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Substituting physicians with nurse practitioners, physician assistants or nurses in nursing homes: a realist evaluation case study

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ABSTRACT

Objectives This study aimed to gain insight into how substitution of elderly care physicians (ECPs) by nurse practitioners (NPs), physician assistants (PAs) or registered nurses (RNs) in nursing homes is modelled in different contexts and what model in what context contributes to perceived quality of healthcare. Second, this study aimed to provide insight into elements that contribute to an optimal model of substitution of ECPs by NPs, PAs or RNs.

Design A multiple-case study was conducted that draws on realist evaluation principles.

Setting Seven nursing homes in the Netherlands

Participants The primary participants were NPs (n=3), PAs (n=2) and RNs (n=2), working in seven different nursing homes and secondary participants were included; ECPs (n=15), medical doctors (MDs) (n=2), managing directors/managers/supervisors (n=11), nursing team members (n=33) and residents/relatives (n=78).

Data collection Data collection consisted of: (1) observations of the NP/PA/RN and an ECP/MD, (2) interviews with all participants, (3) questionnaires filled out by the NP/PA/RN, ECPs/MDs and managing directors/managers and (4) collecting internal policy documents.

Results An optimal model of substitution of ECPs seems to be one in which the professional substitutes for the ECP largely autonomously, well-balanced collaboration occurs between the ECP and the substitute, and quality of healthcare is maintained. This model was seen in two NP cases and one PA case. Elements that enabled NPs and PAs to work according to this optimal model were among others: collaborating with the ECP based on trust; being proactive, decisive and communicative and being empowered by organisational leaders to work as an independent professional.

Conclusions Collaboration based on trust between the ECP and the NP or PA is a key element of successful substitution of ECPs. NPs, PAs and RNs in nursing homes may all be valuable in their own unique way, matching their profession, education and competences.

Strengths and limitations of this study

- In this study a realist evaluation approach was applied in seven cases to gain insight into what mechanism of substituting physicians with nurse practitioners, physician assistants or nurses in nursing homes contributes, in what context and in what respect, to perceived quality of healthcare.
- The theory-driven approach helped us to explore the complexity of substitution of care in a systematic way and challenged us to keep an open mind while collecting and analysing data in this study with certain propositions.
- All relevant stakeholders involved in physician substitution were included and different data collection methods were applied to provide a complete picture of each case which provided input for the cross-case analysis.
- The outcomes in this study were self-reported and qualitative and some were estimated outcomes; we did not confirm these outcomes with quantitative data.

BACKGROUND

Nursing home physician specialists face heavy workloads due to population ageing, increased multimorbidity, and relatively few medical students pursuing a career in healthcare for older adults.[1–3] In the Netherlands, nursing home physician specialists are called elderly care physicians (ECPs) and are employed by the nursing home organisation.[4–6] This is a unique specialty that may contribute to the quality of healthcare.[5 7 8] However, there is a high workload for ECPs in the Netherlands and there are many vacancies.[9 10] At the moment, medical doctors (MDs) without any specific specialty partly fulfil these vacancies, but often for a short time, as they perceive this as an interim employment.[9] Substituting physicians with nurse practitioners (NPs), physician assistants (PAs) or registered nurses (RNs) is a possible solution to maintaining quality nursing home care. In the last decades, RNs, NPs and PAs

increasingly have been introduced into nursing homes to meet these challenges.[11–13]

A systematic review showed that substituting nursing home physicians with NPs, PAs or RNs appears to achieve at least as good resident and process of care outcomes as care provided by physicians.[14] In a focus group study with professionals in Dutch nursing homes, the contributions of NPs, PAs and RNs to quality healthcare, provision of resident-centred care and strengthening of the care team was considered an added value.[15] Nevertheless, the same study showed that physician substitution was organised by different professionals (NPs, PAs, RNs) with different tasks and responsibilities, and there was no consensus on optimal organisation. Physician substitution is influenced by factors at the social, organisational and individual levels.[14 15] For example: (a) at the social level, the support of the professional associations, (b) at the organisational level, the vision on roles, tasks and responsibilities of NPs, PAs and RNs and (c) at the individual level, physicians' willingness to share responsibility for resident care.[14 15]

In short, it is known that there is great variation in how physician substitution is modelled, but we do not know what this variation looks like in practice. In addition, there is some knowledge about how physician substitution might bring about any effect, but it is not clear how contextual factors influence physician substitution and how this influences quality of healthcare. Therefore, we aimed to obtain detailed insight into the connected elements.

The following research questions are addressed in this paper:

(a) How is substitution of ECPs by NPs, PAs and RNs modelled in different Dutch nursing homes?

(b) What mechanism of substitution of ECPs by NPs, PAs and RNs contributes, in what context and in what respect, to perceived quality of healthcare for nursing home residents?

(c) What elements contribute to an optimal model of substitution of ECPs by NPs, PAs and RNs?

METHODS

We performed a realist evaluation, which is a method used to explain how and why a complex intervention is successful.[16–18] In the current study, an initial theory about substituting physicians, articulated in three mechanisms, is evaluated through multiple cases. Those mechanisms describe what it is about a complex intervention (physician substitution) that brings about any effects.[16] In figure 1 the underlying mechanisms are classified under the head mechanisms. Below the main methodological elements are reported. We refer readers to the published study protocol for an extensive description of this multiple-case study and the initial theory that is tested in this case study.[19] The protocol and the current paper are reported according to the realist and meta-narrative evidence syntheses: evolving standards (RAMESES) II reporting standards for realist evaluations.[20]

The research ethics committee of the region Arnhem Nijmegen concluded that this study did not fall within the scope of the Medical Research Involving Human Subjects Act (WMO) (registration number 2014/298).

Patient and public involvement

In this study the patients were represented by 'Zorgbelang Inclusief'. One of the advisors of 'Zorgbelang Inclusief' was a member of the advisory board of this study. 'Zorgbelang Inclusief' supports citizens, patients, care and welfare organisations, local authorities, insurance companies and educational institutions to strengthen self-reliance of people and increase quality of social, healthcare and welfare services. The advisor was involved in the design and conduct of the study. For example, in developing residents' interview guides and in assessing the burden of the interview.

CASE SELECTION

Each case comprised one NP, PA or RN in a nursing home organisation. From the 103 completed selection questionnaires (see protocol) we selected seven cases to create a balance between depth and variation in the study. The main goal of the selection was to select cases in which the professional worked mainly in the medical domain; that is, medical examination, medical diagnosis and medical treatment. In addition, variation was sought on, among others, level of autonomy and type of professional. Maximum variation sampling was used to provide insight into different models of physician substitution and to select cases that did or did not confirm the head mechanisms.

PARTICIPANTS

The primary participants of interest were NPs, PAs and RNs. We included a specific group of RNs, the practice nurses, as they are most likely to substitute for ECPs. Following the example of general practices, more and more practice nurses started working in nursing homes in the Netherlands in the last few decades.[21] Practice nurses in nursing homes have additional training on the healthcare needs of older patients and on the nurse's role in nursing homes. As secondary participants we also included ECPs, managing directors/managers/supervisors, five members of the nursing teams (ie, nurses/healthcare assistants and nurse team leaders) and five nursing home residents and their relatives. Representatives of the residents and/or family council were also included in the study.

DATA COLLECTION

Data collection consisted of observations, interviews, questionnaires and analysis of internal policy documents. Table 1 presents the data that were collected in each case. All interviews were audio-taped, transcribed verbatim

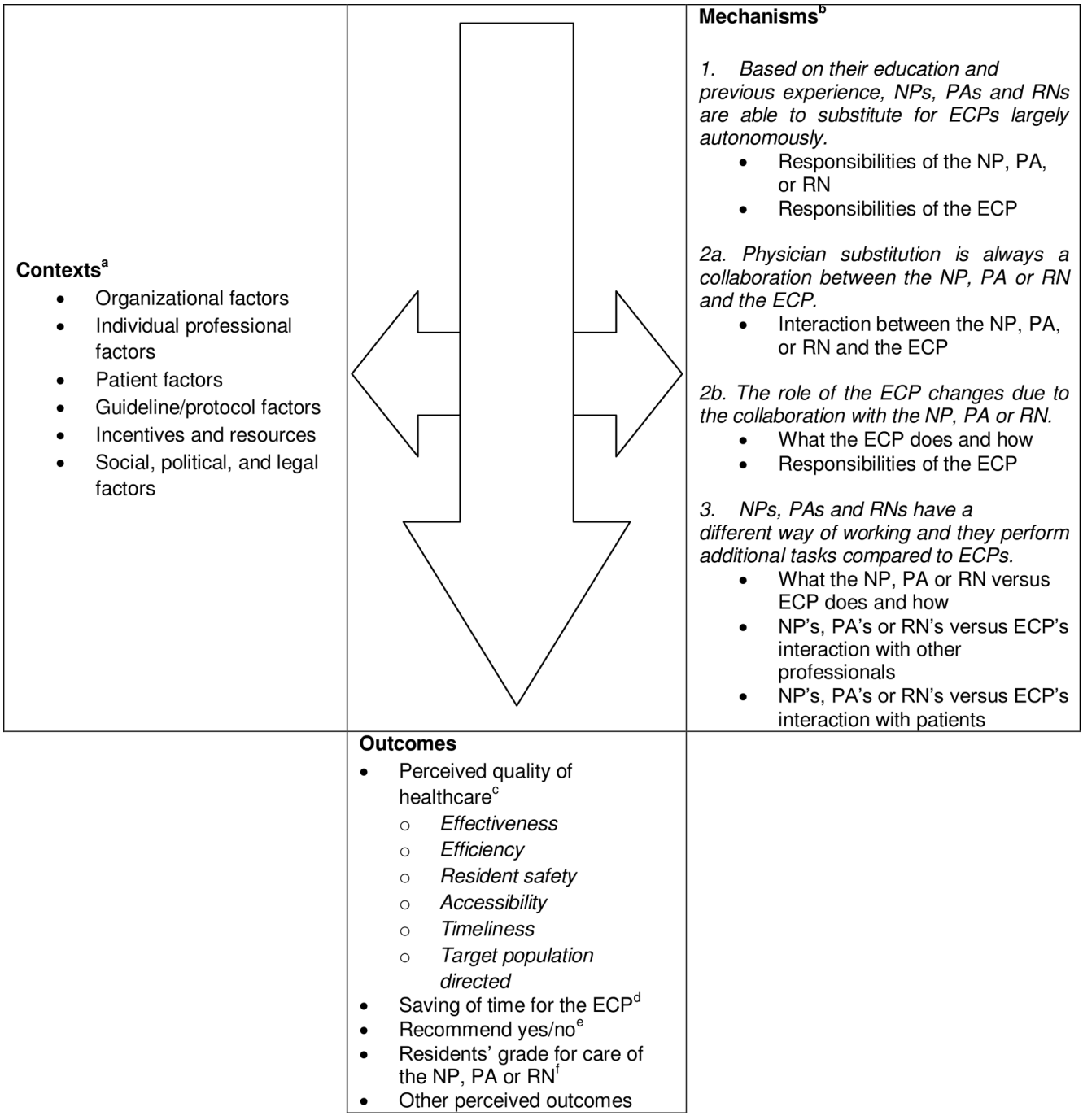

Figure 1 [a]What factors influence physician substitution and how? [b] What is it about physician substitution that brings about any effect? [c]What is the influence of the NP, PA or RN on (quality of healthcare outcome) in comparison to care provided by (the) ECP(s)? [d]What is the percentage of saved time for the ECP of the time the NP, PA or RN works. [e]Would you recommend the way physician substitution by the NP, PA or RN is modelled in your organisation to other organisations? [f]How would you grade the care you receive from the NP, PA or RN? ECPs, elderly care physicians, MDs, medical doctors; NPs, nurse practitioners; PAs, physician assistants; RNs, registered nurses.

and anonymised before analyses. Atlas.ti V.7 and SPSS V.20 were used to facilitate data management and analyses. Data were collected between September 2015 and January 2017 in seven nursing homes. In each case, two researchers (MHL and IM) collected all data in 2 weeks. Written informed consent was obtained from all participants who were interviewed and consent was asked before observation. For full informed consent procedure see published study protocol.[19]

Data analysis

Data were analysed by four researchers in pairs (MLo with IM, AvV or LvD) in the 5 weeks directly after data collection of each case. At completion of the initial analysis

Table 1 Data collection per case

Method	Specific data (see table 3)	Mechanism data	Context data	Outcome data
NP, PA, RN				
Questionnaire	▶ Age, gender ▶ Working experience ▶ Type of unit(s) ▶ Member of which team ▶ Number of residents ▶ Number of collaborating doctor(s) ▶ Type of collaboration with doctor(s) ▶ Level of autonomy ▶ Tasks ▶ Prescribing medication	1, 2a, 3	–	–
Observation (4×4 hours)	▶ Structural and/or ad hoc meetings with doctor(s) ▶ Level of autonomy ▶ Tasks ▶ Prescribing medication	1, 2a, 3	• Individual professional factors • Patient factors	–
Interview, after observation	▶ Structural and/or ad hoc meetings with doctor(s)) ▶ Level of autonomy ▶ Tasks ▶ Prescribing medication	All mechanisms	All context factors	All outcomes except grade
Managing director/manager involved in physician substitution				
Questionnaire	▶ Number of peers of the NP, PA or RN	–	–	–
Managing director/manager involved in physician substitution - supervisor of the NP, PA or RN - head ECP				
Interview	▶ Reason to employ provider ▶ Vision on substitution	All mechanisms	All context factors	Recommend yes/no
ECP with whom the NP, PA or RN collaborates most intensely				
Questionnaire	▶ Type of collaboration with NP, PA or RN ▶ Level of autonomy of NP, PA or RN ▶ Tasks of NP, PA or RN	All mechanisms	–	–
Observation (2×2 hours)	▶ Structural and/or ad hoc meetings with NP, PA or RN ▶ Level of autonomy of NP, PA or RN	All mechanisms	▶ Individual professional factors ▶ Patient factors	–
Interview, after observation	▶ Structural and/or ad hoc meetings with NP, PA or RN ▶ Level of autonomy of NP, PA or RN ▶ Tasks of NP, PA or RN	All mechanisms	All context factors	All outcomes except grade
ECPs with whom the NP, PA or RN collaborates directly				
Questionnaire	▶ Type of collaboration with NP, PA or RN ▶ Level of autonomy of NP, PA or RN ▶ Tasks of NP, PA or RN	All mechanisms	–	–
Interview	▶ Structural and/or ad hoc meetings with NP, PA or RN ▶ Level of autonomy of NP, PA or RN ▶ Tasks of NP, PA or RN	All mechanisms	All context factors	All outcomes except grade
Five nurses/healthcare assistants/nursing team leaders with whom the NP, PA or RN collaborates				
Interview	–	All mechanisms	All context factors	All outcomes except grade
Five residents the NP, PA or RN takes care of and/or their relative/informal caregiver				
Interview	–	3	▶ Individual professional factors ▶ Patient factors	Grade

Continued

Table 1 Continued

Method	Specific data (see table 3)	Mechanism data	Context data	Outcome data
Resident-family council				
Focus group interview	–	All mechanisms	All context factors	Quality of healthcare
Documents				
► Mission and vision of the organisation; ► Mission and vision of the organisation on physician substitution; ► Job description of the NP, PA or RN; ► Working arrangements for the NP, PA or RN and the ECP; ► Treatment protocols for the NP, PA or RN; ► Annual report of the organisation of the preceding year; Information about the NP, PA or RN for residents and family.				

ECP, elderly care physicians; NP, nurse practitioner; PA, physician assistant; RN, registered nurse.

of all cases, a cross-case analysis was carried out by two researchers (MLo and AP). First context, mechanism, and outcome (CMO) configurations were formulated at case level. In addition, CMO configurations across cases were determined. These CMO configurations were discussed within the research team (the authors of this paper).[18]

RESULTS

Three NPs, two PAs and two RNs were included as cases. Two were male and five female and mean age was 45 years (range, 31 to 58 years). The nursing homes were scattered across the Netherlands. For the exact number of participants per case, see table 2.

Models of substitution

In the seven cases, substitution of ECPs by NPs, PAs and RNs was modelled in various ways (see table 3). The professionals worked in three types of units: (1) unit for residents with physical disabilities, (2) dementia special care unit and (3) geriatric rehabilitation unit. In most cases the main reason to employ NPs, PAs or RNs was the shortage of ECPs. The NPs, PAs and RNs were working with one to four ECPs. Some professionals worked fully autonomously while others worked under the supervision of an ECP. Most worked as a generalist, while some (also) worked as a specialist in, for instance, wound care or care for residents with diabetes mellitus.

Mechanisms of substitution

Below we describe whether any of the three pre-defined mechanisms of ECP substitution (see study-protocol and figure 1) were present in the cases, and, if so, in which context and with what outcomes.

Mechanism 1

Based on their education and previous experience, NPs, PAs and RNs are able to substitute for ECPs largely autonomously

This mechanism of substituting for ECPs largely autonomously was present in four cases (2, 3, 4, 7). In two cases the professional was a PA and in the other two an NP. Two PAs and one NP (cases 2, 4, 7) worked on their own unit(s) with an ECP in the background to discuss residents' care if required. The ECP was seen as an expert colleague, not as a supervisor. In case 3, the NP and the ECP shared responsibility for residents on a certain unit and worked closely together.

Contextual factors that made substitution flourish were organisational factors such as 'organisational leaders, like managing directors, managers, supervisors and (head) ECPs, that acknowledge NPs or PAs as independent

Table 2 Number of participants per case

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
Professional	**NP**	**PA**	**NP**	**NP**	**RN**	**RN**	**PA**
Managing director/manager/supervisor	2	1	2	1	2	2	1
ECP	3	2	2	1	4	1 ECP 2 medical doctors	2
Nurse	3	2	1	2	3	1	2
Healthcare assistant	1	2	4	2	2	3	3
Nursing team leader	1	1	–	1	–	1	–
Resident	–	1	5	–	5	–	2
Relative/informal caregiver	7	5	2	5	1	5	3
Member resident-family council	2	2	2	15	7	3	6

ECP, elderly care physician; NP, nurse practitioner; PA, physician assistant; RN, registered nurse.

Table 3 Organisation of physician substitution in nursing homes

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
Professional	**NP**	**PA**	**NP**	**NP**	**RN**	**RN**	**PA**
Working experience in current professional role	22 months	55 months	50 months	26 months	72 months	25 months	74 months
Type of unit	Dementia special care unit (n=1)	Geriatric rehabilitation unit (n=1)	Geriatric rehabilitation unit (n=1)	Dementia special care unit (n=2)	Unit for residents with physical disabilities and dementia special care unit (n=4)	Dementia special care unit (n=8)	Unit for residents with physical disabilities and dementia special care unit (n=3)
Reason to employ provider	Among others the shortage of ECPs	Among others the shortage of ECPs	Among others the shortage of ECPs	To enhance continuity and quality and retain costs	To reduce the workload of the ECPs	Demedicalisation	Among others the shortage of ECPs
Vision on substitution	–	–	If possible; tasks should be performed by a professional of lower level	NPs are autonomous medical providers	–	The employment of RNs corresponds with the vision of demedicalisation	–
Number of collaborating doctor(s)	1 ECP	1 ECP	1 ECP	1 ECP	4 ECPs	2 medical doctors	2 ECPs
Type of collaboration with doctor(s)	Shared responsibility ECP does not work at another unit	ECP supports the PA ECP works at another unit	Shared responsibility ECP works at other units	ECP supports the NP ECP works at another unit	Shared responsibility ECPs work at other unit(s) except for one	Shared responsibility Medical doctors work at other units	ECPs support the PA ECPs work at other units
Structural and/or ad hoc meetings with doctor(s)	Often ad hoc	Structural and minimal ad hoc	Structural and often ad hoc	Structural and often ad hoc	Dependent on the ECP: minimal to often ad hoc meetings	Often ad hoc	Structural and minimal ad hoc
Level of autonomy	The ECP checks and/or approves the acts of the NP The NP provides wound care autonomous	Fully autonomous	Mostly autonomous Together with the ECP: complex situations, general rounds and multidisciplinary meetings	Fully autonomous	Medical domain: the ECPs check the acts of the RN afterwards or the RN works under supervision Nursing domain: autonomous	Medical domain: under supervision Nursing domain: autonomous	Fully autonomous
Number of residents	102	12	20	60	199	56	68
Tasks	▶ Admissions ▶ General rounds ▶ Acute visits ▶ Family meetings ▶ Multidisciplinary meetings ▶ Referral to other disciplines ▶ Wound care	▶ Admissions ▶ General rounds ▶ Acute visits ▶ Family meetings ▶ Multidisciplinary meetings ▶ Discharge ▶ Referral to other disciplines	▶ Admissions ▶ General rounds ▶ Acute visits ▶ Family meetings ▶ Multidisciplinary meetings ▶ Discharge ▶ Referral to other disciplines ▶ Specialist on neurological rehabilitation on organisational level	▶ Admissions ▶ General rounds ▶ Acute visits ▶ Family meetings ▶ Multidisciplinary meetings ▶ Referral to other disciplines	▶ Admission ▶ *(in addition to admission by ECP)* ▶ General rounds ▶ *(in addition to round by ECP)* ▶ Acute visits ▶ Referral to other disciplines ▶ Care for residents with DM	▶ Triage ▶ Wound care ▶ Cardio vascular risk management ▶ Care for residents with DM and COPD ▶ Family meetings ▶ Multidisciplinary meetings	▶ Admissions ▶ General rounds ▶ Acute visits ▶ Family meetings ▶ Multidisciplinary meetings ▶ Referral to other disciplines ▶ Out of hours care ▶ Specialist in acute care on organisational level
Prescribing medication*	Yes, under supervision of the ECP	Yes, autonomous	Yes, autonomous if competent	Yes, autonomous ECP receives an email	Making proposals to the ECP In exceptional situations checked by the ECP afterwards or under supervision of an ECP	Making proposals to the medical doctors	Yes, autonomous

Continued

Table 3 Continued

Professional	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
	NP	PA	NP	NP	RN	RN	PA
Official documents within the organisation	▲ Collaborative agreement	▲▲ Job description Collaborative agreement ▲ Prescribing agreement	▲▲▲▲ Job description Collaborative agreement Prescribing agreement Formation NP/ECP calculator	▲▲▲ Job description Prescribing agreement Vision document: roles and responsibilities NP	▲▲ Job description Framework medical team ▲ Framework diabetes care	▲▲ Job description Flow chart support questions	▲▲ Job description Prescribing agreement
Peers in the organisation	2 NPs	None	3 NPs	4 NPs	4 RNs	17 RNs	1 PA
Member of which team	Medical	Medical	Medical	Medical	Medical	Nursing	Medical

COPD, chronic obstructive pulmonary disease; DM, diabetes mellitus; ECP, elderly care physician; NP, nurse practitioner; PA, physician assistant; RN, registered nurse.
Prescribing medication is one of the so-called 'reserved procedures' described in the Individual Healthcare Professions Act that is mostly performed in nursing homes. In the Netherlands, NPs and PAs are authorised to indicate and perform some of the so-called 'reserved procedures', which were initially only reserved for physicians.

professionals', and individual factors, such as 'the professional having a proactive personality'. Management and the ECPs in these four cases supported the NP or PA to work independently in accordance with their educational background and standards set through legislation. The NPs and PAs in the four cases showed traits that contributed to their work as independent professional since they were proactive, decisive and communicative, and furthermore had working experience in complex or acute care settings.

> We have structural meetings with all NPs and [name manger], where we discuss things like positioning, development, education, supervision of colleague, that is, our role in the organisation. – NP – case 4

> [name PA] is not reactive, but proactive so to say, so (s)he shows what (s)he has to offer and that has made that (s)he has the current role. If (s)he would have been more reactive then it would have been different, I think. – ECP with whom the PA collaborates most intensely – case 2

The outcome 'saving of time for the ECP' was estimated by the ECPs, NPs and PAs in case 2, 3, 4 and 7 to be in a range of 60% to 100%. The ECPs, care teams, NPs and PAs perceived that quality of healthcare outcomes for care provided by the NPs and PAs was as good as that provided by the ECPs concerning effectiveness, efficiency, resident safety, accessibility, timeliness and patient-centredness. A few participants stated that some healthcare outcomes were not at the same level as those when the ECPs provided care, for example, efficiency (PA takes more time for resident visits), and timeliness (NP needs more time for clinical reasoning). However, some participants stated that some outcomes were better, for example, effectiveness (PA is more focused on resident's satisfaction), and safety (NP is more focused on getting the details right). All participants in cases 2, 3, 4 and 7 would recommend the way in which substitution of the ECP by the NP or PA is organised in their facility to others. Residents and relatives/informal caregivers graded the care of the NPs and PAs from 6 to 9 on a scale from 1 to 10.

> Interviewer: Would you recommend the way in which substitution of the ECP by the NP is organised in their facility to other facilities?
>
> Manager involved in physician substitution and supervisor/manager of the NP – case 4: Absolutely. Because of their different perspective on care and medical treatment, their impact on costs and continuity and their critical view in general.

The mechanism of substituting for ECPs largely autonomously was not present in three cases (1, 5, 6). In two cases the professional was an RN and in one an NP.

In case 6 the RN worked together with MDs who were not trained as ECPs. The organisational factor that influenced the role of the RN was the organisational vision on quality of elderly care. The nursing home aimed at

demedicalisation to improve the quality of life of residents. Although the RN did not work autonomously and the estimated outcome of 'saving of time for the MD' was relatively low (<50%), quality of healthcare outcomes were mostly perceived to be as good as care provided by the MDs, and all participants would recommend their model to other organisations because of the added value (see Mechanism 3).

In case 5 the organisational contextual factors identified as hindering optimal substitution were that there was no unambiguous vision for the role of RNs, the RN worked at different locations with different ECPs who all had different expectations for the RN, and the RN took care of numerous residents. The individual contextual factors were that the RN was less organised and a bit reactive. In this context the RN worked quite autonomously occasionally, but the estimated outcome of 'saving of time for the ECPs' was relatively low (≤50%), quality of healthcare outcomes were not always perceived to be as good as care provided by the ECPs and not all participants would recommend this model to other organisations.

> Interviewer: are you making optimal use of the knowledge, skills and competencies of [name RN]?
>
> Nurse – case 5: No, I don't think so. The RN works too few hours [at this location].

The NP in case 1 worked under the supervision of the ECP, instead of autonomously taking care of patients. The position of the NP was more comparable to both RN cases, and on that point distinctive compared with the NPs in cases 3 and 4. Several organisational and individual contextual factors were identified that influenced this case. The management did not fully recognise the autonomy of the NP, the NP was very precise and sought confirmation and the ECP found it hard to share responsibility for resident care. The outcomes were that quality of healthcare outcomes were mostly perceived to be as good as care provided by the ECP, but not all participants would recommend their model to other organisations, primarily because the estimated time savings for the ECP were relatively low (≤50%).

> The NP is very detailed and that helps me to understand the problem, but she also risks losing herself in details. – ECP with whom the NP collaborates most intensely – case 1

Residents and relatives/informal caregivers graded the care of these three professionals (cases 1, 5, 6) from 7 to 10 on a scale from 1 to 10.

> Interviewer: How would you grade the care you receive from the NP, PA or RN?
>
> Resident – case 5: Well, an eight
>
> …
>
> Resident – case 5: Because I think it is just fine, she listens and she is very normal, no attitude.

Mechanism 2

To describe the different results of the seven cases in mechanism 2 we have divided this mechanism into two mechanisms.

Physician substitution is always a collaboration between the NP, PA or RN and the ECP

In cases 3, 4 and 7 the collaboration between the NP or PA and the ECP was based on trust. In these collaborations the ECP shared responsibilities with the NP or PA and the NP or PA took over almost all medical tasks of the ECP. In these cases structural and ad hoc meetings occurred between the NP or PA and the ECP and specific time was allocated for reflection on the collaboration between the NP or PA and the ECP. The organisational contextual factors of these successful collaborations were: 'the NP or PA collaborates (mostly) with only one ECP' and 'organisational leaders that support the NP or PA'. In addition, the following individual contextual factor contributed to this mechanism; 'the NP or PA and the ECP share the same views on what constitutes good resident care'. The quality of healthcare was perceived as good, as described under Mechanism 1.

> [name ECP] is a very good colleague with a lot of knowledge. He is calm, has a listening ear, always has time, always willing to meet … [name ECP] is practical minded and I also do not use too many words… I do not need to give reasons for what is going on. It is either clear or it is not. – PA – case 7

In cases 1, 2, 5 and 6 collaborations were not well balanced for different reasons. In case 1 the collaboration was very close and not fully based on trust. The ECP did not share responsibilities and the NP took over only some of the ECP's tasks. Individual contextual factors of this intense collaboration included that both the NP and the ECP were perfectionists and sought confirmation, they often wanted to discuss their actions and thoughts while their collaboration was in its early stages. This collaboration was further influenced by the presence of conservative organisational leaders regarding the function of the NP. In case 2 the PA and ECP were searching for good collaboration and for the right division of (additional) tasks. The PA worked mostly alone and did not regularly communicate with the ECP. The context for this non-optimal collaboration involved the different personalities of the PA (proactive) and the ECP (reflective), and the fact that the managing director/supervisor gave the PA much freedom to fill in the PA role. Finally, in case 5 and slightly in case 6 there was unstable and ineffective collaboration between the RN and the ECPs or MDs with only ad hoc contact and with ECPs or MDs at a higher hierarchical level. Trust, sharing responsibilities and taking over tasks could not occur in a context in which the RN worked with several ECPs or MDs who all had different visions of their roles. Nonetheless, the perceived quality of healthcare was guaranteed in most of these cases (1, 2, 6). In cases 2

and 6, in contrast to case 1 and 5, all participants would recommend their model to other organisations.

The role of the ECP changes due to the collaboration with the NP, PA or RN

In all cases this mechanism was present, but different forms were observed. In cases 5 and 6 the ECPs and MDs performed less tasks at the border between the medical and the nursing domain, for example, wound care, due to their collaboration with the RN. In case 6, for instance, the RN performed triage and it was stated that the RN could handle 70% of the MD's former consultations. Therefore, the ECPs and the MDs in case 5 and 6 (as well as the ECP in case 1) could focus solely on medical tasks, such as medical diagnosis. In cases 2, 3, 4, 7 and slightly in case 1, ECPs gained time to, for example: fully support general practitioners in the care of older people living at home, chair a multidisciplinary meeting with primary care professionals regarding complex older resident cases, and/or perform (more) tasks such as being a member of internal working groups (eg, on misunderstood behaviour), being a member of the local board of the Dutch association of ECPs or train medical residents. The individual contextual factor that influenced this mechanism positively was the type of professional: RNs reduced the nursing tasks for ECPs while NPs and PAs also decreased the medical tasks of ECPs. The effect of this mechanism is unknown, but it is expected that when ECPs perform tasks that they formerly did not have time for, it will contribute to the quality of healthcare.

> If the ECPs and the NPs are doing it [their collaboration] right, as it is meant to be, then the NP also brings along a lot of information, through which the ECP can work more efficiently. - supervisor/manager of the NP – case 3

Mechanism 3

NPs, PAs and RNs have a different way of working and they perform additional tasks compared with ECPs

In all cases the three types of professionals performed tasks such as: the structural evaluation of restraints, writing care programmes, enhancing rehabilitation climate by implementing a breakfast/lunch buffet, educating the care team, being a member of working groups who discussed specific themes and innovations (eg, on fall prevention). In all cases the management supported the professional to perform these tasks. It was stated that the performance of these tasks contributed indirectly to the quality of healthcare. Continuity of care was increased because NPs, PAs and RNs change jobs less often than MDs who also perform medical tasks autonomously in nursing homes. In cases 1, 3, 4, 5 and 6 the NPs and RNs strengthened the care team by being accessible, being more present at the unit, providing training on the job and by encouraging self-reflection. In cases 5 and 6 the RNs were closely related to residents and their family because they interacted more often than the ECPs. Type of professional was the individual contextual factor that influenced this mechanism: RNs improved communication with both the care team and resident and family, whereas NPs only improved communication within the care team. In case 4 the NP also contributed to the quality of management and the medical team by adopting a critical attitude.

> There is a difference [between MDs and me in contact with residents and family]. It is not necessarily better or worse, but it is different. I think that I am more approachable. Although I have to ensure that I am not too approachable. For the doctor it is the other way around, he has professional contact, but has to ensure that the threshold to contact him is not too high. – RN – case 6

Elements that contribute to an optimal model of substitution of ECPs by NPs, PAs and RNs

Based on the answers to research questions 1 and 2, an optimal model of substitution of ECPs seems to be a model in which the professional substitutes for the ECP largely autonomously, a well-balanced collaboration occurs with the ECP and quality of healthcare is maintained. This was seen in cases 3, 4 and 7, in which care was substituted by NPs and a PA. Elements that enabled professionals to work according to this optimal model were: (a) being responsible for your own unit, (b) being a PA or NP, (c) being proactive, decisive and communicative, (d) having working experience in complex and/or acute care settings, (e) being supported by management and ECP(s) to work as independent professional, (f) collaborating with only one ECP, (g) collaborating with the ECP based on trust, (h) sharing the same views with the ECP on good resident care, (i) time allocated for reflection on collaboration and (j) structural and ad hoc meetings with the ECP.

DISCUSSION

In this case study we found that substitution of ECPs by NPs, PAs and RNs is modelled in various ways. There does not seem to be one single best model, but we were able to identify some elements that contribute to optimal implementation of NPs and PAs as substitutes for ECPs in nursing homes. Our description of three mechanisms of substitution showed that according to participants, the NPs and PAs are able to deliver similar quality of healthcare as the ECPs, based on the condition that the collaboration between the NP or PAs and the ECP is qualified as successful. A successful collaboration decreased the medical tasks of the ECPs and contributed to more time for additional tasks, such as a multidisciplinary meeting with primary care professionals. However, the RNs did not substitute for the ECPs autonomously in the medical domain with maintenance of quality of healthcare. In one case the tasks of the RN were mainly delegated, and the RN performed medical tasks under supervision. In this case quality of healthcare was maintained. In another

case the RN worked autonomously in the medical domain occasionally; however, the estimated outcome of 'saving of time' for the MDs was relatively low and quality of healthcare was not always perceived to be guaranteed by some participants. Nonetheless, in these cases the ECPs and MDs performed fewer tasks on the border between the medical and the nursing domain, for example wound care, due to their collaboration with a RN. In addition, the results showed that NPs, PAs and RNs may all contribute to perceived quality of healthcare in their own unique way. The mechanisms of physician substitution were mainly influenced by organisational factors such as support of the management and individual factors, such as type of professional and personality of the NP, PA or RN.

Collaboration based on trust between the ECP and the NP or PA was the key element of successful substitution of ECPs. Below we explain this paradox of substitution (replacement) and collaboration. In our refined theory based on figure 1, we found that individual factors (*Context*) and organisational factors (*Context*) influenced the interaction and collaboration between the NP or PA and the ECP (*Mechanism*). The mechanism of collaboration influenced in turn the tasks and responsibilities of the NP or PA and the ECP (*Mechanism*), which finally influenced the perceived quality of healthcare (*Outcome*) (see figure 1). The results further showed that documents related to substitution, such as a job description or collaborative agreements, appeared not to be a goal in itself, but rather a way to support collaboration and substitution between the ECP and the NP or PA. This result is supported by other studies in which trust between the ECP and the NP or PA appeared to be the key in collaboration.[22 23] Based on a concept analysis, Bridges (2014) defined collaboration between a physician and an NP as 'an interaction in which both individuals work as a team in a collegial relationship in an environment where there is mutual trust and respect and open communication. p.408.[22] As in our study, the concept analysis of Bridges (2014) revealed that collaboration is influenced by individual and contextual factors. Individual factors that facilitate the collaboration are, for example, self-confidence, having a proactive personality, recognising your limits and willingness to cooperate.[22] On the other hand, individual factors that hindered collaboration in our study were for example, seeking confirmation, being a perfectionist, being less organised and being reactive where a more proactive attitude is expected from these professionals. In addition, ECPs and NPs or PAs might have different ideas about collaboration, for example, hierarchal versus autonomous, or different views on good resident care, which might hinder effective collaboration.[22 24] One contextual organisational facilitating factor is, for example, organisational leaders who support collaborative practice by promoting a shared vision.[22] These factors correspond with our results. Knowing the contextual factors that influence physician substitution enables stakeholders, like professionals, managing directors, managers, supervisors and educators to anticipate on these factors. For example, educators may support NPs, PAs and RNs in developing their leadership competences and organisations may taken into account NPs', PAs' and RNs' proactivity and communication skills during selection procedures.

The results of the present study are consistent with other studies that showed that the employment of NPs, PAs and RNs in nursing homes might contribute to perceived quality of healthcare for different reasons. The first reason that applied to two NP cases and two PA cases is that ECPs are enabled to focus on more complex medical activities for which they are trained, such as treating residents with complex healthcare problems and providing high-quality geriatric treatment for older people in primary care.[6] The second reason is that NPs, PAs and RNs have a different way of working, such as focusing on resident centredness (seen in two RN cases), supporting the care team (seen in three NP cases and two RN cases), and performing additional tasks compared with ECPs (seen in all NP, PA and RN cases). The manner in which each type of professional contributes to perceived quality of healthcare corresponds to their education and competences.[13 25 26] In accordance with our findings, a recent study in the USA also showed that advanced practice nurses can positively influence quality of healthcare in nursing homes by coaching the care team, proactively managing changes in health status and providing evidence-based care.[27]

To further understand how physician substitution in nursing homes may contribute to quality of healthcare we used a realist evaluation approach.[16 18] This theory-driven evaluation matched our research questions perfectly as it gives insight into how mechanisms work and contribute to positive outcomes. Strengths of this approach are the extensive observations and interviews with the stakeholders in each case. In the description of the cases we used the wording of the participants as much as possible and on which they agreed on in the member check. This led to a high level of detail and ultimately to a deeper understanding of the processes concerning substitution and collaboration.

There are some methodological points that should be considered while interpreting the results and in further research on this topic. First, this case study built on a theory, which we based on literature and a focus group study.[19] This theory-driven approach helped us to explore the complexity of substitution of care in a systematic way. However, although theory-driven, as researchers we also kept an open mind while collecting and analysing data in this study with certain propositions, which enabled us to identify new mechanisms when results acquired this.[17] In comparison with other realist evaluations[28 29] we did not identify unanticipated new mechanisms, but we did refine our initial theory. Second, only seven cases were included in this study which affected the generalisation. However, in realist evaluation, generalisation means progressively applying the theory to other settings.[18] Particularly the maximum variation of sampling in our

case study contributed to insight into the head mechanisms in different contexts. The theoretical explanations, which mechanism works in which context, developed in this study are open to further development and refinement. Third, although we cannot rule out selection bias due to voluntary participation, the fact that participants also pointed out barriers and were not all unanimously positive leads us to believe that the influence of selection is relative low. Fourth, the outcomes in this study were self-reported and qualitative and for some (eg, time saving) estimated outcomes; we were not able to confirm these data with other more objective sources such as time sheets or performance indicators. Although the experiences of all parties involved are very valuable it would be interesting to combine these outcomes with quantitative outcomes in the future.[30] Last, the interview guides were based on three key elements: mechanisms, contexts and outcomes. Every key element was explored separately, as the relationships among them were unknown, and in the analysis connections were made.[27] For further research it would be interesting to use an interview guide based on the mechanisms with the accompanying contexts and outcomes found in this study to further understand the relationships among them.[31]

CONCLUSION

In this study we present a refined theory of substitution of ECPs by NPs, PAs or RNs, which shows how context, mechanism and outcomes relate to each other. The main conclusion is that although one best model did not emerge, NPs and PAs seem to be able to largely autonomously substitute for ECPs, with at least maintenance of perceived quality of healthcare in case of a successful collaboration. RNs seem to be able to lower ECPs' tasks at the border between the medical and the nursing domain. Whether the employment of an NP or PA leads to successful collaboration and thus successful substitution depends mostly on whether the collaboration between the NP or PA and the ECP is based on trust. Organisational factors (eg, organisational leaders that support the NP or PA) and individual factors (eg, the NP or PA being proactive, decisive and communicative) influence the collaboration and therefore the level of substitution. NPs, PAs and RNs in nursing homes may all be valuable in their own unique way, matching their profession, education and competences. This information can be used to create an optimal collaboration between different types of professionals in nursing homes. It can also contribute to further research in particular in the theory development of substitution of care.

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