The COVID-19 pandemic and vulnerable older persons: impact of a public health emergency on nursing homes and geriatric rehabilitation

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THE COVID-19 PANDEMIC AND VULNERABLE OLDER PERSONS

Impact of a public health emergency on nursing homes and geriatric rehabilitation

Lisa S. van Tol

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Lisa Sanne van Tol

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General introduction

SITUATION OUTLINE: DUTCH NEWS ARTICLES PUBLISHED MARCH AND APRIL 2020

On March 12, 2020, a press conference and subsequent news reports announced "*corona measures: stay at home with mild complaints, mass cancellation of events* " (1). Dutch citizens with mild symptoms of COVID-19 were advised to avoid social contacts and stay home, to cancel events with more than 100 people, and to limit visits to older persons. In addition, older persons were advised to avoid public transport and large groups of people.

March 15, 2020 was labelled as "*The day the Netherlands went into further lockdown*" (2). All schools, childcare centres, cafes, restaurants and sports clubs in the Netherlands had to close down. These measures would last for at least three weeks until April 6.

A headline on Thursday March 19, 2020: *"Visits to nursing homes are no longer possible due to coronavirus"* (3). It was announced that as of March 20, nursing homes had to close their doors to visitors and others "*who are not necessary for basic care needs*", until at least April 6. Occasionally, an exception could be made for residents in the dying phase. The Minister of Health, Welfare and Sport said at a press conference: "…*We did not take this decision lightly. But we must protect the people we love*".

On Friday April 10, 2020, a news article appeared entitled: "*Silent disaster at nursing homes: 'Older persons dying here one by one'*" (4). The article described the situation in a nursing home in the south of the country, where entire floors were in total isolation. A nurse who works there sees the residents she is taking care of die one by one. In some departments more than half of the residents died.

On April 19, 2020 the article "*Locked up in the nursing home but no corona: 'She is dying of loneliness'*" was published (5), and on April 21 an article describing that more and more nursing home residents "*would rather have corona than go through this long crisis alone.*" (6).

A NEW DISEASE WITH FAR-REACHING CONSEQUENCES

From new disease to pandemic
Coronavirus disease 2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was discovered in Wuhan, China, in early December 2019 (7). In January 2020, the virus started to spread rapidly across the world (8). It soon became

clear that this new disease would pose a serious threat to global public health, especially to vulnerable populations. On January 30, 2020, the World Health Organization (WHO) declared the COVID-19 pandemic a public health emergency of international concern – the highest level of alarm under international law (9, 10).

COVID-19 reached Europe at the end of January 2020 (8). In the Netherlands, the first official COVID-19 diagnosis was confirmed on February 27, 2020 (11), and the first death occurred on March 6, 2020 (12). The first large COVID-19 outbreak in Europe occurred in Lombardy, Italy, starting early March 2020 (13). By mid-March Europe had become the epicentre of the global pandemic (14).

Fear of the unknown

There was a great lack of knowledge about this new disease. Before the COVID-19 pandemic, leading international healthcare institutes such as the WHO and the European Centre for Disease prevention and Control (ECDC) had warned of the risks of global pandemics and published recommendations for pandemic preparedness and response (15, 16). However, when the COVID-19 pandemic began, many of these recommendations could not be implemented due to the lack of diagnostic tests, a cure, and vaccines (17). When the first deaths occurred, there was still uncertainty about how to clinically diagnose COVID-19 and how to distinguish COVID-19 from influenza and other infectious diseases that cause similar symptoms (18). Among the few tools available to prevent further spread of the virus were containment and mitigation strategies (17, 19, 20), referred to in this thesis as infection prevention measures.

SARS-CoV-2 infection was suspected in anyone who developed a cough, a sore throat, shortness of breath (dyspnoea), loss or change of smell or taste, a congested nose, runny nose (rhinorrhoea), headache, fatigue and weakness, fever, and myalgia (21, 22). These symptoms made people fear for their own health, worry about illness and death of their loved ones, and infecting others (23). In addition, it was still unknown how quickly the virus would spread, how many people would die from infection, and how long the pandemic would last. The high level of media attention given to the threats that COVID-19 posed to societies only increased people's fears (23).

Impact on the healthcare sector

The COVID-19 pandemic put pressure on healthcare systems. Healthcare facilities worldwide were inundated with a large influx of COVID-19 patients. By the end of March 2020, Dutch Intensive Care Units (ICUs) were almost full, with more than 1,100 COVID-19 patients in (24). With this limited ICU capacity, ethical dilemmas arose, such as deciding who to treat and who not to treat (25). Older persons braced themselves for possible

decision that there would be no place for them in the ICU (26), and were prompted to have conversations about advance care planning (24, 27). Healthcare workers saw many patients dying, they became ill, and often worked overtime (28). Regular healthcare services were frequently disrupted, cancelled, or postponed (29).

In order to provide care to as many incoming patients as possible, and to isolate CO-VID-19 patients from other patients, hospitals often reorganized their departments (30). Other healthcare facilities, such as nursing homes, played an important role in reducing the pressure on hospitals by creating COVID-19 units to care for COVID-19 patients who did not require intensive hospital care, thus enabling early hospital discharge of COVID-19 patients (31, 32). Nevertheless, the nursing home care sector itself was also hit hard by SARS-CoV-2 infections, as the news headlines above illustrate.

DUTCH NURSING HOMES

Dutch nursing home organizations provide a wide range of care and support services to the most vulnerable groups in our society: persons that require care or supervision 24 hours a day and suffer from long-term, complex health problems. The services provided to these residents include, but are not limited to, support in daily living, social care, palliative care, and other types of (medical) treatment (33, 34). In addition, many Dutch nursing homes provide more temporary inpatient or ambulatory geriatric rehabilitation (33). These services are provided by multidisciplinary teams that only in the Netherlands include specially trained elderly care physicians (33). To persons that do not require care or supervision 24 hours a day, nursing home care organizations often provide long-term care at home, in nursing home day-care, and in other types of residential long-term care facilities, such as care homes (33). Since most care homes in the Netherlands have been closed (35), residential long-term care facilities are referred to in this dissertation as 'nursing homes'.

Susceptibility to outbreaks of infectious diseases

Nursing home residents are susceptible to infection for several reasons. First, close contact between persons is often inherent in the setting of these care facilities. Residents live in clusters and often share common areas such as living rooms and sometimes also sanitary facilities with other residents, and they meet during communal meals and activities (36, 37). In addition, older residents are dependent on daily care that involves close contact with staff members, who move between multiple residents and may transfer the virus throughout the care facility (36, 38). The second reason for the high infection rates in nursing homes is that common characteristics of nursing home residents, including

advanced age, vulnerability, and comorbidities, are also risk factors for many infectious diseases (39, 40). More than 80 percent of residents suffer from multimorbidity, and a quarter have five or more chronic conditions (35). Third, many of the residents who suffer from cognitive impairment are unable to understand, remember, or physically comply with general hygiene rules and imposed infection prevention measures (37, 38). It has been estimated that about three-quarters of nursing home residents suffer from cognitive impairments (35).

ORGANIZATION OF INFECTION PREVENTION AND CONTROL IN NURSING HOMES

Before to the COVID-19 pandemic, nursing homes regularly dealt with outbreaks of infectious diseases, such as influenza, norovirus disease, and methicillin-resistant Staphylococcus aureus (MRSA) infection (41). Therefore, nursing home organizations have an internal structure for hygiene, infection prevention, and control. As recommended by the WHO, an infection prevention and control committee is usually responsible for maintaining hygiene standards, monitoring infection rates, implementing and lifting infection prevention measures, and educating staff about infection prevention (42). During severe infectious disease outbreaks, infection prevention committees convert to or establish outbreak teams (43). These outbreak teams are responsible for implementing and lifting infection prevention measures based on the organization's protocols, and for internal communication (43).

In the early stages of the COVID-19 pandemic, no COVID-19-specific guidelines had been developed yet. However, infection prevention committees and outbreak teams could draw inspiration from infection prevention measures described in existing guidelines for other infectious diseases. For the common infectious diseases mentioned above, guidelines have been published by the Infection Prevention Working Group (de Werkgroep Infectie Preventie, WIP) (44), Partnership Guidelines Infection Prevention (Samenwerkingsverband Richtlijnen Infectiepreventie, SRI) (45), and Centers for Disease Control and Prevention (46). These guidelines recommend, for example, various types of isolation measures and imposing cohorts, personal hygiene, hand hygiene, and the use of personal protective equipment (PPE) by staff and visitors.

Despite these guidelines for other diseases, it was difficult to make ad hoc national and local policy decisions while COVID-19-specific knowledge was still lacking. The Ministry of Public Health, Welfare, and Sport needed insight into what was happening in the sector. Nursing home organizations expressed the need to share and learn from the

experiences gained so far. To accommodate both these needs, the academic University Network for the Care sector Zuid-Holland (UNC-ZH), together with the University Network of Elderly Care Organizations of the University Medical Center Groningen (UNO-UMCG), quickly started the 'COVID-19 management in nursing homes by outbreak teams' (MINUTES) study.

GERIATRIC REHABILITATION AND COVID-19

Not only nursing home residents, but also vulnerable older persons living at home were severely affected by COVID-19. Older COVID-19 patients living at home require hospitalization and admission to an ICU more often than younger patients. By the end of March 2020, half of the COVID-19 patients admitted to Dutch hospitals were 71 years and older (47). This group of older persons is at risk of serious health deterioration (48). Offering support in their recovery may optimize their health outcomes (49). Especially given the large numbers of COVID-19 patients and the pressure to quickly make room for new patients, older patients should be supported in their continuing recovery process after discharge from acute care hospital departments. Recovery support for older persons is usually provided in the form of geriatric rehabilitation.

Geriatric rehabilitation involves "*a multidimensional approach of diagnostic and therapeutic interventions, the purpose of which is to optimise functional capacity, promote activity and preserve functional reserve and social participation in older people with disabling impairments.*" (50). These older people with disabling impairments are more likely than younger patient groups to have a complex health status, including multimorbidity, chronic conditions, cognitive impairments, and frailty (51). Geriatric rehabilitation is tailored to their specific needs (51). In addition, the focus of geriatric rehabilitation is usually not on complete medical recovery, but on regaining independence in daily functioning, preserving functional reserve, promoting activity, social participation, overall well-being, and person-centred goals (50). Throughout Europe, there has been a growing awareness of the importance of geriatric rehabilitation in recent years. However, there are differences across the continent in the formal recognition, national policies and reimbursements, and organization of geriatric rehabilitation care (51, 52).

Early COVID-19 studies indicated that the rehabilitation process after COVID-19 can be unpredictable (48, 53, 54). It was important to know the extent to which older persons recovered after a COVID-19 infection. In addition, it was unknown which geriatric rehabilitation care services best supported COVID-19 recovery. Therefore, in September 2020, the UNC-ZH and members of the EuGMS special interest group for geriatric reha-

bilitation joined forces to set up the European Cooperation in Geriatric Rehabilitation (EU-COGER) after the COVID-19 study. Their aim was to gain insight into the recovery process of persons receiving geriatric rehabilitation because of a SARS-CoV-2 infection (55).

RESEARCH QUESTIONS

This thesis has two main aims regarding nursing home care and geriatric rehabilitation for vulnerable older persons during the COVID-19 pandemic:

1. To describe the impact of, challenges presented by, and policy responses of Dutch nursing home organizations to the COVID-19 pandemic (Part 1).
2. To describe the recovery trajectories of post-acute COVID-19 patients admitted to geriatric rehabilitation and the geriatric rehabilitation care provided to these patients across Europe (Part 2).

Part 1 of this thesis consists of chapters 2 to 6 and presents results of the MINUTES study. In this study we analysed the content of the minutes of the COVID-19 outbreak teams to provide insight into the decisions made by these outbreak teams. In addition, experiences with these decisions were discussed with panels of nursing home staff and resident representatives in a Nominal Group Technique (NGT) study.

Chapter 2 provides insight into the impact of, challenges presented by, and responses to the COVID-19 pandemic, by describing the COVID-19 outbreak teams that were set up by nursing home organizations and by presenting the topics that required the most attention from these teams. In addition, this chapter outlines the design of the MINUTES study. **Chapter 3** provides an overview of the physical distancing measures that were discussed and imposed in nursing homes, and of the challenges that were encountered as a result of these measures. **Chapter 4** shows which activities for residents were cancelled, continued, or started in nursing homes during different periods of the pandemic and what considerations these decisions were based on. In **Chapter 5**, nursing home staff and resident representatives prioritize what they consider to be the most important measures for either preventing infections or maintaining the well-being of nursing home residents during COVID-19 outbreaks. In addition, this chapter describes how nursing home staff and resident representatives experience decision-making processes regarding COVID-19 measures in nursing homes. **Chapter 6** identifies strategies that are used and considered to be important to increase the willingness of nursing home staff to be vaccinated against COVID-19.

Part 2 of this thesis consists of chapters 7 and 8 and presents the results of the EU-COGER study. In this longitudinal observational cohort study, data were collected on the regular care of persons admitted to geriatric rehabilitation for recovery from COVID-19 in various European countries. **Chapter 7** provides insight into the recovery trajectory of COVID-19 patients in geriatric rehabilitation by modeling their daily functioning and quality of life over time. In addition, this chapter examines whether the level of frailty of these patients at admission to geriatric rehabilitation is associated with the recovery trajectory. **Chapter 8** describes differences between the participating countries in the selection criteria for referral to geriatric rehabilitation, the geriatric rehabilitation care provided, and the recovery observed.

Chapter 9 presents a general discussion of the main findings, a broader perspective on these findings, and methodological considerations of the studies described in this thesis. Recommendations regarding COVID-19 and the care of vulnerable older persons are outlined for practice, policy, and education in nursing home and geriatric rehabilitation care, as well as for future research.

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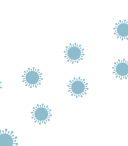
Part 1

Impact of, challenges presented by, and policy measures of Dutch nursing home organizations during the COVID-19 pandemic

2

COVID-19 management in nursing homes by outbreak teams (MINUTES) study: study description and data characteristics. A qualitative study

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ABSTRACT

Objectives: Nursing homes are hit relatively hard by the COVID-19 pandemic. Dutch long-term care (LTC) organizations installed outbreak teams (OT) to coordinate COVID-19 infection prevention and control. LTC organizations and relevant national policy organizations expressed the need to share experiences from these OT that can be applied directly in COVID-19 policy. The aim of the "COVID-19 management in nursing homes by outbreak teams" (MINUTES) study is to describe the challenges, responses, and the impact of the COVID-19 pandemic in Dutch nursing homes. In this first article we describe the MINUTES study and present data characteristics.

Design: This large-scale multi-center study has a qualitative design using manifest content analysis. The participating organizations shared their OT minutes and other meeting documents on a weekly basis. Data from week 16 (April) to week 53 (December) 2020 included the first two waves of COVID-19.

Setting: National study with 41 large Dutch LTC organizations.

Participants: The LTC organizations represented 563 nursing home locations and almost 43,000 residents.

Results: At least 36 of the 41 organizations had one or more SARS-CoV-2 infections among their residents. Most OT were composed of management, medical staff, support services staff, policy advisors, and communication specialists. Topics that emerged from the documents were: crisis management, isolation of residents, personal protective equipment and hygiene, staff, residents' well-being, visitor policies, testing, and vaccination.

Conclusions: OT meeting minutes are a valuable data source to monitor the impact of and responses to COVID-19 in nursing homes. Depending on the course of the COVID-19 pandemic, data collection and analysis will continue until November 2021. The results are used directly in national and organizational COVID-19 policy.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- Minutes of OT capture the impact, challenges and responses to problems and measures taken regarding the COVID-19 pandemic in LTC organizations. However some minutes were only brief descriptions of decisions that lacked context.
- Collecting existing minutes enabled analysis of a large amount of data, without adding to staff burden, that is often not feasible in qualitative studies.
- Minutes data allow not only for in-depth scientific analyses but can also directly be used as input for national and organizational COVID-19 policies.
- The longitudinal nature of our study enables analysis of medium and long-term impact of the pandemic in nursing homes during multiple waves of infections over time.

INTRODUCTION

COVID-19 can have a serious and fatal course, especially among vulnerable older adults (1, 2). Thus, nursing homes were hit relatively hard by the pandemic. In 2020 nursing home residents in many countries made up substantial proportions of COVID-19 related deaths (3). Besides, COVID-19 related measures negatively impact nursing home residents' mental and physical well-being (4).

Prior to the COVID-19 pandemic, nursing homes and other long-term care facilities (LTCF) have had ample experience with outbreaks such as norovirus and influenza. Guidelines are available on how to prevent and act in case of outbreaks of these infectious diseases (5). By contrast, COVID-19 was unknown, and the impact of the pandemic required rapid policy decisions. For example social distancing, wearing face masks, and avoiding crowds became important policies to slow the spread of the virus (6). LTCF in many European countries were also faced with visitor bans (7).

To implement policies regarding infection prevention and control (IPC), the World Health Organization (WHO) recommends LTCF to have an IPC focal point to lead and coordinate IPC activities, supported by an IPC team (8). They would be responsible for IPC training, providing information to residents, maintaining high hygiene standards and more (8). Most Dutch LTC organizations have an IPC committee, but in severe outbreaks such as COVID-19 these organizations install or convert IPC committees into outbreak teams (OT). In contrast to IPC committees, OT include management representatives (9).

Both LTC organizations and national policy institutes, including the Ministry of Public Health Welfare and Sport, expressed the need to learn from each other by sharing experiences, which could be used directly in LTC COVID-19 policy considerations. Therefore, the aim of the "COVID-19 management in nursing homes by outbreak teams" (MINUTES) study was to describe the challenges presented by, responses to, and the impact of the COVID-19 pandemic in nursing homes, based on the minutes and other meeting documents of the OT. We will describe the MINUTES study and present data characteristics and topics discussed by the OT.

METHODS

Study design and setting
The MINUTES study is a large national multi-center study and has a qualitative design based on manifest content analysis of meeting documents. OT document their meetings

in minutes. In order to avoid adding to staff burden during this crisis, we have collected and analyzed these minutes. Directors of all LTC organizations informed their OT about study participation and provided written informed consent.

Dutch LTC organizations often provide a wide range of inpatient and outpatient medical and social care (10). In nursing homes, care is provided by multidisciplinary teams, coordinated by specially trained and registered elderly care physicians (11, 12). Inpatient assisted living care is provided in care homes (10). Furthermore many LTC organizations provide geriatric rehabilitation and homecare (10). The focus of this study is on care homes and nursing homes, hereafter referred to as nursing homes.

In 2020, about 8000 to 13 000 of the total of 115 000 nursing home residents nationwide (13), had a confirmed SARS-CoV-2 infection. More than 2300 COVID-19-related deaths were registered (14). National infection rates in the Netherlands showed a 'first wave' from weeks 11 to 19 of 2020 and a 'second wave' from week 39 onwards (15).

Participants

The LTC organizations of the Dutch academic nursing home research networks (16) were approached for participation by e-mail in weeks 11 to 15 of 2020. The aim was to recruit at least 50% of the organizations from at least two networks to achieve an accurate reflection of the actual situation. Other LTC organizations that heard of the study and expressed a willingness to participate were also eligible for participation. The meeting documents had to include minutes, preferably supplemented with associated meeting documents, such as overviews of SARS-COV-2 infections among residents.

Data collection

OT meeting documents were shared with the study institute's research center within a week after the meetings. The research center operated as trusted third party; they pseudonymized names of LTC organizations and deleted personal data of residents and staff from the submitted documents. Subsequently, they uploaded the documents in the online electronic data capture program 'Castor' (17) to make them available to the researchers for analysis. In addition, the organizations were asked to provide numbers of residents, employees, nursing home locations, as well as organization and OT characteristics.

Data analysis

A coding frame was developed inductively by two coordinating researchers (LSvT, MW-MdW). They independently coded the same minutes document in order to develop a first version of the coding frame. Subsequently, from weeks 12 to 15 they each coded half of

the documents that were available from the first six participating LTC organizations with this first version of the coding frame. In weekly consensus meetings, they discussed their work and expanded the coding frame (**Appendix**). After week 15, all other researchers could suggest additional codes. Which of the suggested codes were added to the coding frame was decided by three coordinating researchers (LSvT, MWMdW, JMG) .

In total, 19 researchers analyzed the meeting documents, ranging from master students and PhD candidates to post-doc researchers. The common denominator was that they all performed research with a focus on LTC and wanted to assist in the pandemic.

Data were analyzed using manifest content analysis (18, 19). This was done on a weekly basis in two steps. First, the researchers coded the meeting documents. They were instructed to select at least all passages, called textual units, that included data on measures, problems, stock or infection rates. This corresponds with the study aim to describe the challenges (problems, stock, infections rates) presented by, responses to (measures), and the impact (resulting from challenges and responses) the COVID-19 pandemic in nursing homes. Besides, the researchers were aware of the use of data for writing the summary reports described below as input for policy. Each textual unit selected had to be assigned with a code from the coding frame in an open field in the Castor database. Second, the coordinating researchers clustered codes into topics, which are referred to as 'data categories' in literature (19).

Quality control

The coordinating researchers provided all other researchers with individual instructions, digital standard operating procedures, and the coding frame. For each researcher the textual units they selected in their first two to four weeks were double coded by LSvT and if needed feedback was given and improvement was monitored. Half yearly meetings with all researchers were organized. Besides, all coded data were checked by one of two coordinating researchers (LSvT or JMG) on a weekly basis.

Summary reports

Besides scientific analysis, coded data were used by the coordinating researchers to prepare summary reports on a weekly to triweekly basis. In these reports, they summarized the most recent meeting documents and listed what they regarded as the most important points of attention for policy makers. These reports were shared as input for policy with participating LTC organizations, the Ministry of Public Health, Welfare and Sport, the chief nursing officer, and professional associations for elderly care physicians, nurses, and nursing homes.

Patient and public involvement

This study was initiated based on the need of LTC organizations and national policy organizations to share experiences from these OT that can be applied directly in COVID-19 policy. The study did not involve patients and the public in study design or analyses. However, we frequently held evaluation meetings with the receivers of the summary reports for feedback and additional research questions. In a follow-up study, nursing home staff has elaborated on OTs' responses to the pandemic that were described in the meeting documents.

RESULTS

The data characteristics presented in this article are based on the data from week 16 to week 53, 2020, including the first two waves of COVID-19 infections.

Participating LTC organizations

A total of 41 LTC organizations participated in this study (**Figure 1**). These organizations represented almost 43 000 residents living in 563 nursing homes locations. Of these 41 organizations, 39 belonged to five of the six Dutch academic nursing home research networks, representing 58% of the organizations in these networks. The organizations varied in size from 3 to 70 nursing homes. More than 40% of the organizations installed their OTs in week 10 or 11. From weeks 16 to 53 at least 88% ($n = 36$) of the organizations had (one or more) SARS-CoV-2 infections among residents (**Table 1**). Organizations, on average, shared meeting documents over 23.1 of 38 weeks (median 24, IQR 10.5–35.0). Per week, 15 (week 32) to 39 (week 18) organizations shared meeting documents (**Figure 2**). Five organizations contributed meeting documents over all 38 weeks.

Figure 1. Participating long-term care (LTC) organizations from the Netherlands.
Note: Two LTC organizations with locations in multiple regions are presented with multiple dots

Table 1. Description of participating long-term care organizations.

Participating organizations	n = 41 (100%)
	Range / no. (%)
Nursing home locations	3 – 70
1 - 10	20 (49)
11- 20	17 (42)
≥ 20	4 (10)
Residents	171 – 4700
1 - 999	20 (49)
1,000-1,999	14 (34)
≥ 2,000	5 (12)
missing	2 (5)
SARS-CoV-2 infected residents	
yes	36 (88)
missing	5 (12)
week 16 - 19	22 (54)
week 20 - 38	9 (22)
week 39 -53	29 (71)
Start date OT	week 8 - 13
≤ week 9	3 (7%)
week 10 –11	17 (42%)
≥ week 12	7 (17%)
missing	14 (34%)
Data shared in weeks	*Median (IQR)*
week 16 – 53 (38 weeks)	24 (10.5 – 35.0)

OT, outbreak team.
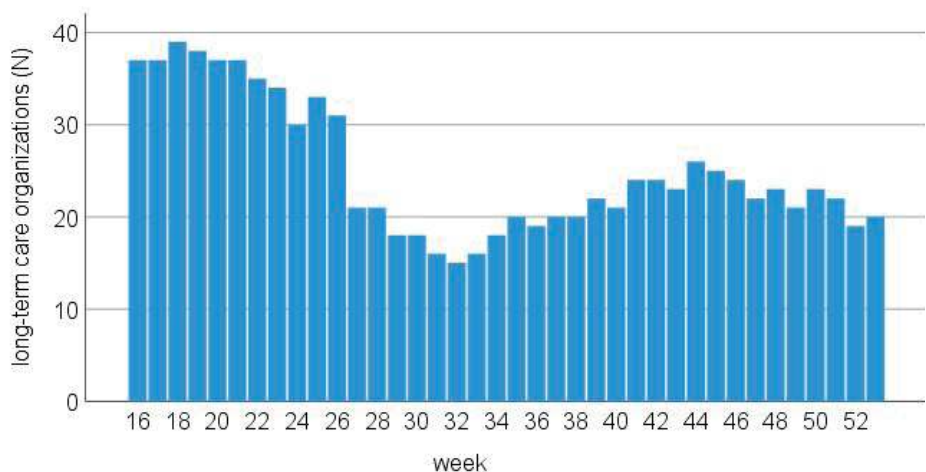
Figure 2. Number of long-term care organizations that shared meeting documents per week.

OTs' members

The composition of the OT was known for 30 LTC organizations (73%). All but one included management (e.g. directors, managers, and administrators). In 60 to 80% of the OT, medical staff (e.g. elderly care physicians, occupational physicians, and other physicians), support services staff (facility management and human resources), policy advisors (including quality officers), and communication specialists were represented. In a few OT, nursing staff (6 OTs) and residents (one OT) were represented (**Figure 3**).
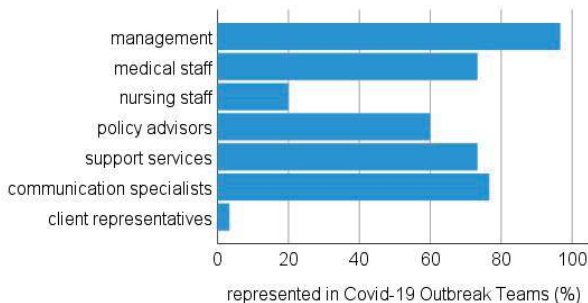
Figure 3. Disciplines represented in outbreak teams.

Qualitative topics

The following eight topics were extracted from the data. Matching quotes that illustrate these topics are presented in **Box 1**.

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Crisis management
From the start of the pandemic, OTs discussed infection rates, COVID-19 related finances, OT meeting frequency, internal and external communication, and regional collaboration. Besides, OTs prepared for worst case scenarios and monitored and evaluated IPC and outbreak management. For example, OT meeting frequencies depended on infection rates.

Isolation of residents
The occupation and availability of beds for both SARS-CoV-2-infected and non-infected residents and other SARS-CoV-2 infected patients was a recurring topic. LTC organizations applied various isolation and social distancing policies, such as quarantine, isolation in single rooms, and cohort isolation. Besides, at various times, nursing home departments stopped admitting new residents or providers of 'non-essential' care, such as hair dressers and dental hygienists. OTs also discussed ethical dilemmas and customization of these measures to local situations or resident groups, e.g. residents with psychogeriatric problems.

Personal protective equipment (PPE) and hygiene
This topic included hygiene procedures, and available stock, policies for use and experiences with wearing personal protective equipment (PPE). With shortages and rising costs, OTs considered the sterilization and reuse of PPE. Besides, OTs discussed promoting proper PPE use and set policies for what types of PPE when to be used by which staff members. Changes in national guidelines gave cause for discussion. Hygiene procedures included hand hygiene, laundry and waste management, and airborne precautions such as use of air conditioning and ventilation.

Staff
This topic included isolation and social distancing restrictions for staff, workforce scheduling, supporting staff with materials and facilities, their well-being, and mental support. The minutes first described distancing policies for employees and volunteers during work, training sessions and meetings, for example, staff members were not allowed to work in more than one nursing home location. In addition, isolation measures and absenteeism were topics of conversation. Staff waiting for their own or their housemates' test results had to stay at home in quarantine or, in times of staff shortages, had to work in COVID-19 cohorts. Second, workforce scheduling was a logistical challenge due to high absenteeism among staff and distancing policies. Therefore, temporary workers, non-healthcare staff members and even army medical staff were deployed. Third, OTs facilitated staff by means of equipment to work from home. Fourth, OTs discussed the impact of the COVID-19 crisis on staff mental well-being. They spoke of emotional

exhaustion of staff due to the high workload, fear of becoming infected, and verbal abuse by residents' family members. LTC organizations set up various mental support initiatives to support staff.

Residents' well-being

A few times the observed impact of the COVID-19 crisis on residents' well-being was mentioned, for example, increased loneliness and restlessness. OTs discussed restarting or continuation of activities for residents. Group activities had to be replaced by individual or living room activities. Issues also included whether to allow residents to go outside with their informal caregivers. Palliative care death rituals and memorial events required adjusting.

Visitor policies

This topic is about the organization of and experiences with visiting policies. During total lockdowns, alternatives for social contact were offered, such as window visits and video calling. After the national visitor ban was partly lifted in May, OTs made decisions about regulated lengths of visits, maximum numbers of visitors, and use of PPE by visitors. To organize these policies, visitors needed to register upon entering the nursing home or had to schedule their visit online. Sometimes LTC organizations allowed staff to customize visiting policies to local situations or for residents in the end-of-life phase. OTs discussed experiences with and impact of these policies and considered how to deal with family of residents disagreed with visiting policies.

Testing

Since week 15, when testing of nursing home staff and residents for COVID-19 became possible nationwide, OTs discussed the policies, organization and logistics of testing. Many LTC organizations implemented a policy to test residents at nursing home admission. In some organizations, staff and residents without symptoms were preventively tested following contact with an infected person. Regarding organization and logistics, routes for requesting tests and receiving test results required OTs' attention. Several organizations arranged their own testing facilities, due to waiting times at governmental test facilities.

Vaccination

The topic vaccination for residents and staff emerged around week 49. Staff and residents had to be informed about the upcoming vaccination process and preparations for vaccination had to be made.

Box 1. Quotes from meeting documents illustrating the topics identified.

Crisis management

"Roadmaps (description of operational [OT[2]] with clear roles) for new infections." (organization XF, week 26)
"A next [OT[2]] meeting will not yet be scheduled, but the situation in [municipality] will be monitored." (organization YF, week 33)
"It is unclear how financing the COVID-wards in the province is going." (organization YX, week 23)

Isolation of residents

"Scenario positive resident: no transferring, isolation in own room/ward - otherwise to cohort ward." (organization YB, week 25)
"Hair dressers and beauticians can't go back to work yet in the nursing homes, because these homes are still locked down. The medical pedicure [podiatrist] can come and treat indoors on doctor's prescription." (organization XT, week 20)
"Residents with psychogeriatric problems and the urge to wander are difficult to keep in quarantine for 7 days. They are therefore not admitted to [location], which is still 'clean'." (organization XZ, week 16)

PPE[3] and hygiene

"Pressure is put on ordering the right aprons, these are hard to get." (organization XF, week 16)
"At psychogeriatrics [ward] it has been indicated that continuously working with mouth mask/PPE[3] is not always experienced positively by residents and staff. Yet with ADL care [care regarding activities of daily living], PPE[3]'s are experienced as pleasant." (organization YS, week 31)
"Attend staff to sound hand hygiene and sound use of gloves. Keep cleaning laptops, telephones, door handles etc." (organization YW, week 41)

Staff

"The exchange of staff between [ward] and other parts of [nursing home] has to be prevented as much as possible." (organization XH, week 20)
"We could fall back on the old scenario, like asking retired nurses and call in the military. Getting regional assistance will be difficult." (organization XF, week 41)
"In ward with many infections the workload is high, staff members are emotionally 'done'." (organization YB, week 18)

Residents' well-being

"Due to a positive [tested] residents, the other residents feel restless and would like to leave their rooms" (organization XF, week 21)
"Church activities with 1.5 meters distance, maximum 30 persons, singing discouraged." (organization XS, week 24)

Visitor policies

"Volunteers are deployed for visitors cabins: scheduling appointments, receiving visitors, serving coffee, cleaning cottage after each visit." (organization XZ, week 17)
"Family does not keep enough distance from the residents. Staff finds this worrisome, visitors don't allow anyone to correct them. The question remains what can be done about this." (organization XH, week 27)

Testing

"If a resident tests positive, we will test the fellow residents and close contacts of the residents with rapid tests." (organization YE, week 46)
"Not enough test materials in stock available. Swaps have to be picked up an brought back again." (organization XC, week 43)
"Because healthcare workers sometimes cannot be tested within 24 hours, our own test location is being set up" (organization XF, week 36)

Vaccination

"Preparing vaccinating, the [IPC[1] committee] believes that it is too early to set up a program/plan. A message with information about how a vaccine works is already being placed on the intranet." (XP week 52)

[1]infection prevention and control, [2]outbreak team, [3]personal protective equipment.

DISCUSSION

The COVID-19 MINUTES study describes the challenges, responses, and the impact of the COVID-19 pandemic in Dutch nursing homes. The representative sample of 41 LTC organizations all installed OTs in weeks 8-13. The composition of OTs was multidisciplinary. Almost all organizations had SARS-CoV-2 infections among nursing home residents. Topics in the qualitative data included crisis management, isolation of residents, PPE and hygiene, staff, residents' well-being, visitor policies, testing, and vaccination.

To our knowledge, the COVID-19 MINUTES study is the first large-scale qualitative study examining the challenges, responses, and the impact of the COVID-19 pandemic in nursing homes. In forthcoming studies, more in-depth analyses of the topics observed here will provide information that will be useful for management and IPC in subsequent phases of the COVID-19 pandemic and beyond.

The fluctuation in the amount of data collected per week (see **Figure 2**) appears to reflect the fluctuation in national infection rates (20). However, compared to infection rates, the second peak in data collection seen in autumn is lower than the first peak in spring. This illustrates that length or frequency of OT meetings decreased, because they learned from the first wave. On the other hand, implementation and adaptation of changing in national guidelines to local settings continued to be topic of conversation.

Our findings show that, in accordance with (inter)national recommendations, OTs were multidisciplinary (21, 22). However, nursing staff was represented in only one-fifth of the OTs, although it is possible that they were consulted. Nevertheless, literature recommends consultation of LTC workers or representation of nurse specialists (21, 22). Besides, paramedics working in nursing homes such as physiotherapists, psychologists and social workers (23) were not represented in OTs. This underrepresentation of nursing staff and paramedics in OTs may have affected the topics discussed.

The observed topics are in line with IPC guidance literature. Apart from vaccination, all topics are mentioned by the WHO in a guidance report on COVID-19 in healthcare (24) and in a policy brief on preventing and managing COVID-19 in LTC (25). Testing, isolation of residents, PPE, and staff and residents' well-being were identified as challenges and dilemmas related to COVID-19 in care homes (26). Remarkably, ample research has shown that COVID-19-related measures negatively impacts nursing home residents' mental and physical well-being (4), but only little has been described about this in the meeting documents. Apparently, either OT meetings have a different focus, or OTs

discuss well-being of residents but regard this as context to decisions that does not have to be written down in the minutes.

Strengths and limitations

The first strength of our study is our data source. Minutes and other meeting documents capture challenges, responses and impact of the COVID-19 pandemic in LTC organizations. Collecting the existing documents enabled analysis of a large amount of data that is often not feasible in qualitative studies; the sample of participating LTC organizations represents over one third of nursing home residents nationwide (13). The participating organizations indicate that the use of this data source led to a low study load during these times of crisis. Second, the data allow for a more in-depth scientific analyses, and can also directly be used as input for national and organizational COVID-19 policies. There are other projects that supported LTC organizations during the pandemic (27), but to our knowledge COVID-19 MINUTES is the only study that supports both organizations and national policy makers with quick input. Third, the longitudinal nature of our study collected from the start of the COVID-19 pandemic enables analysis of medium and long-term impact of the pandemic in nursing homes (28).

Some study limitations should also be recognized. First, some data were missing. Five LTC organizations did not share data on infection rates. In addition, most organizations did not share meeting minutes over the whole study period (38 weeks). However, sometimes meeting documents were absent because OTs had not held meetings, especially from weeks 20 to 38 when infection rates were low. In this regard, the amount of data that were shared is satisfactory. Moreover, the overall large amount of data available will be sufficient to reach saturation in future in-depth analyses. Second, data sometimes lacked context, because meeting documents itself were sometimes only brief descriptions of decisions. To overcome this limitation, each researcher analyzed a fixed set of LTC organizations in order to get a better indication of the context. Moreover, by selecting textual units for coding, these units are removed from their context. This is a known limitation of content analysis (19). Third, the focus on not only scientific analyses but also on writing summary reports as input for organizational and national policy makers could have biased data coding. Possibly, the researchers mainly coded data that they considered relevant for policy making. However, researchers were instructed to code all textual units that included data on measures, problems, stock and infection rates.

Implications and future research

Minutes and other meeting documents provide a valuable data source for studies on IPC and crisis management, without burdening staff with data collection. They can be used directly as input for national and organizational policy and scientific evaluation.

Multidisciplinary OTs discussed crisis management, isolation of residents, PPE and hygiene, staff, residents' well-being, visitor policies, testing, and vaccination during their meetings. Depending on the course of the COVID-19 pandemic, the data collection will continue until November 2021.

In coming studies, data over the complete study period will be analyzed and challenges, responses and impact of the COVID-19 pandemic regarding the various topics will be analyzed in depth. This will provide valuable lessons that can be used for management and IPC in subsequent phases of the pandemic, future heavy-impact epidemics, and other crisis situations, as healthcare organizations, national governments and (inter) national institutes will continue to innovate care.

Competing interests None declared.

Patient consent for publication Not required

Ethics Approval The Leiden-The Hague-Delft Medical Ethical committee reviewed the study protocol and provided a waiver of medical ethical approval since the study is not subject to the Dutch Medical Research Involving Human Subjects Act (WMO).

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Pseudonymized data are available upon reasonable request. prohibit the authors from making the data set publicly available. During the consent process, participating organizations were explicitly guaranteed that the data would be pseudonymized by the study's research center and that pseudonymized data would only be seen my members of the study team. For any discussions about the data set please contact UNC-ZH@lumc.nl .

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APPENDIX: CODING FRAME PRELIMINARY RESULTS COVID-19 MINUTES STUDY

Theme	Code	Explanation	Week added
1.	**Crisis management**		
	budgets, finances	everything concerning finances	14
	communication		14
	Crisis status	general situation, e.g. stabilization of situation, outbreak status	19
2.	**Isolation of residents**		
	Beds, segregation and isolation (general)	including integrated care function	14
	Free up beds		14
	Segregation and isolation	of residents	15
	Admissions	(policy re) new admissions	15
3.	**Personal protective equipement (PPE) and hygiene**		
	Hygiene/disinfection	concerns environment and personal hygiene	14
	Personal protective equipment (PPE)	gloves, masks, aprons, goggles	14
	PPE: disinfectants		14
	PPE: deployment and utilization	e.g. instructions, when to wear face mask	26
	PPE: stock	e.g. shortages, supply, quality tests	26
4.	**Staff**		
	Staff		14
	Staff: competences	e.g. validity of certificates, e.g. caregiver carries out nursing tasks	14
	Staff: cohorting and isolation		14
	Staff: facilitation	e.g. childcare, e-learning	14
	Staff: deployment (additional or change)		14
	Materials for staff	e.g. telephones	14
	Volunteers		14
	Staff: wellbeing		19

(*continued*)

Theme	Code	Explanation	Week added
5.	**Residents' wellbeing**		
	Activities for residents	planning, cancelling, alternatives	14
	Informal caregivers, family		14
	Palliatieve situation, death		14
	Wellbeing of residents	physical and mental wellbeing	19
6.	**Visitors policies**		
	Visitors, door policy (general)		14
	Materials: hardware video calling		14
	Visitors: experiences	evaluation, disruption, problems	26
	Visitors: policy	e.g. number of visitors and who	26
	Visitors: organization	e.g. planning, registration, accompanying visitors	26
7.	**Testing**		
	Staff: testing and disease		17
	Testing residents	testing, contact tracing etc. among clients	45
	Testing (undefined)	testing, contact tracing etc., not specifically staff only or residents only	45
8.	**Vaccination**		
	Vaccinations corona		50

3

Distancing Measures and Challenges Discussed by COVID-19 Outbreak Teams of Dutch Nursing Homes: The COVID-19 MINUTES Study

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ABSTRACT

The most severe COVID-19 infections and highest mortality rates are seen among long-term care residents. To reduce the risk of infection, physical distancing is important. This study investigates what physical distancing measures were discussed by COVID-19 outbreak teams of Dutch long-term care organizations and what challenges they encountered. The COVID-19 MINUTES study is a qualitative multi-center study ($n = 41$) that collected minutes of COVID-19 outbreak teams from March 2020 to October 2021. Textual units about distancing measures were selected and analyzed using manifest content analysis for the first wave: early March–early May 2020; the intermediate period of 2020: mid-May–mid-September 2020; and the second wave: late September 2020–mid-June 2021. During all periods, COVID-19 outbreak teams often discussed distancing visitors from residents. Moreover, during the first wave they often discussed isolation measures, during the intermediate period they often discussed distancing staff and volunteers from residents, and during both the intermediate period and the second wave they often discussed distancing among residents. During all periods, less often admission measures were discussed. Challenges persisted and included unrest among and conflicts between visitors and staff, visitors violating measures, resident non-adherence to measures, and staffing issues. The discussed distancing measures and corresponding challenges may guide local long-term care and (inter)national policymakers during the further course of the COVID-19 pandemic, outbreaks of other infectious diseases, and long-term care innovations.

Keywords: COVID-19; nursing homes; infection prevention and control; isolation; distancing; qualitative

INTRODUCTION

The COVID-19 pandemic has caused millions of deaths worldwide, but the most severe COVID-19 infections and highest mortality rates are found among long-term care long-term care residents (1, 2). To reduce the risk of infections physical distancing measures that limit close interpersonal contact are important (3, 4). However, long-term care facilities such as nursing homes may require very specific physical distancing measures, for several reasons. First, age over 65 (5, 6), underlying medical conditions, and increased vulnerability all are both common in long-term care and are linked to COVID-19 morbidity and mortality (1). Second, large proportions of COVID-19-infected long-term care residents show atypical symptoms (7, 8) or remain asymptomatic (9, 10). This complicates diagnosis and thus transmission prevention (9, 10). Third, a large proportion of long-term care residents has cognitive impairments such as dementia, which reduces their ability to understand and comply with distancing measures (11, 12).

Consequently, much international policy recommendations and guidance documents about COVID-19 infection prevention and control (IPC) in long-term care facilities were formulated, e.g., by the World Health Organization (1), European Centre for Disease Prevention and Control (13), and the Centers of Disease Control and Prevention (14). This guidance comprises, but is not limited to, the following distancing measures: isolation of residents with symptoms or confirmed COVID-19 (1, 13, 14), quarantining residents who had contact with confirmed cases (1), quarantining (14) or testing (1) residents upon (re) admission to the facility, maintaining physical distance of at least 1.5 m (six feet) from others (1, 13, 14), staff compartmentalization and cohorting (1), and strict visitor policies (1, 13, 14).

Besides policy recommendations and guidance documents, case studies have described responses to COVID-19 outbreaks in long-term care (15, 16). To date, large scale and longitudinal studies on physical distancing in long-term care during the COVID-19 pandemic are scarce (17). The aims of this study are to investigate what physical distancing measures were discussed by COVID-19 outbreak teams of a large number of Dutch nursing homes during the first phases of the pandemic, and to investigate what corresponding challenges they encountered.

MATERIALS AND METHODS

Design

The present study is part of the "COVID-19 management in nursing homes by outbreak teams" (MINUTES) study. In this multi-center study, minutes and other meeting documents of the central COVID-19 outbreak teams of Dutch long-term care organizations were collected from March 2020 through October 2021 (18). A detailed description and first results of this study are published elsewhere (18).

Setting

Dutch long-term care organizations provide home care, and 24 h care in residential facilities including nursing homes for high-level or complex care and homes for assisted living care (19). In this study, we focus on residential long-term care and refer to both types of residential facilities as nursing homes. In Dutch nursing homes, care is provided by multidisciplinary teams and coordinated by physicians specially trained in elderly care (20, 21). Dutch long-term care organizations usually have separate nursing home departments for residents with psychogeriatric disorders, such as dementia, and departments for residents that mainly suffer from somatic disorders (21, 22). With severe infectious disease outbreaks, Dutch long-term care organizations convert their infection prevention and control committees into, or install, central outbreak teams (18, 23). The central COVID-19 outbreak teams were multidisciplinary and often include management representatives, medical staff, policy advisors, support services, and communication specialists (18, 23). Some long-term care organizations also installed local COVID-19 outbreak teams per facility (18).

A national 'first wave' of coronavirus infections in the Netherlands was defined based on excess mortality from week 11 (early March) to week 19 (early May) of 2020 (24), and the indistinguishable second and third waves, hereafter referred to as 'second wave', based on excess mortality from week 39 (late September) 2020 to week 24 (mid-June) 2021 (25). From 19 March to mid-May 2020, nursing homes were locked down for visitors (26). From mid-May 2020, nursing homes were reopened and visitor policies were gradually eased (26). From October 2020 the 'COVID-19 (Temporary Measures) Act' required nursing homes to remain open to visitors (27, 28).

Sample and Data Collection

The 41 participating Dutch long-term care organizations and their 41 central COVID-19 outbreak teams represented 563 nursing homes and almost 43,000 residents, which is over one third of nursing home residents nationwide (18). These outbreak teams' meeting documents were coded with a coding frame using a Castor online database (18,

29). With this primary coding frame, we included textual units coded in the topics crisis management, isolation, staff, residents' wellbeing, and visitor policies until week 24 2021 (**Figure 1**). Textual units were pieces of text of one to a few sentences that relate to one measure, challenge, or other point of discussion (30).

Data Analysis

The included textual units were divided into 'first wave': week 11 (early March) to week 19 (early May) 2020; 'intermediate period': week 20 (mid-May) to week 38 (mid-September) 2020; and 'second wave': week 39 (late September) 2020 to week 24 (mid-June) 2021 to enable analysis of differences between these periods. Two researchers (LST and WM) independently coded the first 200 textual units of each time period. This was done inductively, without making use of the a priori identified topics. As coordinating researchers in the COVID-19 MINUTES study, LST and WM were familiar with the data. In several consensus meetings they discussed the coding of these in total 600 textual units, resolved discrepancies, and constructed a coding frame. Multiple codes could be assigned to a textual unit. The constructed coding frame was discussed with senior researchers HJAS and MAAC.

Subsequently, additional batches of 200 randomly selected textual units per time period were coded (LST). Repeatedly, previous batches were recoded when the coding frame was revised, and codes were clustered into categories of distancing measures (31). New codes, and changes in the coding frame, were made by LST in consensus with HJAS. When no new codes emerged from a batch of textual units, we assumed that data saturation was reached for that time period (32, 33). Next, LST added subcodes to textual units coded as 'challenge'. These subcodes were checked by HJAS followed by a consensus meeting (HJAS and LST). To confirm data saturation of challenges and (sub)categories of distancing, we checked if we covered the attention points in our weekly to triweekly summary reports (18).

Data was coded in Microsoft Excel software and exported to SPSS software (version 25 IBM corp., Armonk, New York, U.S.) for further analysis. Manifest content analysis was performed by using descriptive statistics to select textual units based on assigned time period and codes and to describe these. As is meant with manifest content analysis (30, 31), throughout the coding and analyzing process we stayed close to terminology used in the data (34).
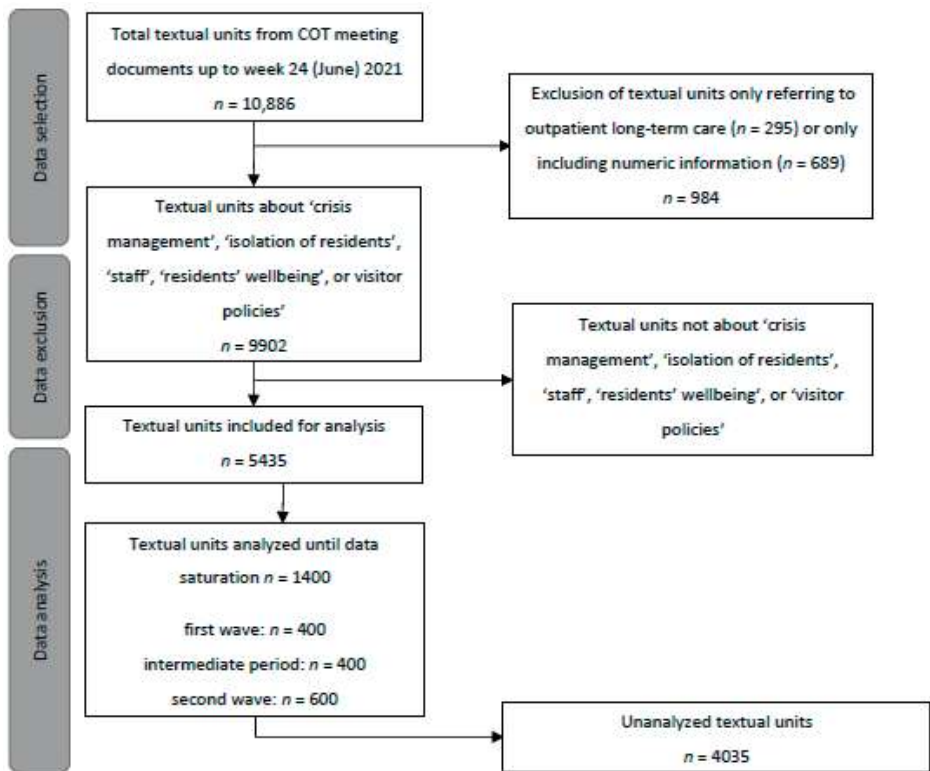
Figure 1. Flowchart of data selection, exclusion, and analysis.

RESULTS

Of the textual units from COVID-19 outbreak teams' meeting documents collected until the end of the second wave ($n = 10,886$), 49.9% ($n = 5435$) were included. Of these, 1400 textual units were analyzed until data saturation (**Figure 1**). Distancing measures for visitors, staff and volunteers, and for residents among each other; admission measures; and isolation measures were identified (**Table 1**). Challenges with these measures (**Table 2**) were described in 83 of the 1400 textual units (5.9%). The results are limited to measures and challenges discussed by at least two outbreak teams in the analyzed data.

Distancing Visitors from Residents

Distancing measures for visitors were the most often discussed category of distancing. During all three periods, COVID-19 outbreak teams discussed visitor bans a few times: they maintained visitor bans (first wave), or reintroduced visitor bans in case of COVID-19 outbreaks (intermediate period) or when there was unrest about infections among managers or staff (second wave). Facilitating alternatives for visiting residents

Table 1. Textual units per category of distancing measures discussed by COVID-19 outbreak teams.

Categories of Distancing Measures, Subcategories of distancing measures *	First Wave n = 400	Intermediate Period n = 400	Second Wave n = 600
Distancing visitors from residents	57 (14.25%)	113 (28.25%)	105 (17.5%)
Ban on visitors	5	4	3
Facilitation of alternatives to visiting	20	13	1
Assigned place for visiting	2	12	12
Fixed visiting times	1	10	4
Health checks for visitors	3	8	1
Limited numbers of visitors allowed	9	18	32
Receiving and instructing visitors	3	9	4
Registration of visitors	1	15	14
Distancing staff and volunteers from residents	29 (7.25%)	44 (11.00%)	27 (4.50%)
Building entry measures	15	33	8
Compartmenting staff	13	11	11
Distancing among residents	21 (5.25%)	49 (12.25%)	58 (9.67%)
Building entry measures	14	24	13
Limited group size	2	3	15
Keeping (living-)groups separate	1	5	13
1.5 m distance	2	5	11
Admission measures	33 (8.25%)	24 (6.00%)	40 (6.67%)
Admission stops	4	5	3
Health checks	2	1	2
Quarantine	9	4	12
Moving with a limited number of people	5	3	1
Testing	4	1	8
Isolation measures	54 (13.50%)	24 (6.00%)	41 (6.83%)
Isolation on COVID-19 units †	30	11	25
Cohort isolation ‡	17	8	19
Isolation in single rooms	7	3	6
Quarantine (in other situations then at admission)	4	16	20

* textual units could be coded with single or multiple codes for (sub)categories of distancing; † other terms used were Corona-unit, COVID ward, (corona-)cohort, cohort ward, and cohort- or corona location; ‡ other terms used were cohort nursing, cohort ward, and cohorting.

was often discussed during the first wave and hardly discussed during the second wave. These alternatives included visitor cabins or tents where residents could meet their relatives by appointment, window visits supported by a speaking–listening connection and aerial platforms, and video calling. A few times it was discussed that it was challenging to facilitate these alternatives.

> Quote 1. *"Family members of nursing home residents need more visual contact with the residents. The problem is: what requirements should such a meeting place comply with, and what can the nursing homes facilitate"* (organization XB, first wave)

Restrictions to visiting were often discussed during the intermediate period and the second wave. First, visits often had to take place in residents' rooms or outside (intermediate period). A few times reopening nursing homes' restaurants for visitors was discussed (second wave). Second, a few times visiting was restricted to fixed daily visitor moments, sometimes spread out over the day. Third, numbers of visitors were limited to 1 or 2 per day during the first wave, or to 1–3 per day or per week during the intermediate period and the second wave. Exceptions were made for residents in the palliative or terminal phase of life. Fourth, several times the COVID-19 outbreak teams discussed instructing visitors about their measures including hand hygiene; escorting visitors directly to the resident; and asking visitors health questions or taking their temperature upon nursing home entry. Fifth, during the intermediate period several times the outbreak teams debated how to register visitors, e.g., via their website, an app, a list on paper at the nursing home's entrance, or at the reception (intermediate period). Sometimes continuing registration of visitors was discussed and a few times lifting this measure was discussed (second wave).

> Quote 2. *"Closing restaurants on location is not a desirable option, because this would mean that all visits must take place in the (small) rooms. And that would mean extra activity and traffic on wards."* (organization XH, second wave)

A challenge regarding distancing visitors from residents that was discussed during all three periods was dealing with residents' relatives that violated measures, e.g., visitors taking their face masks off, ignoring instructions from staff, or not complying with the 1.5 m distance policy. Organizations reminded these visitors of their measures, deployed security guards, or denied entry to visitors who had violated measures. There was also unrest among visitors during all periods, mainly about full visitor bans. This unrest led to conflicts between staff and visitors. Furthermore, a few times outbreak teams discussed challenges related to implementing visitor restrictions in accordance with national and regional policies.

> Quote 3. *"organization sends a letter to the first contact persons of residents with the message that staff has the authority to withdraw visiting rights if family does not comply with the visiting rules"* (organization XN, second wave)

Distancing Staff and Volunteers from Residents

To distance staff and volunteers from residents, COVID-19 outbreak teams often discussed building entry measures during the intermediate period and several times during the first and the second wave. During the intermediate period, entry for hairdressers was often discussed: some outbreak teams did "not yet" allow hairdressers, and some

outbreak teams did allow hairdressers to enter the nursing home, a few times on the condition that they would see no other customers than their nursing homes' residents. Moreover, during all periods a few times outbreak teams allowed volunteers access on a case-by-case basis. During all periods, it was discussed a few times that building entry was allowed for (para)medical care providers, such as dentists and pedicures, only in the case of emergency, when "medically necessary", or on doctor's orders.

Quote 4. *"As long as the [nursing home] locations are closed, the hairdressers and pedicures will not start work. ADL [activities of daily living] care (for example dental hygienists) is allowed for prevention and on medical grounds."* (organization YG, intermediate period)

In addition, several times during all three periods it was discussed that staff were compartmented to work in only one organization, location, or ward. Exceptions were made for practitioners who had to provide essential medical care in multiple locations. A few times COVID-19 outbreak teams discussed that they allowed staff to work in multiple wards if this was not on the same day, or to work in infected wards after they had worked in wards free from infection.

Quote 5. *"Do not deploy staff against the compartmentation. If absolutely necessary: From clean to contaminated [ward]. Or after a 48 h interval."* (organization XC, second wave)

Distancing among Residents

To distance residents from each other, group sizes were limited, residents from different living groups or departments were separated from each other, and 1.5 m distance was maintained between residents. These measures were mostly applied to activities including church services, eating in communal dining areas or restaurants, and visiting the garden and sitting at the terrace. During all three periods a few times COVID-19 outbreak teams increased (the severity of) distancing measures in response to local infection rates. During the intermediate period and the second wave, outbreak teams discussed some times that they allowed residents to meet each other again. A few times they indicated that it was challenging for residents to adhere to distancing from other residents.

Quote 6. *"In view of the increase in the number of infections, allowing residents to participate in activities in other living rooms, or organizing joint activities with different wards is not a preferred option."* (organization XZ, second wave)

Furthermore, COVID-19 outbreak teams discussed building entry measures for residents. During the first wave, a few times they discussed that if residents left the nursing home building, they would not be allowed to reenter the building. During the intermediate period, several times residents were allowed to leave the building to visit the hospital if this was medically necessary, or to go for a walk. A few times this was allowed on the condition or advice to maintain 1.5 m distance from others or else wear a face mask, avoid crowded places, and apply hand hygiene upon return. During the second wave, a few times outbreak teams discussed that they allowed residents to visit family and a few times they discussed that they advised against this.

Admission Measures

Temporary stops to admissions in nursing home locations with coronavirus infections were discussed a few times during all periods. Moreover, COVID-19 outbreak teams discussed restrictions to admitting new residents several times: it was discussed a few times that only one or two persons were allowed to accompany or help residents moving into the nursing home. New residents were tested for COVID-19, and were asked about or monitored for COVID-19 symptoms up to two weeks after admission. Furthermore, it was discussed that new residents had to stay in quarantine for 14 days (first wave), or for 1–10 days or until a negative COVID-19 test result was obtained (second wave).

A challenge discussed was scarce admission capacity for residents with psychogeriatric disorders. A few times outbreak teams discussed they did not admit these residents to locations that were not equipped for this resident group, or during outbreaks. Moreover, because adherence to quarantine was challenging for psychogeriatric residents, a few times outbreak teams requested home quarantine before admission, but discussed that this was not a feasible alternative as effective monitoring was not possible. Other challenges discussed a few times were hesitance of new residents about admission and increased numbers of crisis admissions. This hesitance was discussed to lead to empty beds, and to be due to visit restrictions and lack of a tour of the facility before admission.

> Quote 7. *"Psychogeriatric residents with strong urge to walk are difficult to keep in quarantine for 7 days, are therefore not admitted to [location], which is still 'clean'."* (organization XZ, first wave)

Isolation Measures

COVID-19 outbreak teams discussed isolation on COVID-19 units, cohort isolation, isolation in single rooms, and quarantine. Various terms were used for these different types of isolation and seemed to get mixed up at times (**Table 1**). During the first and the second wave, COVID-19 units were the most frequently discussed type of isolation, but during

all three periods there was variation in when to transfer residents to COVID-19 units: a few times outbreak teams discussed transferring infected residents if they were the only infected resident within their ward, when other types of isolation were precluded, depending on the situation, or always unless otherwise decided. In addition, during the first wave a few times it was discussed when residents could be discharged from COVID-19 units back to regular wards: residents had to be free of symptoms for 24 h up to one week.

Quote 8. *"[COVID-19 outbreak team] decides that if an infection is detected in a resident/client, he/she will be transferred to a cohort unless... Unless is always determined in consultation with the physician and [manager COVID-19 outbreak team]."* (organization XR, second wave)

Challenges for COVID-19 units were, first, meeting the demand for beds in COVID-19 units with fluctuating infection rates. This required insight into and reorganization of empty beds. Organizations worked together regionally to scale up and down the number of beds. Second, it was discussed a few times that the creation of COVID-19 units was not feasible in all nursing home locations, for example, due to the building structure.

Quote 9. *"It is indicated that not all locations are suitable for [creating] a separate [COVID-19 unit]. The director of healthcare indicates that [person] should seriously think about this."* (organization XX, second wave)

COVID-19 outbreak teams discussed that cohort isolation was applied to nursing home locations or wards when multiple residents were infected (all three periods), and for residents with the urge to walk (first wave). With both cohort isolation and COVID-19 units, staffing issues and impact on staff's wellbeing were discussed: with COVID-19 units, a few times outbreak teams encountered staff shortages and employees unwilling to work with infected residents. Outbreak teams discussed several times that they restricted cohort entries to a limited number of staff members.

Quote 10. *"cohort puts a lot of pressure on the staff roster. Cohort period is long. When cohort is dissolved, tension is expected when pressure is released. Aftercare is important."* (organization XV, first wave)

Isolation in single rooms was the least often discussed type of isolation. COVID-19 outbreak teams called limiting the freedom of residents with isolation in a single room an "ethical" dilemma. Quarantine was the most often discussed type of isolation during the intermediate period. Besides quarantine upon admission to a nursing home (see admis-

sion measures), outbreak teams discussed a few times applying quarantine to residents upon readmission after they had left the nursing home building for a hospital visit or vacation (intermediate period), and several times to residents after they had contact with an infected person (intermediate period and the second wave). To lift quarantine, it was discussed several times during all periods that one or two COVID-19 tests needed to have a negative result.

A challenge with wandering residents, residents with severe behavioral problems or dementia, or "non-instructible" residents was adherence to isolation in single rooms and quarantine. A few times outbreak teams discussed how they customized quarantine measures or considered sedative medication to maintain isolation in single rooms. Moreover, a few times they considered establishing or had established separate sections in COVID-19 units for psychogeriatric residents (first and second wave).

> Quote 11. *"In case of a resident with the urge to walk and suspected to have CO-VID-19, the physician decides on how to best isolate the resident. In practice, this will involve confinement to the room or sedation."* (organization XZ, first wave)

Table 2. Textual units regarding challenges discussed by COVID-19 outbreak teams per category of distancing measures.

Challenges per Category of Distancing Measures	First Wave n = 400	Intermediate Period n = 400	Second Wave n = 600
Distancing visitors from residents			
Compliance to national policies	1	N/A	3
Facilitating alternatives to visits	1	2	N/A
Unrest among and conflicts between visitors and staff	2	2	3
Visitors violating measures	2	2	6
Distancing staff and volunteers from residents	N/A	N/A	N/A
Distancing among residents			
Resident non-adherence	1	N/A	1
Admission measures			
Increased number of crisis admissions	1	1	N/A
Limited admission capacity for psychogeriatric residents	2	N/A	3
New residents' hesitance about admission and empty beds	N/A	1	2
Unfeasibility of quarantine at home	N/A	1	1
Isolation measures			
Non-feasibility to create COVID-19 units	N/A	1	1
Fluctuating need for beds	N/A	N/A	2
Impact on staff's wellbeing	2	N/A	1
Staffing issues	3	N/A	3
Ethical dilemma of limiting residents' freedom	1	N/A	1
Resident non-adherence	3	2	2

DISCUSSION

This study investigated what physical distancing measures were discussed by COVID-19 outbreak teams of Dutch nursing homes during the first three periods of the COVID-19 pandemic and what corresponding challenges were encountered. Distancing visitors from residents was the most often discussed category of distancing during all periods. Moreover, these outbreak teams discussed isolation measures (often discussed during the first wave), distancing staff and volunteers from residents (often discussed during the intermediate period), distancing among residents (often discussed during the intermediate period and second wave), and admission measures (less often discussed). The distancing measures for visitors, staff and volunteers, and for residents among each other all included nursing home entry measures and measures for physical distancing within nursing homes or wards. For both distancing measures for staff and volunteers and for residents among each other, very few challenges were encountered.

COVID-19 circumstances in (inter)national long-term care settings varied, making comparison complex. Still, we observed mainly similarities between our findings and cross-national policies and recommendations (1, 13, 14, 35, 36). When comparing our results with the scientific literature, there are some similarities and differences. First, in line with our findings, a literature review showed that visitor policies and physical distancing among residents were among the most common COVID-19 guidelines for long-term care (37). Visitor bans and the shift to allowing restricted visiting were advised or made compulsory by various governments and non-governmental agencies (28, 38). Organizing restricted visiting was more frequently discussed by COVID-19 outbreak teams than maintaining full bans, and, according to another Dutch study, increased workload for staff (39). In contrast to our results, the latter study also reported compliance and no major incidents with local visiting policies in Dutch nursing homes (39). In the minutes, many challenges with visitors were described. Long-term care organizations sometimes acted hard against visitors violating visiting restrictions. To prevent these challenges with visitors and the increase in staff workload in the future, local and (inter) national policy makers may carefully consider staffs', visitors', and residents' experiences with and perspectives on visiting policies. This may lead to a better balance between impact on their daily lives and infection prevention. Second, isolation measures were recommended in many countries (40) and the four types of isolation we identified have been implemented internationally (17). During the first wave, COVID-19 outbreak teams often discussed isolation measures, but during the second wave other distancing measures were more often discussed. However, the challenges encountered with isolation measures during the first wave were also discussed during the second wave. This suggests that the challenges with isolation measures were hard to solve in the short

term. For future outbreaks of COVID-19 and other infectious diseases, we suggest that policy makers in long-term care innovation should involve nursing homes staff and pay attention to the feasibility of creating COVID-19 units, fluctuating needs for beds, staffing cohorts or COVID-19 units, impact on staff wellbeing and residents' freedom. In the short term, local policy makers may only implement isolation measures that suit their building structure, staff, and resident group; consider regional collaboration regarding isolation; and also focus on other types of distancing. In addition, non-adherence to isolation measures, customization of quarantine measures, and implementation of cohort isolation mainly concerned residents with psychogeriatric disorders. This indicates that policy makers may better tailor isolation measures to this resident group. The challenges that include limiting freedom (41), staffing (41), and affecting staff wellbeing (26, 41) have been mentioned elsewhere, although not earlier supported by primary data. Third, measures concerning admission of new residents continued to be discussed, although less often than other measures, and were recommended in half of 30 Western countries (40).

Distancing measures are implemented next to each other, and next to hygiene measures, use of personal protective equipment (PPE), symptom monitoring, testing, and vaccination (16, 18, 42). In this study only textual units from COVID-19 outbreak teams' meeting documents describing distancing measures were included. However, according to literature, on the one hand, the focus on distancing measures increased with insufficient testing possibilities and PPE availability (9, 15). On the other hand, distancing measures can be targeted to infected residents who can be identified with testing and symptom monitoring (15, 43, 44). Future studies should explore the balance between various IPC measures.

A limitation of this study is that the indirect observational nature limits our insights into possible bias regarding what parts of COVID-19 outbreak team meetings were documented. The minutes were sometimes brief descriptions of decisions that seemed to lack context (18). This may also explain the relatively low numbers of textual units describing challenges. Furthermore, content analysis enabled us to count textual units. These counts provide insight into the focus of COVID-19 outbreak teams on distancing measures in relation to each other during the first periods of the COVID-19 pandemic. However, they reflect only analyzed batches of data from time periods of different lengths, and do not necessarily reflect implementation frequency or importance of distancing measures (31). Developments in national guidelines will have influenced the outbreak teams' focus.

Strengths of this study stem from the novel method of qualitative data collection. First, collecting existing meeting documents enabled data collection from the large sample of 41 participating COVID-19 outbreak teams, representing over 500 nursing homes (18). Second, the longitudinal nature of data collection led to a complete overview of distancing measures that were discussed, also in between waves of infections. Most other studies only described what measures were applied during COVID-19 outbreaks (17). These studies may have missed distancing measures that were applied preventively, prior to outbreaks. Third, performing content analysis on these meeting documents enabled generation of big qualitative data without adding to the workload of nursing home staff during the turbulent first periods of the COVID-19 pandemic. Summary reports served as quick input for local and national policy during the study period (18), while results of more in-depth analysis may also offer guidance beyond the COVID-19 pandemic.

CONCLUSIONS

This study investigated what distancing measures and corresponding challenges were discussed by COVID-19 outbreak teams in Dutch nursing homes. Measures to distance visitors from residents, distance staff and volunteers from residents, distance residents among each other, admission measures, and isolation measures were discussed. Challenges with distancing measures persisted over time and included, but were not limited to, unrest among and conflicts between visitors and staff, visitors violating measures, resident non-adherence to measures, and staffing issues.

Since most distancing measures described were in accordance with (inter)national policies and policy recommendations, these apparently offered helpful guidance. However, the shifts in COVID-19 outbreak teams' discussions over time and persisting discussion about challenges may indicate that long-term care organizations also continuously learned lessons from experience. To provide more context to our findings and further reveal what lessons were learned, our findings should be discussed with stakeholders. The distancing measures and challenges discussed may guide and inspire long-term care organizations and (inter)national and local policymakers during the further course of the COVID-19 pandemic, future infectious disease outbreaks, and in long-term care innovations.

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Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to the agreement with participating organizations. During the consent process, participating organizations were explicitly guaranteed that the data would be pseudonymized by the study's research center and that pseudonymized data would only be seen by members of the study team. For any discussions about the dataset, please contact UNC-ZH@lumc.nl.

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4

Activities for Residents of Dutch Nursing Homes during the COVID-19 Pandemic: A Qualitative Study

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ABSTRACT

To protect nursing home residents from getting infected with COVID-19, several measures have been imposed. The aim of this study was to describe the impact of these measures on activities for Dutch nursing home residents, the conditions under which the activities could take place, and the considerations when making decisions about the (dis)continuation of activities. The study consisted of the data of the qualitative MINUTES-study. Textual units derived from documentation of an outbreak team (OT) meetings on activities, well-being, informal caregivers, and volunteers from 39 long-term care organizations were re-analyzed using a content analysis. The results shows that OTs more often discussed restarting and continuing activities than stopping activities during the COVID-19 pandemic. There were differences between time periods, but activities never completely stopped according to the minutes. Activities were offered in an adapted way, often under certain conditions, such as organizing activities at other locations (e.g., outside), with limited group size, and following specific guidelines. The main focus of the considerations made were the ability to adhere to the guidelines, the well-being of residents, ensuring safety, and balancing benefits versus risks given vaccination availability and coverage. Overall, the study showed that organizing activities for nursing home residents despite COVID-19 measures is possible.

Keywords: meaningful activities; geriatric care; dementia; nursing home; long-term care; SARS-Cov-2; COVID-19; pandemic

INTRODUCTION

In December 2019, the first person was infected by SARS-Cov-2, which has spread over the world rapidly since (1). The World Health Organization (WHO) officially announced the coronavirus pandemic in March 2020 (2). The first symptomatic patient with a COVID-19 infection was reported in the Netherlands on 27 February 2020 (3). Within four weeks, the Dutch government imposed a national lockdown. This first lockdown ended on 11 May 2020 and was later known as the first wave (4). By the end of September 2020, the second COVID-19 wave started (5). This wave led to a new lockdown from 14 October 2020 until 5 June 2021 (6,7).

Infections were reported all over the world (8), and Europe seemed to be the worst-infected continent according to available data (9). By October 2021, in the Netherlands, a total of 48,570 people from long-term care (LTC) facilities were reported infected with the coronavirus. This is 38.9% of the approximal 125,000 residents of LTC facilities in the Netherlands and 2.1% (2,295,107 in total) of the reported infections (10–12). To protect nursing home residents from getting infected, several regulations and restrictions have been imposed.

During the first lockdown, similar to other countries around the world (13,14), the 1.5 m distance was implemented, and a visitors ban was imposed in the Netherlands from 20 March 2020 until the end of May 2020 (15). Residents were not allowed to leave the property or, when infected, their room (14,16–18). Furthermore, worldwide but also in the Netherlands, all social activities and group activities were canceled or adjusted to the measures in force (13,17,19,20).

During the second lockdown, the visitor ban was no longer imposed although infected persons still had to isolate themselves, and the 1.5 m distance was maintained. The Netherlands was the only country that mandated that nursing homes reopen to visitors after research showed that this did not cause a rise in infections (15).

The visit ban and the change in organized activities had an impact on challenging behavior in nursing home residents (14,19,21). Healthcare professionals were positive about the adjusted activities, such as small-scale activities and person-oriented activities, because they had a calming effect according to therapists (22). Besides, a decrease in psychotic behavior and agitated behavior was noted, while depressive behavior and apathetic behavior increased (22). One of the influencing factors was a diagnosis of dementia and the associated stage of the syndrome (19,21). Specifically, residents with

mild to moderate cognitive impairments seemed to be more severely impacted by the COVID-19 regulations (23).

There is ample literature indicating that a lack of (meaningful) activities during the COVID-19-pandemic has a negative impact on mental health (24–29). However, most of those studies focused on community-dwelling older persons or those living within an assisted-living setting. Less is known about the impact of the COVID-19 pandemic on activities for nursing home residents and the challenges experienced by nursing homes regarding those activities given the government restrictions. One of the few studies about activities for nursing home residents during the COVID-19 pandemic showed that residents that participated in recreational activities had significantly better mental health (30).

The aim of this study was to describe the impact of the COVID-19 measures on the organization of activities for residents of Dutch nursing homes. First, an overview of the activities that were cancelled, started, and continued is given. Second, the differences in (dis)continuation of activities between the COVID-19 waves are described. Finally, we examined which factors were considered when making decisions on the (dis)continuation of activities for nursing home residents.

MATERIALS AND METHODS

For the present qualitative study, data of the COVID-19 MINUTES study (31), a large Dutch multi-center study in which 41 LTC organizations shared the minutes of their outbreak team (OT) meetings on a weekly basis with the researchers, was used. The data were collected from week 10, 2020 until week 41, 2021. The recruitment and study procedures are described in more detail elsewhere (31).

For this study, the textual units coded as 'activities', 'well-being', 'informal caregivers' and 'volunteers' were selected from the MINUTES study dataset and recoded (31). First, relevant textual units were selected. Textual units were included when about activities, conditions, or considerations within the LTC setting. This study defines *activities* as all the organized leisure activities without a therapeutic aim. Examples are making music together, exercising, and going outdoors. Drinking tea or eating dinner together is considered as a leisure activity because it is a social event. Personal body care (e.g., going to a hairdresser or pedicure) was not considered an activity in this study because they are part of daily care. Well-being is used to express all forms of well-being, such as physical, mental, and social well-being. The conditions contained requirements that needed to be

met in order to organize a certain activity. Textual units were excluded when focused on activities with a therapeutic aim, on home care, on informal caregivers and volunteers without mentioning activities, or being unclear.

Next, textual units were divided in four periods: the first wave from week 10, 2020 until week 19, 2020 (T1); the intermediate period from week 20, 2020 until week 38, 2020 (T2); the second and third wave from week 39, 2020 until week 6, 2021 (T3); and vaccination period from week 7, 2021 until week 41, 2021 (T4). A content analysis (32) was used to re-analyze the selected textual units in this particular study because the existing theory and literature on this topic was limited.

Two researchers (M.S., H.S.) independently coded 75 randomly selected textual units per period and composed an initial list of codes. During a consensus meeting, the initial codebook was composed. Next, the 300 textual units were re-coded. During a second consensus meeting, discrepancies were discussed. Then, the remaining textual units were coded. During a third meeting, differences were discussed, and consensus was reached. A few codes were added to the codebook. The final codebook consists of seven categories with 48 unique topics in total.

RESULTS

The complete dataset of the MINUTES study consisted of 11,711 textual units (**Figure 1**). Out of those units, 884 (7.5%) were coded as *Activities, Well-being, Informal Caregivers* or *Volunteers*. Another 431 units were excluded that did not meet the inclusions criteria, resulting in a total of 453 units that were analyzed. Two of the forty-one LTC organizations did not report on the study topic.

An overview of the frequency of the mentioned codes about activities per wave is given in **Figure 2** and **Appendix A**. The most textual units were coded as restarted activities ($n = 160$), continued activities ($n = 153$), and stopped activities ($n = 70$). Some textual units included an activity whereof the start, stop, or continuation was unknown ($n = 41$). Moreover, 272 textual units were mentioned, and 85 contained considerations.
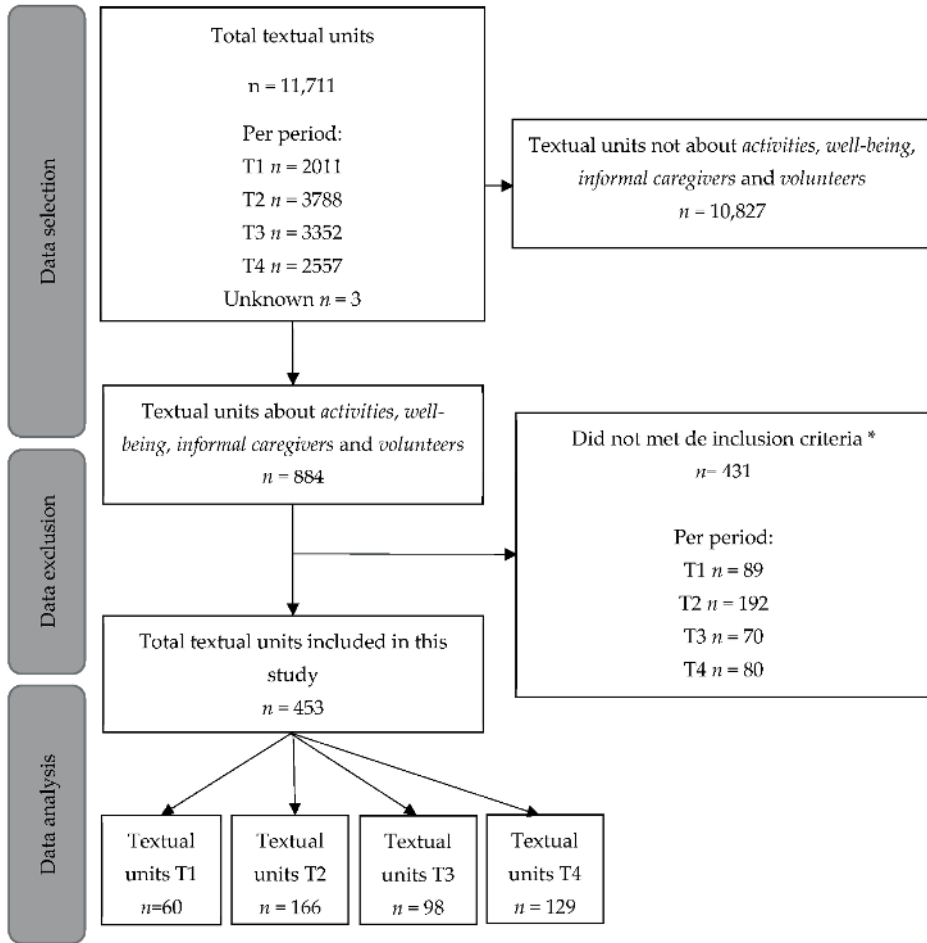
Figure 1. Flowchart of the included textual units per time period. Note: T1 is the first wave, T2 is the intermediate period, T3 is the second and third wave, and T4 is the vaccination period. * Exclusion criteria were: activities with a therapeutic aim, not in long-term care, concerned family caregivers and volunteers without mentioning activities, or were unclear.

Stopped, restarted, and continued activities over time

During the first wave, the numbers of textual units coded as stopped, restarted, or continued activities were all between 12 and 23 textual units, as shown in **Appendix A**. During the intermediate period, most textual units were about restarting activities, and in the second and third wave, continuation of activities was mostly discussed. The vaccination period included most textual units about restarting and continuation of activities, mainly due to the reopening of restaurants: "*National policy is: terraces open as of April 28 [. . .]. The terraces of the nursing homes of [the organization] will be open as of April 28. The tables are placed in such a way that there is sufficient distance. Up to four*

persons can sit at each table at 1.5 m distance. Terraces are open for residents, visitors and staff" (XB, week 17, 2021).
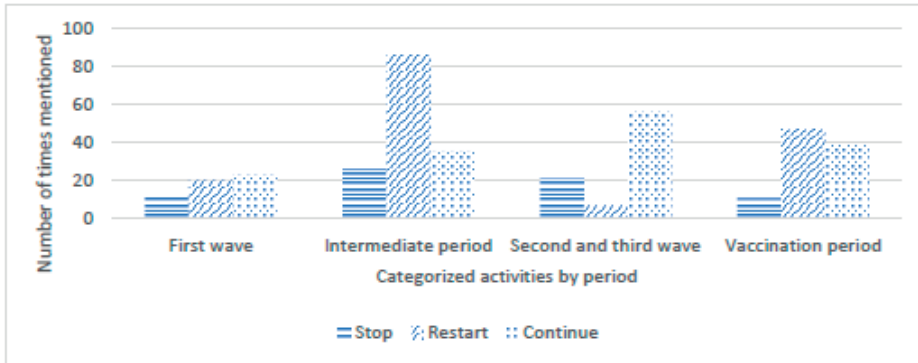
Figure 2. Overview of stopped, restarted, and continued activities for nursing home residents per time period.

Stopped activities

Stopping activities were mostly mentioned by OTs during the intermediate period. Of all stopped activities that were mentioned, most were about restaurants, going on daytrips, and singing activities. Singing was cancelled during all waves: "*Singing is not allowed for the time being because the risk of contamination is higher with this activity*" (XZ, week 27, 2020). Exercising, going outside, religious activities, memorial services, and music activities were almost never mentioned as stopped.

During the first wave, activities that OTs discussed to stop were group activities, going outside, and visits by family. Furthermore, daycare centers were mentioned as closed, and family visits were frequently prohibited. During the intermediate period, OTs discussed to stop day trips, such as visiting museums and visiting family outside the nursing home. Moreover, pets were not allowed: *"Assistance dogs: (in general) no animals allowed at the locations for the time being"* (XF, week 27, 2020). During the second and third wave, the closing of restaurants was mostly mentioned. The vaccination period and first wave had the least stopped activities mentioned.

Restarted activities

Most activities were mentioned as restarted in the intermediate period. In the interme-diate period, restaurants re-opened only for staff and residents, with a maximum group size of 30 persons, while during the vaccination period, restaurants also opened for external guests following the national guidelines. **Appendix A** shows that most textual

units about restarted activities included daycare centers, restaurants, exercising, and going outside.

During the last three weeks (week 17 until week 19, 2020) of the first wave, most daycare centers restarted although with several adjustments: "*Search for locations for starting up daycare centers. Not in our own nursing homes, check whether municipalities have locations available for daycare centers*" (XM, week 19, 2020) "*Daycare centers are slowly being restarted in small groups at all nursing home locations [. . .]*" (YG, week 19, 2020). This restarting of activities in daycare centers continued in the first weeks (until week 25) of the intermediate period. However, some organizations only restarted daycare centers from week 27, 2020 (intermediate period).

Continued activities

During the first wave, daycare centers remained open in some organizations, while they closed in others. The intermediate period was characterized by scaling-up activities. Residents went outside, and exercise and music activities were still offered. Organizations tried to continue the holiday festivities and keep the restaurants open for residents. These were the most often discussed activities during the second and third wave: "*Within residential care there is an explicit wish to allow residents to eat meals together. Residents need this and lose weight, because they are currently eating less*" (XQ, week 3, 2021). The continuation of restaurants was also an often-discussed topic in the vaccination period.

Organizations tried to keep their activities going as long as possible: "*The joint activities in the living rooms will be maintained for as long as possible- outside the living rooms all joint activities will be stopped*" (XR, week 12, 2020). The daycare center and the facilities' shops were also kept open as long as feasible. The parameters of activities (e.g., location or group size) were changed by organizations to facilitate the continuation of the activities within the restrictions and to follow government guidelines. Of the activities that continued, most textual units were about the upscaling of activities and downscaling of COVID-19 measures, holidays, daycare centers, and opening restaurants.

Conditions and considerations and the difference per time period

Conditions and considerations for decisions about continuing, stopping, and (re)starting activities were also discussed by the OTs. **Table 1** presents an overview of the mentioned conditions and considerations per time period.

Conditions and the difference per time period

Out of all the conditions, following the guidelines of the government was mentioned the most. Group size, location, without family/external visitors, and not having any health-related problems were also mentioned often.

During the first wave, organizing activities at other locations (e.g., outside or other external locations) and having no health-related COVID-19 symptoms were the most frequently mentioned conditions. Going outside and going to the daycare centers under the condition that someone had no health-related COVID-19 symptoms were mostly mentioned: *"Walking outside with family, provided that family has no COVID-19-related symptoms, is allowed"* (YA, week 12, 2020).

The intermediate period contained the most conditions about following the guidelines of the government. Guidelines were mentioned in general or in more specific detail: *"The recreational bus may be used again provided that the guidelines are followed. These include performing a health check and wearing a face mask"* (XX, week 30, 2020); *"Residents with decision-making capacity who can adhere to the 1.5 m guideline are allowed to go outside independently."* (XO, week 21, 2020); *"Attention must be paid to ventilation and the maximum number of people in a room during activities. Organize more activities in the restaurant if necessary. The ventilation plan must be linked to activities at a location"* (YF, week 40, 2020).

The vaccination rate within the organization was mentioned as a requirement for organizing and participating in activities: *"Only location X has to wait a little longer* [until activities will be organized again] *until the residents there have been vaccinated"* (XZ, week 13, 2021).

Considerations and the difference in time

The considerations regarding the (dis)continuation of activities made by the OTs during the different time periods are shown in **Table 1**. The main focus of those considerations were the ability to adhere to the guidelines of the government, the well-being of residents, ensuring safety, and balancing benefits versus risks of COVID-19 given vaccination availability and coverage. Most of those considerations were mentioned in the second and third wave and in the vaccination period. The vaccination period included all considerations that centered around vaccinations.

Considerations about the ability to adhere to the guidelines were mostly made during the second and third wave and the vaccination period. Residents' well-being was also most often discussed during the second and third wave. Organizations looked for ways

Table 1. Overview of the mentioned conditions and considerations per time period.

	First Wave	Intermediate Period	Second and Third Wave	Vaccination Period
Conditions				
Condition not specified	-	1	1	-
Access via non-infected wards[1]	1	3	-	1
Limited contact with the outside world exception for close family	2	3	1	1
National guidelines must be followed	3	39	17	38
Only allowed when negative for COVID-19 (family, resident, staff)- or no COVID-19 related symptoms	6	4	4	4
Only allowed when residents suffer from loneliness or being sad	-	-	-	1
Only allowed with a negative COVID-19 (self-)test	-	-	-	1
Organized at a specific location (e.g., outside), online	9	16	13	2
Resident needs to be independent or have decision-making capacity	-	6	-	-
Residents are in need of activities	1	1	-	2
Restriction in group size	3	17	11	13
Scaling down guidelines for activities	-	-	-	5
Transport to and from activities (no group transport)	1	1	-	-
When (fully) vaccinated	-	-	-	7
Without pets	1	-	-	1
Without singing, at a safe distance, no choir	-	7	3	3
Without visitors, family or volunteers	-	-	11	7
Considerations				
Consideration not specified	1	1	-	1
Active dying phase	1	-	-	-
Attune to safety	1	2	4	10
Enforcement options	-	-	-	1
Guidelines	2	-	-	1
Health risks and health benefits	1	3	2	1
Holidays	-	-	2	-
Importance of well-being of residents	-	5	9	4
Limit contact with the outside world	-	-	2	1
Scaling up activities and group size	-	1	-	-
Unable to adhere to the guidelines and imposed restrictions	-	2	8	8
Vaccination rate	-	-	-	11

Note: [1] *Prescribed route to activity location, otherwise the activities are not allowed to continue.* -, there were no textual units coded with this code in this category in the time selected period

to work with the guidelines while looking out for the well-being of residents: *"Looking for loopholes to not having to close the restaurants for the social well-being of our residents"* (XN, week 42, 2020); *"Propose alternatives for the week-start and church service, which are in line with national guidelines and do justice to the needs of residents as much as possible"* (XE, week 5, 2021).

The safety of residents and balancing the benefits of a choice for a certain measure versus the danger of not taking this measure was also most often discussed during the fourth period (T4): *"The question has raised whether decorative chicks can be placed in the hallway around Easter. Due to the risk of groups forming around the chicks, it is decided not to do that this year"* (YI, week 9, 2021).

DISCUSSION

The aim of this study was to describe the impact of the COVID-19 measures on the organization of activities for residents of Dutch nursing homes. Our overview of the activities for nursing home residents indicated that, in general, OTs more often discussed continuing than stopping activities during the COVID-19 pandemic. When activities restarted and continued, this was often under conditions such as using external locations, limited group sizes, and applying specific guidelines. The reduction of measures, guidelines, vaccinations, and safety were most discussed while considering the restart, continuation, or stop of activities.

The most textual units about continued activities were mentioned during the second and third wave, when almost none were mentioned as restarted. This corresponds to earlier research findings on data of September and October 2020 that reported that residents could attend activities again in 59 Dutch nursing homes in October 2020 (33). Although previous findings of studies that collected data between April and June 2020 (19,20) showed that most activities for nursing home residents were mentioned as stopped, our findings suggest that more activities restarted or continued in every time period. This shows that our large nursing home sample was able to retain activities despite the difficult situation during the pandemic.

In addition to differences between time periods, there were also differences within time periods. A proper example is daycare centers. OTs mentioned both the closing and continuation of daycare centers the most during the first wave. This can be explained by the different phases within one time period. During the first period of the first wave, daycare centers remained open as long as possible, but when infection rates skyrocketed, and

mortality rates increased during the second part of wave one, daycare centers had to close to prevent further spread of the virus.

This study has several strengths. One of them is the broad insight it provides into the impact of the measures on activities in nursing homes nationwide. The study gives insight into the considerations that were made regarding the (dis)continuation of the activities for the nursing home residents as well. These rich data were collected without placing an extra burden on nursing homes for an extended period of time, enabling us to make comparisons between time periods during the COVID pandemic (31). Besides, the data were collected during the pandemic instead of afterwards, which gives a direct insight in the decision-making process instead of a retrospective view of participants on the topic.

Limitations of the study are the lack of context in which decisions and considerations were made. The textual units were often concrete, short, and without many details. Moreover, the stop, start or continuation of activities could have been discussed in other meetings instead of the OT meeting. Therefore, it is only possible to make conclusions about the (dis)continuation of the specific activities that were mentioned in the minutes. This limits the generalizability of our data.

The relatively small number of textual units in the MINUTES study dedicated by the OTs to *activities, volunteers, informal caregivers,* and *well-being,* is striking considering the principles of person-centered care of the National Institute for Health and Care Excellence UK (NICE) and the Dutch quality framework for nursing homes (34,35). Both highlight that attention should be paid to the well-being of nursing home residents with dementia and the organization of (individualized) activities. The relatively low amount of textual units suggests that the focus of the OTs was less on the well-being of residents and organized activities but rather on how to stop infections while still being able to provide the daily care. Although this study showed that activities continued, more research on the considerations of long-term care organizations on decisions about the (dis)continuation of activities outside the OTs is necessary, as is research focused on disentangling the relationship between residents' well-being, (meaningful) activities, and the restrictive measures.

CONCLUSIONS

This study showed that it is possible to organize activities for nursing home residents despite COVID-19-related measures although some creativity is needed and important to

meet the restrictions and safety regulations. This is an important finding considering the significance of activities for the well-being and quality of life of nursing home residents. If there is one thing that the pandemic has taught long-term care, it is that we should always strive for a good balance between well-being and safety, and in the beginning of the pandemic, the scale was tilted too much towards safety. Overall, the study showed that nursing homes have put more energy into keeping activities accessible than earlier described.

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APPENDIX A. OVERVIEW OF TEXTUAL UNITS ABOUT RESTARTED, STOPPED, AND CONTINUED ACTIVITIES FOR NURSING HOME RESIDENTS PER TIME PERIOD

Table A1.

	First wave			Intermediate period			Second and third wave			Vaccination period		
	Start	Stop	Continue	Start	Stop	Continue	Start	Stop	Continue	Start	Stop	Continue
Activities without further specification of the type of activity	-	1	1	7	1	-	1	1	3	5	-	1
Activities including pets	1	-	NA	1	2	NA	-	-	NA	1	-	NA
Activities including visitors on a regular or special spot	1	2	3	4	3	-	1	1	4	2	-	2
ADL activities	-	-	-	1	1	1	1	1	-	2	-	-
Celebrating holidays in the nursing home	-	-	-	4	-	-	-	3	23	1	2	4
Going out for coffee or visit family outside of the nursing home	-	-	-	1	-	2	-	-	-	1	1	-
Going out on day trips, vacation, celebrating holidays outside the nursing home, sleepover	-	-	1	5	5	2	-	1	3	5	2	1
Going outside or visit the (communal) garden	2	1	-	10	1	4	1	-	2	1	-	-
Going to the daycare center	11	4	7	15	-	3	-	2	7	6	-	4
Going to the restaurant in the nursing home	1	-	1	12	2	1	1	8	6	12	2	6
Group activities	NA	2	-	NA	1	-	NA	2	-	NA	1	1
Living room[1]	NA	NA	1	NA	NA	-	NA	NA	1	NA	NA	1
Memorial services	-	-	2	2	2	-	-	-	-	-	-	1
Music related activities	-	-	-	2	1	2	-	-	1	-	1	-
Physical exercises (e.g., walking, fitness, duo-bike)	1	-	1	16	1	2	-	-	-	2	1	-
Religious activities (e.g., religious gatherings, church services)	-	-	-	2	1	2	1	1	2	1	-	1
Singing (sing along)	-	-	-	2	5	-	-	1	-	6	1	1
Video calling	2	NA	-	-	NA	1	1	NA	-	-	NA	-
Visits to the store(s) inside the nursing home	-	NA	-	-	NA	1	2	NA	1	2	NA	1
Wellness related activities (e.g., hand massage)	NA	NA	NA	2	NA	NA	NA	NA	NA	-	NA	NA
Window calls (e.g., visits or calls behind a window)	1	NA	2	-	NA	1	1	NA	-	-	NA	-
Total	20	12	23	86	26	35	7	21	56	47	11	39

Note: [1]Living room means that activities are organized in the living room or in the garden, to let them continue. ADL = Activities of daily living, NA means Not Applicable: the code does not apply to the category; -, a category was applicable, but there were no textual units coded with this code in this category in the time selected period.
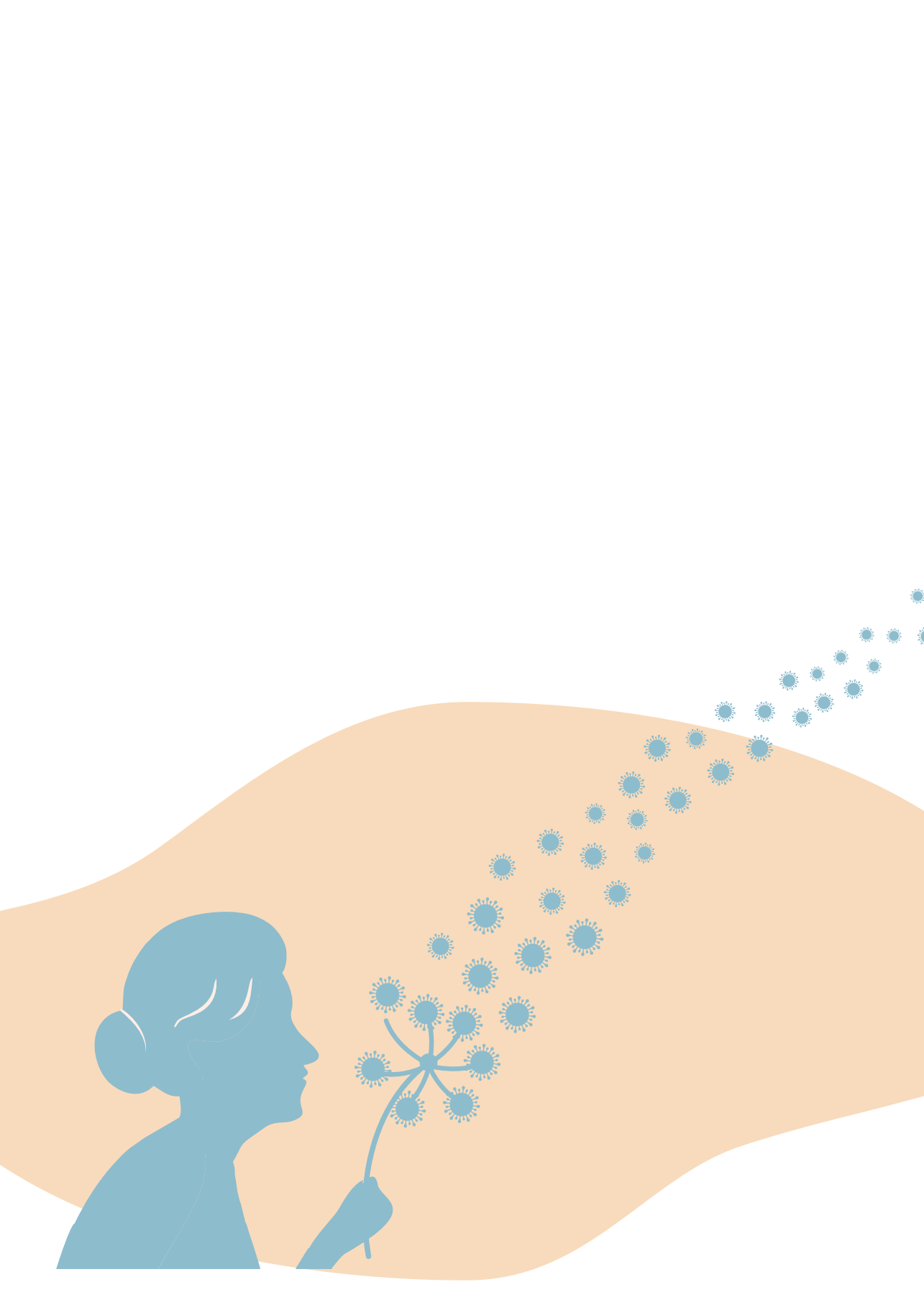
5

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

Van Tol LS, Smaling HJA, Janus SIM, Caljouw MAA, Achterberg WP.

ABSTRACT

Background: COVID-19 infection prevention measures can negatively impact nursing home residents' well-being. Society has been concerned about the imbalance between infection prevention and residents' well-being, and about nursing home residents' autonomy in COVID-19 policymaking.

Objective: This study explores consensus among nursing home staff about which measures they found to be most important in contributing to preventing infections and to maintaining well-being of residents during COVID-19 outbreaks. In addition, this study explores the decision-making processes regarding COVID-19 measures and the involvement of residents or their representatives.

Design: Mixed methods based on an online nominal group technique.

Setting(s): Dutch nursing homes, June–November 2020.

Participants: Managers, policy advisors, elderly care physicians, psychologists, a spiritual counselor, nurses, care assistants, and resident representatives ($n = 35$).

Methods: Four panels from the viewpoint of infection prevention, and four panels from the viewpoint of well-being were performed with 3 to 7 participants per panel. Participants individually selected the measure they found most important, discussed these measures together in an online conversation, and rated the importance and urgency of these measures during COVID-19 outbreaks on a 5-point Likert scale. The measures that were rated as (very) important and (very) urgent by all members of that panel were defined as 'prioritized in consensus'. Panels also discussed the decision-making process regarding COVID-19 measures and the involvement of residents or their representatives. These conversations were transcribed verbatim and thematically coded using an inductive approach.

Results: The infection prevention panels prioritized isolation measures; testing measures; testing and isolation combinations; use of personal protective equipment around (suspected) infected residents; and preparation for outbreaks by COVID-19 outbreak teams. The well-being panels prioritized cohort isolation, testing combined with cohort isolation and with isolation in residents' rooms, exceptions to visitor bans, maximum numbers of visitors, and registration and accompanying visitors to the residents' rooms. Resident representatives and staff were dissatisfied with their reduced involvement in policy making during the first months of the COVID-19 pandemic, although they understood that decisions had to be made quickly.

Conclusions: Staff and resident representatives should be involved in COVID-19 policy making. According to them, priority COVID-19 measures should include: cohort isolation, testing and isolation combinations, use of personal protective equipment, crisis management by COVID-19 outbreak teams, and nursing home visit regulations and instruction of visitors. Combining these measures may be a first step towards packages of

COVID-19 measures that better balance infection prevention and maintaining residents' well-being.

Registration : N/A

Tweetable abstract **:** Priority COVID-19 nursing home measures are isolation, testing, testing and isolation combinations, PPE use, preparations by outbreak teams, and visit regulations @wilcoachterberg

Keywords: COVID-19, Nursing homes, Infection prevention, Well-being, Measures, Policy making, Decision making

WHAT IS ALREADY KNOWN

- COVID-19 infection prevention measures can negatively impact nursing home residents' well-being.
- Society has been concerned that nursing home residents' autonomy has been overlooked in COVID-19 policymaking.
- Society has been concerned about the imbalance between infection prevention and residents' well-being. Nursing home staff, residents, and their families have been struggling to develop better balanced packages of COVID-19 measures.

WHAT THIS PAPER ADDS

- Resident representatives and staff were dissatisfied with their limited involvement in policy making during the first months of the COVID-19 pandemic, although they understood that decisions had to be made quickly.
- Priority measures during COVID-19 outbreaks in nursing homes include cohort isolation, testing, testing and isolation combinations, use of personal protective equipment, crisis management by COVID-19 outbreak teams, and nursing home visits regulations and instruction of visitors.
- There is overlap between priority measures for preventing infections and for maintaining residents' well-being during COVID-19 outbreaks in nursing homes: cohort isolation and combinations of testing and isolation were prioritized from both viewpoints.

BACKGROUND

Among nursing home residents, elevated risks of severe disease courses of COVID-19 and mortality were seen (1, 2). By May 2020, 37 to 66% of all COVID-19-related deaths in European countries had occurred in nursing homes and other long-term care facilities (1, 3). Inherent to the setting of nursing homes is close contact between people. Residents are often dependent on care that is provided by staff to multiple residents (2), and residents often share spaces, facilities, or activities (2, 4). COVID-19 therefore spreads easily among residents.

To protect vulnerable nursing home residents from COVID-19, many local and (inter)national guidelines and restrictions were applied during the first months of 2020, such as isolation measures, visiting bans or regulations, other distancing measures, testing, and use of personal protective equipment (5-9). Although these measures should prevent COVID-19 transmission, public concerns arose about the lack of attention for nursing home residents' well-being during spring and summer (10, 11). Research confirmed that social isolation and loneliness, depressive symptoms, grief, anxiety, and challenging behavior had increased among nursing home residents during the first year of the COVID-19 pandemic (12-15).

Researchers have suggested that infection prevention measures have to be weighed carefully against their potential harms (16) and person-centered care (17-19) in order to maintain residents' well-being. However, how these considerations are to be made in practice is not described (16, 17). Nursing home staff, residents, and residents' family members have also been struggling to find packages of measures that provide a better balance between infection prevention and maintaining residents' well-being (13, 20). Staff and residents' family feared for residents' safety and argued in favor of even stricter infection prevention measures, although they also found visitor restrictions difficult to cope with and campaigned for residents' freedom of movement (16, 21).

Another public concern was that nursing home residents' autonomy has been overlooked in COVID-19 policymaking (15, 22). It was argued that, especially due to their relatively short remaining life expectancy, many nursing home residents had died, or would die, under restrictive measures they had had no say in (23). However, the actual decision-making process in nursing homes and the involvement of residents regarding COVID-19 measures has hardly been studied.

In response to these two public concerns, the first aim of this study is to explore consensus among nursing home staff and resident representatives about measures they

found to be most important in contributing to preventing infections, and to maintaining residents' well-being during COVID-19 outbreaks in nursing homes. The second aim is to explore how the decision-making processes and the involvement of residents or their representatives regarding COVID-19 measures were organized and experienced in nursing homes.

METHODS

Design

This study has a mixed-methods design using the nominal group technique (NGT) (24-26). The NGT was slightly modified to an online procedure with a single rating phase. This consensus method has been used to identify COVID-19 measures that nursing home staff members and resident representatives give priority to. This study made use of participants and data from the MINUTES study (27).

Participants

Long-term care organizations that participated in the MINUTES study (27) were invited to participate. Since the focus of our study is on inpatient long-term care, these were all organizations with at least one nursing home or care home. An information letter was sent by email to the directors of these 41 long-term care organizations. Consent to study participation was received in reply to this email from 12 organizations. Next, the contact person of each participating organization distributed information letters to potential participants. Besides, we asked potential participants if they knew any colleagues who might be interested in receiving an information letter and considering participation in a next round of panels. When potential participants indicated interest in participating, we checked if there were not yet two participants from the same long-term care organization or with the same function registered for the next round of panels. Subsequently, we asked for their availability during the times of the scheduled online panel conversations and if they preferred to participate in a panel regarding infection prevention measures or about well-being measures.

The aim was to organize panels of 4 to 7 participants, to keep the online process manageable (24). To include diverse perspectives of stakeholders in nursing homes' policy making, we aimed to compose panels that consisted of multidisciplinary nursing home staff from various long-term care organizations, including managers or policy advisors; practitioners such as physicians, psychologists, or physiotherapists; nurses or care assistants; and resident representatives.

Setting

Shortly before the start of this study, in May 2020, nursing homes gradually started to reopen for visitors (28), and the Dutch 'first wave' of national excess mortality due to coronavirus infections was just over (29). However, nursing homes were still short of personal protective equipment (30). Right at the beginning of the study period, in June 2020, tests became available for Dutch citizens, including nursing home residents, with symptoms of COVID-19 (29). From September 2020 until June 2021, the indistinguishable second and third waves of coronavirus infections were ongoing (29). By the end of the study period in November 2020, there were no personal protective equipment shortages anymore, but restrictive measures, e.g., to limit group sizes, had been reintroduced at the national level (31). Vaccines were not yet available. Rounds of panels were organized in June, July, August and November 2020.

Procedures

The NGT is a structured group procedure for idea generation, problem solving, and priority setting that encourages equal input from all participants (26). A modified NGT was employed to define levels of agreement about priority COVID-19 measures among nursing home staff. Due to national COVID-19 restrictions, the study had to take place online. To limit the burden on the participants in a time of crisis, and because our aim was not to enforce consensus, but only to explore the existing level of consensus in this early stage of the pandemic, there was no secondary ranking or re-ranking, which is often the last phase of the NGT (24, 26). Multiple rounds of NGT panels from each viewpoint were conducted, until data saturation was reached in the topics of measures selected to be most important. The phases of the NGT are presented in **Table 1**.

Phase 1, the idea generation phase, consisted of a questionnaire via email one week before the panel meeting. The questionnaire contained questions about the most important measure during COVID-19 outbreaks from the viewpoint of either infection prevention or well-being, and about the decision-making process (**Table 1**). To activate participants' thoughts, a list of textual units from the MINUTES data (27) of the previous four weeks was attached to the questionnaire. As an example, **Supplement I** presents the attachment for the first panel about infection prevention measures.

In phase 2, the 1.5 to 2-hour panel conversations were conducted online via Zoom (32) and were guided by a facilitator, an assistant facilitator who also served as technical assistant before and during the conversation, and one person taking minutes (female researchers JG, LT, and SJ in alternating roles). The information letter contained technical instructions regarding Zoom, and shortly before and during the meeting, the assistant facilitator was available to provide participants with technical support. The conversa-

tions followed usual NGT steps: a round robin and a discussion. With a 10-minute break in between, these steps were performed for conversation part 1 regarding the selected measures and for part 2 regarding the decision-making process. The panel conversations were audio recorded.

Phase 3, rating of the measures discussed, was conducted by email one week after the panel conversation. Participants received a form with descriptions of the measures, including arguments and nuances that were mentioned during the conversation. They were asked to rate the importance and the urgency of each measure on a 5-point Likert scale. In addition, the form served as a member check (33). Descriptions of the measures were adapted if participants' comments indicated an inaccurate interpretation of the conversation.

Table 1. Procedures nominal group technique.

Phase	Format	Content/structure
1. Idea generation	Form by email	Open questions: 1. "What measure, taken in the nursing homes organizations you are affiliated with, do you think is most important to implement during a COVID-19 outbreak in nursing home organizations [to prevent infections /to maintain residents' well-being]?" 2. "Why this measure?" 3. "From whose perspective(s) was this measure decided? Was there participation/ consultation/ questioning of client(council)s?" 4. "Does this differ from the way policy is made in the normal situation? What do you think about that?" Attachment: list of textual units from the last four weeks of MINUTES data that described measures.
2. Panel conversation	Online via Zoom	Conversation part 1: measures (phase 1 questions 1 and 2) - step 1. Round robin: participants one by one explain their answers to open questions 1 and 2 - step 2. Discussion: participants ask each other clarifying questions and discuss their ideas Break Conversation part 2: decision making (phase 2 questions 3 and 4) - step 1. Round robin: participants one by one explain their answers to open questions 3 and 4 - step 2. Clarification and discussion
3. Rating	Form by email	5-point Likert scale questions: 1. "This measure is <u>important</u> for [infection prevention]/[the well-being of residents and their family] during COVID-19 outbreaks in the nursing home" 2. "Introducing this measure at the start of a COVID-19 outbreak in the nursing home is <u>urgent</u>, and cannot wait weeks" Comment field

Data analysis

The discussion elements of the panel conversations about important COVID-19 measures were transcribed verbatim. Between phases 2 and 3, the transcripts of conversation part 1, regarding COVID-19 measures, were analyzed using content analysis (25, 34) and converted into the measure descriptions on the rating forms (LT, checked by JG and SJ). After phase 3, the rated measures were classified under the eight main topics that were identified in the MINUTES study as topics of discussion in COVID-19 outbreak teams: crisis management, isolation of residents, personal protective equipment and hygiene, staff, residents' well-being, visitor policies, testing, and vaccination (27) (LT, checked by HS and MC). This classification facilitated comparison between the measures prioritized by the well-being panel and by the infection prevention panel. Measures were considered to be prioritized in consensus if they were ranked as (very) important (4 or 5 points) and (very) urgent (4 or 5 points) by all panel members. The transcripts of part 2 of the panel conversations, regarding decision making, were inductively thematically analyzed (LT, reviewed and discussed with HS) (34).

Ethics

The study was exempt from the Medical Research Involving Human Subjects Act by the Medical Ethics Committee Leiden The Hague Delft (protocol number N20.093). The directors of the long-term care organizations and all panel participants provided written informed consent. The study was announced on the Long-Term Care response to COVID-19 website on March 10, 2021 (35).

RESULTS

Participants

Four rounds of panels on infection prevention and on well-being were performed. After for rounds, data saturation was reached in all topics except crisis management. This topic was assumed to indicated that by November, nursing homes no longer experienced the pandemic as a crisis but reflected on and prepared for future crisis situations. In total, 19 participants participated in the infection prevention panels, and 16 in the well-being panels. Each panel consisted of 3 to 6 participants. Their median ages were 55 (range 30 – 73) and 50 (range 21 – 73) years, 68% and 56% were female, and their median years of experience in their positions were 8.0 (3.0-24.0) and 5.5 (1.6-7.8) years, respectively. Participants included care assistants, elderly care physicians, managers, nurses, policy advisors, psychologists, resident representatives, and a spiritual counselor (**Table 2**). There were no panels with more than one pair of participants from the same function or more than one pair of two participants from the same long-term care organization. The

resident representatives were all members of nursing home client councils and current or former family caregivers of nursing home residents.

Table 2. Participant characteristics.

	Infection prevention panels (n=19)	Maintaining well-being panels (n=16)
Sex		
Female	68.4% (n=13)	56.3% (n=9)
Age (Median (range))	55 (30 – 73)	50 (21 – 73)
Function		
Care assistant*	5.3% (n=1)	6.3% (n=1)
Elderly care physician	10.5% (n=2)	N/A
Manager**	21.1% (n=4)	31.3% (n=5)
Nurse	15.8% (n=3)	18.8% (n=3)
Policy advisor	26.3% (n=5)	6.3% (n=1)
Psychologist	N/A	12.5% (n=2)
Resident representative	15.8% (n=3)	25.0% (n=4)
Spiritual counselor	5.3% (n=1)	N/A
Years in position (Median (IQR))	8.0 (3.0 – 24.0)	5.5 (1.6 – 7.8)

*care assistants were a 'carer' and an 'activity supervisor', **one manager was also chair of the pre-pandemic infection prevention committee

Infection prevention measures

The 19 participants in the panels about infection prevention selected and discussed 16 different measures. These 16 measures were on the topics of isolation, testing, testing and isolation combinations, personal protective equipment, hygiene, visiting measures, and crisis management. Of these 16 measures, 9 were prioritized as being (very) important and (very) urgent in nursing homes during COVID-19 outbreaks. These 9 priorities are described below (**Table 3**).

Of the 9 prioritized measures, 3 concerned the topic of isolation. These isolation measures varied from cohort isolation of wards with infected residents and entry restricted to a limited number of staff members with personal protective equipment (June); transfer of infected residents who cannot be isolated on their ward to an organizational or regional COVID-19 unit (July); and isolation of residents with (suspected) COVID-19 who are cognitively able to comply with this measure in their single room (August). Panel members argued that transfer and isolation in a COVID-19 unit would stimulate

Table 3. Prioritization of measures preventing infections during COVID-19 outbreaks in nursing homes (nominal group technique phase 3).

Measure	Panel (month)	Importance scores						Urgency scores					
		5	4	3	2	1	missing	5	4	3	2	1	missing
Isolation													
Isolate wards with infected residents as cohorts and restrict entry to limited number of staff members with PPE*	Jun		2				2	2					2
Transfer infected residents who cannot be isolated on own ward to a COVID-19 unit	Jul	2	3					2	3				
Isolate residents with (suspected) COVID-19 who are able to comply with isolation measures in a single room	Aug	3	1				1	3	1				1
Transfer residents with (suspected) COVID-19 not able to comply with isolation measures to a COVID-19 unit	Aug	2	2				1	3		1			1
Tailor isolation measures for specific locations, wards, and for residents by their physician	Aug	2	2				1	1	2	1			1
Testing													
Test residents and staff with (minor) symptoms and isolate them in the case of a positive result	Jul	4	1					3	2				
Test staff and residents within the care organization itself if national testing resources are scarce	Nov	2	3					2	2				1
Testing and isolation combinations													
Test and transfer residents suspected of COVID-19 to a COVID-19 unit with experienced staff	Jun	1	1				2	1	1				2
Test and isolate residents who are (possibly) infected until a negative test result is obtained	Nov	4	1					4	1				
PPE*													
Use personal PPE* around (suspected) infected residents	Jul	4	1					4	1				
Use of mouth-nose masks as a precaution by all staff members who enter wards with residents	Nov	3	1	1				4		1			
Crisis management													
Preparation for outbreaks by a COVID-19 outbreak team	Nov	3	2					3	2				

Measure	Panel (month)	Importance scores						Urgency scores					
		5	4	3	2	1	missing	5	4	3	2	1	missing
Hygiene													
Raise staff's awareness of general hygiene, which includes work clothes, PPE*, jewelry, and hand hygiene	Jun	2					2	1	1				2
Keep hygiene and infection prevention policies up to date and share the content with staff	Jul	3	1	1				2	1	2			
Visiting policies													
Ban all visitors other than staff, including residents' families, volunteers, and suppliers	Jun		1	1			2	2	1		1		2
Decentralize policy making about strict visiting instructions and regulating the flow of visitors	Aug	2	1	1			1	2	2				1

Note: measures in bold are prioritized in consensus. *PPE: personal protective equipment

a regionally uniform policy, centralize experiential knowledge on caring for COVID-19 patients, and centralize usage and therefore save personal protective equipment. Isolation in single rooms would prevent transfer of residents to a COVID-19 unit with staff who are not familiar with their normal behavior. Cohort isolation was argued to prevent transfer so residents can stay in their familiar environment as well as prevent isolation in single rooms so residents retain some freedom of movement.

Four measures were prioritized in the topics of testing ($n = 2$), and testing and isolation combinations ($n = 2$). The testing measures were, first, immediate testing of residents and staff in the event of (minor) symptoms, and isolation in case of a positive test result (July). Second, testing of staff and residents should be performed within the care organization itself if national testing resources are scarce or processes are slow (November). The prioritized combinations of testing and isolation were testing and transferring residents suspected of COVID-19 to a COVID-19 unit with experienced staff, especially when test results are not quickly available (June); and, in nursing homes where the building structure makes it difficult to prevent transmission of the virus, testing and isolating residents who are (possibly) infected until a negative test result is obtained (November). Both panels argued that testing can shorten the period during which isolation measures are needed.

Measures prioritized in other topics ($n = 2$) were, first, the use of personal protective equipment around (suspected) infected residents (July). This measure was argued to reduce unrest among staff. Second, having an organizational COVID-19 outbreak teams to prepare for outbreaks was prioritized (November). This was aimed at reducing fear and work overload of staff.

Measures to maintain residents' well-being

The 16 participants in the well-being panels selected and discussed 14 different measures. These 14 measures were on the topics of visitor policies, isolation, testing and isolation combinations, crisis management, and activities for residents. Of these 14 measures, 8 were prioritized as being (very) important and (very) urgent to maintain the well-being of nursing home residents during COVID-19 outbreaks by all panel members. These 8 priorities are described below (**Table 4**).

Of the 8 prioritized measures, 5 concerned the topic of visitor policies. One panel prioritized not permitting visitors to visit residents or wards with positive test results, but allowing visitors who wear mouth masks to visit residents who are suspected of having COVID-19 (August). Two panels prioritized exceptions to visitor bans for terminal residents and other distressing cases (June) and for residents in the phase of dying

Table 4. Prioritization of measures maintaining residents' well-being during COVID-19 outbreaks in nursing homes (nominal group technique phase 3).

measure	Panel (month)	Importance scores						Urgency scores					
		5	4	3	2	1	missing	5	4	3	2	1	missing
Visiting policies													
Lift visitor bans in the case of terminal residents and any other distressing cases	**Jun**	**4**						**4**					
Allow residents in the dying phase to receive 2 or 3 visitors daily with PPE*	**Jul**	**2**	**1**					**2**	**1**				
Register visits and accompany visitors to the residents' rooms	**Aug**	**1**	**3**					**3**	**1**				
Do not permit visitors to visit residents or wards that have tested positive	**Aug**	**2**	**2**					**4**					
Limit the daily number of visitors to 2 or 3 of the residents' choice during COVID-19 outbreaks	**Nov**	**3**	**2**					**3**	**2**				
Ban visitors or allow only regulated visiting, tailored to residents' wishes	Jun	1	1	2				1		1	2		
Facilitate 'visiting windows' where family and residents can see and (video) call each other	Jun	1	2	1				2	1	1			
Isolation													
Isolate ward with residents who are (suspected of) having COVID-19 as a cohort	**Jul**	**2**	**1**					**2**	**1**				
Tailor cohort isolation to the smallest possible units or wards around a COVID-19 outbreak	**Aug**	**3**	**1**					**4**					
Cohort wards and compartment staff to cohorts to allow living room activities to continue within cohorts	Jun	1	3					1	2	1			
Testing and isolation combination													
Test and isolate residents with suspected COVID-19 in their rooms; and in case of positive test results, isolation the entire ward as a cohort	**Jul**	**3**						**3**					
Crisis management													
Appoint a crisis manager or crisis team	Nov	1	2	1	1			2	1	2			
Organize evaluation conversations on COVID-19 measures	Nov	3	2					2		3			
Well-being activities													
Continue indoor and outdoor activities for residents from the same wards	Jul	2	1					1	1	1			

*Note: measures in bold are prioritized in consensus. *PPE: personal protective equipment*

(July). This last panel wanted to allow a maximum of 2 or 3 visitors daily with personal protective equipment. Two panels furthermore prioritized registration of visits and accompanying visitors to the residents' rooms (August), a maximum of 2 or 3 visitors of the residents' choice per day per resident during COVID-19 outbreaks, and additional clear restrictions such as location of visits, mandatory mouth masks, and registration of visits (November). These panel members argued that regulation of visits has less impact on residents' and their family members' daily lives and intimacy and on the workload for staff, than visitor bans. In addition, all visiting measures other than visitor bans were argued to be important to maintain residents' autonomy or privacy.

The other three prioritized measures concerned the topics of isolation and testing and isolation combination. These are overlapping with measures prioritized by the panels about infection prevention. The figure in **Supplement II** illustrates this overlap. Cohort isolation should be applied to wards with (suspected) infected residents (July), and tailored to the smallest possible units or wards around a COVID-19 outbreak (August). Participants argued that cohort isolation to the smallest possible unit or ward would keep the impact on residents, their family, and staff to a minimum (August), and keep other wards within the building accessible for visitors (July). In addition, testing and isolating residents with suspected COVID-19 in their room (droplet isolation) was prioritized. A positive test result would require transition from room isolation to cohort isolation of the ward (July).

Decision making

Most participants were aware of how decisions regarding COVID-19 measures were made within their organization. They explained that the COVID-19 outbreak teams made decisions more quickly and more top-down than usual, often implementing national COVID-19 policies (**Supplement III: quote 1 (Q1))**. However, they did not always know of whom the outbreak teams consisted. Resident representatives were often not involved at all, and were merely informed of COVID-19 policies. Often they only remained involved in the topic of visitor policies **(Q2)**. Barriers to their involvement in the decision-making included not being able to get together on location, to meet with staff, and COVID-19 outbreak teams meeting ad hoc (**Q3**). One panel discussed the possibility of including a resident representative in a COVID-19 outbreak team, but this panel's participants were divided about this idea.

Several staff members indicated feeling they were not heard by the COVID-19 outbreak team (**Q4**). Some staff members explained that they were informed of decisions about COVID-19 measures, but that their questions, or questions they received from residents, family members, and other staff remained unanswered.

While resident representatives and staff expressed dissatisfaction and irritation about their decreased involvement (**Q5**), they also indicated understanding the accelerated decision-making process during the first months of the pandemic (**Q6**). The panels of August and November indicated that staff and client councils were increasingly involved in COVID-19 policy making, and that staff was given more freedom in applying policies (**Q7**).

According to one participant, the decision making process did not differ much from before the pandemic, because it was usual that deviations from 'normal' care were discussed with the manager or physician who were now part of the COVID-19 outbreak team.

DISCUSSION

This study examined a set of COVID-19 measures nursing home staff and resident representatives deemed most important and urgent to prevent infections and maintain residents' well-being during COVID-19 outbreaks in nursing homes. They prioritized cohort isolation and testing and isolation combinations to both prevent infections and maintain residents' well-being. In addition, to prevent infections, more isolation measures, testing measures, use of personal protective equipment around (suspected) infected residents, and preparation for outbreaks by COVID-19 outbreak teams were prioritized; and to maintain residents' well-being, exceptions to visitor bans and several visitor policies were prioritized. These measures combined may be a first step towards packages of COVID-19 measures that better balance infection prevention and maintaining well-being. Resident representatives and staff were dissatisfied with their reduced involvement in policy making during the COVID-19 pandemic, although they understood that decisions had to be made quickly. These prioritized sets of measures are a first step towards packages of COVID-19 measures that better balance infection prevention and maintaining residents' well-being.

This is the first study to prioritize COVID-19 measures in terms of importance and urgency during outbreaks in nursing homes to both prevent infections and maintain residents' well-being. In line with our findings, priority research areas regarding infection prevention that have been designated academic authors and specialist societies include testing and vaccination, and use of personal protective equipment; and also well-being priorities including consequences of COVID-19 for physical, cognitive and psychological health, and the impact of social distancing and lock-down policies (36). Besides, two literature reviews described COVID-19 best practices and potentially effective measures

that are mainly in the topics that our study rated to be important, including (cohort) iso-lation, testing, combining testing and isolation, use of personal protective equipment, hygiene reinforcement, visiting policies, and crisis management (18, 37). In addition to our results, these reviews also described ventilation, digital health applications such as real-time outbreak monitoring, workforce management (18), and person-centered care (37) to be important. Although person-centered care may refer to residents' well-being, these reviews included mostly studies that were only focused on infection prevention, Moreover, many of the studies included in these reviews did not include the perspective of nursing home staff, residents, or resident representatives.

In our study testing and isolation combinations were also prioritized by the well-being panels, although intuitively these may be only infection prevention measures. A plausible explanation is that participants were inclined to select infection prevention measures because they experienced mainly this type of measures in practice during the first months of the pandemic. The well-being measures reflect that relaxation of infection prevention measures benefits residents' well-being. Besides, this might also be explained by the CDC definition of well-being, which besides mental, social, and autonomy components, also includes a physical component (38). Nursing home staff might indeed have regarded infection prevention as part of maintaining physical health and an integral part of well-being. Future research could reveal if the focus regarding well-being has changed after the acute crisis passed.

Our study showed that the autonomy of nursing home residents should be maintained during COVID-19 outbreaks. According to literature, the norm is to involve them or their representatives in care decisions and to deliver person-centered care (13, 39). Dutch care organizations are obliged to have a client council that is informed about, can give advice, and can consent to organizational policy decisions (40). Despite these norms and obligations, internationally involvement of nursing home residents in care and policy decisions remains difficult (41). With regard to COVID-19 measures, researchers have also advised tailor-made measures and the involvement of residents, family, and staff (5, 14, 17, 19). However, our study shows that resident representatives and nursing home staff were less involved in policy making during the first months of the COVID-19 pandemic than before. In fact, according to another Dutch study opinions of staff and resident representatives about who was responsible for policy making even became divided (42). This may be due to hierarchical (18) centralized quick policy making during the first months of the pandemic (22). However, our results showed that by November 2020 there was more room for involvement in the decision-making processes within nursing homes. It has been suggested that, ultimately, these first months of the CO-

VID-19 pandemic may have been a catalyst for a bottom-up urging to better embed involvement in the nursing home sector (23).

Strengths

A first strength of this study is the bottom-up perspective. Our participants represented disciplines that ideally take part in nursing home policy making, ranging from nursing home managers to care assistants, and resident representatives. It is crucial that they support the policy decisions made (23, 43). Second, this study is unique in its prioritization of COVID-19 measures. We made use of a modified NGT to quickly generate results that are easily translatable to nursing home policies and practice. Many different COVID-19 measures have been recommended and implemented, and it has been difficult to select a balanced package of COVID-19 measures. The NGT has much been used to explore priorities and for policy development about other healthcare issues (24, 25). Third, performing this NGT study online made it possible to collect data about COVID-19 measures during the national COVID-19 restrictions. In addition, by performing the study online, participants from across the country were able to participate without traveling (44, 45).

Limitations

Limitations of this study were, first, the small numbers of participants per panel. Still, after four rounds of panels, data saturation was reached. Second, this study was performed during the first year of the COVID-19 pandemic, when vaccines were not available yet. Recent literature stresses the importance of vaccination. Vaccination might have changed the urgency of other measures to prevent infections and maintain well-being in nursing homes. Future research should explore this renewed balance. Third, effectiveness of measures in preventing infections or maintaining well-being remains unknown. In the first phase of the COVID-19 pandemic, effectiveness studies would have been too time consuming, and it would have been ethically irresponsible to withhold potentially effective measures from non-vaccinated NH. In this study, participants' arguments in favor of the prioritized measures included perceived effectiveness, but also feasibility in practice and ethics. Thus, the measures prioritized should be the first focus in future effectiveness studies. Fourth, although formal resident representatives from client councils participated in this study, no nursing home residents participated. All of the client representatives willing to participate were current or former family caregivers. They may have been more familiar with digital communication than most residents. As described in the study background, family members feared for residents' safety and may therefore have selected more infection prevention measures to maintain well-being than residents themselves would do. Future research should also explore which measures have priority from the perspective of residents themselves.

CONCLUSIONS

In conclusion, this study has laid bare that long-term care organizations and the Dutch government were not well-prepared and had no policy in place for a highly infectious disease epidemic in the sector. However, Dutch long-term care organizations were flexible and reactive. During future times of crisis when decisions are made more quickly than usual, staff and residents or their representatives should be better informed about the decision making processes, more involved in decisions, and have more opportunities to ask questions than they had during the first months of the COVID-19 pandemic. Long-term care organizations may draw up a crisis communication and involvement protocol that includes sharing weekly updates with staff. In addition, staff should be given room to tailor-make COVID-19 measures. Priority measures during COVID-19 outbreaks in nursing homes to prevent infections and to maintain residents' well-being partly overlap, and include cohort isolation and other types of isolation, testing measures, testing and isolation combinations, use of personal protective equipment around (suspected) infected residents, crisis management by COVID-19 outbreak teams, and regulation of visits and instructing visitors. Despite public commotion regarding the perceived imbalance between infection prevention and maintaining well-being during the first months of the pandemic, the measures prioritized to maintain residents' well-being seem to mostly reflect gradual relaxation of infection prevention measures. This may be caused by the fact that mainly this type of measures were taken and experienced by the study participants. Future research may reveal whether after the acute crisis situation other topics also have gained priority to maintain residents' well-being during infectious disease outbreaks. These prioritized sets of measures are a first step towards packages of COVID-19 measures that can overcome the perceived imbalance between infection prevention and maintaining residents' well-being. The next step should be to let nursing home staff and residents jointly weigh the prioritized measures. For now, the study results can be translated to nursing home policies and can be used to provide focus to crisis management in future outbreaks of highly infectious or unknown respiratory viral diseases in nursing homes. When doing so, with each measure the effect on residents' well-being should be considered.

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SUPPLEMENT I: LIST OF TEXTUAL UNITS FROM THE MINUTES DATA - ATTACHMENT TO THE IDEA GENERATION QUESTIONNAIRE OF JUNE'S PANEL ON INFECTION PREVENTION

Segregation and isolation of clients

- Separate locations such as care hotels are set up as COVID centers
- Anteroom area available to isolate room and for donning personal protective equipment (PPE).
- Discharge procedure from COVID ward has been established. Definition no longer infectious: when client is symptom-free for 24 hours, at least 14 days after the start of the symptoms, and when client has had droplet isolation for 7 days after the 24 hours symptoms-free.
- Restaurant may reopen 14 days after positive test of last client.
- Care agreement stops when a client goes home with a family caregiver.
- From multiple- to single-bed rooms on [ward X].
- Signage (for one-way routes) is made compulsory. Where too narrow for one direction, (expensive) traffic lights can be used.
- Local residents with physical therapy inside a location are only allowed in if there is a separate entrance and exit.
- Stop on internal transfers and new admissions.
- 2 infections on 1 ward considered as whole ward infected, admissions freeze.
- Chairs with upholstery and cabinets with knickknacks removed from Covid cohorts
- Locations with a terrace on the ground floor will be cordoned off with tape.
- Upon return after leaving location, client must be quarantined for 2 weeks.
- Rehabilitation wards of 7 locations become COVID-cohorts.
- Moving clients who have tested positive is avoided.
- Isolate suspected/infected client in own room. If not feasible (due to behavioural problems/client unable to follow instructions/serious aggression/inappropriate accommodation), client is transferred to cohort ward.
- Residents in individual isolation can be transferred to Covid-Cohort by mutual agreement.
- Negatively tested clients are also quarantined for 24 hours as a precaution.
- If a resident with an urge to wander and suspected corona-virus infection, the doctor decides how best to isolate the resident. In practice, this will involve confinement to the room or sedation.
- After three days symptom-free and at least 8 days after diagnosis by test, the isolation can be lifted. In case of doubt, a second test (at least 24 hours apart) can be performed.
- Admissions freeze infected location.
- New admissions who were not tested in hospital are tested prior to admission.
- PG (psychogeriatrische) cliënten met loopdrang zijn moeilijk instrueerbaar (moeilijk in quarantaine te houden) en worden daarom niet opgenomen.
- Housekeeping will not clean rooms of positive clients. This is done by the care workers themselves.

New admissions

- After a death, a bed in the nursing home can be released for a new resident. If it is a bed in a covid-cohort, only a new resident with (suspected) covid can be admitted.
- When new clients move in, they do not have to be quarantined for 14 days, unless they have symptoms.

- Upon admission, 2 weeks isolation policy (from hospital, care institution or home situation), temperature taken 2x a day, resident stays in own room.
- Process of moving in clients is discussed in broad outline and adjusted where necessary (e.g., guided tour via video calls, professional removal company moving personal belongings).

Hygiene

- Before bedding is taken away to be washed by an external party, the bedding must first be packed airtight for 24 hours.
- Place hand disinfection columns for visitors.
- In case of infection, we clean contacts with alcohol/disinfectant. Other areas with microfibre and water.
- Cleaners pay extra attention to contact points like (door)handles and handrails.
- Keyboards, pagers, etc. may be disinfected with 70% alcohol.
- Cleaner cleans isolated areas last, then goes home.

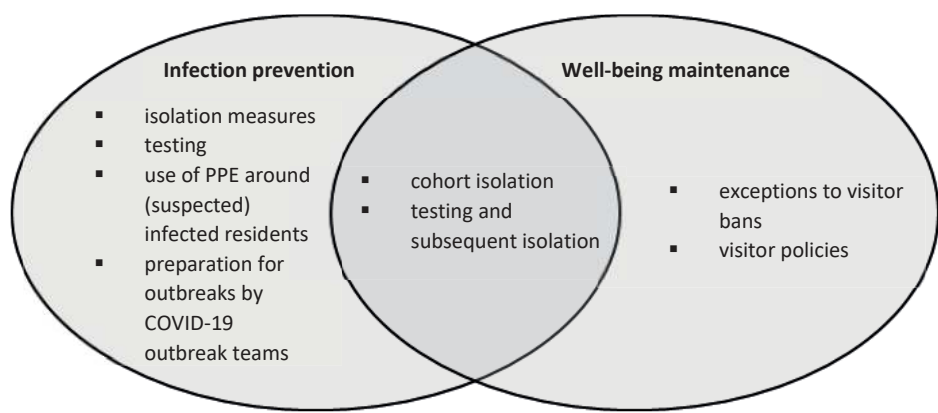**Personal Protective Equipment (PPE)**

- To accept client from the hospital there must be sufficient PPE, either provided by hospital or from our own stock.
- For new admissions and new clients in home care, employees use PPE the first 7 days
- For new applications for terminal overnight care, the organization will accept the client only if supply of PPE is sufficient.
- Employees who have been in contact with a confirmed covid patient are requested to wear a surgical mouth-nose mask and gloves, even if they themselves have no symptoms (yet), to protect other clients.
- Person who accompanies client for hospital visit is required to wear a face mask.
- Instruct personnel about face masks.
- Collect face masks and aprons for reuse.
- Aprons can be worn for up to one shift, including when the apron keeps the isolation gown visibly clean. If the isolation gown gets wet or dirty during a shift: change.
- Staff will always use face masks when a client is quarantined.
- Only face mask in case client has symptoms.
- Employees wear masks in the covid-cohort and on the covid-unit.
- In case of urgent family visits to client, the organization provides PPE to prevent outside infections entering the site.
- Employees without symptoms do not wear face masks, that is not necessary.
- Due to apron shortage only 3 care moments per day in individual isolation.

Other

- Leave contaminated items in a deceased resident's room for 72 hours. After that, do not move clean items across dirty hallway.
- Do not use one lift, only for 'contaminated' items.
- No mouth-to-mouth resuscitation, chest compression only.
- Clients only go to the hospital for check-up appointments if the specialist feels it is necessary. Then we must facilitate this. Otherwise, appointment by telephone or rescheduled.
- Day care: option only for extreme cases, recommendation max. 3 persons.
- All care and treatment only if really necessary. Hairdresser/pedicure not yet. Use face masks.
- Regular treatments in hospitals are started again. Clients may, only when medically necessary, go to a hospital treatment together with a carer if both are free of symptoms and the carer has not had unprotected contact with a person infected with covid.

- To protect resident from outside influences, they cannot go to partner's funeral 'outside the house', unless quarantine is possible upon return.
- Test caregivers with mild symptoms who have client contact.
- Expand testing opportunities to all employees who have symptoms.

SUPPLEMENT II: OVERLAP BETWEEN MEASURES PRIORITIZED TO PREVENT INFECTIONS AMONG RESIDENTS AND MEASURES PRIORITIZED TO MAINTAIN RESIDENTS' WELL-BEING DURING COVID-19 OUTBREAKS IN NURSING HOMES

Infection prevention

- isolation measures
- testing
- use of PPE around (suspected) infected residents
- preparation for outbreaks by COVID-19 outbreak teams

- cohort isolation
- testing and subsequent isolation

Well-being maintenance

- exceptions to visitor bans
- visitor policies

SUPPLEMENT III: QUOTES FROM PART 2 OF THE PANEL CONVERSATIONS REGARDING DECISION MAKING

Quote 1: *"the measures taken were rather directive, based on national decisions. [..] The client council was informed of the measures and was not consulted beforehand."* (resident representative A; August 2020, well-being panel)

Quote 2: *"In my opinion, the early communication was more in the form of announcements, not of consultation. Except when the visiting arrangements were expanded. In the beginning, the visitor policies were also just an order from above."* (manager; July 2020, infection prevention panel)

Quote 3: *"If advice needs to be given quickly, it becomes difficult to ask your local client council for their opinion. [..] At that time the client council was not allowed to join the outbreak team. But the discussions often take place ad hoc and then they can't attend."* (resident representative B; November 2020, infection prevention panel)

Quote 4: *"Nurses are also not very often included in decision-making. Comments don't make it past location managers who are very busy, and so they don't end up in the right place."* (nurse; June 2020, well-being panel)

Quote 5: *"In the beginning they [COVID-19 outbreak team] were very strict about those are government rules. [..] It's different now, but the strictness of that time caused a lot of irritation and complaints."* (psychologist A; August 2020, well-being panel)

Quote 6: *"I get the speed, but I also understand that people feel they were not heard and would have liked to give their opinion. But that, well.. so you only get two days, one day to respond and everyone responds.."* (psychologist B; June 2020,well-being panel)

Quote 7: *"First it was all very top-down, now this has changed. We are doing it together and we jointly determine our relationships. The scenarios provide a clear framework, and are known to everyone, client council and works council. Our organization very much wants to develop policy from the work floor."* (policy advisor; November 2020, infection prevention panel)

6

Strategies to Increase Willingness to Receive a COVID-19 Vaccine among Nursing Home Staff

Van Tol LS, Meester W, Caljouw MAA, Achterberg WP.

ABSTRACT:

Background: Nursing home (NH) staff and residents have been prioritized to receive COVID-19 vaccinations. However, NH staff have been hesitant. This study explored what strategies were used to overcome this hesitancy and which of these were found to be important by NH staff to increase their willingness to take a COVID-19 vaccine. **Methods:** This study employed a sequential exploratory qualitative design. The COVID-19 MIN-UTES study aimed to describe the challenges presented by, responses to, and impact of the COVID-19 pandemic in NHs. The minutes of COVID-19 outbreak teams (COTs) in Dutch long-term care organizations ($n = 41$) were collected and coded using content analysis. Textual units from December 2020 to April 2021 that regarded strategies to increase staff's vaccination willingness ($n = 67$) were selected. Subsequently, to validate these data, two panels of NH healthcare workers (HCWs) and policy workers (PWs) ($n = 8$) selected, discussed, and ranked the strategies that they found to be important using a modified nominal group technique. **Results:** The strategies described in the minutes included financial reimbursements, personal contact, story sharing, logistics support, role models, visual information, and written information. Except for financial reimbursement, all these strategies were considered important or very important by the panel participants. Some organizations combined multiple strategies. **Conclusion:** The strategies that were found important in combination may be used more broadly and should be developed further with the involvement of HCWs.

Keywords: COVID-19; vaccination; nursing homes; staff

INTRODUCTION

Internationally, almost half of the deaths linked to COVID-19 and many of the most severe cases of COVID-19 have occurred among nursing home (NH) and other long-term care (LTC) residents (1, 2). In addition, the staff who care for and have close contact with NH residents have increased risks of COVID-19 morbidity and mortality (3). Fortunately, COVID-19 vaccines are now available. These vaccines have been shown to be highly effective against infection in the general population (86%) and older persons (84%), and the most effective among healthcare workers (HCWs) (95%) (4). COVID-19 vaccination is also highly effective against mortality (>90%) among the Dutch general population and older long-term care users (5). The vaccination of NH staff against COVID-19 decreases their risk of becoming infected (6) and transmitting the virus (7, 8) and can reduce the associated high numbers of absenteeism and staff shortages (9). In addition, the willingness of NH staff to get a COVID-19 vaccine may reflect on the willingness of NH residents to do so, as they regard staff as a reliable source of information (10). Thus, it is important to stimulate the uptake of COVID-19 vaccines among NH staff.

Most high income countries (HICs) have prioritized NH staff and residents to receive COVID-19 vaccines (11). However, internationally, only half of HCWs have been willing to receive a COVID-19 vaccine (12). The willingness among HCWs in HICs to be vaccinated varied from 33 to 77% (10). Between 38 and 83% of staff in HIC NHs had actually received a first dose of the vaccination against COVID-19 by January–March 2021 (13, 14). According to the World Health Organization, vaccine hesitancy is one of the ten greatest threats to global health (15).

Common reasons for hesitation towards COVID-19 vaccination among NH staff and other HCWs include concerns about side effects [16–18]; a lack of confidence in the safety, adequate testing, and effectiveness of COVID-19 vaccines (9, 16-18); the perceived low severity and risk of COVID-19 (16); a lack of information about the vaccine (16, 19); distrust in the government (9); and religion (20). Except for side effects and a lack of information, similar reasons for hesitation were commonly reported among international general populations (21, 22). Moreover, vaccine hesitancy among general populations has been associated with sociodemographic characteristics, including age, gender, education, and occupation (21).

Thus, there is a great need for the development of strategies to stimulate the uptake of vaccination or increase staff knowledge and awareness about vaccines. To overcome low vaccination rates, a few countries have mandated COVID-19 vaccination for NH staff (11). However, before mandatory vaccination is justified, less invasive strategies to in-

crease staff willingness to get a COVID-19 vaccine voluntarily should be considered (23, 24). Little research has been done on such strategies. Therefore, the aims of this study were to explore what strategies were used by COVID-19 outbreak teams to increase the willingness of staff to get a COVID-19 vaccine in Dutch NHs and to explore which of these strategies were considered important by NH staff.

MATERIALS AND METHODS

Design

The present study employed a sequential exploratory qualitative design (25). The first part of this study is embedded in the COVID-19 Management in Nursing Homes by Outbreak Teams (MINUTES) study (26). The objective of the MINUTES study was to describe the challenges presented by, responses to, and impact of the COVID-19 pandemic in NHs. The minutes of COVID-19 outbreak teams (COTs) in LTC organizations were collected from March 2020 to October 2021. Strategies described to increase the willingness of NH staff to get a COVID-19 vaccine were selected from these data. The second part of our investigation entailed a panel study in which NH staff prioritized important COVID-19 measures. In this panel study, we made use of a nominal group technique (NGT) that was modified into an online procedure with a single rating phase. To validate the data from the MINUTES study, panels of NH staff selected, discussed, and rated the strategies they found to be the most important in contributing to increasing in their willingness to receive a COVID-19 vaccine.

Setting

COVID-19 vaccination in the Netherlands started on 6th January 2021 with the vaccination of NH and small-scale living staff (27). Official numbers for vaccination coverage among NH staff are lacking, as the General Data Protection Regulation (28) does not allow employers to process vaccination status, which is classified as special personal data.

Data collection and analysis

Minutes from central COTs in 41 Dutch LTC organizations were saved and coded in an online CASTOR database (29) using qualitative content analysis (26). For the present study, we extracted all textual units that were coded within the code 'vaccination' from around the start of COVID-19 vaccination (early December (week 49) 2020 to early March (week 9) 2021). Next, we selected textual units that could be interpreted as strategies to increase the willingness of staff to get a COVID-19 vaccine, hereafter called strategies. The types of strategies were inductively coded.

Subsequently, participating LTC organizations that described strategies in their COT minutes were invited by email to participate in panel conversations. The aim was to organize panels of four to seven policy workers (PWs) and four to seven HCWs until reaching data saturation. An online modified NGT (30, 31) was performed consisting of three stages: First, before the panel conversation, participants selected the strategy that they found to be most important. To activate their thoughts on the topic, they were provided with a list of textual units from the MINUTES data that illustrated actions by COTs that could be interpreted as strategies (December 2020–early March 2021). Second, during a 1.5 to 2 h online panel conversation via Zoom (32), participants presented their selected strategies to each other. Subsequently, they discussed their ideas. The conversations were guided by a facilitator (WM) and an assistant facilitator who also took minutes and had experience with facilitating online modified NGT panels (LST). The audio from the panel conversations was recorded, partly transcribed verbatim, analyzed using content analysis, and converted into strategy summaries.

Third, within one week, participants received a form with these summaries by email. They were asked to rate the importance of each strategy on a 5-point Likert scale. In addition, they could provide comments on the summaries as a check for correct interpretation by the researchers. The ratings given were then counted. If multiple boxes were ticked, the lowest value was kept. The strategies from the minutes were validated by comparing and matching their code names with the strategies discussed by the panels.

RESULTS

Participants

A total of 41 Dutch LTC organizations participated in the MINUTES study. These organizations varied in size from 3 to 70 NH locations, but together represented 563 NHs (26). All organizations' COTs were installed between mid-February (week 8) and the end of March (week 13) 2020. From December 2020 to April 2021, 663 textual units in their minutes were coded with the code 'vaccination'. Of these, 67 textual units included data that could be interpreted as strategies. These data about strategies originated from 21 organizations' minutes. Out of these 21 organizations, the 11 organizations that discussed the topic most were invited to participate in the panels; however, many staff members rejected participation due to COVID-19-related workload.

Eight participants representing three organizations were recruited. The first panel consisted of five PWs: one care manager, two policymakers, one human resource advisor, and one quality assurance nurse. Three HCWs participated in the second panel: two

nurses and one activity supervisor. The participants' mean age was 44 years old (SD 11.5) and only one was male. Except for one participant, all were vaccinated or were planning to get vaccinated (April 2021). For two participants, this decision was influenced by their organizations' strategies (**Table 1**). According to the panel participants, decisions regarding their organizations' strategies were made by COTs. The participants provided few comments on the summaries of strategies discussed.

Table 1. Panel participants.

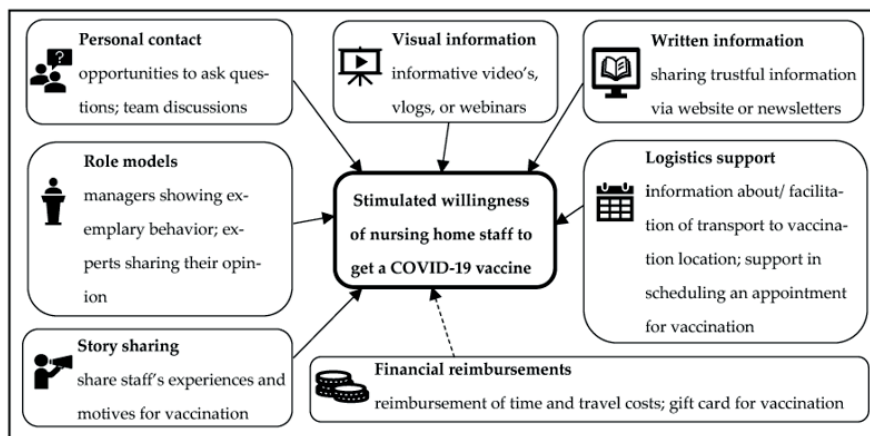| Position	Organization	Gender	Age (Years)	Work Experience (Years)	(Planning to Get) Vaccinated	Strategy Selected as Most Important	Strategies Influenced Decision
Policy workers							
Human resource advisor	A	Female	36	2	No	Visual information	No
Policymaker A	A	Female	62	5	Yes	Written information	No
Policymaker B	B	Female	51	4	Yes	Visual information	No
Quality assurance nurse	B	Female	30	2	Yes	Visual information	Yes
Care manager	C	Male	44	8	Yes	Personal contact	No
Healthcare workers							
Nurse A	B	Female	28	1	Yes	*Multiple categories*	No
Nurse B	A	Missing	44	18	Yes	Written information	Yes
Activity supervisor	B	Female	57	20	Yes	*Multiple categories*	No

Strategies to increase the willingness of staff to get a COVID-19 vaccine

Seven types of strategies were identified from the COT minutes: financial reimbursements ($n = 17$ textual units), personal contact ($n = 14$), story sharing ($n = 3$), logistics support ($n = 8$), role models ($n = 2$), visual information ($n = 5$), and written information ($n = 14$). Some COTs combined various strategies ($n = 4$). Apart from financial reimbursements, all strategies were selected to be important and discussed by the panels (**Table 2**; **Figure 1**).

Table 2. Types of strategies described in the MINUTES study and rated by panels of NH staff.

Types of Strategies	MINUTES Data	Rating by Panel Participants of Measures Selected to be Important			
Rated by *n* Panel Participants	Textual Units (*n* = 67)	Very Important	Important	Not Important Nor Unimportant	Unimportant or Very Unimportant
Financial reimbursement (*n* = 0)	17	N/A	N/A	N/A	N/A
Personal contact (*n* = 8)	14	3	5	0	0
Story sharing (*n* = 5: PW [1])	3	0	3	2	0
Logistics support (*n* = 3: HCW [2])	8	0	2	1	0
Role models (*n* = 3: HCW [2])	2	0	2	1	0
Visual information (*n* = 8)	5	2	6	0	0
Written information (*n* = 8)	14	3	4	1	0
Combinations of strategies	4				

[1] PW—policy workers; [2] HCW—healthcare workers.

Figure 1. Strategies to stimulate uptake of COVID-19 vaccines by nursing home staff.

Financial Reimbursements

It was frequently described in the minutes that staff could claim time and travel costs to a vaccination location. A few textual units described that staff could apply, confidentially, for a gift card after they were vaccinated. Organizations used this to get insight into vaccination rates: *"Healthcare workers can write two hours of (extra) working time per vaccination. [..] Inform planners in advance that this is approved. In addition, it is important that they know that they have a duty of confidentiality."* (COT minutes). However, the PW

panel discussed the idea that financial reimbursements would not be useful: *"I think a gift card won't stimulate vaccination willingness. On the contrary, it will drive people away if they feel this is intended to encourage them."* (quality assurance nurse).

Personal Contact

Some organizations took minutes about introducing telephone numbers, email addresses, and walk-in hours where staff could ask their questions. Others organized team meetings to inform staff about the vaccination program and the importance of vaccination and to allow staff to discuss vaccination with each other and with their supervisors: *"Elderly care physicians already called on all physicians to conducting low-threshold conversations and answering questions"* (COT minutes). All panel participants rated these types of personal contact as important or very important. However, one participant questioned whether staff would discuss personal questions with direct colleagues: "*I haven't heard of anybody who would prefer to discuss this with someone you have to work with and discuss clients with. That you would suddenly have to discuss your own situation.*" (nurse B).

Story Sharing

A few organizations' minutes described sharing the personal experiences and motives of some staff members to be vaccinated: "*Two staff members (one physician and one physician assistant) tell colleagues in a video message why they decided to be vaccinated*" (COT minutes). Three PWs rated this strategy as important, because these experiences set a good example and could be used as a conversation starter among staff.

Logistics Support

A few COTs reported that they shared information about public transport, encouraged car-pooling, or facilitated taxis to vaccination locations. In addition, COTs occasionally assisted staff members in scheduling vaccination appointments, particularly when appointments were fully booked across the country: *"So when you hear from employees that they were unable to schedule an appointment in the first week, point out that this may now be possible"* (COT minutes). The HCWs described travel facilitation as important, but the facilitation of scheduling vaccination appointments remained undiscussed.

Role Models

A few times, COTs considered if it was possible to use members of management teams and client councils or physicians as role models: "*Because of scarcity [in vaccines] it is difficult to for example vaccinate a management team first.*" (COT minutes). Two HCWs felt that the opinion of an external role model was important. One participant mentioned that the expert opinion of this role model was helpful, even though she trusted her employer

completely: *"He is an external person, even though he is connected to the organization, that gave me a little push."* (activity supervisor).

Visual Information

Multiple COTs described sharing informative videos, making vlogs, or holding organized webinars: "*Preparation vaccination process (incl. communication). Thursday there is a webinar about corona vaccination [..]. Next webinar for all employees will be in January when the schedule is known. In between, another webinar for management and coaches.*" (COT minutes). All panel participants found the use of vlogs and webinars important or very important, because these encouraged conversation, facilitated the visibility of directors while working from home, and made staff feel seen. One HCW preferred visual information over written information: "*people already have a lot to read and newsletters are often long so I think a vlog will be stimulating*" (nurse A).

Written Information

The COT minutes also described sharing factual or trustful information about vaccines via the organization website and (news)letters to staff: *"As soon as reliable information becomes available it will be shared. It is quite complicated to find factual answers to questions among the many opinions"* (COT minutes). Seven participants rated this strategy as important or very important. They argued that with the multitude of conflicting messages on social media, it is important to provide staff with correct information to base their considerations on. One nuance that was discussed was that the amount of information quickly became too much.

DISCUSSION

This study identified the strategies used by COTs that were found to be important by NH staff to increase their willingness to receive a COVID-19 vaccine. The strategies identified included financial reimbursements, personal contact, story sharing, logistics support, role models, visual information, and written information. Except for financial reimbursements, all were considered important or very important by NH staff members.

Strategies to increase vaccination willingness among NH staff have hardly been studied. However, the literature exploring COVID-19 vaccination among other HCWs is in line with our findings: personal contact with HCWs (17), story sharing (9, 18), and information and education (19) have been suggested to improve vaccine uptake. Nevertheless, information overload can reduce trustworthiness and cause confusion. (33). Furthermore,

combining strategies has been associated with higher vaccination coverage among NH staff, while financial reimbursement has not (34).

The uptake of vaccination and other strategies to combat COVID-19 largely depends on human behavior (35, 36). Therefore, behavior change theories should underpin follow-up research focusing on behavior changes in NH staff, including the design, implementation, and evaluation of the effectiveness of improved strategies. The most commonly used behavioral change theories in the literature surrounding communicable (37) and infectious disease outbreaks (35), emergency responses (35), and influenza vaccination among HCWs (38) include the health belief model and theory of planned behavior. The health belief model recommends cues to action that are in line with the strategies identified (39). According to the theory of planned behavior, attitudes towards COVID-19 vaccination, social pressure to perform the behavior, and the perceived ease of performing the behavior can predict the willingness of individuals to get a COVID-19 vaccine (40). In this light, a combination of information to increase knowledge, strategies related to personal contact (10), and story sharing or role models (41) have been suggested. In addition, logistics support may add to the perceived ease of getting a vaccine.

Moreover, staff should be involved (9, 17, 33) and "bottom-up" communication should be used in the further development of vaccination strategies (17, 34); an American study identified that the use of "frontline champions" in NHs, similar to role models or story sharing, could be perceived as "bottom-up" communication and was associated with higher vaccine coverage (34). NHs that used top-down messages from inspirational leaders had lower vaccination coverage (34).

The most important limitation of this study is the small number of panel participants. During times of crisis and pressing staff shortages, the recruitment of extra panel participants was difficult. Strongly insisting that the scarce staff participate in our study felt inappropriate. However, there was ample variation in participants' hesitancy profiles: five participants were (willing to be) vaccinated; one participant did not want to take a CO-VID-19 vaccine ('skeptic'); and two participants were influenced by their organizations' strategies. Future research with more adequate numbers of participants may further explore various hesitancy profiles and associated strategies. The literature on COVID-19 hardly takes into account these different profiles. However, one study among nurses in Hong Kong described skeptics as being hard to persuade. They may be convinced by transparent information and trustworthy healthcare authorities. Doubters may be persuaded with easily accessible information, communicating the severity and the risk of contracting the disease, and logistics support (42).

The most important strength of this study is the sequential exploratory design that was used to validate data from the longitudinal qualitative COVID-19 MINUTES study (26) in two panels of NH staff. Except for financial reimbursements, the strategies described by COVID-19 outbreak teams were also considered to be important by nursing home staff.

In conclusion, this study adds to the literature by identifying strategies that have been used to overcome hesitancy towards COVID-19 vaccines in NH staff. These are personal contact, story sharing, logistics support, role models, visual information, and written information. These strategies should be developed further with the involvement of HCWs and in combination may be used more broadly in order to increase the willingness of NH staff to receive a COVID-19 vaccine.

Institutional Review Board Statement: An ethical review was performed (protocol numbers N20.100 and N20.093) and the need for approval was waived for this study by the regional medical ethical committee Leiden-Den Haag-Delft due to this study not being subject to the Dutch Medical Research Involving Human Subjects Act (WMO).

Informed Consent Statement: Informed consent was obtained from all panel participants involved in the study. The directors of the LTC organizations also provided informed consent.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to an agreement with the participating organizations. During the consent process, the organizations participating in the MINUTES study were explicitly guaranteed that the data would be pseudonymized by the study's research center and that the pseudonymized data would only be seen by members of the study team.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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Part 2

Recovery of COVID-19 patients admitted to geriatric rehabilitation

7

Post-COVID-19 Patients in Geriatric Rehabilitation substantially Recover in Daily Functioning and Quality of Life: A European longitudinal cohort study

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ABSTRACT

Background: After an acute infection older persons may benefit from geriatric rehabilitation (GR).

Objectives: This study describes the recovery trajectories of post-COVID-19 patients undergoing GR, and explores whether frailty is associated with recovery.

Design: Multicentre prospective cohort study.

Setting: 59 GR facilities in 10 European countries.

Participants: Post-COVID-19 patients admitted to GR between October 2020 and October 2021.

Methods: Patients' characteristics, daily functioning (Barthel index; BI), quality of life (QoL; EQ-5D-5L), and frailty (Clinical Frailty Scale; CFS) were collected at admission, discharge, 6 weeks and 6 months after discharge. We used linear mixed models to examine the trajectories of daily functioning and QoL.

Results: 723 participants were included with a mean age of 75 (SD: 9.91) years. Most participants were pre-frail to frail (median [interquartile range] CFS 6.0 [5.0–7.0]) at admission. After admission the BI first steeply increased from 11.31 with 2.51 (SE 0.15, $P < 0.001$) points per month, and stabilised around 17.0 (quadratic slope: -0.26, SE 0.02, $P < 0.001$). Similarly, EQ-5D-5L first steeply increased from 0.569 with 0.126 points per month (SE 0.008, $P < 0.001$), and stabilised around 0.8 (quadratic slope -0.014, SE 0.001, $P < 0.001$). Functional recovery rates were independent of frailty level at admission. QoL was lower at admission for frailer participants, but increased faster, stabilizing at almost equal QoL values for frail, pre-frail and fit patients.

Conclusions: Post-COVID-19 patients admitted to GR showed substantial recovery in daily functioning and QoL. Frailty at GR admission was not associated with recovery and should not be a reason to exclude patients from GR.

Key words: geriatric rehabilitation, COVID-19, recovery, older people

KEY POINTS:

- Post-COVID-19 patients from Geriatric Rehabilitation (GR) centres across 10 European countries showed substantial recovery.
- Recovery in daily functioning and quality of life was independent of frailty level at admission to GR following COVID-19.
- Frailty should not be a reason to exclude patients from GR, as even frail people may considerably benefit from post-acute care.

INTRODUCTION

The COVID-19 pandemic was associated with millions of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-COV-2) infections and deaths worldwide, but the highest infection rates and most severe infections were among older people (1-5). Older people with SARS-CoV-2 infection were more often admitted to hospital and to Intensive Care Unit (ICU), with periods of immobility as a consequence (6).

Under normal circumstances older people experiencing acute deterioration in their health and functional status would be offered Geriatric Rehabilitation (GR) (7-9). GR is aimed at people with complex health problems, including pre-existing multimorbidity, cognitive impairment, frailty, or other geriatric syndromes (10). GR can be provided in diverse care settings (11). During the COVID-19 pandemic, the availability of GR care was diminished due to illness among staff, secondment to acute care wards, repurposing of GR facilities as isolation beds for SARS-CoV-2 positive patients, and reduced capacity due to pandemic-related spacing requirements (12). This reduction in rehabilitation supply at a time when demand increased due to many older people experiencing acute health deteriorations due to COVID-19 has been called the 'COVID-19 rehabilitation paradox' (12, 13).

Future pandemic planning should include more effective provision of rehabilitation. Therefore, we need to know whether GR is successful in this context, what type of rehabilitation care to deliver and what population sub-groups, are likely to benefit (10, 14). Evidence on recovery trajectories for people in GR post-COVID still limited, but suggests that people participating in GR post-COVID experienced at least partial recovery (15-18). Outside the context of COVID-19, frailty and functional decline are both frequently used criteria in triage of acutely hospitalised patients for referral to GR (19). Moreover, frailty in older people has been associated with lower functional status (20, 21) and quality of life (QoL) (22). Against this background, in this study we aim to: describe the recovery trajectories in daily functioning and QoL of geriatric patients after COVID-19 in a multicentre, multinational European cohort during GR and up to 6 months after discharge; and explore whether the patient's frailty level at GR admission is associated with recovery in daily functioning and QoL.

METHODS

Design

The European Cooperation in Geriatric Rehabilitation study after COVID-19 (EU-COGER) was an international multicentre prospective observational cohort study. This study was designed by the Special Interest Group for Geriatric Rehabilitation of the European Geriatric Medical Society (EuGMS) and registered in ClinicalTrials.gov (identifier: NCT05749731).

Participants and setting

The terminology and definitions used for GR differ between countries. In this study we defined GR facilities, in line with the consensus definition for GR developed by the EuGMS (11), as facilities that provide multidisciplinary rehabilitation care to frail and/or multimorbid patients. Participants were recruited from the Czech Republic, Germany, Ireland, Israel, Italy, Malta, Russia, Spain, the Netherlands, and the United Kingdom between October 2020 to October 2021 (7). Both inpatient GR facilities and GR facilities that provided care at home were included in the EU-COGER consortium (**Appendix I).**

To be included, patients had to be receiving rehabilitation in one of the participating facilities as part of recovery from a SARS-CoV-2 infection, confirmed with either: Polymerase Chain Reaction (PCR) for viral RNA; or serology for antibodies against SARS-CoV-2. Potential participants with severe cognitive impairment which led to insufficient decisional capacities to participate in the study were excluded (7).

Ethics

The Leiden University Medical Center COVID-19 science ethical committee deemed this study exempt from the Medical Research Involving Human Subjects Act (Wet medisch-wetenschappelijk Onderzoek met mensen, WMO) since the study only used routinely collected data, and approved the study based on an opt-out procedure for the Netherlands (protocol number CoCo 2020-040). In all other countries, the local ethical regulations were followed and approval from local ethics committee was granted as per local regulations.

Data collection

Routine medical care data from health records were collected at admission to GR, and at discharge, including data from two weeks pre-morbid (pre-COVID) status from admission documentation (7). In addition, participating facilities were asked to collect data through telephone follow-ups at 6 weeks and 6 months after discharge. Local study coordinators entered participant data into an online CASTOR (23) database using standard

operating procedures (24). A complete overview of the procedures and all measures collected is described in the published protocol paper (7).

Outcome measures chosen were based on instruments readily available in multiple languages and cross-culturally validated. The primary outcome measure was daily functioning, assessed with the Barthel Index (BI) for activities of daily living (ADL) at all time points (25). When certain countries or facilities used comparable measures, i.e. the Utrecht Scale for the Evaluation of Rehabilitation (USER) or the Functional Independence Measure (FIM), these were converted to the BI using standardised approaches (26, 27). The BI is a 10-item instrument that produces a total score that ranges from 0 to 20, with higher scores indicating higher independence in ADL.

The secondary outcome measure was health related QoL assessed with the EQ-5D-5L, available in over 150 languages (28). EQ-5D-5L was assessed at all timepoints except pre-morbid, and is a 5-item instrument that produces a 5-digit status for mobility, self-care, daily activities, pain, and anxiety/depression. Using an available country tariff, this status can be calculated into a societal value of maximum 1 for optimal QoL (29-34). Malta, Czech Republic, and Russia had no country tariff available and the geographically closest available country tariff (Spain, Poland, and Poland respectively) was used (32, 35). There was no QoL data available for Israeli participants, as data necessary for EQ-5D-5L were not collected as part of routine practice.

Frailty, the independent variable of interest, was measured using the Clinical Frailty Scale (CFS). This ranks frailty on a scale from level 1 to 9, with level 1 'very fit', to 9 'terminally ill' (36). Premorbid frailty level and frailty level at GR admission were collected. Other variables collected include demographic characteristics, clinical characteristics, and received treatment components (**Table 1**).

Statistical analysis

Descriptive statistics were used to give an overview of participants' demographic and clinical characteristics, and treatment components. Continuous variables were reported with mean and SD or median and interquartile range (IQR), depending on whether data were normally distributed. Categorical variables were presented as number (n) and percentage (%).

The recovery trajectories in daily functioning and QoL during and after GR were examined by linear mixed models, with time in months since GR admission. For each outcome measure, three models were built. Unconditional models were used to illustrate the change in daily functioning and QoL of the study population over time, independent

of covariates. To identify the best fitting unconditional models, the following steps were taken: first, we tested whether the fixed slopes were linear or quadratic; second, we tested whether adding random intercept parameters for variance between persons and between countries improved the model fit; third, we tested whether adding random linear and quadratic slope parameters for variance between persons and variance between countries improved the model fit. In every step, we fitted models using the default optimizer in the lmer R function 'nloptwrap', and optimizer 'Neldermead' that has been specially developed to find solutions of boundary fits (37). The model with the highest loglikelihood value (for nested models) or the lowest Akaike Information Criterion value (for non-nested models) was chosen (38). Models were built with unstructured variance-covariance matrices. For daily functioning a premorbid value was available, but not for QoL. Therefore, we were able to add a linear spline from premorbid to GR admission in the models for daily functioning.

Subsequently, the effect of frailty at GR admission on recovery in daily functioning and QoL was examined in univariable models and in multivariable models adjusted for age, sex, premorbid daily functioning, comorbidities (Functional Comorbidity Index) (39), hospital length of stay (days), and ICU stay (yes/no). All independent variables were mean-centred, to present the recovery trajectory in daily functioning and QoL for a sample mean participant. In the same way, the effect of premorbid frailty on trajectories of daily functioning and QoL was examined in a sensitivity analysis. Additionally, we tested whether participants with missing values in the independent variables, who had to be excluded from complete case analysis, had similar recovery trajectories as the included participants.

Outcomes were presented as parameter estimates (SE) for the fixed and random effects of the mixed models. All models were built using R version 4.2.2 and R function lmer for linear mixed models from R package lme4. The effect of frailty is illustrated in graphs for three stages of frailty defined as fit (CFS 1-3), pre-frail (CFS 4-5), and frail (CFS 6-9) (40, 41).

RESULTS

Participants

Participants were recruited from 59 rehabilitation facilities **i**n 10 European countries. Records for 793 participants were created in the database. After the exclusion of participants from rehabilitation centres that withdrew from study participation ($n = 7$), dupli-

cates ($n = 2$), empty records ($n = 10$), and participants who did not meet the inclusion criteria ($n = 51$), the cohort consisted of 723 participants (**Figure 1**).

Participants' mean age was 75 years (SD 9.9) and most of them had been admitted to the hospital prior to GR ($n = 653$; 90.3%). While premorbid most participants were fit or pre-frail ($n = 490$, CFS 3.0, IQR 2.0 – 4.0), at GR admission most participants were frail or pre-frail ($n = 493$, median CFS 6.0, IQR 5.0 – 7.0). More than half of the participants received physiotherapy (88.9%), occupational therapy (69.7%), and a protein or calorie-enriched diet (65.3%) during GR. The median length of stay in GR was 26.0 days (IQR 15.0 – 41.0) (**Table 1**). The available numbers of daily functioning and QoL scores for each timepoint is presented in **Appendix II**.

Data of respectively 388 and 330 participants was complete for all covariates and had outcome data for at least one of the timepoints and could be included in the linear mixed models (**Figure 1**). There were no clinically relevant differences between the recovery trajectories for participants included and excluded from the models for daily functioning.

Table 1. Demographic characteristics, clinical characteristics, and received treatment components and outcomes of post-COVID-19 patients in geriatric rehabilitation

Characteristic	*n* (%) available	Value
Age, mean (SD)	719 (99.4)	75.49 (9.91)
Sex, male, *n* (%)	723 (100)	379 (52.4)
Country, *n* (%)	723 (100)	
Czech republic		53 (7.3)
Germany		50 (6.9)
Ireland		50 (6.9)
Israel		32 (4.4)
Italy		30 (4.1)
Malta		17 (2.4)
Russia		50 (6.9)
Spain		96 (13.3)
the Netherlands		293 (40.6)
United Kingdom		52 (7.2)
Barthel index at GR admission, mean (SD)	714 (98.8)	10.94 (5.40)
EQ-5D-5L at GR admission, mean (SD)	471 (65.1)	0.52 (0.32)
Clinical Frailty Scale (CFS) premorbid, median (IQR)	490 (67.8)	3.0 (2.0 – 4.0)
fit (CFS 1-3)		283 (39.1)
pre-frail (CFS 4 – 5)		149 (20.6)
frail (CFS 6 – 9)		58 (8.0)

Table 1. Demographic characteristics, clinical characteristics, and received treatment components and outcomes of post-COVID-19 patients in geriatric rehabilitation (*continued*)

Characteristic	*n* (%) available	Value
Clinical Frailty Scale (CFS) at GR admission, median (IQR)	493 (68.2)	6.0 (5.0 – 7.0)
fit (CFS 1-3)		51 (7.1)
pre-frail (CFS 4 – 6)		129 (17.8)
frail (CFS 7 – 9)		313 (43.3)
Functional Comorbidity Index, median (IQR)	634 (87.7)	3.0 (2.0 – 4.0)
Hospital stay preadmission, n (%)	720 (99.6)	653 (90.3)
Hospital length of stay, days, median (IQR)	645 (89.2)	23.0 (13.0 – 46.5)
ICU stay preadmission, yes, n (%)	711 (98.3)	240 (33.2)
ICU length of stay, days, median (IQR)	232 (32.1)	23.0 (11.0 – 43.0)
Living situation premorbid, *n* (%)	720 (99.6)	
own home		675 (93.4)
nursing home/assisted living		42 (5.8)
other		3 (0.4)
Treatment components of GR, *n* (%)	670 (92.7)	
oxygen therapy		289 (40.0)
physiotherapy (total)		595 (82.3)
physiotherapy for sarcopenia		496 (74.0)
physiotherapy for lung function		408 (60.9)
occupational therapy (total)		467 (64.6)
occupational therapy for iADL		421 (62.8)
occupational therapy for house adaptations		273 (40.7)
speech/language therapy (total)		126 (17.4)
speech/language therapy for dysphagia		93 (13.9)
speech/language therapy for voice/speech		61 (9.1)
protein or calorie enriched diet		437 (60.4)
psychosocial support		170 (23.5)
cognitive training		82 (11.3)
Length of stay in GR, days; median (IQR)	701 (97.0)	26.0 (15.0 – 41.0)
Discharge destination, *n* (%)	703 (97.2)	
own home		544 (75.2)
nursing home/assisted living		103 (14.3)
hospital		30 (4.1)
other		15 (2.1)
deceased during GR		11 (1.5)
Post-Traumatic Stress Disorder (PTSS) at 6 weeks and/or 6 months after GR discharge, *n* (%)	541 (74.8)	59 (8.16)
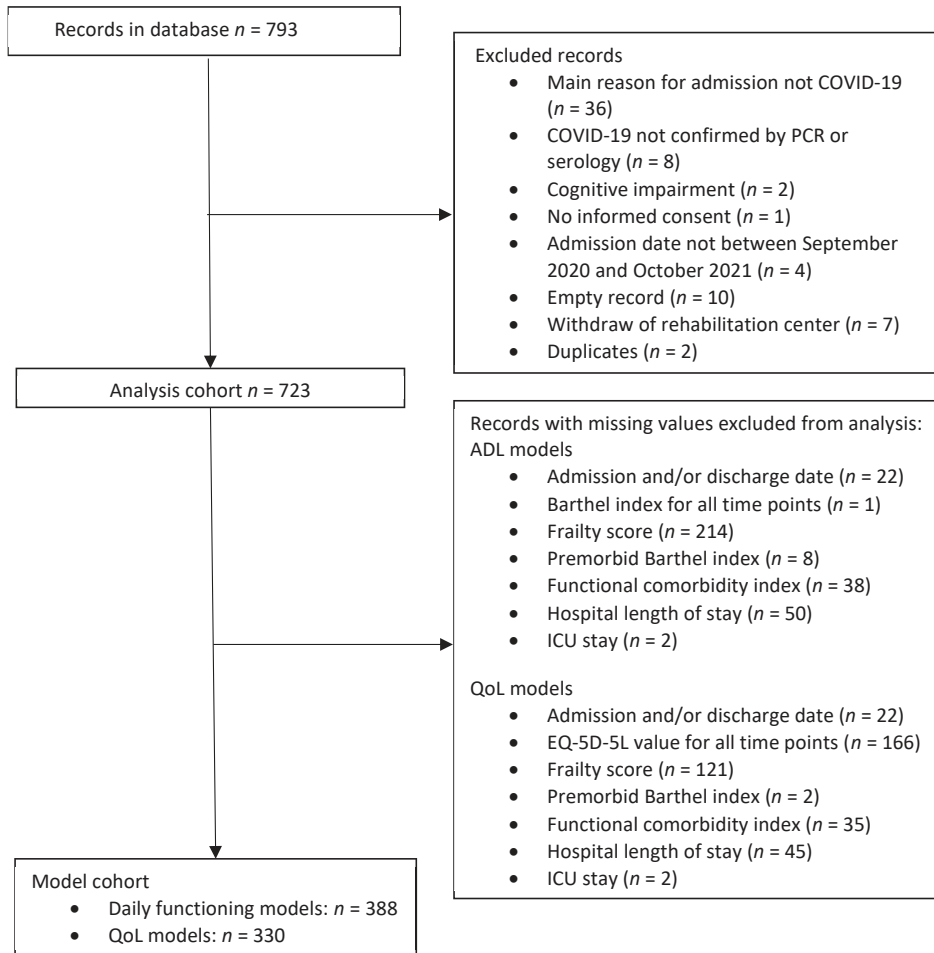
Figure 1. Flowchart of study participants

Daily functioning over time

The best fitting unadjusted model for the recovery trajectory of daily functioning showed that BI decreased during acute COVID infection from 17.41 before GR admission to 11.31 BI (SE 0.81, $P < 0.001$; **Table 2**) at GR admission. After GR admission, the largest increase in BI was seen within the first three months: BI first steeply increased with 2.51 (SE 0.18, $P < 0.001$) points BI per month, and stabilised (quadratic slope -0.26 BI per month squared, SE 0.02, $P < 0.001$) around 17.0 (**Figure 2A**). This best fitting model contained random intercepts and slopes for participants and countries.

The multivariate model showed that BI for daily functioning at GR admission was significantly lower for participants who were frailer at GR admission, estimated as 0.90 (SE 0.11, $P < 0.001$) points lower BI for each point that CFS is higher (**Table 2**). Frailty at GR admission

had little effect on the rate of recovery in daily functioning (linear slope -0.17 points BI per point CFS per month, SE 0.09, P = 0.075; quadratic slope 0.04 points BI per point CFS per month squared, SE 0.01, P = 0.007). **Figure 2B** shows that the recovery trajectories of daily functioning for participants of different frailty stages were almost parallel to each other.

Sensitivity analysis showed that premorbid frailty had a stronger association with the rate of recovery in daily functioning compared to frailty at GR admission. Participants who were frail premorbid (CFS 6-9, n = 49) recovered more slowly, leading to only partial recovery in daily functioning (**Appendix III: Table 5, Figure 3A**).

Table 2. Linear mixed models for change in daily functioning over time (unconditional model) and effect of frailty (univariable and multivariable models) (n = 388)

	Unadjusted model		Univariable model		Multivariable model*	
	Estimate (SE)	*P*-value	Estimate (SE)	*P*-value	Estimate (SE)	*P*-value
Fixed effects						
At admission (intercept)						
Daily functioning (Barthel Index; range 0-20)	11.31 (0.81)	<0.001	11.51 (0.46)	<0.001	11.64 (0.31)	<0.001
Frailty (Clinical Frailty Scale; range 1-9)	N/A	N/A	-1.50 (0.13)	<0.001	-0.90 (0.11)	<0.001
Change before admission (slope)						
Change per week	- 3.05 (0.11)	<0.001	- 3.08 (0.11)	<0.001	- 3.10 (1.06)	<0.001
Change after admission (slope)						
Per month: linear component	2.51 (0.15)	<0.001	2.58 (0.15)	<0.001	2.73 (0.14)	<0.001
Per frailty score: linear component	N/A	N/A	-0.13 (0.09)	0.170	-0.17 (0.09)	0.075
Per month: quadratic component	-0.26 (0.02)	<0.001	-0.28 (0.02)	<0.001	-0.30 (0.02)	<0.001
Per frailty score: quadratic component	N/A	N/A	0.03 (0.01)	0.019	0.04 (0.01)	0.007
	Variance (SD)		Variance (SD)		Variance (SD)	
Random effects						
At admission (intercept)						
Between persons variance	8.13 (2.85)		5.40 (2.32)		1.50 (1.23)	
Between countries variance	6.00 (2.45)		1.72 (1.31)		0.70 (0.84)	
After admission (slope of change)						
Between persons variance	0.03 (0.19)		0.04 (0.20)		0.05 (0.22)	
Between countries variance	0.07 (0.26)		0.05 (0.22)		0.01 (0.10)	
Residual	10.64 (3.26)		10.52 (3.24)		9.98 (3.16)	

N/A, not available. *Adjusted for age, sex, premorbid BI, Functional Comorbidity Index, hospital length of stay, and ICU stay.

Quality of life over time

The best fitting unadjusted model for the recovery trajectory of QoL showed that the largest increase was seen within the first two months: The EQ-5D-5L value also first steeply increased from 0.569 (SE 0.047, $P < 0.001$; **Table 3**) at GR admission with 0.126 (SE 0.008, $P < 0.001$) per month, after which it stabilised (quadratic slope -0.014 points EQ-5D-5L per month squared, SE 0.001, $P < 0.001$) around 0.8 (**Figure 2C**). This best fitting model contained random intercepts for participants and countries and a random slope for participants.

Table 3. Linear mixed models for change in quality of life over time (unconditional model) and effect of frailty (univariable and multivariable models ($n = 330$)

	Unadjusted model		Univariable model		Multivariable model*	
	Estimate (SE)	*P*-value	Estimate (SE)	P-value	Estimate (SE)	*P*-value
Fixed effects						
At admission (intercept)						
Quality of life (EQ-5D-5L; range 0-1)	0.569 (0.047)	<0.001	0.566 (0.037)	<0.001	0.587 (0.031)	<0.001
Frailty (Clinical Frailty Score; range 1-9)	N/A	N/A	-0.098 (0.01)	<0.001	-0.075 (0.010)	<0.001
Change after admission (slope)						
Per month: linear component	0.126 (0.008)	<0.001	0.125 (0.008)	<0.001	0.124 (0.008)	<0.001
Per frailty score: linear component	N/A	N/A	0.027 (0.006)	<0.001	0.023 (0.007)	<0.001
Per month: quadratic component	-0.014 (0.001)	<0.001	-0.014 (0.001)	<0.001	-0.014 (0.001)	<0.001
Per frailty score: quadratic component	N/A	N/A	-0.003 (0.001)	0.006	-0.002 (0.001)	0.033
	Variance (SD)		Variance (SD)		Variance (SD)	
Random effects						
At admission (intercept)						
Between persons variance	0.035 (0.187)		0.026 (0.160)		0.022 (0.148)	
Between countries variance	0.018 (0.132)		0.011 (0.103)		0.007 (0.082)	
After admission (slope of change)						
Between persons variance	0.001 (0.032)		0.001 (0.029)		0.001 (0.025)	
Residual	0.030 (0.172)		0.029 (0.171)		0.029 (0.170)	

N/A, not available. *Adjusted for: age, sex, premorbid BI, Functional Comorbidity Index, hospital length of stay, and ICU stay.

The multivariate model found that EQ-5D-5L values for QoL at GR admission were much lower for participants who were frailer at GR admission, estimated as 0.07 (SE 0.01, *P* <

0.001) points lower EQ-5D-5L for each point that CFS is higher (**Table 3**). Frailty at GR admission was also associated with the rate of recovery in daily functioning. EQ-5D-5L values increased steeper for frailer participants (linear slope 0.02 higher EQ-5D-5L value per point CFS per month, SE 0.01, $P < 0.001$; quadratic slope <-0.00 lower EQ-5D-5L value per point CFS per month squared, SE 0.00, $P = 0.033$). **Figure 2D** shows that within some months this led to almost equal EQ-5D-5L values for frail, pre-frail and fit participants.
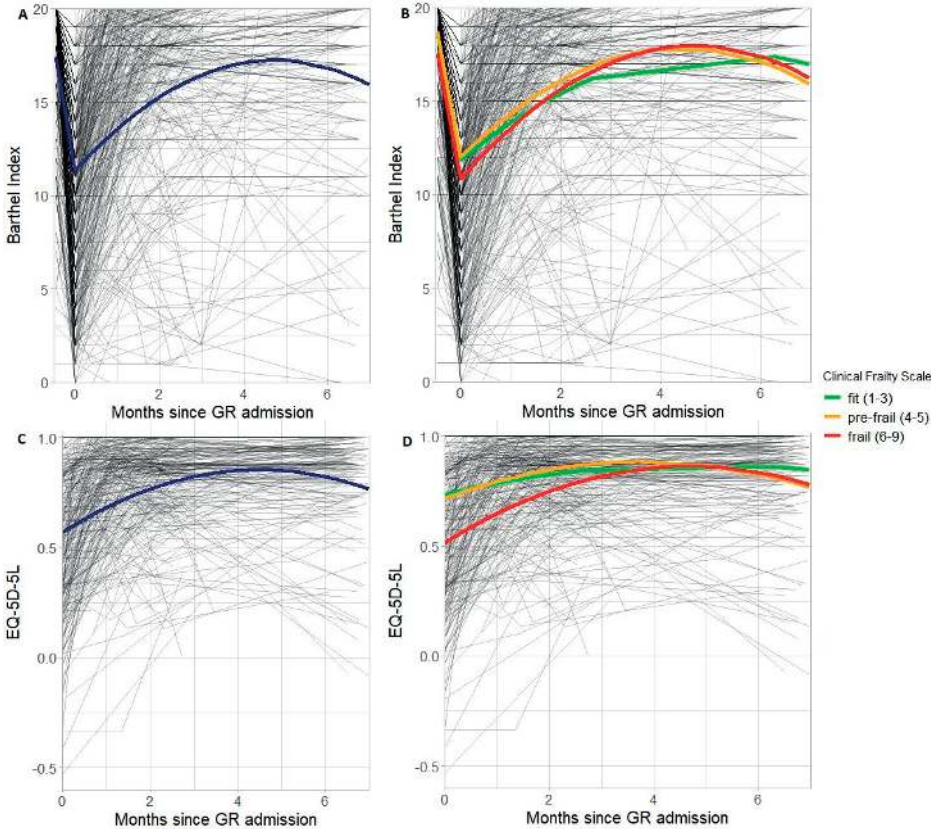
Figure 2. A, Unconditional trajectory of daily functioning ($n = 388$). **B,** Trajectory of daily functioning for fit ($n = 34$), pre-frail ($n = 102$), and frail ($n = 252$) participants at GR admission ($n = 388$). **C**, Unconditional trajectory of quality of life ($n = 330$). **D**, Trajectory of quality of life for fit ($n = 33$), pre-frail ($n = 95$), and frail ($n = 202$) participants at GR admission ($n = 330$).

Sensitivity analysis showed that the association between premorbid frailty and the rate of recovery in QoL was similar to the association for frailty at GR admission: the rate of recovery in QoL was higher for frailer participants (**Appendix III: Table 6, Figure 3B**).

DISCUSSION

This study showed that European patients admitted to GR following COVID-19 recovered in daily functioning almost up to their premorbid status. Their QoL also substantially increased. The largest increases in QoL and daily functioning were observed within the first 2 or 3 months after GR admission. A large proportion of geriatric post-COVID-19 patients were frail at GR admission. These frail patients recovered in daily functioning approximately as fast as more fit patients. Although QoL was lower at admission for patients who were frail (either at GR admission or prior to the infection), their recovery went faster compared to fitter patients, leading to equal levels of QoL after a couple of months.

This study was performed during a period when healthcare systems were severely strained and this likely reduced the quality of rehabilitation care. Patients were sometimes discharged early from the hospital (42). Consequently, possibly patients were frailer than usual at GR admission. Therefore, the observed recovery may be an underestimation of the potential recovery of post-COVID-19 patients. Moreover, post-COVID-19 GR patients in our cohort (mean age 75, SD 9.9) tend to be a little younger than pre-pandemic GR patients (mostly patients recovering from stroke, complex conditions, hip fracture, or repeated falls), who have a mean age of 80 (SD 4.3) (43).

Literature about older COVID-19 patients who did not receive rehabilitation care after hospitalization shows that the majority of them did not fully recover. In a French and in a Spanish cohort, one third had a lower functional status at three months after hospitalization than they had at hospital admission (44, 45). Moreover, the majority experienced cognitive decline, depressive symptoms, required readmission, or died (44); or experienced fatigue, frailty, or died (45). Two third of the older post-COVID-19 patients in a Norwegian cohort reported a decline in any of the EQ-5D-5L dimensions from their premorbid situation to 6 months after hospital discharge (46). Frailty, either measured premorbid or at hospital admission, has been shown to be associated with mortality in hospitalised older people with COVID-19 (41, 47, 48).

The present study found that for patients who were admitted to GR, frailty at admission was not distinctive for recovery. Even patients who were frail premorbid partially recovered, though less completely so (**Appendix III**). These findings support inclusivity when selecting patients for GR. Guidelines are ambiguous about the use of frailty as a selection criterion for GR after COVID-19. For example, according to guidance by the EuGMS a geriatric needs assessment, that includes frailty, should be used in the referral decision (10). Guidelines developed by the World Health Organisation do not mention

frailty as a criterion for GR referral (49). Instead, these guidelines describe that rehabilitation programmes should be individualised based on functional limitations (49).

This study has a number of strengths. First, to our knowledge, this is the only study on COVID-19 rehabilitation with a follow-up time of more than 6 months. Second, patients were recruited from 59 rehabilitation facilities in 10 European countries. However, in the Czech Republic, Italy, Israel, and Malta only one care facility participated, which may reduce the generalizability of our results in these countries. Third, this study specifically focused on GR. Little research has been done on COVID-19 in this field.

A limitation of this study is the lack of more detailed outcome measures, such as instrumental ADL (iADL), because only regular care data were collected. Second, few participants were fit at GR admission ($n = 51$), and few participants were frail prior to the SARS-COV-2 infection ($n = 58$). Therefore, our results are not very precise for these patient groups. However, this is unlikely to pose large threat to the generalisability of our findings to the GR population, as GR patients are often selected based on their potential to benefit from GR, leading to relatively small numbers of premorbid frail or at admission very fit patients. Third, a large number of participants had to be excluded from the linear mixed models due to missing values. However, it is unlikely that this biased our results. Mixed models handle missing outcome data well under the assumption it is missing at random, and the recovery trajectories of the excluded and included participants were similar. Fourth, due to the wide practice variation, it is unclear whether our results apply to all GR care settings and what optimal GR care constitutes.

In conclusion, this study found that patients admitted to GR following COVID-19 substantially recover in terms of daily functioning and QoL. Even patients who were frail at GR admission substantially recovered, which suggests that post-COVID-19 patients of all stages of frailty have the potential to benefit from GR care and that frailty after acute illness should not be used as a criterion to decline patients access to rehabilitation. However, more research is needed to quantify the association between premorbid frailty and rehabilitation potential. To make statements about what optimal GR care for post-COVID-19 patients constitutes, differences between countries in GR care organization, patient selection, and recovery trajectories should be explored. Barring a deterioration in the current global situation regarding COVID-19, opportunities to conduct similar large scale research in this context are unlikely to arise. The work presented here may be extrapolated to other contexts and acute conditions with similar clinical trajectories to bring our understanding forward of where GR may add value.

Declaration of Conflicts of Interest:

None

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APPENDIX I. EU-COGER CONSORTIUM LIST

Name of health centre	Country	Study coordinator #1	Study coordinator #2	Study coordinator #3	Study coordinator #4
Vseobecna fakultní nemocnice	Czech Republic	Eva Topinková	Lucie Bautzká	Helena Michaálková	
Agaplesion Bethanien Hospital	Germany	Stefan Grund	Thomas Mross	Lotte Feesche	
Robert-Bosch-Krankenhaus	Germany	Rebekka Leonhardt	Clemens Becker		
Geriatrisches Zentrum Karlsruhe	Germany	Jan Gerhardus	Brigitte R. Metz		
Geriatrische Rehabilitationsklinik Diakonissenkrankenhaus Mannheim	Germany	Diana Franke-Chowdhury			
University of Limerick Hospital Group (ULHG)	Ireland	Rose Galvin	Aoife McCarthy		
Beaumont Hospital	Ireland	Frances Dockery	Kara McLoughlin		
Fliman geriatric rehabilitation center	Israel	Bahaa Francis			
IRCCS Istituti Clinici Maugeri	Italy	Matteo Cesari	Annalisa Valentini		
Karin Grech Hospital	Malta	Mark Vassallo	Maria Bonnici		
Russian Clinical and Research Center of Gerontology	Russia	Olga Nikolaevna Tkacheva	Ksenia Eruslanova		
Moscow Rehabilitation center	Russia	Luba Matchekhina			
Parc Sanitari Pere Virgili	Spain	Laura Monica Perez Bazan			
Hospital Universitari Sant Joan de Reus	Spain	Esther Roquer Fanlo			
Hospital Universitari Parc de Salut Mar	Spain	Anna Renom Guiteras	Lizzeth Angela Canchucaja		
Hospital Central de la Cruz Roja San José y Santa Adela	Spain	Beatriz Pallardo	Sergio Martínez Zujeros		
Hospital San Joan de Deu Mallorca	Spain	Margarita Viñuela	Oriol Miralles Resina		
Hospital Guadarrama	Spain	Gema Isabel Dominguez	Sarah Caro Bragado		
Hospital de Barcelona	Spain	Nadia Stasi	Jennifer Garrillo Cepeda		

(*continued*)

Name of health centre	Country	Study coordinator #1	Study coordinator #2	Study coordinator #3	Study coordinator #4
Consorci Sanitari Alt Penedès i Garraf	Spain	Marta Arroyo-Huidobro	Ana Gonzalez		
Leiden University Medical Center	the Netherlands	Wilco Achterberg	Monique Caljouw	Miriam Haaksma	Lisa van Tol
Omring	the Netherlands	Saskia Drijver			
Zorgcirkel	the Netherlands	Paula Vonk			
BrabantZorg	the Netherlands	Liesbeth Sikken	Irma Baars		
IJsselheem	the Netherlands	Nathalie Deden			
Topaz Revitel	the Netherlands	Gerda Nijgh	Sylvia van der Drift		
Tante Louise	the Netherlands	Heike de Wever	Els Calle		
MUMC+|Herstelzorg – Vitala+	the Netherlands	Kaoutar Karramass	Josette Hendriks		
Axion continu	the Netherlands	Lauren Ebbes			
TriviumMeulenbeltZorg Almelo	the Netherlands	Anne Hartman	Hatice Koc		
TriviumMeulenbeltZorg Hengelo	the Netherlands	Laura de Vries			
Patyna	the Netherlands	Hylco Bouwstra			
Careyn	the Netherlands	Laura Langendoen-Wigman			
Sensire	the Netherlands	Berber Oldenbeuving	Sabine Noordam-Hemeltjen		
Azora	the Netherlands	Liesbeth Lanting	Lulu Andela		
Argos Zorggroep	the Netherlands	Mathilde Meerkerk			
Meriant (Alliade)	the Netherlands	Lianne Willemstein	Krisztina Krasznai		
Liemerije	the Netherlands	Janneke Wolting			
Laurens Intermezzo Zuid	the Netherlands	Janette Tazmi			
de Wever	the Netherlands	Eveline Keustermans			

(*continued*)

Name of health centre	Country	Study coordina-tor #1	Study coordina-tor #2	Study coordina-tor #3	Study coordina-tor #4
Icare – De Boshof	the Netherlands	Janetta de Vries	Sanne van Weers		
SVRZ 't Gasthuis	the Netherlands	Lenni Boogaard			
De Betuwe, Zorgcentrum Beatrix	the Netherlands	Simone Been			
Archipel Zorggroep	the Netherlands	Danielle Termeer			
Florence	the Netherlands	Patricia te Pas	Eva Lodewijks		
Pieter van Foreest, locatie Bieslandhof	the Netherlands	Jeroen van den Berg			
Reactiveringscentrum Klimop	the Netherlands	Sandra Prent	Marloes Boontje		
Zorgspectrum Nieuwegein	the Netherlands	Joël Harms	Jeffrey Bakker		
Zorggroep Maas en Waal	the Netherlands	Carolien de Croon			
Attent	the Netherlands	Christa van Schieveen			
Vivium Flevoburen (Zorggroep Almere)	the Netherlands	Ewout Smit			
Kennemerhart Schoterhof	the Netherlands	Patricia van Berlo			
Van Neynsel	the Netherlands	Dionne Ruchtie			
Sheffield teaching Hospitals	UK	Jane Manson			
Frimley Health NHS Foundation Trust	UK	Maria Espasandin	Lucy Abbott		
Harrogate District Hospital	UK	Sarah Chadwick	Rebecca Watts		
Imperial College Healthcare NHS Trust	UK	Melani Dani	Jackie McNicholas		
University Hospitals of Derby and Burton	UK	Adam Gordon			
Calderdale & Huddersfield	UK	Vincent Chau			
Derbyshire Community Health Services	UK	Andy Cole			

APPENDIX II. AVAILABILITY OF ADL FUNCTIONING AND QUALITY OF LIFE DATA PER TIMEPOINT

Table 4. Availability of ADL functioning and quality of life data

Outcome measures	*n* (%) available
ADL functioning (Barthel index)	
premorbid	641 (88.7)
GR admission	714 (98.8)
GR discharge	655 (90.6)
6 weeks after discharge	515 (71.2)
6 months after discharge	509 (70.4)
Quality of life (EQ-5D-5L)	
GR admission	471 (65.1)
GR discharge	413 (57.1)
6 weeks after discharge	423 (58.5)
6 months after discharge	425 (58.8)

APPENDIX III: ADL FUNCTIONING AND QUALITY OF LIFE OVER TIME AND THE EFFECT OF PREMORBID FRAILTY ON THESE TRAJECTORIES

Table 5. Linear mixed models for change in ADL functioning over time (unconditional model) and effect of premorbid frailty (univariable and multivariable models) (*n* = 389)

	Unadjusted model		Univariable model		Multivariable model*	
	Estimate (SE)	*P*-value	Estimate (SE)	P-value	Estimate (SE)	*P*-value
Fixed effects						
At admission (intercept)						
ADL functioning (Barthel Index; range 0-20)	11.35 (0.82)	<0.001	11.73 (0.51)	<0.001	11.65 (0.52)	<0.001
frailty (Clinical Frailty Scale; range 1-9)	N/A	N/A	-1.45 (0.12)	<0.001	-0.29 (0.14)	0.036
Change before admission (slope)						
Change per week	- 3.06 (0.11)	<0.001	- 3.06 (0.11)	<0.001	- 3.10 (1.06)	<0.001
Change after admission (slope)						
Per month: linear component	2.45 (0.15)	<0.001	2.47 (0.15)	<0.001	2.65 (0.14)	<0.001
Per frailty score: linear component	N/A	N/A	-0.06 (0.08)	0.415	-0.38 (0.11)	<0.001
Per month: quadratic component	-0.25 (0.02)	<0.001	-0.26 (0.02)	<0.001	-0.28 (0.02)	<0.001
Per frailty score: quadratic component	N/A	N/A	0.01 (0.01)	0.521	0.04 (0.02)	0.005
	Variance (SD)		Variance (SD)		Variance (SD)	
Random effects						
At admission (intercept)						
Between persons variance	7.91 (2.81)		5.00 (2.24)		1.65 (1.29)	
Between countries variance	6.31 (2.51)		2.16 (1.47)		2.43 (1.56)	
After admission (slope of change)						
Between persons variance	0.06 (0.25)		0.04 (0.19)		0.04 (0.19)	
Between countries variance	0.07 (0.26)		0.07 (0.26)		0.04 (0.19)	
Residual	10.45 (3.23)		10.51 (3.24)		10.00 (3.16)	

N/A, not available. *Adjusted for: age, sex, premorbid BI, Functional Comorbidity Index, hospital length of stay, and ICU stay.

Table 6. Linear mixed models for change in quality of life over time (unconditional model) and effect of premorbid frailty (univariable and multivariable models ($n = 330$)

	Unadjusted model		Univariable model		Multivariable model*	
	Estimate (SE)	*P*-value	Estimate (SE)	*P*-value	Estimate (SE)	*P*-value
Fixed effects						
At admission (intercept)						
Quality of life (EQ-5D-5L; range 0-1)	0.564 (0.047)	<0.001	0.571 (0.040)	<0.001	0.586 (0.037)	<0.001
Frailty (Clinical Frailty Score; range 1-9)	N/A	N/A	-0.041 (0.011)	<0.001	-0.044 (0.01)	0.001
Change after admission (slope)						
Per month: linear component	0.122 (0.008)	<0.001	0.125 (0.008)	<0.001	0.12 (0.014)	<0.001
Per frailty score: linear component	N/A	N/A	0.004 (0.006)	0.535	0.021 (0.008)	0.015
Per month: quadratic component	-0.013 (0.001)	<0.001	-0.014 (0.001)	<0.001	-0.014 (0.001)	<0.001
Per frailty score: quadratic component	N/A	N/A	-0.001 (0.001)	0.288	-0.002 (0.001)	0.077
	Variance (SD)		**Variance (SD)**		**Variance (SD)**	
Random effects						
At admission (intercept)						
Between persons variance	0.036 (0.191)		0.034 (0.185)		0.027 (0.165)	
Between countries variance	0.017 (0.132)		0.012 (0.109)		0.010 (0.101)	
After admission (slope of change)						
Between persons variance	0.001 (0.033)		0.001 (0.032)		0.001 (0.027)	
Residual	0.031 (0.177)		0.031 (0.177)		0.030 (0.173)	

N/A, not available. *Adjusted for: age, sex, premorbid BI, Functional Comorbidity Index, hospital length of stay, and ICU stay.
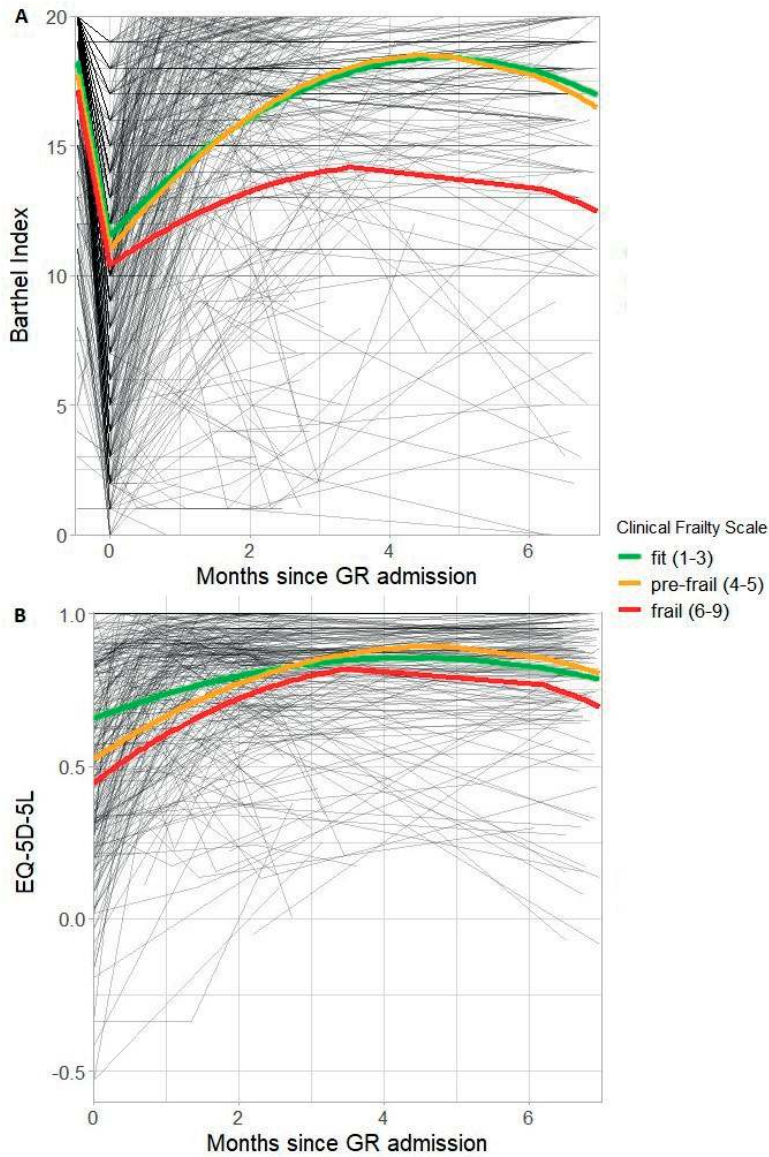
Figure 3. A, Trajectory of ADL functioning for premorbid fit (n = 216), pre-frail (n = 124), and frail (n = 49) participants (n = 389). **B**, Trajectory of quality of life for premorbid fit (n = 203), pre-frail (n = 100), and frail (n = 27) participants (n = 330).

8

Post-COVID-19 recovery and geriatric rehabilitation care: A European inter-country comparative study

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KEY SUMMARY POINTS

Aim To describe selection criteria for referral to geriatric rehabilitation, care provided, and recovery trajectories of post-COVID-19 patients referred to geriatric rehabilitation in Europe.

Findings In the ten participating countries, patients showed recovery in daily functioning and quality of life, albeit at variable rates. This variation in recovery rates was accompanied by variation in geriatric rehabilitation selection criteria, patient characteristics, and provided rehabilitation care.

Message The heterogeneity in recovery of post-COVID-19 patients admitted to geriatric rehabilitation, selection criteria, and organization of geriatric rehabilitation care highlights the need for harmonization of measurements in geriatric rehabilitation in order to perform explanatory research and optimize geriatric rehabilitation throughout Europe.

ABSTRACT

Purpose There is variation in organization of geriatric rehabilitation across Europe. The purpose of this study was to describe the selection criteria for referral to geriatric rehabilitation, care provided, and recovery trajectories of post-COVID-19 patients referred to geriatric rehabilitation in Europe.

Methods This observational cohort study included 723 patients in 59 care facilities for geriatric rehabilitation across 10 countries. Patient data were collected from medical records on admission to geriatric rehabilitation (between September 2020 and October 2021), discharge, 6 weeks and 6 months follow-up. The primary and secondary outcomes were recovery in daily functioning (Barthel Index) and Quality of Life (EQ-5D-5L) from admission to discharge. These were examined using linear mixed models with two levels (measurements nested in patients) and country as an independent variable. Random intercept and random linear slope parameters were added when they improved model fit. A survey about organization of geriatric rehabilitation for post-COVID-19 patients was filled out by country coordinators and data were analyzed using descriptive statistics and inductive coding of answers to open questions.

Results Patients had a mean age of 75.7 years old and 52.4% were male. Many countries used various combinations of the selection criteria, such as functional status, age, frailty, Comprehensive Geriatric Assessment, comorbidities, and cognitive impairments. Most patients received physiotherapy (88.8%) and occupational therapy (69.7%), but there was substantial variance between countries in the percentages of patients that received protein or calorie enriched diets, oxygen therapy, and other treatment components. In all countries, patients showed recovery in daily functioning and quality of life, although

there was variation in between countries in rate of recovery. Daily functioning seemed to increase most rapidly in the Czech Republic, Germany, and Russia. The steepest increases in quality of life were seen in the Czech Republic, Germany, and Spain.

Conclusion Post-COVID-19 patients showed recovery during geriatric rehabilitation, albeit at variable rates. The observed variation may be explained by the heterogeneity in selection criteria and care provided. This study highlights the need for harmonization of measurements in geriatric rehabilitation order to perform explanatory research and optimize geriatric rehabilitation throughout Europe to ensure optimal patient recovery.

Keywords: Geriatric rehabilitation, COVID-19, recovery, Europe

INTRODUCTION

Millions of people have been infected with Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-COV-2) since the start of the COVID-19 pandemic in 2020 (1). Although COVID-19 is no longer called a public health emergency since May 2023, the end of the pandemic is not yet in sight (2). Infections and deaths still occur (1) and new virus variants may again cause increased infection rates and disease outbreaks. Older age is strongly associated with increased risk of severe COVID-19 infection and death (3-5).

The large number of older patients with COVID-19 has led to increased demand for geriatric rehabilitation. The European Geriatric Medicine Society (EuGMS) has defined geriatric rehabilitation as "*a multidimensional approach of diagnostic and therapeutic interventions, the purpose of which is to optimise functional capacity, promote activity and preserve functional reserve and social participation in older people with disabling impairments*" (6). Unlike rehabilitation for specific diseases, geriatric rehabilitation is tailored to specific needs and appropriate goals for older people who more often experience multiple long-term conditions and geriatric syndromes such as frailty (7). In many European countries geriatric rehabilitation is still underdeveloped (8). A survey by the EuGMS revealed that, in 2018, geriatric rehabilitation was only recognized formally in two thirds (20 out of 31) of participating European countries, and national or local geriatric rehabilitation guidelines were in use in only one third (11 out of 31) (8).

The COVID-19 pandemic increased demand for geriatric rehabilitation, but also reduced its capacity. This has been called the COVID "rehabilitation paradox" (9). Reasons for reduced capacity included pandemic-related spacing requirements, adapted admission criteria, and GR beds being repurposed to deliver acute care (9). Moreover, GR facilities had staff shortages due to illness or secondment to acute care wards.

Despite efforts of expert groups to provide guidance on geriatric rehabilitation in post-COVID patients (10), scientific evidence on how best to organize care to facilitate recovery for geriatric patients after COVID-19 is limited. More insight into geriatric rehabilitation care provided during the pandemic in various European countries and the recovery of geriatric patients after COVID-19 are needed for countries to be able to learn from each other, optimise COVID-19 rehabilitation and prepare for potential future pandemics. This study aimed to describe selection criteria for referral to geriatric rehabilitation, care provided, and recovery of patients after COVID-19 in geriatric rehabilitation across multiple European countries.

METHODS

Design

This study was part of the European Cooperation in Geriatric Rehabilitation study after COVID-19 (EU-COGER). EU-COGER was an international observational cohort study designed by the EuGMS Special Interest Group for Geriatric Rehabilitation. The study was registered at ClinicalTrials.gov (identifier: NCT05749731).

Setting and participants

We used the consensus definition of geriatric rehabilitation published by the EuGMS (6), including facilities which provided multidisciplinary rehabilitation care to frail and/or multimorbid patients. Both inpatient facilities and geriatric rehabilitation at home were included in the EU-COGER consortium (**Appendix I).**

Geriatric rehabilitation care facilities were recruited from the Czech Republic, Germany, Ireland, Israel, Italy, Malta, the Netherlands, Russia, Spain, and the United Kingdom by members of the EuGMS Special Interest Group. The Special Interest Group members acted as country coordinators, and maintained contact with local study coordinators in participating geriatric rehabilitation care facilities in their country (11). Patients admitted to participating facilities were recruited by the local study coordinators, between September 2020 and October 2021. Patients could be included if admitted to recover from a SARS-CoV-2 infection, confirmed with either Polymerase Chain Reaction (PCR) for viral RNA or serology for virus antibodies, depending on local protocols. Severe cognitive impairment which prevented patients from providing consent was an exclusion criterion (12). In total 793 patient records were created in the database, of which 70 were excluded due to three centres withdrawing from study participation (n=7), duplicates (n=2), empty records (n=10), and patients who did not meet inclusion criteria (n=51).

Ethics

The study was performed in accordance with the Declaration of Helsinki (2013 version) for medical research and General Data Protection Regulation (GDPR). The Leiden University Medical Center COVID-19 science ethical committee deemed this study exempt from the Medical Research Involving Human Subjects Act (WMO) since the study only used routinely collected data, and approved the study based on an opt-out procedure for the Netherlands (protocol number CoCo 2020-040). In all other countries, the local regulations were adhered to and, when required, additional approval was obtained from a local Ethics committee.

Data collection

Cohort data

Routinely collected medical care data from patients' (electronic) health records were collected in cloud-based clinical data management system Castor (13). Data were collected at admission to geriatric rehabilitation, including pre-morbid (pre-COVID) status from referral letters, at geriatric rehabilitation discharge, 6 weeks and 6 months follow-up. A complete overview of data collected is provided in the study protocol (12).

The primary outcome measure was daily functioning, assessed with the Barthel Index for activities of daily living (14). The Barthel Index by Collin et al. produces a total score of 20, where higher scores represent higher independence in activities of daily living. This is the only functional outcome measure routinely collected across participating countries. Certain countries or facilities used the Utrecht Scale for the Evaluation of Rehabilitation (USER) or the Functional Independence Measure (FIM). These comparable measures were converted to Barthel Index using standardized approaches (15, 16). The secondary outcome measure was health related quality of life assessed with the EQ-5D-5L, available in over 150 languages (17). The EQ-5D-5L is a 5-item instrument that produces a maximum score of 1 for optimal quality of life. Patients' EQ-5D-5L scores were calculated using available country tariffs (18-23). For Malta, Czech Republic, and Russia no country tariffs were available and the geographically closest available country tariffs (Spain, Poland and Poland respectively) were used (21, 24). In Israel and the United Kingdom no quality of life data were collected as part of routine practice. In addition, duration of geriatric rehabilitation and discharge destination across countries are described in **Table 2**. Data collected about treatment components provided as part of geriatric rehabilitation comprised: oxygen therapy, physiotherapy, occupational therapy, speech and language therapy, protein or calorie enriched diets, psychosocial support, and cognitive training. The number of missing data is presented in **Appendix II.**

Survey data

During the EU-COGER project we noticed that there are large differences in characteristics and triage of post-COVID patients across countries that have implications for the health condition of patients at the time of admission to geriatric rehabilitation. Therefore, a survey was developed to collect data about the referral process of post-COVID-19 patients to geriatric rehabilitation and characteristics of geriatric rehabilitation care organization in participating countries. The survey comprised multiple choice and open questions about types of geriatric rehabilitation care facilities, selection criteria for referral for patients recovering from COVID-19 to geriatric rehabilitation, and geriatric rehabilitation discharge criteria for this patient group. A glossary of GR care facilities

is in **Appendix III**. The study's country coordinators answered these questions for the participating care providers from their country.

Data analysis

Cohort data

Patients' demographic and clinical characteristics and treatment components were analysed using descriptive statistics. Normally distributed continuous variables were reported with mean and SD, other continuous variables with median and interquartile range (IQR). Categorical variables were presented as percentages (%) and numbers (n).

The recovery trajectories of daily functioning and quality of life between admission and discharge from geriatric rehabilitation were examined using linear mixed models, with time operationalized as weeks since admission to geriatric rehabilitation. Linear trajectories were modelled using data from admission to discharge. For the Barthel Index two splines were fitted, as the premorbid measurement was also included. Random intercept and random linear slope parameters for variance between participants were added when they improved model fit. Models were built with unstructured variance-covariance matrices. The models had two levels for measurements nested in patients. Country was added as an independent categorical variable, and models were adjusted for mean centred age and sex. This enabled us to plot recovery trajectories for the average participant in each country. All models were built using R package lme4 in R version 4.2.2. Model equations are presented in **Appendix V**.

Survey data

Responses to multiple choice questions about geriatric rehabilitation facility types, selection criteria for referral to geriatric rehabilitation, and geriatric rehabilitation discharge criteria were converted to tabular form with checkboxes for participating countries. Answers to open questions regarding patient selection and discharge criteria were inductively grouped into categories by TL and checked by LST. These data conversions were checked by the country coordinators, each for the participating care facilities from their country.

RESULTS

Patients characteristics

A total of 723 patients from 59 European rehabilitation facilities were included in the analysis. Participating countries were the Czech Republic (n=53), Germany (n=50),

Ireland (n=50), Israel (n=32), Italy (n=30), Malta (n=17), the Netherlands (n=293), Russia (n=50), Spain (n=96), and the United Kingdom (n=52) (**Table 1**). Patient characteristics varied between countries. Mean age was 75.7 years (SD 9.9), ranging from 73.1 (SD 11.3) in Spain and 73.6 (SD 9.0) in the Netherlands to 83.1 (SD 6.0) years old in Germany (**Table 1**). The percentage of male participants ranged from 32.0% in Russia, 35.8% in the Czech Republic, and 38.0% in Germany, to 83.3% in Italy. Participants' median FCI score for comorbidities was 3.0 (IQR 2.0-4.0). Participants seemed to have fewer comorbidities in Malta (2.0, IQR 1.0-3.8) and the Netherlands (2.0, IQR 1.0-4.0), and seemed to have more comorbidities in the Czech Republic (5.0, IQR 2.0-6.0) and Russia (6.0, IQR 5.0-8.0).

Most participants (93.4%) lived at home before SARS-CoV-2 infection. In Ireland and Italy this was the case for all participants. In Russia, much smaller percentages of participants lived at home before infection (54.0%); almost half of the Russian participants (46.0%) lived in a nursing home. In all countries except Russia, over 80% of patients had been admitted to the hospital due to COVID-19 before admission to geriatric rehabilitation (in total 90.3%). There was variation in the median duration of this hospital stay, from 53 days in Italy (IQR 39.5 – 65.25) and 51 days in Malta (IQR 30.25 – 66.0), to only 13 days in the Czech Republic (7.0 – 23.0) and 10 days in Russia (6.25 – 14.75). One third of the patients (33.2%) had stayed at an intensive care unit (ICU), but these percentages were much lower in the Czech Republic (17%), Germany (22%), Italy (13.3%), Russia (6%) and the United Kingdom (13.5%), and much higher in Malta (64.7%) and Spain (56.3%).

The mean Barthel Index score at admission to geriatric rehabilitation for participants from all countries was 10.9 (SD 5.4) (**Table 2**), and most participants were living with moderate frailty (median CFS 6.0, IQR 5.0-7.0) (**Table 1**). In Italy and Russia, the Barthel Index scores of the participants at admission were more than two points higher than the cohort's mean (15.5, SD 3.9; 16.1, SD 4.0, respectively) and participants seemed to be less frail than in other countries (median CFS 4.0, IQR 4.0 – 5.5; median CFS 3.5, IQR 3.0 – 4.25, respectively). In Israel, Malta, and the United Kingdom, Barthel Index scores at admission were more than two points lower than the cohort's mean (4.0, SD 2.2; 6.3, SD 3.5; 6.4, SD 4.7, respectively) and participants seemed to be frailer than in other countries (median CFS 6.0, IQR 6.0 – 7.0; median CFS 7.0, IQR 6.0 – 7.0; median CFS 7.0, IQR 6.0 – 7.0, respectively). In Ireland and the United Kingdom, the EQ-5D-5L scores of the participants at admission (0.26, SD 0.40; 0.28 SD 0.06, respectively) seemed to be lower than the cohort's mean (0.52, SD 0.32).

Referral of post-COVID-19 patients to geriatric rehabilitation

In all countries a combination of multiple criteria was used when selecting patients for geriatric rehabilitation, but there was substantial heterogeneity in which criteria

Table 1. Characteristics of post-COVID-19 patients in geriatric rehabilitation (GR)

Participants, n (%)	All	CZ	DE	IE	IL	IT	MT	NL	RU	ES	UK
	723 (100)	**53 (7.3)**	**50 (6.9)**	**50 (6.9)**	**32 (4.4)**	**30 (4.1)**	**17 (2.4)**	**293 (40.6)**	**50 (6.9)**	**96 (13.3)**	**52 (7.2)**
Age, mean (SD)	75.7 (9.8)	79.0 (9.8)	83.1 (6.0)	74.2 (11.0)	81.2 (8.3)	75.6 (7.0)	74.6 (6.3)	73.6 (9.0)	75.2 (7.1)	73.1 (11.3)	81.6 (11.4)
Sex, male, n (%)	379 (52.4)	19 (35.8)	19 (38.0)	27 (54.0)	15 (46.9)	25 (83.3)	12 (70.6)	163 (55.6)	16 (32.0)	63 (65.6)	20 (38.5)
Number of comorbidities, FCI*, median (IQR)	3.0 (2.0-4.0)	5.0 (3.0-6.0)	3.0 (2.0-4.0)	3.0 (1.0-4.0)	3.0 (2.0-4.0)	3.0 (1.0-4.0)	2.0 (1.0-3.75)	2.0 (1.0-4.0)	6.0 (5.0-8.0)	3.0 (1.0-4.0)	3.0 (2.0-4.0)
Frailty at GR admission, CFS**, median (IQR)	6.0 (5.0-7.0)	6.0 (5.0-6.0)	6.0 (4.0-6.0)	6.0 (6.0-7.0)	NAMP^	4.0 (4.0-5.5)	7.0 (6.0-7.0)	NAMP^	3.5 (3.0-4.25)	6.0 (5.0-7.0)	7.0 (6.0-7.0)
Lived at home pre-morbid, n (%)	675 (93.4)	47 (88.7)	46 (92.0)	50 (100.0)	30 (93.8)	30 (100.0)	16 (94.1)	287 (98.0)	27 (54.0)	94 (97.9)	48 (92.3)
Hospital stay before GR admission	653 (90.3)	45 (84.9)	49 (98.0)	41 (82.0)	32 (100.0)	30 (100.0)	16 (94.1)	267 (91.1)	28 (56.0)	95 (99.0)	50 (96.2)
Hospital length of stay prior to GR, days, median (IQR)	23.0 (13.0-46.5)	13.0 (7.0-23.0)	28.0 (18.0-51.5)	26.0 (15.0-52.0)	29.0 (20.0-33.0)	53.0 (39.5-65.25)	51.0 (30.25-66.0)	21.0 (13.0-40.0)	10.0 (6.25-14.75)	40.0 (18.0-63.5)	16.5 (9.0-63.25)
ICU stay prior to GR, n (%)	240 (33.2)	9 (17.0)	11 (22.0)	14 (28.0)	9 (28.1)	4 (13.3)	11 (64.7)	118 (40.3)	3 (6.0)	54 (56.3)	7 (13.5)

CZ= the Czech Republic, DE=Germany, IE=Ireland, IL=Israel, IT=Italy, MT=Malta, NL=the Netherlands, RU=Russia, ES=Spain, UK= the United Kingdom; *FCI=Functional Comorbidity Index; **CFS= Clinical Frailty Scale; ^NAMP= not available for majority of patients

Table 2. Outcomes of post-COVID-19 patients in geriatric rehabilitation (GR)

	All	CZ	DE	IE	IL	IT	MT	NL	RU	ES	UK
Participants, n (%)	723 (100)	53 (7.3)	50 (6.9)	50 (6.9)	32 (4.4)	30 (4.1)	17 (2.4)	293 (40.6)	50 (6.9)	96 (13.3)	52 (7.2)
Duration GR, weeks, median (IQR)	3.7 (2.1-5.7)	3.1 (2.2 – 3.9)	2.9 (2.7 – 3.9)	3.4 (1.5 – 5.8)	3.4 (2.4 – 6.2)	4.9 (4.1 – 5.6)	6.4 (3.4 – 7.5)	4.1 (2.7 – 6.6)	1.9 (1.4 – 2.0)	4.7 (3.4 – 6.4)	3.1 (2.0 – 4.7)
Daily functioning, Barthel Index, mean (SD)											
at GR admission	10.9 (5.4)	10.7 (3.7)	12.7 (3.8)	10.6 (4.1)	4.0 (2.2)	15.5 (3.9)	6.2 (3.5)	11.9 (5.0)	16.1 (4.0)	9.0 (5.6)	6.4 (4.7)
at GR discharge	15.9 (4.7)	15.4 (3.0)	16.5 (2.9)	16.8 (17.0)	10.3 (4.6)	18.1 (2.8)	14.8 (7.1)	17.3 (3.6)	17.1 (3.6)	16.1 (5.0)	9.5 (6.3)
Quality of life, EQ-5D-5L, mean (SD)											
at GR admission	0.52 (0.32)	0.51 (0.24)	0.64 (0.29)	0.26 (0.40)	NAMP^	0.68 (0.15)	0.53 (0.37)	NAMP^	0.85 (0.15)	0.45 (0.31)	0.28 (0.06)
at GR discharge	0.77 (0.22)	0.68 (0.19)	0.81 (0.150)	0.61 (0.30)	NAMP^	0.86 (0.11)	0.85 (0.20)	NAMP^	0.91 (0.11)	0.78 (0.24)	NAMP^
Discharge destination, n (%)											
Own Home	544 (75.2)	22 (41.5)	37 (74.0)	41 (82.0)	21 (65.6)	27 (90.0)	14 (82.4)	246 (84.0)	25 (50.0)	78 (81.3)	33 (63.5)
Assisted Living	20 (2.8)	5 (9.4)	2 (4.0)	0 (0.0)	2 (6.3)	0 (0)	0 (0.0)	6 (2.0)	0 (0.0)	5 (5.2)	0 (0)
Nursing Home	83 (11.5)	20 (37.7)	6 (12.0)	0(0.0)	7 (21.9)	1 (3.3)	1 (5.9)	7 (2.4)	24.0 (48.0)	5 (5.2)	12 (23.1)
Hospital	30 (4.1)	1 (1.9)	3 (6.0)	1 (2.0)	1 (3.1)	2 (6.7)	1 (5.9)	11 (3.8)	1 (2.0)	3 (3.1)	6 (11.5)
Deceased During GR	11 (1.5)	0 (0)	0 (0.0)	2 (4.0)	0 (0.0)	0 (0.0)	0 (0.0)	7 (2.4)	0 (0.0)	2 (2.1)	0 (0.0)
Other	15 (2.1)	5 (9,4)	0(0.0)	4 (8.0)	1 (3.1)	0 (0.0)	1 (5.9)	1 (0.3)	0 (0.0)	2 (2.1)	1 (1.9)

CZ= the Czech Republic, DE=Germany, IE=Ireland, IL=Israel, IT=Italy, MT=Malta, NL=the Netherlands, RU=Russia, ES=Spain, UK= the United Kingdom; *FCI=Functional Comorbidity Index; **CFS= Clinical Frailty Scale; ^NAMP= not available for majority of patients

were used between countries. In the Irish and Italian facilities two criteria were used for patient selection (cognitive status and functional status, and cognitive status and psychosocial needs respectively). In facilities from other countries combinations of up to six criteria were used (**Table 3**).

Minimum ages were used as selection criteria for geriatric rehabilitation across eight participating countries but not the Netherlands and Spain. In seven of the ten countries daily functioning and frailty were used as referral criteria. In German and Irish care facilities, daily functioning was used as a criterion but not frailty, and in the Italian care facilities neither one of these characteristics was used. Comorbidities were used as selection criterion in care facilities from six countries, but not in the Czech Republic, Ireland, Italy or Malta. Quality of life was not used as a selection criterion. Comprehensive Geriatric Assessment was used in patient selection for geriatric rehabilitation in six countries. In six countries, cognitive impairment that may affect adherence to geriatric rehabilitation treatment was used as a contraindication for referral to geriatric rehabilitation.

In most countries, selecting patients for geriatric rehabilitation after COVID-19 was the responsibility of hospital physicians and general practitioners (GPs). In Israel, referral could also be done by physio- or occupational therapists or social workers. In the United Kingdom, referral of COVID-19 patients was usually done by hospital nurses and therapists.

Geriatric rehabilitation care provided to post-COVID-19 patients

Geriatric rehabilitation care was provided in diverse types of care facilities. Participating care facilities included: specialized (geriatric) rehabilitation facilities from all countries except the United Kingdom; long-term care facilities and intermediate care facilities in Spain and the United Kingdom; skilled nursing facilities in the Netherlands; acute care hospital wards in the Czech Republic, Ireland, Spain, and United Kingdom; and geriatric rehabilitation care at home or on ambulatory/outpatient basis in the Netherlands, Russia, and Spain.

Post-COVID-19 geriatric rehabilitation care always comprised various treatments. In all countries at least 70% of participants received physiotherapy. Occupational therapy was provided to at least 70% of the participants in all countries except Italy, Russia and Spain. Most participants also received protein and calorie enriched diets (65.2%), but these showed greater variance between countries. In the Czech Republic, Israel, Malta, and Netherlands, more than three-quarters of the participants received protein and calorie-enrichment, but in Italy, Russia, and the United Kingdom this was 13.3, 36.0, and 40.0% respectively (**Figure 1**). Large differences between countries were observed
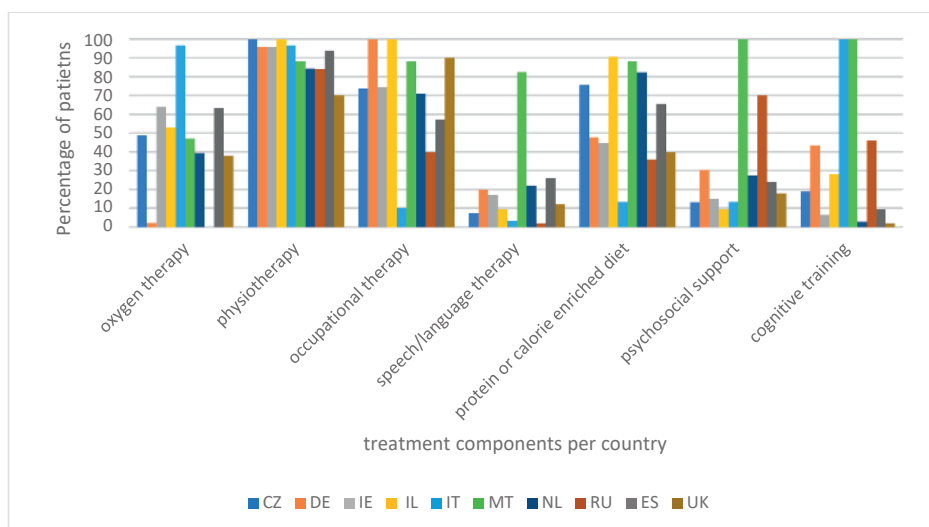
Table 3. Post-COVID-19 geriatric rehabilitation (GR): selection criteria, types of care facilities, and discharge criteria in the participating facilities

	All	CZ	DE	IE	IL	IT	MT	NL	RU	ES	UK
Participants, n (%)	723 (100)	53 (7.3)	50 (6.9)	50 (6.9)	32 (4.4)	30 (4.1)	17 (2.4)	293 (40.6)	50 (6.9)	96 (13.3)	52 (7.2)
GR selection criteria, x=criterion used											
Minimum age cut-off		65+	varying	varying	65+	varying	60+	N/A	65+	N/A	varying
Comprehensive geriatric assessment			x	x	x		x	x	x	x	x
Functional status		x	x	x	x		x	x	x	x	x
Frailty level		x					x	x	x	x	x
Multimorbidity			x		x			x	x	x	x
Psychosocial needs					x	x		x	x	x	
Cognitive impairment		x	x	x	x	x		x			x
GR care facilities, x=included facility type											
Nursing home/LTC* facility										x	x
Skilled Nursing facility							x	x			
Acute care hospital ward		x		x						x	x
Specialized rehabilitation facility		x	x	x	x	x	x	x	x	x	
Intermediate care facility										x	x
Home-based treatment								x			x
ambulatory/outpatient treatment								x	x	x	
GR discharge criteria, x=criterion used											
Ability to function in the premorbid living situation (with or without support)		x		x	x		x		x		
Duration of GR		varying	21 days	NA	90 days	30 days	N/A	180 days	60 days	N/A	42 days
Achievement of personal goals								x			x
Stability (medically/rehabilitation)								x		x	

CZ= the Czech Republic, DE=Germany, IE=Ireland, IL=Israel, IT=Italy, MT=Malta, NL=the Netherlands, RU=Russia, ES=Spain, UK= the United Kingdom; *LTC=Long-Term Care

in the number of participants receiving oxygen therapy during geriatric rehabilitation (43.1%), from no participants in Russia and only one in Germany, to all but one participant in Italy. Smaller percentages of participants received speech and language therapy (18.8%), psychosocial support (25.4%) and cognitive training (12.2%). In Malta, speech and language therapy was provided much more often than in other countries (82.4%). Psychosocial support was provided more often to participants from Malta and Russia (100.0% and 70.0% respectively) than in other countries, and cognitive training was provided more often to participants from Italy, Malta, and Russia (100.0%, 100.0%, and 46.0% respectively) than to participants from other countries.

The median duration of geriatric rehabilitation trajectories was 3.7 weeks (IQR 2.1 – 5.7). The longest median duration was in Malta (6.4 weeks, IQR 3.4 – 7.5) and the shortest in Russia (1.9 weeks, IQR 1.4 – 2.0).


**Fig. 1** Treatment components of geriatric rehabilitation for post-COVID-19 patients (n=670)
CZ= the Czech Republic, DE=Germany, IE=Ireland, IL=Israel, IT=Italy, MT=Malta, NL=the Netherlands, RU=Russia, ES=Spain, UK= the United Kingdom

Recovery of post-COVID-19 patients during geriatric rehabilitation

The recovery trajectories of daily functioning and quality of life in each country are shown in **Figures 2 and 3** respectively. In all countries, participants' Barthel Index scores decreased from premorbid to admission to geriatric rehabilitation and increased again during geriatric rehabilitation. These increases were the steepest in participants from the Czech Republic, Germany, and Russia, and the least steep in Israel, the United Kingdom and Malta (**Appendix IV**). On average participants did not reach their premorbid Barthel
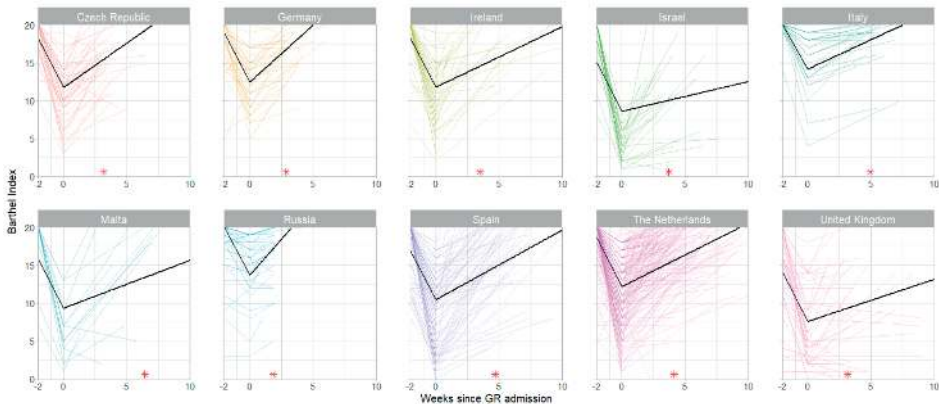
Fig.2 Recovery of post-COVID-19 patients in daily functioning during geriatric rehabilitation (GR) and median duration of GR (*)
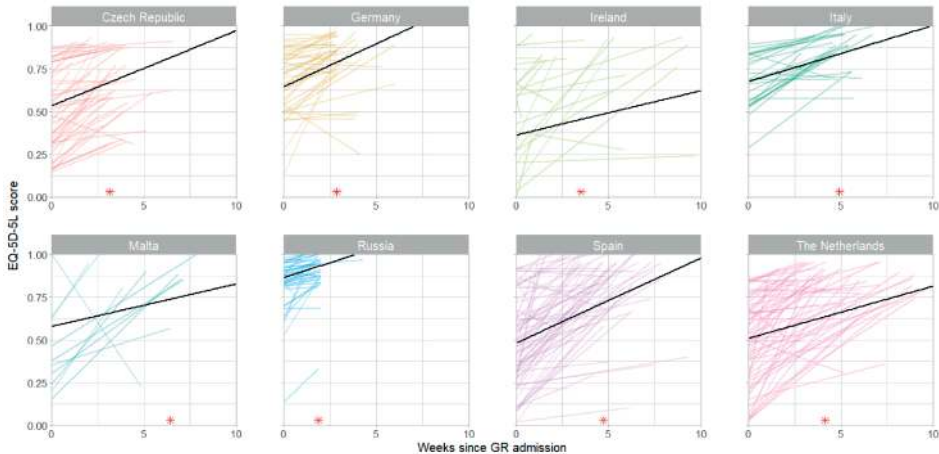
Fig.3 Recovery of post-COVID-19 patients in quality of life during geriatric rehabilitation (GR) and median duration of GR (*)

Index score during geriatric rehabilitation. Due to heterogeneous Barthel Index scores at admission, countries with the largest increase in Barthel Index between admission and discharge (Malta and Spain) were not the same as those with the highest Barthel Index score at discharge (Netherlands and Italy). Like Barthel Index scores, EQ-5D-5L scores increased in all countries where these were measured during geriatric rehabilitation. The steepest increases were in participants from the Czech Republic, Germany and Spain, and the least steep in Ireland, Malta and the Netherlands (**Appendix IV**).

Discharge of post-COVID-19 patients from geriatric rehabilitation

Table 3 indicates which criteria were used to determine discharge from geriatric rehabilitation by country. In several countries, participants were discharged when they were able to function independently (or with help of family) and/or to go back to their premorbid living situation. Besides this, achievement of personal treatment goals and stabilization of medical condition were criteria for discharge. In six of the ten countries, post-COVID-19 patients were automatically discharged after maximum duration of geriatric rehabilitation, ranging from 3.0 weeks (21 days) in participating German care facilities to 25.7 weeks (180 days) in facilities in the Netherlands. In Germany and in Italy, these permitted maximum durations (3 weeks (21 days) and 4.3 weeks (30 days) respectively) were exceeded by some participants (IQR 19.0 – 27.0; and IQR 29.0 – 39.0 days, respectively).

When discharged from geriatric rehabilitation, 75.2% of all study participants returned home (more than 65% in seven countries), compared to 93.4% still living at home premorbidly. However, in the Czech Republic, where patients' daily functioning recovery rates were relatively high, less than half (41.5%, n=22) of the 47 participants that premorbidly lived at home (88.7%) returned home after rehabilitation.

DISCUSSION

This study provides insight into the selection criteria for referral to geriatric rehabilitation, care provided, and post-COVID-19 recovery in patients receiving geriatric rehabilitation across ten different European countries. Across countries, post-COVID-19 patients showed recovery in daily functioning and quality of life during geriatric rehabilitation. The variation in selection criteria and patient characteristics was accompanied by some variation in recovery outcomes. All participating European countries used multiple selection criteria to refer patients to geriatric rehabilitation, often including patients' functional status, age, frailty, CGA, comorbidities, and cognitive impairments. Although care settings and care provided varied widely, in all countries the majority of patients received physiotherapy, and in many countries the majority also received occupational therapy. The median duration of geriatric rehabilitation trajectories ranged from 13 to 45 days across countries. In all countries post-COVID-19 patients showed recovery in daily functioning and quality of life during geriatric rehabilitation, albeit at variable rates. The steepest increases in daily functioning were seen in the Czech Republic, Germany, and Russia, and the steepest increases in quality of life were seen in the Czech Republic, Germany, and Spain.

Geriatric rehabilitation care already varied across Europe prior to the pandemic. Previous studies described large differences in care settings in which geriatric rehabilitation care is provided (7), duration of geriatric rehabilitation trajectories, and geriatric rehabilitation capacity (8). Despite these differences in settings, physiotherapists and occupational therapists have been the practitioners that were most often involved in geriatric rehabilitation teams across Europe (8) and this is reflected in our data. Variation in geriatric rehabilitation care between countries may have further increased during the pandemic because of differences in infection rates and ways of coping with COVID-19 (25). In Europe, Italy and the United Kingdom were hit hard during the first wave (spring 2020), with the highest death rates per million population (26). In the United Kingdom, rates of staff absenteeism also increased from 4% to over 6% during the pandemic (27). Moreover, the impact of the pandemic on the United Kingdom's healthcare system might have been even more severe due to pre-existing vulnerability before the pandemic, as the number of hospital beds and medical staff (28) per capita was already low. This seems to be in line with the relatively low recovery rate of daily functioning which we observed in the United Kingdom.

Based on the descriptive results of this study, hypotheses can be generated about potential relationships between patient characteristics, selection criteria, organizational aspects of geriatric rehabilitation, and recovery. Some remarkable things in our data are for example, first, that two of the three countries with the steepest recovery in daily functioning, the Czech Republic and Russia, are also the only countries that maintained a relatively high minimum age of 65 years old for geriatric rehabilitation selection. However, the mean ages of Czech and Russian patients (respectively 79.0 and 75.2) did not differ much from the population mean (75.7). In line with our findings, it has been suggested that age criteria should be combined with, for example, frailty criteria (7). Second, in countries with the lowest recovery rates in daily functioning, i.e. Israel, Malta, and the United Kingdom, patients were more frail and had lower daily functioning levels at admission to geriatric rehabilitation than in other countries. However, a previous publication of the EU-COGER study shows that post-COVID-19 patients who are frail at admission to geriatric rehabilitation also have the potential to substantially recover in daily functioning (29). Third, in the three countries with the highest recovery rates in daily functioning, the Czech Republic, Germany, and Russia, the lowest percentages of male participants were observed and few patients stayed at an ICU prior to admission to geriatric rehabilitation. It is also described in literature that for male COVID-19 patients outcomes are worse than for female patients (30), and that for other patient groups recovery after an ICU stay is difficult (31). However, in our study, large heterogeneity in known and unknown organizational variables may also have influenced recovery. Fourth, regarding treatment components, patients from countries with high recovery

rates, such as the Czech Republic and Germany, mainly received physiotherapy and occupational therapy, and in the Czech Republic also protein or calorie enriched diets. This suggests that physiotherapy, occupational therapy, and protein or calorie enriched diets are most important to increase daily functioning and quality of life. However, before recommendations can be made about how to optimize geriatric rehabilitation for post-COVID-19 patients, future explanatory research should confirm which organizational aspects of geriatric rehabilitation and which patient characteristics affect recovery. In order to do so, measurements of patient characteristics and recovery outcomes in geriatric rehabilitation across countries should be harmonized.

Some limitations of this study should be recognised. Firstly, we collected data from only a limited number of care facilities per country, and in some countries from small numbers of patients. Especially in large countries with small sample sizes, our data is unlikely to be representative of the participating countries as a whole. Secondly, the collected data may not provide a complete reflection of the geriatric rehabilitation care provided across Europe, as the treatment components presented in this study are not exhaustive. The most relevant treatment variables were, however, included as the study was designed by members of the EuGMS special interest group for geriatric rehabilitation from different countries, who can be regarded as experts in the field. Thirdly, as a consequence of only collecting routine care data, more detailed outcome measures of recovery (e.g. iADL), information about the frequency and duration of geriatric rehabilitation treatment components are lacking, and the survey did not collect cut-off values in selection and discharge criteria. Insight into these factors could add to a better understanding of rehabilitation and recovery in each country (32). Fourthly, the observed variation in recovery rates may partly be explained by variation in the timing of patients' admission to geriatric rehabilitation. During the inclusion period, between September 2020 and October 2021, treatment effectiveness and organization of geriatric rehabilitation care for post-COVID-19 patients might have improved. It would be interesting to conduct future research into changes in care over time.

A strength of this study is that patients from care facilities from ten European countries were included. This international collaboration was set up quickly during a turbulent time. This study provides unique insight into the care provided on a large scale during the first year of the pandemic. A second strength is the combination of patient data from our cohort with survey data about the care organization in participating countries. This provides a comprehensive picture of post-COVID-19 patients admitted to geriatric rehabilitation, their recovery during geriatric rehabilitation, and the organization of geriatric rehabilitation care. A third strength is that this study focused on geriatric rehabilitation

after acute COVID-19. Although a number of studies have observed recovery of older COVID-19 patients, not much research has been focused on rehabilitation (33).

CONCLUSION

The present study shows that post-COVID-19 patients substantially recover during geriatric rehabilitation across Europe, although there was variation in the rates of recovery between countries. This variation may partly be explained by the heterogeneity in geriatric rehabilitation practice and patient characteristics between countries. This heterogeneity complicates international comparisons. Moreover, this heterogeneity suggests that geriatric rehabilitation has not been given equal priority between countries. This study may enable countries to learn from each other, and facilitated the generation of hypotheses about factors that are related to recovery. Future explanatory studies and harmonisation of measurements in geriatric rehabilitation are needed to understand the optimal configuration of rehabilitation care. The ultimate goal should be to ensure that all patients, wherever they live, can receive the best available rehabilitation care to which they are entitled.

Data availability The data are not publicly available due to the agreement with participating care facilities and the consentprovided by patients included. Researchers who wish to conduct analyses using EU-COGER data should submit a proposal to P.I. Prof.Wilco Achterberg (W.P.Achterberg@lumc.nl) including

research questions and an analysis plan. If the request is approved, a data transferagreement has to be signed before the data will be shared.

Declarations:

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

Ethical approval The Leiden UniversityMedical Center COVID-19 science ethical committee deemed this study exempt from the Medical Research Involving Human SubjectsAct (WMO) since the study only used routinely collected data, and approved the study based on an opt-out procedure for the Netherlands(protocol number CoCo 2020-040). In all other countries, the local regulations were adhered to and, when required, additional approvalwas obtained from a local Ethics committee.

Informed consent As the study was approved based on an opt-out procedure for theNetherlands, informed consent was not required. In all other countries, the local regulations were adhered to and, when required, informedconsent was obtained from participants.

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APPENDIX I. EU-COGER CONSORTIUM LIST

Name healthcare organization	Country	Professional 1	Professional 2	Professional 3	Professional 4
Vseobecna fakultní nemocnice	Czech Republic	Eva Topinková	Lucie Bautzká	Helena Michaálková	
Agaplesion Bethanien Hospital	Germany	Stefan Grund	Thomas Mross	Lotte Feesche	
Robert-Bosch-Krankenhaus	Germany	Rebekka Leonhardt	Clemens Becker		
Geriatrisches Zentrum Karlsruhe	Germany	Jan Gerhardus	Brigitte R. Metz		
Geriatrische Rehabilitationsklinik Diakonissenkrankenhaus Mannheim	Germany	Diana Franke-Chowdhury			
University of Limerick Hospital Group (ULHG)	Ireland	Rose Galvin	Aoife McCarthy		
Beaumont Hospital	Ireland	Frances Dockery	Kara McLoughlin		
Fliman geriatric rehabilitation center	Israel	Bahaa Francis			
IRCCS Istituti Clinici Maugeri	Italy	Matteo Cesari	Annalisa Valentini		
Karin Grech Hospital	Malta	Mark Vassallo	Maria Bonnici		
Russian Clinical and Research Center of Gerontology	Russia	Olga Nikolaevna Tkacheva	Ksenia Eruslanova		
Moscow Rehabilitation center	Russia	Luba Matchekhina			
Parc Sanitari Pere Virgili	Spain	Laura Monica Perez Bazan			
Hospital Universitari Sant Joan de Reus	Spain	Esther Roquer Fanlo			
Hospital Universitari Parc de Salut Mar	Spain	Anna Renom Guiteras	Lizzeth Angela Canchucaja		
Hospital Central de la Cruz Roja San José y Santa Adela	Spain	Beatriz Pallardo	Sergio Martínez Zujeros		
Hospital San Joan de Deu Mallorca	Spain	Margarita Viñuela	Oriol Miralles Resina		
Hospital Guadarrama	Spain	Gema Isabel Dominguez	Sarah Caro Bragado		
Hospital de Barcelona	Spain	Nadia Stasi	Jennifer Garrillo Cepeda		

(*continued*)

Name healthcare organization	Country	Professional 1	Professional 2	Professional 3	Professional 4
Consorci Sanitari Alt⬚Pènedes i Garraf	Spain	Marta Arroyo-Huido-bro	Ana Gonzalez		
Leiden University Medical Center	the Netherlands	Wilco Achterberg	Monique Caljouw	Miriam Haaksma	Lisa van Tol
Omring	the Netherlands	Saskia Drijver			
Zorgcirkel	the Netherlands	Paula Vonk			
BrabantZorg	the Netherlands	Liesbeth Sikken	Irma Baars		
Ijsselheem	the Netherlands	Nathalie Deden			
Topaz Revitel	the Netherlands	Gerda Nijgh	Sylvia van der Drift		
Tante Louise	the Netherlands	Heike de Wever	Els Calle		
MUMC+|Herstelzorg – Vitala+	the Netherlands	Kaoutar Karramass	Josette Hendriks		
Maastricht University	the Netherlands	Jos Schols	Irma Everink		
Axion continu	the Netherlands	Lauren Ebbes			
TriviumMeulenbeltZorg Almelo	the Netherlands	Anne Hartman	Hatice Koc		
TriviumMeulenbeltZorg Hengelo	the Netherlands	Laura de Vries			
Patyna	the Netherlands	Hylco Bouwstra			
Careyn	the Netherlands	Laura Langendoen-Wigman			
Sensire	the Netherlands	Berber Oldenbeuving	Sabine Noordam-Hemelt-jen		
Azora	the Netherlands	Liesbeth Lanting	Lulu Andela		
Argos Zorggroep	the Netherlands	Mathilde Meerkerk			
Meriant (Alliade)	the Netherlands	Lianne Willemstein	Krisztina Krasznai		
Liemerije	the Netherlands	Janneke Wolting			
Laurens Intermezzo Zuid	the Netherlands	Janette Tazmi			
de Wever	the Netherlands	Eveline Keustermans			

(continued)

Name healthcare organization	Country	Professional 1	Professional 2	Professional 3	Professional 4
Icare – De Boshof	the Netherlands	Janetta de Vries	Sanne van Weers		
SVRZ 't Gasthuis	the Netherlands	Lenni Boogaard			
De Betuwe, Zorgcentrum Beatrix	the Netherlands	Simone Been			
Archipel Zorggroep	the Netherlands	Danielle Termeer			
Florence	the Netherlands	Patricia te Pas	Eva Lodewijks		
Pieter van Foreest, locatie Bieslandhof	the Netherlands	Jeroen van den Berg			
Reactiveringscentrum Klimop	the Netherlands	Sandra Prent	Marloes Boontje		
Zorgspectrum Nieuwegein	the Netherlands	Joël Harms	Jeffrey Bakker		
Zorggroep Maas en Waal	the Netherlands	Carolien de Croon			
Attent	the Netherlands	Christa van Schieveen			
Vivium Flevoburen (Zorggroep Almere)	the Netherlands	Ewout Smit			
Kennemerhart Schoterhof	the Netherlands	Patricia van Berlo			
Van Neynsel	the Netherlands	Dionne Ruchtie			
Sheffield teaching Hospitals	UK	Jane Manson			
Frimley Health NHS Foundation Trust	UK	Maria Espasandin	Lucy Abbott		
Harrogate District Hospital	UK	Sarah Chadwick	Rebecca Watts		
Imperial College Healthcare NHS Trust	UK	Melani Dani	Jackie McNicholas		
University Hospitals of Derby and Burton	UK	Adam Gordon			
Calderdale & Huddersfield	UK	Vincent Chau			
Derbyshire Community Health Services	UK	Andy Cole			

APPENDIX II. MISSING DATA

Table I. Missing data in characteristics of post-COVID-19 patients in geriatric rehabilitation (GR).

	ALL	CZ	DE	IE	IL	IT	MT	NL	RU	ES	UK
Number of participants per country, n (%)	**723 (100)**	**53 (7.3)**	**50 (6.9)**	**50 (6.9)**	**32 (4.4)**	**30 (4.1)**	**17 (2.4)**	**293 (40.6)**	**50 (6.9)**	**96 (13.3)**	**52 (7.2)**
Patients with missing data on…, n (%)											
Age											
Sex, male, n (%)											
Number of comorbidities, FCI*	89 (12.3)		11 (22.0)	3 (6.0)		1 (3.3)	1 (5.9)	58 (19.8)	2 (4.0)	5 (5.21)	8 (15.4)
Frailty at GR admission, CFS**	230 (31.8)		1 (2.0)	19 (28.0)	19 (59.0)	1 (3.3)		168 (57.3)	10 (20.0)	12 (23.1)	12 (23.1)
Lived at home premorbid	3 (0.4)								1 (2.0)		2 (3.8)
Hospital stay before GR admission, n (%)	1 (0.1)							1 (0.3)			
Hospital length of stay prior to GR, n (%)	78 (10.8)	8 (15.1)	1 (2.0)	11 (22.0)			1 (5.9)	30 (10.2)	22 (44.0)	3 (3.13)	2 (3.8)
ICU stay prior to GR, n (%)	12 (1.7)					1 (3.3)		11 (3.8)			
Treatment components, n (%)	53 (7.3)		4 (8.0)					44 (15.0)		1 (1.04)	2 (3.8)
Duration GR, weeks, n (%)	32 (4.4)		2 (4.0)		3 (9.4)			23 (7.8)		1 (1.04)	2 (3.8)
Daily functioning, Barthel Index, n (%)											
at GR admission	9 (1.2)							8 (2.7)			1 (1.9)
at GR discharge	68 (9.4)		4 (8.0)	6 (12.0)				56 (19.1)		1 (1.04)	1 (1.9)
Quality of Life, EQ-5D-5L, n (%)											
at GR admission	252 (34.9)			11 (22.0)	30 (100.0)			149 (50.9)		11 (0.11)	48 (92.3)
at GR discharge	310 (42.9)		4 (8.0)	12 (24.0)	30 (100.0)	1 (3.3)		198 (67.6)		14 (14.6)	49 (94.2)
Discharge destination, n (%)	20 (2.8)		2 (4.0)	2 (4.0)				15 (5.12)		1 (1.04)	

CZ= the Czech Republic, DE=Germany, IE=Ireland, IL=Israel, IT=Italy, MT=Malta, NL=the Netherlands, RU=Russia, ES=Spain, UK= the United Kingdom; *FCI=Functional Comorbidity Index; **CFS= Clinical Frailty Scale

APPENDIX III. GLOSSARY GERIATRIC REHABILITATION (GR) CARE FACILITIES

Nursing home/long term care facility	An inpatient rehabilitation and medical treatment centre staffed with trained medical professionals, providing round-the-clock care. It is a **long term** residence.
Skilled nursing facility	An inpatient rehabilitation and medical treatment centre staffed with trained medical professionals, providing 24-hour nursing supervision. It is a **temporary** residence.
Acute care hospital ward	A ward of an acute care hospital (i.e. a hospital that provides inpatient medical care and other related services for surgery, acute medical conditions or injuries) dedicated specifically to (geriatric) rehabilitation, staffed with trained medical professionals, providing 24-hour nursing supervision. It is a **temporary** residence.
Specialised rehabilitation facility	An inpatient centre dedicated specifically to (geriatric) rehabilitation, staffed with trained medical professionals, providing 24-hour nursing supervision. It is a **temporary** residence.
Intermediate care facility	An inpatient rehabilitation and medical treatment centre staffed with trained medical professionals, which does **not** provide 24-hour nursing supervision. It is a **temporary** residence which generally caters to patients who are mobile and need less care compared to patients in skilled nursing facilities.
Ambulatory / outpatient treatment	Care that doesn't involve admission to an inpatient hospital bed. The patient visits the caregiver.
Home-based treatment	Care that doesn't involve admission to an inpatient hospital bed. The caregiver visits the patient at home for treatment.

APPENDIX IV. MODEL ESTIMATES FOR RECOVERY IN DAILY FUNCTIONING AND QUALITY OF LIFE

Table S1. Linear mixed model for change in daily functioning (Barthel Index) over time ($n = 699$).

Model parameters	
Fixed effects *	
Intercept (at admission)	
Country	
Reference: United Kingdom	7.58 (0.47)
the Czech Republic	4.18 (0.65)
Germany	4.87 (0.66)
Ireland	4.20 (0.65)
Israel	1.00 (0.73)
Italy	6.60 (0.77)
Malta	1.76 (0.92)
Russia	6.09 (0.66)
Spain	2.87 (0.58)
The Netherlands	4.60 (0.52)
Linear weekly rate of change shortly before admission	-3.25 (0.09)
Linear weekly rate of change after admission	
Country	
Reference: United Kingdom	0.56 (0.14)
the Czech Republic	0.61 (0.22)
Germany	0.95 (0.24)
Ireland	0.24 (0.19)
Israel	-0.16 (0.20)
Italy	0.22 (0.22)
Malta	0.08 (0.21)
Russia	1.35 (0.36)
Spain	0.36 (0.16)
The Netherlands	0.28 (0.15)
Random effects	
Intercept variance	5.21 (2.28)
Slope variance after admission	0.09 (0.31)
Residual variance	11.77 (3.43)

*adjusted for: mean centred age and sex

Table S2. Linear mixed model for change in quality of life (EQ-5D-5L) over time ($n = 481$).

Model parameters	
Fixed effects *	
Intercept (at admission)	
Country	
Reference: Ireland	0.36 (0.04)
the Czech Republic	0.17 (0.05)
Germany	0.28 (0.06)
Italy	0.31 (0.06)
Malta	0.22 (0.07)
Russia	0.50 (0.05)
Spain	0.12 (0.05)
The Netherlands	0.15 (0.04)
Linear weekly rate of change after admission	
Country	
Reference: Ireland	0.03 (0.01)
the Czech Republic	0.02 (0.01)
Germany	0.02 (0.01)
Italy	0.01 (0.01)
Malta	-0.01 (0.01)
Russia	0.01 (0.02)
Spain	0.02 (0.01)
The Netherlands	0.00 (0.01)
Random effects	
Intercept variance	0.04 (0.19)
Residual variance	0.04 (0.19)

*adjusted for: mean centred age and sex

APPENDIX V. MULTILEVEL MODEL EQUATIONS

level 1: $Y_{ij} = a + b*x_{ij} + c*age + d*sex + f_i + \varepsilon_{ij}$

where:

Y_{ij} = Barthel Index (BI) or EQ-5D-5L score (QoL) for individual i at time j

a = intercept parameter (BI or QoL at GR admission)

b = slope parameter

x_{ij} = weeks since admission for individual i at time j

c = parameter estimate for age

d = parameter estimate for sex

f = parameter estimate for country of individual i

ε = residual error for individual i at time j

level 2: $a = a_0 + a_i$

where:

a_0 = fixed intercept (BI or QoL at GR admission)

a_i = random intercept for individual i

$b = b_0 + b_i$

where:

b_0 = fixed slope

a_i = random slope for individual i (only in BI model, as this parameter resulted in non-convergence for QoL)
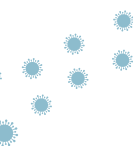
Final chapters

9

General discussion

This chapter outlines the main findings of the studies in this thesis, reflects on the findings by placing them in a broader perspective, describes some methodological considerations, and presents recommendations for practice, policy, education, and future research.

SUMMARY OF MAIN FINDINGS

Part 1 of this thesis aimed to describe the impact of, challenges presented by, and policy responses of Dutch nursing home organizations to the COVID-19 pandemic, particularly regarding infection prevention and maintaining the well-being of nursing home residents. **Chapter 2** describes that multidisciplinary COVID-19 outbreak teams of 41 Dutch nursing home organizations participated in the COVID-19 management in nursing homes by outbreak teams (MINUTES) study. These outbreak teams discussed eight recurring topics: 1. crisis management, including infection rates, frequency of outbreak team meetings, COVID-19 related finances, internal and external communication, and regional collaboration; 2. isolation and distancing measures for residents; 3. personal protective equipment (PPE) and hygiene; 4. staff, including distancing measures for staff, staff scheduling, and staff well-being; 5. resident well-being; 6. visitor policies; 7. testing; and 8. vaccination. **Chapter 3** showed that COVID-19 outbreak teams discussed and implemented a variety of distancing measures. The most frequently discussed were visitor bans and other visitor policies. Also discussed were different types of isolation measures, measures to distance staff and volunteers from residents, measures to distance among residents, and admission measures. Challenges with distancing measures persisted over time. These included, but were not limited to, unrest and conflicts between visitors and staff, visitors not complying with measures, resident non-adherence, and staffing issues. **Chapter 4** showed that outbreak teams discussed continuing and restarting activities for nursing home residents more often than stopping activities. Maintaining resident well-being was an important consideration for continuing or restarting activities. However, activities were often continued or restarted under certain conditions, such as being in accordance with governmental guidelines, limited group size, at assigned locations, for residents without COVID-19-related symptoms, or later only for vaccinated residents. In **Chapter 5**, Nominal Group Technique (NGT) panels were performed with multidisciplinary nursing home staff and resident representatives. The panels prioritized the most important measures to prevent SARS-CoV-2 infections among nursing home residents: cohort isolation, other isolation measures for residents who are cognitively unable to adhere to cohort isolation, basing isolation measures on test results, testing in case of symptoms, use of PPE around (suspected) infected residents, and preparing for outbreaks. Prioritized measures to maintain resident well-being were, again, cohort

isolation and basing isolation measures on test results, but also exceptions to visitor bans, and various visitor policies. In addition, this chapter describes how resident representatives and staff were dissatisfied with their limited involvement in local COVID-19 policy decisions during the first months of the pandemic. **Chapter 6** explains that two NGT panels found five of the strategies described in the outbreak teams' minutes for overcoming nursing home staff reluctance to be vaccinated against COVID-19 to be important: personal contact and opportunities to ask questions, for example during team meetings; sharing of stories among staff; logistical support, such as transportation to a vaccination location; role models who share their opinions; visual information, such as informative videos; and written information, for example through the intranet or newsletters. A sixth strategy, providing financial rewards such as gift cards, was not found to be stimulating.

In **part 2** of this thesis, the aim was to describe recovery of post-COVID-19 patients admitted to geriatric rehabilitation and the rehabilitation care they received, across Europe. **Chapter 7** showed that, on average, geriatric post-COVID-19 patients included in the European Cooperation in Geriatric Rehabilitation (EU-COGER) study recover substantially in terms of daily functioning and quality of life. This is the case for fit, as well as for pre-frail and frail patients. In **Chapter 8**, some differences were observed in the rates of recovery between patients included from various European countries. These differences may be partly explained by variation in selection criteria for referral to geriatric rehabilitation, in patient characteristics, and in provided care. Functional status, age, frailty, Comprehensive Geriatric Assessment, comorbidities, and cognitive impairments were part of the selection criteria in various countries, but in different combinations. Most patients received physiotherapy and occupational therapy. The median duration of geriatric rehabilitation care ranged from 13 to 45 days across countries.

MAIN FINDINGS IN A BROADER PERSPECTIVE

In March 2020, it was not anticipated that the pandemic would continue for much longer than a few weeks. The COVID-19 pandemic lasted for over three years, until May 2023 (1, 2). During this time, almost seven million deaths were recorded worldwide (1, 2). The nursing home sector was hit hard. It has been estimated that, almost half of the Dutch COVID-19 deaths occurred within nursing homes, while they represent less than one percent of the population (3). Constant shifts in infection rates, knowledge development, and availability of materials such as PPE, tests, and vaccines followed each other rapidly. This required continuous policy changes. **Figure 1** presents an overview

of important Dutch policy decisions and other important moments for vulnerable older persons during the period of the studies in this thesis, based on several sources (4-6).

Weighing infection prevention and maintaining well-being among nursing home residents

Generic infection prevention measures were imposed top-down
During the first wave of the pandemic, the government imposed generic infection prevention measures, including a visitor ban for nursing homes (4, 7), and a national 'intelligent lockdown' (**Figure 1**). Nursing home organizations were obligated to implement (derivatives of) these measures locally. At this time it was expected that, if we acted quickly, these measures would only be needed for a few weeks (8). Policy decisions about these measures were therefore made more quickly and more top-down than usual. The Outbreak Management Team was established to advise the Dutch government about adequate national measures (9). Within nursing home organizations, outbreak teams implemented the generic infection prevention measures **(Chapter 5)** (10). The objective of these quickly imposed generic measures was to prevent the spread of the disease, illness and death.

Not enough weight was given to well-being
For nursing home residents, who have a relatively short remaining life expectancy, well-being is often considered more important than the prevention of illness and death. Social relationships play an important role in the perceived well-being of nursing home residents (11), but restrictions in social contacts and freedom of movement were inherent in infection prevention measures. A negative impact of these measures on the well-being of nursing home residents might therefore have been expected. However, at the start of the COVID-19 pandemic, literature on the effects of infection prevention measures on the well-being of vulnerable older persons was still scarce (12, 13).

After the measures were maintained for more than a few weeks, it became clear that the impact of these generic measures on the overall well-being of nursing home residents was indeed predominantly negative. Residents showed increased symptoms of depression, loneliness, anxiety (14-16), and decreased physical health (14, 17). An exception to these negative effects was sometimes seen in a reduction in challenging behaviour among nursing home residents with dementia (18).

early December, 2019	•	SARS-CoV-2 virus discovered in Wuhan, China
late January, 2020	•	first COVID-19 cases in Europe
January 30	•	WHO[1] declares the COVID-19 pandemic a public health emergency
February 27	•	first COVID-19 case detected in the Netherlands
early March, 2020	•	first large European COVID-19 outbreak in Lombardy, Italy
March 6	•	first recorded COVID-19-related death in the Netherlands
March 9	•	start of data collection MINUTES study
mid-March	•	Europe is epicentre of the pandemic
March 12	•	national infection prevention measures introduced, including. call to limit visits to older people
March 15	•	tightening of national infection prevention measures
March 18	•	national plan to manage shortage of PPE
March 20	•	national visitors ban in nursing homes
March 23	•	national 'intelligent lock down'
March 26	•	tightening of intelligent lock down, including keeping distance of 1.5 meters
April 6	•	testing available for nursing home staff and residents
May 11	•	start of pilot reopening nursing homes to visitors
May 26, 2020	•	reopening of all nursing homes free of COVID-19 for visitors
June 1	•	start of relaxation of national intelligent lock down measures
June 1	•	testing possible for all Dutch citizens
June 6	•	first NGT panel study panel conversation
September 29, 2020	•	tightening of national infection prevention measures
October 1	•	start of patient recruitment EU-COGER study
October 14	•	start of 'partial lockdown'
November 3	•	tightening of partial lockdown
late November	•	last panel conversations of NGT panel study about well-being and infection prevention
January 6, 2021	•	start of vaccination in the Netherlands with vaccination of nursing home staff
January 18	•	start of vaccination of nursing home residents
April 4	•	last panel conversation of NGT panel study about vaccination strategies
June 5	•	start of relaxation of partial lockdown
July 10, 2021	•	tightening of national infection prevention measures
September 25	•	relaxation of national infection prevention measures
October 31	•	end of patient recruitment EU-COGER study
October 31	•	end of data collection in the MINUTES study
November 2, 2021	•	tightening of national infection prevention measures
November 12	•	start of new 'partial lockdown'
November 26	•	tightening of lockdown measures i.e. with evening lockdown
December 19	•	tightening of 'partial lockdown' to 'hard lockdown'
January 10, 2022	•	first relaxations of the lockdown measures
February -May	•	further relaxation of lockdown measures
July 31	•	end of collection follow-up data EU-COGER study
	•	[..]
May 5, 2023	•	World Health Organization declares end of COVID-19 pandemic as international public health emergency

Figure 1. Timeline of policy decisions and other important moments regarding care for vulnerable older persons in the Netherlands during the studies of this thesis.

Lessons learned on finding a balance between infection prevention and well-being

An important insight resulting from the pandemic, is that the need to prevent infections should never overshadow the importance of the overall well-being of nursing home residents. Over time, a few lessons on how to prevent this in practice were learned.

First, some measures with a large impact on resident well-being over time were replaced with - often milder - alternatives. Visitor bans strongly limited residents' social contact and therefore their well-being (**Chapter 5**) (19). As a result, the national visitors ban received negative media attention, based in part on the results of the MINUTES study (7, 20, 21). In May 2020, the Dutch government mandated reopening of nursing homes to visitors (**Figure 1**) (22). Nursing homes replaced visitor bans with other visitor policies, such as visits at assigned places, fixed times, instruction for visitors, and limited numbers

of visitors (**Chapter 5**). With regard to isolation measures, experience has shown that both transfer to an isolation unit and isolation in a single room could have a major impact, especially on residents with cognitive impairments. Cohort isolation was perceived as a better alternative, as this type of isolation allows residents to stay in their own environment and maintain some freedom of movement (**Chapters 3 and 5**). In addition, discontinuing activities was thought to be detrimental to the well-being of nursing home residents. Using creative solutions, outbreak teams were able to continue or restart activities while infection prevention measures were in force (**Chapter 4**). For a better balance between infection prevention and well-being during future outbreaks of infectious diseases that can cause severe illness among vulnerable older adults, visitor bans should be avoided, as well as transfer to isolation units and isolation in single rooms for residents with cognitive impairments. Other visitor policies and cohort isolation can be considered as suitable alternatives. In addition, activities should be continued, if necessary in a modified form.

Second, there did not appear to be a 'one size fits all'. Which distancing measures and other infection prevention measures best balance infection prevention and well-being was found to depend on the local context in nursing homes, including the physical structure of the building, infection rates, residents' cognitive abilities to understand and comply with the measures, residents' family adherence to the measures, and availability of staff (**Chapter 3**) (23). Cohort isolation, for example, could only be applied if the structure of the building allowed it, and if there was enough staff available and willing to be divided over cohorts (**Chapter 3**). Over time, the government gave nursing home organizations more room to tailor infection prevention measures such as visitor policies, and nursing home organizations increasingly gave to departments and healthcare professionals more freedom to tailor measures (**Chapters 3 and 5**). In future outbreaks, more responsibility for tailoring generic measures should therefore be given locally to, for example, team leaders or (nurse) practitioners.

The imbalance between infection prevention and well-being may have resulted in part from an imbalance in who made decisions, and who were left out of decision-making. Most nursing homes' outbreak teams initially included managers and physicians, but not nurses or resident representatives (**Chapter 2**). Moreover, client council meetings were hampered by the visitor ban, and pressure to act quickly (**Chapter 5**) (24). This was despite the legal obligation to consult with a client council on decisions that affect resident care (25, 26). Also at the national level, the Outbreak Management Team initially included, for example, virologists, epidemiologists and acute care physicians, but the nursing (home) sector and vulnerable older persons were not represented (9). It is important to involve all stakeholders in policymaking because they all have a unique

perspective on care. Traditionally, physicians are educated to rely on diagnoses and make decisions (27), nurses are trained to work from a more person-centred view (27), and resident representatives are more focussed on social and emotional aspects of care than on care tasks (28). In several nursing home organizations, following societal concerns about the impact of the national visitor ban on resident well-being, client councils and staff were involved again in the development of alternative visitor policies (24). This was an important step in restoring the balance between infection prevention and well-being. The NGT panels were experienced as a suitable method to include perspectives from different stakeholders (**Chapter 5**). Multidisciplinary decision-making should be better preserved in future pandemics or other situations that require adapted decision-making. Therefore, it may be useful to practice multidisciplinary collaboration and decision-making during the education of nurses, physicians, and other (future) nursing home staff, according to the principles of team-based learning (29). By doing so, they develop appreciation for teamwork for accomplishing difficult tasks or decisions (29).

Fourth, maintaining well-being became easier when materials such as PPE, clinical tests, and vaccines became available (**Figure 1**). PPE and tests made it possible to impose more targeted distancing measures. For example, when tests became available it was no longer needed to isolate and restrict the freedom of movement of all residents (in wards) with symptoms, but only of residents with confirmed tests (**Chapter 5**). As vaccines prevent illness and death, they reduce the need for other infection prevention measures and, for example, facilitate the restart of activities for residents (**Chapter 4**). With future emerging infectious diseases that can cause severe illness among vulnerable older adults, it is therefore important to invest in the development and availability of PPE, tests, and vaccines. In addition, especially when vaccines become available, it is important to stimulate willingness of (legal representatives of) residents and the people around them to be vaccinated. To stimulate staff, the five strategies that were found to be important to do so in **Chapter 6** should be used.

Geriatric rehabilitation care for older persons with serious infections

Substantial recovery after COVID-19 despite differences in geriatric rehabilitation care

Throughout the pandemic, many patients were admitted to geriatric rehabilitation to recover from a SARS-CoV-2 infection. Before the pandemic, only a minority of geriatric rehabilitation admissions were due to infection (30, 31). Post-COVID-19 patients admitted to geriatric rehabilitation recovered well in terms of daily functioning and quality of life. Across countries, they showed recovery during geriatric rehabilitation (**Chapter 8**) and continued to recover after rehabilitation almost up to their premorbid status within

a few months (**Chapter 7**). In comparison, Dutch patients who underwent geriatric rehabilitation after traumatic injuries or stroke showed less increase in daily functioning (30). These findings suggest that the recovery capacity of vulnerable older patients with COVID-19, and perhaps other serious infections, is greater than expected, and that they should be offered geriatric rehabilitation care. In addition, COVID-19 patient who were frail at admission to geriatric rehabilitation have the potential to recover as well as more fit patients (**Chapter 7**). The same was observed for COVID-19 patients who did or did not experience delirium during or before geriatric rehabilitation (32). This suggests that caution is warranted in triaging and rejecting vulnerable older patients who have experienced a serious infection for geriatric rehabilitation, including those who are thought to have little rehabilitation potential.

Across countries, patients admitted to geriatric rehabilitation showed recovery, despite some differences in the organization of geriatric rehabilitation care (**Chapter 8**). Several of these differences reflect differences in healthcare systems and health policies, rather than differences between patients. For example, no Russian patients and only one German patients received oxygen therapy during geriatric rehabilitation, probably because they were not allowed to be transferred to a specialized rehabilitation facility (Germany) or to go home (Russia) with oxygen equipment (**Chapter 8**). In addition, at more than six weeks Malta had the longest average duration of geriatric rehabilitation, whereas in some other countries policies stipulated that rehabilitation trajectories should be shorter than this (**Chapter 8**). Besides some differences between countries across Europe in terms of organization of geriatric rehabilitation care, also many similarities were observed (**Chapter 8**).

Developing more homogeneity in measurement instruments used in geriatric rehabilitation across Europe

To gain insight into the recovery trajectories of patients admitted to geriatric rehabilitation across countries, recovery should be measured with instruments that are routinely used internationally. Currently, there still is great heterogeneity in the measurement instruments used in geriatric rehabilitation (33). Furthermore, recovery should be measured with instruments that are consistent with the international definition of geriatric rehabilitation developed by Grund et al. (34) and with the World Health Organization (WHO) International Classification of Functioning, Disability and Health (ICF) (35) on which the international definition is based. According to this definition, the purpose of geriatric rehabilitation is to optimise functional capacity, promote activity, and preserve functional reserve and social participation (34). The ICF model implies that functioning and disability are determined by physical functions, activities, and participation (35). In the EU-COGER study, recovery was measured with two of the few measurement instru-

ments that met these two requirements (33): the Barthel Index for daily functioning (36) and the EQ-5D-5L for quality of life (37) (**Chapters 7 and 8**).

International geriatric rehabilitation research would benefit from an international core set of measurement instruments (38). The EU-COGER study may stimulate the development of such a core set of instruments. The study demonstrated that at least the Barthel Index and EQ-5D-5L are suitable for generic use in international comparative research. In addition, the study established an international collaboration between geriatric rehabilitation care providers from ten countries. In addition to the Barthel Index and the EQ-5D-5L, a core set could also include, first, an instrument to measure social participation. According to the consensus definition of geriatric rehabilitation and the ICF model, as well as according to patients (39), participation in society and social relationships are important outcomes of geriatric rehabilitation. Existing measurement instruments for participation, such as the Participation scale (P-scale) (40), may need to be adapted and validated for vulnerable older persons, before they can be used in geriatric rehabilitation. Second, a core set of measurement instruments could develop more homogeneity in the measurement of cognition. At present, numerous instruments are used in different countries (33). Third, the Clinical Frailty Scale (CFS) for frailty (41), could be included in this core set. One of the first international guidelines for the care of adults with COVID-19 recommended taking CFS into account when making treatment decisions (42). As a result, the CFS was increasingly used in COVID-19-related care and research during the pandemic (43). Ultimately, more homogeneity in measurement instruments and international research will stimulate the optimization of geriatric rehabilitation care and recovery of vulnerable older patients after serious health events.

METHODOLOGICAL CONSIDERATIONS

Acute situations demand rapid and responsive research

Researchers have a responsibility to create knowledge that serves society and contributes to the greater good. This should mean that researchers adapt their usual ways of working when extraordinary circumstances in an ever-changing context call for extraordinary research. The studies in this thesis were carried out according to the principles of 'rapid and responsive' research methods. The aim of rapid and responsive research is to shorten the time-frame for conducting research and disseminating results when pressing contextual developments make it impossible to wait for more time-consuming research and scientific publications before taking action (44, 45). The results of rapid and responsive research often serve as input for policy (44, 45). Rapid and responsive research has been used more frequently in humanitarian crises, including wars, hurricanes

and other natural disasters, and in previous public health threats such as the spread of HIV/AIDS and the Ebola epidemic (44, 46-48). However, they may also be useful for answering other policy-related or context-dependent research questions (44, 46), or in rapidly developing fields of research. Several advantages and disadvantages of applied rapid and responsive research principles are described below.

Rapid recruitment: making use of existing research infrastructures

Using an existing research infrastructure enables rapid recruitment of participants and saves time that must be invested in building trust with new relationships (47). For the MINUTES study and the NGT panel study, a large number of Dutch nursing home organizations could be quickly approached thought the Dutch Collaborative Academic Networks for care for Older persons ('Samenwerkende Academische Netwerken Ouderenzorg', SANO). The EU-COGER study was initiated by the University Network for the Care sector Zuid-Holland (UNC-ZH) and members of the European Geriatric Medicine (EuGMS) special interest group for geriatric rehabilitation. Several members of the special interest group were willing to recruit and maintained contact with other participating geriatric rehabilitation care facilities in their country.

Rapid data collection: Making use of existing data

The MINUTES study and the EU-COGER study both collected existing information. In addition to saving time (38), another important reason for collecting existing data was that it limits the burden for healthcare staff at a time when they are under great pressure (47, 49). The MINUTES study collected minutes from the COVID-19 outbreak teams. Several other studies about care for vulnerable older persons have also analysed textual information to provide insight into current topics of discussion within the sector, such as Twitter data and newspapers (50), and questions asked in a closed WhatsApp group of care home managers and staff (51). A limitation of these textual data sources is that they often provide brief and undetailed descriptions of the situation (**Chapter 2**) (50). In the EU-COGER study, geriatric rehabilitation staff collected routine patient data from patient records (**Chapters 7 and 8**) (33). A disadvantage of only collecting data from patient records was that measurements that had not been documented resulted in missing data.

Responsive data collection and analysis: moving with changing circumstances and knowledge needs

Although research should always be conducted with a clear aim, in responsive research this aim does not include a pre-set endpoint (45). Responsiveness to context is especially important in crisis situations, when it is often unknown how the situation will progress and how long it will last (47). The MINUTES study and the NGT panel study are a good examples of this. The subtopics for the in-depth analyses were chosen in response to

changing circumstances in the sector and public debates. This was in line with our aim to provide insight into what was happening in the nursing home sector. **Chapter 2** provides an overview of topics and subtopics that were discussed by COVID-19 outbreak teams over time. Next, during the first wave of infections (52), vaccines were still lacking, and tests (53) and PPE (54) were often scarce (**Figure 1**). Therefore, distancing measures were considered important, and these are investigated in **Chapter 3**. Over time, concerns arose about the impact of distancing measures on the daily lives and well-being of nursing home residents and staff (18). The impact of distancing measures the on (dis) continuation of activities was therefore studied in **Chapter 4** (55), and priority measures to prevent infections and priority measures to maintain well-being were compared in **Chapter 5.** After almost a year, COVID-19 vaccines became available, first for nursing home staff in January 2021 (**Figure 1**) (56). This prompted an investigation into how to stimulate their vaccination willingness in **Chapter 6**.

Rapid dissemination of results: input for policy

The results of the studies in this thesis were shared from the start of data collection, in order to quickly provide policy input at national and local levels. Practical results of all studies in this thesis were openly shared in many factsheets (57, 58), and during online and physical presentations at (inter)national congresses, before scientific articles were published. In addition, during the MINUTES study, a total of thirty summary reports describing the situation in the sector were shared with the participating nursing home organizations, the Ministry of Health, Welfare, and Sport (Volksgezondheid, Welzijn en Sport), the Chief Nursing Officer who advices the government with regard to the position of the nursing profession, and with a few national associations of nursing home staff (**Chapter 2**). The participating organizations and the Ministry expressed that they valued and used these rapid results. For example, after the first few summary reports had revealed unrest among staff about when to use the scarce available PPE, the government changed the national sector-based distribution of PPE into distribution based on infection risks by mid-April (59). An additional advantage was that nursing home organizations were motivated to (continue to) participate in data collection. At the request of the Ministry and the participating organizations, data collection and the sharing of summary reports was extended from the initial six months to more than one and a half years. During the course of the EU-COGER study, practical lessons were frequently exchanged in online meetings between the research team and the geriatric rehabilitation care providers collecting the data. These healthcare providers included leaders in the field in their country or organization. The importance of rapid dissemination of results and grey literature in case of acute situations is becoming increasingly recognized (46).

Responsible research: checking data quality to ensure trustworthiness

In theory, the need to share results quickly can put pressure on the quality of research (44, 47). It is therefore a strength of the studies in this thesis that quality checks were carried out. In the MINUTES study, several efforts were made to ensure the quality of data coding and intercoder reliability among 21 researchers (**Chapter 2)**. In the EU-COGER study, data was checked each time preliminary results were shared. Whenever the data contained crucial missings, outliers, or discrepancies, local study coordinators were asked to check and, if necessary, correct them. A disadvantage of these quality checks is that they require effort and time, which is contrary to the nature of rapid and responsive research. It is debatable whether in acute situations such as a pandemic, it is more important to work rapidly to enable policy makers to make informed decisions than to strive for scientific perfection (44, 47). However, precisely because regular re-search procedures are adjusted in rapid and responsive research, it is important to be transparent about these procedures and about the efforts made to ensure their quality and therefore the trustworthiness of results (48).

Conducting panel conversations online

The studies in this thesis were conducted at a time when distancing measures forced research to take place completely digitally. Especially research methods for NGT panels had to be adapted to an online version. Adaptations that seemed to work well online, were providing participants with instructions on how to enter the digital platform, offer-ing assistance with technical issues, maximum group sizes of four to seven participants per panel, and a short break after 45 to 60 minutes to maintain the participations' atten-tion. One advantage of online panel conversations for staff, especially during demand-ing times, is that it saves travel time (47, 60). Similar considerations for organizing online focus groups are described in the literature (60, 61).

A limitation of this study may be that the participants did not include nursing home residents. All recruited client council members were family members of residents. Actu-ally, participating in this online NGT study may have been too complex for residents, who often suffer from cognitive impairments. There are simpler methods for involving nursing home residents in research (62, 63), but little is known about how to do so digitally. Face-to-face conversations should still be preferred for vulnerable older adults, to prevent the exclusion of those who are not competent in using technology, and to be able to use other ways of communicating when cognitive impairments make it difficult for them to express themselves verbally (61).

RECOMMENDATIONS FOR PRACTICE, POLICY, AND EDUCATION

Prevent infections among nursing home residents without compromising their well-being

Before any infection prevention policy is implemented in nursing homes, it is always important to consider whether this policy is balanced with the importance of the overall well-being of nursing home residents. Infection prevention measures should be chosen that have the mildest possible negative effect on the overall well-being of residents. Visitor bans have a large impact on resident well-being and should not be imposed, but visitor policies can be considered (**Chapters 3 and 5**). Cohort isolation should be preferred over transfer of nursing home residents to isolation units and isolation in single rooms, especially for residents with cognitive impairments (**Chapters 3 and 5**). Activities for residents should be continued (**Chapter 4**).

A variety of distancing measures can be considered to prevent infections, including visitor policies, various types of isolation measures, measures to distance staff and volunteers from residents, measures to distance among residents; and admission measures (**Chapter 3**). However, there is no 'one size fits all'. Measures should be tailored to local circumstances, including the physical structure of the nursing home, infection rates, the ability of residents with cognitive impairments to adhere to measures, adherence of and unrest among the family of residents, and availability of staff (**Chapter 3**).

Representatives of residents and nursing staff should always be involved in policy decisions that affect resident care. Even when decisions have to be made quickly, they should at least have the opportunity to ask questions and provide advice about policy plans. The NGT panels were experienced as a suitable way to collect input from different stakeholders (**Chapter 5**), and can be used more often in making care policies.

Strategies that could be used to stimulate nursing home staff to get vaccinated against COVID-19 are personal contact and opportunities to ask questions, sharing of stories among staff, logistical support, role models who share their opinions, visual information, and written information (**chapter 6**). As high vaccination rates among staff, residents, and other people around the residents decrease the risk of illness and death, they reduce the need for infection prevention measures, that impact residents' well-being.

Recommendations for referral of post-COVID-19 patients to geriatric rehabilitation

Older persons who experience severe illness resulting from SARS-CoV-2 infection or perhaps some other infection should be referred to geriatric rehabilitation. They have the capacity to recover well (**Chapters 7 and 8**). Caution is warranted in triaging and rejecting for geriatric rehabilitation vulnerable older patients who have experienced a serious SARS-CoV-2 or other serious infection. Specifically, older persons should not be excluded from geriatric rehabilitation on the basis of their frailty status. COVID-19 patients who were frail at admission to geriatric rehabilitation have the potential to recover as well as more fit patients (**Chapter 7**).

Integration of recommendations in education

The above recommendations for infection prevention measures and referral to geriatric rehabilitation should be integrated in education for current and future nursing home and geriatric rehabilitation staff to prepare them for future outbreaks of infectious diseases that can cause severe illness among vulnerable older persons. To facilitate the involvement of all stakeholders in decision-making and to prevent a potential imbalance in who makes decisions, multidisciplinary decision-making and collaboration should be practiced in the education of nurses, physicians, and other (future) staff, according to principles of team-based learning (29).

RECOMMENDATIONS FOR FUTURE RESEARCH

Monitoring well-being over time

It would be interesting to monitor which, how and when infection prevention measures exactly impact the well-being of individual nursing home residents. In order to observe change, aspects of well-being should be measured with a simple instrument at least before, during, and after distancing measures or other infection prevention measures are in force. Well-being could be measured longitudinally during future research or on a regular basis as part of routine care. Regularly measuring well-being would also facilitate future research into other care interventions or policy changes, as the focus on well-being is an important part of care for vulnerable older people.

Development of more homogeneity in measurement instruments in geriatric rehabilitation

The development of an international core set of measurement instruments for use in geriatric rehabilitation across Europe would facilitate more international research and care optimization in the field. As a first step, in the EU-COGER study protocol (33) an in-

ventory was made of the instruments used in various countries. Following the example of the UNC-ZH for developing a Dutch core set of measurements instruments in geriatric rehabilitation, the next steps would be to assess advantages and disadvantages of existing instruments based on literature and experiences (64), and to reach consensus about measurement instruments for example via Delphi procedures. Some measurements that may be integrated in such a core set are described earlier in this discussion chapter.

More often performing rapid and responsive research

In future humanitarian crises, research in rapidly developing fields, or when answering policy-related or context-dependent research questions, the application of principles of rapid and responsive research should be considered. These principles include using existing research infrastructures to recruit participants, using existing data sources, adapting data collection or analysis in response to changing circumstances, and sharing results from the start of data collection. In order to do so during future crises, it is important to, in less turbulent times, invest in setting up and maintaining research networks and in routine data collection. These rapid and responsive procedures can shorten the timeframe of conducting research and disseminating results and provide input for policy decision that quickly have to be made, limit the burden of research for healthcare staff, and motivate them to participate in studies. When conducting rapid and responsive research, it is important that efforts are put into monitoring the quality of research procedures during data collection and analysis and that there is transparency about the trustworthiness of results.

CONCLUDING REMARKS

We can now look back on a turbulent time. Everyone has their own COVID-19 story, but many of these stories involve panic and later sadness. Unfortunately, the question is not if there will be new pandemics, but when. However, the COVID-19 pandemic provided an opportunity for the care sector for vulnerable older persons to show resilience and learn quickly from the situation. The lessons learned can help to better prepare for future outbreaks of unknown infectious diseases that can cause severe illness among vulnerable older persons. Therefore, it is strongly recommended that the lessons learned are incorporated in the practice of nursing home organizations and geriatric rehabilitation, outbreak policies, educational programs to prepare (future) staff, and future research. Hopefully, we can then look forward to a future in which headlines will never again read that "*Visits to nursing homes are no longer possible...*", there being a *"Silent disaster in the nursing home"*, or a mother saying about her daughter that *"'She is dying of loneliness".*

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10

Summary
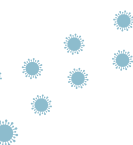
In March and April 2020 Dutch news headlines read that "*Visits to nursing homes are no longer possible …*", there is being a "*Silent disaster in the nursing home*", and that "*She is dying of loneliness*". The disease COVID-19, which is caused by the Coronavirus SARS-CoV-2, was discovered in Wuhan, China, in early December 2019. In January 2020, the virus started to spread rapidly across the world. By mid-March Europe had become the epicentre of the global Corona pandemic.

There was a great lack of knowledge about this new disease at the time: It was still unknown how quickly the virus would spread, how many people would die from it, and how long the pandemic would last. Diagnostic tests, a cure, and vaccines against the disease were lacking. People feared for their own health and for the illness and death of their loved ones. In addition, the large numbers of COVID-19 patients put high pressure on healthcare systems. It soon became clear that this new disease would pose a serious threat to global public health, especially to vulnerable populations such as vulnerable older persons.

Nursing homes were hit hard by the COVID-19 pandemic. Nursing home residents are susceptible to infections. Common characteristics of nursing home residents, including old age, vulnerability, and having multiple diseases, are also risk factors for many infectious diseases. Besides, they often have close contact with healthcare staff and other residents. In addition, many residents are unable to comply with general hygiene rules and infection prevention measures due to cognitive impairments. Nursing home organizations usually have an infection prevention and control committee and, during severe outbreaks of infectious diseases, an outbreak team. However, it was difficult for these outbreak teams to have to make quick decisions regarding COVID-19 in absence of COVID-19-specific knowledge and guidelines.

Older persons living at home were also at risk of becoming severely ill from COVID-19. They were more often than younger patients admitted to the hospital and intensive care units. To promote their recovery, there was a great demand for geriatric rehabilitation. Geriatric rehabilitation is a form of recovery care that is specifically aimed at older people and people with complex health problems, including having multiple diseases, cognitive impairments, and frailty. The main goals of geriatric rehabilitation are that someone learns to function independently again and can return home. However, at the beginning of the pandemic, it was still unclear what geriatric rehabilitation care could be provided to them during the pandemic and to what extent vulnerable older persons could recover from COVID-19.

PART 1. IMPACT OF, CHALLENGES PRESENTED BY, AND POLICY MEASURES OF DUTCH NURSING HOME ORGANIZATIONS DURING THE COVID-19 PANDEMIC

Part 1 of this thesis describes the impact, challenges, and policy measures of Dutch nursing home organizations during the COVID-19 pandemic. Dutch nursing home organisations and national policy makers requested insight into what was happening in the sector, in order to quickly learn from each other's experiences and make policy. That was the reason for quickly setting up the "COVID-19 management in nursing homes by outbreak teams" (MINUTES) study. In this study, minutes of COVID-19 outbreak teams were ultimately collected for more than a year and a half, providing many new insights.

Chapter 2 describes the design of the MINUTES study. In total 41 Dutch nursing home organizations participated in the study. These together represent more than 500 nursing home locations. Every week to three weeks, summary reports that included the most important points of attention were shared with participating nursing home organizations and national policy makers. The composition of participating COVID-19 outbreak teams is also described. Most outbreak teams included managers, medical staff, support services staff (such as facility management and human resources), policy advisors, and communication specialists. Nursing and care staff and resident representatives were usually not part of the outbreak teams. The minutes included eight large recurring topics
1. Crisis management, including infection rates, finances related to COVID-19, internal and external communication, etc.;
2. Isolation and distancing measures for residents;
3. Personal protective equipment and hygiene;
4. Staff, including staff scheduling, and staff well-being;
5. Resident well-being;
6. Visitor policies;
7. Testing; and
8. Vaccination.

Chapter 3 zooms in on the variety of isolation and distancing measures that outbreak teams took during the first wave (spring 2020), summer 2020, and second wave (fall 2020 – spring 2021). The minutes reveal that outbreak teams most frequently discussed visitor bans and other visitor policies (during all three periods). Also discussed were various types of isolation measures (especially during the first wave); measures to distance staff and volunteers from residents (especially during the summer period); and measures to distance among residents (especially during the summer period and second wave). Less often, measures upon admission to the nursing home were also discussed. Distancing

measures brought challenges, such as unrest and conflicts between visitors and staff, visitors and residents who did not comply with the measures, and staffing issues. The measures were continually adjusted, due to changing circumstances but also because lessons were learnt from challenges and gained experience.

Chapter 4 examined the impact of the COVID-19 pandemic and infection prevention measures on activities for nursing home residents. Continuing and restarting activities were discussed more often by outbreak teams than stopping activities. It was possible to continue organizing activities if infection prevention measures are in force. However, activities were often only organized under certain conditions or in an adapted manner, such as in smaller groups, in certain places (e.g., outside), or only for vaccinated residents or residents without COVID-19-related complaints. Important considerations for restarting, continuing, or stopping activities were maintaining the well-being and safety of residents.

In order to prioritize the most important measures among the many measures and decisions described in the minutes of outbreak teams, a panel study was conducted with nursing home staff and resident representatives.

Chapter 5 describes which measures were deemed most important by four panels to prevent corona infections. It is also described which measures are considered most important by four additional panels to maintain the well-being of residents. Each panel member selected an important measure. These selected measures were discussed during an online meeting. Each panel member then assessed the measures discussed. Each panel consisted of three to seven members. The most important measures to prevent infections are also found that applying isolation measures based on test results and cohort isolation are among the most important measures. In addition, they prioritize exceptions to the visitor ban in nursing homes and various (other) visitor regulations. The prioritized measures provide greater focus and a better balance between infection prevention and the maintaining well-being during future outbreaks of COVID-19. The panel members were dissatisfied with their limited involvement in decision-making during the first months of the pandemic.

Chapter 6 identifies strategies to increase the willingness of nursing home staff to become vaccinated against COVID-19. According to the minutes of outbreak teams, at least seven strategies were used to do so in participating nursing home organizations. Two panels of nursing home staff believe that six of these seven strategies are important:
1. personal contact and opportunities to ask questions, for example during team meetings;

2. sharing of stories among staff;
3. logistical support, such as transportation to a vaccination location;
4. role models who share their opinions;
5. visual information, such as informative videos; and
6. written information, for example through the intranet or newsletters.

Combinations of these six strategies should be used more often. The seventh strategy, providing financial rewards such as gift cards, is believed not increase vaccination willingness.

A number of important insights emerge from the studies described in part 1 of this thesis. First, infection prevention measures should never overshadow the importance of the overall well-being of nursing home residents. Infection prevention measures should be chosen that have the least impact on the overall well-being of the residents. Second, there is no 'one size fits all' for the best balance between infection prevention and well-being. Measures should be tailored to local circumstances, including for example the building structure of the nursing home, the infection rate, the residents, their family members, and availability of staff. Third, besides managers and physicians, nurses and resident representatives should remain involved when quick decisions have to be made about measures to be taken. Fourth, it is important to invest in the development and availability of personal protective equipment, diagnostic tests, and vaccines. These can reduce the risk of infection and therefore possibly the need for far-reaching infection prevention measures.

PART 2. RECOVERY OF COVID-19 PATIENTS ADMITTED TO GERIATRIC REHABILITATION

Part 2 of this thesis describes the recovery of COVID-19 patients who received geriatric rehabilitation care. It is also described what geriatric rehabilitation care was provided in various European countries. In total 59 geriatric rehabilitation care facilities in ten countries (the Czech Republic, Germany, Ireland, Israel, Italy, Malta, Russia, Spain, the Netherlands, and the United Kingdom) participated in the European Cooperation in Geriatric Rehabilitation (EU-COGER) after the COVID-19 study. They collected routine care data of 723 post-acute COVID-19 patients that were admitted from October 2020 to October 2021. These patients were followed until six months after geriatric rehabilitation.

Chapter 7 shows that older COVID-19 patients who received geriatric rehabilitation after a coronavirus infection, on average, recover their daily functioning within a few

months, almost back to the level before they contracted COVID-19. Their quality of life also increases substantially during this period. Most patients are pre-frail to frail at admission to geriatric rehabilitation. This degree of frailty did not affect their recovery. Therefore, frailty should not be the main reason to deny COVID-19 patients access to geriatric rehabilitation.

Chapter 8 describes that recovery occurs in rehabilitation patients from all participating European countries, but that there is some variation in the speed of recovery. This variation in recovery speed was accompanied by differences between countries in the organization of geriatric rehabilitation care. Geriatric rehabilitation care was provided in different types of healthcare settings, such as nursing homes, specialised rehabilitation facilities, and ambulatory. These care facilities used different combinations of selection criteria to refer patients to geriatric rehabilitation, often including, for example, the patients' level of daily functioning, age, frailty, and cognitive impairments. In all countries the majority of patients received physiotherapy and in many countries also occupational therapy. There was substantial variance in the percentages of patients that received some other therapies. This variation in organizational aspects of geriatric rehabilitation makes it difficult to make statements about which organizational aspects promoted recovery, but it can contribute to developing expectations for further research.

An important insight arising from part 2 of this thesis is that older COVID-19 patients have the ability to recover well. This also applies to frail patients, who may be thought to have little recovery potential. Therefore, they should receive geriatric rehabilitation care and caution is warranted when selecting and rejecting older patients for geriatric rehabilitation. More international research is needed to optimize geriatric rehabilitation care throughout Europe. However, in addition to the measuring instruments for daily functioning (the Barthel Index) and quality of life (the EQ-5D-5L) using in this study, few measurement instruments are routinely used internationally in geriatric rehabilitation. The development of a set of more measurement instruments that can be used internationally would make further research easier.

RAPID AND RESPONSIVE RESEARCH METHODS

The studies in this thesis were conducted according to some principles of 'rapid and responsive' research methods. Existing research infrastructures for research were used, such as the University Network for the Care sector Zuid-Holland (UNC-ZH) and the European Geriatric Medicine Society (EuGMS) special interest group for geriatric rehabilitation. Furthermore, existing data was collected (minutes of nursing home organizations'

outbreak teams and routinely collected geriatric rehabilitation care data). In addition, data analysis was adjusted in response to changing circumstances of the pandemic. Results were also shared from the start of data collection in weekly to triweekly summary reports, factsheets, and presentations. In this way, the timeframe of conducting research was shortened, the burden of the study for the staff from participating healthcare facilities was limited, were they motivated to participate in studies, and it was possible to provide input for policy decisions that had to be made quickly. When conducting rapid and responsive research, in theory, the need to share results quickly can put pressure on the quality of research. Therefore, it is important to monitor the quality and reliability of the research and the results. Applying principles of rapid and responsive research should be considered more often in future pandemics, research in rapidly developing fields, or when answering policy-related or context-dependent research questions.

FINAL REMARKS

We can now look back on a turbulent time that for many people involved panic and sadness. Unfortunately, the question is not if there will be new pandemics, but when. The lessons learned from the COVID-19 pandemic can help to better prepare for future outbreaks of unknown infectious diseases that can cause severe illness among vulnerable older people. It is therefore strongly recommended to incorporate the lessons learned into nursing home care and geriatric rehabilitation, outbreak policies, education for (future) staff in the sector, and future research.

11

Nederlandse samenvatting
Bibliography
Dankwoord
Curriculum Vitae
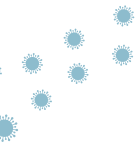
NEDERLANDSE SAMENVATTING

In maart en april 2020 luidden de Nederlandse nieuwskoppen: "*Bezoek aan verpleeghuizen niet langer mogelijk ...*", "*Stille ramp in verpleeghuizen …*", en "*Ze sterft aan eenzaamheid*". De ziekte COVID-19, die wordt veroorzaakt door het Coronavirus SARS-CoV-2, werd begin december 2019 ontdekt in Wuhan, China. In januari 2020 begon het virus zich snel over de wereld te verspreiden. Medio maart was Europa het epicentrum van de wereldwijde COVID-19-pandemie geworden.

Er was een groot gebrek aan kennis over deze nieuwe ziekte. Het was nog onbekend hoe snel het virus zich verder zou verspreiden, hoeveel mensen eraan zouden sterven en hoelang de pandemie zou duren. Diagnostische tests, een geneesmiddel en vaccins tegen de ziekte ontbraken. Mensen vreesden voor hun eigen gezondheid en voor ziekte en overlijden van hun dierbaren. Bovendien zetten de grote aantallen COVID-19 patiënten de gezondheidszorg ernstig onder druk. Het werd snel duidelijk dat deze nieuwe ziekte een ernstige bedreiging zou worden voor de mondiale volksgezondheid, vooral voor kwetsbare bevolkingsgroepen zoals kwetsbare ouderen.

Verpleeghuizen werden zwaar getroffen door de COVID-19-pandemie. Verpleeghuisbewoners zijn vatbaar voor infecties. Kenmerken van verpleeghuisbewoners, zoals hoge leeftijd, kwetsbaarheid en het hebben van meerdere ziekten, zijn namelijk ook risicofactoren voor veel infectieziekten. Daarnaast hebben verpleeghuisbewoners vaak nauw contact met zorgpersoneel en andere bewoners. Bovendien zijn veel bewoners vanwege cognitieve beperkingen niet in staat de algemene hygiëneregels en infectiepreventiemaatregelen na te leven. Verpleeghuisorganisaties hebben doorgaans een commissie voor infectiepreventie en -bestrijding en tijdens een ernstige infectie uitbraak een uitbraakteam. Het was echter moeilijk voor deze uitbraakteams om snel beslissingen te nemen met betrekking tot COVID-19 toen specifieke kennis en richtlijnen over COVID-19 nog ontbraken.

Ook thuiswonende ouderen liepen het risico om ernstig ziek te worden van COVID-19. Ze werden vaker dan jongere patiënten opgenomen in het ziekenhuis en op de intensive care. Om hun herstel te bevorderen was er grote vraag naar geriatrische revalidatiezorg. Geriatrische revalidatie is een vorm van herstelzorg, die zich richt op ouderen en mensen met complexe gezondheidsproblemen, zoals het hebben van meerdere ziekten, cognitieve beperkingen en kwetsbaarheid. De belangrijkste doelen van geriatrische revalidatie zijn dat iemand weer zelfstandig leert functioneren en naar huis kan terugkeren. Het was aan het begin van de pandemie echter nog niet duidelijk welke geriatrische

revalidatiezorg er tijdens de pandemie beschikbaar was en in hoeverre ouderen van COVID-19 konden herstellen.

Deel 1. Impact, uitdagingen en beleidsmaatregelen van Nederlandse verpleeghuisorganisaties tijdens de COVID-19-pandemie

Deel 1 van dit proefschrift beschrijft de impact, uitdagingen en beleidsmaatregelen van Nederlandse verpleeghuisorganisaties tijdens de COVID-19-pandemie. Nederlandse verpleeghuisorganisaties en landelijke beleidsmakers vroegen om inzicht in wat er speelde in de sector, om snel te kunnen leren van elkaars ervaringen en om beleid te kunnen maken. Dat was de aanleiding voor het snel opzetten van de "COVID-19 management in nursing homes by outbreak teams" (MINUTES) studie. In deze studie werden uiteindelijk meer dan anderhalf jaar lang notulen van COVID-19-uitbraakteams verzameld die vele nieuwe inzichten opleverden.

Hoofdstuk 2 beschrijft hoe de MINUTES studie eruit zag. Er namen 41 Nederlandse verpleeghuisorganisaties deel aan de studie. Deze vertegenwoordigden samen meer dan 500 verpleeghuislocaties. Wekelijks tot driewekelijks werden de belangrijkste aandachtspunten uit de notulen van deze uitbraakteams samengevat in rapporten en gedeeld met de deelnemende verpleeghuisorganisaties en nationale beleidsmakers. Ook beschrijft dit hoofdstuk de samenstelling van de deelnemende COVID-19-uitbraakteams. In de meeste uitbraakteams zaten managers, medisch personeel, ondersteunend personeel (zoals facilitaire zaken en personeelszaken), beleidsadviseurs en communicatiespecialisten. Verplegend en verzorgend personeel en bewonersvertegenwoordigers maakten meestal geen deel uit van de uitbraakteams. De notulen bevatten acht grote terugkerende onderwerpen

1. Crisisbeheersing, inclusief infectiepercentages, financiën die gerelateerd zijn aan COVID-19, interne en externe communicatie, etc.;
2. Isolatie- en afstandsmaatregelen voor bewoners;
3. Persoonlijke beschermingsmiddelen en hygiëne;
4. Personeel, inclusief personeelsplanning en welzijn van personeel;
5. Welzijn van de bewoners;
6. Bezoekersbeleid;
7. Testen; en
8. Vaccinatie.

Hoofdstuk 3 zoomt in op de verscheidenheid aan isolatie- en afstandsmaatregelen die uitbraakteams namen tijdens de eerste golf (voorjaar 2020), zomer 2020, en tweede golf (najaar 2020 – voorjaar 2021). Uit de notulen blijkt dat uitbraakteams het bezoekersverbod en ander bezoekersbeleid het vaakst bespraken (tijdens alle drie de

periodes). Ook werden verschillende soorten isolatiemaatregelen besproken (vooral tijdens de eerste golf); maatregelen om personeel en vrijwilligers op afstand te houden van bewoners (vooral tijdens de zomerperiode); en maatregelen om afstand te houden tussen bewoners onderling (vooral tijdens de zomerperiode en tweede golf). Minder vaak werden ook maatregelen bij nieuwe opnames in het verpleeghuis besproken. Afstandsmaatregelen brachten uitdagingen met zich mee, zoals onrust en conflicten tussen bezoekers en personeel, bezoekers en bewoners die zich niet aan de maatregelen hielden en personeelsproblemen. De maatregelen werden voortdurend bijgesteld vanwege veranderende omstandigheden, maar ook omdat men leerde van uitdagingen en opgedane ervaringen.

In **hoofdstuk 4** is de impact van de COVID-19-pandemie en infectiepreventiemaatregelen op de activiteiten van verpleeghuisbewoners onderzocht. Het voortzetten en herstarten van activiteiten werden vaker door uitbraakteams besproken dan het stoppen van activiteiten. Het bleek mogelijk om activiteiten te blijven organiseren als er infectiepreventiemaatregelen van kracht zijn. Maar vaak werden activiteiten alleen onder bepaalde voorwaarden of op aangepaste wijze georganiseerd, zoals in kleinere groepen, op bepaalde plekken (bijvoorbeeld buiten), of alleen voor gevaccineerde bewoners of bewoners zonder klachten die op COVID-19 kunnen wijzen. Belangrijke overwegingen om activiteiten voort te zetten, te herstarten, of te stoppen waren het behouden van het welzijn en de veiligheid van de bewoners.

Om van de vele maatregelen en besluiten die in de notulen van uitbraakteams werden beschreven de belangrijkste maatregelen te kunnen prioriteren, is er een panelonderzoek uitgevoerd met verpleeghuispersoneel en bewonersvertegenwoordigers.

In **hoofdstuk 5** beschrijft welke maatregelen er door vier panels het meest belangrijk worden gevonden om coronabesmettingen te voorkomen. Ook is beschreven welke maatregelen er door nog eens vier panels het meest belangrijk worden gevonden om het welzijn van bewoners te behouden. Ieder panellid selecteerde een belangrijke maatregel. Deze geselecteerde maatregelen werden tijdens een online bijeenkomst met elkaar besproken. Daarna beoordeelde ieder panellid de besproken maatregelen. Ieder panel bestond uit drie tot zeven leden. De meest belangrijke maatregelen om infecties te voorkomen zijn: het toepassen van isolatiemaatregelen op basis van testresultaten, testen bij symptomen van COVID-19, cohortisolatie, andere isolatiemaatregelen voor bewoners die cognitief niet in staat zijn om zich aan cohortisolatie te houden, gebruik van persoonlijke beschermingsmiddelen rondom (vermoedelijk) besmette bewoners en het treffen van voorbereidingen op uitbraken door uitbraakteams. Ook de panels die over welzijn gingen vonden isolatiemaatregelen op basis van testresultaten en

cohortisolatie tot de meest belangrijke maatregelen behoren. Daarnaast prioriteerden zij uitzonderingen op bezoekersverboden en diverse (andere) bezoekersregelingen. De geprioriteerde maatregelen zorgen voor meer focus en voor een beter evenwicht tussen infectiepreventie en het behoud van het welzijn tijdens toekomstige uitbraken van COVID-19. De panelleden waren ontevreden over hun beperkte betrokkenheid bij de besluitvorming tijdens de eerste maanden van de pandemie.

Hoofdstuk 6 benoemt strategieën om de bereidheid van verpleeghuispersoneel zich tegen COVID-19 te laten vaccineren te vergroten. Volgens de notulen van uitbraakteams zijn hiervoor ten minste zeven strategieën gebruikt in de deelnemende verpleeghuis-organisaties. Twee panels van verpleeghuispersoneel zijn van mening dat zes van deze zeven strategieën belangrijk zijn

1. persoonlijk contact en mogelijkheden om vragen te stellen, bijvoorbeeld tijdens teamvergaderingen;
2. het delen van verhalen onder het personeel;
3. logistieke ondersteuning, zoals vervoer naar een vaccinatielocatie;
4. rolmodellen die hun mening delen;
5. visuele informatie, zoals informatieve video's; en
6. schriftelijke informatie, bijvoorbeeld via intranet of nieuwsbrieven.

Combinaties van deze zes strategieën zouden vaker moeten worden ingezet. De zevende strategie, het verstrekken van financiële beloningen zoals cadeaubonnen, zou niet bijdragen aan een grotere vaccinatiebereidheid.

Een aantal belangrijke inzichten komen voort uit de onderzoeken die beschreven zijn in deel 1 van dit proefschrift. Ten eerste mogen infectiepreventiemaatregelen nooit het belang van het algehele welzijn van verpleeghuisbewoners overschaduwen. Er moeten infectiepreventiemaatregelen worden gekozen die de minste impact hebben op het algehele welzijn van de bewoners. Ten tweede bestaat er niet één manier die altijd werkt om de beste balans tussen infectiepreventie en welzijn te bereiken. Maatregelen moeten worden afgestemd op lokale omstandigheden, waaronder bijvoorbeeld de fysieke structuur van het verpleeghuis, besmettingspercentages, de bewoners, hun familieleden en de beschikbaarheid van personeel. Ten derde moeten naast managers en artsen ook verplegend en verzorgend personeel en bewonersvertegenwoordigers betrokken blijven wanneer er snel besluiten moeten worden gemaakt over te nemen maatregelen. Ten vierde is het belangrijk om te investeren in de ontwikkeling en beschikbaarheid van persoonlijke beschermingsmiddelen klinische tests, en vaccins. Deze middelen kunnen het risico op een infectie verminderen en daarmee mogelijk ook de noodzaak voor vergaande infectiepreventiemaatregelen.

Deel 2. Herstel van COVID-19 met geriatrische revalidatie

Deel 2 van dit proefschrift beschrijft het herstel van COVID-19 patiënten die geriatrische revalidatiezorg kregen. Ook wordt beschreven welke geriatrische revalidatiezorg er in verschillende Europese landen wordt gegeven. Er deden 59 geriatrische revalidatiezorginstellingen in tien landen (Duitsland, Ierland, Israël, Italië, Malta, Nederland, Rusland, Spanje, Tsjechië en het Verenigd Koninkrijk) mee aan de ⬚European Cooperation in Geriatric Rehabilitation (EU-COGER) after COVID-19⬚ studie. Zij verzamelden routinematige zorggegevens van in totaal 723 COVID-19 revalidanten die van oktober 2020 tot en met oktober 2021 werden opgenomen. Deze revalidanten werden gevolgd tot 6 maanden na hun revalidatietraject.

Hoofdstuk 7 laat zien dat ouderen die na een Coronavirus infectie geriatrische revalidatie kregen gemiddeld genomen binnen enkele maanden herstellen in hun dagelijks functioneren, tot bijna terug op het niveau van voordat ze COVID-19 kregen. Ook hun kwaliteit van leven neemt in deze periode aanzienlijk toe. De meeste revalidanten zijn lichtkwetsbaar of kwetsbaar bij aanvang van geriatrische revalidatie. Deze mate van kwetsbaarheid beïnvloedde hun herstel niet. Daarom zou kwetsbaarheid niet de hoofdreden mogen zijn om COVID-19-patiënten de toegang tot geriatrische revalidatie te weigeren.

Hoofdstuk 8 beschrijft dat er bij revalidanten uit alle deelnemende Europese landen herstel optreed, maar dat er wel variatie is in de snelheid van het herstel. Deze variatie in herstelsnelheid ging gepaard met verschillen tussen landen in de organisatie van de geriatrische revalidatiezorg. Geriatrische revalidatiezorg werd verleend in verschillende soorten zorginstellingen, zoals verpleeghuizen, gespecialiseerde revalidatiecentra en ambulant. Deze zorginstellingen gebruikten verschillende combinaties van selectiecriteria om patiënten te verwijzen naar geriatrische revalidatie, waaronder bijvoorbeeld vaak het niveau van dagelijks functioneren, leeftijd, kwetsbaarheid en cognitieve stoornissen. In alle landen kreeg de meerderheid van de revalidanten fysiotherapie en in veel landen ook ergotherapie. Er waren aanzienlijke verschillen in de percentages revalidanten die andere behandelingen kregen. Deze variatie in de organisatie van aangeboden geriatrische revalidatie maakt het moeilijk om uitspraken te doen over welke aspecten het herstel bevorderden, maar kan wel bijdragen aan het ontwikkelen van verwachtingen voor vervolgonderzoek.

Een belangrijk inzicht dat voortkomt uit deel 2 van dit proefschrift is dat ouderen die COVID-19 hebben gehad het vermogen hebben om goed te herstellen. Dit geldt ook voor kwetsbare ouderen, waarvan wellicht wordt gedacht dat ze weinig herstelpotentieel hebben. Daarom moeten zij geriatrische revalidatiezorg krijgen en is voorzichtigheid

geboden bij het selecteren en afwijzen van ouderen voor geriatrische revalidatie. Om de geriatrische revalidatiezorg in Europa te kunnen optimaliseren is er meer internationaal onderzoek nodig. Echter, naast de meetinstrumenten voor dagelijks functioneren (de Barthel Index) en kwaliteit van leven (de EQ-5D-5L) die in dit onderzoek zijn gebruikt, worden er internationaal weinig meetinstrumenten routinematig gebruikt in de geriatrische revalidatie. De ontwikkeling van een set van meer meetinstrumenten die internationaal gebruikt kunnen worden, zou verder onderzoek makkelijker maken.

Snelle en responsieve onderzoeksmethoden

De studies in dit proefschrift zijn uitgevoerd volgens enkele principes van 'snelle en responsieve' onderzoeksmethoden. Er werd gebruik gemaakt van bestaande infrastructuren voor onderzoek zoals van het Universitair Netwerk voor de Care sector Zuid-Holland (UNC-ZH) en de 'special interest group' voor geriatrische revalidatie van de 'European Geriatric Medicine Society' (EuGMS). Verder werd bestaande data verzameld (notulen van uitbraak teams van verpleeghuisorganisaties en routinematig verzamelde geriatrische revalidatiezorggegevens). Daarnaast werd de data-analyse aangepast als reactie op veranderende omstandigheden van de pandemie. Ook werden vanaf de start van de dataverzameling resultaten gedeeld in wekelijkse tot driewekelijkse samenvattende rapporten, factsheets en presentaties. Op deze manier werd het tijdsbestek voor het uitvoeren van onderzoek verkort, werden de lasten van het onderzoek voor personeel in deelnemende zorginstellingen beperkt, waren zij gemotiveerd om deel te nemen aan de onderzoeken en was het mogelijk om input te leveren voor beleidsbeslissingen die snel genomen moesten worden. Bij het uitvoeren van snel en responsief onderzoek kan de noodzaak om resultaten snel te delen in theorie de kwaliteit van het onderzoek onder druk zetten. Daarom is het belangrijk om de kwaliteit en de betrouwbaarheid van het onderzoek en de resultaten te bewaken. Bij toekomstige pandemieën, onderzoek in snel ontwikkelende vakgebieden, of bij het beantwoorden van beleidsgerichte of situatie specifieke onderzoeksvragen moet vaker worden overwogen om de principes van snel en responsief onderzoek toe te passen.

Tot slot

We kunnen inmiddels terugkijken op een roerige tijd die voor veel mensen paniek en verdriet met zich meebracht. Helaas is de vraag niet óf er nieuwe pandemieën zullen komen, maar wanneer. De lessen die we leerden van de COVID-19-pandemie kunnen helpen om ons beter voor te bereiden op toekomstige uitbraken van onbekende infectieziekten waarvan kwetsbare ouderen ernstig ziek kunnen worden. Het is daarom sterk aanbevolen om de geleerde lessen op te nemen in verpleeghuiszorg en geriatrische revalidatie, het uitbraakbeleid, onderwijs voor (toekomstig) personeel in de sector, en toekomstig onderzoek.

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CURRICULUM VITAE

Lisa Sanne van Tol was born on the 21ˢᵗ of January, 1995 in Leiden. She obtained her secondary school VWO diploma at the Vlietland college in Leiden in 2013. Subsequently, she started her study Health and Life sciences, which is a combination study of Health Sciences and Biomedical Sciences, at the Vrije Universiteit in Amsterdam. Within this Bachelor's curriculum, Lisa followed the Health Sciences track, the minor Psychobiology in Eating Behaviour at Wageningen University, and conducted a research internship at the epidemiology department of GGD Hollands Midden. She graduated in 2016 with a bachelor's degree in Health Sciences. That same year, Lisa started the master study Vitality and Ageing in Leiden. During this master's, she got to know the department of Public Health and Primary Care (PHEG) of the Leiden University Medical Center (LUMC) where she performed a research internship. In 2017 she graduated cum laude with a Master of Science degree.

Directly after her graduation, Lisa started working at the department of Gerontology and Geriatrics at the LUMC. She was employed here as a junior researcher assisting in the 'Warm transfer' project regarding the transfer of care for older patients upon hospital discharge to a home care organization and in the Acutely Presenting Older Patient (APOP) study about older patients at the emergency department. In addition, she worked here as secretary of the regional Older Persons Advisory Board ('Ouderenberaad Zorg en Welzijn Zuid-Holland Noord') and as a junior teacher in the Vitality and Ageing master's programme. During this time, Lisa obtained her Basic Teaching Qualification (BKO) as a university teacher.

In 2019, Lisa started a PhD position, back at the department of Public Health and Primary Care, within the University Network for the Care sector South-Holland (UNC-ZH). Initially, her PhD research would be about how to involve vulnerable older persons in scientific research. She started a literature review on the topic and she continued her role in the Older Persons Advisory Board. However, when the COVID-19 pandemic hit us, she helped setting up the COVID-19 management in nursing homes by outbreak teams (MINUTES) study. After some months, she decided to change her PhD research into this direction. During her time as a PhD student, Lisa participated in the department's PhD student journal club (2021–2022) and in the PhD students committee, representing the voice of PhD students working in the department (2022–2023). Since 2023, Lisa has coordinated the educational activities of the UNC-ZH. Upon completing her PhD, she will expand the role of education coordinator and focus on knowledge dissemination for the UNC-ZH in a broader sense.