 52% of units (22/42), while 19 units (19/42; 45%) continued activities and excluded infected residents. Full cancelation was more common in COVID-19 units (18/28; 64%), whereas selective exclusion was more frequent in influenza (5/7; 71%) and mixed units (5/7; 71%).

Finally, visitor restrictions were installed in one-third of all outbreak units (14/42; 33%), primarily in COVID-19 outbreak units (12/14; 86%). Visitor restrictions were most common in GR units (4/6; 66%), followed by PG units (8/25; 32%) and somatic units (2/7; 29%).

Extensive Outbreak Monitoring

Seven outbreaks were extensively followed, and for each outbreak, the epidemic curves and corresponding IPC measures can be found in Supplementary Material S3. Below, we elaborate on the considerations made on IPC measures and residents' well-being and how IPC strategies were adjusted. Illustrative quotes translated to English can be found in Table 4.

Outbreak 1

This COVID-19 outbreak occurred in a mental health unit with 5 residents, where 4 got infected (four-fifths; 80%), and the outbreak lasted for 7 days (Supplementary Material S3A). At the start of the outbreak, the first resident who had COVID symptoms also had chronic obstructive pulmonary disease. Therefore, staff hesitated to test the resident even though testing residents with symptoms was protocoled. Staff assumed the resident's cough was chronic, and they wanted to avoid unnecessary discomfort. However, this decision was made without consulting the resident. When other residents later developed symptoms and testing was offered more broadly, the resident who first showed symptoms was finally asked, she expressed a clear willingness to be tested, not only to support outbreak management but also to know her own status.

Eventually, 4 residents tested positive, but the fifth resident refused testing despite being symptomatic. One nurse explained this led them to regard the entire unit as infected, which affected their PPE use, as PPE could no longer prevent transmission to residents. She added that protecting residents or their own families, rather than themselves, was the main reason for wearing PPE in the pandemic end-stage (Table 4, quotes 1 and 2).

The 4 COVID-19–positive residents were encouraged to stay in their rooms but were allowed to leave their room to smoke in the communal garden. A type of isolation classified by the organization as "light isolation." Although this offered some freedom, staff noticed increased agitation due to disrupted routines and therefore proposed a switch to cohort isolation. Without a local outbreak management team (OMT), a nurse and her team lead oversaw IPC measures. Despite suspecting a fifth infection, the team leader decided to follow protocol that permitted cohort isolation only if all residents were infected. She reasoned there was sufficient staff capacity for individual care (Table 4, quote 3). This decision left staff conflicted, as they restricted 4 residents' movement to protect one (Table 4, quote 4).

Outbreak 2

The second COVID-19 outbreak lasted 14 days and occurred on a PG unit, where most residents (6/8; 75%) were infected (Supplementary Material S3B). At this small outbreak location, no local OMT was formed; instead, a physician, advised by the organization-wide Corona team, oversaw IPC measure implementation. At the outbreak's onset, the physician chose to test all residents, despite feeling moral discomfort, particularly about testing a resident with chronic obstructive pulmonary disease. The physician acknowledged the tension between overtesting and missing infections but ultimately prioritized group safety over individual discomfort (Table 4, quote 5). Following the organization-wide corona team's advice, visitors were not limited. A quality nurse, and member of this coronavirus team,

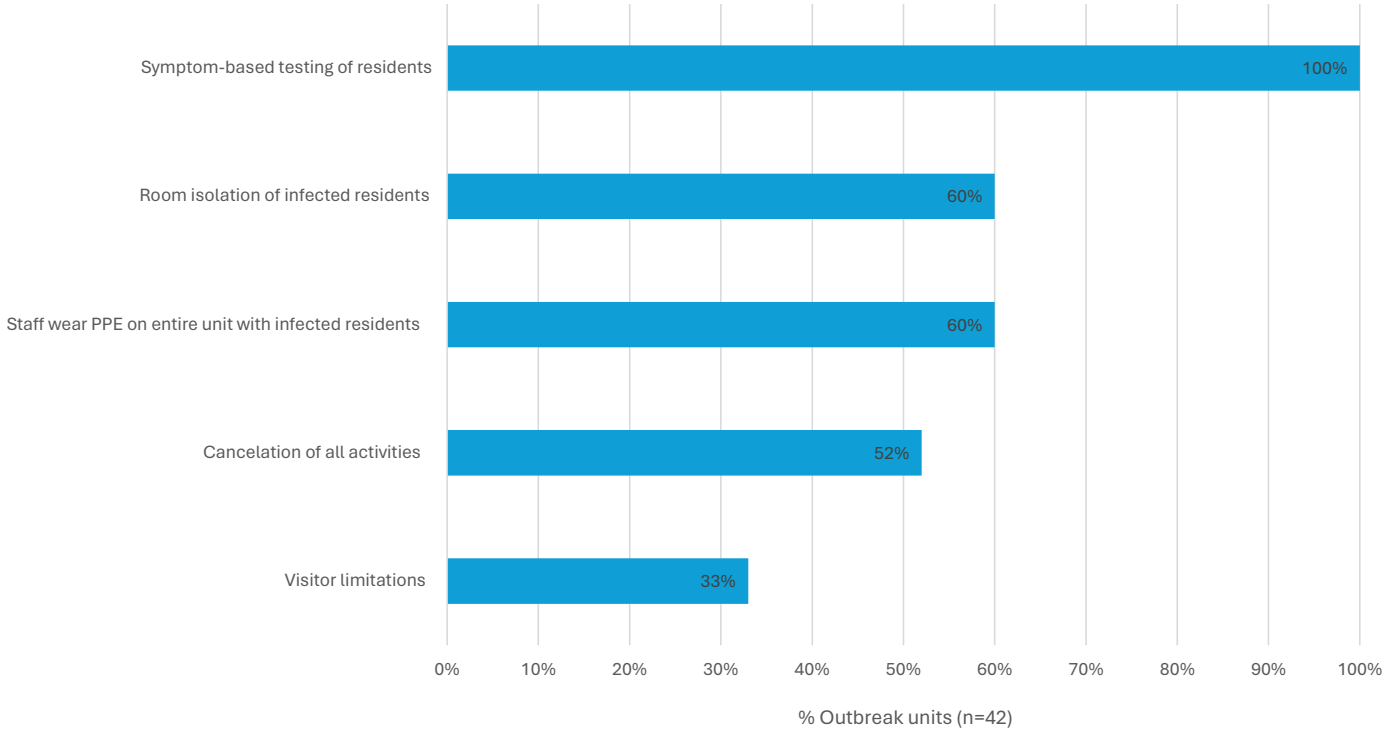

Fig. 1. Implementation of IPC measures per nursing home unit during COVID-19 and influenza outbreaks. This bar graph illustrates the percentage of outbreak units that adopted specific categories of IPC measures during either COVID-19 or influenza outbreaks. Bars represent the proportion of units implementing each measure, expressed as percentages. Categories include testing, isolation, PPE, visitor restrictions, and cancelation of group activities.

explained that they considered visitor limitations insufficiently effective and emphasized the ongoing balance between safety and resident well-being, acknowledging that complete protection is not always possible (Table 4, quote 6).

Moreover, during this outbreak, a physician also reconsidered the impact of room isolation on residents with dementia. Although those residents were initially bedridden, they became more restless and agitated as they recovered. The physician then considered the measure no longer proportional to its protective benefit and deviated from the 5-day isolation protocol by switching to a mixed cohort approach (Table 4, quote 7).

Outbreak 3

The third monitored COVID-19 outbreak began in a somatic care unit (8/28; 29%) and spread to 4 residents in a PG unit (4/28; 14%), lasting 30 days. During this time, IPC decisions were made by a physician and a location manager, participating in the organization-wide outbreak control team. Room isolation was considered feasible on the somatic unit because of residents' understanding of IPC measures. In the PG unit, however, isolation was described as unworkable as residents with dementia often left their rooms. The manager explained they decided against cohort isolating the unit to maintain the freedom of both infected and uninfected residents, instead advising staff to minimize contact between them (Table 4, quote 8).

Additionally, the organization-wide OCT had previously decided to exclude only confirmed infected residents from activities. In the PG unit, this meant that residents who had potentially been exposed to infected residents were still allowed to attend communal activities. The manager explained that this decision was based on fairness, questioning why uninfected residents should be treated differently from members of the general public (Table 4, quote 9).

Outbreak 4

The fourth COVID-19 outbreak occurred on one of 2 floors, where 56 residents lived in 9 different but connected units (Supplementary Material S3D). A total of 23 residents (23/56; 41%) were infected as the outbreak spread to 7 units (3 somatic and 4 PG) and lasted 16 days.

During this outbreak, a local OMT, comprising a physician, manager, and quality officer, implemented different isolation measures for the somatic units than for PG units. Although somatic residents were room isolated, mixed cohorts were formed on the PG units, allowing both infected and noninfected residents to move freely within their unit but restricting access to other units. Two certified nursing assistants (CNAs) noted that this measure negatively affected residents' well-being by limiting their freedom, distractions, and social interaction. Nonetheless, they agreed that it is necessary and effective in limiting transmission to other units.

In those mixed cohorts, PPE had to be worn at all times. However, staff considered the PPE measures to be ineffective to protect themselves because residents in the PG unit, longing for physical touch, could not be instructed to keep their distance. Both interviewed certified nursing assistants recalled instances when infected residents, unaware of being infected, did not keep their distance and instead hugged them, kissed them on the cheek, or sneezed on them (Table 4, quote 10).

Outbreak 5

This mixed outbreak occurred in 1 GR care unit, which consisted of 13 two-person rooms, with shared sanitation, and 2 one-person rooms (Supplementary Material S3E). During 12 days, 17 of the 24 residents staying in the unit were infected [7 COVID-19 (7/24; 29%), 5 influenza (5/24; 21%), and 5 with both COVID-19 and influenza (5/24; 21%)].

Table 4
Considerations Made on the Impact and Effectiveness of Measures During Outbreaks Illustrated by Quotes Translated From Dutch to English

	Quote
1	In the beginning everyone thought: “Oh we have to because otherwise we will become deathly ill.” In the end phase, where we were in, people thought: “Let’s get it over with, it is just a bit of flue.” Other said: “No, I want to visit my grandma or I do not want my kids to get it because we have plans.” So, you see staff takes that into account when deciding to use full PPE or not. (Nurse, interview 1)
2	If you have a resident somewhere and you have 10 other residents, yes, then people start to think: if I walk in unprotected by one of them, I increase the risk for the others. So that is a constant topic of conversation, and then you see that people deal with it consciously. With us, of course . . . everyone (all residents) had COVID, so then you see that it is dealt with less strictly. (Nurse, interview 1)
3	Because we only have 5 residents and a 1-to-5 staff ratio, you have a lot of time for individual attention. So you have some time to sit with a resident (in their room) and give them attention that way. (Team lead, interview 1)
4	Well, I found it difficult in the sense that he is the one who had all the power over the well-being of the other 4, whereas if he had taken that test, then they could have had dinner together and they would have had much more interaction and those 5 days would have been peanuts for them. (Nurse, interview 1)
5	We have clients with COPD, for instance, who frequently cough and sneeze, so at a certain time you feel a kind of reluctance to test with each sneeze and cough. But you may miss a possible infection. So that is kind of an impediment: how often should you test and what is the wisest course of action? (Elderly care physician, interview 3)
6	I think that as a corona team we have always looked at the balance between safety and well-being. That sometimes you also scale back certain measures earlier, because it benefits well-being, and sometimes at the expense of a bit of safety. You cannot protect your residents 100% against infections. And at some point we also reached a point where we no longer wanted that. And of course you want your residents to be healthy, but you also want your residents to have freedom of movement and to receive visitors. (Quality nurse, interview 2)
7	Because the people were recovering a bit, it was becoming increasingly difficult to keep them in their rooms. And with other people it worked, but they suffer a lot psychologically. That is why the following was agreed: people would be allowed out of isolation on Sunday, and then be sort of cohort isolated from Saturday onward. There has been a deviation from the national policy of at least 5 days of isolation. (Elderly care physician, interview 2)
8	We look per resident, as one resident is better kept in their room than the other. If you have a resident with COVID who cannot be kept in the room, then we keep the other residents in the rooms as much as possible, so that there is as little contact with others as possible. (Manager, interview 3)
9	We actually want to restrict people as little as possible in everything, right? And yes, in the Netherlands it has been the case for a long time now that even if you have a housemate who has tested positive, not all housemates have to stay indoors. So as long as you test negative, you can also go outside in normal life. Yes, why not residents then, right? (Manager, interview 3)
10	You take all the right precautions, but yeah . . . I mean, a resident who coughs in your face, who sneezes in your face, who gives you a kiss. At PG, people don’t understand that they are doing something wrong. . . . (Certified nursing assistant, interview 4)
11	The measures that we are implementing, yes, you have implemented them because they are still expected of you, then I sometimes think: yes, in health care we implement so many things because we actually have to cover ourselves a bit, because we have to. (Nurse, interview 5)
12	Facemasks. . . . you know, if you want to wear those properly, there are so many measures and step-by-step plans in between, I dare to bet that in the entire COVID period, that maybe 70% did not wear it properly and 30% did. If you want to use that very effectively, what are you doing at a given moment? What are you doing it for? There is a kind of picture presented at a given moment: this is the ritual that we have to do with COVID. (Nurse, interview 5)
13	In the past we were very strict; of course, then people could no longer go to the buffet, which is a therapeutic means to get your own food, that is part of the rehabilitation climate. Then people had to sit at a meter and a half apart, by themselves and then they were served, but we did not do that this time either because the rehabilitation is also important, that must continue. So another consideration, that also weighs heavily. (Elderly care physician, interview 5)
14	That (isolation duration) was sometimes a search, but we then coordinated that with, say, a doctor, nurses: "Are the complaints over, can they just come out of isolation again after 5 days, returning to a very large group without any problems?" However, a few kept complaints that made us question should they stay in isolation longer, yes or no. Also depending a bit on whether someone can keep a bit of distance from someone else, yes or no. That you move the individual along with that. (Nurse, interview 6)
15	Now, after a week, we decided whether or not to stop the activities, but at the time, that had such an impact on so many residents, the complaints were so mild that we said: "No, that does not seem desirable to us for the greater whole." And we also did not have the feeling that we were preventing a lot more infections . . . yes, we could prevent them. Of course, some, but not everything. And that had such an impact on the house that we decided not to do that. In the end, it has now lasted 3 weeks, yes, maybe it would have been 2 weeks otherwise, you don’t know of course. But with a lot of impact for people. (Manager, interview 6)
16	Because their mother could no longer walk and was in a wheelchair and had to be locked up in a room all alone. And that other woman who could walk around independently and open all the doors was allowed to walk around the ward. (Nurse, interview 7)

COPD, Chronic obstructive pulmonary disease.

During this outbreak, decisions on the IPC measures were made by 2 ICPs who instructed an advanced practice nurse. Although room isolation was theoretically feasible for the residents on the GR care unit, limited access to 1-person rooms with private bathrooms posed a challenge. Consequently, infected residents were relocated to rooms with shared sanitation facilities, only with other infected individuals. However, the advanced practice nurse later questioned the effectiveness of this strategy, given the unit’s small size and high visitor and therapist turnover (Table 4, quote 11). As infections rose, staff considered relocation ineffective, accepted the transmission risk, and stopped their attempts to separate residents. Simultaneously, staff also questioned the effectiveness of wearing PPE on this small and compact unit, especially as they observed noncompliant behavior among their peers (Table 4, quote 12).

Visitors were limited to 1 visitor per resident per day. One ICP stated that they considered it necessary to limit the continuous flow of people entering the unit but wanted to do so without depriving residents of social contact. Infected residents were excluded from group activities, but these were not canceled entirely for the continuation of the rehabilitation programs (Table 4, quote 13).

Outbreak 6

This influenza outbreak occurred in 4 of 6 units of an NH location and lasted 21 days (Supplementary Material S3F). A total of 18 residents were infected (18/90; 20%), including 7 residents on somatic unit A (7/15; 47%), 9 on somatic unit B (9/15; 60%), 1 on PG unit C (1/15; 7%), and 1 on PG unit D (1/15; 7%).

In the absence of an OMT, IPC decisions during this influenza outbreak were made by the manager and physician, who applied the familiar COVID-19 protocol because of a lack of influenza-specific protocols. According to this protocol, they room-isolated suspected and confirmed residents, which had not been protocoled in previous influenza outbreaks. Staff experienced moral discomfort isolating residents with mild symptoms, particularly while awaiting polymerase chain reaction results. Ultimately, a lighter form of isolation was agreed on, wherein residents were granted some freedom of movement to leave their rooms, as a more balanced measure for this influenza outbreak.

Again, moral conflict arose because of uncertainty around influenza’s incubation period and appropriate isolation duration. In consultation with a physician, a minimum 5-day isolation was

adopted, followed by symptom and transmission risk assessment. In the search for the appropriate isolation duration, the need to protect the group was prioritized over the interest of the individual. Therefore, it was occasionally decided to isolate residents beyond 5 days (Table 4, quote 14).

It was also decided not to cancel group activities, but instead to exclude only infected residents. Together with a team lead, the manager concluded that residents' symptoms were too mild, the negative impact too big, and the protective advantage too small for such a strict measure (Table 4, quote 15).

Outbreak 7

The final outbreak lasted for 33 days on 1 PG unit, with 3 different residential groups. First, an influenza outbreak co-occurred with a Norovirus outbreak and then ended with some COVID-19 cases [by test confirmed 3 influenza (3/24; 13%); 2 COVID-19 (2/24; 8%)] (Supplementary Material S3F).

During this outbreak, the OMT consisted of the physician and the team lead, who together decided the first few influenza cases could be room isolated. When the fourth resident could not be instructed for room isolation, it was decided not to isolate this resident at all, as this resident with dementia had the urge to wander. The customization of isolation measures sparked a discussion with family members of one of the first infected residents, as their mother who used a wheelchair was easily room isolated and not granted the same privileges. Staff then reconsidered the impact of room isolation and the ethics of not isolating all infected residents. Finally, they decided cohorting with the risk of transmission to other residents would be more ethically appropriate (Table 4, quote 16).

Comparative Analysis

A comparison of IPC strategies across 7 outbreaks revealed consistent attention to the effectiveness and consequences of measures. Considerations on IPC strategies were generally made by 1 or 2 individuals in charge (decision-makers), without systematic involvement of an organization-wide IPC or outbreak committee.

However, individual and interpersonal variation in how these considerations were weighed led to notable differences in decision making across these 7 outbreaks. Often individual decisions determined the timeliness of the outbreak management strategy. For example in outbreak 1, a nurse's decision to delay testing because of perceived burden slowed response, whereas in outbreak 2, a physician prioritized early detection and initiated enhanced testing.

Room isolation decisions varied widely across the 7 outbreaks. Although most interviewed decision makers viewed it as effective, they differed in how they balanced its benefits against impact (eg, increased restlessness and agitation), feasibility (eg, staff levels, whether the resident was understanding, wheelchair-bound, or bedridden), and protective benefit compared to cohort isolation (ie, the number of uninfected residents on the unit). These differences shaped diverse approaches: Some strictly implemented isolation even when most residents were already infected (outbreak 1), or extended isolation durations (outbreak 6). Others adjusted measures due to visible resident distress or gradually questioned effectiveness (outbreaks 2, 5, and 7). Some interviewed decision makers really emphasized their prioritization of freedom of movement, which led them to immediately implement cohort isolation (outbreak 4), or no form of isolation at all (outbreak 3). Across interviews, decision makers emphasized the need to tailor isolation to individual circumstances, often deviating from protocol.

On the contrary, in each of the 7 outbreaks, PPE protocols were broadly implementable and required little decision making. Yet, interviewed frontline staff reported inconsistent compliance citing doubts about PPE effectiveness because of high attack rates, residents' inability to distance, and peer behavior (outbreaks 1, 4, and 5).

Across these 7 outbreaks, consensus existed in the decisions to limit visitor restrictions. Generally, complete bans were avoided by decision makers, as they considered the perceived protective benefit to not outweigh the social harm for residents. Again, views differed, some questioned the protective value entirely (outbreak 3), whereas others saw justification to limit visitors as outbreaks worsened due to high infection rates or introduction of Noro virus (outbreaks 4, 5, and 7).

Finally, decisions about canceling group activities during these 7 outbreaks reflected a tension between group safety and individual well-being. In outbreak 6, the same decision maker who enforced prolonged room isolation in order to protect the group safety chose not to cancel group activities all together, as the cancelation of activities was considered ineffective in protecting the group from transmissions and harmful to the individual's well-being. This displays an interpersonal contrast in reasoning within the same outbreak.

Discussion

In this study, we investigated how NH organizations managed outbreaks of COVID-19 and influenza during the pandemic end-stage, and which considerations led to adjustments in IPC strategies. We found substantial variation in outbreak management practices both between and within NH organizations, with frequent deviations from established protocols. These deviations were often driven by the perceived inapplicability or ineffectiveness of specific measures and were typically made in response to evolving circumstances.

Our findings illustrate how the involvement of multiple stakeholders shapes the translation of IPC strategies from policy to practice. Although our previous work indicated organization-wide committees often developed IPC policies, the extensive monitoring as part of this study revealed IPC committee members were frequently not involved in the day-to-day management of those 7 outbreaks. In practice, older adult care physicians or managers were typically responsible for implementing protocols, and the extent to which they received support from the broader committee varied across organizations. Notably, organization-wide IPC protocols were often too general and insufficiently tailored to the diverse contexts within NHs, which is consistent with D'Souza et al,[10] who also reported that inconsistent guidance compelled staff to adapt protocols based on situational judgment.

These findings raise critical questions about the role of individual decision making in outbreak management, particularly regarding the factors that influence NH staff's choices and whether similar and consistent decisions would be made under comparable circumstances. Although managers and older adult care physicians consistently aimed to balance the impact and protective value of IPC measures, their assessments and priorities varied. This led to differences in how resident well-being was considered and in the IPC strategies applied. Similar interpersonal variation has previously been observed in the implementation of isolation measures.[11,24] Besides previously known inter-individual differences, we also found inner personal differences, as decision makers' reasoning was sometimes inconsistent; in some cases, they prioritized group safety over the interests of an infected individual, whereas in others, they favored the infected resident's well-being.

In addition to those responsible for IPC strategy decisions, the choices of frontline staff also played a role in the outbreak management in practice. Frontline staff members sometimes chose to adjust or ignore certain IPC measures, particularly those within their direct control, such as PPE use, based on their own assessment of impact and effectiveness. For other IPC measures, such as isolation policies, they generally followed the decisions of those in charge. Still, they occasionally challenged them, leading to adjustments in the outbreak

management strategy over time. Highlighting, on the one hand, the need for integrating frontline staff's perspectives into local IPC strategies and decision making, but on the other hand, the potential gain of increased awareness of IPC measure effectiveness.[11,22,24]

Together, considerations of the impact on residents and the effectiveness of the measure led NH staff to forgo or adjust IPC measures gradually during outbreaks, which often meant staff diverged from adherence to current medical practice guidelines. Adjustments included not testing residents, no (room) isolation, not maintaining an isolation period of 5 days, no cancelation of activities, not limiting visitors, and not wearing (sufficient) PPE. These adjustments might have improved what staff considered to be residents' well-being but might have also contributed to the spread of COVID-19 or influenza to other residents, units, and potentially even the death of residents.[1,2,4] Future research could explore whether specific variations in IPC measures influence transmission dynamics and outbreak severity across different nursing home contexts. Additionally, examining the impact of autonomy-restricting measures on residents' well-being would yield valuable insights into the broader implications of outbreak management, and could support more informed decision making by staff, grounded in residents' expressed preferences and lived experiences rather than staff interpretations alone.

Strengths and Limitations

A key strength of this study is its mixed-methods design, which enabled a deeper understanding of outbreak management considerations and adjustments, and explained variation in IPC strategies across 7 diverse outbreaks. These outbreaks differed in type, duration, and NH characteristics, allowing for a comprehensive assessment of outbreak responses during the pandemic's end stage.

A limitation is the variability in questionnaire respondents during general outbreak monitoring, as NHs could freely appoint a location representative. Although this flexibility facilitated participation, some respondents, such as managers or ICPs, may not have been directly involved in IPC implementation. Consequently, this could have led to incomplete or socially desirable responses. In one instance, inconsistencies between general and extensive monitoring data, stemming from a location representative's misinterpretation of the outbreak definition, led to underreporting of cases and were resolved through follow-up verification and reviewing of internal records.

Conclusions and Implications

The current study provides an understanding of how NH organizations managed COVID-19 and influenza outbreaks in NHs, including the considerations on the well-being of residents that were made and the adjustments to IPC strategies that were gradually implemented during the outbreaks. In conclusion, this study highlights how individual decision making by various NH stakeholders influenced the management of COVID-19 and influenza outbreaks in NH organizations in the pandemic end stage. Both staff responsible for IPC strategy decisions and frontline staff frequently adjusted IPC measures based on perceived effectiveness and the anticipated impact on residents' well-being. Although these adjustments may have mitigated negative consequences, they also carried the risk of increased viral transmission and adverse outcomes. These findings underscore the need for proactive, context-sensitive IPC planning that takes the realities of care delivery in diverse settings into account. Without such preparation, staff are left to make complex ethical decisions under pressure, which can lead to inconsistent practices, moral distress, and suboptimal outcomes for both residents and staff involved.

The frequent adjustment of IPC measures during outbreaks, driven by staff assessments of effectiveness and resident well-being, highlights the limitations of generic, organization-wide IPC protocols that leave room for personal interpretation. To support consistent and ethically sound decision making, IPC strategies should be tailored to specific settings and developed collaboratively with all NH stakeholders involved in the outbreak management. Moreover, to reduce reactive decision making, scenario-based training and pre-outbreak planning at the unit level, and evaluation of local IPC adjustments, might help. Additionally, more research is needed on the effectiveness of measures and their impact on residents' well-being to inform clinical practice. Finally, it would be particularly relevant to learn how to involve residents and their loved ones during this process.

Disclosure

There is nothing to declare.

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Supplementary Data

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References

1. Zhang J, Yu Y, Petrovic M, Pei X, Tian QB, Zhang L, Zhang WH. Impact of the COVID-19 pandemic and corresponding control measures on long-term care facilities: a systematic review and meta-analysis. *Age Ageing*. 2023;52:afac308.
2. Eltaybani S, Igarashi A, Cal A, et al. Long-term care facilities' response to the COVID-19 pandemic: an international, cross-sectional survey. *J Adv Nurs*. 2024;80:350–365.
3. Hoben M, Dymchuk E, Corbett K, et al. Factors associated with the quality of life of nursing home residents during the COVID-19 pandemic: a cross-sectional study. *J Am Med Dir Assoc*. 2023;24:876–884.e5.
4. Bloch N, Manner J, Gardiol C, et al. Effective infection prevention and control measures in long-term care facilities in non-outbreak and outbreak settings: a systematic literature review. *Antimicrob Resist Infect Control*. 2023;12:113.
5. Noten S, Stoop A, De Witte J, et al. "Precious time together was taken away": impact of COVID-19 restrictive measures on social needs and loneliness from the perspective of residents of nursing homes, close relatives, and volunteers. *Int J Environ Res Public Health*. 2022;19:3468.
6. Gray KL, Birtles H, Reichelt K, James IA. The experiences of care home staff during the COVID-19 pandemic: a systematic review. *Aging Ment Health*. 2022;26:2080–2089.
7. van Dijk Y, van Tol LS, Achterberg WP, Zuidema SU, Janus SIM. COVID-19 measures implemented for nursing home staff and their perspectives on the importance of the measures: a qualitative study. *Int J Nurs Stud Adv*. 2024;6:100163.
8. van den Besselaar JH, Spaargaren M, Smalbrugge M, et al. Implementation of a national testing policy in Dutch nursing homes during SARS-CoV-2 outbreaks. *J Am Geriatr Soc*. 2022;70:940–949.
9. Kolk D, van der Horst IR, Smalbrugge M, et al. *Preparedness of long-term care facilities for outbreaks of Covid-19, Influenza and new emerging viral respiratory infections: the CIAO study*. 2026.
10. D'Souza GC, Kraschnewski JL, Francis E, et al. Implementation of COVID-19 infection control best practices in nursing homes amid the pandemic. *Bmc Health Serv Res*. 2024;24:941.
11. Cohen CC, Pogorzelska-Maziarz M, Herzig CT, et al. Infection prevention and control in nursing homes: a qualitative study of decision-making regarding isolation-based practices. *BMJ Qual Saf*. 2015;24:630–636.
12. van Tol LS, Smaling HJA, Janus SIM, Caljouw MAA, Achterberg WP. Priority measures to prevent infections and maintain residents' well-being during COVID-19 outbreaks in nursing homes: consensus among staff and resident representatives determined in an online nominal group technique study. *Int J Nurs Stud Adv*. 2023;5:100142.
13. van Wijngaarden J, de Mul M, Ahaus K. Crisis management tasks in Dutch nursing homes during the COVID-19 pandemic: a longitudinal interview study. *Med Care Res Rev*. 2023;80:318–327.

14. Storr J, Kilpatrick C, Seale H. The relevance of nursing to the achievement of person-centred infection prevention and control. *J Res Nurs*. 2024;30:34–44.
15. Wouters F, van Loon AM, Rutten JJS, Smalbrugge M, Hertogh C, Joling KJ. Risk of death in nursing home residents after COVID-19 vaccination. *J Am Med Dir Assoc*. 2022;23:1750–1753.e2.
16. Crevecoeur J, Hens N, Neyens T, et al. Change in COVID19 outbreak pattern following vaccination in long-term care facilities in Flanders, Belgium. *Vaccine*. 2022;40:6218–6224.
17. Bonacina F, Boelle PY, Colizza V, Lopez O, Thomas M, Poletto C. Global patterns and drivers of influenza decline during the COVID-19 pandemic. *Int J Infect Dis*. 2023;128:132–139.
18. Boudewijns B, Paget J, Del Riccio M, Coudeville L, Crepey P. Preparing for the upcoming 2022/23 influenza season: a modelling study of the susceptible population in Australia, France, Germany, Italy, Spain and the United Kingdom. *Influenza Other Respir Viruses*. 2023;17:e13091.
19. Townsend JP, Hassler HB, Lamb AD, et al. Seasonality of endemic COVID-19. *mBio*. 2023;14:e0142623.
20. Smeitink MMP, Smaling HJA, van Tol LS, Haaksma ML, Caljouw MAA, Achterberg WP. Activities for residents of Dutch nursing homes during the COVID-19 pandemic: a qualitative study. *Int J Environ Res Public Health*. 2022;19:5465.
21. Abed AM, Abdeen S, Selim N, et al. Knowledge and perceived effectiveness of infection prevention and control measures among health care workers during the COVID-19 pandemic: a national survey. *J Nurs Care Qual*. 2022;37:E23–E30.
22. Alshawish E, Benbenishty J. Global nurse involvement in ethical decision-making during pandemics: a concept analysis. *J Res Nurs*. 2023;28:92–101.
23. Sizoo EM, Monnier AA, Bloemen M, Hertogh C, Smalbrugge M. Dilemmas with restrictive visiting policies in Dutch nursing homes during the COVID-19 pandemic: a qualitative analysis of an open-ended questionnaire with elderly care physicians. *J Am Med Dir Assoc*. 2020;21:1774–17781.e2.
24. Iaboni A, Quirt H, Engell K, et al. Barriers and facilitators to person-centred infection prevention and control: results of a survey about the dementia isolation toolkit. *BMC Geriatr*. 2022;22.
25. Samdal GB, Alpers LM, Sekse RJT, Drageset S, Smith-Strøm H, Oksholm T, Ellingsen S. Barriers and facilitators for leading nursing homes through the COVID-19 pandemic: a focus group study in Norway. *Nurs Open*. 2023;10:7154–7167.
26. RIVM. COVID-19 richtlijnen voor zorginstellingen. 2022. Accessed October 23, 2025. https://lci.rivm.nl/richtlijnen/covid-19
27. V&VN. Leidraad voor het gebruik van FFP2-maskers. 2021. Accessed October 23, 2025. https://www.venvn.nl/media/viib111e/leidraad_voorzorgsgebruik_ffp2maskers_versie1-9_def_dec2021.pdf
28. VERENSO N. Behandeladvies COVID-19 Diagnostiek, behandeling en infectiepreventie/uitbraakmaatregelen voor verpleeghuizen, instellingen voor verstandelijk gehandicapten, woonzorgcentra en kleinschalige woonvoorzieningen (mits hoofdbehandelaar). 2023. Accessed October 23, 2025. https://www.verenso.nl/assets/Thema-en-projecten/Infectieziekten/Covid-19/230824_-Update-behandeladvies-COVID-19.pdf
29. V&VN. Kwetsbare cliënten goed blijven beschermen. 2023. Accessed October 23, 2025. https://www.venvn.nl/nieuws/v-vn-kwetsbare-clienten-goed-blijven-beschermen
30. Rijksoverheid. Laatste specifieke corona-adviezen vervallen, maar gebruik je gezonde verstand bij luchtwegklachten. 2023. Accessed October 23, 2025. https://www.rijksoverheid.nl/actueel/nieuws/2023/03/10/laatste-specifieke-corona-adviezen-vervallen-maar-gebruik-je-gezonde-verstand-bij-luchtwegklachten
31. van der Horst IR, Kolk D, Janssen M, et al. Barriers and facilitators to successful outbreak management of viral respiratory tract infections in long-term care facilities: a qualitative interview study. *J Am Med Dir Assoc*. 2025;26:105575.
32. Hoek JF, Ribbe MW, Hertogh CM, van der Vleuten CP. The role of the specialist physician in nursing homes: the Netherlands' experience. *Int J Geriatr Psychiatry*. 2003;18:244–249.
33. Fassmer AM, Zuidema SU, Janus SIM, Hoffmann F. Comparison of medical care needs and actual care in German and Dutch nursing home residents: a cross-sectional study conducted in neighboring European countries. *Arch Gerontol Geriatr*. 2024;117:105178.
34. Gale NK, Heath G, Cameron E, Rashid S, Redwood S. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Med Res Methodol*. 2013;13:117.