Age and Ageing 2023; **52:** 1–10
https://doi.org/10.1093/ageing/afad022

RESEARCH PAPER

Cluster randomised trial of a complex interprofessional intervention (*interprof* ACT) to reduce hospital admission of nursing home residents

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Abstract

Background: Some hospital admissions of nursing home residents (NHRs) might be attributed to inadequate interprofessional collaboration. To improve general practitioner–nurse collaboration in nursing homes (NHs), we developed an intervention package (*interprof* ACT) in a previous study.
Objective: To assess the impact of *interprof* ACT on the proportion of hospitalisation and other clinical parameters within 12 months from randomisation among NHRs.
Methods: Multicentre, cluster randomised controlled trial in 34 German NHs. NHRs of the control group received usual care, whereas NHRs in the intervention group received *interprof* ACT. Eligible NHs had at least 40 long-term care residents. NHs were randomised 1:1 pairwise. Blinded assessors collected primary outcome data.
Results: Seventeen NHs (320 NHRs) were assigned to *interprof* ACT and 17 NHs (323 NHRs) to usual care. In the intervention group, 136 (42.5%) NHRs were hospitalised at least once within 12 months from randomisation and 151 (46.7%) in the control group (odds ratio (OR): 0.82, 95% confidence interval (CI): [0.55; 1.22], $P = 0.33$). No differences were found for the average number of hospitalisations: 0.8 hospitalisations per NHR (rate ratio (RR) 0.90, 95% CI: [0.66, 1.25], $P = 0.54$). Average length of stay was 5.7 days for NHRs in the intervention group and 6.5 days in the control group (RR: 0.70, 95% CI: [0.45, 1.11], $P = 0.13$). Falls were the most common adverse event, but none was related to the study intervention.
Conclusions: The implementation of *interprof* ACT did not show a statistically significant and clinically relevant effect on hospital admission of NHRs.

Keywords: physician–nurse relations, nursing homes, patient-centred care, cluster randomised controlled trial, interprofessional relations, older people

Key Points

- Improved collaboration is thought to result in better outcomes and less hospitalisations for nursing home residents.

- Interprof ACT was implemented to improve interprofessional collaboration in nursing homes and reduce hospital admissions.
- No significant difference could be found regarding any primary or secondary outcomes.

Introduction

Nursing home residents (NHRs) are a vulnerable population with high rates of hospitalisations [1–3]. Many of these are considered inappropriate [4, 5] or have a negative impact on NHRs' health [6]. In Germany, practice-based general practitioners (GPs) predominantly provide medical care to NHRs as home visits [7, 8], on average 58.5 different GPs per 100 NHRs [9]. Such a high rate could influence coordination of care between GPs and nursing home (NH) staff as interactions take place for heterogeneous reasons (acute, routine), in varying constellations and with different expectations of further collaboration [10–13]. Consequently, an improvement on collaboration is a possible approach to improve care of NHRs [14, 15].

We developed the *interprof* ACT intervention in a participatory approach in our previous study *interprof* [16]. ACT stands for 'action', as the intervention was intended to be implemented in a subsequent project. *Interprof* ACT consists of six components (e.g. name badges, appointment of a contact person) and was generated with person groups (nurses, GPs, residents and relatives) involved in the medical care of NHRs [17].

A few projects attempted to improve medical care of NHRs by improving interprofessional collaboration in Germany [18], none of them was a randomised controlled trial (RCT). Some RCTs focusing on clinical outcomes of NHRs showed indifferent findings [19, 20]. A recent English pilot RCT found no significant effect on avoidable hospitalisations by implementing a complex intervention [21]. However, a systematic review on interventions in NHs revealed benefits on NHRs' health, if GPs were involved [22]. A meta-analysis on the effects of interprofessional collaboration also showed only slightly positive findings and no clear effect [23]. The study design of our trial [24] differed from earlier studies as *interprof* ACT was individually tailored to each NH of the intervention group. Preventing intermixing between groups also led to the choice of a cluster randomised controlled trial (cRCT) as design.

The overall goal of this study was to prove the clinical effectiveness of *interprof* ACT. The main hypothesis was that *interprof* ACT reduces the proportion of hospitalisations of NHRs in the intervention group compared with the control group within 12 months from randomisation. Secondary, NHRs of the intervention group were hypothesised to spend fewer days in hospital, to have a decreased mean number of hospital admissions and to have a lower mortality rate during follow-up. In addition, NHRs in the intervention group were expected to report a higher quality of life. Also, we compared the use of the health care system and the occurrence of adverse events between the groups. A mixed-methods process evaluation and a health economical evaluation were conducted as well. Their findings will be published separately.

Methods

The *interprof* ACT study methods have been previously described [24].

Trial design

A cRCT design was used to evaluate the effectiveness of the implementation of *interprof* ACT compared with controls receiving care as usual [25]. Three study centres in Germany were involved: Department of General Practice, Medical Center Göttingen; Department of General Practice and Primary Care, University Medical Center Hamburg-Eppendorf; Institute for Social Medicine and Epidemiology, Nursing Research Unit, University of Lübeck.

Ethical approval was obtained from the ethical committee of the Medical Faculty, Georg-August-University, Göttingen (no. 31/7/17), the University of Lübeck (no. 18–051) and the Medical Association of Hamburg-Eppendorf (no. MC-304/17).

Study settings/clusters

NHs with at least 40 long-term care residents were eligible if not participating in any other project on interprofessional collaboration. After a comprehensive education on the intervention package and implementation strategies, NH directors had to provide informed consent prior to randomisation.

Participants

Eligible participants were NHRs having at least one GP contact in the past 3 months, two GP contacts in the past 6 months or had moved into the NH in the previous 6 months. Participants had to be at least 18 years of age and not admitted for short-term care only. NH staff were asked whether eligible residents could consent or a legal guardian had to be consulted, as required by German law in case the patient is not capable to consent (§1896 BGB). If a NHR or a legal guardian was willing to participate, they were informed by a researcher. The informed consent form was signed by the researcher and the NHR/legal guardian before inclusion.

Randomisation and allocation concealment

Baseline data were collected before randomisation of the NHs. NHs were stratified by study centre and randomised

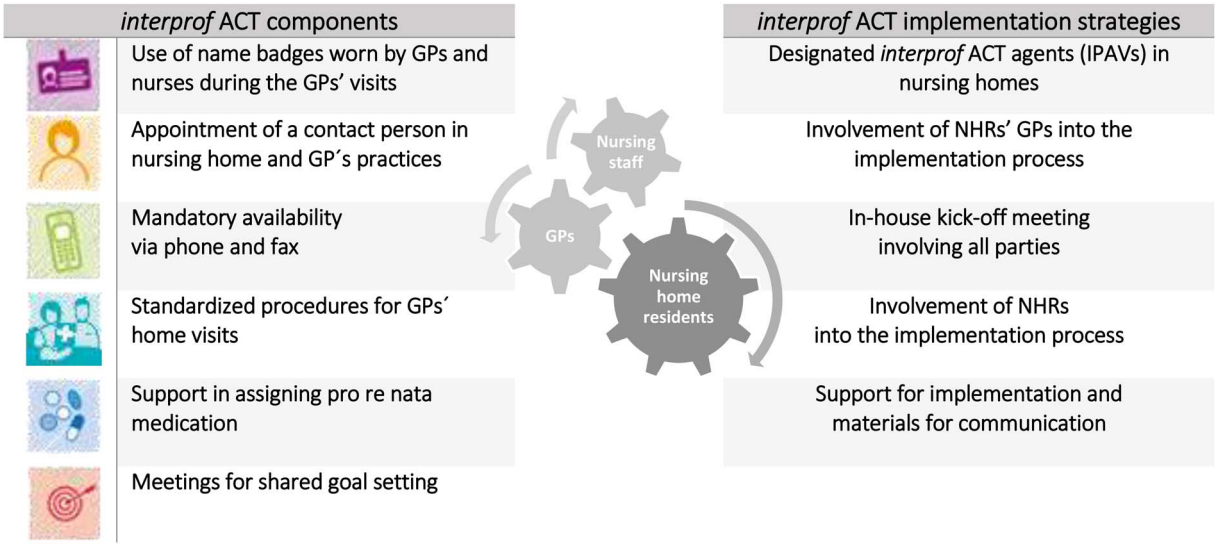

Figure 1. Interprof ACT components and strategies of implementation. NHR: nursing home resident, GP: general practitioner.

in blocks of two (1:1 ratio). The randomisation list was generated with nQuery Advisor 4.0. A biometrician performed the randomisation consecutively using a standardised process, which was predefined in a randomisation plan, from 23rd August 2018 to 24th April 2019. He provided the allocation result to the NH by e-mail. The randomisation list was provided to the analyst after database lock. Seventeen NHs were allocated to the intervention group and 17 to the control group. Blinding of NHRs, NHs or GPs was not possible. However, trained research assistants collecting the primary outcome data were not aware of the allocation.

Intervention

Interprof ACT should avoid hospitalisations of NHRs by encouraging and supporting NH staff and GPs to coordinately work together. It consists of six components: name badges, contact persons, who assured the communication within the team and between GPs and nurses. The mandatory availability and the structured GPs' home visits cover the need of reachability and constancy of medical support. Standard forms guide the administration of pro re nata medication. Person-centred goals are defined by all involved parties to assure shared decision making in regular meetings. *Interprof* ACT was implemented within 12 months from randomisation and supported by specific strategies to assure fidelity (Figure 1) [24]. The intervention did not interfere directly with any decisions taken by GPs or nursing staff.

All involved parties (NHRs, GPs and NHs) were engaged in adapting and implementing the intervention. In the NHs, designated *interprof* ACT agents (IPAVs) were responsible for facilitating and overseeing the implementation process into daily care routine. They received two trainings by study team researchers: the first one provided information about the intervention and their role as change agents. An important first task was the organisation of a kick-off meeting. The focus of this meeting was to adopt the *interprof* ACT components to the needs of all parties involved in the care of participating NHRs. Nurses, GPs and representatives of the NHRs were involved in this process. In the second IPAV training, the implementation, maintenance and supervision of the adapted intervention were discussed. In addition, IPAVs received materials to support the implementation, such as a model for name tags, several documentation forms (fax sheet, pro re nata medication form and shared goal-setting meetings), an implementation handbook and material for promoting the intervention within the NH. During follow-up, the IPAVs were regularly supervised by study team via telephone, email and in face-to-face meetings [24].

Usual care

In NHs of the control group, interaction between staff, NHRs and medical care providers proceeded as usual. NHs and GPs received short information on potential benefits of better collaboration, but no further information on *interprof* ACT.

Data collection

Data on NH characteristics were collected by self-administered questionnaires answered by NH managers before randomisation at baseline (t0) and 12 months after randomisation (t2). Data on NHR-related outcomes (primary and secondary outcomes), adverse events and the use of medical services (FIMA-Questionnaire for Health-Related Resource Use in an elderly Population) [26] were extracted from NHRs' files by trained research assistants at baseline (t0), 6 months (t1) and 12 months (t2) from randomisation. In addition, general and health-related quality of life (QoL-AD NH) [27, 28], (EQ-5D-5L) [29] were assessed at t0 and t2. EQ-5D-5L was collected for the health economic analysis. Depending on NHR's ability

to answer questionnaires (assessed with the Dementia Screening Scales (DSS) [30]), the NHR or a proxy (qualified nurse, if DSS 5 or greater) assessed quality of life in a standardised interview.

Outcomes

The primary outcome was the proportion of hospitalisation of participating NHRs within 12 months from randomisation. Secondary outcomes included the mean number of hospital admissions and of hospital days per participating NHR, mortality (proportion of NHRs dying) as well as the proportion of NHRs with at least one adverse event (fall, fracture, pneumonia and chronic wound or skin lesion). In addition, NHRs' mean quality of life (QoL-AD NH) was assessed at baseline and at t2 [27–29]. Hospitalisations and possible life-threatening events were not defined as serious adverse events (SAEs) in our trial as they were expected events in the group of NHRs regardless of the intervention.

Sample size

Assuming a hospitalisation rate of ∼50% [24, 31–33] per year, an absolute reduction from 50 to 35% was considered a relevant intervention effect. A total sample size of 340 NHRs yields a power of 80% at a two-sided significance level of 5%. Expecting 20% dropouts resulted in a total sample size of 425. Assuming an average cluster size of 20 NHRs per NH and an intra-cluster correlation (ICC) of 0.021 results in a design effect of 1.4 [34], requiring a total sample size of 600 NHRs (30 clusters, 15 clusters per group). Non-recruiting clusters were replaced. Anticipating that four clusters would probably drop out, we randomised a total of 34 clusters. Since there was some uncertainty regarding the hospitalisation rates in NHs (reported rates vary between 31 and 63%) [26, 31], ICC and dropouts, a blinded sample size review was conducted half way through the recruitment [35].

Statistical methods

All analyses were conducted using SAS v9.4 based on the intention-to-treat population. The primary outcome was analysed using a generalised linear mixed model (GLMM) with logit function and fixed effects for intervention and important prognostic factors and random effects for clusters. Random effects were included to account for possible ICCs. Fixed (predefined) prognostic factors were study group (intervention vs. control), sex, age at baseline, nursing level and nursing facility size. The secondary outcomes (total number of hospitalisations, total number of days in hospital) were evaluated with negative binomial regression, which implicitly included gamma random effects accounting for heterogeneity between residents (over dispersion). To analyse mortality and adverse events, the same model was chosen as for the primary outcome. Quality of life [27, 28] was evaluated using a hierarchical model with random effects for the clusters. Use of other medical services and the DSS [30] were analysed descriptively. As an alternative to the mixed models to account for the correlation induced by clusters, the models were fitted using generalised estimating equations (GEEs) as a sensitivity analysis.

Results

Recruitment rate and baseline characteristics

From December 2017 to February 2018, invitation letters were sent to 360 NHs in the larger areas of the study centres, 34 NHs agreed to participate, 17 were assigned to control and intervention groups, respectively. About 725 NHRs were interested and screened for eligibility, 643 NHRs were eligible, consented and registered for the study. Nineteen NHRs did not fulfil the inclusion criteria, 51 declined and 12 died before randomisation. Baseline assessment started in February 2018 (first NH in: 5th February, first NHR in: 12th February), and the follow-up was completed in July 2020 (last patient out: 8th July) (see Figure 2). About 75.6% of all eligible NHRs completed the 12-month follow-up.

As all NHs recruited well and the sample size review was appropriate, a replacement or further recruitment of NHs was not necessary. During the last months of data collection, infection control measures related to the SARS-CoV-2 pandemic precluded us from conducting interviews with NHRs in two NHs (study site Hamburg). In consequence, only data from 32 NHs were available for analysing the effects on quality of life. Other NHR-related outcomes data could be extracted from the NHR files.

Characteristics of participating NHs and NHRs can be found in Table 1. Supplementary material provides information about dropouts between allocation and t1 and between t1 and t2.

Primary and secondary outcomes

The completion rates were 76.6 and 74.6% in the intervention and control groups, respectively. In the intervention group, 136 (42.5%) NHRs were hospitalised at least once within 12 months from randomisation compared with 151 (46.7%) NHRs in the control group (odds ratio (OR) 0.82, 95% confidence interval (CI) (0.55; 1.22), $P = 0.33$) (Table 2). The variance of the random cluster (NH) effects was 0.113 (standard error 0.087) on the logit scale; this variance translates to an ICC of about 0.033. Also, regarding secondary outcomes, no significant differences could be found between groups (Table 2).

Table 3 provides information on the use of medical services.

Discussion

Principal findings

The implementation of *interprof* ACT resulted in no significant difference of the number of NHRs admitted to hospital within 1 year. Earlier positive findings on interprofessional

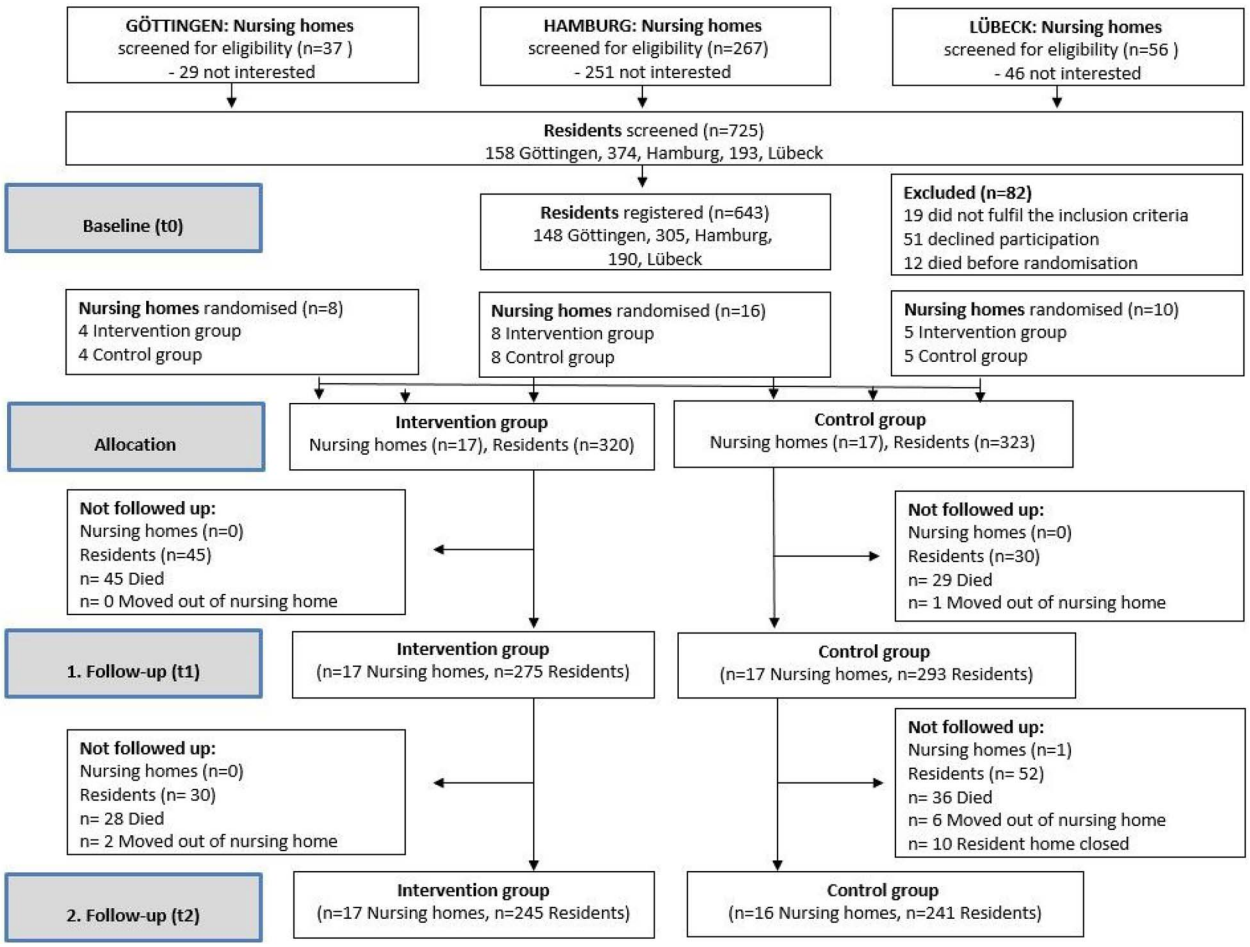

Figure 2. CONSORT flow diagram.

collaboration as strategy to avoid hospital admissions [14, 15, 22] could not be confirmed here. The secondary outcomes mortality, quality of life, adverse events and use of medical services also showed no differences between the study arms.

The findings of our cRCT are consistent with the results of the US American trial INTERACT [20] and the British BHiRCH-NH pilot cRCT [21]. Both trials tested complex interprofessional interventions, based on training of professionals involved in care [20, 21], and implementation of support approaches. They also found no statistically significant reduction of hospitalisations, emergency department visits [20] or avoidable hospital admissions [21]. Although we included a blinded sample size review to check planning assumptions regarding the event rates, ICC and dropout, our trial was not conclusive. This might, at least partially, be due to the higher than assumed ICC and lower than assumed event rate in the control group.

Some aspects are important to reflect these results in all three trials [20, 21]. One common key element were change agents in the NHRs to coordinate the implementation of the interventions: champions and co-champions [20], practice development champions [21] and in our trial IPAVs [24]. Nurse empowerment and leadership were identified as likely elements for a better management of acute changes in NHRs' conditions [21]. Hoben and colleagues [36] confirmed the effectiveness and sustainability [37] of nursing staff's involvement in improving the interprofessional exchange about NHRs' health. Change agents in all three trials were trained, received implementation material and were supervised regularly. Despite the intensive support, inconsistencies in the implementation process were considered as possible reasons for these results [20, 21]. Also, in our trial, not all intervention components were equally implemented. These aspects will be analysed in the process evaluation [38] and published later.

Strengths and weaknesses of the study

A selection bias might have been a limitation when recruiting NHs. We assume managers of NHs to be more inclined to participate if they were already interested in the topic.

In our cRCT, the intervention was delivered on a cluster level, whereas the outcomes were measured at the individual level. In this sense, the exposure of non-participating residents to the intervention in participating NHs cannot be excluded. Retrospectively, data collection for all residents per cluster could have been a better assessment strategy.

Table 1. Baseline characteristics of NHs and NHRs

NHs	Total (N = 33)	Control (N = 17)	Intervention (N = 16)[a]
Ownership			
Private (N [%])	21 [64%]	13 [76%]	8 [50%]
Not-for-profit (N [%])	10 [30%]	3 [18%]	7 [44%]
Public and ecclesiastical (N [%])	2 [6%]	1 [6%]	1 [6%]
City size < 100,000 citizens [N (%)]	16 [48%]	8 [47%]	8 [50%]
Full inpatient long-term care			
Actual places (mean [min, max])	100 [41, 255]	96 [41, 162]	103 [42, 255]
Occupied places (mean [min, max])	92 [39, 211]	89 [41, 151]	94 [39, 211]
Long-term care grade[b] (mean [min, max])		3.2 [2.6, 3.9]	3.3 [2.8, 4.3]
NHRs	Total (N = 643)	Control (N = 321–323)[a]	Intervention (N = 316-320)[a]
Age at baseline in years (mean [SD])	81.8 [11.7]	82.1 [11.1]	81.4 [12.2]
Sex, female (N [%])	436 [67.8%]	215 [66.6%]	221 [69.1%]
Insurance type, statutory (N [%])	600 [93.8%]	309 [96.3%]	291 [91.2%]
Welfare recipient (N [%])	188 [29.5%]	110 [34.4%]	78 [24.6%]
DSS score, 0–14 (mean [SD]), (median)	4.3 [4.6]	4.1 [4.5]	4.6 [4.6]
	3.0	3.0	3.0
Long-term care grade (mean [SD])	3.1 [1.1]	3.0 [1.1]	3.2 [1.1]
Long-term care grade (N [%])			
0	8 [1.2%]	5 [1.6%]	3 [0.9%]
1	15 [2.3%]	10 [3.1%]	5 [1.6%]
2	195 [30.4%]	108 [33.5%]	87 [27.3%]
3	196 [30.6%]	102 [31.7%]	94 [29.5%]
4	136 [21.2%]	57 [17.7%]	79 [24.8%]
5	91 [14.2%]	40 [12.4%]	51 [16.0%]
Number of NHRs recruited per NH (mean [min, max])	**Total**	**Control**	**Intervention**
	18.9 [11, 27]	19.1 [11, 26]	18.8 [11, 27]

NHR = nursing home resident, N = number of person (population), max = maximum, min = minimum [a]Values not available for all NHs or NHRs. Information was not received from one NH. [b]Long-term care grade: 0 = no impairment of independence or capabilities; 1 = low level of impairment of independence or capabilities; 2 = significant level of impairment of independence or capabilities; 3 = serious level of impairment of independence or capabilities; 4 = the most severe level of impairment of independence or capabilities; 5 = the most severe level of impairment of independence or capabilities with special long-term care requirements

Interprof ACT consists of positive and sense-making components consented in our previous study, which nevertheless showed no effect. Perhaps, the intervention might have an impact on other important outcomes as peer-acceptance, patient satisfaction or improvement of reachability [39] not being considered here. An underpowerment of the study is less likely, as sample size calculation was performed carefully.

Although achieving the highest possible quality of life is a central aspect of person-centred care for NHRs [40] and collaboration impacts quality of life [41], results did not demonstrate this in our study. Perhaps, the effect would have been greater if we had fewer missing data on QoL. There were several reasons: we lost one NH during follow-up, and got no access to QoL data in two further NHs because of COVID-19 contact restrictions. In addition, data collection from residents with high levels of cognitive impairment was ensured in using proxy-rating adapted to the NH setting (QoL-AD NH), which was the best available option. Nevertheless, the meaning of true inclusiveness should be reconsidered. Proxies might rate patients' quality of life differently than patients themselves, if they were capable to do so (weak inter-rater reliability) [28]. The development of QoL-instruments for all severity levels in a self-assessed manner or at least of more reliable proxy-person-instruments [28] is still needed [42, 43].

In general, sensitivity analyses assessing the potential impact of COVID-19 are recommended [44]. In this study, however, the impact of the pandemic on follow-up was rather small, since most follow-up assessments were completed in July 2020.

Unanswered questions and future research

Looking retrospectively at the intervention and its insignificant effect, the question might arise, if the intervention was too 'weak' to be successful. As the aim of our previous project *interprof* was to develop a strategy to improve interprofessional collaboration, the scientific consequence was to evaluate its implementation in practice. The answer to this question might be found in the process evaluation, being published soon.

The challenge remains to cultivate the field of interprofessional research by performing studies of high quality in real-care settings. Systems often do not react to interventions as assumed [45]. Process evaluations are therefore important as they allow insights into implementation processes and show reasons for possible failures. This information seems to be indispensable for trials on interprofessional interventions.

In addition, future research should clarify, if interprofessional interventions in NHs might achieve positive effects on NHRs in a broader sense. Patient-reported

Table 2. Effects of the intervention on (I) primary and (II) secondary outcomes after 12 months (t2) and (III) on the occurrence of adverse events during 12 months from randomisation

(I) Primary outcomes	Total (N = 643)	Control (N = 323)	Intervention (N = 320)	OR [95 % KI]	*P*-value
Proportion of NHRs' hospitalisations[a] (N[%])	287 [44.6%]	151 [46.7%]	136 [42.5%]	0.82 [0.55, 1.22]	0.33
(II) Secondary outcomes	Total (N = 643)	Control (N = 323)	Intervention (N = 320)	Rate ratio/Hazard ratio [95 % KI]	*P*-value
Hospitalisation per NHR[b] (mean [min, max])	0.8 [0, 12]	0.8 [0, 10]	0.8 [0, 12]	0.91 [0.66, 1.24]	0.54
Days in hospital per NHR[b] (mean [min, max]))	6.1 [0, 125]	6.5 [0, 100]	5.7 [0, 125]	0.70 [0.45, 1.11]	0.13
Mortality[a] (N [%])	138 [21.5%]	65 [20.1%]	73 [22.8%]	1.12 [0.80, 1.58]	0.50
	Total (N = 340)[c]	Control (N = 167)[c]	Intervention (N = 173)[c]	Mean difference [95 % KI]	*P*-value
Quality of life of NHR[d] (mean difference T0–T2 [min, max])	−0.3 [−23.0, 23.3]	0.3 [−17.8, 23.3]	−0.9 [−23.0, 11.7]	−0.61 [−1.86, 0.64]	0.34
(III) Adverse events	Total (N = 643)	Control (N = 323)	Intervention (N = 320)		*P*-value[e]
Falls (N [%])	296 [46.0%]	147 [45.5%]	149 [46.6%]		GLMM 0.72, GEE 0.71
Bone fractures (N [%])	32 [5.0%]	15 [4.6%]	17 [5.3%]		GLMM -[f], GEE 0.65
Pneumonia (N [%])	32 [5.0%]	15 [4.6%]	17 [5.3%]		GLMM -[f], GEE 0.65
Chronic wounds/ skin lesions (N [%])	160 [24.9%]	82 [25.4%]	78 [24.4%]		GLMM 0.85, GEE 0.67

NHR = nursing home resident, t0 = at baseline, t2 = 12 months from randomisation [a]Generalised linear mixed effects model (GLMM) with logit link and fixed effects for intervention and important prognostic factors on the cluster and individual levels (size of NH, sex, age, level of care), and random effects for clusters. The random effects are included to account for possible ICC. [b]Negative binomial regression with random cluster effects and fixed effects for intervention, and important prognostic factors on the cluster and individual levels (size of NH, sex, age, level of care), and the logarithm of the follow-up time included as an offset. [c]Smaller population due to loss NHR during follow-up and missing data of NHR in two NHs (no data collection possible because of pandemic contact restrictions). [d]Hierarchical model with random cluster effects, fixed effects for intervention, important prognostic factors (sex, age, level of care) and baseline quality of life value as covariate. [e]Results of the GLMM and GEE model. [f]This model does not converge due to the small number of events with respect to the number of NHs.

Table 3. Descriptive results of use of medical services after 12 months from randomisation (t2)

Use of medical services	Total (N = 643)	Control (N = 323)	Intervention (N = 320)
Rehabilitation [N (%)]	12 [1.9%]	8 [2.5%]	4 [1.3%]
Out-of-hours/emergency services (mean [min, max])	0.5 [0, 5]	0.4 [0, 4]	0.6 [0, 5]
Ambulance services (mean [min, max])	0.6 [0, 13]	0.6 [0, 13]	0.6 [0, 7]
Ambulance transports (mean [min, max])	0.8 [0, 12]	0.8 [0, 12]	0.8 [0, 8]
GP care			
Contact via telephone, fax, mail (mean [min, max])	13.3 [0, 108]	12.4 [0, 67]	14.2 [0, 108]
Home visit in the NH (mean [min, max])	12.1 [0, 68]	14.1 [0, 68]	10.0 [0, 43]
NHR visits GP at the office (mean [min, max])	0.3 [0, 19]	0.3 [0, 19]	0.2 [0, 11]
Specialist care (total number [ratio][a])			
Neurologist/psychiatrist	1,667 [2.59]	821 [2.54]	846 [2.64]
Dentist	649 [1.01]	295 [0.91]	354 [1.11]
Internist	365 [0.57]	184 [0.57]	181 [0.57]
ENT specialist	381 [0.59]	158 [0.49]	223 [0.70]
Urologist	381 [0.59]	145 [0.45]	236 [0.74]

NHR = nursing home resident, GP = general practitioner, ENT = ear–nose–throat, N = number of person (population), t2 = 12 months from randomisation, mean = average number of service use by NHR, max = maximum, min = minimum [a]ratio: number of contacts/number of NHRs.

outcome measures (PROMs), patient-reported experience measures (PREMs) [46] and further patient-related outcomes should be more often taken into account [47]. Currently, a core outcome set for patient-related outcomes is being developed with the involvement of the patients themselves [48]. For further work within the interprofessional research field, a core data set including outcomes with regard to patient/person centredness [49, 50] will be helpful for evaluating interprofessional collaboration.

Moreover, a recent realist synthesis underlined aspects of trust and mutual successes to be important elements of interorganisational collaboration [51]. They were considered only marginally in *interprof* ACT and its implementation and should receive more attention in future trials.

Conclusions

Even though this study could not demonstrate that our intervention leads to better clinical outcomes for NHRs, it provides—together with findings from other trials—the basis for future research and new paths to be taken into consideration with regard to interprofessional care in NHs. Findings from our study confirm the high numbers of hospitalisations of NHRs as shown in other studies, which implicates the urgency to improve the health care of this person group. During the corona pandemic, the vulnerability of NHRs can be seen through a magnifying glass [52] and the current situation shows a high need for effective, crisis-resilient interprofessional strategies for the health care of NHRs.

Supplementary Data: Supplementary data mentioned in the text are available to subscribers in *Age and Ageing* online.

Acknowledgements: The authors would like to thank the many people who have supported this work. In particular, Federal Joint Committee for funding this piece of work and the members of the study group: Heike Kretzschmer, Annette Strauss, Gerrit von Deyen, Thomas Zimmermann, Sarah Porzelt, Anja Rakebrandt, Anke Theuerkauf, Carolin Birau, Maria Hendrick, Anja Kühn, Friederike Lüth, Anne-Marei Jarchow, Ramona Wilfing, Katrin Schütz for their support given to this study. Thanks are also extended to the members of the Project Advisory Board for their support, advice and guidance throughout the work. Finally, the authors would like to thank staff and residents of nursing homes as well as general practitioners who took part in this study.

Declaration of Conflicts of Interest: None.

Declaration of Sources of Funding: Federal Joint Committee (Gemeinsamer Bundesausschuss), Register ID: 01VSF16029.

Trial Registration: ClinicalTrials.gov ID: NCT03426475, 7 February 2018.

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Received 10 March 2022; editorial decision 13 December 2022