Differences that matter

Citation for published version (APA):

van den Bulck, A. O. E. (2022). *Differences that matter: Understanding case-mix and quality for prospective payment of home care*. [Doctoral Thesis, Maastricht University]. Maastricht University. https://doi.org/10.26481/dis.20220613ab

Document status and date:
Published: 01/01/2022

DOI:
10.26481/dis.20220613ab

Document Version:
Publisher's PDF, also known as Version of record

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

Link to publication

General rights
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the “Taverne” license above, please follow below link for the End User Agreement:

www.umlib.nl/taverne-license

Take down policy
If you believe that this document breaches copyright please contact us at:

repository@maastrichtuniversity.nl

providing details and we will investigate your claim.

Download date: 30 okt.. 2023

Differences that matter

Understanding case-mix and quality for prospective payment of home care

Anne O.E. van den Bulck

The research presented in this dissertation was conducted at the Care and Public Health Research Institute (CAPHRI), department of Health Services Research, Maastricht University. CAPHRI participates in the Netherlands School of Public Health and Care Research (CaRe), which has been acknowledged by the Royal Academy of Science (KNAW). This research was conducted within the Living Lab for Sustainable Care (AWDZ), the Living Lab in Ageing and Long-Term Care (AWO), and the scientific consortium Wetenschappelijk Programma Wijkverpleging (WPW). This research was funded by the Dutch Healthcare Authority (NZa) and long-term care organization MeanderGroep Zuid-Limburg. The studies in this dissertation were conducted in close collaboration with four Dutch long-term care organizations, being MeanderGroep Zuid-Limburg, Envida, Vierstroom, and Cordaan.

Cover and chapter design: Evelien Jagtman | ©evelienjagtman.com
Lay-out: Anne O.E. van den Bulck
Printing: Ridderprint | www.ridderprint.nl

ISBN: 978-94-6423-801-3

Differences that matter

Understanding case-mix and quality for prospective payment of home care

PROEFSCHRIFT

ter verkrijging van de graad van doctor aan de Universiteit Maastricht,
op gezag van de Rector Magnificus, Prof. dr. Pamela Habibović,
volgens het besluit van het College van Decanen,
in het openbaar te verdedigen op maandag 13 juni 2022 om 13:00 uur

door

Anne Odilia Emile van den Bulck

Promotoren
Prof. dr. D. Ruwaard
Prof. dr. M.C. Mikkers (Tilburg University, Nederlandse Zorgautoriteit (NZa))

Co-promotoren
Dr. A.M.J. Elissen
Dr. S.F. Metzelthin

Beoordelingscommissie
Prof. dr. S.M.G. Zwakhalen (voorzitter)
Prof. dr. A.J.H.M. Beurskens
Prof. dr. B.M. Buurman (Universiteit van Amsterdam/AMC)
Prof. dr. A.L. Francke (Vrije Universiteit/Amsterdam UMC)
Dr. A. Moser

Contents

Chapter 1

General introduction

Anne O.E. van den Bulck

The sustainability challenge in healthcare

The demographics and social environments of the general population are changing, as people are getting older and the prevalence of chronic diseases increases. This causes (long-term) care demands and healthcare costs to grow steadily higher, and care needs to become increasingly complex.[1] Moreover, on the supply-side, the availability of qualified healthcare workers, such as nurses, is scarce and is expected to get continuously scarcer. As a result of these demand- and supply-driven developments, Western healthcare systems have been – and still are – facing great sustainability challenges.[2] Home care, as part of the healthcare system, is a sector that has a large stake in dealing with these challenges. How home care is payed for could influence the efficiency and quality of care provided, and thus could contribute to healthcare system improvements regarding sustainability. Therefore, this dissertation contributes to the development of a suitable home care payment system that, among others, aims to improve the sustainability of home care. As an introduction to this dissertation, this chapter describes current policy developments in healthcare, a definition of home care within the Dutch healthcare system, and how aspects of a home care payment system could influence the realization of efficient, high-quality home care.

Healthcare policy developments influencing home care

Multiple developments have occurred in home care internationally to deal with the sustainability challenge. Since several years, long-term care policies tend to focus on reducing the more expensive residential care use, and instead provide home care more often.[1,3,4] Furthermore, because older adults also prefer to live at home as independently as possible (i.e. to 'age in place')[5], long-term care policies also focus on increasing the independence of older adults. This shift contributes to providing 'the right care in the right place'. This means that a client should be considered a human being. Care is provided as close to home as possible taking into account a person's functioning within the own environment, and is carried out at reasonable costs.[6]

Defining 'home care' in the Netherlands

Different terms are used to define 'home care' across countries. Examples of terms used other than home care are home health care, community nursing, or district nursing care. Typical home care services comprise nursing care (e.g. technical nursing care such as wound care or catheterization) and personal care (e.g. assistance with activities of daily living such as bathing or toileting) (note: in some other countries, domestic care (e.g. assistance with for example housekeeping) is also considered home care).[1] Following among others previous work from

Maurits[7] and Van Eenoo et al.[4], in this dissertation home care is defined as care provided by healthcare professionals at the client's own home. In general, services within home care can be of short or long-term and may have a preventive, acute, rehabilitative or palliative nature. In the Netherlands, home care as covered by the Dutch Health Insurance Act (in Dutch Zvw) comprises care for clients who need care for less than 24 hours per day.[8] Long-term care and domestic care are arranged differently: clients who need care 24 hours per day often receive their care in a nursing home, which is covered by the Dutch Long-term Care Act (in Dutch Wlz); and domestic care is arranged via Dutch municipalities by the Social Support Act (in Dutch Wmo). Therefore, this dissertation will focus on nursing care and personal care that are being provided within the Zvw.

Home care is mainly provided by registered nurses or certified nursing assistants. Registered nurses are district nurses with a bachelor's degree from a university of applied sciences (i.e. European Qualification Framework (EQF) level 6), or – specifically for the Netherlands – vocational nurses with an associate degree after completing senior secondary vocational education (i.e. EQF level 4).[9] Certified nursing assistants finished vocational training after secondary school (i.e. EQF level 3).[1,10] In the Netherlands, care assistants (i.e. EQF level 2) and specialized nurses with a master's degree (i.e. EQF level 7) also provide home care. The total number of Dutch home care workers was almost 80,000 in 2018. District nurses are responsible for performing standard needs assessments to determine a client's needs for personal care and nursing care covered by the Zvw, taking into account the self-reliance of clients and the resources available in their social network.

In most Western countries, the majority of home care providers are non-for-profit organizations. In the Netherlands, home care providers act in a competitive environment,[1] in which the number of commercial providers is growing. Alongside this trend, small-scale neighborhood-centered autonomous home care teams increasingly arise.[4] In 2018, approximately 3,070 home care providers (including self-employed nurses) provided services to more than 580,000 clients in the Netherlands.[11] Expenditures on Dutch home care comprised 3.6 billion euros in 2018 (i.e. on average 6,300 euros per capita),[12] which is the same as the average spending on home care of European countries.[4]

Home care is very much interdependent to other healthcare sectors, such as social care, primary care, and hospital care. In many counties, coordination between these sectors is not structured, yet if coordination is arranged, this is often done by a nurse, general practitioner (GP), or social worker.[1] In the Netherlands, district nurses are a central link between these sectors; they are responsible for the close collaborations and coordinating care with among others nursing homes and GPs.[13]

Home care payment system: from fee-for-service to prospective payment

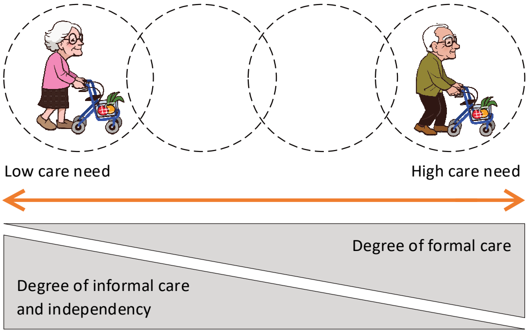
Sources of funding for home care payment differ between countries: from public funding via taxations and/or the insurance system, to private funding via third-party contributions and/or co-payments.[1] In the Netherlands, funding mainly goes via obligatory insurance payments. The Zvw obliges residents to annually purchase a basic health insurance package for essential services from a private health insurer (note: for more information on (the need for) regulations of the Dutch healthcare insurance system, see e.g. Van Kleef et al.[14] or Kleijne[15]). Private health insurers act as the payer of home care by contracting home care providers.

Home care payment systems play an important role in coping with the existing healthcare system challenges and providing efficient, high-quality home care.[16] A payment system outlines how the allocation of resources to providers is arranged.[17] Within the Netherlands, and many other Western countries, home care is paid for retrospectively on an hourly rate basis, i.e. fee-for-service (FFS).[18] The hours of care are registered by the home care provider and afterwards the provided care is reimbursed. With FFS, access to the best available care generally is guaranteed. However, payment by FFS has some disadvantages. Firstly, as long as the reimbursed price is equal to (or higher than) marginal costs, FFS is known to stimulate quantity of care rather than quality of care: the more services home care providers deliver, the more money they earn.[18,19] This may hinder the provision of efficient home care, because care provision may not be incentivized by the actual needs of clients. The incentive of FFS to stimulate quantity of care can thus undermine the professional autonomy of nurses in e.g. promoting the independence of clients. Secondly, FFS creates a high administrative burden for home care providers due to the plethora of administrative requirements and the complexity of funding arrangements.[20,21]

An alternative to payment by FFS is a prospective payment system.[16,21] With prospective payment, the amount of payment per client is determined and paid for ex-ante for a certain period of time. In the Netherlands, since 2019, an experimental policy rule already allows for healthcare insurers to make contractual arrangements alternative to FFS, i.e. including prospective payment arrangements (note: this is an experiment and not established as a national policy rule).[22] Prospective payment incentivizes the provision of more efficient home care, because home care is financed with a given amount of money.[21] Furthermore, with prospective payment, the professional autonomy of district nurses is acknowledged, as, compared to FFS, they are more flexible to provide the right care when needed for a client and they are supported to stimulate a client’s independence. However, prospective payment may also have its perverse incentives. Under prospective payment systems, home care providers bear a certain financial risk, because their costs for a given client can be higher than the ex ante defined reimbursement.[21] As a consequence, providers may attempt to reduce costs by, for example, providing too little care or only accepting cases that are profitable under the reimbursement scheme (i.e. risk selection).[21,23] Then the quality of and access to care might be at stake. To deal with these perverse incentives, two mechanisms can be applied in how the prospective payment system is set up, namely: using case-mix classification to base payments on, and by evaluating outcome measurement of home care.[21] Both themes are addressed in this dissertation, with a central role for case-mix classification.

Case-mix classification of home care clients

Case-mix classification is the act of grouping clients, based on their characteristics, into clinically similar groups (i.e. case-mix groups) that are believed to also consume a similar amount of resources and, by extension, have similar costs of care.[24] An example of case-mix classification in home care is provided in Figure 1.1. When using case-mix classification as a basis for prospective payment, each case-mix group is subsequently funded. Case-mix is an essential aspect for prospective payment systems because it accounts for differences in risk characteristics of clients, which is crucial to prevent risk selection by home care providers.[25]



Mrs. Jansen and Mr. de Vries are two clients receiving home care after breaking a hip. During their stay in the hospital, they both received similar treatment. However, as soon as they get home, their need for home care might be very different from each other. Mrs. Jansen, on the one hand, has an active lifestyle as she used to walk around the neighborhood every day, and her children visit her weekly to have a coffee and help her with the household. Therefore, having her positive attitude and enough informal care available, her need for formal home care after her hospital stay is rather low (i.e. belonging to a case-mix group with a low degree of formal care). Mr. de Vries, on the other hand, has a more sedentary lifestyle, no children to visit him, and little contact with neighbors. As a result, his rehabilitation at home is harder than expected, especially concerning washing himself and getting dressed without help from others. Therefore, he has a rather high need for formal home care (i.e. belonging to a case-mix group with a high degree of formal care).

Figure 1.1. Example of case-mix classification in home care

Since the 1970s, case-mix classifications have been developed for many healthcare sectors, including hospital care (e.g. the diagnosis-related groups),[26] nursing home care (e.g. resource utilization groups-III)[27], inpatient psychiatric care (e.g. the psychiatric diagnostic groupings)[28] and ambulatory care (e.g. ambulatory care groups).[29] Home care is arguably one of the more challenging sectors for case-mix classification, particularly compared with inpatient care. As early as 1987, Manton and Hausner noted that 'a case-mix measure for community-based long-term care services is intrinsically more complex than that for acute care because it must describe a multidimensional system of health, functional and social needs evolving over a potentially long time span'.[30] Indeed, the determinants of the need for home care include not only clients' medical diagnoses but also their physical and cognitive functioning[31-33], as can also be noticed in the case of Mrs. Jansen and Mr. de Vries (see Figure 1.1). Despite these complexities, some countries have already developed case-mix models for prospective payment of home care, including the Home and Community Services Support (HCSS) model used in New Zealand[34] and the Home Health Resource Groupings (HHRG) model from the US.[35,36] While these case-mix models were developed successfully, they were developed specifically for the country they are being used. As a result, the large differences in healthcare systems and type of home care clients between countries impede the adaptation of case-mix models to other countries. Moreover, a common ground on home care case-mix classification is currently not available. Therefore, this dissertation will focus on the Dutch context, while aiming to gain insights that could also be applicable to other countries.

Outcome measurement in home care

Although case-mix classification can reduce incentives for undesirable strategic behavior, such as risk selection, monitoring quality of care is equally important.[34] Home care provision should namely be as efficient as possible without compromising on the quality of care. Quality of care can be measures in terms of the processes (such as its appropriateness and continuity), the organization of care (such as staff and equipment), and outcomes (such as a client's health and satisfaction with care).[37] However, of these aspects, outcomes remain the ultimate validation of quality of care.[37] Measuring outcomes of care could incentivize providing high-quality, accessible care,[21] instead of under-provision of quality to clients or limiting access to less profitable clients.

General information on outcomes to measure the quality of care is available. For example, the Nursing Outcome Classification (NOC) provides a set of nursing outcomes that can be used across the care continuum to assess the outcomes of care following nursing interventions.[38] As a more home care-specific example, Joling et al.[39] identified 567 potentially relevant quality indicators for older people in the community care setting (i.e. primary care and home care) from their systematic review. Indicators relate for example to the care process or the client's health status and wellbeing.[39] However, it remains unclear what outcomes are suitable to measure for home care specifically. This also applies to the Dutch context.

Working towards a new payment system for Dutch home care

In line with the long-term care reforms in 2015, the Dutch government also asked for a transition to a new suitable payment system for home care. Strategies in Regulated Markets (SiRM) sketched the contours of this new payment system.[40] They emphasized the importance of creating the right incentives on, among others, innovation, self-reliance and needs of clients, and autonomy of district nurses. As a result, SiRM proposed to pay for home care by means of client groups (i.e. case-mix groups), as with case-mix based prospective payment, that are developed based on data from the standard registration systems (including nursing classification system data). In 2016, Gupta Strategists made an attempt to develop case-mix groups for Dutch home care using data from the nursing classification system Omaha.[41] They did not succeed in predicting home care use and concluded that developing case-mix groups from nursing classification data is unfeasible. As nursing classification data was considered insufficient in explaining home care use of a client, the Dutch umbrella organization of health insurers (ZN) came up with a list of six types of clients to be registered by district nurses to gain insight in home care use and home care client types.[42] This was seen as a 'best of the rest' solution until a better instrument or new payment system (possibly with other registrations) would be developed. Then in 2017, the Dutch Healthcare Authority (NZa) decided to have a new attempt to develop a new payment system for Dutch home care together with partners from practice and academia.

Scientific consortium

To develop this new payment system, the NZa initiated a consortium with three scientific partners, being Maastricht University, Utrecht University/Utrecht University of Applied Sciences, and Tilburg University. The aim of this consortium is to conduct scientific research that contributes to the development of a case-mix based prospective payment system for Dutch home care. Since the start of the project, regular meetings have taken place to discuss policy developments from the NZa, and research plans and findings from the scientific partners.

Three PhD candidates (i.e. one per scientific partner from the consortium) are assigned to perform the studies within the consortium: Anne van den Bulck (working at Maastricht University, and additionally guided by team members from Tilburg University/the NZa), Maud de Korte (working at Tilburg University and the NZa, and additionally guided by team members from Maastricht University), and Jessica Veldhuizen (working at Utrecht University/University of Applied Sciences Utrecht, and additionally guided by team members from Tilburg University/the NZa). Each PhD candidate has her own focus to contribute to the development of the new home care payment system. Studies conducted by Anne van den Bulck (i.e. the author of this dissertation) focus on gaining an understanding of client characteristics that predict home care use. Maud de Korte focuses on the development of case-mix classification for Dutch home care clients. Research by Jessica Veldhuizen focuses on gaining understanding in (measuring) outcomes of home care. Exchange of scientific and practice expertise occurs between all scientific partners. For example, expertise on qualitative research methods is shared by Maastricht University, and Tilburg University has its expertise in conducting quantitative research.

Collaboration with stakeholders

Besides the scientific cooperation within the consortium, multiple other stakeholders from Dutch home care are involved in planning, conducting, and analyzing the studies by means of participatory action research[43] (i.e. applying participative research methods from an action research paradigm[44]). District nurses from various home care providers and the Dutch Nurses

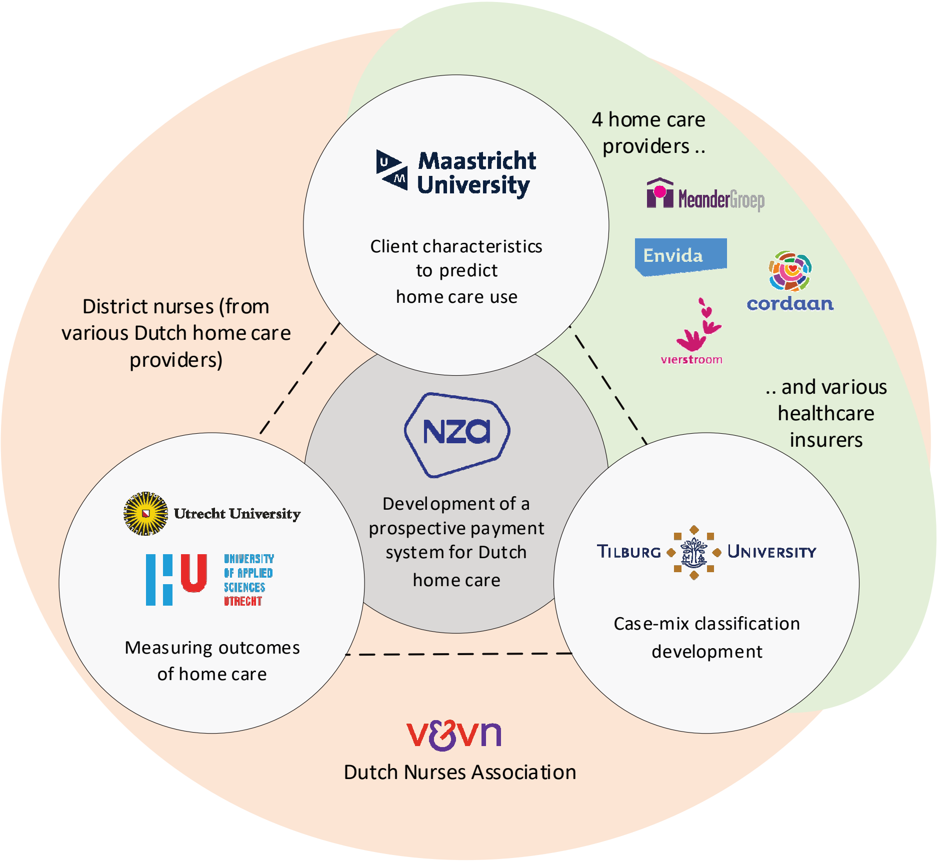


Figure 1.2. Overview of the consortium's scientific partners and involved stakeholders

▨ Scientific partners and their research focus.
🟧 Stakeholders that are involved with studies from all scientific partners.
🟩 Stakeholders that are involved with studies from Maastricht University and Tilburg University.
- - Collaboration between scientific partners with one or multiple scientific studies.

Association (V&VN) are involved in studies from all three scientific partners. Additionally, researchers from Maastricht and Tilburg University work in close contact with four Dutch home care providers – MeanderGroep Zuid Limburg, Envida, Vierstroom, and Cordaan – and their district nurses, and with (representatives from) Dutch healthcare insurers. The consortium's scientific partners, what their (primary) focuses are, how they cohere, and which stakeholders they involve in their studies are summarized in Figure 1.2.

Aim and outline of this dissertation

The primary aim of this dissertation is to gain insight into predictors of home care use for the development of home care case-mix classification. This aim is linked to the research focus from, and is to be attained together with, Maud de Korte. Additionally, the secondary aim of this dissertation is to provide first insights into outcomes of home care. This aim is linked to the research focus from, and is to be attained together with, Jessica Veldhuizen. With these aims, this dissertation should yield a wider applicability and understanding of home care case-mix and quality. More specifically, this dissertation has the following objectives, which are to be achieved in close collaboration with stakeholders:

1. Creating an overview of the current knowledge and views from practice on (which client characteristics are relevant to include in) case-mix classification for home care;
2. Developing and evaluating a widely applicable basis for data collection for the purpose of case-mix model development;
3. Exploring outcomes that are suitable for quality measurement in home care.

Chapter 2 describes the results of a systematic review of scientific and grey literature on existing case-mix models for prospective home care payment. **Chapter 3** explores in a survey-study which client characteristics are potentially relevant for predicting home care use according to district nurses. Then in **Chapter 4**, results are presented on the development and evaluation of a questionnaire that aims to collect data on the most relevant predictors of home care use. **Chapter 5** describes a Delphi study, where experts – i.e. district nurses and home care insurers – assessed the relevance of the client characteristics included in the developed questionnaire and new potentially relevant characteristics. **Chapter 6** presents nurse-sensitive outcomes for home care according to a Delphi-study among district nurses with expertise in research, training, teaching, home care practice or home care policy. The final chapter, **Chapter 7**, discusses the main findings of the studies in this dissertation and reflects on the theoretical and methodological considerations. Lastly, recommendations for policy, practice, and further research are presented.

References

1. Genet N, Boerma W, Kroneman M, Hutchinson A, Saltman RB. *Home care across Europe.* Kopenhagen, Denmark: World Health Organization; 2012.
2. European Commission. *Communication from the commission: On effective, accessible and resilient health systems.* Brussels, Belgium: European Commission; 2014.
3. Morris M, Powick A, De Vetorri E, et al. *2016 global health care outlook: Battling costs while improving care.* New York, NY: Deloitte; 2016.
4. Van Eenoo L, Declercq A, Onder G, et al. Substantial between-country differences in organising community care for older people in Europe - a review. *Eur J Public Health.* 2015;26(2):213-219.
5. Keenan TA. *Home and community preferences of the 45+ population.* Washington, DC: AARP Reaearch & Strategic Analysis; 2010.
6. Taskforce Juiste Zorg op de Juiste Plek. *The right care in the right place.* 2018.
7. Maurits EEM. *Autonomy of nursing staff and the attractiveness of working in home care*. Utrecht, the Netherlands: University of Utrecht; 2019.
8. Kroneman MBW, Van den Berg B, Groenewegen PP, De Jong J, Van Ginneken E. *Health systems in transition: The Netherlands.* Brussels, Belgium: European Observatory on Health Systems and Policies; 2016.
9. NLQF Nationaal Coördinatiepunt. *Referencing the Dutch qualifications framework NLQF to the European qualifications framework.* Brussels, Belgium: European Union; 2019.
10. Van der Windt W, Bloemendaal I. *Toekomstverkenning voor de thuiszorg: Vraag en aanbod van verplegend en verzorgend personeel 2015-2019.* The Netherlands: Arbeidsmarkt Zorg en Welzijn (AZW); 2015.
11. Vektis Intelligence. Wijkverpleging. Zorgprisma publiek. 2018.
12. Vektis. Factsheet wijkverpleging. 2020; https://www.vektis.nl/intelligence/publicaties/factsheet-wijkverpleging. Accessed December 22, 2021.
13. Rosendal H. *Expertisegebied wijkverpleegkundige.* Utrecht, the Netherlands: V&VN; 2019.
14. Van Kleef RC, McGuire T, Schut E, van de Ven WPMM. Strategies to counteract risk selection in social health insurance markets. *Oxford Research Encyclopedia of Economics and Finance.* 2019.
15. Kleijne I. Schippers wil openheid NZa over ziekenhuistarieven. 2016; https://www.medischcontact.nl/nieuws/laatste-nieuws/artikel/schippers-wil-openheid-nza-over-ziekenhuistarieven.htm. Accessed December 23, 2021.
16. Mueller M, Hewlett E. *Better ways to pay for health care.* Paris, France: OECD; 2016.
17. Dúran A, Kutzin J, Martin-Moreno JM, Travis P. Understanding health systems: Scope, functions and objectives. In: Figueras J, McKee M, eds. *Health systems, health, wealth and societal well-being. Assessing the case for investing in health systems.* 2012:19-37.
18. Miller HD. From volume to value: Better ways to pay for health care. *Health Aff (Millwood).* 2009;28(5):1418-1428.
19. Koster NM, Harmsen J, van der Palen J. *Analyzing client characteristics and needs in home health care.* Enschede, the Netherlands: University of Twente; 2015.
20. V&VN. *Verkenning ontwikkeling zorgprofielen wijkverpleegkundige.* Utrecht, the Netherlands: V&VN; 2016.
21. Jegers M, Kesteloot K, De Graeve D, Gilles W. A typology for provider payment systems in health care. *Health Policy.* 2002;60(3):255-273.
22. Nederlandse Zorgautoriteit. *Beleidsregel experiment bekostiging verpleging en verzorging - br/reg-19144.* Utrecht, the Netherlands: Nederlandse Zorgautoriteit; 2021.
23. Langenbrunner JC, Cashin C, O'Dougherty S. *Designing and implementing health care provider payment systems.* Washington, DC: The World Bank; 2009.
24. Costa AP, Poss JW, McKillop I. Contemplating case mix: A primer on case mix classification and management. *Healthc manage forum.* 2015;28(1):12-15.
25. Eggleston K. Risk selection and optimal health insurance-provider payment systems. *J Risk Insur.* 2000;67(2):173-196.
26. Kobel C, Thuilliez J, Bellanger M, Pfeiffer K-P. DRG systems and similar patient classification systems in Europe. In: Busse R, Geissler A, Quentin W, Wiley M, eds. *Diagnosis-Related Groups in Europe: moving*

towards transparency, efficiency and quality in hospitals. Maidenhead: Open University Press; 2011:37-58.

27. Poss JW, Hirdes JP, Fries BE, McKillop I, Chase M. Validation of resource utilization groups version III for home care (RUG-III/HC): Evidence from a Canadian home care jurisdiction. *Med Care.* 2008;46(4):380-387.
28. Ashcraft MLF, Fries BE, Nerenz DR, et al. A psychiatric patient classification system: An alternative to diagnosis-related groups. *Med Care.* 1989;27(5):543-557.
29. Starfield B, Weiner J, Mumford L, Steinwachs D. Ambulatory care groups: A categorization of diagnoses for research and management. *Health Serv Res.* 1991;26(1):53-74.
30. Manton KG, Hausner T. A multidimensional approach to case mix for home health services. *Health Care Financ Rev.* 1987;8(4):37-54.
31. Masso M, Allingham SF, Banfield M, et al. Palliative care phase: Inter-rater reliability and acceptability in a national study. *Palliat Med.* 2015;29(1):22-30.
32. Slobbe LCJ, Wong A, Verheij RA, van Oers HAM, Polder JJ. Determinants of first-time utilization of long-term care services in the Netherlands: An observational record linkage study. *BMC Health Serv Res.* 2017;17(1):626.
33. Lee Y, Penning M. The determinants of informal, formal, and mixed in-home care in the Canadian context. *J Aging Health.* 2019;31(9):1692-1714.
34. Parsons M, Rouse P, Sajtos L, Harrison J, Parsons J, Gestro L. Developing and utilising a new funding model for home-care services in New Zealand. *Health Soc Care Community.* 2018;26(3):345-355.
35. Medicare Payment Advisory Commission. *Home health care services payment system.* 2018.
36. Teenier P. 2008 refinements to the medicare home health prospective payment system. *Home Healthc Nurse.* 2008;26(3):181-184.
37. Donabedian A. Evaluating the quality of medical care. *Milbank Q.* 2005;83(4):691-729.
38. Moorhead S, Johnson M, Maas ML, Swanson E. *Nursing outcomes classification (NOC) e-book: Measurement of health outcomes.* Elsevier Health Sciences; 2018.
39. Joling KJ, van Eenoo L, Vetrano DL, et al. Quality indicators for community care for older people: A systematic review. *PLoS One.* 2018;13(1):e0190298.
40. Strategies in Regulated Markets. *Contouren bekostiging wijkverpleging.* Den Haag, the Netherlands: Strategies in Regulated Markets; 2015.
41. Gupta Strategists. *Onderzoek bekostiging wijkverpleging.* Amsterdam, the Netherlands: Gupta Strategists; 2016.
42. Zorgverzekeraars Nederland. *ZN doelgroepenregistratie schema en beslisboom, d.d. 01 juli 2018, versie 2.0.* The Netherlands: Zorgverzekeraars Nederland; 2018.
43. Koshy E, Koshy V, Waterman H. *Action research in healthcare.* Londen, United Kingdom: SAGE Publications Ltd; 2011.
44. Bell J, Cheney G, Hoots C, et al. Comparative similarities and differences between action research, participative research, and participatory action research. 2004; https://arlecchino.org/ildottore/mwsd/group2final-comparison.html. Accessed December 23, 2021.

Chapter 2

A systematic review of case-mix models for home care payment: Making sense of variation

Anne O.E. van den Bulck
Maud H. de Korte
Arianne M.J. Elissen
Silke F. Metzelthin
Misja C. Mikkers
Dirk Ruwaard

Health Policy. 2020; 124: 121-132

Abstract

Background: Case-mix based payment of health care services offers potential to contain expenditure growth and simultaneously support needs-based care provision. However, limited evidence exists on its application in home care. Therefore, this study aimed to synthesize available international literature on existing case-mix models for home care payment.

Methods: We performed a systematic review of scientific literature, supplemented with grey literature. We searched for literature using six scientific databases, reference lists, expert consultation, and targeted websites. Data on study design, case-mix model attributes, and conclusions were extracted narratively.

Results: Of 3,303 references found, 22 scientific studies and 27 grey documents met eligibility criteria. Eight case-mix models for home care were identified, from the US, Canada, New Zealand, Australia, and Germany. Three countries have implemented a case-mix model as part of a home care payment system. Different combinations of in total 127 unique case-mix predictors are included across models to predict home care use. Case-mix models also differ in targeted services, operationalization, and outcome measures and predictive power.

Conclusions: Case-mix based payment is not yet widely used within home care. Multiple varieties were found between home care case-mix models, and no one best form of a model seems to exist. Even though varieties are partly inevitable due to country-specific contexts, developing a shared vision in case-mix model attributes would be key to achieving efficient, needs-based home care.

Introduction

Worldwide, increasing numbers of older adults have complex care needs. Because most older adults prefer aging in place[1], and long-term care policies tend to focus on reducing residential care use, there is a rising demand for home care.[2] Home care includes various types of care services, such as nursing care (e.g. medication management support or wound care) and personal care (e.g. assistance with bathing), provided in the home mainly – although not exclusively – to older adults. Given the increasing demand for these services, it is unsurprising that expenditures of home care have risen over the past decade and are expected to continue to rise in the years to come. For example, in the US, home care costs increased from \$80.5 billion in 2013 to \$97.1 billion in 2017.[3] Furthermore, the expected annual growth of home care costs in the US until the year 2026 is 6.7%, which is higher than for any other healthcare service.[3]

In order both to create a sustainable healthcare system and provide care that fits clients' needs, innovative approaches aim to reduce the client's need for long-term support by helping older adults to live at home as independently as possible, and to tailor services to their individual needs.[4,5] However, the implementation of certain approaches in home care is often impeded by the way in which home care tends to be funded. In Western countries, home care is mostly paid for on a fee-per-hour basis, i.e. fee-for-service (FFS), which can create perverse incentives for providers. Notably, FFS is known to stimulate quantity of care rather than its quality, since delivering more care means earning more money.[6,7] This hinders supporting the independence of clients, rather than promoting it. Providers who adopt an enabling approach are therefore expected to be disadvantaged by FFS, despite their efforts to provide care that fits client's needs.

As a result, internationally, there is increasing interest in case-mix based prospective payment systems as a means of promoting greater client-centeredness and efficiency in home care. Under such models, clients are allocated – based on their specific characteristics – to homogeneous, hierarchical subgroups in terms of resource use, which are subsequently funded. Case-mix is an essential aspect for prospective payment systems because it accounts for differences in risk characteristics of clients, which is crucial to prevent risk selection by home care providers.[8] Examples of the application of case-mix based payment are the use of diagnostic related groups (DRGs) in hospital care[e.g. 9], Adjusted Clinical Groups (ACGs) in primary care[10,11], and Resource Utilization Groups (RUG-III) in nursing home care.[e.g. 12]

The predictive value of case-mix models depends considerably on the accuracy of predictors, which varies between settings. For inpatient settings such as nursing homes, clinical characteristics – for example diagnoses – are reasonably accurate predictors of service needs.[12] For home care, however, reliably predicting case-mix has proven considerably more complex. Previous research suggests that diagnoses become less accurate predictors of service need when care is delivered closer to the home and as the duration of a care episode increases.[13] Furthermore, predictors comprising 'a multidimensional system of health, functional, and social needs'[14] are likely to provide a more reliable representation of clients' care needs at home than diagnostic predictors alone.[15,16] It is important to have a case-mix model that is statistically robust because, when used for payment purposes, the model forms the basis of the subsequent prospective payment (i.e. resource allocation).[17] However, thus far, an overview of existing case-mix models for home care is lacking, and it is unclear whether and how the multiple dimensions of home care needs are approached in these models.

To address this knowledge gap, we conducted a comprehensive systematic review of international literature on case-mix models for prospective payment for home care. The objective for our systematic literature review was to synthesize existing scientific evidence on the configuration of international case-mix models developed and/or implemented for prospective payment of home care. Therefore, the following research questions were formulated:

- Which case-mix models have been developed and/or implemented for home care payment, internationally?
- What are the attributes of the case-mix models, i.e. data sources, case-mix predictors, number and type of case-mix groups, algorithms for case-mix classification, outcome variables, and explained variances?

By answering these research questions, we aim to develop an evidence base on case-mix modelling for home care payment. Such an evidence base could provide an important resource for the growing group of researchers, policymakers, and professionals in various countries, who are involved in developing or reforming case-mix based prospective payment systems to better align available resources with the demand for home care in their respective countries.

Methods

We carried out a systematic review of scientific literature, supplemented with grey literature (i.e. non-scientific) according to the PRISMA Statement.[18] A review protocol was established a priori and registered with PROSPERO (https://www.crd.york.ac.uk/PROSPERO/, ID CRD42019091822).

A two-phase, sequential approach was followed. In the first phase, we collected and extracted data from scientific literature, and then from grey literature in the second phase. We expected to find relevant, additional information in the grey, non-scientific literature, in particular in policy and other governmental documents.

Phase 1: Identifying and selecting scientific literature

We searched six databases: PubMed, Cochrane Library, Web of Science (WoS), Embase (via OVID, 1994-2017), Emerald, and EconLit (via EBSCO). The search strategy was designed in PubMed and adapted for the remaining databases (see Appendix 2A for search strategies for all databases). The strategy was formulated by the first author (AvdB), in consultation with two co-authors (AE and SM), and checked by a librarian. It consisted of three main concepts: “home health care”, “payment”, and “case-mix”, which were combined with Boolean Operator “AND”. The final search was performed on May 24, 2019, and contained no restrictions. All results were imported into reference manager software EndNote X8.2, and de-duplicated using the Bramer-method, a step-wise method for de-duplicating results from multiple databases.[19]

In order to select the relevant literature, a three-step screening, i.e. title screening, abstract screening and full text screening, was performed by two reviewers (AvdB and MdK). For all three steps reviewers used Rayyan, a web app for performing the screening of results in systematic reviews (https://rayyan.qcri.org). The screening-criteria can be found the flow diagram in Figure 2.1. For all three steps in the screening process, both reviewers screened the first 5% of studies independently. When consensus was less than 85% overall, a further 5% of studies were screened independently. In the screening process, screening 5% of titles, and 15% of abstracts and of full-texts by two reviewers was necessary to reach sufficient consensus on inclusion. The remaining studies were divided between the two reviewers. Discrepancies and doubts were discussed, when necessary with a third reviewer (AE or SF), until agreement was reached.

Phase 2: Identifying and selecting grey literature

In order to collect grey literature, several sources were used: reference lists, expert consultation, and targeted websites.[e.g. 20-22] One researcher (AvdB) screened reference lists of all scientific articles included for relevant scientific and/or grey literature. Furthermore, a selection of relevant experts in case-mix based payment of home care was made by three authors (AvdB, AE, and SM) based on their own professional networks and/or the authors of scientific literature included. This was done to check for possibly missing case-mix models and/or related relevant literature. We considered someone to be an experts when he/she had (co-)developed or evaluated a case-mix model for home care and/or the accompanying payment system of a certain case-mix model. Experts were approached by mail with specific questions on the existence of a case-mix model for home care payment in their respective countries, and asked for suggestions regarding relevant literature. Also, the experts were asked for other experts in the field, potentially from other countries, because our knowledge of countries in that had developed case-mix model(s) was limited to those countries identified

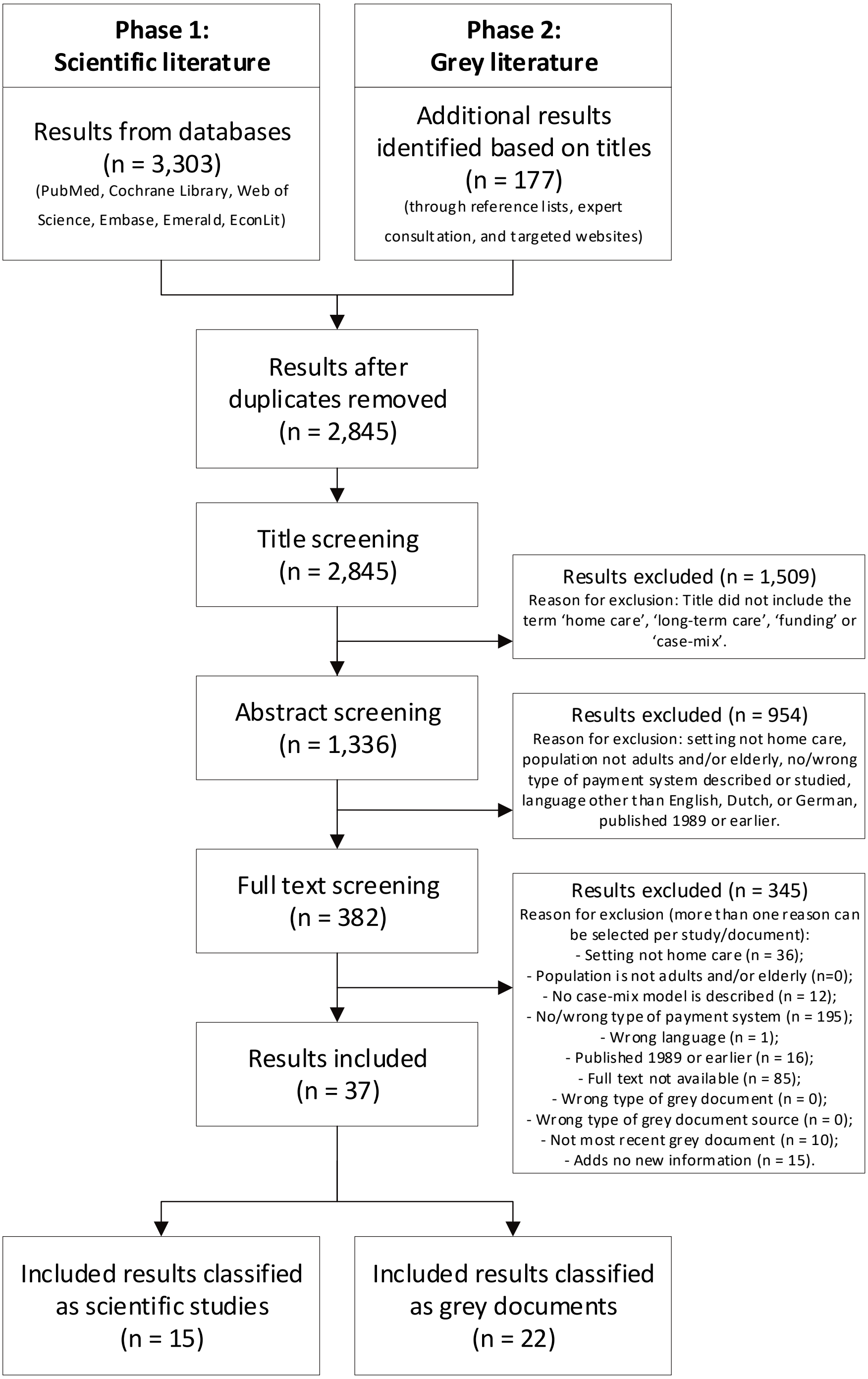


Figure 2.1. Flow diagram of selecting scientific literature (phase 1) and grey literature (phase 2)

by this review. If necessary after consulting reference lists and experts, country-specific targeted websites (e.g. of government or research institutes) were searched.

We screened titles and full-texts using the same inclusion- and exclusion criteria as in Phase 1. Abstracts were not screened since most grey literature does not include abstracts. We limited our selection of grey literature to dissertations/theses, country profiles, policy reports, presentations and websites, published by knowledge- or research institutes, health care organizations and/or government (agencies).

Data extraction and analysis

A narrative synthesis approach was used to extract the data.[23] Data were extracted by two reviewers (AvdB and MdK) using a structured form for data extraction based on the research questions. Whenever there were uncertainties, these were discussed with two co-authors (AE and SM). Information on the following topics was extracted: study aim and methods; case-mix model attributes; and; study conclusions and recommendations.

The extracted data were ordered for each case-mix model. Subsequently, data were integrated by comparing and summarizing findings per topic, using data from scientific literature as the main source. When (parts of) a research question(s) could not be answered based on scientific literature, additional data from grey literature were used.

Results

Study selection

Phase 1 resulted in the identification of 3,303 studies. In Phase 2, two experts from the US, two from Canada, one from New Zealand, three from Australia, and one from Germany were contacted. Two of them were suggested by the initially selected experts, yet no new countries were identified. All of the experts replied, except for one Canadian expert. Phase 2 yielded an additional 177 possibly relevant titles. Eventually, of the 2,845 unique titles, 15 scientific studies and 22 grey documents met the inclusion criteria (see Figure 2.1 for a flow diagram, and Appendix 2B for a list of all literature included).

Study characteristics

Three types of scientific studies were found: case-mix model development and validation studies (n=7), and comparative (n=7) or evaluation studies (n=1) of case-mix based payment systems. Most of the studies (n=11, 73%) and grey literature (n=13, 59%) concerned case-mix models from the US. Most scientific studies were performed in or after the year 2000 (n=15), with only one study conducted between 1989 and 1999. Grey literature tended to be recent, with the oldest documents being published in 2000. A summary of the study characteristics is shown in Table 2.1.

Table 2.1. Study characteristics of scientific literature (n=15) and grey literature (n=22) included

	Scientific literature n (%)	**Grey literature** n (%)
Type of study [a]		
Case-mix development and validation	7 (47%)	n.a.
Comparative	7 (47%)	n.a.
Evaluation	1 (7%)	n.a.
Country		
US	11 (73%)	13 (59%)
Canada	1 (7%)	0 (0%)
New Zealand	1 (7%)	2 (9%)
Australia	1 (7%)	0 (0%)
Germany	1 (7%)	6 (27%)
Multiple countries	0 (0%)	1 (5%)
Publication date		
1989-1999	1 (7%)	0 (0%)
2000-2010	10 (67%)	11 (50%)
2011 or later	4 (27%)	11 (50%)

[a] For grey literature, this is not applicable, since a type of study is mostly not mentioned/not applicable.

The case-mix models identified

In total, eight case-mix models were identified (see Table 2.2 for more information on the models' country and year of development and/or implementation):

- An Alternative model to the Resource Utilization Groups to Home Health Care (RUG-HHC-alt.)[24];
- Resource Utilization Groups Version III for Home Care US (RUG-III/HC-US)[13];
- Resource Utilization Groups Version III for Home Care Canada (RUG-III/HC-Canada)[25];
- Home and Community Care model (HACC)[26];
- Personal Care Services Case-Mix Model (PCS CM)[27];
- Degrees of Need (DoN)[28-34];
- Home and Community Support Services Case-Mix Model (HCSS CM)[16,35-37];
- Home Health Resource Groups (HHRG)[38-58].

Three out of eight case-mix models – DoN, HCSS CM, and HHRG – were implemented as part of a prospective payment system for home care.

General information about the case-mix models

Targeted home care services vary between case-mix models, but all models were developed for prospective payment for some form of personal services (e.g. home health aide care), personal care, and/or domestic support. Furthermore, nursing care (i.e. skilled nursing care or visiting nurses) and allied health services by a physical, occupational, or speech therapist are included in five models, i.e. RUG-HHC-alt., RUG-III/HC-US, RUG-III/HC-Canada, HACC, and

Table 2.2. Case-mix models for home care (chronological order)

Case-mix model	Abbreviation	Country	Development/implementation status (year)	Developed by … (main author, plus additional included references)
Alternative model to the Resource Utilization Groups to Home Health Care	RUG-HHC-alt.	US	Developed (1993)	Branch et al.[24]
Resource Utilization Groups Version III for Home Care	RUG-III/HC-US	US	Developed and validated (2000)	Björkgren et al.[13]
Home and Community Care model	HACC	Australia	Developed (2004)	Calver et al.[26]
Resource Utilization Groups Version III for Home Care	RUG-III/HC-Canada	Canada	Validated (2008)	Poss et al.[25]
Personal Care Services Case-Mix Model	PCS CM	US	Developed (2008)	Philips et al.[27]
Degrees of Need	DoN	Germany	Developed (2008) and implemented (2017)	Büscher et al.[28-34]
Home and Community Support Services Case-Mix Model	HCSS CM	New Zealand	Developed (2009) and implemented	Parsons et al.[16,35-37]
Home Health Resource Groups	HHRG	US	Developed, implemented, and continuously updated (since 2000)	Centers of Medicare and Medicaid Services (CMS) commissioned by the US government[38-58]

HHRG. Additionally, four models include social services provided by a (medical) social worker, i.e. RUG-HHC-alt., RUG-III/HC-US, RUG-III/HC-Canada, and HHRG. Informal care, respite care, support services for carers, food (support) services, and home maintenance and modification services are only included once across models.

Appendix 2C provides more detailed general information concerning the case-mix models identified.

Operationalizing case-mix predictors

In total, six different needs assessment instruments are used to operationalize predictors across the case-mix models included (see Appendix 2D). Half of the models (n=4) base their operationalization on existing classification systems for home care. The most commonly used classification system (n=3) is one (section of) or multiple International Resident Assessment Instruments (InterRAI): RUG-III/HC-US and RUG-III/HC-Canada both use a Minimum Data Set for Home Care (MDS-HC), based on the information for the InterRAI for Home Care (InterRAI-HC), and HCSS CM additionally uses the InterRAI Contact Assessment (InterRAI-CA).

Furthermore, the Outcome and Assessment Information Set (OASIS) is used for HHRG. Other case-mix models operationalize their predictors based on instruments developed specifically for the model or on required routine forms.

The literature included provides a limited and diversified description of when and by whom the needs assessment is performed. In general terms, it seems that the needs assessment is mostly performed by a health professional, i.e. a nurse, therapist, or doctor.

Attributes of the case-mix models

A total of 127 unique case-mix predictors were identified across the eight case-mix models (see Appendix 2E for an overview of predictors in each model). The models contain between 3 and 42 case-mix predictors. Three case-mix models (i.e. RUG-HHC-alt., PCS CM, and HCSS CM) contain relatively few predictors, i.e. between 17 and 23 predictors with a mean of 21. Four models (i.e. RUG-III/HC-US, RUG-III/HC-Canada, DoN, and HHRG) contain relatively many predictors, i.e. between 34 and 42 predictors with a mean of 39. One model (i.e. HACC) contains three predictors of which two are aggregated (i.e. ‘ADL functioning’ and ‘IADL functioning’).

None of the 127 predictors is included in all models. The most frequently included predictors, each included by five case-mix models, are ‘Ambulation’, ‘Toileting’, ‘Managing medication’, ‘Decision-making’, and ‘Intravenous cannula/therapy’. The majority of case-mix predictors are mentioned by one (n=68, 54%) or two models (n=35, 28%). The 127 predictors were divided into eight categories, defined by three authors (AvdB, MdK, and AE). Figure 2.2 shows the number of predictors per category per case-mix model identified. The most frequently included categories, each included in seven models, are ‘Physical functioning’, ‘Daily functioning’, and ‘Health service use’. The least frequently included category, included in two models, is ‘Social environmental characteristics’. Within the category ‘Daily functioning’, it is notable that PCS CM includes 13 predictors, while among the other models the numbers range between 0 and 10, with an average of 5 (note: this includes HACC which uses two aggregated predictors for ‘Daily functioning’). Case-mix predictors in the category ‘Health status’ are mentioned most frequently in HHRG (n=21), and RUG-III/HC-US and RUG-III/HC-Canada (both n=20), while the other models include on average three of those predictors. In the category ‘Health service use’, predictors represent previous, current, and/or expected use of specific health services. As an example, the predictor ‘Physical, occupational, and/or speech therapy’ indicates a clients’ rehabilitation potential.

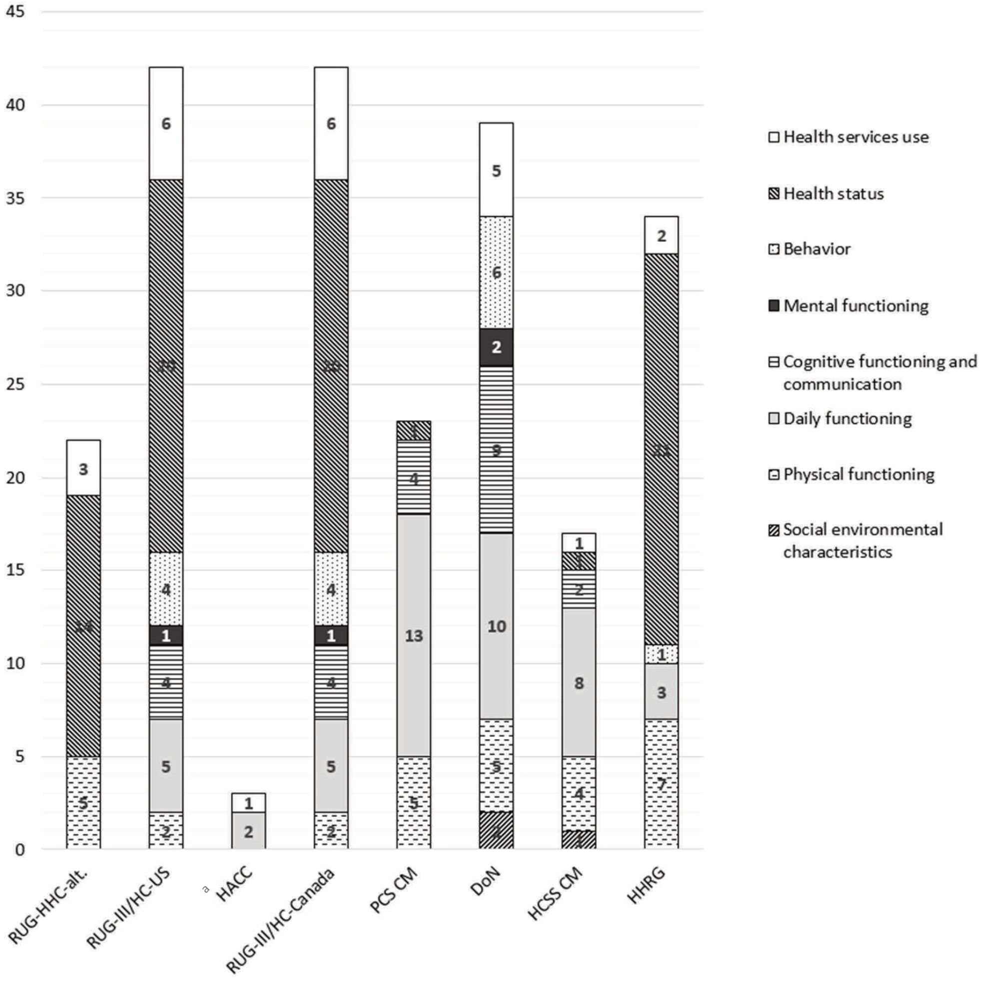


Figure 2.2. Number of case-mix predictors per category per case-mix model

[a] For HACC, the two case-mix predictors of 'Daily functioning' are aggregated predictors.

Abbreviations used: RUG-HHC-alt. = Alternative model to the Resource Utilization Groups to Home Health Care (RUG-HHC); RUG-III/HC = Resource Utilization Groups version III for Home Care; HACC = Home and Community Care; PCS CM = Preliminary case-mix model for allocating personal care services; DoN = Degrees of Need (Pflegengraden); HCSS CM = Home and Community Support Services Case-Mix Model; HHRG = Home Health Resource Groups.

Based on the case-mix predictors, the models use a variety of complex algorithms to form case-mix groups (see Table 2.3). The number of case-mix groups is between 5 and 39 across most models, apart from HHRG which has 153 case-mix groups. For six out of eight models' algorithms, case-mix groups are allocated using a decision tree containing three or four splits based on the predictors included. Two exceptions are DoN and HHRG, which both use a sum of scores to determine a case-mix group rather than a decision tree.

Table 2.3. Case-mix model attributes and predictive power: number of case-mix groups, algorithm, description of case-mix groups, outcome variable, and explained variance

Case-mix model	Number of case-mix groups [a]	Algorithm	Description case-mix groups [b]	Outcome variable [c]	Explained variance
RUG-HHC-alt.	11	For the first split, the whole group is dichotomized based on whether rehabilitation care is provided (yes/no). Only for clients not receiving rehabilitation, an extra split is made by a dichotomization based on whether special care is provided (yes/no). For the second split, all 3 current groups are dichotomized based on whether skilled nurse monitoring is provided (yes/no). Finally, for the third split, all current groups, are dichotomized based on the presence of paralysis (yes/no), except for the group of no rehabilitation, no special care and no skilled nurse monitoring. This results in a total of 11 groups.	Group 3, i.e. clients with skilled nurse monitoring, and no rehabilitation, no special care and no paralysis, formed the largest group containing 58% of the cases studied. This group had mean 60-day allowed charges of $713. 5 of the 11 groups had between 0.5% and 2% of the cases studied, with 4 of them having allowed charges higher than the mean of $847. Overall, allowed charges during the first 60 days of care ranged from $473 to $2,562.	Costs, i.e. allowed charges during the first 60 days of home health care.	For a 60-day period: 22% in the learning sample, and 14% in the confirmatory sample.
RUG-III/HC-US	21	First, clients are assigned to a clinical category based on the presence of one of the clinical characteristics. The clinical categories (named similar to the characteristics) are ranked hierarchically, in decreasing order of resource use. If none of the clinical characteristics is present, clients are assigned to the lowest clinical category, i.e. reduced physical functions. Second, once a clinical category is assigned, a split is made based on an index of four ADLs for all categories except 'Extensive services' (named SE1). The category of 'Special rehabilitation' is split into two subcategories, i.e. ADL-score 4-10 (RA) and 11-15 (RB). The category of 'Special care' is split into two subcategories, i.e. ADL-score 7-13 (SSA) and 14-16 (SSB). The category of 'Clinically complex' is split into three subcategories, i.e. ADL-score 4-5 (CA), 6-10 (CB), and 11-16 (CC). The categories of 'Impaired cognition' and 'Behavior	Most clients are assigned to the categories 'Reduced physical functions' (49.5%), and 'Clinically complex' (27.5%). Two categories contain less than 10% of the clients assigned, i.e. 'Special rehabilitation' (9.2%), and 'Impaired cognition' (7.8%). The remaining three categories contain less than 3% of the clients. Across the 21 groups, the number of clients per case-mix group ranged from 23% in group PA_1, to a single client in group IA_1. The whole sample has a coefficient of variation (CV) of 1.08, indicating a large variation of resource use between all clients.	Costs (weighted), i.e. both formal care time spent by formal caregivers and therapists, and informal unpaid care time spent by primary and/or secondary caregivers.	At initial assessment: 33.7% after wage-weight (formal and informal) care time, and 36.7% when agency identifiers were added. At 45-day assessment: 38.1%. At 90-day assessment: 42.5%. At 180-day assessment: 43.5%.

		problems' are split into two subcategories, i.e. ADL-score 4-5 (IA and BA) and 6-10 (IB and BB). The category of 'Reduced physical functions' is split into four subcategories, i.e. 4-5 (PA), 6-8 (PB), 9-10 (PC), and 11-15 (PD). Third, for five subcategories, a dichotomized split is made based on IADLs. The subcategories with the lowest ADL dependency, i.e. RA, CA, IA, BA, and PA, are split into RA_1 and RA_2, CA_1 and CA_2, etc. This results in a total of 21 groups.	Within a clinical category, case-mix indexes (CMIs) increase with higher ADL dependency. Also, the proportion of informal care tends to increase with greater function dependency.		Formal cost alone: 26.3%. Formal cost, without 'Special rehabilitation' cases: 7.0%.
HACC	9	First, clients are allocated to one of four ADL-groups based on a summative score of ADL dependency, i.e. ADL-low (score 10 to 13), ADL-medium (score 14 to 20), ADL-medium-high (score 21 to 25), and ADL-high (score 26-30). Second, all ADL-groups are dichotomized based on the need for clinical services (i.e. yes/no). Finally, the ADL-low groups with no need for clinical services is further dichotomized based on a summative score of IADL dependency, i.e. IADL2 (score 8 to 13) and IADL2 (score 14 to 24). This results in a total of 9 groups.	Most clients are assigned to the category ADL-low (77%). The remaining three ADL-categories contained less than 20% of the clients, i.e. 17% with ADL-medium, 3% with ADL-medium-high, and 2% with ADL-high. Concerning the 9 groups, most clients are assigned to ADL-low with no need for clinical services and IADL1 (40%). This is also the least expensive group with a mean daily cost of $16.58. The smallest and also the most expensive group is ADL-high with no need for clinical services (1%, and mean daily cost of $159.42). All but the IADL1 group have a mean of daily costs higher than the mean of $28.55 for the total sample. Seven of the groups have coefficients of variation (CVs) greater than one, indicating they are relatively heterogeneous.	Costs, i.e. HACC services related costs accumulated for each client during each three-monthly assessment period.	For a 3-month period: 23.7%
RUG-III/HC-Canada	23	First, clients are assigned to a clinical category based on the presence of one of the clinical characteristics. The clinical categories (named similar to the characteristics) are ranked hierarchically, in decreasing order of resource use. If none of the clinical characteristics is present, clients are assigned to the lowest clinical	Most clients are assigned to the categories 'Reduced physical functions (56.1%), 'Clinically complex' (21.2%), and 'Impaired cognition' (12.8%). Category 'Rehabilitation' contains 6.8% of the clients. Less than 2% of the clients are assigned to the remaining	Costs (weighted), i.e. both formal and informal care costs.	For a 13-week period: Overall, 37.3% for formal and informal costs.

Table 2.3. *(continued)*

Case-mix model	Number of case-mix groups [a]	Algorithm	Description case-mix groups [b]	Outcome variable [c]	Explained variance
		category, i.e. reduced physical functions. Second, once a clinical category is assigned, a split is made based on an index of four ADLs for all categories except 'Extensive services' (named SE1). The category of 'Special rehabilitation' is split into two subcategories, i.e. ADL-score 4-10 (RA) and 11-15 (RB). The category of 'Special care' is split into two subcategories, i.e. ADL-score 7-13 (SSA) and 14-15 (SSB). The category of 'Clinically complex' is split into three subcategories, i.e. ADL-score 4-5 (CA), 6-10 (CB), and 11-15 (CC). The categories of 'Impaired cognition' and 'Behavior problems' are split into two subcategories, i.e. ADL-score 4-5 (IA and BA) and 6-10 (IB and BB). The category of 'Reduced physical functions' is split into four subcategories, i.e. 4-5 (PA), 6-8 (PB), 9-10 (PC), and 11-15 (PD). The category of 'Extensive services' is split into three subcategories based on the number of treatments received, i.e. 1 (SE1), 2 (SE2) or 3 (SE3) treatments. Third, for five subcategories, a dichotomized split is made based on IADLs. The subcategories with the lowest ADL dependency, i.e. RA, CA, IA, BA, and PA, are split into RA_1 and RA_2, CA_1 and CA_2, etc. This results in a total of 23 groups.	three categories. Across the 23 groups, the number of clients per case-mix group ranged from 26% in group PA_1, to a single client in group SE3. The mean number of informal care hours is 21.7, with a coefficient of variation (CV) of 1.09. The formal cost case-mix index (CMI) is 1.00, with a CV of 1.07. The formal and informal cost CMI is 1.00, with a CV of 0.88. The coefficient of variation (CV) for combined formal and informal cost (CV = 0.88) is lower than for formal cost alone (CV = 1.07).		Formal cost alone: 20.5%. Formal cost, without 'Special rehabilitation' cases: 20.0%. Newly opened cases: 28.4%. Long-standing cases (> 1,000 days): 44.5%. Personal support service cost alone: 21.4%. Informal hours alone: 29.3%. Nursing cost alone: 1.3%. Physical therapy alone: 0.4%. Occupational therapy alone: 1.9%.

PCS CM	11	First, a dichotomous split is made based on a client's cognitive functioning, i.e. cognitively intact or impaired. Second, both groups are split into groups based on the client's ADL status score ranging from 0 (independent) to 60 (total dependence). The group 'Cognitively intact' is split into two groups, i.e. moderate and high ADL need, and the group 'Cognitively impaired' is split into three groups, i.e. low, moderate and high ADL need. Third, of 'High ADL need' groups are split based on continence, i.e. continent and incontinent. The groups of 'Moderate ADL need' are split based on IADL, i.e. low/moderate IADL need and higher IADL need. Finally, the fourth split is done for both groups of incontinence based on the presence of a problem diagnosis, i.e. forming a group with and without problem diagnosis. This results in a total of 11 groups.	Most clients were allocated to groups 'Cognitively impaired with high ADL needs, incontinent, and no problem conditions' (group 5) (31%), 'Cognitively intact with high ADL needs and incontinence, and no problem conditions' (group 10) (14%), and 'Cognitively intact with moderate ADL needs, high IADL needs, continent, and no problem conditions' (group 8) (13%). For the other groups, the percentage of allocated clients ranges from 1% to 10%. The number of presumed hours of care ranges between a minimum of 10 hours for the low ADL needs group, to 34 hours for cognitive impaired and incontinent clients with high ADL needs, and a problem diagnosis (group 6). Case-mix indices (CMIs) range from 0.56 to 1.72.	Care time, i.e. hours of care needed.	For a 3-month period: Overall, based on all client characteristics: 29%. All client characteristics and caseworker ID: 51%. Only caseworker ID: 32%. Only ADLs and IADLs: 27%.
DoN	5	The first step is to determine independence and abilities by scoring multiple items in six modules (see 'Case-mix predictors'). The second step is to calculate the scores for the individual modules by summing the scores assignedper module. For the third step, the sum scores of the modules are weighted. The weightings are as follows: 10% for module 1; 15% for module 2 or 3 (only the module with the highest score is included); 40% for module 4; 20% for module 5; and 15% for module 6. Finally, a case-mix group is assigned based on an integrated overall score between 0 and 100 by summing the weighted scores. A client is assigned to group 1, 'First degree of dependency', with a score from 15-29; to group 2, 'Second degree of dependency', with a score from 30-49; to group 3, 'Third degree of	In the first seven months of implementation, there were 536,000 applicants for home care, of whom 432,999 clients were assigned to one of the degrees of need. 19.3% of applicants were not considered eligible for care. Group 1 contains clients with a minor impairment in independence, counting 24.9% of the clients. Group 2 contains clients with a significant impairment in independence, counting 34.5%. Group 3 contains clients with a severe impairment of independence, counting 14.9%. Group 4 contains clients with the severest impairment of independence, counting 4.8%. Group 5	Costs, i.e. personal budget of a client.	Unknown

Table 2.3. (continued)

Case-mix model	Number of case-mix groups [a]	Algorithm	Description case-mix groups [b]	Outcome variable [c]	Explained variance
		dependency', with a score from 50-69; to group 4, 'Fourth degree of dependency', with a score from 70-89; and to group 5, 'Fifth degree of dependency', with a score of 90 or higher.	contains clients with a special-needs constellation, counting 1.6%. Wingenfeld (2011) found six aspects as special needs constellation, i.e. exceptionally high food intake support for more than 2 hours, exceptionally high support costs due to pronounced pain symptoms or spasticity or contractures, exceptionally high effort due to extreme motor agitation, occurrence of generalized seizures several times a day, and home intensive care with the a need for permanent monitoring.		
HCSS CM	6 for non-complex clients, and 33 for complex clients	Clients are categorized as non-complex or complex on the basis of a Supporting Allocations Tool (not described within this study, see Harrison (2011)). For clients categorized as non-complex, the first split is made by dichotomizing based on independence in bathing or managing personal hygiene. If the score is =0, a second split is made based on independence in performing ordinary housework. If =0, the client is allocated to group 1b, 'Care management'. If =1, a third split is made based on independence in climbing stairs, moving between locations on the same floor, or how meals are prepared. If =0, the client is allocated to group 1a, 'Housework only'. If =1, a fourth split is made based on the client's stability, or the urgency of services needed in physiotherapy or occupational therapy. If =0, the client is allocated to group 2a, 'Housework and shopping stable'. If =1, the client is allocated to group 2b, 'Housework and shopping flexible'. If the score of the first	The non-complex case-mix groups are ordered hierarchically, i.e. the need for care increases from group 1a with the lowest to group 3b with the highest need. Most clients are allocated to stable case-mix groups 1a, 2a, and 3a, of which 1a is the largest group. As the needs level rises, clients have an increased mean weekly hours of care, ranging from 1.49 to 3.78 hours. Furthermore, higher variability in mean weekly hours is found for flexible case-mix groups. The main groups of the complex case-mix groups, i.e. A until E, are also hierarchically ordered with increasing complexity. Furthermore, the disability clusters can be divided into 'low needs',	Care time, i.e. mean weekly hours of home-care services.	For a 1-week period: 16% for non-complex clients, and 24% for complex clients (for formal hours only).

	split with bathing or personal hygiene =1, a second split is also made based on the stability or urgency of needed therapy services. If =0, the client is allocated to group 3a, 'Personal care stable'. If =1, the client is allocated to group 3b, 'Personal care flexible'. For clients categorized as complex, the first split is made based on the occurrence of a significant rehabilitation episode. If yes, then the client is allocated immediately to group E, 'Rehabilitation group'. If no, the second split is made by dichotomizing based on cognitive impairment (yes/no). A third split is made by dichotomizing based on having brittle social support (yes/no). This forms 4 groups, i.e. group A, 'Disability only', group B, 'Brittle social support and disability', group C, 'Cognitive impairment and brittle social support', and group D, 'Cognitive impairment, brittle social support, and disability'. Thus, in total there are 5 main groups. Within each group, there are eight clusters that classify a client into low, medium, or high needs, i.e. disability clusters. First, the client is assessed on his or her independence in lower body dressing. If the score is <=1, a second split is made based on a client's independence in bathing. If <=1, the client is in disability cluster 1, 'Low need'. If >1, a third split is made based on independent meal preparation. If <=1, a fourth split is made based on independence in medication management, leading to cluster 2, 'Bathing', when =0, and to cluster 3, 'Bathing and cognitive processes', when >0. If >1, a fourth split is made based on incontinence, leading to cluster 4, 'Meal and bathing', when <=1, and to cluster 5, 'Meal and bathing and incontinence', when >1. If the score for the first split with lower body dressing is >1, a second split is made based on independence in upper body dressing. If the score is <=3, a third split is made based on incontinence, leading to cluster 6, 'Dressing lower body', when <=2, and to cluster 7,	i.e. cluster 1 and 2, 'moderate needs', i.e. clusters 3 to 5, and 'high needs', i.e. clusters 6 to 8.

Table 2.3. (continued)

Case-mix model	Number of case-mix groups [a]	Algorithm	Description case-mix groups [b]	Outcome variable [c]	Explained variance
		'Dressing lower body and incontinence', when >2. If the score is >3, the client is in cluster 8, 'Dressing'. Thus, in total there are 8 disability clusters groups. By incorporating the 4 clinical groups with the 8 disability groups, a total of 33 groups including the rehabilitation cluster are formed.			
HHRG	153 (before the 2008-update, the model contained 80 case-mix groups).	Various combinations of the assessment results of client characteristics determine the allocation of a client to a case-mix group. For each of the three domains, i.e. clinical severity (C), functional status (F), and service utilization (S), scores are assigned for each client characteristics. A sum of scores is calculated for each domain, ranging from 0 to 3 for clinical severity (C0-C3), 0 to 3 for functional status (F0-F5) (before the 2008 update, the range was 0 to 4), and 1 to 5 for service utilization (before the 2008 update, the range was 0 to 3). The final score is expressed with a CFS rating, e.g. C2F1S1 or C2F5S2. In total, 153 combinations of these scores are formed.	The highest scores correspond to more serious or complex conditions, i.e. the highest resource utilization.	Costs (weighted), i.e. volume and type of home health care.	For a 60-days period: 54.29% in 2019 (an increase from 50.95% for the 2018 recalibration) according to the most recent CMS report (CMS, 2018a). 32% in 2000 according to a referral to Goldberg & Delargy (2000) (Elias, 2000).

[a] For each model, – except for HACC for which this is unknown, – the case-mix groups are mutually exclusive, i.e. a client can be assigned to only one group.

[b] For interpretation of the coefficient of variation (CV), a value of 1 represents a normal distribution, whereas CV values >1 indicate poor within-group homogeneity.

[c] For three models that use weighted costs asoutcome variable, the costs are weighted using an hourly rate for different levels of home care professionals, for example.

Abbreviations used: RUG-HHC-alt. = Alternative model to the Resource Utilization Groups to Home Health Care (RUG-HHC); RUG-III/HC = Resource Utilization Groups version III for Home Care; HACC = Home and Community Care; PCS CM = Preliminary case-mix model for allocating personal care services; DoN = Degrees of Need (Pflegengraden); HCSS CM = Home and Community Support Services Case-Mix Model; HHRG = Home Health Resource Groups.

Predictive power of the case-mix models

Two outcome variables are identified across case-mix models: costs (n=6), and care time (n=2) of home care services. The reported explained variances in outcomes in terms of R^2 (see Table 2.3) vary between a minimum of 14% for RUG-HHC-alt. to a maximum of 37.3% for RUG-III/HC-Canada. An exception is HHRG, for which reported explained variances in outcomes increased from 32% in 2000 to 54.3% in 2019. The prediction timeframes vary from one week for HCSS CM (the shortest) to 180 days for RUG-III/HC-US (the longest). The explained variance and timeframe for DoN are unknown. For some of the models, the included studies/documents reported different explained variances after correcting for factors such as formal and informal costs, the care-time of a client, or the caseworker that performed the needs assessment (see Table 2.3).

For six case-mix models – all except for DoN and HHRG –, one group can be identified as the largest case-mix group concerning number of clients allocated (see Table 2.3). Most often, these are groups with lower relative care needs. For example, for HCSS CM it is stated that groups of stable clients represent the largest groups, and groups of flexible or unstable clients the smallest. For three models, a coefficient of variation (CV) is reported (see Table 2.3). Overall, the CV's reported show relatively high heterogeneity within groups, meaning large variations in resource use between clients, particularly within large, low-need case-mix groups.

Discussion

Our systematic review of scientific and grey literature identified eight case-mix models developed for prospective payment for home care. Less than half of the models are implemented in practice. The models identified derive their case-mix predictors from one (or more) of six different needs assessment instruments. Across case-mix models, highly diverse combinations of 127 unique case-mix predictors are used to assign clients to case-mix groups. The most frequently included predictors relate to physical functioning, daily functioning and health service use, while social environmental characteristics are included least often. The number of case-mix groups per model ranges from 5 to 39, except for the HHRG model which has 153 groups. Most models include one relatively large case-mix group comprising clients with the lowest care needs in comparative terms: within this group, however, there still tends to be considerable heterogeneity in needs. Overall, the identified case-mix models explain between 14 and 54% of variation in either care time or (weighted) costs of home care.

A number of explanations can be given for the identified variation in case-mix models in terms of predictors and groups included. Firstly, there are considerable differences in the organization of home care in different countries, as a result of which the scope of services covered and clients eligible varies per payment system. Thus, where PCS CM and DoN have a strong focus on personal (care) services, and HCSS CM additionally includes domestic support, HHRG and RUG-III/HC focus more on nursing and allied health services. Secondly, there is a lack of uniformity across models in assessment instruments used to operationalize case-mix predictors. Besides the comprehensive needs assessment instrument of InterRAI, which a number of the models use as basis for case-mix predictor selection, a range of other needs assessment instruments and routine forms are also used. Using standardized assessments is essential in order to base the case-mix model on data that were as reliable and accurate as possible.[17,59] At the same time, however, the choice of case-mix predictors is constrained by the items available in these different instruments, which causes variation between models in both the total number and type of predictors. Thirdly, variation in the configuration of the case-mix models relates to specific design choices, such as whether case-mix groups should be both statistically and clinically relevant. According to some authors, the aim should be to create case-mix groups that are not only homogeneous in terms of service utilization, but also represent clinically similar clients who can be targeted with tailored interventions, and clinical guidelines or policy changes.[16,27] Indeed, when developing four of the models – RUG-III/HC-US, RUG-III/HC-Canada, HCSS CM, and PCS CM – researchers were explicitly striving towards developing clinically meaningful case-mix groups.[13,16,25,27] Parsons et al. also argue that involving home care professionals in case-mix model development increase levels of professional support when implementing or adapting a case-mix based payment system. However, incorporating clinical relevance into a case-mix model can undermine statistical performance[17], because more complex models – with higher numbers of relevant predictors and case-mix groups – tend to predict future resource use better. Since developing a good case-mix model, – at least in the early stage, – is largely statistical[12], we would suggest first developing the model based on its statistical performance. Additionally, adjustments to increase clinical relevance may be considered, yet these should be deliberated in relation to the accompanying reduction in statistical performance.

When examining the types of predictors included in case-mix models in more detail, it seems that there is a lack of consensus on what the key determinants of future resource use are in home care case-mix models. Of the 127 predictors identified, none is used consistently across all models, and more than three in four are used in only one or two case-mix models. However, when we group the predictors into a smaller number of categories, some trends can be identified. According to the seminal work of Andersen and Newman's on the Behavioral Model of Health Service Use, conceptualizing the main determinants of health service use, an individual's health service use is a function of three characteristics: predisposing factors (i.e. characteristics that exist prior to a person's illness, such as demographics and health beliefs), enabling factors (i.e. logistical aspects such as social relationships and income), and need factors (i.e. a person's functional and health problems that generate the need for health services).[60] The most widely used predictor categories of physical functioning and daily functioning, as well as almost all other categories of predictors identified across models, correspond to what Andersen and Newman describe as 'need factors'.[60] The identification of daily functioning as commonly used predictor is also consistent with the view of nurses working in home care regarding which predictors are important: in a survey study, they ranked daily functioning (in terms of ADL functioning) as most relevant predictor of clients' home care needs.[15] Concerning Andersen and Newman's predisposing factors, none is included in the case-mix models identified except for two predictors in the German DoN (i.e. 'resting and sleeping', and 'occupying oneself'). Finally, enabling factors identified are the three predictors in the category of social environmental characteristics, which are only included in DoN (i.e. 'interacting with people in direct social contact', and 'contacting people outside direct surrounding') and HCSS CM (i.e. 'brittle social support'). Thus, predisposing and enabling factors are clearly underrepresented in the models, relative to need factors. However, of the former two categories, enabling factors are particularly important in order to reliably predict client's home care needs.[14-16,61] Besides the social environmental characteristics predictors identified, these could also relate to a client's education or social status, for instance.[62] Even though no guideline is available to measure needs predictors adequately, evidence is available and continues to emerge.[62] To conclude, inclusion of more enabling predictors may be an important and feasible step towards higher predictive values for home care case-mix models.

Two design choices in case-mix model development are particularly important in balancing optimum predictive power to create the right incentives for providers operating under a prospective payment system. First, there is the choice of whether or not to include predictors related to health services used by a client in a previous period. Of the case-mix models identified, only HHRG – the model with the highest predictive power of identified models – included such an 'ex post predictor', i.e. 'Service utilization'. Inclusion of ex post predictors will automatically lead to higher predictive power, since previous health service use is statistically the strongest predictor of future health service use.[63] However, using previous health service use to predict future use is problematic, since historic health service use may not represent the objective of efficient, client-centered care, but may instead reflect patterns of overuse or wasteful spending, or even underuse and unmet needs.[63,64] Moreover, it may not take into account changes in need for example when acute need increases due to a fall incident or the loss of an informal caregiver.[61] As a result, home care professionals are not incentivized to deliver high-quality, needs-based care. For this reason, it is necessary to shift the balance more towards creating the right incentives for home care professionals instead of increasing the model's predictive power in order to achieve prospective payment system goals. Second, the decision on the timeframe for which home care service use is predicted also influences predictive power: predicting the need for these services tends to be more accurate over a shorter timeframe, such as a one-week period with HCSS CM, compared to a longer timeframe, such as a 3-month period with HACC.[65] Choosing a shorter timeframe would therefore seem to be a more attractive option, because it would reduce the financial risks for home care providers, yet this approach would lead to negative incentives. The shorter the timeframe, the closer funding comes to FFS, leading to incentivization of larger volumes of care, as with FFS. Thus, even though a longer timeframe may be less accurate, it is also preferred in order to create the right incentives using case-mix based payment systems – i.e. decrease incentivizes for quantity of care and create positive incentives for delivering high-quality care.

One strength of this study is the inclusion of grey literature in addition to scientific literature, as this provided a more comprehensive view of the literature on home care case-mix models[66], and prevented publication and availability bias.[67] Key papers on methodologies for grey literature were consulted to select suitable sources and form a search strategy for the Phase 2 search for grey literature.[20-22] Another strength is the consultation of experts in the field of home care case-mix. They were asked to report any additional case-mix models or experts. Since no new case-mix models were suggested, our overview is assumed to be relatively complete. It also confirmed that language bias most likely did not occur for case-mix models reported in languages other than English, Dutch, or German. A limitation is that no quality appraisal of the included literature was performed. Due to the descriptive nature of this review, we deliberately chose not to appraise the quality of scientific literature included. Multiple quality appraisal instruments were considered, such as the Critical Appraisal Skills Programme (CASP) checklists[68] and the QualSyst tool[69], but no instrument was found to be suitable for assessing the studies included. Another limitation is the limited comparability of identified case-mix models' predictive power (in terms of explained variance), given the large variation found in the attributes of the models. Hence, only a descriptive analysis was possible.

Conclusions

Prospective payment for home care is a promising solution for policymakers wishing to realize efficient, needs-based home care, but a robust case-mix model is a prerequisite for this as a scientific, objective basis on which to develop a well-functioning prospective payment system. Results of this systematic review, however, suggest that there is limited interest in research on case-mix models and associated payment systems for home care. Only 15 scientific articles were found, of which over 70% had been carried out in the US. Moreover, while predisposing, enabling and needs factors are important predictors of resource use in home care, a high degree of ambiguity exists about which combination(s) of factors to include and how to operationalize them. Additional research should seek to develop a shared vision on what the main determinants of home care use are, and how to combine these determinants into a case-mix model that both performs well statistically and includes the right incentives for home care providers. As to the latter, it is important that we gain more insight into effects of different prospective, case-mix based payment systems on the client-centeredness and efficiency of home care. To support further research in this area, a second article based on this systematic review will comparatively analyze available evidence. This evidence relates to existing prospective payment systems in home care – in terms of, amongst others, type of payment contracts used, covered services, and (determination of) payment levels – and their measured impacts on micro-, meso- and macro-levels of care.

References

1. Keenan TA. Home and community preferences of the 45+ population. Washington, DC: AARP Reaearch & Strategic Analysis, 2010.
2. Institute of Medicine, National Research Council. The future of home health care: Workshop summary. Washington, DC: The National Academies Press, 2015.
3. Cuckler GA, Sisko AM, Poisal JA, et al. National health expenditure projections, 2017-26: Despite uncertainty, fundamentals primarily drive spending growth. *Health Aff (Millwood)*. 2018;37:482-92.
4. Sims-Gould J, Tong CE, Wallis-Mayer L, Ashe MC. Reablement, reactivation, rehabilitation and restorative interventions with older adults in receipt of home care: A systematic review. *J Am Med Dir Assoc*. 2017;18:653-63.
5. Metzelthin SF, Rostgaard T, Parsons M, Burton E. Development of an internationally accepted definition of reablement: A Delphi study. *Ageing Soc*. 2020;1-16
6. Koster NM, Harmsen J, van der Palen J. *Analyzing client characteristics and needs in home health care*. Enschede, the Netherlands: University of Twente, 2015.
7. Miller HD. From volume to value: Better ways to pay for health care. *Health Aff (Millwood)*. 2009;28:1418-28.
8. Eggleston K. Risk selection and optimal health insurance-provider payment systems. *J Risk Insur*. 2000;67:173-96.
9. Fetter RB, Shin Y, Freeman JL, Averill RF, Thompson JD. Case mix definition by diagnosis-related groups. *Med Care*. 1980;18(iii),1-53.
10. Halling A, Fridh G, Ovhed I. Validating the Johns Hopkins ACG case-mix system of the elderly in Swedish primary health care. *BMC Public Health*. 2006;6.
11. Lemke KW, Weiner JP, Clark JM. Development and validation of a model for predicting inpatient hospitalization. *Med Care*. 2012;50:131-9.
12. Fries BE, Schneider DP, Foley WJ, Gavazzi M, Burke R, Cornelius E. Refining a case-mix measure for nursing homes: Resource Utilization Groups (RUG-III). *Med Care*. 1994;32:668-85.
13. Bjorkgren MA, Fries BE, Shugarman LR. A RUG-III case-mix system for home care. *Can J Aging*. 2000;19:106-25.
14. Manton KG, Hausner T. A multidimensional approach to case mix for home health services. *Health Care Financ Rev*. 1987;8:37-54.
15. Van den Bulck AOE, Metzelthin SF, Elissen AMJ, et al. Which client characteristics predict home-care needs? Results of a survey study among Dutch home-care nurses. *Health Soc Care Community*. 2019;27:93-104.
16. Parsons M, Rouse P, Sajtos L, Harrison J, Parsons J, Gestro L. Developing and utilising a new funding model for home-care services in New Zealand. *Health Soc Care Community*. 2018;26:345-55.
17. James ML, Fries BE, Goodell M, Wellens N. *Design principles for HCBS case mix: A primer*. Michigan: University of Michigan Institute of Gerontology, 2015.
18. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Med*. 2009; 6:e1000097.
19. Bramer WM, Giustini D, de Jonge GB, Holland L, Bekhuis T. De-duplication of database search results for systematic reviews in endnote. *J Med Libr Assoc*. 2016;104:240-3.
20. Mahood Q, Van Eerd D, Irvin E. Searching for grey literature for systematic reviews: Challenges and benefits. *Res Synth Methods*. 2014;5:221-34.
21. Adams RJ, Smart P, Huff AS. Shades of grey: Guidelines for working with the grey literature in systematic reviews for management and organizational studies. *Int J Manag Rev*. 2017;19:432-54.
22. Paez A. Gray literature: An important resource in systematic reviews. *J Evid Based Med*. 2017;10:233-40.
23. Popay J, Roberts H, Sowden A, et al. *Guidance on the conduct of narrative synthesis in systematic reviews: A product from the ESRC methods programme*. Lancaster: Lancaster University, 2006.
24. Branch LG, Goldberg HB. A preliminary case-mix classification system for Medicare home health clients. *Med Care*. 1993;31:309-21.
25. Poss JW, Hirdes JP, Fries BE, McKillop I, Chase M. Validation of Resource Utilization Groups version III for home care (RUG-III/HC): Evidence from a canadian home care jurisdiction. *Med Care*. 2008;46:380-7.
26. Calver J, Holman CD, Lewin G. A preliminary case-mix classification system for home and community care clients in western Australia. *Aust Health Rev*. 2004;27:27-39.

27. Phillips CD, Dyer J, Janousek V, Halperin L, Hawes C. Providing appropriate services to individuals in the community: A preliminary case-mix model for allocating personal care services. *J Health Hum Serv Adm*. 2008;30:378-401.
28. Büscher A, Wingenfeld K, Schaeffer D. Determining eligibility for long-term care - lessons from Germany. *Int J Integr Care*. 2011;11.
29. Advisory board. *Implementation report by the advisory board to review the definition of the need for long-term care*. Germany: Ministry of Health, 2009.
30. Büscher A. *Home care in Germany (PowerPoint)*. Osnabrück: Osnabrück University of Applied Sciences, 2019.
31. Medizinischer Dienst des Spitzenverbandes Bund der Krankenkassen. *Ergebnisse der pflegebegutachtung*. 2017.
32. Bundesministerium für Gesundheit. Der *neue pflegebedürftigkeitsbegriff und das Neue Begutachtungsassessment (NBA)*. Praxisseiten Pflege, 2015.
33. Schaeffer D, Wingenfeld K, Büscher A, Heine U, Gansweid B. *Das neue begutachtungsassessment zur feststellung von pflegebedürftigkeit anlagenband*. 2008.
34. Wingenfeld K, Büscher A, Gansweid B. *Das neue begutachtungsinstrument zur feststellung von pflegebedürftigkeit*. 2011.
35. Harrison J, Parsons M, Rouse P, Sajtos L. *Case mix in home care: Non-complex and complex analysis*. 2011.
36. Parsons M. *Profiles and pathway development within home care in New Zealand*. 2016.
37. Elissen AMJ, Metzelthin S, Van den Bulck AOE, Verbeek H, Ruwaard D. *Case-mix classificatie als basis voor bekostiging van wijkverpleging*. Maastricht, the Netherlands: Maastricht University, Faculty of Health, Medicine and Life Sciences, Care and Public Health Research Institute (CAPHRI), Department of Health Services Research, 2017.
38. Centers for Medicare and Medicaid Services. *CY 2019 Medicare home health prospective payment system (HHPPS) rates and wage index for calendar year (CY) 2019*. 2018.
39. Collins T, Herness J, Martenas J, Roberson A. Medicare prospective payment before and after implementation: A review of visits and physical performance among Medicare home health patients after total knee replacements. *Home Healthc Nurse*. 2007;25:401-7.
40. Livesay JL, Hanson KS, Anderson MA, Oelschlaeger M. Client characteristics and the cost of home care in the prospective payment system. *Public Health Nurs*. 2003;20:287-96.
41. Murtaugh CM, McCall N, Moore S, Meadow A. Trends in Medicare home health care use: 1997-2001. *Health Aff (Millwood)*. 2003;22:146-56.
42. Rosati RJ, Russell D, Peng T, et al. The care span: Medicare home health payment reform may jeopardize access for clinically complex and socially vulnerable patients. *Health Aff (Millwood)*. 2014;33:946-56.
43. Schlenker RE, Powell MC, Goodrich GK. Initial home health outcomes under prospective payment. *Health Serv Res*. 2005;40:177-93.
44. Shew PA, Sanders SL, Arthur NC, Bush KW. OASIS inter-rater reliability and reimbursement: A study of inter-rater reliability of the Outcome and Assessment Information Set (OASIS): Its effects on the Home Health Resource Group (HHRG) and reimbursement. *Home Healthc Nurse*. 2010;28:31-6.
45. Shih HC, Temkin-Greener H, Votava K, Friedman B. Medicare home health care patient case-mix before and after the Balanced Budget Act of 1997: Effect on dual eligible beneficiaries. *Home Health Care Serv Q*. 2014;33:58-76.
46. Centers for Medicare and Medicaid Services. *Home health prospective payment system (booklet)*. 2018.
47. Anderson MA, Clarke MM, Helms LB, Foreman MD. Hospital readmission from home health care before and after prospective payment. *J Nurs Scholarsh*. 2005;37:73-9.
48. Elias JW, Ferry R, Treland J. When world views collide: A commentary on home health care case-mix and patient outcomes. *Exp Aging Res*. 2000;26:181-8.
49. Ferry R, Elias J. Why caregiver depression, and self-care abilities should be part of the PPS case mix methodology. Interview by Robert Ferry. *Home Healthc Nurse*. 2001;19:23-30.
50. Grimaldi PL. Medicare's new home health prospective payment system explained. *Healthc Financ Manage*. 2000;54:46-56.
51. Haydel J. Clinical implications of prospective payment in home health care. *Home Care Provid*. 2000;5:148-53.
52. Medicare Payment Advisory Commission. *Home health care services payment system*. 2018.
53. Medicare Payment Advisory Commission. *Report to the congress: Medicare payment policy*. 2018.
54. Office of the Inspector General. *Access to home health care after hospital discharge 2001*. 2001.
55. Pappas-Villafane V. The demise of a psychiatric home care program. *Home Healthc Nurse*. 2001;19:576.

56. Sienkiewicz JI. Answers to frequently asked questions about the proposed home care prospective payment system. *Home Healthc Nurse*. 2000; 18:323-30;30-1.
57. Teenier P. The clinician's role in Medicare prospective payment: Part 1 basic terms. *Home Healthc Nurse*. 2004;22:526-8.
58. Teenier P. 2008 refinements to the Medicare home health prospective payment system. *Home Healthc Nurse*. 2008;26:181-4.
59. Ferreira DC, Nunes AM, Marques RC. Optimizing payments based on efficiency, quality, complexity, and heterogeneity: the case of hospital funding. *Int Trans Oper Res*. 2019:1-32.
60. Andersen RM. Revisiting the behavioral model and access to medical care: Does it matter? *J Health Soc Behav*. 1995;36:1-10.
61. Elissen AM, Struijs JN, Baan CA, Ruwaard D. Estimating community health needs against a triple aim background: What can we learn from current predictive risk models? *Health Policy*. 2015;119:672-9.
62. Andermann A. Screening for social determinants of health in clinical care: Moving from the margins to the mainstream. *Public Health Rev*. 2018;39:19.
63. Verisk Health Inc. *Verisk health performance of risk adjustment and predictive risk models (white paper)*. Boston, Massachusetts: Verisk Health Inc., 2012.
64. Huntley AL, Johnson R, Purdy S, Valderas JM, Salisbury C. Measures of multimorbidity and morbidity burden for use in primary care and community settings: A systematic review and guide. *Ann Fam Med*. 2012;10:134-41.
65. Soyiri IN, Reidpath DD. An overview of health forecasting. *Environ Health Prev Med*. 2013;18:1-9.
66. Hong QN, Pluye P, Bujold M, Wassef M. Convergent and sequential synthesis designs: Implications for conducting and reporting systematic reviews of qualitative and quantitative evidence. *Syst Rev*. 2017;6:61.
67. Rothstein HR, Hopewell S. Grey literature. In: Cooper H, Hedges LV, Valentine JC, eds. *The Handbook of Research Synthesis and Meta-Analysis*. Russell Sage Foundation, 2009:103-26.
68. CASP UK. *CASP checklists*. 2018.
69. Kmet LM, Lee RC, Cook LS. *Standard quality assessment criteria for evaluating primary research papers from a variety of fields. HTA Initiative*. Edmonton, Alberta, Canada: Alberta Heritage Foundation for Medical Research, 2004.

Appendices

Appendix 2A. Search strategies for scientific literature

Table 2A.1. PubMed search strategy

("Home Care Services"[Mesh] OR "Home Health Nursing"[Mesh] OR home care service*[Title/Abstract] OR "domiciliary care"[Title/Abstract] OR "home care"[Title/Abstract] OR homecare[Title/Abstract] OR "home health nursing"[Title/Abstract] OR "home health care nursing"[Title/Abstract] OR "home healthcare nursing"[Title/Abstract] OR "home health care"[Title/Abstract] OR "home healthcare"[Title/Abstract] OR "home care nursing"[Title/Abstract] OR "homecare nursing"[Title/Abstract] OR "community care"[Title/Abstract] OR "community care nursing"[Title/Abstract] OR community care service*[Title/Abstract] OR "district nursing"[Title/Abstract] OR "community nursing"[Title/Abstract]) AND ("Fees and Charges"[Mesh] OR "Financing, Organized"[Mesh] OR "Reimbursement Mechanisms"[Mesh] OR "Prospective Payment System"[Mesh] OR "Capitation Fee"[Mesh] OR fee[Title/Abstract] OR "fees"[Title/Abstract] OR charge[Title/Abstract] OR charges[Title/Abstract] OR "organized financing"[Title/Abstract] OR grant[Title/Abstract] OR grants[Title/Abstract] OR "financing"[Title/Abstract] OR finance[Title/Abstract] OR "financed"[Title/Abstract] OR reimburse[Title/Abstract] OR reimbursement[Title/Abstract] OR reimbursements[Title/Abstract] OR reimbursed[Title/Abstract] OR prospective payment*[Title/Abstract] OR prospective payment system*[Title/Abstract] OR prospective reimbursement*[Title/Abstract] OR prospective reimbursement system*[Title/Abstract] OR prospective pric*[Title/Abstract] OR block fund*[Title/Abstract] OR blockfund*[Title/Abstract] OR bulk fund*[Title/Abstract] OR bulkfund*[Title/Abstract] OR lump sum*[Title/Abstract] OR lumpsum*[Title/Abstract] OR pay[Title/Abstract] OR "payment"[Title/Abstract] OR payments[Title/Abstract] OR paying[Title/Abstract] OR purchase[Title/Abstract] OR purchasing[Title/Abstract] OR purchased[Title/Abstract] OR "price"[Title/Abstract] OR "pricing"[Title/Abstract] OR "fund"[Title/Abstract] OR "funding"[Title/Abstract] OR "funded"[Title/Abstract] OR capitation[Title/Abstract] OR "regulation"[Title/Abstract] OR "incentive"[Title/Abstract] OR "incentives"[Title/Abstract]) AND ("Risk Adjustment"[Mesh] OR "Needs Assessment"[Mesh] OR "Population Characteristics"[Mesh] OR "Residence Characteristics"[Mesh] OR "Diagnosis-Related Groups"[Mesh] OR case mix*[Title/Abstract] OR casemix*[Title/Abstract] OR "case-mix"[Title/Abstract] OR case-based[Title/Abstract] OR "diagnosis-related groups"[Title/Abstract] OR "diagnosis-related group"[Title/Abstract] OR "diagnostic-related groups"[Title/Abstract] OR "diagnostic-related group"[Title/Abstract] OR "DRG"[Title/Abstract] OR "DRGs"[Title/Abstract] OR risk adjust*[Title/Abstract] OR needs assessment*[Title/Abstract] OR population characteristic*[Title/Abstract] OR client characteristic*[Title/Abstract] OR patient characteristic*[Title/Abstract] OR residence characteristic*[Title/Abstract] OR risk stratif*[Title/Abstract] OR population segment*[Title/Abstract] OR health determinant*[Title/Abstract] OR need-adjust*[Title/Abstract] OR needs-adjust*[Title/Abstract] OR condition-adjust*[Title/Abstract] OR needs-based[Title/Abstract] OR need-based[Title/Abstract])

Table 2A.2. Cochrane search strategy

#1 MeSH descriptor: [Home Care Services] explode all trees
#2 MeSH descriptor: [Home Health Nursing] explode all trees
#3 ("home care service*" or "domiciliary care" or "home care" or homecare or "home health nursing" or "home health care nursing" or "home healthcare nursing" or "home health care" or "home healthcare" or "home care nursing" or "homecare nursing" or "community care" or "community care nursing" or "community care service*" or "district nursing" or "community nursing"):ti,ab
#4 #1 or #2 or #3
#5 MeSH descriptor: [Fees and Charges] explode all trees
#6 MeSH descriptor: [Financing, Organized] explode all trees
#7 MeSH descriptor: [Reimbursement Mechanisms] explode all trees
#8 MeSH descriptor: [Prospective Payment System] explode all trees
#9 MeSH descriptor: [Capitation Fee] explode all trees
#10 (fee or "fees" or charge or charges or "organized financing" or grant or grants or "financing" or finance or "financed" or reimburse or reimbursement or reimbursements or reimbursed or "prospective payment*" or "prospective payment system*" or "prospective reimbursement*" or "prospective reimbursement system*" or "prospective pric*" or "block fund*" or blockfund* or

	"bulk fund*" or bulkfund* or "lump sum*" or lumpsum* or pay or "payment" or payments or paying or purchase or purchasing or purchased or "price" or "pricing" or "fund" or "funding" or "funded" or capitation or "regulation" or "incentive" or "incentives"):ti,ab
#11	#5 or #6 or #7 or #8 or #9 or #10
#12	MeSH descriptor: [Risk Adjustment] explode all trees
#13	MeSH descriptor: [Needs Assessment] explode all trees
#14	MeSH descriptor: [Population Characteristics] explode all trees
#15	MeSH descriptor: [Residence Characteristics] explode all trees
#16	MeSH descriptor: [Diagnosis-related Groups] explode all trees
#17	("case mix*" or casemix* or "case-mix" or case-based or "diagnosis-related group" or "diagnosis-related groups" or "diagnostic-related group" or "diagnostic-related groups" or "DRG" or "DRGs" or "risk adjust*" or "needs assessment*" or "population characteristic*" or "client characteristic*" or "patient characteristic*" or "residence characteristic*" or "risk stratif*" or "population segment*" or "health determinant*" or need-adjust* or needs-adjust* or condition-adjust* OR needs-based OR need-based):ti,ab
#18	#12 or #13 or #14 or #15 or #16 or #17
#19	#4 and #11 and #18

Note: The Cochrane Library updated the library's search criteria while this study was underway, consequently leading to different results with the same search strategy. It was advised not to compare the new Cochrane Library and the old Cochrane Library. This search strategy was therefore performed only in the primary search at December 14, 2017, and not in the final search at May 24, 2019.

Table 2A.3. Web of Science search strategy

TS=(("home care service*" OR "home health nursing" OR "domiciliary care" OR "home care" OR homecare OR "home health care nursing" OR "home healthcare nursing" OR "home health care" OR "home healthcare" OR "home care nursing" OR "homecare nursing" OR "community care" OR "community care nursing" OR "community care service*" OR "district nursing" OR "community nursing") AND (fee OR "fees" OR charge OR charges OR "organized financing" OR grant OR grants OR "financing" OR finance OR "financed" OR reimburse OR reimbursement OR reimbursements OR reimbursed OR "prospective payment*" OR "prospective payment system*" OR "prospective reimbursement*" OR "prospective reimbursement system*" OR "prospective pric*" OR "block fund*" OR blockfund* OR "bulk fund*" OR bulkfund* OR "lump sum*" OR lumpsum* OR pay OR "payment" OR payments OR paying OR purchase OR purchasing OR purchased OR "price" OR "pricing" OR "fund" OR "funding" OR "funded" OR capitation OR "regulation" OR "incentive" OR "incentives") AND ("risk adjust*" OR "needs assessment*" OR "case mix*" OR casemix* OR "case-mix" OR case-based OR "diagnosis-related group" OR "diagnosis-related groups" OR "diagnostic-related group" OR "diagnostic-related groups" OR "DRG" OR "DRGs" OR "population characteristic*" OR "client characteristic*" OR "patient characteristic*" OR "residence characteristic*" OR "risk stratif*" OR "population segment*" OR "health determinant*" OR need-adjust* OR needs-adjust* OR condition-adjust* OR needs-based OR need-based))

Note: Selection of a search field is obligatory for Web of Science. For this study, the search strategy for Web of Science is performed in 'topic' (TS=), i.e. title, abstract, (author) keywords and keywords plus.

Table 2A.4. Embase (OVID) search strategy

(exp home care/ or ("home care service*" or "domiciliary care" or "home care" or homecare or "home health nursing" or "home health care nursing" or "home healthcare nursing" or "home health care" or "home healthcare" or "home care nursing" or "homecare nursing" or "community care" or "community care nursing" or "community care service*" or "district nursing" or "community nursing").ti,ab.) AND (exp "fees and charges"/ or exp financial management/ or exp reimbursement mechanisms/ or exp prospective payment system/ or exp fee/ or exp fees/ or exp "capitation fee"/ or (fee or "fees" or charge or charges or "organized financing" or grant or grants or "financing" or finance or "financed" or reimburse or reimbursement or reimbursements or reimbursed or "prospective payment*" or "prospective payment system*" or "prospective reimbursement*" or "prospective reimbursement system*" or "prospective pric*" or "block fund*" or blockfund* or "bulk fund*" or bulkfund* or "lump sum*" or lumpsum* or pay or "payment" or payments or paying or purchase or purchasing or purchased or "price" or "pricing" or "fund" or "funding" or "funded" or capitation or "regulation" or "incentive" or "incentives").ti,ab.) AND (exp needs assessment/ or exp population characteristics/ or exp residence characteristics/ or exp case mix/ or exp health determinant/ or exp diagnosis related group/ or ("case mix*" or casemix* or case-mix* or case-based or "diagnosis related group*" or "diagnostic group" or "drg" or "risk adjust*" or "needs assessment*" or "population characteristic*" or "client characteristic*" or "patient characteristic*" or "residence characteristic*" or "risk stratif*" or "population segment*" or "health determinant*" or "need-adjust*" or "needs-adjust*" or "condition-adjust*" or need-adjust* or needs-adjust* or condition-adjust* or needs-based or need-based).ti,ab.)

Table 2A.5. Emerald search strategy

"home care service*" OR "home health nursing" OR "domiciliary care" OR "home care" OR homecare OR "home health care nursing" OR "home healthcare nursing" OR "home health care" OR "home healthcare" OR "home care nursing" OR "homecare nursing" OR "community care" OR "community care nursing" OR "community care service*" OR "district nursing" OR "community nursing"

AND

fee OR "fees" OR charge OR charges OR "organized financing" OR grant OR grants OR "financing" OR finance OR "financed" OR reimburse OR reimbursement OR reimbursements OR reimbursed OR "prospective payment*" OR "prospective payment system*" OR "prospective reimbursement*" OR "prospective reimbursement system*" OR "prospective pric*" OR "block fund*" OR blockfund* OR "bulk fund*" OR bulkfund* OR "lump sum*" OR lumpsum* OR pay OR "payment" OR payments OR paying OR purchase OR purchasing OR purchased OR "price" OR "pricing" OR "fund" OR "funding" OR "funded" OR capitation OR "regulation" OR "incentive" OR "incentives"

AND

"risk adjust*" OR "needs assessment*" OR "case mix*" OR casemix* OR "case-mix" OR case-based OR "diagnosis-related group" OR "diagnosis-related groups" OR "diagnostic-related group" OR "diagnostic-related groups" OR "DRG" OR "DRGs" OR "population characteristic*" OR "client characteristic*" OR "patient characteristic*" OR "residence characteristic*" OR "risk stratif*" OR "population segment*" OR "health determinant*" OR need-adjust* OR needs-adjust* OR condition-adjust* OR needs-based OR need-based

Note: The search strategy in Emerald did not allow adding title/abstract in the search. Therefore, 'search on publication title' and 'search on abstract' were additionally selected as filters.

Table 2A.6. EconLit

("home care service*" OR "home health nursing" OR "domiciliary care" OR "home care" OR homecare OR "home health nursing" OR "home health care nursing" OR "home healthcare nursing" OR "home health care" OR "home healthcare" "home care nursing" OR "homecare nursing" OR "community care" OR "community care nursing" OR "community care service*" OR "district nursing" OR "community nursing") AND (fee OR "fees" OR charge OR charges OR "organized financing" OR grant OR grants OR "financing" OR finance OR reimburse OR reimbursement OR reimbursements OR reimbursed OR "prospective payment*" OR "prospective payment system*" OR "prospective reimbursement*" OR "prospective reimbursement system*" OR "prospective pric*" OR "block fund*" OR blockfund* OR "bulk fund*" OR bulkfund* OR "lump sum*" OR lumpsum* OR pay OR "payment" OR payments OR paying OR purchase OR purchasing OR purchased OR "price" OR "pricing" OR "fund" OR "funding" OR "funded" OR capitation OR "regulation" OR "incentive" OR "incentives") AND ("risk adjust*" OR "needs assessment*" OR "case mix*" OR casemix* OR "case-mix" OR case-based OR "diagnosis-related group" OR "diagnosis-related groups" OR "diagnostic-related group" OR "diagnostic-related groups" OR "DRG" OR "DRGs" OR "population characteristic*" OR "client characteristic*" OR "patient characteristic*" OR "residence characteristic*" OR "risk stratif*" OR "population segment*" OR "health determinant*" OR need-adjust* OR needs-adjust* OR condition-adjust* OR needs-based OR need-based)

Appendix 2B. Summary of scientific and grey literature included

Scientific literature					
Authors and year of publication	**Type of study**	**Country**	**Outcomes of interest**	**Main methods used**	**Key findings**
Anderson, Clarke, Helms, Foreman (2005)	Comparative (before-after)	US	Characteristics of elderly patients readmitted to the hospital in a pre-PPS versus post-PPS environment.	Comparing medical records data of 75 clients pre-PPS and post-PPS, and subsequently interviewing agency administrators on those findings.	Readmitted clients in the post-PPS group were somewhat older, sicker, and more complex to manage at the time of discharge.
Björkgren, Fries, Shugarman (2000)	Case-mix model development and validation study	US	Validation of a RUG-III system fitted to the home care sector (basic model) and development of a refined RUG-III model incorporating classification items especially relevant for home care clients (RUG-III/HC model).	Testing the RUG-III models using traditional measures of statistical fit (variance explanation (R2), coefficient of variation (CV), and significant differences between groups), using resource use and cost data from 804 initial client's assessments.	A case-mix classification for long-term home care can be successfully developed by augmenting the RUG-III system.
Branch, Goldberg (1993)	Case-mix model development study	US	An algorithm for the classification of clients into homogeneous groups regarding allowed charges during their first 60 days of care, as a modified version of the existing RUG-HHC model.	Constructing binary decision trees with classification and regression trees (CART) software, using approximately 60 variables from the assessment forms of 2,830 beneficiaries.	A four-component model was developed that yielded 11 case-mix groups and explained 22% of the variance for the test sample (N = 1,929).
Büscher, Wingenfeld, Schaeffer (2011)	Case-mix model development study	Germany	A tool for determining eligibility for long-term care.	Conducting a survey of international long-term care systems, studying assessment tools and relevant literature.	The assessment developed results in one of five degrees of dependency. This can be used when determining eligibility for long-term care and the associated benefits.
Calver, Holman, Lewin (2004)	Case-mix model development study	Australia	Feasibility of using routinely available assessment, Minimum Data Set (MDS), socio-economic, geographic, and unit cost data to define Home and Community Care (HACC) case-mix groups.	Constructing groups that are homogeneous with regard to client characteristics and costs with PC Groups software, using data from 5,687 HACC clients' records and service use data.	A branching structure was developed that contained nine terminal nodes, achieved an explained variance of 23.7% and was robust to fluctuations in cost.

Appendix 2B. (continued)

Scientific literature					
Authors and year of publication	**Type of study**	**Country**	**Outcomes of interest**	**Main methods used**	**Key findings**
Collins, Herness, Martenas, Roberson (2007)	Comparative (before-after)	US	Effect of Medicare PPS on the number of visits a patient with total knee replacement receives, and on the patient's functional outcome.	Comparing the number of home health visits, average distance that a patient ambulated, change in active knee range of motion assistive device used at discharge, and how often outpatient physical therapy was recommended, using 14 IPS-period and 25 PPS-period patient charts.	The average number of home health physical therapy visits decreased after the implementation of the PPS; however, this did not lead to an adverse effect on functional performance.
Livesay, Hanson, Anderson, Oelschlaeger (2003)	Comparative study (before-after)	US	Characteristics of clients that resulted in a financial gain or loss under the PPS compared to under IPS.	Categorizing medical records from 140 cases, containing 27 variables, into a financial gain and financial loss group, and analyzing their demographic, resource utilization, and financial characteristics.	Projected loss clients had more recertifications, a longer stay (3 weeks), and more visits, particularly from skilled nursing staff.
Murtaugh, Mccall, Moore, Meadow (2003)	Comparative study (before-after)	US	The extent to which the PPS altered patterns of beneficiaries' use and Medicare's spending on home health care.	Analyzing patterns of use and spending, using claims data and eligibility files from between 24,453 and 35,516 Medicare home health users.	The rapid decline in the incidence of use and visits per user under the IPS slowed in its final year and then picked up again in the first year of the PPS. Average payment per visit increased sharply under the PPS. A shift toward skilled services occurred: the decline in home health aide visits was almost twice that of skilled visits.
Parsons, Rouse, Sajtos, Harrison, Parsons, Gestro (2018)	Case-mix model development study	New Zealand	A case-mix tool and corresponding pathways for older people with long-term support needs.	Performing decision dree analyses, using costing data and assessment data of 3,135 clients.	Two case-mix tools were developed. The tool for older people with non-complex and for complex needs, achieved 24% of variance explained.
Philips, Dyer, Janousek, Halperin, Hawes (2008)	Case-mix model development	US	A preliminary case-mix classification for patients receiving home care services	Developing and evaluating a series of correlation matrices and models, using the criterion of variable hours of care and	The preliminary case-mix model has 11 categories and explains roughly 30 percent of the variance

	study		through the Medicaid program.	the independent variables and scales from the client's assessment of 779 clients.	in personal care allocation.
Poss, Hirdes, Fries, McKillop, Chase (2008)	Case-mix model validation study	Canada	The technical performance of the RUG-III/HC classification, i.e. distribution, informal care hours, case-mix indices, coefficients of variation, and explained variance of formal and informal costs.	Regressing cost by RUG-III/HC case-mix index values, using client's assessment data and billing records from 21,578 unique client residing in their own homes.	Overall, RUG-III/HC performs well in the validation. Explained variance for a function of combined formal and informal cost was 37.3%, with personal support services as well as informal care showing the strongest fit.
Rosati, Russell, Peng, Brickner, Kurowski, Christopher, Sheehan (2014)	Evaluation study	US	Identification of characteristics of groups of home care patients whose services tend to be under- or overpaid.	Analyzing the association between patient characteristics, service use, and Medicare reimbursement margins with multivariate mixed models, using financial and clinical assessment data from 96,621 home health care episodes.	Socially vulnerable patients with complex conditions are less profitable - lower-to-negative Medicare margins - for home health agencies.
Schlenker, Powell, Goodrich (2005)	Comparative study (before-after)	US	Changes in visits per episode and outcomes between the pre-PPS and initial PPS periods, focusing on home health care episodes of Medicare beneficiaries aged 65 years and over.	Comparing changes in visits and outcomes using regression analyses, using clients' assessment data and Medicare claims files of random samples of 164,810 care episodes.	Results showing fewer visits and similar outcomes under PPS suggest improved system efficiency under PPS; however, declines in several clients’ improvement rates merit ongoing monitoring.
Shew, Sanders, Arthur, Bush (2010)	Comparative study (sequential)	US	Differences in assessment scores with regards to reimbursement rates, and ratings of case-mix group scores, between home health professionals.	Comparing (the distribution of) results of assessments performed by 18 registered nurses (RNs) and 12 physical therapists (PTs), using 52 pairs of home health patients' assessment data set results.	54% of the scores were the same for RNs and PTs. Of the scores that were different, there was no indication that one discipline consistently rated patient in higher categories.
Shih, Temkin-Greener, Votava, Friedman (2014)	Comparative study	US	Effect of the introduction of the Balanced Budget Act (BBA) on home health care (HHC) patient case-mix.	Comparing patient case-mix pre-BBA, and during IPS- and PPS periods with descriptive, unadjusted, and adjusted (multivariable) analyses, using data on expenditures, health statuses and risk scores of 8,429 patient-months.	There was a significant increase in Medicare HHC patient case-mix between the pre-BBA and PPS-periods.

Appendix 2B. (continued)

Grey literature					
Authors and year of publication	**Type of document**	**Country**	**Subject / Outcomes of interest**	**Source**	**Key findings / Summary**
Advisory Board (2009)	Governmental report	Germany	Implementation steps for the new definition of the need for long-term care and the corresponding assessment procedure.	Ministry of Health	The new structure of the need for long-term care is based on 5 degrees of need. It is recommended to introduce the new assessment procedure in one step nationwide, with sufficient time foreseen.
Bundesministerium für Gesundheit (2015)	Non-scientific article	Germany	Summary of developments concerning the new concept of need for care, and the new needs assessment instrument.	Ministry of Health	The new assessment instrument and the classification into one of five degrees of need are described. In two pilot studies, the instrument has been successfully tested for its suitability in practice.
Büscher (2019)	Presentation	Germany	Presenting the organization and payment system of and developments in long-term care and home care in Germany.	Osnabrück University of Applied Sciences	Clients eligible for long-term care receive a certain benefit per month, determined by their need for care. The challenge now is to expand services in line with the eligibility criteria.
Centers for Medicare & Medicaid Services (CMS) (2018a)	Governmental report	US	Final rule with comment period on the Home Health Prospective Payment System (HH PPS) rules for 2019.	Federal Register	HH PPS payment rates and case-mix weights are updated for 2019. An updated case-mix methodology, "Patient-Driven Groupings Model", is finalized to take effect on January 1, 2020.
Centers for Medicare & Medicaid Services (CMS) (2018b)	Booklet	US	Explaining the Home Health Prospective Payment System (HH PPS) to Medicare providers.	Federal Register	The eligibility criteria for clients, elements and updates of HH PPS, and the billing and payment methods are described.
Elias, Ferry (2001)	Interview article [a]	US	An interview on the importance of including the client's assessment information in the PPS.	Journal 'Home Healthcare Nurse'	Two assessment indicators omitted from the case-mix, i.e. the presence of a caregiver and assessment of the patient’s psychological status, are seen as critical to determining client needs and, therefore, should be linked to reimbursement.

Elias, Ferry, Treland (2000)	Peer-reviewed commentary	US	Illustrating how merging the world views of fiscal management and patient outcome may produce unexpected results.	Journal 'Experimental Aging Research'	With PPS, the presence or absence of limited criteria determines the 'minutes of care' a patient is permitted to receive. The case-mix model does not take into account the patient's difficulty in functioning which is not accounted for by their diagnosis.
Elissen, Metzelthin, Van den Bulck, Verbeek, Ruwaard (2017)	Report	US, Canada and New Zealand	An overview of client characteristics to predict home health care, and if/how these can be used for payment purposes in the Netherlands.	Maastricht University	Three international case-mix models are identified in Canada, the US and New Zealand, with the latter being most user-friendly and client-focused. Physical functioning, incontinence and instability in the client's condition are found promising predictors of care.
Grimaldi (2000)	Peer-reviewed non-scientific article	US	Detailing the construction and principal components of the Medicare home health prospective payment system (HH PPS).	Journal 'Healthcare Financial Management'	The building blocks of Medicare's HH PPS are described, and suggestions are made for steps that home health agencies can take to respond most effectively to the system's requirements.
Harrison, Parsons, Rouse, Sajtos (2011)	Report	New Zealand	Developing and implementing a case-mix model for Home Based Support Services (HBSS) in New Zealand.	Auckland District Health Board (ADHB) and the University of Auckland	Two models are developed, one for non-complex and one for complex clients. Product classification is assigned following several questions from the InterRAI assessment.
Haydel (2000)	Research article [a]	US	Understanding of the Medicare PPS and the data on which it is based.	Journal 'Home Care Provider'	The implementation of disease state management (DSM) and clinical pathways may assist in developing reliable predictors for the PPS. Clinicians must consider the financial implications of their actions to survive in a PPS environment.
Medicare Payment Advisory Commission (MedPAC) (2018a)	Booklet	US	An overview of how Medicare's Home Health Prospective Payment System (HH PPS) functions.	Medicare Payment Advisory Commission (MedPAC)	The type of payment contract is explained. Information is provided on how the assessment results lead to a certain Home Health Resource Group (HHRG), and how the payment rates are determined.
Medicare Payment Advisory Commission (MedPAC) (2018b)	Governmental report	US	Assessing the payment adequacy for home health care.	Medicare Payment Advisory Commission (MedPAC)	Access to home health care is more than adequate in most areas. Medicare payments are substantially in excess of costs. Therefore, home health payments need to be significantly reduced.

Appendix 2B. (continued)

Grey literature					
Authors and year of publication	**Type of document**	**Country**	**Subject / Outcomes of interest**	**Source**	**Key findings / Summary**
Medizinischer Dienst des Spitzenverbandes Bund der Krankenkassen (MDS) (2017)	Website	Germany	Reviewing the number of applicants for care services.	Medizinischer Dienst des Spitzenverbandes Bund der Krankenkassen (MDS) (Medical Advisory Service of the Central Federal Association of Health Insurance Funds)	Out of 536,000 applicants for care services, 432,000 were assigned to one of the five degrees of need.
Office of Inspector General (2001)	Governmental report	US	Assessing the effect of the Home Health Prospective Payment System (HH PPS) on access to home health for Medicare beneficiaries discharged from the hospital.	Department of Health and Human Services	Medicare beneficiaries discharged from hospitals have access to home health care. There is no evidence that access to care has been limited by the HH PPS.
Pappas-Villefane (2001)	Journal section/forum [a]	US	Addressing the position of patients with psychiatric diagnoses within the PPS.	Journal 'Home Healthcare Nurse'	Patients with psychiatric diagnoses become undesirable under PPS. Adequate reimbursement along with reasonable treatment guidelines must be developed that provide the required care without bankrupting the healthcare system.
Parsons (2016)	Report	New Zealand	An overview of the case-mix development within New Zealand.	University of Auckland	An exploration of methods for home care funding alternatives to fee-for-service leads to two available case-mix models, i.e. Resource Utilization Groups Version 3 for Home Care (RUG-III/HC) and Home and Community Support Services (HCSS CM). Only HCSS CM has been implemented in New Zealand.
Schaeffer, Wingenfeld, Büscher (2008)	Governmental agency report	Germany	Provide the assessment instrument and manual for assessing the need for care.	GKV-Spitzenverband (National Association of Statutory Health Insurance Funds)	The manual should ensure nationwide assessment in accordance with uniform criteria. However, even though the assessment is quite detailed, it cannot replace the nursing assessment.
Sienkiewicz (2000)	Journal section [a]	US	An overview of the proposed PPS rule and	Journal 'Home Healthcare Nurse'	Answers to questions on comparing PPS with IPS, the components of the PPS, and clinical implications are

			specific clinical strategies agencies and clinicians should be adopting in order to prepare, as a response to frequently asked questions.		given. PPS will be the most significant change in the history of the Medicare home healthcare benefit, but it may also be the factor that will restore access to quality home care back for the frail elderly and disabled that need it.
Teenier (2004)	Journal section/forum [a]	US	Define the basic elements that affect a home health agency's ability to successfully manage case mix weight, and tie their importance to PPS reimbursement.	Journal 'Home Healthcare Nurse'	A good starting point in successful data management is to understand the basic definitions of the PPS elements. Only then can analysis and improvement activities begin.
Teenier (2008)	Journal section [a]	US	Description of the structural, payment adjustment, and base rate changes for Medicare home care reimbursement that were implemented on January 1, 2008.	Journal 'Home Healthcare Nurse'	The calculation for the exact episode payment has changed, but from a clinical management perspective, the focus must still be on ensuring that both the assessment and classification of disease coding are completed accurately.
Wingenfeld, Büscher, Gansweid (2011)	Governmental agency report	Germany	Developing an assessment tool for long-term care based on scientific research, while fulfilling the requirement for practicability.	GKV-Spitzenverband (National Association of Statutory Health Insurance Funds)	The goal of providing a practicable method for clarifying the need for rehabilitation care, or the ability to rehabilitate, could be achieved with the new assessment procedure.

[a] Unclear if the document has been peer-reviewed.

Appendix 2C. Case-mix models for home care (chronological order)

Case-mix model	Country	Development/ implementation status (year)	Care services included for case-mix group allocation	Eligible clients included for case-mix group allocation	Developed into a payment system?	References
RUG-HHC-alt.	US	Developed (1993)	Medicare Home Health Agency's care - i.e. skilled nursing care, home health aide care, physical, occupational, and speech therapy, and medical social services.	Medicare home care clients (i.e. people of 65 years or older, certain younger people with disabilities, and people with End-Stage Renal Disease).	No	Branch et al. (1993)
RUG-III/HC-US	US	Developed and validated (2000)	All types of care provided in the home, both formal care - i.e. home health aides, visiting nurses, homemaking services, social worker in home, and physical, occupational, and speech therapy (including any terminal care) -, and informal care.	Long-term home care clients of the Michigan Care Management Program, or Medicaid Home and Community-Based Services Waiver for the Elderly and Disabled (i.e. people who prefer to receive long-term care services and support in their own home or community, rather than in an institutional setting).	No	Björkgren et al. (2000)
HACC	Australia	Developed (2004)	Full breadth of Home and Community Care (HACC) services - i.e. domestic assistance, personal care, home maintenance, home modification, community nursing, food services, allied health services, respite care, and support services for carers -, with general nursing care, and/or technical nursing.	Frail aged or disabled clients, aged 18 years of older, receiving home care services directed at maintenance and support.	No	Calver et al. (2004)
RUG-III/HC-Canada	Canada	Validated (2008)	Care provided by the following disciplines: nursing, personal support (i.e. personal care with or without home making services), dietetics, social work, and physical, occupational, and speech therapy.	Adults in home care that receive service for about 60 days or longer (i.e. long-stay).	No	Poss et al. (2008)

PCS CM	US	Developed (2008)	Personal care services.	Medicaid home care clients in the state of Texas.	No	Philips et al. (2008)
DoN	Germany	Developed (2008) and implemented (2017)	Long-term home care services regarding personal hygiene, body care, dressing, mobility, nutrition, and domestic care.	Adults (i.e. older than 15 years) who are dependent on personal help from others for at least one of the following criteria: mobility, cognitive and communication abilities, behavior and psychological problems, self-care, ability to deal with illness-/therapy-related demands and stress, and managing everyday life and social contacts.	Yes	Büscher et al. (2011). Advisory board (2009); Büscher (2019); MDS (2017); Bundesministerium für Gesundheit (2015); Schaeffer et al. (2008); Wingenfeld et al. (2011).
HCSS CM	New Zealand	Developed (2009) and implemented	Home-care, or home management, i.e. support with housework, and personal care.	Older people living at home with long-term, non-complex and complex support needs for longer than 6 months.	Yes	Parsons et al. (2018). Harrison et al. (2011); Parsons (2016); Elissen et al. (2017).
HHRG	US	Developed, implemented, and continuously updated (since 2000)	Medicare-covered home health care services, i.e. skilled nursing care, home health aides, physical, occupational and speech therapy, and medical social services. Additionally, Anderson et al. (2005) mention hospice care.	Clients aged 65 years of age or older, receiving (at least one) Medicare-covered home care service(s).	Yes	Anderson et al. (2005); Collins et al. (2007); Livesay et al. (2003); Murtaugh et al. (2003); Rosati et al. (2014); Schlenker et al. (2005); Shew et al. (2010); Shih et al. (2014). CMS (2018a); CMS (2018b); Ferry et al. (2000); Elias et al. (2001); Grimaldi (2000); Haydel (2000); MedPAC (2018a); MedPAC (2018b); Office of Inspector General (2001); Pappas-Villafane (2001); Sienkiewicz (2000); Teenier (2004); Teenier (2008).

Abbreviations used: RUG-HHC-alt. = Alternative model to the Resource Utilization Groups to Home Health Care (RUG-HHC); RUG-III/HC = Resource Utilization Groups version III for Home Care; HACC = Home and Community Care; PCS CM = Preliminary case-mix model for allocating personal care services; DoN = Degrees of Need (Pflegengraden); HCSS CM = Home and Community Support Services Case-Mix Model; HHRG = Home Health Resource Groups.

Appendix 2D. Operationalization of predictors of case-mix models for home care

Case-mix model	Instrument used for needs assessment for case-mix group allocation	Procedure in performing needs assessment
RUG-HHC-alt.	Routine forms required by the Health Care Financing Administration (HCFA), i.e. Forms 485 and 486. No independent instrument was developed. Additional information needed for group allocation is provided by the home health agency case manager.	The HCFA forms are completed for each client by a case manager. Form 485 is completed once at the intake. Form 486 is completed with the first bill, and is updated as necessary.
RUG-III/HC-US	The Minimum Data Set for Home Care (MDS-HC), based on information in the International Resident Assessment Instrument for Home Care (InterRAI-HC).	Unknown.
HACC	The Home and Community Care Minimum Data Set (HACC MDS), and a primary assessment form developed and piloted for the study.	The HACC MDS collects information on the type of service and the number of units (i.e. hours, visits, count, cost) per client. The primary assessment form assesses the functional, sensory, and emotional health status of the client.
RUG-III/HC-Canada	The International Resident Assessment Instrument for Home Care (InterRAI-HC).	The InterRAI-HC is completed at the intake, and updated after six months. Administration and case management is done by Community Care Access Centers (CCACs), a regional single point access agency.
PCS CM	The Community Care Assessment Tool (CCAT).	Caseworkers use the CCAT.
DoN	The New Needs Assessment Tool for Determining Dependency on Nursing Care (Neue Begutachtungsinstrument zur Feststellung von Pflegebedürftigkeit) (NBA)	The NBA is completed by a nurse or doctor. For clients assigned to care groups 1 to 3, the needs assessment is performed two times a year, and for care groups 4 and 5, four times a year. A reassessment can be done earlier if the situation is unstable. Assessment using the NBA takes about 60 minutes.
HCSS CM	The Minimum Data Set for Home Care (MDS-HC), based on the International Resident Assessment Instrument Contact Assessment (InterRAI-CA) for non-complex clients, and the International Resident Assessment Instrument for Home Care (InterRAI-HC) for complex clients.	Older people with long-term support needs over a period longer than 6 months are screened by a central co-ordination center as 'non-complex' or 'complex' to determine the type of assessment instrument to be used. This is done based on a client's cognitive ability, mobility, and social support circumstances. Non-complex clients are then assessed by a health professional in a person's own home. The InterRAI-CA takes between 30 and 60 minutes. The procedure for complex clients is the same, but the InterRAI-HC takes between 90 and 120 minutes. The frequency of reassessment depends on the assigned case-mix group, i.e. the stability of the client.
HHRG	The Outcome and Assessment Information Set (OASIS).	The OASIS is completed for each client upon admission to home health care (maximum 90 days preceding or 30 days following the start of care), and upon recertification, and altered when a client's

	condition changes. This is done by a nurse or therapist. Each OASIS component is rated on a scale and awarded a score.

Abbreviations used: RUG-HHC-alt. = Alternative model to the Resource Utilization Groups to Home Health Care (RUG-HHC); RUG-III/HC = Resource Utilization Groups version III for Home Care; HACC = Home and Community Care; PCS CM = Preliminary case-mix model for allocating personal care services; DoN = Degrees of Need (Pflegengraden); HCSS CM = Home and Community Support Services Case-Mix Model; HHRG = Home Health Resource Groups.

Appendix 2E. Case-mix predictors per case-mix model for home care

	RUG-HHC-alt.	RUG-III/HC-US	HACC	RUG-III/HC-Canada	PCS CM	DoN	HCSS CM	HHRG	Number of models including a (category of) predictor(s)
Social environmental characteristics									**2**
Interacting with people in direct social contact						X			1
Contacting people outside the direct surroundings						X			1
Brittle social support							X		1
Total number of predictors per model	0	0	0	0	0	2	1	0	
Physcial functioning									**7**
Endurance	X								1
Mobility									7
Transfer		X		X				X	3
Bed mobility		X		X					2
Transferring tub or shower					X		X		2
Locomotion outside					X				1
Ambulation (walking, moving at one level)	X				X	X	X	X	5
Gait abnormality								X	1
Stairs					X	X	X		3
Change of position						X			1
Keeping stable sitting position						X			1
Rising up from sitting position						X			1
Sensory ability									2
Vision								X	1
Legally blind	X							X	2
Hearing	X								1
Continence									4
Bowel/bladder incontinence	X				X				2
Urinary incontinence							X	X	2
Bowel incontinence								X	1
Total number of predictors per model	5	2	0	2	5	5	4	7	
Daily functioning									**7**
Resting and sleeping						X			1
Shaping daily routine						X			1
Occupying oneself						X			1
Making plans for the future						X			1

	RUG-HHC-alt.	RUG-III/HC-US	HACC	RUG-III/HC-Canada	PCS CM	DoN	HCSS CM	HHRG	Number of models including a (category of) predictor(s)
ADL									7
ADL functioning [a]			X						1
Toileting		X		X	X	X		X	5
Eating		X		X	X	X			4
Drinking						X			1
Bathing					X		X	X	3
Personal hygiene					X	X	X		3
Dressing						X		X	2
Dressing upper body					X		X		2
Dressing lower body					X		X		2
IADL									6
IADL functioning [a]			X						1
Meal preparation		X		X	X		X		4
Managing medication		X		X	X	X	X		5
Phone use		X		X	X				3
Ordinary housework					X		X		2
Managing finances					X				1
(Grocery) Shopping					X		X		2
(Mode of) Transportation					X				1
Total number of predictors per model	0	5	2	5	13	10	8	3	
Cognitive functioning and communication									**5**
(Short-term) Memory		X		X	X	X	X		5
Decision-making		X		X	X	X	X		5
Make oneself understood		X		X	X				3
Eating performance		X		X	X				3
Recognition of significant others						X			1
Spatial and temporal orientation						X			1
Understanding of facts and information						X			1
Detection of risks and dangers						X			1
Conveyance of basic needs						X			1
Understanding of requests						X			1
Participation in conversations						X			1
Total number of predictors per model	0	4	0	4	4	9	2	0	
Mental functioning									**3**
Hallucinations		X		X					2
Delusions/illusions						X			1
Anxiety						X			1

Appendix 3E. (continued)

	RUG-HHC-alt.	RUG-III/HC-US	HACC	RUG-III/HC-Canada	PCS CM	DoN	HCSS CM	HHRG	Number of models including a (category of) predictor(s)
Total number of predictors per model	0	1	0	1	0	2	0	0	
Behavior									**4**
Behavior problems								X	1
Inappropriate behavior		X		X					2
Physical abuse		X		X					2
Verbal abuse		X		X					2
Wandering		X		X					2
Agitation						X			1
Nocturnal restlessness						X			1
Self-endangering and auto-assaultive behavior						X			1
Verbal and other aggression						X			1
Refusal of supportive actions						X			1
Vocal deviant utterances						X			1
Total number of predictors per model	0	4	0	4	0	6	0	1	
Health status									**6**
Instability (i.e. conditions or diseases make cognitive, ADL, mood or behavior patterns unstable)							X		1
Disease diagnosis and health conditions of MDS-HC					X				1
Other functional limitations	X								1
Heart- and blood diseases									4
CVA	X								1
Septicemia		X		X					2
Blood disorder								X	1
Heart disease diagnosis								X	1
Hypertension								X	1
Neurological diseases									4
Neurological diagnosis								X	1
Paralysis	X								1
Quadriplegic or comatose	X	X		X					3
Hemiplegia		X		X					2
Multiple sclerosis		X		X					2
Cerebral palsy		X		X					2
Aphasia		X		X					2
Contracture	X								1
Lung diseases									4
Pneumonia		X		X					2

	RUG-HHC-alt.	RUG-III/HC-US	HACC	RUG-III/HC-Canada	PCS CM	DoN	HCSS CM	HHRG	Number of models including a (category of) predictor(s)
Tracheostomy (care)	X	X		X					3
Ventilators	X	X		X					3
Dyspnea, minimal exertion	X							X	2
Pulmonary diagnosis								X	1
Oncological diseases									2
Malignant neoplasm	X								1
Cancer								X	1
Orthopedic diseases									2
Orthopedic diagnosis								X	1
Amputation	X								1
Gastrointestinal diseases									4
Gastrointestinal diagnosis								X	1
Urinary tract infection		X		X					2
Ostomy (care)	X							X	2
Parenteral feeding		X		X				X	3
Suctioning		X		X					2
Tube feeding		X		X					2
Dysphagia								X	1
Diseases related to senses									1
Pain								X	1
Skin injuries									4
Skin diagnosis								X	1
Decubitus ulcer level 1 or 2	X								1
Decubitus level 3 or 4	X								1
Pressure ulcer (stage/stage 3 or 4)		X		X				X	3
Multiple pressure ulcers								X	1
(Stage of) Stasis ulcer		X		X				X	3
Stage of surgical ulcer								X	1
Burns		X		X					2
Wound/lesion								X	1
Other diseases									3
Diabetes diagnosis								X	1
Psychiatric diagnosis								X	1
Terminal illness		X		X					2
Reduced physical functions		X		X					2
Fever		X		X					2
Dehydration		X		X					2
Speech	X								1
Total number of predictors per model	14	20	0	20	1	0	1	21	
Health service use									**7**
Services utilization								X	1

Appendix 3E. (continued)	**RUG-HHC-alt.**	**RUG-III/HC-US**	**HACC**	**RUG-III/HC-Canada**	**PCS CM**	**DoN**	**HCSS CM**	**HHRG**	**Number of models including a (category of) predictor(s)**
Physical, occupational, and/or speech therapy	X	X		X			X		4
Visit to physicians/therapeutic facilities						X			1
Therapeutic measures in the home (e.g. teaching motion exercises)	X					X			2
Need for clinical services			X						1
Radiation treatment		X		X					2
Chemotherapy		X		X					2
Transfusions		X		X					2
Intravenous cannula/therapy	X	X		X		X		X	5
Taking and interpreting body parameters						X			1
Dressing/wound care		X		X		X			3
Total number of predictors per model	3	6	1	6	0	5	1	2	
Overall total number of predictors per model	22	42	3	42	23	39	17	34	

[a] The predictors ‘ADL functioning’ and ‘IADL functioning’ are aggregated.

Abbreviations used: RUG-HHC-alt. = Alternative model to the Resource Utilization Groups to Home Health Care (RUG-HHC); RUG-III/HC = Resource Utilization Groups version III for Home Care; HACC = Home and Community Care; PCS CM = Preliminary case-mix model for allocating personal care services; DoN = Degrees of Need (Pflegengraden); HCSS CM = Home and Community Support Services Case-Mix Model; HHRG = Home Health Resource Groups.

Chapter 3

Which client characteristics predict home care needs? Results of a survey study among Dutch home care nurses

Anne O.E. van den Bulck
Silke F. Metzelthin
Arianne M.J. Elissen
Marianne C. Stadlander
Jaap E. Stam
Gia Wallinga
Dirk Ruwaard

Health and Social Care in the Community. 2019; 27: 93-104

Abstract

Fee-for-service, funding care on an hourly-rate basis, creates an incentive for home care providers to deliver high amounts of care. Under case-mix funding, by contrast, clients are allocated – based on their characteristics – to homogenous, hierarchical groups, which are subsequently funded to promote more effective and efficient care. The first step in developing a case-mix model is to understand which client characteristics are potential predictors of home care needs. Nurses working in home care (i.e. home care nurses) have a good insight into clients' home care needs. This study was conducted in cooperation with the Dutch Nurses' Association and the Dutch Healthcare Authority. Based on international literature, 35 client characteristics were identified as potential predictors of home care needs. In an online survey (May, 2017), Dutch home care nurses were asked to score these characteristics on relevance, using a 9-point Likert scale. They were subsequently asked to identify the top 5 client characteristics. Data were analyzed using descriptive statistics. The survey was completed by 1,007 home care nurses. Consensus on relevance was achieved for 15 client characteristics, with 'terminal phase' being scored most relevant, and 'sex' being scored as the least relevant. Relevance of the remaining 20 characteristics was uncertain. Additionally, based on the ranking, 'ADL functioning' was ranked as most relevant. According to home care nurses, both biomedical and psychosocial client characteristics need to be taken into account when predicting home care needs. Collaboration between clinical practice, policy development and science is necessary to realize a funding model, to work towards the Triple Aim (improved health, better care experience, and lower costs).

Introduction

Countries around the world are grappling with the challenge of maintaining a sustainable healthcare system. Ageing populations and the increasing prevalence of chronic disease and multi-morbidity are leading to a growing demand for care, pushing healthcare costs steadily higher. As a result, there is increasing pressure to improve the effectiveness and efficiency of the healthcare system [1,2] on the basis of the 'Triple Aim': simultaneously improving care outcomes, improving experiences of care, and lowering the overall per capita cost of care.[3]

In most countries, long-term care accounts for a substantial proportion of total healthcare spending. In 2016, 21% of the healthcare spending in the US was spent on long-term care[4], while in the Netherlands, long-term care accounted for 27% of total spending on healthcare.[5] With regard to a sustainable healthcare system, home care is a highly relevant source of long-term care, because it is known to be more efficient than long-term institutional care.[6] The different types of home care services include nursing care (e.g. medication management support or wound care) and personal care (e.g. assistance with bathing).

In most Western countries, home care is funded on a fee-for-service basis, but this can create perverse incentives for providers.[7] For instance, fee-for-service funding is known to stimulate quantity of care rather than quality of care: the more services that home care providers deliver, the more money they earn.[7,8] This is inconsistent with recent approaches to home care, which focus on increasing self-reliance and independence of clients[9,10], such as the 'Reablement' approach (also known as restorative care). According to reablement, home care services should be goal-oriented, holistic and person-centered, taking into account the capabilities of older adults and their social network.[11,12] Furthermore, fee-for-service funding creates a higher administrative burden for home care providers due to the plethora of administrative requirements and the complexity of funding arrangements.[9,13]

A potential solution that could improve the sustainability of healthcare systems, and in particular home care, would be to implement case-mix funding. This would involve categorizing clients into homogenous, hierarchical groups according to their actual need for home care, based on an assessment of for example their clinical and/or functional status and, in some cases, the level of social support available.[14] For each of these so-called case-mix groups, a specific budget – in terms of allocated care (funds) – would be determined. Rather than incentivizing service volume, case-mix funding would incentivize providers to provide needs-based, high-quality and efficient care that focuses on increasing self-reliance and independence of clients. This would help countries to achieve the Triple Aim[15] and it could be a solution to the high administrative burden in home care, simplifying the funding model and using standardized registrations, such as data from nursing classification systems, as a basis.[16]

Several countries have already successfully developed case-mix models for home care, each of them highlighting different case-mix groups and including a variety of client characteristics to assess home care needs.[14,17,18] For example, in the US, two case-mix models have been developed: Home Health Resource Groups (HHRGs), which is adapted to Medicare reimbursement and uses case-mix groups based on the Outcome and Assessment Information Set (OASIS)[14,17], and Resource Utilization Groups (version 3) for Home Care (RUG-III/HC), based on a standardized assessment (RAI) and validated in Canada.[14] However, due to differences between national healthcare systems, adaptations would likely be necessary to implement existing case-mix models in other countries.[6]

In 2017, on behalf of the Dutch Ministry of Health, Welfare and Sport, the Dutch Healthcare Authority (NZa) initiated a joint venture with knowledge partners to create a knowledge base for the development of a new case-mix model for home care in the Netherlands.[16] Rather than incentivizing the volume of care, the new model should incentivize nurses working in home care (further referred to as home care nurses) to – based on their professional knowledge and experience – provide high-quality care that is tailored to clients' needs.

Home care nurses will play a major role in developing the new model, since they have valuable insight into their clients' needs, and the type and amount of home care required, because they regularly perform home care needs assessments. The aim of this survey study was therefore to determine which client characteristics are predictors of clients' needs for home care, according to home care nurses in the Netherlands. These insights are valuable for the development of (case-mix groups for) a Dutch home care funding model, as well as in other countries that use case-mix based models to analyze or review their existing funding model for home care.

Methods

Study design and respondents

A cross-sectional survey study was conducted among Dutch home care nurses in May 2017. The survey's target group consisted of approximately 20,000 Dutch home care nurses[19,20], who can be divided into about 9,000 district nurses (bachelor prepared registered nurses, with or without additional postgraduate education, Dutch Qualification Framework (NLQF) level 6) and about 11,000 vocational nurses (vocationally trained registered nurses, NLQF level 4).[6] The primary target group for this study was level 6 nurses, since they were assumed to perform home care needs assessments in the Netherlands. In practice, vocational nurses are also involved in this task if they meet certain criteria. Vocational nurses were therefore included. The aim was to maximize the response rate within the target group.

Survey development

The content of the survey was based on relevant literature. Seven reports were identified that describe existing case-mix models for home care and/or client characteristics that potentially predict home care needs. These reports were studied in order to design the survey. One report describes a systematic literature search conducted in 2014 on behalf of the Dutch Ministry of Health, Welfare and Sport, focusing on the client characteristics used in funding models to predict clients' healthcare needs.[21] The other six reports published thereafter, related to home care case-mix models and/or client characteristics, were sourced from the researchers' personal network.[8,17,18,22-24]

The seven reports identified three home care case-mix models. In addition to the US models RUG-III/HC and HHRG[21], mentioned above, New Zealand's Home and Community Support Services Case Mix (HCSS CM) was identified. In this model, a brief screening is performed to assign clients to either a complex or a non-complex case-mix group. Next, the clients' home care needs are assessed using the InterRAI Full Assessment or the InterRAI Contact Assessment respectively.[18,25] All seven of the reports analyzed described client characteristics that were potential predictors of clients' home care needs.[8,17,18,21-24]

Based on the seven reports, client characteristics that potentially predict home care needs were extracted. This analysis, taking place April 2017, resulted in an extended list of 118 client characteristics which were potential predictors of home care needs. All characteristics were defined using nursing literature.[26-30] Characteristics were then selected by the researchers based on their potential relevance. The criterion applied was that the characteristic had to be included in at least one case-mix model or be mentioned in at least two reports. Where possible, client characteristics were clustered with similar characteristics. Finally, the list was reduced to 35 client characteristics (Table 3.1) through a consultation process involving multiple stakeholders. Those characteristics were clustered into eight categories: socio-demographic characteristics (n=4); social environmental characteristics (n=3); physical functioning (n=5); daily functioning (n=4); cognitive functioning (n=2); mental functioning (n=4); behavior (n=6); and health status and services (n=7). All 35 characteristics were redefined and then, including their definitions, incorporated into the survey. The survey was developed in cooperation with the Dutch Nurses' Association (V&VN, the sectoral association for nurses and carers in the Netherlands) and the Dutch Healthcare Authority (NZa), and tested and approved by stakeholders from various organizations (i.e., Utrecht University and Utrecht University of Applied Sciences, Tilburg University, the Dutch Society of Community Nurses (NWG) and the Dutch Patient Federation).

Table 3.1. Client characteristics retrieved from available case-mix funding models and additional reports

	HCSS CM (Parsons et al. 2016)	**RUG-II/HC** (Parsons et al, 2016, Elissen et al., 2014, Poss et al., 2008)	**HHRG** (Elissen et al., 2014)	Elissen et al. (2014)	Parsons et al. (2016)	Guptra Strategics (2016)	Koster, Harmsen & Palen (2015)	Elissen et al. (2017)	V&VN (2016)	Stam, Stadlander (not published)
Client characteristic (N=35)	**Available funding models**			**Additional reports**						
Socio-demographic characteristics										
1. Age				x			x	x	x	x
2. Sex						x	x	x		x
3. Socio-economic status				x	x	x		x	x	x
4. Area of living				x			x	x	x	x
Social environmental characteristics										
5. Composition of household				x	x			x		x
6. Social support	x			x				x	x	x
7. Burden of informal caregiver	x							x	x	x
Physcial functioning										
8. Physical functions	x						x	x		x
9. Indoor mobility	x	x	x				x			
10. Outdoor mobility		x					x			
11. Sensory ability			x		x		x	x		x
12. Bladder and bowel continence	x		x				x	x		
Daily functioning										
13. ADL functioning	x	x	x	x			x	x		
14. IADL functioning	x	x		x			x	x		
15. Participation in social activities	x						x			
16. Medication management	x	x		x			x	x		x
Cognitive functioning										
17. Cognitive functions	x	x	x				x	x		x
18. Awareness of own health issues								x	x	x
Mental functioning										
19. Motivation								x	x	
20. Emotional concerns				x				x		x
21. Anxiety								x		x
22. Signs of depression								x		x

Table 3.1. (continued)

	HCSS CM (Parsons et al. 2016)	**RUG-II/HC** (Parsons et al., 2016, Elissen et al., 2014, Poss et al., 2008)	**HHRG** (Elissen et al., 2014)	Elissen et al. (2014)	Parsons et al. (2016)	Guptra Strategics (2016)	Koster, Harmsen & Palen (2015)	Elissen et al. (2017)	V&VN (2016)	Stam, Stadlander (not published)
Client characteristic (N=35)	**Available funding models**			**Additional reports**						
Behavior										
23. Lifestyle		x		x			x	x		x
24. Problem behavior		x	x				x			
25. Resistance to receiving care										x
26. Self-directing									x	x
27. Self-management						x		x	x	x
28. Coping							x	x		x
Health status and services										
29. Stability	x							x	x	
30. Revalidation phase	x	x					x	x		x
31. Presence of chronic disease		x	x	x			x			x
32. Multi-morbidity								x	x	x
33. Complications of (chronic) disease	x	x		x						x
34. Terminal phase		x				x	x			
35. Complex or specialized care		x	x		x		x			

Procedure

Home care nurses were approached through convenience sampling, as this is an efficient method to reach a large population of home care nurses across the country. The survey was posted online on the website of V&VN on May 3, 2017. On May 4, 2017 the survey link was also publicized in the newsletter of V&VN. Two weeks later (May 18, 2017), a reminder was sent with the subsequent V&VN newsletter. Meanwhile, home care nurses were approached via the researchers' personal network and the stakeholders involved, via Twitter and LinkedIn, via internal communication channels of healthcare organizations, and through articles posted on Skipr, a Dutch healthcare news website (www.skipr.nl), and the NZa website. The survey was closed after 21 days (on May 23, 2017). Only completed surveys were included in the analyses. Respondents completed the survey anonymously. Participation in the survey was voluntary. Information on the reason, goal, contents and development of the survey, and contact information were included in the survey's introduction. Respondents were not asked to declare informed consent since no approval is needed according to the Dutch Medical Research (Human Subjects) Act (WMO).

Measures

The survey consisted of four sections: 1) background characteristics of the respondent; 2) 35 client characteristics which were to be scored on their relevance to predicting the clients' needs for home care; 3) an opportunity to name, define and score up to two missing client characteristics; and 4) a request to choose and rank the top 5 client characteristics.

The following background characteristics were collected on the respondents: sex, age, education, years of working experience in home care, function (i.e. district nurse or vocational nurse), whether the respondent conducts needs assessments or not, whether the respondent works as a generalist and/or specialist, working area (i.e. zip code of the area in which the respondent mainly works), whether the respondent is currently working in home care or not, and whether the respondent is member of V&VN.

The relevance of each of the 35 potential client characteristics to indicate home care needs was scored on a 9-point Likert scale from 1 (totally irrelevant) to 9 (extremely relevant). Respondents were asked to score characteristics independently of possible interaction with other client characteristics. If the respondent thought a relevant client characteristic was missing from the survey, up to two client characteristics could be added. Missing characteristics were named, defined and scored using the same 9-point Likert scale. Finally, respondents chose and ranked the top 5 characteristics from the entire selection available, i.e. 35 characteristics included in the survey plus the one or two that they may have added.

Data analysis

The background characteristics of the sample were analyzed using descriptive statistics (i.e. frequencies, percentages, means, minimum and maximum scores). To assess the relevance of the 35 client characteristics and determine the consensus of opinions among the respondents regarding relevance, medians and interquartile ranges (IQR) were calculated. IQR was used to define the degree of consensus between respondents. In line with previous research[17,21], consensus about relevance was defined as a median between 7 and 9, combined with an IQR≤1.5. A median between 1 and 3 combined with IQR≤1.5 meant consensus for irrelevance. All other possibilities with a median between 4 and 6 or IQR>1.5 were defined as uncertain.

In a sensitivity analysis, vocational nurses who do not perform home care needs assessments were excluded, since they could have less insight into client characteristics that predict home care needs.

Client characteristics added by the respondents were analyzed by listing these answers and clustering similar characteristics based on the definitions provided. Missing characteristics overlapping with one or more of 35 characteristics from the survey were excluded from further analysis. The remaining characteristics were ordered according to the frequency with which they were added by respondents. Missing client characteristics were only included for further analysis if they were mentioned by ≥5 respondents.

The ranked top 5 client characteristics received a score ranging from 1 (least relevant out of the ranked 5) to 5 (most relevant). The scores were added, resulting in a sum score for each individual characteristic that indicated the characteristic's ranking within the total set of characteristics, based on the rankings of all respondents.

Results

Respondents

A total of 1,007 home care nurses completed the online survey, which corresponds with 5% of the total number of Dutch home care nurses.[19,20] Table 3.2 shows the background characteristics of the respondents. Most were district nurses (n=757, 75%); years of working experience ranged from 0 to 44 years, with an average of 10 years. Furthermore, all 12 provinces of the Netherlands were represented, with between 13 and 205 respondents per province.

Table 3.2. Background characteristics of respondents (N=1,007)

	N (%)	Mean	Minimum	Maximum
Sex				
Female	948 (94.1)			
Male	59 (5.9)			
Age		40.2	19	66
≤25 years	151 (15.0)			
26-40 years	364 (36.1)			
41-55 years	341 (33.9)			
≥56 years	151 (15.0)			
Education				
High school or Secondary Vocational Education (SVE)	203 (20.2)			
University of Applied Sciences (UAS)	748 (74.3)			
University	42 (4.2)			
Other	14 (1.4)			
Years of working experience in home care		10.0	0	44
≤2 years	162 (16.1)			
3-7 years	364 (36.1)			
8-19 years	313 (31.1)			
≥20 years	168 (16.7)			
Function				
District nurse	757 (75.2)			
Vocational nurse	202 (20.1)			
Other	48 (4.8)			

Table 3.2. (continued)

	N (%)	Mean	Minimum	Maximum
Conducting home care needs assessments				
Yes	854 (84.8)			
No*	153 (15.2)			
Generalist or specialist				
Generalist	832 (82.6)			
Specialist	62 (6.2)			
Generalist and specialist	113 (11.2)			
Currently working as home care nurse				
Yes	972 (96.5)			
No	35 (3.5)			
Membership V&VN				
Membership V&VN	762 (75.7)			
No membership V&VN	245 (24.3)			

* 110 vocational nurses (54% of the vocational nurses; 11% of all respondents) do not conduct home care needs assessments.

Relevance of and consensus on the 35 client characteristics

Table 3.3 presents the medians and IQRs for each individual client characteristic. Thirty client characteristics achieved a median score of ≥7. A consensus on relevance was found for 15 of these characteristics (IQR≤1.5). The highest degree of consensus on relevance was achieved by the characteristic ‘terminal phase’ (median=9 and IQR=1). The relevance of the remaining twenty characteristics was uncertain: in 19 cases, this was due to both the median score between 4 and 7 and the lack of consensus on relevance (IQR>1.5); in one case this was due to lack of consensus on irrelevance (median score ≤3 and IQR>1.5). These twenty uncertain client characteristics included all characteristics in the categories of ‘socio-demographic characteristics’ (n=4) and ‘mental functioning’ (n=4), and most characteristics in the category of ‘daily functioning’ (n=3). Furthermore, there was no consensus on any client characteristic being irrelevant (median≤3 and IQR≤1.5).

No respondent scored all the characteristics as irrelevant (score≤3). Fifteen respondents (2%) scored all client characteristics as relevant (score≥7), one of whom (0%) scored all characteristics with a score of 9.

The results of a sensitivity analysis showed that results of the survey did not differ when vocational nurses who do not perform the assessment (n=110) were excluded, except for a small difference in IQR for ‘revalidation phase’: For the total sample, IQR was 2, while when excluding the described group IQR was 1.

Missing client characteristics

In total, 62 missing client characteristics were mentioned by 112 respondents (11%). Most of these (60%) overlapped with one or more of the proposed 35 characteristics and were

Table 3.3. Relevance of client characteristics based on median and IQR

	Median	IQR (boundaries)
Relevant client characteristics (N=15)		
Terminal phase	9	1 (8-9)
Complex or specialized care	8	1 (8-9)
Social support	8	1 (7-8)
Burden of informal caregiver	8	1 (7-8)
Physical functions	8	1 (7-8)
Indoor mobility	8	1 (7-8)
Medication management	8	1 (7-8)
Awareness of own health issues	8	1 (7-8)
Self-directing	8	1 (7-8)
Self-management	8	1 (7-8)
Presence of chronic disease	8	1 (7-8)
Complications of (chronic) disease	8	1 (7-8)
Revalidation phase	7	1 (7-8)
Sensory ability	7	1 (6-7)
Composition of household	7	1 (6-7)
Uncertain client characteristics (N=20)		
ADL functioning	8	2 (7-9)
Cognitive functions	8	2 (7-9)
Multi-morbidity	8	2 (7-9)
Age	7	2 (6-8)
Bladder and bowel continence	7	2 (6-8)
IADL functioning	7	2 (6-8)
Motivation	7	2 (6-8)
Emotional concerns	7	2 (6-8)
Anxiety	7	2 (6-8)
Signs of depression	7	2 (6-8)
Lifestyle	7	2 (6-8)
Problem behavior	7	2 (6-8)
Resistance to receiving care	7	2 (6-8)
Coping	7	2 (6-8)
Stability	7	2 (6-8)
Socio-economic status	6	2 (5-7)
Area of living	6	2 (5-7)
Outdoor mobility	6	2 (5-7)
Participation in social activities	6	2 (5-7)
Sex	3	4 (1-5)
Irrelevant client characteristics (N=0)		
None		

therefore excluded. The remaining 25 missing client characteristics were mentioned by a minimum of one and a maximum of ten respondents, of which eight characteristics were mentioned by ≥5 respondents. The most frequently mentioned missing client characteristic was ‘living situation’ (n=10), meaning the safety, hygiene or liveability of the client’s housing, which could be placed into the category ‘social environmental characteristics’. Other missing characteristics mentioned by five to nine respondents related to the categories ‘socio-demographic characteristics’ (i.e. financial situation and ethnicity), ‘cognitive functioning’ (i.e. communication (skills)), ‘mental functioning’ (i.e. sense of coherence and loneliness), ‘behavior’ (i.e. nutrition) and ‘health status and services’ (i.e. mental illnesses and multidisciplinary care).

Ranking client characteristics

Based on the sum scores for the respondents' rankings, 'ADL functioning' was the most relevant client characteristic for predicting the clients' home care needs. Among respondents, 45% chose 'ADL functioning' as one of the ranked top 5 characteristics. 'Outdoor mobility' was ranked least relevant. Table 3.4 represents the ranking of all 35 client characteristics.

Discussion

The aim of this study was to determine which client characteristics predict clients' needs for home care according to Dutch home care nurses. To achieve this aim, based on a review of international literature, 35 potentially relevant client characteristics were included in a cross-sectional, online survey. A total of 1,007 nurses completed the survey (i.e. 5% of Dutch home care nurses). There was a consensus among the respondents regarding the relevance of 15 client characteristics for predicting clients' needs for home care.

Across the client characteristics included in the survey, higher median scores for relevance were associated with lower IQRs. Hence, it seems that a stronger consensus exists among nurses regarding those characteristics that are generally considered more relevant, such as 'terminal phase' and 'indoor mobility'. Moreover, this confirms that characteristics on which there was uncertainty among home care nurses (median<7 and/or IQR>1.5), are indeed uncertain. However, there were three notable exceptions to this: the characteristics 'ADL functioning', 'cognitive functioning' and 'multi-morbidity'. Although there was insufficient consensus among the nurses on the relevance of these characteristics (IQR>1.5), they attained among the highest individual scores for relevance (medians of 8) and were ranked in the overall top 10 of the most relevant factors (rank 1, 3 and 8, respectively). Also, 'ADL functioning' and 'cognitive functioning' were the only client characteristics included in all case-mix models consulted.[18,21,31] Both are widely considered as important predictors of home care needs, and are therefore expected to support efficient planning and organization of home care.[32] One possible explanation for the contradictory findings could be differing interpretations of these characteristics by home care nurses, in particular regarding the causal relationship with home care needs. For example, some nurses may consider limited 'ADL functioning' to be a direct and important cause of home care needs, and, as such, score and rank 'ADL functioning' highly. Other nurses may have viewed the same limitation not as a direct cause, but as a symptom of a more important, underlying problem (e.g. cognitive limitations) resulting in a need for home care.[32] As such they could have scored and ranked 'ADL-functioning' lower. Also, the survey only measured the relevance of client characteristics individually, while in practice combinations of characteristics may determine home care needs. Additional qualitative research, such as in-depth interviews with home care nurses,

Table 3.4. Ranking client characteristics based on sum of scores for the top 5 client characteristics

Overall rank	Client characteristic	Chosen as one of the top 5 characteristics N (%)	Rank 1 score 5 N (%)*	Rank 2 score 4 N (%)*	Rank 3 score 3 N (%)*	Rank 4 score 2 N (%)*	Rank 5 score 1 N (%)*	Sum total score
1.	ADL functioning	451 (44.8)	*126 (27.9)*	*113 (25.1)*	*84 (18.6)*	*80 (17.7)*	*48 (10.6)*	1542
2.	Terminal phase	392 (38.9)	*130 (12.9)*	*62 (15.8)*	*44 (11.2)*	*56 (14.3)*	*100 (25.5)*	1242
3.	Cognitive functions	389 (38.6)	*66 (17.0)*	*101 (26.0)*	*107 (27.5)*	*71 (18.3)*	*44 (11.3)*	1241
4.	Physical functions	278 (27.6)	*99 (35.6)*	*67 (24.1)*	*43 (15.5)*	*39 (14.0)*	*30 (10.8)*	1000
5.	Social support	342 (34.0)	*40 (11.7)*	*69 (20.2)*	*89 (26.0)*	*80 (23.4)*	*64 (18.7)*	967
6.	Burden of informal caregiver	330 (32.8)	*28 (8.5)*	*68 (20.6)*	*95 (28.8)*	*83 (25.2)*	*56 (17.0)*	919
7.	Complex or specialized care	302 (30.0)	*69 (22.8)*	*59 (19.5)*	*50 (16.6)*	*52 (17.2)*	*72 (23.8)*	907
8.	Multi-morbidity	299 (29.7)	*52 (17.4)*	*65 (21.7)*	*61 (20.4)*	*62 (20.7)*	*59 (19.7)*	886
9.	Self-directing	251 (24.9)	*91 (36.3)*	*45 (17.9)*	*41 (16.3)*	*41 (16.3)*	*33 (13.1)*	873
10.	Self-management	245 (24.3)	*67 (27.3)*	*56 (22.9)*	*48 (19.6)*	*32 (13.1)*	*42 (17.1)*	809
11.	Presence of chronic disease	216 (21.4)	*35 (16.2)*	*40 (18.5)*	*50 (23.1)*	*44 (20.4)*	*47 (21.8)*	620
12.	Medication management	206 (20.5)	*12 (5.8)*	*32 (15.5)*	*52 (25.2)*	*61 (29.6)*	*49 (23.8)*	515
13.	Complications of (chronic) disease	189 (18.8)	*21 (11.1)*	*32 (16.9)*	*38 (20.1)*	*55 (29.1)*	*43 (22.8)*	500
14.	Awareness of own health issues	153 (15.2)	*31 (20.3)*	*30 (19.6)*	*39 (25.5)*	*34 (22.2)*	*19 (12.4)*	479
15.	Age	124 (12.3)	*40 (32.3)*	*19 (15.3)*	*15 (12.1)*	*14 (11.3)*	*36 (29.0)*	385
16.	Motivation	82 (8.1)	*11 (13.4)*	*20 (24.4)*	*16 (19.5)*	*25 (30.5)*	*10 (12.2)*	243
17.	Socio-economic status	90 (8.9)	*12 (13.3)*	*19 (21.1)*	*15 (16.7)*	*12 (13.3)*	*32 (35.6)*	237
18.	Coping	90 (8.9)	*10 (11.1)*	*11 (12.2)*	*16 (17.8)*	*23 (25.6)*	*30 (33.3)*	218
19.	Lifestyle	77 (7.6)	*10 (13.0)*	*12 (15.6)*	*17 (22.1)*	*18 (23.4)*	*20 (26.0)*	205
20.	Indoor mobility	78 (7.7)	*7 (9.0)*	*15 (19.2)*	*18 (23.1)*	*17 (21.8)*	*21 (26.9)*	204
21.	Resistance to receiving care	66 (6.6)	*8 (12.1)*	*6 (9.1)*	*10 (15.2)*	*24 (36.4)*	*18 (27.3)*	160
22.	Composition of household	53 (5.3)	*4 (7.5)*	*14 (26.4)*	*10 (18.9)*	*11 (20.8)*	*14 (26.4)*	142
23.	Problem behavior	51 (5.1)	*3 (5.9)*	*7 (13.7)*	*8 (15.7)*	*13 (25.5)*	*20 (39.2)*	113
24.	Bladder and bowel continence	49 (4.9)	*2 (4.1)*	*8 (16.3)*	*7 (14.3)*	*10 (20.4)*	*22 (44.9)*	105
25.	IADL functioning	25 (2.5)	*4 (16.0)*	*4 (16.0)*	*6 (24.0)*	*7 (28.0)*	*4 (16.0)*	72
26.	Stability	27 (2.7)	*3 (11.1)*	*6 (22.2)*	*1 (3.7)*	*9 (33.3)*	*8 (29.6)*	68

Table 3.4. (continued)

Overall rank	**Client characteristic**	**Chosen as one of the top 5 characteristics N (%)**	**Rank 1 score 5 N (%)***	**Rank 2 score 4 N (%)***	**Rank 3 score 3 N (%)***	**Rank 4 score 2 N (%)***	**Rank 5 score 1 N (%)***	**Sum total score**
27.	Area of living	29 (2.9)	*3 (10.3)*	*4 (13.8)*	*5 (17.2)*	*2 (6.9)*	*15 (51.7)*	65
28.	Emotional concerns	24 (2.4)	*2 (8.3)*	*5 (20.8)*	*3 (12.5)*	*6 (25.0)*	*8 (33.3)*	59
29.	Signs of depression	20 (2.0)	*2 (10.0)*	*4 (20.0)*	*3 (15.0)*	*4 (20.0)*	*7 (35.0)*	50
30.	Anxiety	19 (1.9)	*2 (10.5)*	*2 (10.5)*	*3 (15.8)*	*8 (42.1)*	*4 (21.1)*	47
31.	Participation in social activities	18 (1.8)	*0 (0.0)*	*3 (16.7)*	*3 (16.7)*	*4 (22.2)*	*8 (44.4)*	37
32.	Revalidation phase	17 (1.7)	*0 (0.0)*	*1 (5.9)*	*4 (23.5)*	*3 (17.6)*	*9 (52.9)*	31
33.	Sensory ability	7 (0.7)	*2 (28.6)*	*1 (14.3)*	*1 (14.3)*	*2 (28.6)*	*1 (14.3)*	22
34.	Sex	3 (0.3)	*1 (33.3)*	*1 (33.3)*	*0 (0.0)*	*0 (0.0)*	*1 (33.3)*	10
35.	Outdoor mobility	1 (0.1)	*0 (0.0)*	*1 (100.0)*	*0 (0.0)*	*0 (0.0)*	*0 (0.0)*	4

* Percentages relate to N of 'chosen as one of the top 5 characteristics'.

Note: Example calculation for the ranking of ADL functioning: The first column is the percentage of respondents who ranked ADL functioning in the top 5 characteristics, i.e. 45% of the respondents. The following 5 columns explain how many respondents ranked ADL functioning in respectively rank 1 (i.e. 27.9% of those 45%), rank 2 (i.e. 25.1% of those 45%), rank 3 (i.e. 18.6% of those 45%), rank 4 (17.7% of those 45%) and rank 5 (i.e. 10.6% of those 45%). Finally, the total sum score was calculated to determine the overall rank of ADL functioning among all 35 characteristics by the following calculation: (126 x score 5) + (113 x score 4) + (84 x score 3) + (80 x score 2) + (48 x score 1) = 1542. The characteristic with the highest total sum score was placed on overall rank 1, and the lowest on overall rank 35.

would provide further insight into the nurses' interpretations and considerations, in order to identify the reasons for these contradictions.

The 15 consensually relevant client characteristics to predicting home care needs identified in this study relate to both biomedical determinants, such as 'terminal phase' and 'physical functions', and psychosocial determinants of health, such as 'social support' and 'self-management'. The nurses therefore seem to believe that the biopsychosocial perspective[33] is relevant when assessing clients' needs. This is consistent with the nature of the work done by home care nurses, as stated in their professional profile: home care nurses should be able to handle increasing complexity of clients by incorporating a holistic, biopsychosocial perspective.[34,35] However, a biopsychosocial perspective has not yet been incorporated into most existing case-mix models. Four of the relevant characteristics (27%) are psychosocial characteristics and did not appear in any of the models at all: 'composition of household', 'awareness of own health issues', 'self-directing' and 'self-management'. Most current case-mix models were developed based on a more biomedical model of health.[36,37] According to previous research, this is suitable when determining case-mix in an inpatient setting, since biomedical characteristics – such as a diagnosis – are accurate predictors of service need in, for example, a nursing home, as well as based on valid, reliable and available data.[36,38,39] Determining case-mix in the community though, including contextual factors – such as health status of the informal caregiver – provides a more reliable representation of the client's care needs.[36,40] However, including psychosocial data in a home care funding model is viewed as a challenge[21], since most routinely collected data concern biomedical determinants of health.[21,38,40]

This study has certain strengths and limitations. First, it is unknown how many V&VN members met the inclusion criteria. Also, the exact number of Dutch home care nurses is uncertain, since different sources report different numbers, which makes it difficult to determine a precise response rate. Yet, based on an estimated total population of 20,000 home care nurses[19,20], we have a response rate of 5%, which is considerable. Furthermore, background characteristics of the respondents concerning sex (i.e. 94% female) and age (i.e. mean age of 40 years) only slightly deviate from the available population characteristics (i.e. approximately 92% female; approximate mean age of 44 years)[41] and all provinces of the Netherlands were represented. Therefore, the sample is considered as being representative. Respondents who completed the questionnaire had no missing values, as they were obliged to fill in all questions. However, there is no data about respondents who did not complete the survey, as only completed surveys were saved and included in the study. According to previous research on large-scale web-based surveys, about 10% of respondents who start a survey quits nearly instantaneously, with an additional 2% dropout per 100 survey items.[42] Given the size and diversity of this survey sample, there is no reason to assume that dropouts are not at random. A strength of this study is the comprehensive, systematic selection of client characteristics for the survey. A wide range of reports and several existing case-mix models were screened for client characteristics. Although there will always be a possibility that relevant characteristics were overlooked due to unknown or unpublished studies, the low maximum frequency (n=10) with which respondents added characteristics suggests that the survey was relatively comprehensive. Furthermore, defining client characteristics using nursing literature led to unambiguous interpretation, in line with the nursing profession, on the meaning of each characteristic.

This study aimed at exploring the view of home care nurses in general. Results were compared for one subgroup, i.e. by performing a sensitivity analysis for vocational nurses who do not perform home care needs assessments. As a subsequent step, a qualitative study is planned to get more in-depth information if and why these findings would differ for relevant (other) subgroups, by for example looking at available resources in the community, or rural versus urban working areas.

As far as we are aware, this survey study among Dutch home care nurses is one of the first attempts to utilize nurses' professional knowledge and experience in order to develop a case-mix model. The involvement of home care nurses is expected to help in the development of a funding model that is both robust and suitable for clinical practice, and maximize trust and support during implementation. Besides continuous involvement of nurses, quantitative research is necessary to collect objective information concerning the coherence and predictability of (combinations of) relevant client characteristics and home care needs. It is therefore recommended to examine the client data routinely collected, bearing in mind the paradigm shift in home care over recent years and its effect on reported data. Data from various sources, such as health and social care providers and municipalities, should be included to compensate for the lack of psychosocial data.

Conclusions

Based on a review of relevant literature, a comprehensive set of client characteristics was presented to home care nurses in a survey to determine their relevance to predicting clients' home care needs. Although a strong consensus was revealed concerning the relevance of some characteristics, discrepancies were also identified between responses, possibly due to differences in interpretation. According to the respondents, client characteristics that are relevant to predicting home care needs are of both biomedical and psychosocial nature. However, even though incorporating a biopsychosocial perspective into a funding model could provide the right incentives to work towards the Triple Aim, current home care funding models often omit psychosocial determinants of health, making the funding model being less in line with clinical practice. To incorporate the biopsychosocial perspective, close collaboration between clinical practice, policy development and science – by combining connected clients' data from different sources with the knowledge and experience of home care nurses for example – is necessary. This could improve both existing (case-mix) funding models and facilitate the development of new models.

References

1. Morris M, Powick A, De Vetorri E, et al. *2016 global health care outlook: Battling costs while improving care.* New York, NY: Deloitte; 2016.
2. European Commission. *Communication from the commission: On effective, accessible and resilient health systems.* Brussels, Belgium: European Commission; 2014.
3. Berwick DM, Nolan TW, Whittington J. The triple aim: Care, health, and cost. *Health Aff (Millwood).* 2008;27(3):759-769.
4. Kaiser Family Foundation. *Distribution of fee-for-service Medicaid spending on long term care*. 2017; https://www.kff.org/medicaid/state-indicator/spending-on-long-term-care/. Accessed November 22, 2017.
5. Rijksoverheid. *Vaststelling van de begrotingsstaten van het Ministerie van Volksgezondheid, Welzijn en Sport (XVI) voor het jaar 2016*. Den Haag, the Netherlands: Ministry of Finance; 2016.
6. Genet N, Boerma W, Kroneman M, Hutchinson A, Saltman RB. *Home care across Europe.* Kopenhagen, Denmark: World Health Organization; 2012.
7. Miller HD. From volume to value: Better ways to pay for health care. *Health Aff (Millwood).* 2009;28(5):1418-1428.
8. Koster NM, Harmsen J, van der Palen J. *Analyzing client characteristics and needs in home health care.* Enschede, the Netherlands: University of Twente; 2015.
9. V&VN. *Zelfmanagementondersteuning behoort tot de kern van verplegen!* Utrecht, the Netherlands: V&VN; 2014.
10. Tuntland H, Aaslund MK, Espehaug B, Førland O, Kjeken I. Reablement in community-dwelling older adults: A randomised controlled trial. *BMC Geriatrics.* 2015;15:145.
11. Metzelthin SF, Zijlstra GA, van Rossum E, et al. 'Doing with ...' rather than 'doing for ...' older adults: Rationale and content of the 'Stay active at home' programme. *Clin Rehabil.* 2017;31(11):1419-1430.
12. Ryburn B, Wells Y, Foreman P. Enabling independence: restorative approaches to home care provision for frail older adults. *Health Soc Care Community.* 2009;17(3):225-234.
13. Vereniging van Nederlandse gemeenten (VNG). *Bekostiging wijkverpleging en de prestatie op maat voor wijkgericht werken.* Den Haag, the Netherlands: VNG; 2016.
14. Poss JW, Hirdes JP, Fries BE, McKillop I, Chase M. Validation of resource utilization groups version III for home care (RUG-III/HC): Evidence from a Canadian home care jurisdiction. *Med Care.* 2008;46(4):380-387.
15. Seow HY, Sibley LM. Developing a dashboard to help measure and achieve the triple aim: A population-based cohort study. *BMC Health Serv Res.* 2014;14:363.
16. Van Rijn M. *Bekostiging wijkverpleging 2017.* Den Haag, the Netherlands: Ministry of Health, Welfare and Sports; 2016.
17. Elissen AMJ, Metzelthin S, Van den Bulck AOE, Verbeek H, Ruwaard D. *Case-mix classificatie als basis voor bekostiging van wijkverpleging.* Maastricht, the Netherlands: Maastricht University, Faculty of Health, Medicine and Life Sciences, Care and Public Health Research Institute (CAPHRI), Department of Health Services Research, 2017.
18. Parsons M. *Profiles and pathway development within home care in New Zealand.* 2016.
19. Bloemendaal I, van Essen G, Kramer S, van der Windt W. *Vraag en aanbod van wijkverpleegkundigen 2015-2019.* Den Haag, the Netherlands: CAOP and Kiwa Carity; 2015.
20. Van der Windt W, Bloemendaal I. *Toekomstverkenning voor de thuiszorg: Vraag en aanbod van verplegend en verzorgend personeel 2015-2019.* The Netherlands: Arbeidsmarkt Zorg en Welzijn (AZW); 2015.
21. Elissen AM, Struijs JN, Baan CA, Ruwaard D. Estimating community health needs against a triple aim background: What can we learn from current predictive risk models? *Health Policy.* 2015;119(5):672-679.
22. V&VN. *Verkenning ontwikkeling zorgprofielen wijkverpleegkundige.* Utrecht, the Netherlands: V&VN;2016.
23. Gupta Strategists. *Onderzoek bekostiging wijkverpleging.* Amsterdam, the Netherlands: Gupta Strategists; 2016.
24. Stam J, Stadlander MC. *Cliëntkenmerken die zorg voorspellen op basis van ervaring wijkverpleegkundigen van NWG (internal document)*. Utrecht, the Netherlands: Dutch Healthcare Authority; n.d.
25. InterRAI. *InterRAI Contact Assessment (CA) form and user's manual, 9.2*. 2016.

26. Herdman TH, Kamitsuru S. *NANDA international, Inc, nursing diagnoses: Definitions & Classification 2015-2017.* 10th ed. West Sussex, UK: John Wiley & Sons; 2014.
27. Herdman TH. *NANDA international verpleegkundige diagnoses en classificaties 2012-2014.* Houten, the Netherlands: Bohn Stafleu van Loghum; 2014.
28. Gordon M. *Handleiding verpleegkundige diagnostiek.* 4th ed. Amsterdam, the Netherlands: Reed Business Education; 2014.
29. van Achterberg T, Bours GJJW, Eliens AM. *Effectief verplegen 2.* 3rd ed. Dwingeloo, the Netherlands: Kavanah; 2011.
30. van Achterberg T, Bours GJJW, Eliens AM. *Effectief verplegen 1.* 4th ed. Dwingeloo, the Netherlands: Kavanah; 2012.
31. New Zealand Productivity Commission. *Appendix E Home-based support for older people.* 2015.
32. Døhl Ø, Garåsen H, Kalseth J, Magnussen J. Factors associated with the amount of public home care received by elderly and intellectually disabled individuals in a large Norwegian municipality. *Health Soc Care Community.* 2016;24(3):297-308.
33. Van Tilburg W. Het biopsychosociale model. In: Clijsen M, Garenfeld W, Kuipers G, et al., eds. *Leerboek psychiatrie voor verpleegkundigen.* Houten, the Netherlands: Bohn Stafleu van Loghum; 2016.
34. Schuurmans M, Lambregts J, Grotendorst A, van Merwijk C. *V&V 2020 Deel 3 beroepsprofiel verpleegkundige.* Utrecht, the Netherlands: V&V 2020; 2012.
35. de Bont M, van Haaren E, Rosendal H, Wigboldus M. *Expertisegebied wijkverpleegkundige.* Den Haag, the Netherlands: V&VN; 2015.
36. Parsons M, Rouse P, Sajtos L, Harrison J, Parsons J, Gestro L. Developing and utilising a new funding model for home-care services in New Zealand. *Health Soc Care Community.* 2018;26(3):345-355.
37. Wade DT, Halligan PW. The biopsychosocial model of illness: A model whose time has come. *Clin Rehabil.* 2017;31(8):995-1004.
38. Laporte A, Croxford R, Coyte PC. Can a publicly funded home care system successfully allocate service based on perceived need rather than socioeconomic status? A Canadian experience. *Health Soc Care Community.* 2007;15(2):108-119.
39. Fries BE, Schneider DP, Foley WJ, Gavazzi M, Burke R, Cornelius E. Refining a case-mix measure for nursing homes: Resource utilization groups (RUG-III). *Med Care.* 1994;32(7):668-685.
40. Bjorkgren MA, Fries BE, Shugarman LR. A RUG-III case-mix system for home care. *Can J Aging.* 2000;19:106-125.
41. Arbeidsmarkt Zorg en Welzijn (AZW). AZWinfo databank. 2015; https://www.azwinfo.nl/jive/jive. Accessed November 22, 2017.
42. Hoerger M. Participant dropout as a function of survey length in internet-mediated university studies: Implications for study design and voluntary participation in psychological research. *Cyberpsychology Behav Soc Netw.* 2010;13(6):697-700.

Chapter 4

The Case-Mix Short-Form questionnaire for prospective payment of home care services: Development and psychometric testing

Anne O.E. van den Bulck
Arianne M.J. Elissen
Silke F. Metzelthin
Maud H. de Korte
Gertjan S. Verhoeven
Misja C. Mikkers
Dirk Ruwaard

Submitted for publication (under review)

Chapter 5

Identifying client characteristics to predict home care use more accurately: A Delphi study involving nurses and home care purchasing specialists

Anne O.E. van den Bulck
Arianne M.J. Elissen
Silke F. Metzelthin
Maud H. de Korte
Gertjan S. Verhoeven
Teuntje A.T. de Witte-Breure
Lieuwe C. van der Weij
Misja C. Mikkers
Dirk Ruwaard

BMC Health Services Research. 2022; 22: 394

Abstract

Background: Case-mix based prospective payment of home care is being implemented in several countries to work towards more efficient and client-centered home care. However, existing models can only explain a limited part of variance in home care use, due to their reliance on health- and function-related client data. It is unclear which predictors could improve predictive power of existing case-mix models. The aim of this study was therefore to identify relevant predictors of home care use by utilizing the expertise of district nurses and health insurers.

Methods: We conducted a two-round Delphi-study according to the RAND/UCLA Appropriateness Method. In the first round, participants assessed the relevance of eleven client characteristics that are commonly included in existing case-mix models for predicting home care use, using a 9-Point Likert scale. Furthermore, participants were also allowed to suggest missing characteristics that they considered relevant. These items were grouped and a selection of the most relevant items was made. In the second round, after an expert panel meeting, participants re-assessed relevance of pre-existing characteristics that were assessed uncertain and of eleven suggested client characteristics (divided into six categories). In both rounds, median and inter-quartile ranges were calculated to determine relevance.

Results: Twenty-two participants (16 district nurses and 6 insurers) suggested 53 unique client characteristics (grouped from 142 characteristics initially). In the second round, relevance of the client characteristics was assessed by 12 nurses and 5 health insurers. Of a total of 22 characteristics, 10 client characteristics were assessed as being relevant and 12 as uncertain. None was found irrelevant for predicting home care use. Most of the client characteristics from the category ‘Daily functioning’ were assessed as uncertain. Client characteristics in other categories – i.e. ‘Physical health status’, ‘Mental health status and behavior’, ‘Health literacy’, ‘Social environment and network’, and ‘Other’ – were more frequently considered relevant.

Conclusion: According to district nurses and health insurers, home care use could be predicted better by including other more holistic predictors in case-mix classification, such as on mental functioning and social network. The challenge remains, however, to operationalize the new characteristics and keep stakeholders on board when developing and implementing case-mix classification for home care prospective payment.

Introduction

Case-mix classification has been developed (and in some countries also implemented) as part of prospective payments in home care, with the aim of making home care more efficient and client-centered.[1,2] Under case-mix classification, clients are allocated into groups that are relatively homogenous in their use of resources. Examples of case-mix models are the Home and Community Services Support Case-Mix (HCSS CM) model in New Zealand, which is based on the International Resident Assessment Instrument for Homecare (InterRAI-HC) data.[1] Most recently, in the Netherlands a case-mix model has been developed for Dutch home care, based on Case-Mix Short Form (CM-SF) questionnaire data.[3,4]

To date one systematic literature review has been conducted that gathered knowledge on existing case-mix models for home care and relevant predictors. This systematic literature review from Van den Bulck et al. (2020) found that existing home care case-mix models focus largely on data on the client's health (e.g. cognitive functioning and continence) and daily functioning (e.g. independence in washing and dressing) to predict home care use.[5] However, based on these most common type of predictors, home care case-mix models are only able to explain variance in home care use to a limited extent (i.e. between 14 and 21% for newly developed models).[5] Including other types of predictors could potentially improve the predictive value of case-mix models in home care.[3] In a more recent study on predictors of home care use, it was described that people in need for home care are generally older, visit the general practitioner more often, and use more and/or expensive medications and aid devices.[6] Besides looking at the client's health and daily functioning, home care professionals apply a more holistic view of the client to accurately predict their need for home care.[1,7,8] For example, according to the definition of Positive Health, health is more than simply the absence of disease, and client characteristics such as a client's well-being and social functioning also affect health[9], and consequently also that client's use of care. Looking beyond commonly included types of predictors may therefore be necessary in order to reduce unexplained variance in the predicted home care use.[3]

To establish a more holistic view of the client and thereby improve predictive value of home care case-mix models, more insight is needed regarding which client characteristics should be included in case-mix models. There is a large number of possible predictors to include.[5] Therefore, it is valuable to involve district nurses and health insurers in the decision making process as they have experiential expertise and knowledge[10] on client characteristics that could predict home care use. Involving nurses and insurers could also improve the model's clinical relevance, and increase levels of professional support when implementing case-mix based prospective payments.[1] The aim of our study was therefore to evaluate which relevant predictors of home care use are promising, or potentially even more relevant compared to the predictors that are currently commonly used, according to nurses and insurers.

Methods

Design

We conducted a two-round Delphi-study according to the RAND/UCLA Appropriateness Method (RAM).[11] The aim of the RAM is to detect agreement between experts, rather than to reach consensus among them[11], which is in line with our study aim. Furthermore, the recommendations for Conducting and Reporting of Delphi Studies (CREDES) were followed to enhance the robustness of our study.[12] According to Dutch law on Medical Research (Human Subjects) Act (WMO), this study needed no ethical approval since the target group is not a vulnerable group, data were collected and processed anonymously, and participation was voluntary.

The following steps were conducted: the expert panel was selected; the first Delphi-round involving two online surveys (A and B) and the second Delphi-round with an expert panel meeting and an online survey (C) were prepared and carried out; and the survey data were analyzed. Figure 5.1 provides an overview of the steps involving data collection and analysis in the two Delphi-rounds.

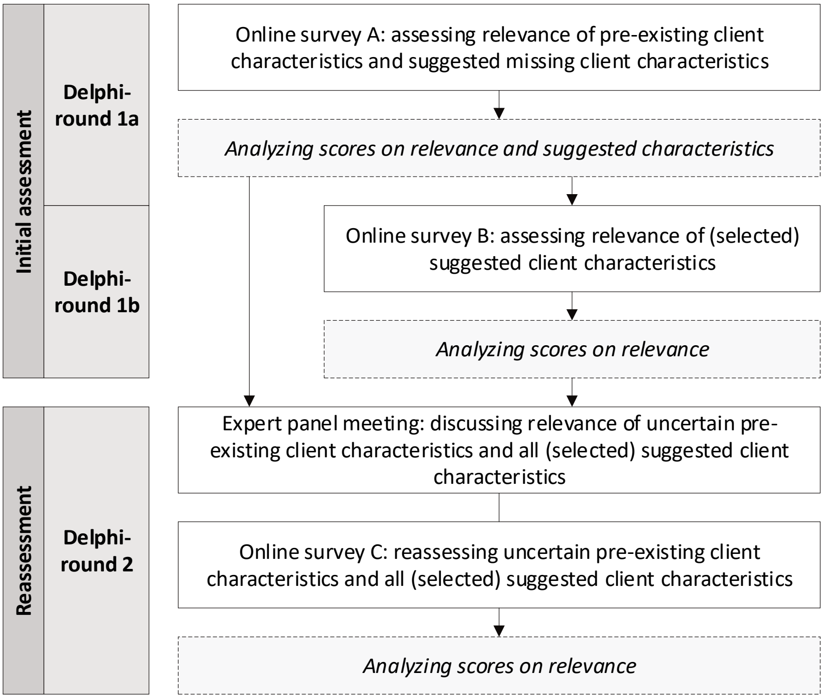


Figure 5.1. Steps in data collection and data analysis for the first and second Delphi-rounds.
Note: White boxes represent data collection; light grey boxes represent data analysis.

Participants

District nurses and health insurers were selected as experts ¬– i.e. people with significant knowledge of client characteristics that could be predictors of home care use[13] – to participate in our study. When conducting a Delphi-study, it is advisable to include experts from diverse practice settings and diverse geographic settings.[11] Our aim was to involve a minimum of seven and a maximum of 15 participants per group.[11]

District nurses are considered experts due to their experience in professional practice: they assess care needs of home care clients based on a standard needs assessment and can fulfil a central role in the coordination of care from home care clients. Therefore, they represent expertise in the area of nursing care, geriatric care and primary care. To recruit nurses for our study, we approached six Dutch home care organizations who had previously participated in a pilot-study on the development of a case-mix model for prospective home care payments. Those home care organizations are located in different regions in the Netherlands. Each provider selected two or three district nurses from their organization. Three representatives from the Dutch Nurses Association (V&VN), who are also district nurses from diverse home care organizations, were also asked to participate.

Health insurers are considered experts because of their experience in contracting home care services, either as a home care purchaser or as a policy adviser working for a health insurance company (both are considered home care purchasing specialists). Therefore, they represent expertise in the area of health policy and health economics. The aim was to at least include experts from the four health insurance companies with the largest market share in the Netherlands, which together represent 85% of the market.[14] The home care organizations were asked to propose home care purchasers and/or policy advisers from the health insurance companies which they had the most frequent contact with regarding contracting home care services. Additionally, the remaining six health insurance companies in the Netherlands with a smaller market share (i.e. between 1 and 4%) were asked to participate.

An e-mail was sent to the proposed participants providing information on the aim of the study, its design and the inclusion criteria for experts. Participants who wished to take part in our study were asked to indicate their availability so that the expert panel meeting could be scheduled. Additionally, informed consent was asked from the participants. If a participant did not believe they had the right knowledge on the subject or did not want to participate, they were asked to suggest a colleague instead.

First Delphi-round

The first Delphi-round consisted of two online surveys – A and B – using the survey tool Qualtrics.[15]

Data collection

Online survey A started with an informed consent declaration, and a list defining the terms used in the survey. Participants were asked to provide background information including their name, sex, age, education, organization, and current job title. Their names were only used to inform the participants of their own scores, and so that the moderator would have an overview of the scores of the participants in the expert panel meeting (as prescribed by the RAM[11]). Other than that, all data collected were fully anonymized by removing the names from the data.

The participants were then asked to assess the relevance of client characteristics for predicting home care use. The pre-existing client characteristics that had to be assessed were selected from our previously developed Case-Mix Short Form (CM-SF) questionnaire.[3] The CM-SF questionnaire was developed to collect data for home care case-mix classification for prospective payment, independently of the nursing classification system used. Using this 11-item questionnaire, data were collected on the most common predictors of home care use in existing case-mix models.[5,7] It assesses a home care client's current functioning with regard to 11 client characteristics: 1) Illness prognosis, 2) Meal preparation, 3) Eating and drinking, 4) Continence, 5) Toileting, 6) Mobility, 7) Dressing, 8) Washing/showering, 9) Medication use, 10) Cognitive skills for daily decision making, and 11) Informal care. All 11 characteristics in the CM-SF were included in our Delphi-survey. To help the participants reflect on potentially relevant predictors of home care use, we divided the survey into six categories: 1) Daily functioning, including eight CM-SF questionnaire items: meal preparation, eating and drinking, continence, toileting, mobility, dressing, washing/showering, and medication use; 2) Physical health status; 3) Mental health status and behavior, including one CM-SF questionnaire item: cognitive skills for daily decision making; 4) Health skills; 5) Social environment and network, including one CM-SF questionnaire item: informal care; and 6) Other, including one CM-SF questionnaire item: Illness prognosis.

The relevance of the 11 pre-existing characteristics was scored by the participants using a 9-Point Likert scale, ranging from 1 (completely irrelevant) to 9 (extremely relevant). If the participants found that one or more relevant client characteristics was missing, they could add these client characteristics (up to a maximum of six per category). For each client characteristic suggested, participants were asked to provide a brief definition and, where applicable, refer to an existing question or questionnaire to measure it objectively. An example of the survey questions (translated from Dutch to English) is provided in Appendix 5A.

All participants who agreed to take part were sent the link for survey A by e-mail. The participants had ten days to complete the survey, starting on 10 March 2021. Two reminders were sent to increase the response rate.

For online survey B, conducted prior to the discussion of the expert panel meeting, participants assessed the relevance of a selection of the suggested client characteristics in survey A. This was to encourage the participants think about an initial score for all the characteristics before the discussion. The suggested characteristics were assessed in the same way as in survey A – i.e. by scoring their relevance on a 9-Point Likert scale.

Data analysis

We used descriptive statistics to analyze the background characteristics of the participants (i.e. frequencies, percentages, and means). Analyses of the relevance of each client characteristic were guided by previous studies in which the relevance of client characteristics was assessed.[7,16-18] For both surveys, we used median scores to determine relevance: client characteristics with a median between 1 and 3 were interpreted as irrelevant, a median between 4 and 6 as uncertain, and a median between 7 and 9 as relevant. Furthermore, inter-quartile ranges (IQR) were used to determine the level of consensus between participants: an IQR≤2 was considered as sufficient consensus and IQR>2 as a lack of consensus. The combination of the median and IQR determined how the relevance of each client characteristic was judged. A client characteristic was considered relevant if it had a median between 7 and 9, combined with an IQR≤2; irrelevant if it had a median between 1 and 3, combined with an IQR≤2; and uncertain if it had a median between 4 and 6, or IQR>2. Sensitivity analyses were performed to check for differences between nurses and insurers regarding the relevance assigned. The results of survey A were analyzed prior to survey B and the second Delphi-round.

We performed content analysis[19] to analyze the client characteristics suggested by the participants in survey A. One researcher reordered each of the characteristics by grouping together similar suggestions and defining these based on the definitions provided by the participants. If too many characteristics were mentioned to assess and discuss during the expert panel meeting, the researchers selected the potentially most relevant suggestions. The researchers involved in this selection have expertise in the areas of (home care) nursing, primary care, health policy and health economics. We selected characteristics that: 1) were known predictors of home care use in the literature; 2) involved a predictor category that had not yet been included in the CM-SF questionnaire; or 3) were identified as lacking in the CM-SF questionnaire by (among others) district nurses in the pilot-study.[4,20] Suggestions that overlapped with items already in the CM-SF questionnaire or for which no definition was provided were excluded. The researchers discussed this until agreement was reached regarding the selection.

Second Delphi-round

Data collection

The second Delphi-round consisted of an expert panel meeting and online survey C. Due to the large difference in perspective between district nurses and insurers, and the potential barriers to speaking openly, we decided to hold two separate expert panel meetings: one for district nurses, and one for insurers. Each two-hour expert panel meeting was held online using Zoom video-conferencing software. The meeting was recorded using an external voice recorder. All participants who completed the first Delphi-round survey were invited to participate. One researcher chaired the meeting and moderated the discussion, one researcher timed the meeting and was able to ask questions, and one researcher (i.e. a panel observer) took notes. In advance of the meeting, the participants were sent a document revealing their individual scores, the median and range of the group scores of the first Delphi-round. The moderator also had a personalized score sheet showing the scores of each participant for each client characteristic.

During the meeting, the participants shared their thoughts and discussed their thinking regarding the scores they had given to each client characteristic. Pre-existing client characteristics that were found to be consensually relevant or irrelevant in survey A in the first Delphi-round were not discussed.

At the end of the meeting, the participants completed survey C in which they reassessed a) pre-existing client characteristics that had initially been found to be uncertain, and b) all (selected) suggested client characteristics (because no results on relevance for all participants were available yet). Reassessment was carried out in the same way as the initial assessment in survey A and B, i.e. by scoring relevance on a 9-Point Likert scale. If the participant’s score did not change between rounds, they could fill in the same score. Unlike in survey A, it was not possible to suggest new client characteristics in this survey.

Data analysis

The scores were analyzed in the same way as in survey A and B, i.e. by determining median and IQR.

Results

Background characteristics of participants

Table 5.1 presents an overview of (the background characteristics of) the participating experts. All 16 contacted nurses agreed to participate and filled in survey A in the first Delphi-round (100%). Of these, 12 nurses (75%) also participated in the expert panel meeting and completed surveys B and C. Almost all the participating nurses were district nurses working at a home care organization. Six out of eight contacted insurers agreed to participate and filled in survey A (75%). The two insurers who did not participate were already being represented by colleagues from their health insurance company who had agreed to participate. In the second Delphi-round, five insurers were able to participate in the expert panel meeting and surveys B and C (63%). Most participating insurers worked as home care purchasers. Reasons given for not participating in the second Delphi-round (for both nurses and insurers) were lack of time, other appointments, or maternity leave.

Table 5.1. Background characteristics of the participants (per Delphi-round and per Delphi-group)

	Delphi-round 1a			**Delphi-round 1b and 2**		
	Total	**Nurses**	**Insurers**	**Total**	**Nurses**	**Insurers*****
	N=22	**n=16**	**n=6**	**N=17**	**n=12**	**n=5**
Gender (n, %)						
Male	5 (22.7)	1 (6.3)	4 (66.7)	2 (11.8)	0 (0)	2 (40.0)
Female	17 (77.3)	15 (93.8)	2 (33.3)	15 (88.2)	12 (100)	3 (60.0)
Age (range, average)	24-65 (39)	24-65 (36)	31-61 (48)	24-61 (35)	24-49 (32)	31-61 (41)
Education (n, %)						
University of Applied Science	16 (72.7)	15 (93.8)	1 (16.7)	12 (70.6)	11 (91.7)	1 (20.0)
University	6 (27)	1 (6.3)	5 (83.3)	5 (29.4)	1 (8.3)	4 (80.0)
Organization (n, %)*						
Home care organization	15 (68.2)	15 (93.8)	0 (0)	11 (64.7)	11 (91.7)	0 (0)
Dutch Nurses Association	3 (13.6)	3 (18.7)	0 (0)	2 (11.8)	2 (16.7)	0 (0)
Health insurance company	6 (27.3)	0 (0)	6 (100)	5 (29.4)	0 (0)	5 (100)
Job title (n, %)**						
District nurse	14 (63.6)	14 (87.5)	0 (0)	11 (64.7)	11 (91.7)	0 (0)
Home care purchaser	5 (22.7)	0 (0)	5 (83.3)	3 (17.6)	0 (0)	3 (60.0)
Policy advisor insurer	0 (0)	0 (0)	1 (17)	1 (5.9)	0 (0)	1 (20.0)
Other**	3 (14)	2 (12.5)	1 (17)	2 (11.8)	1 (8.3)	1 (20.0)

* Some participants were working at multiple organizations or held multiple positions. Frequencies and percentages therefore do not add to N/100%.

** Process director electronic health records at home care organization, policy advisor at home care organization (only Delphi-round 1), policy manager at health insurance company.

First Delphi-round

The participants assessed the relevance of 11 pre-existing client characteristics. The results on the relevance of each characteristic are presented in Table 5.2. In total, three client characteristics (27%) were considered relevant (median 7-9 and IQR≤2); these were ‘Washing/showering’, ‘Cognitive skills for daily decision making’, and ‘Illness prognosis’. The relevance of the other eight client characteristics (73%) was found to be uncertain (median 4-6 or IQR>2), mainly due to a lack of consensus between participants (i.e. IQR>2). None of the characteristics was considered irrelevant as a predictor of home care use.

In the open-ended questions in survey A, participants suggested 142 client potentially relevant characteristics for predicting home care use. After these were grouped, we ended up with 53 unique client characteristics, that were added to a corresponding predictor category (see Appendix 5B). On average, nine client characteristics were added to each category, ranging from four in the ‘Social environment and network’ category to 14 in the ‘Others’ category. Of the 53 client characteristics, the 11 potentially most relevant were selected: ‘Multi-morbidity’, ‘Skin problems’, ‘Vision and hearing’, ‘Malnutrition’, ‘Mental functioning’, ‘Resilience’, ‘Dementia’, ‘Self-management and self-direction’, ‘Learning ability’, ‘Social network’, and ‘Need for technical nursing care’.

The results regarding the relevance of each of the 11 suggested client characteristics are shown in Table 5.2 (marked with an *). Five characteristics (45%) were assessed as relevant (median 7-9 and IQR≤2). The relevance of the remaining six characteristics (55%) was uncertain (median 4-6 or IQR>2), due to a lack of consensus (i.e. IQR>2) and/or a low median score (median 4-6). Again, none of the characteristics was considered irrelevant as a predictor of home care use.

According to the sensitivity analyses (see Appendix 5B), the nurses seem to have given the client characteristics higher median scores than the insurers. Additionally, there was more consensus regarding relevance (i.e. a relatively lower IQR) among the nurses than among the insurers.

Second Delphi-round

After the discussion during the expert panel meeting, the participants reassessed the relevance of the eight pre-existing client characteristics that were found to be uncertain (see Table 5.2). With the exception of ‘Eating and drinking’, on which there was consensus regarding relevance following reassessment, the seven other pre-existing client characteristics that were reassessed remained uncertain. Of the client characteristics that had been suggested, the characteristics ‘Learning ability’ and ‘Need for technical nursing care’ were found to be relevant after reassessment, while ‘Dementia’ shifted from relevant to uncertain.

After the second Delphi-round, there was thus agreement between participants on the relevance of 10 of the 22 client characteristics for predicting home care use. Overall, more of the client characteristics that had been suggested were considered relevant than the

Table 5.2. Results on client characteristics' relevance (median, IQR) per Delphi-round, sorted by category of client characteristics

	Delphi round 1a and 1b				Delphi round 2			
	Median	Q1-Q3	IQR	Judgment	Median	Q1-Q3	IQR	Judgment
Daily functioning								
Meal preparation	6	2.75-7.0	4.25	Uncertain	5	2.5-7.0	4.50	Uncertain
Eating and drinking	7	5.75-8.0	2.25	Uncertain	7	5.0-7.0	2.00	Relevant
Continence	6	4.5-7.0	2.50	Uncertain	5	3.0-6.5	3.50	Uncertain
Toileting	7	3.75-8.25	4.50	Uncertain	7	4.0-8.0	4.00	Uncertain
Mobility	7	5.0-9.0	4.00	Uncertain	7	5.0-7.5	2.50	Uncertain
Dressing	7	5.0-8.0	3.00	Uncertain	6	5.0-7.5	2.50	Uncertain
Washing/ showering	7	5.0-7.0	2.00	Relevant	-	-	-	-
Medication use	7	4.75-8.0	3.25	Uncertain	7	5.0-8.0	3.00	Uncertain
Physical health status								
Multi-morbidity*	7	6.5-7.5	1.00	Relevant	7	7.0-7.0	0.00	Relevant
Skin problems*	7	5.0-8.0	3.00	Uncertain	7	5.0-8.0	3.00	Uncertain
Vision and hearing*	5	3.5-6.0	2.50	Uncertain	5	3.0-6.0	3.00	Uncertain
Malnutrition*	6	4.5-6.0	1.50	Uncertain	6	5.0-6.5	1.50	Uncertain
Mental health status and behavior								
Cognitive skills for daily decision making	8	7.0-9.0	2.00	Relevant	-	-	-	-
Mental functioning*	7	6.0-8.0	2.00	Relevant	7	6.0-8.0	2.00	Relevant
Resilience*	7	6.5-7.5	1.00	Relevant	7	6.5-8.0	1.50	Relevant
Dementia*	7	6.5-8.0	1.50	Relevant	5	3.0-7.5	4.50	Uncertain
Self-management and self-direction*	7	6.0-8.5	2.50	Uncertain	8	6.5-9.0	2.50	Uncertain
Health literacy								
Learning ability*	7	6.0-8.5	2.50	Uncertain	8	7.0-8.0	1.00	Relevant
Social environment and network								
Informal care	8	6.0-9.0	3.00	Uncertain	9	6.5-9.0	2.50	Uncertain
Social network*	7	7.0-8.0	1.00	Relevant	8	7.0-8.5	1.50	Relevant
Other								
Illness prognosis	8	7.0-9.0	2.00	Relevant	-	-	-	-
Need for technical nursing care*	6	5.5-8.0	2.50	Uncertain	7	6.0-8.0	2.00	Relevant

Note: Pre-existing client characteristics that were assessed as relevant in the first Delphi-round were not re-assessed in the second Delphi-round.

* Characteristics were selected from the client characteristics suggested by the participants in survey A. These were assessed in survey B (in Delphi-round 1b) and re-assessed in survey C.

pre-existing characteristics (6/11 vs. 4/11, respectively). Furthermore, there were differences in the number of client characteristics in each predictor category that were assessed as relevant (see Table 5.2).

In the results of the sensitivity analysis (see Appendix 5C), no clear changes were found in the medians (i.e. some increased and others decreased) or the consensus (i.e. on some characteristics more consensus, and on others less consensus was found) in the reassessment by the nurses compared to the reassessment by the insurers. Furthermore, compared to the assessment of all the participants combined in the second round, the nurses' final assessment of relevance deviated on two client characteristics (i.e. one was relevant instead of uncertain;

one was uncertain instead of relevant). For the insurers, the assessment deviated on seven client characteristics (mainly less relevant compared to all participants).

Discussion

In this Delphi-study, district nurses and home care insurers discussed and assessed the relevance of various client characteristics as predictors of home care use. Eleven pre-existing characteristics from the CM-SF questionnaire were assessed. The participants also suggested 142 client characteristics as potentially relevant predictors of home care use: we were able to group these suggested characteristics into 53 unique characteristics and, after discussion, we selected 11 for expert assessment. The relevance of the client characteristics in the category of 'Daily functioning' was mainly assessed as uncertain, except for 'Eating and drinking' and 'Washing/showering'. Client characteristics from other categories were more likely to be considered relevant: 'Multi-morbidity' (from the category 'Physical health status'), 'Cognitive skills for daily decision making', 'Mental functioning', and 'Resilience' (from the category 'Mental health status and behavior'), 'Learning ability' (from the category 'Health literacy'), 'Social network' (from the category 'Social environment and network'), and 'Illness prognosis' and 'Need for technical nursing care' (from the category 'Other'). In total, 10 client characteristics were assessed as relevant and 12 as uncertain. The participants did not consider any of the characteristics as irrelevant for predicting home care use.

The participants' view on which characteristics are relevant predictors of home care use deviates from the set of characteristics currently included in existing case-mix models for home care. In a systematic literature review from Van den Bulck et al. (2020), we found that characteristics from the 'Daily functioning' category were included in all existing case-mix models.[5] Notably, these characteristics were mainly assessed as of uncertain relevance by our participants. Examples include 'Toileting', 'Mobility', and 'Dressing'. At the same time, the majority of characteristics that were assessed as relevant by nurses and insurers, such as 'Resilience', 'Learning ability', and 'Social network', are seldom included in existing case-mix models.[5] One possible explanation relates to the difficulty of operationalizing these characteristics in a concise and standardized manner. For example, existing questionnaires relating to the 'Social network' characteristic include numerous sub-items and multiple aspects – e.g. the number of social contacts that a client has, what kind of social contact a client has, or whether a client is satisfied with his/her own social network.[3] In addition to this, these client characteristics are difficult to assess. For example, it can be challenging to assess the client's resilience or social network, because it requires good an probably long-term knowledge of the client. Another possible explanation for this relates to the explanation for a client's care needs. Characteristics in the category 'Daily functioning' are more 'downstream' (i.e. proximal) characteristics that influence a client's home care use more directly.[21] By contrast, most of the suggested characteristics assessed as relevant are more 'upstream' (i.e.

distal) characteristics, which are fundamental causes of a client's home care use and that may have an influence on one or multiple downstream characteristics.[21] For example, having few social contacts (an upstream characteristic) may not necessarily be a direct reason for receiving home care, but when combined with dementia (a downstream characteristic) it may cause the client to have a (higher) need for home care. The associations between several characteristics and home care use have also been demonstrated in other studies. For example, for 'Multi-morbidity', home care use appears to increase with the number of chronic diseases that a client has[22]; and with regard to 'Mental functioning', home care use is higher for clients with depressive symptoms[23] and clients with dementia[24] compared to those without.

The development of a case-mix classification is affected by the tension between the need for a relatively simple model and the broad range of views on home care policy and practice. The participants suggested a large number of additional unique client characteristics (more than 50) as potentially relevant predictors of home care use. One possible explanation for this would be the broad perspective on home care among the participants, who have experienced a great variety of increasingly complex home care clients and interventions. This broad perspective might be difficult to reconcile with the need for relatively simple CM-SF questionnaire items. With regard to home care policy, the Dutch government is focusing on encouraging clients to live independently at home for as long as possible by adopting approaches such as Positive Health[9] and "reablement" (i.e. "a person-centered, holistic approach that aims to enhance an individual's physical and/or other functioning, to increase or maintain their independence in meaningful activities of daily living at their place of residence and to reduce their need for long-term services").[25] Driven by national-level policies[26,27], but also developments at the international level[28,29], nurses and insurers are increasingly striving to improve the independence and self-reliance of clients. This focus within home care policy can thus also be expected to show through in how nurses and insurers view client characteristics when seeking to predict home care use (i.e. by suggesting additional characteristics such as 'Self-management and self-direction'). What is more, when district nurses assess a client's home care needs, they not only determine functional limitations, such as difficulties with dressing, but they look specifically for the etiology that lies behind it, such as a client's resilience or learning ability.[30] However, the goal of the CM-SF questionnaire and of a case-mix model is not to explain home care, but to predict home care use adequately, and this goal may deviate from or be narrower than the broad focus of policy and the views of experts within the home care sector.

One strength of this study is its robustness, enhanced by its compliance with the RAM and CREDES guidelines when performing and reporting on our study. Furthermore, we included two different groups of experts in the field of home care: nurses and insurers. On the one hand, discussions of the relevance of the characteristics were held separately for each group, so that all participants would feel comfortable enough to share their views. On the other hand, the results of the assessments of both groups were combined, so that they had quantitative input from the other group to help them reflect on their own assessments. Another strength was the initial assessment of the relevance of suggested client characteristics prior to the expert panel meeting to ensure that all participants had the opportunity to consider their view before the discussion. A limitation of our study is that the researchers selected the 53 suggested client characteristics. It is unclear how the total group of experts would have rated the client characteristics that were omitted. However, since the selected characteristics were assessed as relevant relatively often, we may conclude that an appropriate selection was made. Another limitation is the small sample size of the participating insurers. This could have led to the relatively low consensus among this group compared to the nurses. However, since the participants represented four health insurers with a combined 85% of market share in the Netherlands, we assume that the lack of consensus and the scores provided are a relatively accurate representation of the views of Dutch health insures on home care use predictors.

The participating nurses and insurers seem to agree that characteristics beyond the client's health and daily functioning may be relevant for case-mix classification, and that a more holistic view of the client could be useful in predicting home care use. For other countries that have been developing home care case-mix classification, this knowledge could be used to improve their models. Moreover, our findings also guide future research on home care case-mix classification, for example for countries that still are to develop certain models. However, the challenge remains determining which relevant suggested characteristics are suitable for case-mix classification due to the difficulty of operationalizing these characteristics. To continue the development of case-mix based prospective payment in the Netherlands, we would therefore recommend to conduct additional research with stakeholders in home care – including district nurses, insurers, home care providers, the nurses association – to discuss how the client characteristics assessed as relevant can best be operationalized and measured. Furthermore, to avoid misunderstandings (e.g. on why certain characteristics are or are not included as predictors for case-mix classification) and maintain professional support, it would be essential for policy makers to involve district nurses and insurers (and possibly other parties) in the development of the CM-SF questionnaire (for example) and when implementing case-mix classification for prospective payment. This is necessary because, according to our study, client characteristics that end up in case-mix classification may not necessarily be representative of home care as a whole.

Conclusions

While some client characteristics have proven their relevance as predictors of the use of home care in existing home care case-mix models, these models could still be improved further. In this Delphi-study, we have found that, according to district nurses and health insurers, it may be possible to achieve higher predictive value by including a more holistic view in the predictors in the case-mix model. However, the challenge remains keeping all stakeholders on board as their views on how case-mix classification should be formed and used may differ. New client characteristics namely still have to be operationalized (which is rather complex) and to prove their predictive value, and characteristics that could have high predictive value may not be in line with the full breadth of daily home care practice.

References

1. Parsons M, Rouse P, Sajtos L, Harrison J, Parsons J, Gestro L. Developing and utilising a new funding model for home-care services in New Zealand. *Health Soc Care Community*. 2018;26(3):345-355.
2. Poss JW, Hirdes JP, Fries BE, McKillop I, Chase M. Validation of Resource Utilization Groups version III for home care (RUG-III/HC): Evidence from a canadian home care jurisdiction. *Med Care*. 2008;46(4):380-387.
3. Van den Bulck AOE, Elissen AMJ, Metzelthin SF, et al. The Case-Mix Short-Form questionnaire for prospective payment of homecare services: Development and psychometric testing. (submitted for publication)
4. Elissen AMJ, Verhoeven GS, de Korte MH, et al. Development of a casemix classification to predict costs of home care in the Netherlands: a study protocol. *BMJ Open*. 2020;10(2):e035683.
5. Van den Bulck AOE, de Korte MH, Elissen AMJ, Metzelthin SF, Mikkers MC, Ruwaard D. A systematic review of case-mix models for home health care payment: Making sense of variation. *Health Policy*. 2020;124(2):121-132.
6. Veldhuizen JD, Mikker MC, Schuurmans MJ, Bleijenberg N. Predictors of district nursing care utilisation for community-living people in the Netherlands: an exploratory study using claims data. *BMJ Open*. 2021;11(9):e047054.
7. Van den Bulck AOE, Metzelthin SF, Elissen AMJ, et al. Which client characteristics predict home-care needs? Results of a survey study among Dutch home-care nurses. *Health Soc Care Community*. 2019;27(1):93-104.
8. Manton KG, Hausner T. A multidimensional approach to case mix for home health services. *Health Care Financ Rev*. 1987;8(4):37-54.
9. Seligman MEP. Positive Health. *Applied Psychology*. 2008;57(s1):3-18.
10. Beresford P. Public Participation in health and social Care: Exploring the co-production of knowledge. *Fron Sociol*. 2019;3(41).
11. Fitch K, Bernstein SJ, Aguilar MD, et al. *The RAND/UCLA Appropriateness Method User's Manual*. Santa Monica, CA: RAND; 2001.
12. Jünger S, Payne SA, Brine J, Radbruch L, Brearley SG. Guidance on Conducting and REporting DElphi Studies (CREDES) in palliative care: Recommendations based on a methodological systematic review. *Palliat Med*. 2017;31(8):684-706.
13. Keeney S, Filicity H, McKenna H. *The Delphi Technique in Nursing and Health Research*. United Kingdom: Blackwell Publishing; 2010.
14. Zorgwijzer. Cijfers zorgverzekering. https://www.zorgwijzer.nl/faq/cijfers-zorgverzekering. Accessed 16 November 2021.
15. Qualtrics. Qualtrics XM homepage. https://www.qualtrics.com/nl/. Accessed 16 November 2021.
16. Elissen AM, Struijs JN, Baan CA, Ruwaard D. Estimating community health needs against a triple aim background: What can we learn from current predictive risk models? *Health Policy*. 2015;119(5):672-679.
17. Elissen AMJ, Metzelthin S, Van den Bulck AOE, Verbeek H, Ruwaard D. *Case-mix classificatie als basis voor bekostiging van wijkverpleging*. Maastricht, the Netherlands: Maastricht University, Faculty of Health, Medicine and Life Sciences, Care and Public Health Research Institute (CAPHRI), Department of Health Services Research; 2017.
18. Hertroijs DFL, Brouwers MCGJ, Elissen AMJ, Schaper NC, Ruwaard D. Relevant patient characteristics for estimating healthcare needs according to healthcare providers and people with type 2 diabetes: A Delphi survey. *BMC Health Serv Res*. 2019;19(1):575-575.
19. Polit DF, Beck CT. *Nursing research: Generating and assessing evidence for nursing practice*. Ninth ed. Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2012.
20. Verhoeven G, De Korte M, Van der Weij L, et al. *Onderzoeksrapport Pilot Cliëntprofielen Wijkverpleging: Ontwikkeling van cliëntprofielen in de wijkverpleging*. Dutch Healthcare Authority (NZa), Utrecht, Tilburg University, Tilburg, and Maastricht University, Maastricht, 2020.
21. Gehlert S, Sohmer D, Sacks T, Mininger C, McClintock M, Olopade O. Targeting health disparities: a model linking upstream determinants to downstream interventions. *Health Aff (Millwood)*. 2008;27(2):339-349.
22. Lehnert T, Heider D, Leicht H, et al. Review: health care utilization and costs of elderly persons with multiple chronic conditions. *Med Care Res Rev*. 2011;68(4):387-420.
23. Hoell A, Weyerer S, Maier W, et al. The impact of depressive symptoms on utilization of home care by the elderly: Longitudinal results from the AgeMooDe study. *J Affect Disord*. 2016;204:247-254.

24. Eichler T, Hoffmann W, Hertel J, et al. Living alone with dementia: Prevalence, correlates and the utilization of health and nursing care services. *J Alzheimer's Dis*. 2016;52(2):619-629.
25. Metzelthin SF, Rostgaard T, Parsons M, Burton E. Development of an internationally accepted definition of reablement: A Delphi study. *Ageing Soc*. 2020:1-16.
26. Stuurgroep Kwaliteitskader. *Wijkverpleging: Kwaliteitskader Wijkverpleging*. Utrecht, the Netherlands: Stuurgroep Kwaliteitskader;2018.
27. V&VN. *Zelfmanagementondersteuning behoort tot de kern van verplegen!* Utrecht, the Netherlands: V&VN; 2014.
28. WHO. *WHO global strategy on people-centred and integrated health services: interim report*. Geneva: World Health Organization; 2015.
29. Tuntland H, Aaslund MK, Espehaug B, Førland O, Kjeken I. Reablement in community-dwelling older adults: a randomised controlled trial. *BMC Geriatr*. 2015;15:145.
30. Rosendal H. *Expertisegebied Wijkverpleegkundige*. Utrecht, the Netherlands: V&VN; 2019.

Appendices

Appendix 5A. Example of survey questions

Appendix 5B. The 53 unique client characteristics that were suggested

Appendix 5C. Sensitivity analysis regarding the relevance of client characteristics (median and IQR) per Delphi-round, comparing results for all participants, nurses, and insurers

Appendix 5A. Example of survey questions

Category 1. Daily functioning

For example: (instrumental) activities of daily living (ADL and IADL).

From the category ‘Daily functioning’, the following client characteristics are included in the Case-Mix Short Form (CM-SF) questionnaire:

- Meal preparation
- Eating and drinking
- Continence
- Toileting
- Mobility
- Dressing
- Washing/showering
- Medication use

Meal preparation

Answer options in the CM-SF:

- *The client prepares all meals independently.*
- *The client needs some help from others (e.g. encouragement, supervision, or physical support) when preparing (a) meal(s).*
- *Meals need to be prepared fully by others.*

How relevant do you consider the characteristic of ‘Meal preparation’ to predicting the need for home care?

Totally irrelevant											**Extremely relevant**
○	○	○	○	○	○	○	○	○	○	○	○

[…]

Do you think any additional client characteristic(s) from the category ‘Daily functioning’ is/are relevant to predicting the need for home care?

If yes:

Client characteristic 1 (max. 6 words)	………………………………………………………………………
Definition client characteristic 1	………………………………………………………………………
Suggest an existing question or questionnaire to objectively measure client characteristic 1 (optional)	……………………………………………………………………… ……………………………………………………………………… ………………………………………………………………………

Appendix 5B. The 53 unique client characteristics that were suggested

The 53 suggested client characteristics (per category of predictors) that resulted from grouping the 142 client characteristics suggested by the participants:

- Category 'Daily functioning' (11):
  1. Daily routine
  2. Use of telephone
  3. Housework
  4. Grocery shopping
  5. Sleeping
  6. Managing (financial) administration
  7. Taking the initiative
  8. ADL tasks*
  9. Stocking*
  10. Changing incontinence material*
  11. Medication*
- Category 'Physical health status' (13):
  12. Multimorbidity**
  13. Diabetes
  14. Skin problems**
  15. Airway functioning
  16. Vision and hearing**
  17. Pain
  18. Polypharmacy
  19. Risk of falls
  20. Physical fitness
  21. Malnutrition**
  22. Excess weight
  23. Mobility*
  24. Progressive disease*
- Category 'Mental health status and behaviour' (7):
  25. Mental functioning**
  26. Resistance to receiving care
  27. Resilience**
  28. Dementia**
  29. Communication skills
  30. Self-management and self-direction**
  31. Cognitive skills*
- Category 'Health literacy' (7):
  32. Health literacy
  33. Healthy lifestyle
  34. Learning ability**
  35. Compliance with therapy
  36. Digital skills
  37. Awareness of support options
  38. Capacity for self-care*
- Category 'Social environment and network' (4):
  39. Loneliness
  40. Social network**
  41. Participation in social activities
  42. Meaning
- Category 'Other' (11):
  43. Financial resources
  44. Formal care network
  45. Living in an urban area
  46. Need for technical nursing care**
  47. Quality of transfer from the hospital
  48. Quality of life
  49. Frailty
  50. Availability of facilities
  51. Care needs at multiple levels*
  52. Terminal status*
  53. (Illness) prognosis/Stability*

* Client characteristics that (partially) overlap with one or several of the 11 pre-existing client characteristics that were already included in the Case-Mix Short Form questionnaire.
** The 11 suggested client characteristics that were selected by the researchers for further assessment.

Appendix 5B. Sensitivity analysis regarding the relevance of client characteristics (median and IQR) per Delphi-round, comparing results for all participants, nurses, and insurers

	Delphi round 1									Delphi round 2								
	Total			Nurses			Insurers			Total			Nurses			Insurers		
	Median	Q1-Q3	IQR	Median	Q1-Q3	IQR	Median	Q1-Q3	IQR	Median	Q1-Q3	IQR	Median	Q1-Q3	IQR	Median	Q1-Q3	IQR
Pre-existing																		
Meal preparation	6.00	2.75-7.0	4.25	6.00	5.0-7.0	2.00	4.00	1.75-6.25	4.50	5.00	2.5-7.0	4.50	6.00	4.25-7.0	2.75	3.00	2.0-4.0	2.00
Eating and drinking	7.00	5.75-8.0	2.25	7.00	6.0-8.75	2.75	6.00	4.75-8.0	3.25	7.00	5.0-7.0	2.00	7.00	7.0-7.75	0.75	5.00	3.5-6.0	2.50
Continence	6.00	4.5-7.0	2.50	6.00	5.0-7.0	2.00	5.50	3.0-6.5	3.50	5.00	3.0-6.5	3.50	5.50	3.25-7.0	3.75	5.00	3.0-5.5	2.50
Toileting	7.00	3.75-8.25	4.50	7.00	3.75-9.0	5.25	4.50	3.75-7.25	3.50	7.00	4.0-8.0	4.00	7.50	5.25-8.0	2.75	4.00	3.5-7.5	4.00
Mobility	7.00	5.0-9.0	4.00	7.50	5.25-9.0	3.75	6.50	4.75-7.5	2.75	7.00	5.0-7.5	2.50	7.00	5.0-8.0	3.00	5.00	4.5-7.0	2.50
Dressing	7.00	5.0-8.0	3.00	6.50	5.0-8.0	3.00	7.00	5.0-8.25	3.25	6.00	5.0-7.5	2.50	6.50	5.0-7.75	2.75	5.00	5.0-7.5	2.50
Washing	7.00	5.0-7.0	2.00	7.00	5.0-7.0	2.00	7.00	5.75-7.5	1.75	-	-	-	-	-	-	-	-	-
Medication use	7.00	4.75-8.0	3.25	7.50	6.25-8.75	2.50	4.50	2.75-7.25	4.50	7.00	5.0-8.0	3.00	7.00	6.25-8.75	2.50	5.00	3.5-6.0	2.50
Cognitive skills for daily decision making	8.00	7.0-9.0	2.00	8.50	7.25-9.0	1.75	7.00	3.75-9.0	5.25	-	-	-	-	-	-	-	-	-
Informal care	8.00	6.0-9.0	3.00	8.00	7.25-9.0	1.75	7.50	5.75-9.0	3.25	9.00	6.5-9.0	2.50	9.00	8.25-9.0	0.75	7.00	5.5-9.0	3.50
Illness prognosis	8.00	7.0-9.0	2.00	8.00	7.0-9.0	2.00	8.00	6.0-8.25	2.25	-	-	-	-	-	-	-	-	-
Suggested																		
Multimobidity	7.00	6.5-7.5	1.00	7.00	7.0-7.75	0.75	7.00	6.0-7.5	1.50	7.00	7.0-7.0	0.00	7.00	7.0-7.75	0.75	7.00	5.5-7.0	1.50
Skin problems	7.00	5.0-8.0	3.00	7.00	5.0-8.0	3.00	7.00	4.0-8.0	4.00	7.00	5.0-8.0	3.00	7.00	5.0-8.0	3.00	5.00	4.0-7.0	3.00
Vision and hearing	5.00	3.5-6.0	2.50	6.00	4.25-6.0	1.75	4.00	3.0-5.5	2.50	5.00	3.0-6.0	3.00	5.50	3.25-6.0	2.75	3.00	3.0-4.5	1.50
Malnutrition	6.00	4.5-6.0	1.50	6.00	4.25-6.75	2.50	5.00	4.5-5.5	1.00	6.00	5.0-6.5	1.50	6.00	5.25-7.75	2.50	5.00	3.5-5.0	1.50
Mental functioning	7.00	6.0-8.0	2.00	7.00	6.0-8.0	2.00	7.00	6.0-7.5	1.50	7.00	6.0-8.0	2.00	7.00	6.25-8.0	1.75	7.00	6.0-7.5	1.50
Resilience	7.00	6.5-7.5	1.00	7.00	6.25-8.0	1.75	7.00	6.5-7.0	0.50	7.00	6.5-8.0	1.50	8.00	6.25-8.0	1.75	7.00	6.5-7.5	1.00
Dementia	7.00	6.5-8.0	1.50	7.00	6.0-7.75	1.75	8.00	7.0-8.5	1.50	5.00	3.0-7.5	4.50	4.00	3.0-5.75	2.75	8.00	7.0-8.5	1.50
Self-management and self-direction	7.00	6.0-8.5	2.50	7.50	6.0-8.75	2.75	7.00	5.5-8.5	3.00	8.00	6.5-9.0	2.50	8.00	6.25-9.0	2.75	8.00	6.0-8.5	2.50
Learning ability	7.00	6.0-8.5	2.50	7.00	6.25-8.75	2.50	6.00	5.5-8.5	3.00	8.00	7.0-8.0	1.00	8.00	7.0-8.0	1.00	7.00	6.0-8.5	2.50
Social network	7.00	7.0-8.0	1.00	7.00	7.0-8.0	1.00	7.00	4.5-8.5	4.00	8.00	7.0-8.5	1.50	8.00	7.0-9.0	2.00	7.00	4.5-8.0	3.50
Need for technical nursing care	6.00	5.5-8.0	2.50	6.00	5.0-8.0	3.00	7.00	6.0-8.5	2.50	7.00	6.0-8.0	2.00	7.50	6.0-8.75	2.75	6.00	4.5-8.0	3.50

Chapter 6

Nurse-sensitive outcomes in home care: A Delphi study

Jessica D. Veldhuizen
Anne O.E. van den Bulck
Arianne M.J. Elissen
Misja C. Mikkers
Marieke J. Schuurmans
Nienke Bleijenberg

*PLOS ONE. 2021; 16(5): e0251546**

Abstract

Objectives: To determine nurse-sensitive outcomes in home care for community-living older people. Nurse-sensitive outcomes are defined as patient outcomes that are relevant based on nurses' scope and domain of practice and that are influenced by nursing inputs and interventions.

Design: A Delphi study following the RAND/UCLA Appropriateness Method with two rounds of data collection.

Setting: Home care in the community care setting in the Netherlands.

Participants: Experts with current or recent clinical experience as district nurses as well as expertise in research, teaching, practice, or policy in the area of district nursing.

Main outcome measures: Experts assessed potential nurse-sensitive outcomes for their sensitivity to nursing care by scoring the relevance of each outcome and the ability of the outcome to be influenced by nursing care (influenceability). The relevance and influenceability of each outcome were scored on a nine-point Likert scale. A group median of 7 to 9 indicated that the outcome was assessed as relevant and/or influenceable. To measure agreement among experts, the disagreement index was used, with a score of <1 indicating agreement.

Results: In Delphi round two, 11 experts assessed 46 outcomes. In total, 26 outcomes (56.5%) were assessed as nurse-sensitive. The nurse-sensitive outcomes with the highest median scores for both relevance and influenceability were the patient's autonomy, the patient's ability to make decisions regarding the provision of care, the patient's satisfaction with delivered home care, the quality of dying and death, and the compliance of the patient with needed care.

Conclusions: This study determined 26 nurse-sensitive outcomes for home care for community-living older people based on the collective opinion of experts in home care. This insight could guide the development of quality indicators for home care. Further research is needed to operationalize the outcomes and to determine which outcomes are relevant for specific subgroups.

* In the published article, the term 'district nursing care' is used. In this and other Chapters, this term has been changed to 'home care' for the purpose of this dissertation.

Introduction

Worldwide, healthcare services are challenged by the rapidly growing ageing population.[1] Moreover, the majority of older people desire to continue living at home, resulting in a rise in the total number of community-living older people. In Europe, the majority of older people live independently at home, either alone or with a spouse or other family members.[2] However, with increasing age, adverse consequences such as frailty, disability, chronic diseases, and multiple complex long-term conditions are present among these community-living older people.[3,4] Because of these adverse consequences, community-living older people often need assistance with their daily life activities to be able to live at home as long as possible. Professional care assistance at home is provided through home care, next to other healthcare professionals such as the general practitioner and other (paramedic) professionals in primary care.[5] The funding, organization, definition, and delivery of home care vary between countries worldwide.[6-8] For the purpose of this paper, home care is defined as any technical, medical, supportive or rehabilitative nursing care and the provision of assistance with personal care.[7] This definition is in line with the definition used for community care nursing in Europe[7,9] and reflects home care in the Netherlands.[10]

In many European countries, the quality of care at home is under pressure, as demands on home care are increasing due to the ageing population, the increase in care complexity, and the shortage of home care professionals.[11,12] Therefore, it is crucial to monitor the quality of home care in terms of patient outcomes. Insight into patient outcomes is necessary to measure the effect of healthcare services on patient health and wellbeing.[13,14] However, patient outcomes to measure the quality of home care in clinical practice on patients' health status and wellbeing are currently scarce.[15]

For home care, it is necessary to determine nurse-sensitive outcomes, i.e., patient outcomes that are relevant based on nurses' scope and domain of practice and that are influenced by nursing inputs and interventions.[16] The Nursing Outcome Classification (NOC) provides a set of nursing outcomes that can be used across the care continuum to assess the outcomes of care following nursing interventions.[17] However, in this overview, it is unclear what outcomes are relevant for home care. Two studies, one by the International Consortium for Health Outcomes Measurement (ICHOM)[18] and the other by Joling et al.[15] have already been conducted on outcomes that are potentially relevant to home care. The ICHOM developed a set of standard health outcome measures to guide the improvement of the quality of care for the general population of older people.[18] While this study provided a meaningful overview of relevant outcomes for this population, it remains unclear whether these outcomes are nurse-sensitive outcomes specifically for home care because they were developed by teams of physician leaders, researchers and patient advocates.[18] The systematic review by Joling et al.[15] identified 567 quality indicators for older people in the community care setting (i.e., primary care and home care). Most of these indicators refer to care processes (80%), while only 33 indicators focus on 18 unique patient outcomes regarding health status and wellbeing (5.8%).[15] However, it is unclear which of the proposed outcomes in the literature could be used as nurse-sensitive outcomes for home care. Before quality indicators can be developed and operationalized, it is necessary to determine what outcomes are relevant to measure.

The aim of this study was to determine nurse-sensitive outcomes for home care for community-living older people. Measuring nurse-sensitive outcomes for home care is important because it can contribute to understanding the internal quality of teams and organizations. It provides insight into the quality of delivered care, which consequently could guide monitoring and improve the quality of home care. Moreover, public transparency regarding outcomes allows patients to compare and choose a desired organization. Finally, insight into nurse-sensitive outcomes could guide health insurers in contracting home care organizations based on the quality of delivered care.

Materials and methods

Design

A Delphi study following the RAND/UCLA Appropriateness Method (RAM)[19] was performed. The objective of the RAM is to detect when experts agree rather than to reach consensus among experts.[19] The RAM is focused on combining available scientific evidence with the collective judgement of experts to provide a statement regarding the appropriateness of delivered care.[19] This focus fits the aim of this study to determine nurse-sensitive outcomes for home care based on the collective opinion of national experts. Because of the specific national context of home care, this study focused on the situation in the Netherlands. To enhance the robustness of this study, the guidance on conducting and reporting Delphi studies (CREDES) was followed.[20] In accordance with the RAM, the following steps were conducted: questionnaire development, identification of experts, two rounds of data collection (an online questionnaire and an expert panel meeting including a paper questionnaire), and data analysis after both rounds. Attrition bias due to the exhaustion of the experts was prevented by limiting the number of Delphi rounds to two rounds.

Questionnaire development

The questionnaire was developed by reviewing the literature. Scientific and grey literature were searched using the following keywords and their accompanying synonyms: “patient outcomes,” “district nursing care,” and “quality indicators.” For scientific literature, MEDLINE/PubMed and CINAHL/EBSCO were searched. For grey literature, international and national websites and reports of governments and research institutions were searched. Additionally, Dutch reports on what older people find important in the care that they receive at home were identified and analyzed to include the patient perspective and guide the identification of important patient outcomes for home care.[21,22] The literature was reviewed until no new outcomes for home care were identified. In total, 41 patient outcomes were identified. The 41 outcomes were clustered following the domains used in the nursing outcomes classification by Moorhead et al.[17]: Functional health (n = 4), physiologic health including neurocognitive health (n = 16), psychosocial health (n = 4), health knowledge and behavior (n = 6), perceived health (n = 2), and family health (n = 1). Additionally, the domains death (n = 2) and healthcare utilization (n = 6) were added. These outcomes were extracted from systematic reviews; peer-reviewed scientific publications, including those from the ICHOM; and reports on potentially preventable complications (see Appendix 6A). Different references were used for defining the outcomes. The outcomes were defined based on the definition used by one references or–in case definitions were incomplete, inconsistent between references, or not suitable for district nursing practice–a combination of multiple references. Because the participants were from the Netherlands, mostly Dutch literature has been used. Because the study aims to determine what outcomes are nurse-sensitive to home care rather than developing and operationalizing quality indicators, the definitions of the outcomes were not constructed as quality indicators.

To determine the sensitivity of the identified outcomes to nursing care, the relevance and influenceability of the outcomes were scored. Relevance was operationalized as “being a relevant patient outcome to measure the quality of home care,” and influenceability was operationalized as “the extent to which home care has an influence on the patient outcome.”

At the beginning of the developed questionnaire, information was provided about the study. The background information of the participants regarding their age, sex, years of experience in home care, and area of work was collected. Next, all 41 potential nurse-sensitive outcomes were presented along with their definitions. Participants were asked to score both the relevance and influenceability of each outcome on a 9-point Likert scale, with 1 being completely not relevant/influenceable and 9 being completely relevant/influenceable. An example question is shown in Appendix 6B. Participants had the opportunity to propose additional outcomes in case outcomes had been omitted. The complete questionnaire is available upon request.

Identification of experts

A purposive sample of national participants was selected for the expert panel of this Delphi study. To ensure the diversity of the home care professionals, the following inclusion criteria were used: 1) the participant had current or recent clinical experience as a district nurse, and 2) the participant had experience in research, teaching, practice, or policy with regard to home care. The aim was to purposively create a balance between people currently working in home care and those with recent experience in practice yet currently fulfilling a role in research, teaching, practice or policy regarding home care. With the requirement of the nurses to have an (additional) role in research, teaching, practice, or policy, it was assumed that the nurses would be accustomed to critical thinking and reflection, which was necessary given the challenges of defining outcomes of care.[16] Participants (hereafter referred to as experts) from a diversity of organizations across the Netherlands were selected. Based on the RAM, the aim was to include a panel of 10–15 experts, which would allow the expert panel to have sufficient diversity while also ensuring that all experts would have a chance to participate.[19] To take into account the possible decline in participation during the multiple rounds, a total of 20 experts were approached via the Dutch nurses' association and the researchers' networks. Experts were informed about the study and invited to participate by email.

Data collection

Delphi round one: Online questionnaire.

The first Delphi round started with an online questionnaire using the online tool Qualtrics.[23] The experts received a personal invitation to the questionnaire by email. A letter including information about the study and providing consent for the study was provided within the questionnaire. The experts were asked to complete the questionnaire within two weeks. Two reminders were sent to increase the response rate. After the deadline, the online questionnaire was closed, and the results were analyzed. New outcomes proposed by the experts were reviewed by a part of the research team (JDV, NB, MJS). The team discussed if the outcomes focused on patient outcomes or were relevant for measuring the quality of care. Decisions were made based on the expertise of the research team. Five outcomes were included in the next round: a meaningful life, duration of home care, the intensity of home care, total time at home, and quality of dying and death. Two outcomes focusing primarily on process or structure of care (providing preventive care and accessibility of district nursing team) were not included. The newly added outcomes were defined using the literature and by insights of the experts (Appendix 6A).

Delphi round two: Expert panel meeting and paper questionnaire.

After the analysis of the results of round one, the content from the online questionnaire was supplemented with the five newly added outcomes in a paper questionnaire. In the second Delphi round, the experts participated together in a three-hour face-to-face expert meeting. During this meeting, the findings from the questionnaire from round one regarding the relevance and influenceability of the outcomes were discussed, with special attention to the outcomes that lacked agreement (disagreement index (DI) ≥1), the outcomes that had an uncertain rating (group median 4–6), and the newly added outcomes. Additionally, the definitions of the newly added outcomes, formulated by the research team were discussed and concluded with the experts in the second Delphi round to assure that this corresponded to what the experts initially meant. After discussion of the outcomes in the expert meeting, the paper questionnaire was completed. In this questionnaire, the experts' individual scores from the first round; the group median score; and the DI, as an indication of the level of agreement, were provided (Appendix 6B).

After the analysis of the results of round two, a draft of the results was shared with the participating experts as a member check to confirm the credibility of the results.

Data analysis

All analyses were guided by the RAM. The relevance and influenceability of each potential nurse-sensitive outcome was scored on a nine-point Likert scale. For each outcome, a group median score was calculated to determine the degree of relevance and influenceability, and the DI was calculated to determine the level of agreement. As described in the RAM, the DI is the ratio between the inter-percentile range (IPR) and the IPR adjusted for symmetry (IPRAS), which can be calculated following the equation in Appendix 6C.[19] A DI <1 indicates agreement, with a score closer to zero indicating stronger agreement. A group median score of 1–3 with agreement (DI<1) indicated that the outcome was not relevant/influenceable, a lack of agreement (DI≥1) and/or a group median score of 4–6 with agreement (DI<1) on an outcome indicated that the relevance/influenceability of the outcome was uncertain, and a group median of 7–9 with agreement (DI<1) indicated that the outcome was relevant/influenceable.[19] Scores were analyzed using SPSS version 24.

Ethical considerations

The experts were informed that participation was voluntary and that all data would be processed anonymously and only for research purposes. The experts' consent was assumed upon their return of the completed questionnaires. Because participants in this study were not subjected to physical and/or psychological procedures, no approval was needed according to the Dutch Medical Research Act (WMO). This study was conducted in accordance with the principles of the Declaration of Helsinki, and data were handled according to the General Data Protection Regulation.

Results

Demographics of the expert panel

In total, 16 of the 20 contacted experts (80%) agreed to participate, 15 of whom completed the online questionnaire in round one (93.8%) (Table 6.1). Of the experts who completed the questionnaire in round one, 11 were able to participate in the expert meeting and questionnaire in round two (73.3%). In both rounds, seven experts indicated that they worked in multiple areas of home care. Reasons for non-response were a lack of time for participation and illness.

Table 6.1. Characteristics of the expert panel

	Delphi round 1 N=15	Delphi round 2 N=11
Response rate, n (%)	15/16 (93,8)	11/15 (73,3)
Age in years, mean (minimum-maximum; sd)	40,3 (27-65; 12,2)	35,5 (27-53; 9,2)
Female, n (%)	13 (86,7)	9 (81,8)
Years of clinical experience in home care, mean (min-max; sd)	12,3 (3-20; 6,4)	10,3 (3-20; 6,0)
Current area of work[A]		
District nurse, n (%)	7 (46,7)	7 (63,6)
Researcher, n (%)	5 (33,3)	3 (27,3)
Teacher bachelor of nursing, n (%)	5 (33,3)	4 (36,4)
Practice or policy (manager, professional association), n (%)	7 (46,7)	6 (54,5)

[A] The percentages do not add up, because some experts worked in multiple areas.

Delphi round one

The 41 potential nurse sensitive outcomes identified in the literature were assessed by the experts in round one. The group median scores and DIs for the relevance and influenceability of the potential nurse-sensitive outcomes are provided in Table 6.2. Based on the median scores and DIs <1, the experts assessed 22 outcomes as relevant (53.7%) and two outcomes as not relevant (multimorbidity and planned hospital admission) (4.9%). For the remaining 17 outcomes (41.5%), there was uncertainty; for four of these outcomes, the uncertainty was due to a lack of agreement among experts.

Regarding influenceability, the experts assessed nine outcomes as influenceable (22.0%) and two outcomes as not influenceable (multimorbidity and planned hospital admission) (4.9%). The remaining 30 outcomes were assessed as uncertain (73.2%), with none lacking expert agreement. After round one, the following five outcomes were added as new outcomes: meaningful life, duration of home care, intensity of home care, total time at home, and quality of dying and death.

Delphi round two

After the face-to-face discussion in round two, the experts assessed 30 of 46 outcomes as relevant (65.2%), which were mainly distributed among the domains of functional health (4/4), perceived health (3/3), family health (1/1), psychosocial health (3/4), and outcomes regarding death (2/3). (Table 6.2). Six outcomes were assessed as not relevant (13.0%). The remaining 10 outcomes were assessed as uncertain (21.7%), of which none lacked expert

Table 6.2. Median scores and Dis of the relevance and influenceability of outcomes per Delphi round

	Relevant		Influenceable	
	Round 1 Group median (DI)[A]	Round 2 Group median (DI)[A]	Round 1 Group median (DI)[A]	Round 2 Group median (DI)[A]
Functional health				
Activities of daily living	8 (0)	8 (0)	6 (0.21)	7 (0)
Frailty	7 (0)	7 (0.22)	6 (0.22)	7 (0)
Instrumental activities of daily living	7 (0.13)[D]	7 (0.16)	6 (0.72)	6 (0.21)
Mobility	7 (0.32)	7 (0.16)	6 (0.21)	7 (0)
Physiologic health including neurocognitive health				
Bladder continence	6 (1.36)[B]	4 (0.97)	4 (0.32)	4 (0.32)
Bowel continence	5 (0.93)	4 (0.52)	4 (0.32)	4 (0.32)
Cognitive functioning	6 (0.95)	4 (0.97)	5 (0.32)	5 (0.32)
Communication	6 (0.86)	4 (0.21)	5 (0.72)	6 (0.85)
Decision making	8 (0.13)	8 (0)	7 (0.16)	8 (0.16)
Decubitus	8 (0.16)	8 (0)	7 (0.16)	7 (0.16)
Dehydration	8 (0.33)	8 (0)	7 (0.22)	7 (0)
Delirium	6 (0.86)	7 (0.16)	5 (0.97)	7 (0.21)
Dyspnoea	6 (0.95)	6 (0.52)	5 (0.85)	6 (0)
Fatigue	6 (0.18)	7 (0.16)	6 (0.32)	7 (0)
Fracture and wounds other than decubitus	6 (0.52)	7 (0.22)	6 (0.25)	6 (0)
Infection	7 (0.22)	7 (0)	6 (0)	6 (0)
Multimorbidity	3 (0.33)	2 (0.16)	2 (0.16)	2 (0.16)
Pain	7 (0.16)	7 (0.16)	7 (0.22)	7 (0)
Polypharmacy	5 (1.70)[B]	3 (0.37)	4 (0.98)	4 (0.32)
Unintentional weight loss	7 (0.33)	8 (0.16)	6 (0.45)[D]	7 (0.37)
Psychosocial health				
Anxiety	6 (0.52)	7 (0.32)	5 (0.52)	7 (0.22)
Loneliness	7 (0.22)	7 (0)	5 (0.86)	6 (0.22)
Participation in social activities	7 (0.22)[D]	7 (0)	6 (0.18)	7 (0.22)
Signs of depression	6 (0.52)	6 (0.51)	5 (0.72)	6 (0.22)
Health knowledge and behavior				
Autonomy	8 (0)	8 (0)	7 (0.13)	8 (0.16)
Compliance	8 (0.16)	8 (0.16)	7 (0.13)	8 (0.16)
Falls	7 (0.32)	8 (0.16)	6 (0.52)	7 (0.21)
Knowledge of the patient	6 (0.49)	2 (0.16)	5 (0.72)	4 (0.52)
Problem behavior	5 (0.85)	4 (0.21)	5 (0.72)	5 (0.32)
Substance use	4 (0.97)[D]	3 (0.16)	4 (0.32)	4 (0)
Perceived health				
Quality of life	8 (0.16)	8 (0.16)	6 (0.22)[D]	7 (0)
Satisfaction with home care	8 (0.23)	8 (0)	8 (0.16)	8 (0.16)
Meaningful life[C]	-	8 (0)	-	7 (0.16)
Family health				
Informal caregiver burden	8 (0)	8 (0)	7 (0.16)	7 (0)
Death				
Death	5 (1.36)[B]	3 (0.16)	4 (0.86)	3 (0)
Place of death	8 (0.16)	8 (0.16)	7 (0)	7 (0.16)
Quality of dying and death[C]	-	8 (0)	-	8 (0.16)
Healthcare consumption				
Emergency department or service use	7 (0.37)	7 (0)	6 (0.42)	7 (0)

Table 6.2. (continued)

	Relevant		**Influenceable**	
	Round 1 Group median (DI)^A	**Round 2 Group median (DI)^A**	**Round 1 Group median (DI)^A**	**Round 2 Group median (DI)^A**
General practitioner visit	5 (0.85)	5 (0.52)	6 (0.72)	6 (0.52)
Nursing home admission	6 (2.38)^B	5 (0.96)	6 (0.93)	7 (0)
Planned hospital admission	2 (0.37)	2 (0)	3 (0,59)^D	3 (0)
Unplanned hospital admission	8 (0.65)	8 (0.16)	6 (0.32)	7 (0)
Unplanned hospital readmission	8 (0.33)	8 (0)	6 (0.22)	7 (0.22)
Duration of home care^C	-	7 (0.22)	-	7 (0,.6)
Intensity of home care^C	-	7 (0.22)	-	8 (0.16)
Total time at home^C	-	5 (0.96)	-	6 (0.22)

Notes: ADL: activities of daily living; IADL: instrumental activities of daily living

Green: Indicates the outcome is relevant/influenceable based on a median score between 7-9 and a DI <1.

Orange: Indicates the uncertainty of the relevance/influenceability of the outcome based on a median score between 4-6 and/or a DI ≥1.

Red: Indicates the outcome is not relevant/influenceable based on a median score between 1-3 and DI <1.

[A] DI: disagreement index, with a DI <1 indicating agreement.

[B] No agreement based on a DI ≥1.

[C] Newly added outcomes after Delphi round one.

[D] In an additional analysis, the median socres and Dis of around 1 with all experts (N = 15) were compared to those of round 1 with only the experts who participated in the expert meeting (N = 11). This comparison revealed the following deviating results for N = 11 compared to N = 15, as described in this table:

- IADL: DI 1.61 (uncertain relevance)
- Substance use: median 3 (not relevant)
- Participation in social activities: median 6 (uncertain relevance)
- Unintentional weight loss: median 7 (influenceable)
- Quality of life: median 7 (influenceable)
- Planned hospital admission: median 4 (uncertain influenceability)

agreement. The discussion during the expert meeting led to changes in the assessment of the relevance of eight outcomes.

Regarding influenceability after Delphi round two (Table 6.2), the experts assessed 27 outcomes as influenceable (58.7%), which were mainly distributed among the domains of perceived health (3/3), family health (1/1), functional health (3/4), healthcare consumption (6/9), and outcomes regarding death (2/3). Three outcomes were assessed as not influenceable (6.5%), and 16 outcomes were assessed as uncertain (34.8%). The expert meeting discussion led to changes in the assessment of the influenceability of 15 outcomes.

To determine whether the different compositions of the experts in the two rounds resulted in deviating overall results regarding the relevance and influenceability of the variables, the median scores and DIs of round 1 with all experts (N = 15) were compared to those of round 1 with only the experts who participated in the expert meeting (N = 11). This comparison revealed deviating results for the following six variables: the relevance of instrumental activities of daily living (IADL), substance use, and participation in social activities and the influenceability of unintentional weight loss, quality of life and planned hospital admission. The relevance of IADL and participation in social activities changed from relevant to uncertain, and that of substance use changed from uncertain to not relevant; the influenceability of unintentional weight loss and quality of life changed from uncertain to influenceable, and that of planned hospital admission changed from not influenceable to uncertain. All other variables (92.6%) had minor changes that did not influence the overall results.

In total, the experts agreed that 26 outcomes (56.5%) were nurse-sensitive, i.e., both relevant and influenceable. From high to low, the nurse-sensitive outcomes were distributed among the following domains: perceived health (3/3), family health (1/1), functional health (3/4), death (2/3), healthcare utilization (5/9), health knowledge and behavior (3/6) psychosocial health (2/4), and physiologic health (7/16). Table 6.3 shows an overview of the nurse-sensitive outcomes, listed in order of most relevant and influenceable (left column) to least relevant and influenceable (right column) based on the group median and the overall DI. The nurse-sensitive outcomes with the highest median scores were the autonomy of the patient, the patient's ability to make decisions regarding the provision of care, the patient's satisfaction with delivered home care, the quality of dying and death, and the compliance of the patient with needed care (i.e., the extent to which the behavior of a patient matches the established care).

Table 6.3. Nurse-sensitive outcomes according to home care experts

Outcomes with a group median score of 8 for both relevance and influenceability (N = 5)	Outcomes with a group median score of 8 for relevance and 7 for influenceability (N = 12)	Outcomes with a group median score of 7 on both relevance and influenceability (N = 9)
• Autonomy • Decision making • Satisfaction with home care • Quality of dying and death • Compliance	• ADL • Dehydration • Burden informal caregiver • Decubitus • Meaningful life • Quality of life • Unplanned hospital readmission • Falls • Unplanned hospital admission • Place of death • Unintentional weight loss • Intensity of home care[A]	• Emergency department or service use • Pain • Mobility • Fatigue • Participation with social activities • Frailty • Delirium • Anxiety • Duration of home care

Notes: ADL: activities of daily living

[A] Median score of 7 for relevance and 8 for influenceability.

Discussion

This study is the first to provide insight into nurse-sensitive outcomes for home care based on the collective opinion of experts who represent the district nursing profession. After two Delphi rounds, the experts determined that 26 of 46 outcomes (56.5%) were nurse-sensitive outcomes for home care. The nurse-sensitive outcomes that were assessed as the most relevant and influenceable (i.e., with a median of 8 and a DI between 0 and 0.16) were patient autonomy, the ability of the patient to make decisions regarding the provision of care, the patient's satisfaction with delivered home care, the quality of dying and death, and the compliance of the patient with needed care.

In the comparison of our results to the outcomes of care for home care described by previous studies by Joling et al.[15] and the ICHOM[18], similarities were found in 14 of the 26 nurse-sensitive outcomes. Activities of daily living, falls, pain, participation in social activities, and informal caregiver burden were considered important outcomes by all three studies. Additionally, overlap with Joling et al.[15] was found for outcomes including decubitus, unintentional weight loss, emergency department or service use, and unplanned hospital (re)admissions. Additionally, overlap was found with the ICHOM study in relation to outcomes including autonomy, frailty, decision making, and place of death.[18] An important difference was that the experts agreed that polypharmacy and mortality were not suitable as nurse-sensitive outcomes for home care. A possible explanation for the differences between our study and those by Joling et al.[15] and the ICHOM[18] lies in the focus of this Delphi study on nurse-sensitive outcomes. The other two studies did not study the relevance of these outcomes to measure the quality of home care specifically and the influence nurses could or could not have on these patient outcomes. Additionally, our Delphi study determined 12 additional nurse-sensitive outcomes that were considered important and that were added by the experts after round one or were mentioned in other relevant literature on patient-reported outcomes for adults in general[24], home care quality indicators[25], or effect measures for primary care.[26] All outcomes identified in our study as nurse-sensitive outcomes for home care are available as nurse outcomes in the nursing outcome classification, except for the outcomes regarding healthcare utilization, which are not included in this classification.[17] In our study, healthcare utilization was used as an outcome following other literature.[15,18]

Strengths and limitations

To enhance the robustness of this study, the RAM and the guidance on CREDES were followed.[19,20] An important strength was the high response rates for both rounds (93.8% and 73.3%). The differences in characteristics between the experts in the two rounds were minimal, and additional analyses showed that these differences did not influence the results for 92.6% of the variables. Additionally, the member check did not result in any comments. Furthermore, through the inclusion of experts who had clinical experience as district nurses and who had fulfilled additional roles in research, teaching, practice, or policy, the full scope of the home care profession were reflected. In the interpretation of the results, some limitations should be considered. First, only Dutch experts were included in this study because of the specific district nursing context in the Netherlands. This approach limits the generalizability of the results. Second, patients were not included as experts because of the challenges regarding defining outcomes of care.[16] To incorporate their meaningful views, however, we included Dutch reports on what patients find important in receiving care at home.[21,22] Last, the identification and definitions of the outcomes have some limitations. It is possible that outcomes and quality indicators were missed since no systematic review has been conducted. This risk was minimized by letting experts add and define missing outcomes. However, the definitions by the experts may not be comprehensive and requires further research. Additionally, the outcomes used in this study focus on older people which may limit application in home care which also include care for children and middle-aged people. However, 75% of the people receiving home care in The Netherlands is 67 years or older, and the mean age of the people receiving home care is 75 years.[27]

Conclusion and implications

This study provides insight into nurse-sensitive outcomes based on the collective opinion of experts who represent the district nursing profession. In total, 26 nurse-sensitive outcomes were identified that could guide the development of quality indicators for home care. Measuring nurse-sensitive outcomes provides insight into the impact of home care, which is a first step in monitoring and improving the quality of care. This contributes to the major call to action internationally on prioritizing the development of the evidence base for home care.[6] At the national level, policy makers, the Dutch Nurses Association and healthcare organizations are working together to define quality indicators for home care. The results of this study contribute to this development by determining 26 nurse-sensitive outcomes. To use nurse-sensitive outcomes as quality indicators, outcomes should be made measurable in a way that is feasible for current practice. Although the outcomes were defined based on the literature, they were not operationalized as quality indicators with a denominator and numerator. Making these nurse-sensitive outcomes measurable as quality indicators requires further research and development before their implementation in practice. In addition, the nurse-sensitive outcomes may differ between different groups of patients in various types of home care, such as palliative care, rehabilitative care, and chronic care. The distinction between these groups and the accompanying relevant and influenceable outcomes for the quality of home care require further research. Lastly, careful consideration is needed regarding the influenceability of the outcomes. None of these outcomes was assessed as completely relevant or influenceable (median 9), the uncertainty of the influenceability of the outcomes is relatively high (34,8%) and the overall medians of the influenceability of the outcomes are lower compared to the assessment of the relevance. This could be explained by the multidisciplinary role of district nurses in practice. Care for community-living older people is not only provided by district nurses, but also by the general practitioner and other (paramedic) professionals in primary care. Most of the outcomes are indeed often not completely influenceable by the delivered home care. Coordinated care by interdisciplinary teams is associated with better outcomes regarding hospitalizations, emergency department visits, and long-term care admissions in community-living people.[5] Therefore, close collaboration between professionals in district nursing practice is needed to influence and achieve the best possible outcomes for people receiving home care.

References

1. United Nations. *World population prospects 2019: Highlights*. New York, US: United Nations, Department for Economic and Social Affairs, Population Division; 2019.
2. European Statistical System. *Population and Housing Census*. 2011.
3. Maybin J, Charles A, Honeyman M. *Understanding quality in district nursing services: Learning from patients, carers and staff*. London, UK: The King’s Fund; 2016.
4. Oliver D, Foot C, Humphries R. *Making our health and care systems fit for an ageing population*. London, UK: The King’s Fund; 2014.
5. Stall N, Nowaczynski M, Sinha SK. Systematic review of outcomes from home-based primary care programs for homebound older adults. *J Am Geriatr Soc*. 2014;62:2243–2251. 10.1111/jgs.13088.
6. Jarrin OF, Pouladi FA, Madigan E. International priorities for home care education, research, practice, and management: Qualitative content analysis. *Nurse Educ Today*. 2019;73:83–87.10.1016/j.nedt.2018.11.020.
7. Van Eenoo L, Declercq A, Onder G, et al. Substantial between-country differences in organising community care for older people in Europe - a review. *Eur J Public Health.* 2015;26(2):213-219.
8. Genet N, Boerma W, Kroneman M, Hutchinson A, Saltman RB. *Home care across Europe.* Kopenhagen, Denmark: World Health Organization; 2012.
9. Tarricone R, Tsouros AD. *Home care in Europe: the solid facts*. World Health Organization; 2008.
10. Maurits EEM. *Autonomy of nursing staff and the attractiveness of working in home care* [PhD Thesis], Utrecht, the Netherlands, Utrecht University; 2019.
11. Carrera F, Pavolini E, Ranci C, Sabbatini A. Long-term care systems in comparative perspective: Care needs, informal and formal coverage, and social impacts in European countries. In: Ranci C, Pavolini E, eds. *Reforms in long-term care policies in Europe*. Springer. 2013. 23-52.
12. MacLean L, Hassmiller S, Shaffer F, Rohrbaugh K, Collier T, Fairman J. Scale, causes, and implications of the primary care nursing shortage. *Annu Rev Public Health*. 2014;35:443–457. 10.1146/annurev-publhealth-032013-182508
13. Mant J. Process versus outcome indicators in the assessment of quality of health care. *Int J Q Health Care*. 2001;13:475–480. 10.1093/intqhc/13.6.475
14. World Health Organization. *Quality of care: a process for making strategic choices in health systems*. World Health Organization; 2006.
15. Joling KJ, Van Eenoo L, Vetrano DL, et al. Quality indicators for community care for older people: A systematic review. *PloS One*. 2018;13:e0190298. 10.1371/journal.pone.0190298
16. Doran D. *Nursing outcomes*. Jones & Bartlett Learning; 2010.
17. Moorhead S, Johnson M, Maas ML, Swanson E. *Nursing Outcomes Classification (NOC)-e-book: Measurement of health outcomes*. Elsevier Health Sciences; 2018.
18. Akpan A, Roberts C, Bandeen-Roche K, et al. Standard set of health outcome measures for older persons. *BMC Geriatr*. 2018;18:36. 10.1186/s12877-017-0701-3
19. Fitch K, Bernstein SJ, Aguilar MD, et al. *The RAND/UCLA Appropriateness Method User’s Manual*. 2001.
20. Jünger S, Payne SA, Brine J, Radbruch L, Brearley S. Guidance on Conducting and REporting DElphi Studies (CREDES) in palliative care: Recommendations based on a methodological systematic review. *Palliat Med*. 2017;31:684–706. 10.1177/0269216317690685
21. Hoegee I. *Toetsingskader wat vinden ouderen belangrijk bij wonen, welzijn en zorg*. Utrecht, the Netherlands: Beteroud; 2018.
22. Tegelaar R, Van Haastrecht C. *Kwaliteit en keuze informatie verpleging en verzorging thuis. Wat willen mensen zelf*. Utrecht: NPCF; 2015.
23. Qualtrics. *Qualtrics*. Provo; 2005.
24. Cella D, Riley W, Stone A, et al. The Patient-Reported Outcomes Measurement Information System (PROMIS) developed and tested its first wave of adult self-reported health outcome item banks: 2005–2008. *J Clin Epidemiol*. 2010;63:1179–1194. 10.1016/j.jclinepi.2010.04.011
25. Morris JN, Fries BE, Frijters D, Hirdes JP, Steel RK. InterRAI home care quality indicators. *BMC Geriatr*. 2013;13:1–11. 10.1186/1471-2318-13-1
26. Keleher H, Parker R, Abdulwadud O, Francis K. Systematic review of the effectiveness of primary care nursing. *Int J Nurs Pract*. 2009;15:16–24. 10.1111/j.1440-172X.2008.01726.x
27. Vektis. *Factsheet Wijkverpleging*. https://www.vektis.nl/intelligence/publicaties/factsheet-wijkverpleging. Accessed January 4, 2021.

Appendices

Appendix 6A. Overview of identified potential nurse-sensitive outcomes, corresponding definitions and references

Appendix 6B. Examples of questionnaire questions round one and round two

Appendix 6C. Equation to calculate disagreement index (DI)

Appendix 6A. Overview of identified potential nurse-sensitive outcomes, corresponding definitions and references

Identifying nurse-sensitive outcomes

Potential nurse-sensitive outcomes for district nursing were identified using the following literature:

- Adams, C. E., Wilson, M., Haney, M., & Short, R. (1998). Using the outcome-based quality improvement model and OASIS to improve HMO patients' outcomes. Outcome Assessment and Information Set. *Home healthcare nurse*, *16*(6), 395-401.
- Akpan A, Roberts C, Bandeen-Roche K, Batty B, Bausewein C, Bell D, et al. Standard set of health outcome measures for older persons. BMC Geriatr. 2018;18(1).
- Bryan, S., Davis, J., Broesch, J., Doyle-Waters, M. M., Lewis, S., Mcgrail, K., ... & Sawatzky, R. (2014). Choosing your partner for the PROM: a review of evidence on patient-reported outcome measures for use in primary and community care. *Healthcare Policy*, *10*(2), 38.
- Bryant, L. L., Floersch, N., Richard, A. A., & Schlenker, R. E. (2004). Measuring healthcare outcomes to improve quality of care across post–acute care provider settings. *Journal of nursing care quality*, *19*(4), 368-376.
- Caminal, J., Starfield, B., Sánchez, E., Casanova, C., & Morales, M. (2004). The role of primary care in preventing ambulatory care sensitive conditions. *The European Journal of Public Health*, *14*(3), 246-251.
- Coster, S., Watkins, M., & Norman, I. J. (2018). What is the impact of professional nursing on patients' outcomes globally? An overview of research evidence. *International journal of nursing studies*, *78*, 76-83.
- Department of Health and Human Services, Agency for Healthcare Research and Quality. 2008. "AHRQ Quality Indicators. Prevention Quality Indicators: Technical Specifications, Version 3.2" [accessed October 18, 2017]. Available at http://www.qualityindicators.ahrq.gov.
- HealthMeasures. PROMIS, Patient-Reported Outcomes Measurement Information System. [Online] Northwestern University, 2018. [accessed November 08, 2018]. Available at http://www.healthmeasures.net/explore-measurement-systems/promis .
- Hirdes, J. P., Fries, B. E., Morris, J. N., Ikegami, N., Zimmerman, D., Dalby, D. M., ... & Jones, R. (2004). Home care quality indicators (HCQIs) based on the MDS-HC. *The Gerontologist*, *44*(5), 665-679.
- Keleher, H., Parker, R., Abdulwadud, O., & Francis, K. (2009). Systematic review of the effectiveness of primary care nursing. *International journal of nursing practice*, *15*(1), 16-24
- Martin KS. The Omaha System: A key to practice, documentation, and information management. WB Saunders Co; 2004 Dec 1.
- Meadows, K. A. (2011). Patient-reported outcome measures: an overview. *British journal of community nursing*, *16*(3), 146-151.Meadows KA1.
- Moorhead, S., Johnson, M., Maas, M. L., & Swanson, E. (2018). *Nursing Outcomes Classification (NOC)-E-Book: Measurement of Health Outcomes*. Elsevier Health Sciences.
- Morris, J. N., Fries, B. E., Frijters, D., Hirdes, J. P., & Steel, R. K. (2013). interRAI home care quality indicators. *BMC geriatrics*, *13*(1), 127.
- Nakrem, S., Vinsnes, A. G., Harkless, G. E., Paulsen, B., & Seim, A. (2009). Nursing sensitive quality indicators for nursing home care: international review of literature, policy and practice.*International journal of nursing studies*, *46*(6), 848-857.
- Recio-Saucedo: Recio-Saucedo, A., Dall'Ora, C., Maruotti, A., Ball, J., Briggs, J., Meredith, P., ... & Griffiths, P. (2017). What impact does nursing care left undone have on patient outcomes? Review of the literature.*Journal of Clinical Nursing*
- Russell, D., Rosati, R. J., Rosenfeld, P., & Marren, J. M. (2011). Continuity in home health care: is consistency in nursing personnel associated with better patient outcomes?. *Journal for healthcare quality*, *33*(6), 33-39.

- Shaughnessy, P. W., Hittle, D. F., Crisler, K. S., Powell, M. C., Richard, A. A., Kramer, A. M., ... & Mulvey-Lawlor, K. L. (2002). Improving Patient Outcomes of Home Health Care: Findings from Two Demonstration Trials of Outcome-Based Quality Improvement. *Journal of the American Geriatrics Society*, *50*(8), 1354-1364.

Defining nurse-sensitive outcomes

Different references were used for defining the outcomes. For most outcomes, multiple references were combined to one definition. Because all experts were from the Netherlands, mostly Dutch literature has been used.

- Akpan A, Roberts C, Bandeen-Roche K, Batty B, Bausewein C, Bell D, et al. Standard set of health outcome measures for older persons. BMC Geriatr. 2018;18: 36.
- Bakker, A. J. E. M., Habes, V., & Quist, G. (2016). *Klinisch redeneren bij ouderen: functiebehoud in levensloopperspectief*. Bohn Stafleu van Loghum.
- Beers MH, editor. Merck manual medisch handboek. Bohn Stafleu van Loghum; 2016 Jan 13.
- Gordon, M. (2014). *Handleiding verpleegkundige diagnostiek*. (4th. ed.). Amsterdam, the Netherlands: Reed Business Education.
- Herdman, T. H. (2014). *NANDA International Verpleegkundige diagnoses en classificaties 2012–2014*. Houten, the Netherlands: Bohn Stafleu van Loghum.
- Herdman, T. H., & Kamitsuru, S. (2014). *NANDA International, Inc., Nursing Diagnoses: Definitions & Classification 2015–2017*, (10th ed.). West Sussex, UK: John Wiley & Sons.
- Martin, K. S., & Scheet, N. J. (2005). The OMAHA system. *Applications for Community health nursing*, 1992.
- Moorhead, S., Johnson, M., Maas, M. L., & Swanson, E. (2018). *Nursing Outcomes Classification (NOC)-E-Book: Measurement of Health Outcomes*. Elsevier Health Sciences.
- Nederlandse Zorgautoriteit (NZa, Dutch healthcare authority). (2015). *Handboek Gebruik Zorgactiviteiten*. DBC Onderhoud.
- van Achterberg, T., Bours, G. J. J. W., & Eliens, A. M. (2011). *Effectief Verplegen 2* (3rd ed.). Dwingeloo, the Netherlands: Kavanah.
- van Achterberg, T., Bours, G. J. J. W., & Eliens, A. M. (2012). *Effectief Verplegen 1* (4th ed.). Dwingeloo, the Netherlands: Kavanah.
- World Health Organization. Lexicon of alcohol and drug terms published by the World Health Organization [internet]. Available via https://www.who.int/substance_abuse/terminology/who_lexicon/en/

Definitions previous identified and defined by van den Bulck et al. were often used with permission by the first author.

- van den Bulck AOE, Metzelthin SF, Elissen AM, Stadlander MC, Stam JE, Wallinga G, Ruwaard D. Which client characteristics predict home-care needs? Results of a survey study among Dutch home-care nurses. Health & Social Care in the Community. 2019 Jan;27(1):93-104.

Newly added outcomes after round 1 were defined by the experts and checked by researchers from the research group (JDV, NB, MJS).

Outcome	Definition	Source
Functional health		
Activities of daily living (ADL)	The extent to which the patient (together with the people around the patient) is independent in carrying out activities of daily living (ADL) such as washing / showering, external care, dressing and undressing, eating, and visiting the toilet.	van den Bulck
Frailty	The extent to which the patient is frail, whereby frailty is defined as a process of accumulating physical, psychological and/or social deficits in	Bakker

	functioning that increases the chance of negative health outcomes. Frailty is characterized by the weak position that the patient has in society and/or the risk that the patient runs of not catching up with society, getting into social isolation or experiencing deterioration in terms of physical, mental or social functioning.	
Instrumental activities of daily living (IADL)	The extent to which the patient (together with the people around the patient) is independent in carrying out instrumental activities of daily living (IADL) such as housework, shopping, preparing meals, and making telephone calls.	van den Bulck
Mobility	The ability to move purposefully in one's own environment (indoors and outdoors), possibly with the help of (walking) aids. Think of climbing stairs, moving from a standing position to a sitting position, mobility in and around the bed, moving in or out of a bath/shower; movements in or out of the car, movements on foot, by bicycle or public transport.	van den Bulck; Moorhead
Physiologic health including neurocognitive health		
Bladder continence	The extent to which the patient has control over the excretion of urine.	van den Bulck
Bowel continence	The extent to which the patient has control over the excretion of faeces.	van den Bulck
Cognitive functioning	The extent to which the patient is able to record, process, reproduce and apply information based on his cognitive functions, such as intelligence, memory, attention and concentration, orientation ability, language and communication, decision making, and problem solving ability.	van den Bulck
Communication	The extent to which the patient is able to communicate effectively by being able to receive, interpret and express spoken, written or non-verbal messages. This also concerns the extent to which the patient has the skills to perform this (such as eye contact, speaking, articulating thoughts, forms of sentences and words, selective attention, and using body language and facial expressions).	van den Bulck; Herdman; Moorhead
Decision making	The extent to which the patient is able to make decisions regarding the provision of care, by making an assessment and choosing between two or more alternatives.	Herdman; Moorhead
Decubitus (Pressure ulcers)	The presence of decubitus, where decubitus is defined as damage to the skin and tissues under the skin as a result of local action of pressure or shear forces.	Bakker, Herdman
Dehydration	The presence of dehydration in the patient, where dehydration is defined as a condition in which there is a lack of bodily fluid. There is an unbalanced fluid balance and composition of the patient's body fluids, characterized by a relative lack of fluid in the body, which is not sufficient to meet the physiological needs.	van den Bulck; Bakker
Delirium	The presence of delirium in the patient, where delirium is defined as a reversible disorder in consciousness and cognition that develops within a short period of time.	Moorhead
Dyspnoea	The degree to which the patient experiences dyspnoea, where dyspnoea is defined as a situation where the balance between oxygen uptake and carbon dioxide release in the lungs is disturbed, which is accompanied by a feeling of shortness/lack of breath.	Achterberg

Fatigue	The extent to which the patient experiences long-term general fatigue, which leads to reduced capacity for physical and mental exertion at the usual level.	Moorhead
Fracture and wounds other than decubitus	The presence of new fractures and injuries, where injuries are defined as injuries to the skin (for example, damaged epidermis and / or dermis, such as skin tears, cuts or wounds from burns). Note: decubitus is included as a separate outcome.	Herdman
Infection	The presence of infections caused by bacteria, virus or parasite, regardless of the location of the inflammation. For example: urinary tract infection, respiratory tract infection, pneumonia, wound infection.	Beers
Multimorbidity	The presence of multimorbidity, defined as the presence of more than one (chronic) disease in the patient at the same time.	van den Bulck
Pain	The extent to which the patient experiences pain, where pain is defined as an unpleasant, sensory, and emotional experience, which can be subjective, continuous/recurrent, and sudden/slow-induced, caused by actual/imminent tissue damage, with every possible intensity (from mild to severe).	van den Bulck; Bakker
Polypharmacy	The presence of polypharmacy, defined as the chronic use of five or more medications at the same time.	Bakker
Unintentional weight loss	The presence of unintended weight loss in the patient, where unintended weight loss is defined as a weight loss of more than 10% in the last six months or more than 5% in the last month.	Bakker
Psychosocial health		
Anxiety	The extent to which the patient experiences a feeling of unease or insecurity with a source that is usually unclear or unknown to the patient.	van den Bulck
Loneliness	The extent to which the patient experiences loneliness, whereby loneliness is defined as the subjective experience of an unpleasant or unacceptable lack of (quality of) certain relationships. This may involve emotional loneliness (lack of an emotionally close bond and/or intimate relationship) or social loneliness (lack of meaningful relationship with a wide circle of people).	Bakker
Participation in social activities	The extent to which the patient participates in society in a way that is meaningful to the patient, such as (un)paid work, following education, and participation in sports activities and other leisure activities.	van den Bulck
Signs of depression	The extent to which the patient experiences periods of reduced, (seriously) depressed mood, characterized by, among other things, loss of interest or pleasure in activities, less energy, insomnia, and reduced self-esteem and self-confidence.	van den Bulck
Health knowledge and behavior		
Autonomy	The extent to which the patient has control over his own life in various areas of life (such as living, working and social contacts) and any support therein.	van den Bulck
Compliance	The extent to which the behavior of a patient matches the established therapy or the health promotion plan.	Herdman
Falls	The presence of fall incidents, where a fall incident is defined as an unintended change of body position that results in a fall on the ground or another lower level.	van den Bulck; Bakker

Knowledge of the patient	The ability of the patient to remember and interpret information.	Martin
Problem behavior	The extent to which the patient exhibits behavior that has or may have a negative impact on his own health, well-being and/or (the relationship with) other people such as verbal or physical violence, distrust or hallucinations, compulsions or astray.	van den Bulck
Substance use	The extent to which the patient absorbs psychoactive substances in a harmful or dangerous way, including alcohol and (illegal) drugs.	World Health Organization
Perceived health		
Quality of life	The extent to which the patient values his or her quality of life, whereby quality of life is defined as a positive experience of one's own current living conditions.	Moorhead
Satisfaction with home care	The extent to which the patient is satisfied with the care provided by home care.	
Meaningful life	Living from what is really important to a person.	Experts
Family health		
Informal caregiver burden	The extent to which the informal caregiver of the patient experiences a balance in burden/vulnerabilities (load) and the resources of the caregiver to carry the burden (capacity).	van den Bulck
Death		
Death	The patient has died.	NZa
Place of death	The patient has died at the desired place of death.	Akpan
Quality of dying and death	Discuss timely the options and take care of counselling in the palliative and terminal phase.	Experts
Healthcare consumption		
Duration of district nursing	Total duration that a patient receives home care (e.g. in weeks).	NZa; Experts
Emergency department or service use	The patient makes use of the emergency department or emergency service (out of office general practitioner visit).	NZa
General practitioner visit	The patient has visited the doctor or the doctor has visited the patient at home during office hours.	NZa
Intensity of district nursing	Total number of minutes of care per week that a patient receives home care.	NZa; Experts
Nursing home admission	The patient has an admission to a nursing home with no prospect of returning home (no first-line residence or rehabilitation).	NZa
Planned hospital admission	The patient has been scheduled to be admitted or treated at the hospital. The patient has stayed in the hospital for at least one night.	NZa; ICHOM
Total time at home	Total time that a patient lives independently at home (e.g. in months or days per year).	Experts
Unplanned hospital admission	The patient has been admitted to hospital or treated at the hospital unplanned. The patient has stayed in the hospital for at least one night.	NZa; Akpan
Unplanned hospital readmission	Within three months of a previous hospital visit, the patient has been admitted to hospital or treated unplanned. The patient has stayed in the hospital for at least one night.	NZa

Appendix 6B. Examples of questionnaire questions round one and round two

Round one example question on relevance and influenceability of mobility as an outcome

Please fill in how relevant you think this outcome is as a measurement for the quality of home care.

Please fill in how influenceable you think this outcome is by your work in a district nursing team.

Mobility

Definition: The ability to move purposefully in one's own environment (indoors and outdoors), possibly with the help of (walking) aids. Think of climbing stairs, moving from a standing position to a sitting position, mobility in and around the bed, moving in or out of a bath / shower; movements in or out of the car, movements on foot, by bicycle or public transport.

Completely NOT relevant								**Completely relevant**	**Completely NOT influenceable**								**Completely influenceable**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Round two example question on relevance and influenceability of mobility as an outcome

Please fill in how relevant you think this outcome is as a measurement for the quality of home care.

Mobility								
Individual score								
Median (group score)								7
Disagreement Index (Score <1 = agreement)								0,37
Completely not relevant				**Neutral**				**Completely relevant**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
☐	☐	☐	☐	☐	☐	☐	☐	☐

Please fill in how influenceable you think this outcome is with your work in a district nursing team.

Mobility								
Individual score								
Median (group score)								6
Disagreement Index (Score <1 = agreement)								0,22
Completely not influenceable				**Neutral**				**Completely influenceable**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
☐	☐	☐	☐	☐	☐	☐	☐	☐

Appendix 6C. Equation to calculate disagreement index (DI)

Lower Limit IPR = 30th percentile of the series of ratings

Upper Limit IPR = 70th percentile of the series of ratings

IPR = (Upper Limit IPR) – (Lower Limit IPR)

IPRCP (Central Point of IPR) = Average of Upper Limit IPR and Lower Limit IPR

Asymmetry Index = 5* – (IPRCP)

IPRAS = 2.35* + (1.5* · Asymmetry Index)

Disagreement Index (DI) = IPR/IPRAS

*Notes: IPR=Interpercentile Range; IPRCP=interpercentile Range Central Point; IPRAS = Interpercentile Range Adjusted for Symmetry. *Numbers determined by RAND/UCLA Appropriateness Method (16)*

Chapter 7

General discussion

Anne O.E. van den Bulck

Introduction

The rising demand for home care in most Western healthcare systems stresses the importance of having suitable payment systems that incentivize the provision of efficient home care while improving or maintaining high quality. Case-mix based prospective payment, including a monitor on and possible correction for the quality of care, could provide the right incentives (see Chapter 1). Case-mix classification of home care clients is complex and internationally not applied widely. Furthermore, outcomes that are suitable to measure for home care specifically are currently still unclear. Therefore, in the Netherlands a scientific consortium with three Dutch universities was founded by the Dutch Healthcare Authority (NZa) to develop a case-mix based prospective payment system for Dutch home care.

This dissertation is the result of scientific research conducted at one of three universities of the consortium (i.e. Maastricht University). The primary aim of this dissertation was to gain insight into predictors of home care use for the development of home care case-mix classification. Additionally, the secondary aim of this dissertation was to provide first insights into relevant outcomes of home care. More specifically, the objectives of this dissertation were to:

1. Create an overview of the current knowledge and views from practice and science on (which client characteristics are relevant to include in) case-mix classification for home care;
2. Develop and evaluate a widely applicable data collection method for the purpose of case-mix model development; and
3. Determine outcomes that are suitable for quality measurement in home care.

The five studies that have contributed to the dissertation's objectives have been described in the previous chapters of this dissertation. In this chapter, the main findings of the studies will be presented. Subsequently, theoretical and methodological considerations will be discussed. Finally, the implications of this dissertation for policy, practice, and further research are presented.

Main findings

Current knowledge and views on home care case-mix classification

Case-mix based prospective payment is not yet widely used within international home care. In a systematic literature review (Chapter 2), eight home care case-mix models were identified. Existing models largely differ on multiple aspects, including the home care services that are covered, how predictors of home care use are operationalized, their outcome measures, and the predictive power. Additionally, a high degree of ambiguity exists about which combination(s) of home care use predictors to include. In total, 127 unique predictors were found across models. Most often, models included predictors related to a client's physical and daily functioning (e.g. 'Mobility' and 'Toileting') and health services use (e.g. 'Intravenous therapy'). Social environmental characteristics (e.g. 'Social support') were included least frequently. Thus, existing case-mix models seem to omit psychosocial determinants of health.

However, according to nurses that participated in the survey-study (Chapter 3), both biomedical and psychosocial characteristics need to be taken into account when predicting home care needs of a client. Out of the 35 presented client characteristics, nurses assessed 15 characteristics as being relevant for predicting home care needs. Those assessed relevant included biomedical characteristics such as 'Terminal phase' and 'ADL (activities of daily living) functioning', and psychosocial characteristics such as 'Social support' and 'Self-management'.

A widely applicable data collection method for home care case-mix

The systematic review (Chapter 2) showed variations exist between and within countries on how data on predictors of home care use are collected. Therefore, there was a need to develop a separate questionnaire to collect high-quality, standardized data for case-mix model development in the Netherlands. For that reason, the 11-item Case-Mix Short Form (CM-SF) questionnaire was developed (Chapter 4) in collaboration with district nurses. The multiple-choice items cover the most commonly used predictors of home care use over five categories: 'Illness prognosis', 'Functional status in terms of ADL', 'Self-reliance in terms of IADL (instrumental activities of daily living)', 'Cognitive functioning', and 'Informal care'. Psychometric testing showed that all possible answer options of the questionnaire were used within the population of home care clients. Furthermore, substantial to excellent agreement existed between raters for all items. However, including other items – for example on 'Social network' – may be necessary to improve the predictive value of case-mix classification in home care.

In a Delphi-study among district nurses and healthcare insurers (Chapter 5), client characteristics that might improve case-mix classification in home care were identified. Eleven items from the CM-SF questionnaire and eleven additional characteristics – selected from the over 140 client characteristics suggested by participants – were assessed regarding their relevance. Overall, twelve characteristics were assessed as relevant by the experts: 'Eating and drinking' and 'Washing/showering' (both from the CM-SF questionnaire), 'Multimorbidity', 'Cognitive skills for daily decision making', 'Mental functioning', 'Resilience', 'Learning ability', 'Social network', 'Illness prognosis' and 'Need for technical nursing care'. Most client characteristics from the CM-SF questionnaire did not achieve consensus for relevance among the experts, despite existing evidence on their predictive value. Including the relevant suggested client characteristics in case-mix classification is expected to lead to higher predictive values.

Suitable outcomes for quality measurement in home care

In another Delphi-study, suitable outcomes for home care were identified (Chapter 6). Forty-six outcomes were assessed by district nurses regarding their relevance for home care and the extent to which home care has an influence on the outcome for clients (i.e. together defining nurse-sensitiveness). In total, 26 outcomes were assessed as nurse-sensitive. Outcomes that received the highest median scores for both relevance and influenceability were ‘autonomy’, ‘decision making’ (regarding the provision of care), ‘satisfaction with home care’, ‘quality of dying and death’, and ‘compliance’ (of a client with needed care).

Theoretical considerations

The dynamics of case-mix classification

Context plays a key role in why and how case-mix classification is developed, as is illustrated by the findings of the systematic literature review on home care case-mix in Chapter 2. In the Dutch healthcare context, home care is comprised of nursing and personal care services. The context of home care is however not static. As the demography of Western countries changes, so do the policy objectives of home care, and thus also how case-mix classification of home care clients should be. As an example, current home care policy objectives in the Netherlands stress the importance of integrated care and ageing in place.[1] Therefore, within the coming years services provided within Dutch home care are expected to change away from the current more fragmented (home) care. An exception to the highly fragmented home care is the care that some large Dutch home care providers offer via the ‘Full package at home’ (in Dutch: Volledig Pakket Thuis (VPT)). With the VPT, clients who need care from the Dutch Long-term Care Act (Wlz)[2] – i.e. needing care or supervision 24-hours a day – can receive care at home instead of in a long-term care institution.[3] Nursing care, personal care, and (additionally) domestic care services are then funded via one package by insurers instead of by municipalities, who normally fund domestic care services (via the Social Support Act (Wmo)). Similar ways of working are already taking place in other countries such as New Zealand. There the integrated care perspective is reflected in their case-mix based home care prospective payment system, which covers nursing, personal care, and domestic care services.[4] As a result, there is more room for collaboration and task delegation. For example, domestic support workers can additionally provide low-complex personal care tasks, which consequently decreases the workload of nurses. Thus, as nationally and internationally integrated care is desirable and sometimes even already occurring, it might even do more justice to the current home care context to start looking at case-mix from a more integrated care perspective too. This means that there is more included than only nursing and personal care services, even though other services are financed differently.

Thus, it is important that case-mix classification follows the current and expected context in order to be valuable for the payment of home care. Therefore, case-mix classification of home care clients should – similarly to home care in general – be seen as a dynamic, learning model rather than static. The model should be able to adapt to the changes in among others a country's healthcare policy objectives, the population and technology. This also brings along the need for more (and more frequent) scientific research on home care case-mix classification.

Registering data on client characteristics: what to standardize?

Data on client characteristics that predict home care use would ideally be collected via standard registration systems, as the re-use of data instead of collecting data for single use is desirable. From the systematic review (Chapter 2), we know that existing case-mix models indeed largely base their model development on data from standard registration systems. However, a lack of standardization in these standard registration systems – which is essential for case-mix classification development[4] – exists for the Dutch home care setting. In the Netherlands home care providers use multiple different instruments such as NANDA, Omaha, and InterRAI.[5] Moreover, data on relevant client characteristics (Chapter 3 and 5) might not be available or registered differently per registration system.[5,6] This resulted in the necessity to develop a separate standardized questionnaire, i.e. the Case-Mix Short Form (CM-SF) (Chapter 4), to collect data for the development of Dutch home care case-mix classification.

The CM-SF questionnaire, as a concise and standardized data collection tool, showed promising results in classifying home care clients.[7] However, especially district nurses argue that the CM-SF questionnaire (as presented in Chapter 4) is an oversimplification of what home care is in practice. The complexity of home care clients and their needs are not recognized in the mainly ADL-focused items, leading to responses such as "*home care is more than just washing and dressing*". The variation of relevant characteristics coming from the Delphi-study (Chapter 5) underlines this broad perspective that Dutch district nurses and purchasing experts have. The broad client information gathered by the district nurse is of course relevant to among others compose a client's care plan. However, for payment purposes the extensiveness of data seemed to be less relevant as long as data on the right predictors is properly registered.

Would it therefore not be more in line with home care practice to increase standardization of the standard registration system(s) in Dutch home care, instead of collecting data with the CM-SF questionnaire? Previous research has shown that the overload of possible fields to register in nursing classification systems, that do reflect the complexity of clients and their needs, are used to a limited extent. Elissen et al. found that only 118 out of the possible 216 NANDA-I diagnoses were used over 9 month-period for one or more of the 119 included home care clients.[8] As a result, to reach increased standardization, it might thus be required to oblige nurses to register certain relevant client characteristics' data by using their nursing classification system more extensively. This adds to the administrative burden of nurses, possibly even more than the rather concise CM-SF questionnaire. Another argument that could speak against attempting to increase standardization in standard registration systems is that preferences of home care providers or their district nurses cannot be taken into account. Other studies namely noted for example that there should be room in the system to narratively describe the unique situation of a client[9], and that it is unlikely that one format would be sufficient for client registrations in all nursing areas.[10] Furthermore, reaching agreement with all stakeholders on one system is a challenging process due to the variety of interests from different stakeholders (such as the many home care providers, the Dutch nurses' association, and numerous software developers). Consequently, it seems questionable if trying to solve the lack of standardization in standard registration systems is a feasible and desirable step in improving the predictive value of home care case-mix models. Registering standardized data on relevant client characteristics with a specific CM-SF questionnaire would therefore be more suitable for case-mix classification development, at least for the short term.

Refining first before using the full potential of home care outcomes

This dissertation has provided insight into which outcomes are relevant measures in home care (Chapter 6). In interpreting outcomes, one should be able to correct for case-mix of clients as expectedly the type of services and interventions differ between clients. Take as an example two of the case-mix groups developed with the CM-SF questionnaire: one that clusters clients who receive palliative care, and one that clusters clients who only need help with managing their medication.[7] The nurse-sensitive outcome 'Quality of dying and death' (Chapter 6) may be extremely relevant for the first group, but not at all for the latter. In primary care, a study has been conducted on how different types of patients vary in their preferences of realizing patient-centered care.[11] They found that, for example, prepared proactive patients want to be in charge of their own care, while vulnerable patients require accessible care and professionals taking the lead. Furthermore, another study in home care found that preferences differ also between home care clients, care workers, and administrators.[12] For example, clients themselves selected their IADLs as very important to be able to live independently, while it was considered less important by care workers and administrators for whom not all IADL-related aspects are part of the care they provide at home, such as grocery shopping or administrative tasks.

These arguments and examples would speak strongly for increasing knowledge on the relevance of outcomes for different types of clients. Moreover, this is a precondition for realizing patient-centered care – which has become a hallmark of quality in home care.[12] Furthermore, using data on outcomes of home care – possibly in combination with data on client characteristics – will support learning within and between providers to optimize quality and efficiency of care, such as better targeting interventions or deploying highly educated staff in the neighborhoods where they are needed the most.[13] However, limitations exist in using this knowledge on outcomes to its full potential. Besides the lack of knowledge on the relevance of outcomes for different types of clients and from different perspectives (including clients themselves), it is also still unknown how the relevant outcomes should be measured in home care practice (Chapter 6). Moreover, home care providers should have sufficient resources to learn about outcomes of home care, or better said should want to spend their resources on improving their data and learning about it. This is not the case for most home care providers when it comes to learning from their data, especially with regards to time and money (for example to employ data analysts). As a result, learning from available data are – and will be if resources remain scarce – barely taking place at the moment.[14] So, even though great potential exists to learn from home care in general with data on relevant outcomes (combined with client characteristics), this can only take place under the condition that resources and knowledge would be available and used.

Methodological considerations

The degree of stakeholder involvement in the participatory action research approach

The studies in this dissertation comprise a combination of methods following a participatory action approach. Waterman et al.[15,16] defined participatory action research as follows:

> "Action research is a period of inquiry, which describes, interprets, and explains social situations while executing a change of intervention aimed at improvement and involvement. It is problem-focused, context-specific, and future-orientated. Action research is a group activity with an explicit value basis and is founded on a partnership between action researchers and participants, all of whom are involved in the change process. The participatory process is educative and empowering, involving a dynamic approach in which problem-identification, planning, action, and evaluation are interlinked. Knowledge may be advanced through reflection and research, and qualitative and quantitative research methods may be employed to collect data. […]" [16]

Conducting research with and in support of stakeholders leads to a co-creation of knowledge from academia and home care practice. Many home care stakeholders throughout the country were involved in almost every phase of developing a case-mix model: branch organizations (such as umbrella organizations of home care providers and healthcare insurers, and the patient federation), several home care providers, district nurses and healthcare insurers from different areas in the Netherlands, and the Dutch nurses' association (V&VN). This is essential when wanting to have a case-mix based prospective payment system that is supported by and based on their expertise.[17,18] Examples of the valuable inputs by involving stakeholders are numerous. For example, it was decided together with home care providers if conducting home visits is feasible in daily home care practice to determine the inter-rater reliability of the CM-SF questionnaire (Chapter 4) – especially during the COVID-19 pandemic from March 2020 on, just after the home visits started. Also, based on the advice of a director, it was decided not to include directors as experts with the Delphi-study in Chapter 5. According to this director, the most relevant knowledge within the organization on the subject was covered by including district nurses.

However, from a research perspective, it can be difficult to find a balance onto what level stakeholders should be involved when performing participatory action research. Lower levels of participation from stakeholders were highly fulfilled, i.e. informing them, consulting them, deciding together, and acting together.[19] These were achieved for example via national webinars that were presented and newsletters that were written together with stakeholders. However, the highest level of involvement was not attained in this dissertation, as stakeholders were not in control. It is questionable though if that should be the desired level of participation. For example, based on the aim and approach of the studies[19] it was deliberately chosen not to involve clients. However, for the Delphi-studies conducted and possible future research, it is expected that the involvement of clients would lead to relevant insights. Multiple other studies have namely shown that what professionals think clients find important sometimes deviates from what clients themselves find important when it comes to their health and care.[11,12,20] Furthermore, higher levels of involvement might be less suitable when having research subjects that are relatively difficult to explain and complex for stakeholders to understand. For example in the Delphi-study on outcomes (Chapter 6), discussions about the relevance and the influenceability of outcomes were mixed up easily, even within the selected group of district nurses with more than solely practical knowledge. Moreover, bringing together the many views that often deviate from each other when involving multiple stakeholders is complex. For example, in Chapter 5 it can be noticed that asking stakeholders about relevant client characteristics yields a huge number of possible relevant characteristics according to them.

Therefore, with such a complex subject, to which so many interests are linked[17], it is not obvious that stakeholders together would be in control when applying a participatory action research approach. Instead, in that case, it is desirable that a scientific consortium is in the lead to support and manage the process of developing a prospective payment system. To answer the right research questions while keeping all stakeholders on board – including, but not only, those involved as participants in the studies –, it is essential to at least provide tailored and timely information. As one of the district nurses said, proving that it is not impossible to involve all stakeholders: *"At the beginning of the project in 2017, I was the one who needed to be educated on client characteristics and case-mix classification. Now, after the intensive involvement the past few years, I can explain the project and the relevance of a new home care payment system to my colleagues, within but also outside my own organization. Only broadly informing and involving others will get all of us on the same page someday*."

The feasibility of qualitative research methods to study client characteristics as predictors

Insight into client characteristics that predict home care use is essential to develop clinically similar case-mix groups. Therefore, multiple studies were conducted to develop a case-mix classification for Dutch home care (i.e. Chapter 2 to 5, and the development of home care case-mix groups by Tilburg University and the NZa[7]).

In participatory action research, qualitative research methods are often applied to involve stakeholders. However, for case-mix classification development, this has proven to be a challenge as appeared from a separate pilot-study we conducted in 2017. In four focus-group interviews, between seven and ten district nurses discussed the 15 client characteristics that were considered relevant for predicting home care use in the survey-study (Chapter 3). They first ordered the 15 characteristics based on their relevance, followed by the formation of client groups, based on these characteristics, from groups with the lowest to the highest home care needs. In the end, none of the four focus-group interviews led to clear case-mix groups. Based on this pilot-study experience, this question of finding coherence of client characteristics and assessing these (cohering) characteristics on their relevance for predicting home care use was considered too complex. The most feasible way to still take into account stakeholders' insights in case-mix model development was therefore to let stakeholders assess the relevance of client characteristics independently from the possible coherence with other characteristics. This was done in both the survey-study (Chapter 3) and the Delphi-study (Chapter 5). The advantage of this approach was that a less complex question was addressed to stakeholders, leading to a clear-cut answer on relevant client characteristics. However, this is not in line with home care practice, where client characteristics do not occur independently but in coherence with other characteristics. For example, a client's functioning in ADL would be interdependent with his/her cognitive functioning or mobility. Consequently, our question resulted in the numerous possible client characteristics mentioned when stakeholders were able to openly think about relevant predictors (Chapter 5).

To prevent from drowning in the long list of potentially relevant client characteristics, quantitative and qualitative research methods should be considered complementary to each other in the development of case-mix classification. Quantitative research methods are namely able to show these coherences between relevant predictors of home care use, for example by using machine-learning techniques (as was done with the Dutch case-mix model development by Tilburg University and the NZa[7]). These methods have a strength in testing the hypotheses that follow from the qualitative research methods by searching for the trends in characteristics that clients may have, in order to find clinically similar case-mix groups.[21] Qualitative research methods have strengths in incorporating the view of stakeholders in finding initially relevant client characteristics and further refining developed case-mix groups – such as with the Delphi-study in Chapter 5. Combining these methods could therefore lead to a case-mix classification that not only contains clinically similar but also clinically relevant case-mix groups comprising actionable insights.

Bringing stakeholder views together in Delphi-studies

Within this dissertation, two Delphi-studies were conducted aiming at detecting agreement on two subjects: relevant client characteristics for predicting home care use (Chapter 5) and nurse-sensitive outcomes of home care (Chapter 6). A Delphi-study is valuable for bringing together different perspectives – such as with client characteristic for predicting home care use – or when there is incomplete knowledge on a subject – in our case on outcomes of home care to find out on what subjects either consensus or uncertainty exists.[22] In addition, the iteration between Delphi-rounds, as one of the main characteristics of a Delphi-study, provides room for participants to (re)consider their own thoughts based on the views from other participants.[22]

However, a limitation in applying a Delphi-study is that no one golden standard seems to exist on how to conduct a Delphi-study, as the appropriate methodology could differ according to the study aims. There are no strict rules on for example the number of Delphi-rounds that should be conducted or on the number of experts to participate in the study.[22] However, when properly explained, this gives the advantage of having the freedom to select an appropriate methodology. For example, the differences in selected measures of agreement in the two Delphi-studies conducted (Chapter 5 and 6) can be explained (among other) by their aims. The goal of the Delphi-study on outcomes (Chapter 6) was to have a broad orientation on relevant outcomes, while the Delphi-study on client characteristics (Chapter 5) was less explorative and needed somewhat stricter cut-off points as the results were to be used as input for the CM-SF questionnaire (Chapter 5). Therefore, different measures were appropriate for each study.

In addition to this, the lack of a golden standard provides room to facilitate the participatory action research approach.[16] First of all, it made it possible to have expert panel meetings, in contrast to most traditional Delphi-studies that solely use surveys. These meetings can provide an opportunity for stakeholders to get to know each other's vision.[22] Moreover, based on the expert panel meetings, insights were gained on perspectives that could not have been extracted by simply reviewing existing literature.[23] For example, in the Delphi-study on client characteristics (Chapter 5), the participants not only scored the relevance of client characteristics, but they also acted as a soundboard by indirectly making clear to the researchers what they thought of the so-far developed tool for the collection of home care case-mix classification data. Furthermore, involving stakeholders could support the development of creating an appropriate survey for the Delphi-study, while simultaneously contributing to the participatory action research approach.[22] This was for example done with the Delphi-study on client characteristics by discussing the survey design with V&VN and a director of a Dutch home care provider. By involving stakeholders, especially the first survey would reflect the key elements of the research subject[23] better compared to developing the survey based on existing literature only. Finally, contact between researchers and participants is one of the key aspects in keeping all participants on board.[23] Doing so during a Delphi-study could help to build strong collaborations and commitment among stakeholders to contribute to – in this dissertation's case – the development of a prospective home care payment system.[22,23]

Recommendations for policy, practice, and research

This dissertation is one of the results of the scientific consortium with Tilburg University and Utrecht University/Utrecht University of Applied Sciences, initiated by the NZa. With this setup, this dissertation ensured to make a valuable contribution for policy, practice, and research in the development of prospective home care payment.

Policy

This dissertation brings along several recommendations for the future of home care policy. But, as a point of attention for the following recommendations, there is one major aspect that determines to what extent these recommendations can actually be followed. Future steps are very much dependent on new policy choices in the coming years, regarding among others contracted versus non-contracted (home) care and governmental laws on care (including the Health Insurance Act, Long-term Care Act and Social Support Act).

If one wants to get rid of the current payment system that is very much intertwined with the care that is being provided (i.e. fee-for-service), the first and foremost recommendation for policymakers is: act accordingly to the developments on case-mix classification and outcomes in home care. The NZa, which has an advisory function to the government, includes this dissertation's findings in regular reports that are presented to the Dutch Ministry of Health, Welfare and Sport. Stakeholders – including the Dutch Ministry of Health, Welfare and Sport, the NZa, branch organizations such as umbrella organizations of home care providers and healthcare insurers – should however still discuss together how client characteristics in the form of case-mix classification and nurse-sensitive outcomes of home care will play a role in the prospective payment of Dutch home care. Currently, it is not set yet how this would work out. For example, will information on case-mix and outcomes be used in contracting conversations between healthcare insurers and home care providers in a qualitative way? Or will this information be openly available for (potential) home care clients so they can gain insight in for example the quality of care (in terms of outcomes) to select a home care provider of their choice? Participatory action research as an approach is advised to be continued throughout the process of determining how to work with client characteristics and outcomes in home care, including tailored and timely informing all stakeholders. This would namely lead to a strong support base among all those stakeholders who have to work with the prospective home care payment system[4], more accurate indications for implementation strategies, and quicker identification of aspects of resistance.

Second, there is a need for standardization of data within home care. Using standardized terminologies in documentation has numerous potential benefits: it can provide an accurate formulation of clients' care needs and the planning of the care to be provided, it can improve communication among nurses and with other healthcare professionals, it can provide a structure in electronic health records that could facilitate the reuse of registered data, and finally, it allows for comparison within and between home care providers.[5] Realizing increased standardization of registration data in home care is however very complex, among others due to the various stakeholder interest in play. To start working with prospective payments in home care in the short term, it is therefore advised to let home care providers implement the CM-SF questionnaire items necessary for case-mix classification. In the long term, however, standardization of home care registration data in general would be desirable. This can for example mean choosing one nursing classification system to be used by all home care providers in the Netherlands, or to continue on the development of so-called care information building blocks (in Dutch: 'zorginformatie bouwstenen') by Nictiz to have the same health and care data on a client available for all healthcare professionals involved.[24] Thus, attempts should be made by policymakers and relevant stakeholders to undertake this complex process of working towards increased standardization of registering data in home care.

Finally, home care should not only be seen as nursing and personal care services provided at home. Policymakers should embrace a broader perspective on home care policy by being open to considering the inclusion of domestic and long-term care too in developments of healthcare payment. This would increasingly support district nurses to have autonomy and delegate and coordinate care tasks to/with other professionals. As a consequence, the CM-SF questionnaire would however need to be revised as this was developed for home care from the perspective of including nursing and personal care services.

Practice

The recommendations for home care practice especially relate to the role district nurses can play in collecting and using knowledge on client characteristics and outcomes in home care.

To start with, knowledge about predictors of home care use – and subsequently also about the type of clients that are present within a certain provider or neighborhood and the care they use –, can be supportive in the home care needs assessment with clients. This was mentioned by multiple district nurses who filled in the CM-SF questionnaire during the pilot. Some client characteristics namely have high predictive value for home care use but are less often discussed during a needs assessment, even though it might eventually be meaningful to discuss more often. This does not mean district nurses are not assessing the needs appropriately but instead should look beyond their regular way of thinking. For example, a client’s continence might not be discussed if one only needs help with putting on stockings due to arthrosis, but it could still be good to address in terms of identifying (future) home care needs. Therefore, implementing the CM-SF questionnaire items that are necessary for case-mix classification in home care practice is advised.

Additionally, improving certain outcomes of home care requires close collaboration with other healthcare professionals. The Delphi-study on outcomes (Chapter 6) showed that some outcomes are relevant according to district nurses, but they are not fully influenceable by delivering home care alone. In searching for this explanation, the multidisciplinary nature of home care[25] gives it away a bit already; the interdependence of home care with other healthcare sectors automatically gives the motivation for the importance of close collaborations with for example GPs, physiotherapists, and social care workers to achieve the best possible outcomes for clients in home care. Therefore, this multidisciplinary nature should not be overlooked when determining the role of outcomes and improving outcomes in home care.

Finally, resources, knowledge and willingness need to be available at home care providers to learn about home care in general with data on relevant outcomes (in combination with client characteristics). The value of learning from data became clear for example during meetings in which analysis results of CM-SF questionnaire data were presented and discussed with district nurses. Peer learning took place regarding the nurses’ way of working and how to register information of a client. Therefore, providers and their employees should get acquainted with (the idea of) working with data. But, for sure, they should certainly consider at least giving more priority to learn from data first.

Research

Based on this dissertation, several future directions for research can be given on case-mix classification, outcomes of home care, and/or prospective payment of home care in general. First of all, regarding case-mix classification, additional research should seek to develop a shared vision on what the main determinants of home care use are and how to combine these into a case-mix model that both performs well statistically and includes the right incentives for home care providers. Consequently, also the CM-SF questionnaire needs to be developed further, preferably together with stakeholders. This could mean omitting characteristics that showed little potential for predicting home care use, and including new potentially relevant client characteristics based on the results from the Delphi-study (Chapter 5). Refinements of the CM-SF questionnaire and a subsequent new home care case-mix model will be studied by the NZa, Tilburg University and Maastricht University in the continuation of the research described in this dissertation. Furthermore, research on the case-mix groups that are developed with data on client characteristics[7] could use some refinement in collaboration with stakeholders in order for the groups to become more actionable for home care practice, also in terms of outcomes. It is advised to adopt both quantitative and qualitative research methods, as both methods have their complementary strengths suit with the development of case-mix classification and simultaneously applying a participatory action research approach. The NZa is making plans to study this together with Maastricht University. Finally, case-mix classification requires more (and more frequent) research as it must be adapted along with changes in the future context of home care, in order to remain valuable for home care payment.

Second, regarding outcomes, transforming nurse-sensitive outcomes (Chapter 6) into measurable quality indicators is necessary before they can be implemented in practice and policy. Moreover, additional research will have to show if the relevance of outcomes differs for different types of clients in home care. This can for example comprise a comparison on how relevant outcomes would differ for clients compared to what district nurses find relevant. Future plans for these studies will be discussed by the NZa, with Utrecht University/Utrecht University of Applied Sciences as primary scientific partner to possibly execute this research.

Third, a participatory action research approach, involving all stakeholders including clients while maintaining the control among researchers, lends itself well when studying payment policy matters. In addition, the application of Delphi-study as a research method can be an appropriate method to stimulate the involvement of the stakeholders in research. To end with, creating a broader evidence base on prospective payment in home care and its (planned and unplanned) impacts on micro, meso and macro levels of care would help provide guidance on creating the right incentives.

References

1. Van Eenoo L, Declercq A, Onder G, et al. Substantial between-country differences in organising community care for older people in Europe - a review. *Eur J Public Health.* 2015;26(2):213-219.
2. Rijksoverheid. Long-term care act (WLZ). 2021; https://www.government.nl/topics/nursing-homes-and-residential-care/long-term-care-act-wlz. Accessed December 17, 2021.
3. Ministerie van Volksgezondheid Welzijn en Sport. Volledig pakket thuis (vpt). 2021; https://www.regelhulp.nl/onderwerpen/volledig-pakket-thuis. Accessed December 17, 2021.
4. Parsons M, Rouse P, Sajtos L, Harrison J, Parsons J, Gestro L. Developing and utilising a new funding model for home-care services in New Zealand. *Health Soc Care Community.* 2018;26(3):345-355.
5. De Groot K, De Veer AJE, Paans W, Francke AL. Use of electronic health records and standardized terminologies: A nationwide survey of nursing staff experiences. *Int J Nurs Stud.* 2020;104:103523-103523.
6. Kieft R, Vreeke EM, de Groot EM, et al. Mapping the Dutch SNOMED CT subset to Omaha system, nanda international and international classification of functioning, disability and health. *Int J Med Inform.* 2018;111:77-82.
7. Verhoeven G, De Korte M, Van der Weij L, et al. *Onderzoeksrapport pilot cliëntprofielen wijkverpleging: Ontwikkeling van cliëntprofielen in de wijkverpleging.* Dutch Healthcare Authority (NZa), Utrecht, Tilburg University, Tilburg, and Maastricht University, Maastricht; 2020.
8. Elissen AMJ, Metzelthin S, Van den Bulck AOE, Verbeek H, Ruwaard D. *Case-mix classificatie als basis voor bekostiging van wijkverpleging.* Maastricht, the Netherlands: Maastricht University, Faculty of Health, Medicine and Life Sciences, Care and Public Health Research Institute (CAPHRI), Department of Health Services Research; 2017.
9. De Groot K, Triemstra M, Paans W, Francke AL. Quality criteria, instruments, and requirements for nursing documentation: A systematic review of systematic reviews. *J Adv Nurs.* 2019;75(7):1379-1393.
10. Riesenberg LA, Leitzsch J, Cunningham JM. Nursing handoffs: A systematic review of the literature. *Am J Nurs.* 2010;110(4):24-34.
11. Kuipers SJ, Nieboer AP, Cramm JM. Views of patients with multi-morbidity on what is important for patient-centered care in the primary care setting. *BMC Fam Pract.* 2020;21(1):71.
12. Sillner AY, Buck H, VanHaitsma K, Behrens L, Abbott KM. Identifying preferences for everyday living in home health care: Recommendations from an expert panel. *Home Health Care Manag Pract.* 2019;31(2):128-133.
13. Stichting Omaha System Support. *Zorgspiegel Omaha system: Samen leren van data.* 2021.
14. Costa AP, Poss JW, McKillop I. Contemplating case mix: A primer on case mix classification and management. *Healthc Manage Forum.* 2015;28(1):12-15.
15. Koshy E, Koshy V, Waterman H. *Action research in healthcare.* Londen, United Kingdom: SAGE Publications Ltd; 2011.
16. Waterman H, Tillen D, Dickson R, de Koning K. Action research: A systematic review and guidance for assessment. *Health Technol Assess.* 2001;5(23):iii-157.
17. Hopfe M, Stucki G, Marshall R, Twomey CD, Üstün TB, Prodinger B. Capturing patients’ needs in casemix: A systematic literature review on the value of adding functioning information in reimbursement systems. *BMC Health Serv Res.* 2016;16(1):40.
18. Sajtos L, Rouse P, Harrison J, Parsons M. Case-mix system as a boundary object: The case of home care services. *Australas Mark J.* 2014;22(3):189-196.
19. Boeije H, de Jong J, Rademakers J. *Kennissynthese: Patiëntenparticipatie in onderzoek.* Utrecht, the Netherlands: NIVEL; 2017.
20. Zeh S, Christalle E, Zill JM, Härter M, Block A, Scholl I. What do patients expect? Assessing patient-centredness from the patients' perspective: An interview study. *BMJ Open.* 2021;11(7):e047810.
21. Fries BE, Schneider DP, Foley WJ, Gavazzi M, Burke R, Cornelius E. Refining a case-mix measure for nursing homes: Resource utilization groups (RUG-III). *Med Care.* 1994;32(7):668-685.
22. Kezar A, Maxey D. The Delphi technique: An untapped approach of participatory research. *Int J Soc Res Methodol.* 2016;19(2):143-160.
23. Franklin KK, Hart JK. Idea generation and exploration: Benefits and limitations of the policy Delphi research method. *Innov High Educ.* 2007;31(4):237-246.
24. Nictiz. Standaardisatie: Zib-centrum. https://www.nictiz.nl/standaardisatie/zib-centrum/. Accessed December 8, 2021.
25. Rosendal H. *Expertisegebied wijkverpleegkundige.* Utrecht, the Netherlands: V&VN; 2019.

Addenda

Summary
Samenvatting
Impact
Dankwoord
About the author
Publications

Summary

People are getting older, the prevalence of chronic diseases increases, and there is a scarcity of qualified healthcare workers, such as nurses. Because of, among others, these developments, it is a great challenge for Western healthcare systems to remain or become sustainable. Of the different sectors within healthcare, home care is a sector that is of increasing importance in dealing with this challenge. How home care is paid for plays an important role in coping with the sustainability challenges and providing efficient, high-quality home care. Therefore, this dissertation contributed to the development of a suitable payment system for home care in the Netherlands, as part of the scientific collaboration initiated by the Dutch Healthcare Authority (NZa). More specifically, the following objectives were to be achieved by this dissertation, using a participatory action research approach: 1) Creating an overview of the current knowledge and views from practice on (which client characteristics are relevant to include in) case-mix classification for home care; 2) Developing and evaluating a widely applicable basis for data collection for the purpose of case-mix model development; and 3) Exploring outcomes that are suitable for quality measurement in home care.

Chapter 1 provides a description of the healthcare policy developments to deal with the sustainability challenge, which influences home care. Furthermore, it was explained how prospective payment in home care – as an alternative to the currently mostly used fee-for-service payment – could provide the right incentives in home care. Correcting for case-mix classification and outcomes of home care are mentioned as two mechanisms to apply to deal with the perverse incentives of a prospective payment system. These two mechanisms are the focus of this dissertation.

In **Chapter 2**, a systematic literature review of scientific and grey literature gives insight into existing case-mix models for home care. In total, 22 scientific studies and 27 grey documents were included for the analysis. Based on these articles and documents, case-mix based prospective payment seemed not to be widely used within international home care. From the eight home care case-mix models identified, only the US, New Zealand, and Germany have implemented a model in home care payment. Large differences were found between the existing case-mix models. First of all, different home care services are covered (e.g. only personal care, or also nursing care and domestic support). Second, predictors of home care use are operationalized differently. The operationalization can be based on an existing classification system such as an International Resident Assessment Instrument (InterRAI), or an instrument developed specifically for the model development. Third, they differ in terms of outcome measures (e.g. (weighted) costs or care time) and predictive power (ranging between 14 to 21% for newly developed models until 54% for a model that was continuously developed through the years). Finally, highly diverse combinations in total 127 unique client characteristics are included across models to predict home care use. Most often, models included predictors related to a client's physical functioning (e.g. 'Mobility' and 'Continence'), daily functioning (e.g. 'Toileting' and 'Managing medication'), and health services use (e.g.

'Intravenous therapy'). Social environmental characteristics (e.g. 'Social support') were included least frequently.

Chapter 3 described a survey study among nurses working in home care, to assess which client characteristics are relevant predictors of home care use. The survey contained 35 client characteristics, which were assessed on their relevance using a 9-point Likert scale and a ranking of the five most relevant characteristics. The relevance was determined using descriptive statistics (i.e. median and inter-quartile ranges, and an overall ranking). In total, 1,007 nurses completed the survey. Out of 35 client characteristics, nurses assessed 15 characteristics as being relevant for predicting home care needs, including biomedical characteristics such as 'Terminal phase' (assessed as most relevant), 'ADL functioning' (ranked as most relevant) and 'Physical functions', and psychosocial characteristics such as 'Social support' and 'Self-management'. None of the 35 presented client characteristics was assessed as irrelevant. Characteristics for which relevance was considered uncertain included among others several characteristics related to a client's mental functioning (e.g. 'Anxiety', 'Signs of depression', and 'Problem behavior'). Concluding, according to nurses, both biomedical and psychosocial characteristics need to be taken into account when predicting home care needs of a client.

Due to the large variations between and within countries on how data on predictors of home care use are collected, the need arose to develop a separate questionnaire to collect high-quality, standardized data for case-mix model development in the Netherlands. Therefore, in **Chapter 4**, the Case-Mix Short Form (CM-SF) questionnaire was developed and tested in collaboration with district nurses. Based on the findings from, among others, the systematic literature review and the survey study (in Chapters 2 and 3, respectively), the most commonly used relevant predictors of home care use were included in the CM-SF questionnaire. The initial questionnaire's content validity was tested in focus-group interviews including district nurses. After processing their feedback, a small-scale feasibility test was carried out with 22 clients to gather the final comments. The final version of the CM-SF questionnaire assesses a client's status based on 11 multiple-choice items that cover the most commonly used predictors of home care use over five categories: 'Illness prognosis', 'Functional status in terms of ADL', 'Self-reliance in terms of IADL', 'Cognitive functioning', and 'Informal care'. The questionnaire was implemented in practice at four Dutch home care providers. Based on the 5,485 completed CM-SF questionnaires, answer distributions were determined. These analyses showed that all possible answer options of the questionnaire were used within the population of home care clients, with the majority of clients being scored as completely or partially independent. Additionally, inter-rater reliability was determined by two raters who independently completed the questionnaire after performing a needs assessment. All 11 items showed substantial to excellent agreement (i.e. Kappa value ≥ 0.6) between raters based on CM-SF data from 38 clients.

In a study from Tilburg University and the NZa, the CM-SF questionnaire shows to be a promising instrument to collect data for case-mix classification in home care. However, including items on other categories of home care use predictors, such as regarding a client's mental health status or the social network, may be necessary to improve case-mix classification in home care. Therefore, as described in **Chapter 5**, a two-round Delphi-study with district nurses and healthcare insurers was conducted which aimed to identify client characteristics that might improve case-mix classification in home care. Participants assessed the eleven client characteristics from the CM-SF questionnaire (i.e. 'pre-existing' characteristics) and eleven additional characteristics – selected from the 142 characteristics suggested by participants – on their relevance for predicting home care use using a 9-point Likert scale. Six categories were used to group characteristics, of which most pre-existing characteristics belonged to the category 'Daily functioning'. After the first Delphi-round and an expert panel meeting, the final assessment took place as part of the second Delphi-round, with 16 district nurses and 6 insurers participating. Similar to the survey study (Chapter 3), relevance was determined based on medians and inter-quartile ranges. The findings showed that mostly characteristics from categories other than 'Daily function' were assessed relevant, being: 'Multimorbidity' (from the category 'Physical health status'), 'Cognitive skills for daily decision making', 'Mental functioning', and 'Resilience' (from the category 'Mental health status and behavior'), 'Learning ability' (from the category 'Health literacy'), 'Social network' (from the category 'Social environment and network'), and 'Illness prognosis' and 'Need for technical nursing care' (from the category 'Other'). The relevance of most characteristics from the category 'Daily functioning' was considered uncertain, except for characteristics 'Washing/showering' and 'Nourishing'. Concluding, including relevantly assessed client characteristics in case-mix classification, herewith specifically indicating which characteristics would incorporate a more holistic view on home care clients, is expected to lead to higher predictive values.

Chapter 6 presents a two-round Delphi-study that was conducted to identify nurse-sensitive outcomes of home care, i.e. outcomes that are relevant and can be influenced by district nurses. After the initial assessment in the first Delphi-round and an expert panel meeting, 46 outcomes were assessed on their nurse-sensitiveness by 11 district nurses using a 9-point Likert scale in the second Delphi-round. The median and disagreement index were calculated to determine relevance and infleunceability per outcome. In the end, 26 outcomes were assessed as nurse-sensitive. Outcomes that received the highest median scores for both relevance and influenceability (n=5) were 'autonomy', 'decision making' (regarding the provision of care), 'satisfaction with home care', 'quality of dying and death', and 'compliance' (of a client with needed care). Furthermore, three outcomes received consensus on being not nurse-sensitive (i.e. irrelevant and not influenceable) (n=3), namely 'multimorbidity', 'death', and 'planned hospital admission'. The 26 nurse-sensitive outcomes could guide the development of quality indicators in home care. A first step would be to operationalize outcomes and determine which outcomes are relevant for specific subgroups of home care clients.

To end with, **Chapter 7** reflects on the theoretical and methodological considerations of this dissertation. For the theoretical considerations, it describes that a case-mix classification should be a dynamic, learning model, which can adapt to changes in for example healthcare policy and population needs, to be valuable for payment in home care. Furthermore, it is argued that increased standardization of home care registration data would be desirable. For the short term, a separate questionnaire, such as the CM-SF questionnaire, is needed to collect high-quality case-mix classification data. For the long term, standard registration systems – or how these are used – need to change to use those data for case-mix classification and to not (further) increase the administrative burden for nurses. Another point raised is that refinements on outcomes for specific subgroups of clients and an increase in resources are needed to use the knowledge on home care outcomes to its full potential. For the methodological considerations, a reflection is provided on the degree of stakeholder involvement in the studies of this dissertation. For a complex matter such as payment system development, informing and involving stakeholders is desirable, but, ideally, a scientific consortium is in the lead to support and manage the process. Also, clients – as one of the stakeholders – should not be ignored, especially concerning studies on outcomes of home care. Another methodological reflection pleaded for the application of mixed-methods research in the development of case-mix classification. This could namely result in a case-mix classification that is both clinically relevant and contains actionable insights. Furthermore, it was discussed that Delphi-studies are a suitable method to apply when one wants to involve stakeholders in studies following a participatory action research approach. Following these considerations, this chapter finishes with several recommendations for policy, practice, and research.

Samenvatting

Mensen worden ouder, het aantal chronisch zieken neemt toe en er is een groot tekort aan gekwalificeerde zorgverleners, zoals verpleegkundigen. Ten gevolge van (onder andere) deze ontwikkelingen is het voor veel Westerse landen een uitdaging om hun zorgsystemen duurzaam te maken of houden. Daarbij speelt de wijkverpleging een steeds belangrijkere rol. De bekostigingsvorm van wijkverpleging is van grote invloed op duurzaamheid en de mogelijkheid tot het leveren van efficiënte, kwalitatief goede zorg. Dit proefschrift draagt daarom bij aan de ontwikkeling van een passende bekostiging voor wijkverpleging in Nederland, als onderdeel van het Wetenschappelijk Programma Wijkverpleging van de Nederlandse Zorgautoriteit (NZa). De doelstellingen van dit proefschrift luidden als volgt: 1) Een overzicht creëren van de huidige kennis en opvattingen uit de praktijk over (welke cliëntkenmerken relevant zijn voor) case-mix classificatie voor bekostiging in de wijkverpleging; 2) Het ontwikkelen van een breed toepasbare basis voor dataverzameling ten behoeve van de ontwikkeling van case-mix classificatie; en 3) Verkennen welke uitkomsten geschikt zijn voor kwaliteitsmeting in de wijkverpleging.

Hoofdstuk 1 beschrijft welke ontwikkelingen gaande zijn binnen de wijkverpleging, als reactie op de uitdagingen omtrent duurzaamheid. Verder is uitgelegd hoe een prospectieve bekostiging van wijkverpleging – als alternatief voor het op dit moment vaak gebruikte ‘uurtje-factuurtje’ – de juiste prikkels zou kunnen geven. Er zijn vervolgens twee mechanismen toegelicht om mogelijk perverse prikkels van prospectieve bekostiging tegen te gaan, namelijk correctie voor case-mix classificatie en uitkomsten van wijkverpleging. Deze twee mechanismen staan centraal in dit proefschrift.

In **Hoofdstuk 2** is een systematisch literatuurstudie beschreven naar bestaande case-mix modellen voor bekostiging in de wijkverpleging. In totaal werden 22 wetenschappelijke studies en 27 grijze documenten geïncludeerd voor verdere analyse. Uit analyse van deze artikelen en documenten bleek dat prospectieve bekostiging op basis van case-mix classificatie nog slechts beperkt wordt toegepast binnen de wijkverpleging. Van de acht geïdentificeerde case-mix modellen zijn slechts drie modellen daadwerkelijk geïmplementeerd voor de bekostiging van wijkverpleging, te weten in de Verenigde Staten, Nieuw-Zeeland en Duitsland. Bestaande case-mix modellen verschillen sterk van elkaar. Allereerst worden er diverse soorten zorg gedekt (bijvoorbeeld uitsluitend persoonlijke verzorging of ook verpleging en huishoudelijke hulp). Ten tweede worden voorspellers van zorggebruik in de wijkverpleging op verschillende wijzen geoperationaliseerd. Dit kan gebaseerd zijn op een bestaand classificatiesysteem, zoals de InterRAI, of op een instrument dat is ontwikkeld specifiek voor de ontwikkeling van case-mix classificatie. Ten derde verschillen de modellen in hun gebruikte uitkomstmaten (bijvoorbeeld (gewogen) kosten of aantal uren zorg) en hun voorspelkracht (variërend van 14 tot 21% voor nieuw ontwikkelde modellen tot 54% voor een geïmplementeerd en doorontwikkeld model). Tot slot gebruiken de geïdentificeerde case-mix modellen zeer uiteenlopende combinaties van in totaal 127 unieke cliëntkenmerken om zorggebruik te voorspellen. Kenmerken met betrekking tot het fysiek functioneren van een cliënt (zoals ‘Mobiliteit’ en ‘Continentie’), het dagelijks functioneren (zoals ‘Toiletgang’ en ‘Medicatiemanagement’) en het gebruik van gezondheidszorg (zoals ‘Intraveneuze therapie’) worden het vaakst gebruikt als voorspellers van zorggebruik. Sociale omgevingskenmerken (zoals ‘Sociale steun’) worden het minst vaak gebruikt als voorspeller.

Hoofdstuk 3 beschrijft een survey-studie onder verpleegkundigen werkzaam in de wijk over welke cliëntkenmerken relevant zijn voor het voorspellen van zorggebruik in de wijkverpleging. In de survey werden 35 cliëntkenmerken voorgelegd ter beoordeling op een 9-punts Likert-schaal. Daarnaast werden de vijf meest relevante cliëntkenmerken op een rij gezet. De relevantie per cliëntkenmerk werd bepaald op basis van beschrijvende statistiek (zijnde mediaan en interkwartielafstand). In totaal vulden 1.007 verpleegkundigen de survey in. Van de 35 cliëntkenmerken werden 15 kenmerken als relevant beoordeeld door verpleegkundigen voor het voorspellen van zorggebruik in de wijkverpleging. Dit waren onder andere biomedische kenmerken zoals ‘Terminale fase’ (als meest relevant beoordeeld), ‘ADL-functioneren’ (als hoogste geordend) en ‘Fysiek functioneren’, en psychosociale kenmerken zoals ‘Sociale steun’ en ‘Zelfmanagement’. Geen enkel cliëntkenmerk werd als irrelevant beoordeeld. Kenmerken waarvan de relevantie als onzeker werd beoordeeld waren onder andere kenmerken omtrent het mentaal functioneren, zoals ‘Angst’, ‘Signalen van depressie’ en ‘Probleemgedrag’. Concluderend moet volgens verpleegkundigen met zowel biomedische als psychosociale cliëntkenmerken rekening worden gehouden bij het voorspellen van zorggebruik van cliënten in de wijkverpleging.

Vanwege grote verschillen in de manier waarop data over voorspellers van zorggebruik worden geregistreerd, is een aparte vragenlijst nodig om op gestandaardiseerde wijze kwalitatief goede gegevens te verzamelen voor case-mix classificatie in Nederland. **Hoofdstuk 4** beschrijft dan ook de Case-Mix vragenlijst (in Engels de Case-Mix Short Form (CM-SF)) die is ontwikkeld en getest in samenwerking met wijkverpleegkundigen. Op basis van de bevindingen uit onder meer het systematische literatuurstudie en de survey-studie (respectievelijk Hoofdstuk 2 en 3) werden de meest gebruikte relevante voorspellers van zorggebruik in de wijkverpleging geïdentificeerd. Deze zijn opgenomen in de Case-Mix vragenlijst. De content validiteit van de initiële vragenlijst werd getest in focusgroep interviews met wijkverpleegkundigen. Na het verwerken van de feedback werd de werkbaarheid van de vragenlijst kleinschalig getest in de praktijk bij 22 cliënten om de laatste feedback te verzamelen en verwerken. De definitieve versie van de Case-Mix vragenlijst bevat elf meerkeuzevragen, waarmee de status van de cliënt kan worden beoordeeld op het gebied van de meest gebruikte voorspellers van zorggebruik in de wijkverpleging, verdeeld over vijf categorieën: ‘Verwachte verloop’, ‘Functionele status op het gebied van ADL’, ‘Zelfredzaamheid op het gebied van IADL’, ‘Cognitief functioneren’ en ‘Mantelzorg’. De Case-Mix vragenlijst werd getest bij vier Nederlandse aanbieders van wijkverpleging. Op basis van 5.485 ingevulde vragenlijsten werden de antwoordverdelingen bepaald. Hieruit bleek dat alle mogelijke antwoordopties van de vragenlijst werden gebruikt binnen de populatie van cliënten in de wijkverpleging, waarvan de meerderheid van de cliënten als volledig of gedeeltelijk onafhankelijk werd gescoord. Daarnaast werd de interbeoordelaars-betrouwbaarheid van de vragenlijst bepaald. Na afloop van de anamnese vulden twee beoordelaars los van elkaar de Case-Mix vragenlijst in. Er bleek substantiële tot uitstekende overeenstemming te zijn tussen de beoordelaars (zijnde Kappa-waarde ≥ 0,6) voor alle 11 vragen op basis van de ingevulde Case-Mix vragenlijsten bij 38 cliënten.

In een onderzoek van Universiteit Tilburg en de NZa bleek de Case-Mix vragenlijst een veelbelovend instrument te zijn voor het verzamelen van data voor case-mix classificatie in de wijkverpleging. Het toevoegen van andere categorieën voorspellers, zoals op het gebied van de mentale gezondheidstoestand van een cliënt of het sociale netwerk, zou echter kunnen leiden tot betere voorspellingen van zorggebruik in de wijkverpleging. Daarom werd een Delphi-studie met twee rondes uitgevoerd met wijkverpleegkundigen en zorgverzekeraars (**Hoofdstuk 5**). Het doel van de studie was om cliëntkenmerken te identificeren die de case-mix classificatie in de wijkverpleging kunnen verbeteren. Deelnemers beoordeelden de elf cliëntkenmerken uit de Case-Mix vragenlijst en elf aanvullende kenmerken – geselecteerd uit de 142 kenmerken die als aanvullend zijn benoemd door de deelnemers – op hun relevantie voor het voorspellen van zorggebruik middels een 9-punt Likert-schaal. Cliëntkenmerken werden gegroepeerd in zes categorieën, waarvan de meeste Case-Mix vragenlijst kenmerken behoorden tot de categorie ‘Dagelijks functioneren’. Na de eerste Delphi-ronde en een bijeenkomst met deelnemende experts vond een tweede en tevens laatste beoordeling van de kenmerken plaats. In deze tweede Delphi-ronde deden 16 wijkverpleegkundigen en zes verzekeraars mee. Evenals bij de survey-studie (Hoofdstuk 3) werd de relevantie van de cliëntkenmerken bepaald op basis van medianen en interkwartielafstanden. Uit de resultaten bleek dat vooral kenmerken uit andere categorieën dan ‘Dagelijks functioneren’ als relevant werden beoordeeld, namelijk: ‘Multimorbiditeit' (uit de categorie ‘Lichamelijke gezondheidsstatus’), 'Cognitieve vaardigheden voor dagelijkse besluitvorming', ‘Psychisch functioneren' en ' Veerkracht' (uit de categorie 'Geestelijke gezondheidsstatus en gedrag'), 'Leervermogen' (uit de categorie 'Gezondheids-vaardigheden'), 'Sociaal netwerk' (uit de categorie 'Sociale omgeving en netwerk') en 'Verwachte verloop' en 'Verpleegtechnische zorg' (uit de categorie 'Overig'). De relevantie van de meeste kenmerken uit de categorie ‘Dagelijks functioneren’ bleef onzeker, met uitzondering van de kenmerken ‘Wassen/douchen’ en ‘Voeden’. Concluderend, het opnemen van de relevant beoordeelde cliëntkenmerken in case-mix classificatie, met dus een meer holistische kijk op cliënten, zal naar verwachting leiden tot hogere voorspellende waarden.

Hoofdstuk 6 beschrijft een Delphi-studie, bestaande uit twee rondes, die was uitgevoerd om verpleeg-sensitieve uitkomsten van wijkverpleging te identificeren. Dat zijn uitkomsten die relevant zijn voor en bovendien te beïnvloeden zijn door wijkverpleegkundige zorg. Na de eerste Delphi-ronde vond de tweede Delphi-ronde plaats in een bijeenkomst met deelnemende experts. Elf wijkverpleegkundigen beoordeelden de verpleeg-sensitiviteit van 46 uitkomsten op een 9-punts Likert-schaal. De mediaan en disagreement-index werden berekend per uitkomst om de relevantie en mate waarin een uitkomst beïnvloedbaar is, te bepalen. In totaal werden 26 uitkomsten als verpleeg-sensitief beoordeeld. De uitkomsten met de hoogte mediaan scores voor zowel relevantie als beïnvloedbaarheid (n=5) waren ‘autonomie’, ‘besluitvorming’ (met betrekking tot de zorgverlening), ‘tevredenheid (van de cliënt) met wijkverpleging’, ‘kwaliteit van sterven en overlijden’ en ‘therapietrouw’ (van de cliënt). Verder was er consensus over de niet-verpleegsensitiviteit (dat wil dus zeggen niet relevant en niet beïnvloedbaar) van drie uitkomsten, namelijk ‘multimorbiditeit’, ‘overlijden’ en ‘geplande ziekenhuisopname’. De 26 verpleeg-sensitieve uitkomsten kunnen richting geven aan verdere ontwikkeling van kwaliteitsindicatoren in de wijkverpleging. Een eerste stap hierbij is om de uitkomsten te operationaliseren en te bepalen welke uitkomsten relevant zijn voor specifieke cliëntgroepen in de wijkverpleging.

Tot slot reflecteert **Hoofdstuk 7** op de theoretische en methodologische overwegingen van dit proefschrift. Als theoretische reflectie is beschreven dat case-mix classificatie een dynamisch en lerend model zou moeten zijn dat zich aanpast aan veranderingen, in bijvoorbeeld gezondheidszorgbeleid en behoeften aan zorg, om waardevol te zijn voor bekostiging van wijkverpleging. Verder is beargumenteerd dat meer standaardisatie van gegevensregistratie in de wijkverpleging wenselijk zou zijn. Voor de korte termijn is een aparte vragenlijst nodig, zoals de Case-Mix vragenlijst, om gestandaardiseerde, kwalitatief goede case-mix data te kunnen verzamelen. Voor de lange termijn is aanpassing van de standaard registratiesystemen in de wijkverpleging – of de wijze waarop deze worden gebruikt – belangrijk om deze gegevens te kunnen benutten voor case-mix classificatie en de registratielast voor wijkverpleegkundigen daarmee zo laag mogelijk te houden. Wat betreft de uitkomsten van wijkverpleging is beter inzicht nodig in welke uitkomstindicatoren relevant zijn voor specifieke cliëntgroepen. Ook zijn meer middelen (zoals tijd en geld) nodig om de kennis over de uitkomsten van wijkverpleging optimaal te benutten. Bij de methodologische overwegingen wordt gereflecteerd op de mate van betrokkenheid van stakeholders bij de studies van dit proefschrift. Voor complexe onderwerpen zoals de ontwikkeling van een nieuwe bekostiging is het informeren en betrekken van stakeholders wenselijk, maar idealiter heeft een wetenschappelijk consortium de leiding om het proces inhoudelijk te voeden, ondersteunen en managen. Verder mogen ook cliënten – als een van de stakeholders – niet vergeten worden, vooral niet als het gaat om onderzoeken naar de uitkomsten van wijkverpleging. Een andere methodologische reflectie betreft de waarde van mixed-methods onderzoek voor de ontwikkeling van case-mix classificatie. Dit kan namelijk resulteren in een case-mix classificatie die klinisch relevant is en daarnaast ook bruikbare inzichten voor de praktijk kan opleveren. Verder is stilgestaan bij het belang van Delphi-studies als geschikte methode om stakeholders te betrekken bij studies binnen participatief actie-onderzoek. Tot slot eindigt het hoofdstuk met een aantal aanbevelingen voor beleid, praktijk en onderzoek.

Impact

Gaining insight into case-mix and outcomes in home care, as is done with this dissertation, is one thing. However, this knowledge only becomes of value once it is shared and used. Therefore, this chapter addresses the contribution of this dissertation to society, its impact on science, and the efforts made to disseminate the findings.

Societal impact

The societal impact of this dissertation can be found on different levels, being on a macro level (i.e. nationally, including the government and branch organizations), on a meso level (i.e. including healthcare insurers and home care providers) and a micro level (i.e. locally, including nurses and clients). This dissertation informs the NZa, which is an independent regulatory agency in the healthcare market with an advisory function to the Dutch Ministry of Health, Welfare and Sport. This also concerns advice on the development of a new home care payment system. Their reports[1,2] – among others describing findings from the studies of this dissertation and other outcomes from the scientific consortium (see Chapter 1) – go to the minister and the involved policy makers so they can base their decision for the new payment system on the most recent available scientific evidence. Hence, this dissertation has a direct influence on policymaking in the area of home care in the Netherlands. Additionally, home care outcomes are mentioned as an important part of the quality framework for Dutch home care (in Dutch 'Kwaliteitskader Wijkverpleging'), published in June 2018. One of the goals of this quality framework is 'to reach increased unity and higher quality of care, […] with room to learn and improve'.[3] A steering committee – in which one scientific consortium member of Utrecht University/Utrecht University of Applied Sciences also participates as sounding board, to ensure application of our study results – was constituted that would specifically focus on the development and implementation of quality indicators. This is where the home care outcomes step in. The committee had made a selection of indicators themselves that were developed, of which home care providers are obliged to register. For the continuation of the committee's work, the findings on nurse-sensitive outcomes provide guidance on the future selection of the next indictors to develop and implement. To end with for the societal impact on the macro level, this dissertation has stressed the importance of decreasing fragmentation in care and have more integrated (home) care. Even from before the start of the work in this dissertation in 2017, multiple organizations – including individual home care providers and branch organizations such as Actiz – called for organizing and financing care with the client as central point, instead of the providers within a specific sector.[4,5] And, as clients increasingly use care from different sectors, this thus means for home care it does not stand alone when developing or changing national home care policy.

On a meso level, this dissertation's societal impact is noticeable for healthcare insurers and home care providers. The aim of the new home care payment system is, among others, for insurers to have contracting conversations with home care providers based on the content and outcomes of home care. The findings in this dissertation provide knowledge on client characteristics and outcomes that are relevant to discuss during these conversations. Instead of talking about hours and costs of home care in the previous years as input for the next year's contracting, conversations could for example be about the types of clients a home care provider has, considering (as resulting from case-mix groups in other studies[6]) these clients might be high or low (resource) users of home care. Furthermore, the overarching goal of a new payment system for home care – to which this dissertation aims to contribute – is that delivery of home care is no longer incentivized by quantity of care, but instead based on the actual needs of home care clients. Thus, for the professionals this means a shift in their way of working. Multiple home care providers across the country have already adopted this new way of working, as: a) they were allowed by the government to already start with making contracting arrangement alternative to fee-for-service (note: this is an experiment and not established as a national policy rule), and b) they started educating their home care staff in stimulating self-reliance of clients. As an example to the latter, home care provider MeanderGroep Zuid Limburg trained their staff with the Stay Active at Home program, that aimed at changing the behavior of home care professionals from doing things *for* the client to providing care *with* the client.[7,8] Certain training programs might be necessary – especially for those organizations who do not adopt alternative contracting arrangement nor additional education of staff – alongside the change of a payment system in order to reach the payment system goals (see also Chapter 1). Lastly, home care cannot be regarded as an isolated sector on a meso level. This dissertations emphasizes that the collaborations between for example municipalities, who are currently responsible for social care, and home care providers could be intensified.

Finally, on a micro level this dissertation also impacts home care professionals (including district nurses) in interaction with their clients. The recommended need for increasing standardization of registrations in home care is one of them. While this is a complex matter that either one way or another implies changes in what and how nurses register information in home care, improving standardization could support nurses on the long-term. Examples of benefits include realizing improved communication among nurses and with other healthcare professionals, comparisons (e.g. of types of clients, interventions delivered, and quality of care) between teams and organizations[9], and – ultimately – maybe even decrease the documentation burden experienced by nurses as re-use of data is better possible. Furthermore, the CM-SF questionnaire (Chapter 4) was considered relevant for more than solely case-mix classification development. Nurses working with the CM-SF questionnaire acknowledged this questionnaire can be supportive in home care needs assessments. It makes them adopt a wider perspective by including the objective knowledge on what predicts home care use, in addition to the expertise they already have themselves regarding needs assessments. Moreover, home care provider Envida kept on registering CM-SF questionnaire data after the pilot as they were interested in learning about their own population of home care clients in terms of their characteristics and providing these insights to their district nurses. Similarly to this, in a report of Omaha System Support (i.e. the organization of one of the existing nursing classification systems)[10], it was mentioned that home care teams that they studied were enthusiastic about discovering what data could mean for their daily practice, by detecting similarities and differences between home care teams and what they could learn from each other. However, they also acknowledged that this was hindered by the complexity of the raw data and accompanying analyses, and the difficulty for home care staff to perform the analyses themselves that are necessary for gaining these insights. Thus, increasing standardization in home care data and – once these are standardized – learning from these data would certainly impact providers and their nurses, as they have to adapt their standard way of working regarding registrations in home care. Ultimately, the development of a prospective payment system using inputs from this dissertation should result in improved care for the clients. A prospective payment system that corrects for case-mix and outcomes could prevent overuse, underuse and misuse of care by targeting the scarce resources to those who need it the most. Furthermore, it is likely that the autonomy of district nurses will increase as a prospective payment system gives them room to adopt what is needed at that moment for the client, according to their experiential and practical expertise. As a result, it is expected that care will become more client-centered, provided at the right time and the right place, following the needs of the client.

Scientific impact

This dissertation also has its impact on science. First and foremost, it shows the value of applying a participatory action research approach in the development of healthcare policy. All previous attempts without involvement of academia (described in Chapter 1) have failed in finding a suitable new payment system for home care. However, this dissertation, in cooperation with the other partners of the scientific consortium initiated by the NZa, so far has succeeded in developing a home care case-mix classification. Additionally, stakeholders within home care – i.e. the Dutch patient federation (Patiëntenfederatie), the Dutch nurses' association (V&VN), branch organizations for healthcare, home care providers, and healthcare insurers (i.e. Actiz, Zorgthuisnl, and Zorgverzekeraars Nederland, respectively), and the NZa – have signed a covenant in which they laid down their joint intentions regarding the aims and design of a new experiment.[11] In this new experiment, running from 2022 until 2026, the number of home care providers and insurers that will contract home care based on the developed case-mix classification[6] will gradually increase. This successful step in working towards a nationally used home care prospective payment system shows the value of doing this together with stakeholders. It emphasizes the importance of participatory action research, where the right balance in between doing it with and for stakeholders can result in a new payment policy based on case-mix and outcomes that is not only informative but also really actionable for home care practice.

Additionally, this dissertation has added to the scientific knowledge base on case-mix classification and outcomes in home care. For case-mix classification, this dissertation has identified a scattered picture of knowledge about client characteristics that existed in current scientific and non-scientific publications. Learned from other countries seemed only possible to a very limited extent. This possibility has now be enhanced by the synthesis of internationally conducted research in this dissertation (see Chapter 2). Moreover, it is expected that more countries might have information on their case-mix model for home care, yet only available in national policy document or reports in country-specific languages. This dissertation has therefore contributed to making this information available at least for the Dutch context to not scatter the picture on case-mix classification even more than before and cohere with the available evidence.

Dissemination of findings

The knowledge produced by this dissertation has been disseminated in various ways during the past several years. Informing home care stakeholders has been of high importance throughout this process, also to increase support among stakeholders. Therefore, information has been presented at national and regional conferences for diverse audiences – including conferences and webinars for district nurses, insurers and/or policy makers –, at regular meetings of the NZa with branch organizations, and at multiple meeting at home care providers – including for directors, district nurses and client councils – especially those involved in the pilot study. Moreover, reports[1,2,6] from the NZa that included this dissertation's findings were shared with among others the government and branch organizations. Additionally, two Dutch articles about the studies conducted were published in the journal of the Dutch nurses' association to inform nurses[12,13], and one Dutch in the annual report of the Living Lab in Ageing and Long-Term Care (AWO), addressed at all long-term care providers, employees and clients, and educational institutes affiliated with the AWO.[14] Also, care-related Dutch news websites such as Skipr and Zorgvisie have dedicated multiple articles to the development of a new payment system in Dutch home care. Regarding scientific disseminations, the articles from Chapter 2 to 6 were submitted for publication in peer-reviewed scientific journals, of which three are accepted and open-access available (i.e. Chapter 2, 3 and 6). Furthermore, multiple poster presentations were given at international conferences. More detailed information on publications and presentations can be found in the Addendum 'Publications'. Lastly, this dissertation can contribute to the development of education, especially regarding the master Healthcare Policy, Innovation and Management at Maastricht University. For several years now, the development of a new payment system for Dutch home care has been part of a student assignment, as example of a real-world healthcare policy issue.

References

1. Nederlandse Zorgautoriteit. *Advies bekostiging wijkverpleging 2022: Van kwantiteit naar kwaliteit.* Utrecht, the Netherlands: Nederlande Zorgautoriteit; 2019.
2. Nederlandse Zorgautoriteit. *Tussenrapportage ontwikkeling nieuwe bekostiging wijkverpleging.* Utrecht, the Netherlands: Nederlandse Zorgautoriteit; 2020.
3. Stuurgroep Kwaliteitskader Wijkverpleging. *Kwaliteitskader wijkverpleging*. 2018.
4. Skipr. Ontschot de financiering van de zorg. 2012; https://www.skipr.nl/nieuws/ontschot-de-financiering-van-de-zorg/. Accessed December 13, 2021.
5. Van Aartsen C. Ontschotting bespraart 1,5 miljard op zorgkosten. 2016; https://www.zorgvisie.nl/ontschotting-kan-15-miljard-besparen-op-zorgkosten/. Accessed December 13, 2021.
6. Verhoeven G, De Korte M, Van der Weij L, et al. *Onderzoeksrapport pilot cliëntprofielen wijkverpleging: Ontwikkeling van cliëntprofielen in de wijkverpleging.* Dutch Healthcare Authority (NZa), Utrecht, Tilburg University, Tilburg, and Maastricht University, Maastricht; 2020.
7. Metzelthin SF, Zijlstra GA, van Rossum E, et al. 'Doing with ...' rather than 'doing for ...' older adults: Rationale and content of the 'Stay active at home' programme. *Clin Rehabil.* 2017;31(11):1419-1430.
8. Rooijackers TH, Zijlstra GAR, van Rossum E, et al. Process evaluation of a reablement training program for homecare staff to encourage independence in community-dwelling older adults. *BMC Geriatr.* 2021;21(1):5.
9. De Groot K, De Veer AJE, Paans W, Francke AL. Use of electronic health records and standardized terminologies: A nationwide survey of nursing staff experiences. *Int J Nurs Stud.* 2020;104:103523-103523.
10. Stichting Omaha System Support. *Zorgspiegel Omaha system: Samen leren van data.* 2021.
11. Nederlandse Zorgautoriteit. *Convenant bekostiging wijkverpleging 2022-2026*. Utrecht, The Netherlands: Nederlandse Zorgautoriteit; 2021.
12. Van den Bulck A, De Bont M, Huisman A, Stadlander M. Nieuwe bekostiging wijkverpleging: Kennis als basis. *V&VN Maatschappij & Gezondheid.* 2017;17(4):8-9.
13. Van den Bulck A, De Korte M, Vietje T. Nieuwe bekostiging voor de wijkverpleging: Wat levert het op voor wijkverpleegkundigen? *V&VN Maatschappij & Gezondheid.* 2019;19(4):18-20.
14. Academische Werkplaats Ouderzorg Limburg. "Ik vind het heel belangrijk om de stem van wijkverpleegkundigen mee te nemen". Limburg AWO, ed. *Jaarverslag 2019.* Maastricht: Maastricht University; 2019:46-47.

Dankwoord

Een promotietraject is eigenlijk net als bakken. Je kunt zelf voor de ingrediënten en benodigdheden zorgen, maar... het bedenken van nieuwe ideeën, wat hulp en advies en genieten van een taart of cake, daar heb je anderen bij nodig! En dat is niet anders als je wilt promoveren. Gedurende het promotietraject de afgelopen 4,5 jaar zijn er heel wat mensen geweest die hebben bijgedragen aan het tot stand komen van dit proefschrift. Op deze plek wil ik eenieder daarvoor bedanken.

Allereerst wil ik alle deelnemers bedanken die hebben meegedaan aan en meegedacht over de onderzoeken uit dit proefschrift. Daarmee bedoel ik **alle betrokken wijkverpleegkundigen, verpleegkundigen in de wijk, verzorgenden, directeuren, managers, beleidsmedewerkers, zorgverzekeraars in Nederland, brancheorganisaties, beroepsvereniging V&VN en internationale experts** op het gebied van case-mix classificatie in de wijkverpleging. Middels het delen van jullie ervaringen, visies en expertise heb ik nieuwe perspectieven leren kennen die me als persoon en professional hebben laten groeien.

Een speciaal woord van dank wil ik richten aan de meest intensief betrokken zorgaanbieders van wijkverpleging, oftewel ‘de pilot-aanbieders’: **MeanderGroep, Envida, Vierstroom en Cordaan**. **Roger Ruijters**, als bestuurder van MeanderGroep zag je hoe relevant het was om als organisatie een bijdrage te leveren aan een nieuwe bekostiging voor wijkverpleging. Je bent een echte inspirator, zowel voor mij als voor alle medewerkers destijds bij MeanderGroep en nu bij Envida. Met MeanderGroep als financierder van de helft van mijn promotietraject kan ik gerust zeggen dat ik hier zonder jou en MeanderGroep niet had gezeten. Een enorm groot woord van dank voor je vertrouwen en het prettige contact de afgelopen jaren. **Tessa Schreibers**, vanaf het begin ben ook jij namens MeanderGroep nauw betrokken geweest. Jij stond altijd klaar voor mijn vragen en was niet bang om te zeggen wat je ergens van vond. Je hebt er altijd voor gezorgd dat het onderzoek ook daadwerkelijk aansluiting vindt bij de praktijk. Dat heeft de link tussen onderzoek en praktijk beter gemaakt! Dankjewel voor de goede hulp en input de afgelopen jaren. **Susan Veenhoff**, ik bewonder de manier waarop jij je kunt verwoorden. Altijd inspirerend en met een duidelijke visie. Bedankt voor jouw steun en het creëren van de altijd positieve en constructieve sfeer bij Vierstroom. Bij Cordaan zou ik graag **Chris van der Hout en Joost Hultzer** willen bedanken. Als nuchtere Zeeuw kon ik soms wel wat Amsterdamse directheid gebruiken! Bedankt voor jullie en Cordaan’s waardevolle bijdragen aan het onderzoek.

Dirk Ruwaard, Misja Mikkers, Arianne Elissen en Silke Metzelthin, wat zou ik zonder jullie moeten als mijn promotieteam! **Dirk**, ik heb je ooit weleens verteld dat je me aan mijn vader doet denken, vanwege je snor. Misschien is dat dan ook de reden geweest dat ik me zo snel op mijn gemak voelde bij je. Of je nou druk was of niet, altijd mocht ik mijn vragen stellen en kon ik met mijn verhaal bij je terecht. Als vanzelfsprekend kwam er van jou altijd een snelle reactie en gedetailleerde feedback (note to self: altijd eerst de nummering van pagina’s en tabellen checken voor ik het naar Dirk stuur). Bedankt! **Misja**, de NZa’er in mijn promotieteam. Jouw expertise leverde altijd interessante discussies op, waarvan ik stiekem niet altijd zeker wist of ik wel begreep waar het over ging. Gelukkig stond jij er voor open om alles uit te leggen als dat nodig was. Je was een enorm waardevolle aanvulling van het team. Bedankt voor je begeleiding! **Arianne**, wat ben ik blij met jou in mijn promotieteam! Als ik het even niet meer zag zitten – en dat was niet alleen tijdens de review – stond jij klaar om te luisteren, me te helpen relativeren en er een positieve draai aan te geven. En als er wat te vieren was, stond jij ook vooraan om het te vieren, natuurlijk wel met wat lekkers. Ik kijk er enorm naar uit in de toekomst met je te blijven samenwerken. **Silke**, december 2017 stond ik bij je aan de deur, op zoek naar een master thesis onderwerp, toen je me vertelde dat er een onderzoek zou starten naar de bekostiging van wijkverpleging. Jij zei nog 'misschien wordt dit later nog een promotietraject', niet wetende dat ik een half jaar later zelf die promovenda zou worden. Het was het opstapje naar 4,5 mooie promotie-jaren. Je hebt altijd vertrouwen in mij gehad. Bedankt!

Alle leden van de beoordelingscommissie, hartelijk dank voor het beoordelen van mijn proefschrift: prof. dr. **Sandra Zwakhalen**, prof. dr. **Sandra Beurskens**, prof. dr. **Bianca Buurman**, prof. dr. **Anneke Francke** en dr. **Albine Moser**.

De afstand van Maastricht naar Utrecht blijft even ver, maar door de jaren heen voelt het alsof de NZa steeds dichter bij me is komen te staan. Dat komt ongetwijfeld door de steeds intensiever wordende samenwerking. Allereerst wil ik de NZa, als mede-financierder van mijn promotietraject, bedanken voor het vertrouwen in mij. Verder wil ik **Marianne Stadlander**, **Jaap Stam** en **Annekatrien Huisman** (aan het begin van het traject) en **Thijs Vietje** (sinds de tweede helft van het traject) bedanken voor de fijne samenwerking. Gertjan Verhoeven, Teanne de Witte-Breure, Lieuwe van der Weij en Maud de Korte – oftewel 'het pilot-team' – verdienen ook zeker een woord van dank. **Gertjan**, op een of andere manier heb ik bij jou altijd een lichte associatie met een verstrooide professor. Je verhalen zijn vaak wat chaotisch, maar wat heb jij een hoop kennis van data en analyses! Je bent onmisbaar in dit pilot-team en ik wil je enorm bedanken voor je inzet om onze samenwerking voort te zetten. **Teanne**, jij bent allesbehalve chaotisch. Je brengt rust en overzicht in het team. Ik vind het leuk hoe we ook op persoonlijk vlak elkaar af en toe wat beter leren kennen. **Lieuwe**, je bent een fijne aanvulling in het pilot-team! Ik moet toch altijd weer een beetje lachen als ik je kat voorbij zie lopen door het beeld. At last – en zeker niet at least –, **Maud**. Ik geloof niet dat er (behalve van mijn promotieteam) iemand is die meer weet van wat ik doe dan jij. Je bent een enorm harde werker en staat altijd voor me klaar om samen te sparren, lekker te klagen, te relativeren en om gif'jes en memes te delen zo vaak als nodig is. Ik kijk ernaar uit om te gaan genieten van onze mijlpalen (of gewoon zomaar, dat mag natuurlijk ook hè) met speciaalbiertjes op een terrasje in de zon!

Marieke Schuurmans, Nienke Bleijenberg en Jessica Veldhuizen van de Universiteit Utrecht/Hogeschool van Utrecht, jullie waren eveneens onderdeel van het Wetenschappelijk

Programma Wijkverpleging (WPW). Met name in de eerste jaren hebben we intensief afgestemd welke kant we op zouden gaan met onze projecten, waarbij voldoende ruimte was voor eenieders persoonlijke interesses. **Marieke en Nienke**, bedankt voor het delen in jullie praktijk- en onderzoekskennis en de waardevolle discussies tijdens onze WPW-overleggen! **Jessica**, ik vind het ongelooflijk hoe jij met zoveel dingen tegelijkertijd kunt bezig zijn: onderzoeken, onderwijzen, zorg verlenen in de wijk, kinderen krijgen en opvoeden. Bedankt voor je samenwerking en dat je me laat zien dat je ene passie de andere niet hoeft uit te sluiten!

Lieve ladies van kamer 0.009, lieve Rowan, Teuni en Marlot. Op een week na zijn we met z'n vieren tegelijk gestart. We kwamen te zitten op een van de beste plekken in het gebouw, vond ik persoonlijk, met heerlijk grote ramen (wel verduisterde ramen, maar toch). We hadden er plantjes, er werden vlaggetjes aangeschaft om de verjaardagen te vieren en we maakten mijlpalenposters. Er werd hard gewerkt, maar gezellig was het bij ons zeker. **Rowan**, destijds hebben wij allebei gesolliciteerd op dezelfde functie. Wat ben ik blij dat ze voor ons beiden een plekje vrij hadden bij HSR! Ik bewonder je gedegen werkstijl, ook al levert het voor jezelf soms de nodige stress op. Maar reserveer een tafel in een lekker restaurant en jij bent zo alles vergeten. Misschien hadden we dat op onze reis naar Washington en New York ook nog wat vaker moeten doen! Nu we veel hebben thuisgewerkt – wat bleek jij een (t)huis(werk)mus te zijn! – mis ik de dagelijkse gesprekken naast je op kantoor. Gelukkig hebben we nog genoeg tijd om dat terug in te halen nu we met zijn twee verhuisd zijn naar onze postdoc-kamer! **Teuni**, als jij op kantoor was kreeg ik standaard minder werk gedaan. Dat was meestal vanwege de gezelligheid, maar soms ook omdat je maar in en uit de kamer bleef lopen met alle mappen en papieren voor je cliënten die geregeld moesten worden. Ondanks dat we elkaar fysiek weinig zagen de laatste jaren, wisten we elkaar telefonisch goed te vinden. Dat ging vooral over alles wat nog moest gebeuren voor het afronden van onze promotietrajecten en over de kaften van onze boekjes. Het bellen was leuk, maar ik kijk er echt naar uit om je straks wél fysiek naast me te hebben staan als mijn paranimf! **Marlot**, door jou hadden we nooit gebrek aan frisse lucht in de kamer, want jij had het altijd warm dus gingen de ramen vaak open als jij er was! (Tot groot plezier van Rowan, de koukleum, die daarna natuurlijk meteen het kacheltje weer aan zou zetten.) Je hebt een kritische blik, die jezelf misschien soms grijze haren bezorgt, maar mij al menig maal goed geholpen heeft! Ik ben blij dat we nog een poosje collega's blijven. Meiden, bedankt voor alle gezelligheid, jullie steun, hulp en alles wat ik van jullie heb mogen leren. Ik hoop dat we elkaar nog vaak terug zullen zien!

Luca en Floor, waar moet ik beginnen! Laat ik beginnen bij onze voorliefde voor kneuterigheid, samen thee drinken en vooral festiviteiten uitkiezen die overdag zijn en niet tot al te laat duren (we noemen ons niet voor niks de oma's). Daarnaast vinden we ontspanning in het samen knutselen, variërend van kerstballen tot carnavalspakjes. **Floor**, met jouw angst voor vogels en mijn angst voor honden is het bijna een wonder te noemen dat we zo graag bij elkaar thuis langs komen! Maar al had je 10 honden, dan nog kwam ik bij je langs, zeker voor jouw heerlijke schuimtaart of chocoladekoekjes. **Luca**, je bent ondernemend en een ster in het creatief vormgeven van leuke bijeenkomsten. Maar ben je vooral ook een heel warm persoon, die altijd de deur open heeft staan voor anderen! Ik ben blij met jou als paranimf naast mijn zijde. Met zijn drietjes zijn we niet alleen oud-collega's of knutselfrustelclub-leden, maar vooral bijzonder goede vriendinnen. Zelfs als ik niet helemaal mee ben met jullie maatschappijlessen of alle quotes uit Friends. De hoogtepunten en de dieptepunten, wij zijn er altijd voor elkaar. Ik ben er trots op jullie vriendin te zijn!

Beste **(oud-)collega's van HSR**. Ik heb het altijd enorm gezellig gevonden om achterin te lunchen, hier en daar eens te komen kletsen, vlaai-momenten te delen en successen te vieren. Het viel me dan ook zwaar om tijdens de pandemie thuis achter mijn bureautje te moeten werken. Het werd me al snel duidelijk: dat werken in mijn eentje thuis, dat is niks voor mij! Ik ging de contacten op kantoor des te meer waarderen. Ik wil iedereen bedanken voor de fijne afgelopen jaren bij HSR. En een aantal mensen in het bijzonder. Oud-kamergenootje **Lisanne**, bedankt voor je frisse input in onze kamer 0.009 en veel succes met de rest van je promotietraject. Oud-collega **Annick**, je verbaasde me altijd hoe jij dingen kon onthouden van iedereen, of het nou een succes-wens was of een verjaardag. Bedankt voor gezellige etentjes en knutselavonden (als vierde lid van de knutselfrutselclub). Mijn **collega's van de AWDZ** (Academische Werkplaats Duurzame Zorg), jullie geven me het gevoel dat ik als onderzoeker ergens thuishoor. Van onze inspiratiesessies word ik een betere, reflectievere onderzoeker. Daarnaast wil ik ook de **collega's van de AWO** (Academische Werkplaats Ouderenzorg) bedanken. Ik vind het inspirerend om te zien hoe er binnen de AWO zo'n sterke verbinding tussen onderzoek en praktijk wordt gelegd. Een groot woord van dank ook aan het **secretariaat en de ondersteunende medewerkers**. **Brigitte**, ik heb ervan genoten samen met (o.a.) jou het Dagje Uit 2019 te organiseren! Maar bewonder ik bovenal hoe goed jij het overzicht kunt houden en hoe onverwacht snel je dingen geregeld krijgt! De meiden van kamer 0.058 – **Robin**, **Rose**, **Lise**, **Svenja** en **Ines** – mijn dagen zijn nooit saai als jullie op kantoor zijn! En stiekem ook een stuk minder productief, aangezien mijn kamer nu op jullie wandelroute naar het keukentje zit.. Bedankt dat jullie ook voor mij de deur vaak open hebben staan, jullie zijn super collega's!

Mirjam, **Dagmar**, **Harmke**, **Dyonne** en **Evy**, oftewel: de BHN'ies! Samen met jullie de opleiding tot verpleegkundige doen heeft me echt laten zien dat je samen verder komt dan alleen. Want wat zijn wij allemaal strevers zeg! Door samen de Honours-route te volgen hebben we destijds echt het beste in elkaar naar boven gehaald. Bedankt daarvoor! En hoe leuk is het dat we nu, 5 jaar na ons afstuderen, nog altijd contact hebben. Ik hoop dat we dat voorlopig ook nog even zullen vasthouden!

Kim, mede-promoverende wijkverpleegkundige en mede-Zeeuw! Meer overeenkomsten hadden we niet nodig om goede vriendinnen te worden. We leerden elkaar kennen op het EDCNS-congres, maar inmiddels spreken we meer af voor de gezelligheid. Alhoewel, we fantaseren we ook maar al te graag inhoudelijk door over hoe het ons later zou vergaan en wat we dan bereikt zouden hebben voor de wijkverpleging. Bedankt voor de leuke gesprekken over onze onderzoeken, de brainstorm over mijn titel (ondanks dat die het uiteindelijk niet geworden is), de leuke reis in Lissabon en nog veel meer. Laten we elkaar blijven inspireren en zeker ook regelmatig een terrasje blijven opzoeken in Brabant, Limburg of Zeeland!

Anne, **Bart**, **Sander**, **Yara**, **Robin**, **Peter**, **Nicky**, **Dian**, **Laurens** en **Laura**. Onze groepsnaam – de dansingvoetjesvandevloer – stamt nog uit de tijd van ons afstuderen op de middelbare school. Inmiddels zijn we te vinden op allerlei plekken in het land, van Zeeuws-Vlaanderen tot Zuid-Limburg, Eindhoven, Leiden en de Noordoostpolder. We weten elkaar daarentegen nog altijd goed te vinden. Bij jullie voel ik me echt weer even Zeeuw, zeker als we Concert at Sea bezoeken. Een paar jaar terug werden de promotiedata van mij, Nicky en Robin al in de agenda's gezet. Ik had vrij optimistisch gemikt op augustus 2021. Met wat lichte vertraging is het toch eindelijk zo ver. Ik ben echt trots dat ik mijn promotie-moment met jullie kan delen! Ik kijk uit naar alle andere promoties, weekendjes weg, bowling- en bioscoop-avonden rond de kerstdagen, fietstochten en alle leuke dingen die we samen nog gaan meemaken! De uitjes met jullie hebben me namelijk altijd voorzien van de nodige ontspanning tijdens mijn promotietraject. Wanneer zullen we het volgende uitje plannen?

Ook de sjoenfemilie heeft gezorgd voor de nodige steun en ontspanning. En vooral dat laatste, hè **Bert**, **Miriam**, **Bo** en **Kamiel**! De zaterdagen waren regelmatig gevuld met de hobby-bakkerij. Het helpen met brood snijden of, als ik niet meehielp, een vroege ochtendwandeling van Heer naar Sint Geertruid heeft me vaak geholpen mijn hoofd leeg te maken. Als ik aan jullie denk, denk ik daarnaast aan "genieten!" en "gewoon doen!". Dit kan betrekking hebben op het drinken van een speciaal biertje ('nne Belsj), maar in algemene zin heeft het mij als persoon geholpen om jullie positiviteit en daadkracht om me heen te hebben. Bedankt!

Opa en oma, jullie hebben allebei in het onderwijs gezeten. Ik heb ongetwijfeld iets van jullie meekregen in mijn genen, want ook lesgeven is onderdeel van mijn werk. Bedankt dat ik altijd bij jullie terecht kan, voor de altijd oprechte interesse in mijn promotietraject, en voor de lekkere groenten uit eigen tuin en versgebakken schuimpjes! Het geeft me een super goed gevoel om te zien hoe trots jullie op me zijn.

Lieve zusje en broertjes. **Astrid**, ik weet hoe sterk we elkaar bewonderen. Langs de buitenkant lijken we misschien veel op elkaar, maar iedereen die ons kent weer dat we vanbinnen sterk van elkaar kunnen verschillen! Jouw daadkracht en doorzettingsvermogen is iets waar ik al jaren veel van heb geleerd, maar wat ik vooral tijdens mijn promotie-jaren des te hard kon gebruiken. Ik zal echter altijd wel een 'lieve' blijven denk ik, maar jij hebt me laten inzien dat zelfs dat een mooie eigenschap is om te behouden. Dankjewel! **Maurits**, je bent geen man van veel woorden, maar laat altijd blijken dat je blij bent me te zien met een knuffel en een glimlach op je gezicht. Bedankt dat je er voor me bent. Of het nou is om me te helpen een laptop uit te zoeken, een telefoon te repareren of als gezelschap aan tafel onder het genot van een bord spaghetti. **Arnoud**, als ik in Koewacht kwam heb ik je vaak bij de konijnen en cavia's zien zitten. Je straalt dan een bepaald rust uit, waar ook ik ontspanning in kan vinden als ik het druk heb. Misschien moeten we voor bij mij thuis dan ook maar een hok gaan timmeren (als ik Koen kan overtuigen)? Dat doen we dan natuurlijk wel onder het genot van een door jou gebakken bolus!

Pa en ma, wie had dat gedacht, dat ik zou gaan promoveren. **Ma**, zonder dat ik het vroeger echt door had, was jij eigenlijk altijd al mijn voorbeeld. Ik had altijd gezegd dat ik niet jouw werk zou gaan doen. En kijk daar, ik ging tóch verpleegkunde studeren en na mijn eerste stage in de wijkverpleging was ik verkocht. Ik volgde je voorbeeld om voor een master naar Maastricht te gaan. Je zou bijna denken dat ik ervoor in de wieg ben gelegd, wetende dat ik als baby bij jouw diplomering Verplegingswetenschappen in Maastricht aanwezig was. Zo trots dat jij bent op mijn onderzoeken, zo trots ben ik dat ik kan zeggen: mijn moeder is ook wijkverpleegkundige, ze was de eerste deelnemer van mijn survey-studie! **Pa**, het gedegen werken moet ik haast wel van jou hebben. Jarenlang stond je voor me klaar om me te helpen met mijn huiswerk. Gelukkig geen schoolprojectjes meer nu, maar in plaats daarvan kom ik nu bij je voor advies en hulp in werkelijk álles. Of het nu een trekhaak monteren is of een kraan vervangen. Zeg nou zelf, dat is toch veel leuker? Dat ik nu in Zuid-Limburg woon, maakt daarvoor gelukkig helemaal niet uit. Tijdens mijn rit naar Koewacht kijk ik er al naar uit om thuis de oprit op te rijden, waar jij vaak klaar staat om de koffer uit te laden en me een dikke knuffel te geven. Pa en ma, ik voel me gezegend dat ik in zo'n warm gezin heb mogen opgroeien met zulke liefhebbende en trotse ouders. Ik hou van jullie. Dikke kus en merci!

Mijn lieve **Koen**. Ik mocht van jou gewoon 'dankjewel, Koen' neer zetten, maar dat ga ik natuurlijk niet doen hè. Want ik zou echt niet weten hoe ik dit promotietraject door had moeten komen zonder jou. We wonen nu een aantal jaar samen in Maastricht en ik kan gerust zeggen dat jij mij aardig goed in balans houdt. Als ik stress heb vind ik bij jou mijn rust, als ik iets heb bereikt vieren we samen het succes en als ik verdrietig ben laat jij me lachen (en als ik niet verdrietig ben ook heel vaak!). Daarnaast heb ik door jou mijn passie voor muziek weer teruggevonden. Het blazen op jouw bugel maakte me in eerste instantie niet zo enthousiast, maar toen ik eenmaal de saxofoon in handen had – toch enigszins lijkend op de klarinet waar ik vroeger op speelde – kwam al het plezier meteen terug (en stiekem is dat ook leuker dan een bugel, omdat ik dan tegenover je zit bij de fanfare in plaats van achter je)! Ik kijk uit naar onze toekomst samen, met een huisje in Sint Geertruid, met een moestuintje erbij, een hele hoop (race)fietsen in de garage, een konijn (of twee, of drie, of misschien toch die kinderboerderij waar we nu wel eens mee lachen) en hopelijk ook minstens zo veel plezier als dat we de afgelopen jaren al samen hebben gehad!

About the author

Anne Odilia Emile van den Bulck was born on February 28, 1994 in Terneuzen. She completed secondary school (VWO) at Reynaertcollege in Hulst. In 2012, Anne moved to Nijmegen to follow the Bachelor of Nursing at HAN University of Applied Sciences. During the bachelor period, she did various internships at Dutch healthcare providers and an internship abroad in Indonesia. Furthermore, she followed an Honours Program, which included following additional courses and minors, presenting at a conference, writing an article, and organizing an excursion abroad. She graduated the Bachelor's degree with Honours Nursing in April 2016. From then until the end of 2016, she worked as a district nurse in Axel. Meanwhile, in September 2016, Anne moved to Maastricht to start a Master's program at Maastricht University. She obtained her Master's degree in Healthcare Policy, Innovation and Management in 2017.

In September 2017, Anne started her PhD research at the department of Health Services Research at Maastricht University. As part of the scientific collaboration initiated by the Dutch Healthcare Authority (NZa), her research contributed to the development of a prospective payment system for home care in the Netherlands. During her PhD, she collaborated with a large number of home care stakeholders, such as multiple home care providers and district nurses, healthcare insurers, and the Dutch Nurses Association (V&VN). Anne presented her work at different national and international conferences and meetings, including the Academy Health Annual Research Meeting (Washington, US) and a national NZa-conference on Dutch home care (Utrecht, the Netherlands). Besides her research, Anne participated in several extracurricular activities. Anne has been chair of the early-career researchers of her department for a year. Moreover, she was involved as a tutor, trainer and (co-)supervisor of students at various bachelor and master courses at Maastricht University (i.e. in Health Sciences and Healthcare Policy, Innovation and Management). In 2021, she obtained her University Teaching Qualification at Maastricht University. Furthermore, during the COVID-pandemic in 2020 Anne worked as a volunteer in a nursing home in Maastricht. Additionally, she was a student at 3-years summer school of the European Academy of Nursing Science (EANS), which she completed in 2021.

Since March 2022, Anne continues her study on case-mix classification and outcomes in home care as a postdoctoral researcher within the same department. Over the next coming years, Anne aspires to be the bridge between daily practice and healthcare policy. She wants to contribute to improvements in and knowledge of the organization of (home) care, and bring closer together nurses and policymaker through research and education.

Publications

Scientific articles in international journals

- **Van den Bulck AOE**, Elissen AMJ, Metzelthin SF, de Korte MH, Verhoeven GS, de Witte-Breure TAT, van der Weij LC, Mikkers MC, Ruwaard D. Identifying client characteristics to predict homecare use more accurately: A Delphi-study involving nurses and homecare purchasing specialists. *BMC Health Serv Res*. 2022;22:394

- **Van den Bulck AOE**, de Korte MH, Metzelthin SF, Elissen AMJ, Everink IHJ, Ruwaard D, Mikkers MC. In the eye of the storm: A quantitative and qualitative account of the impact of the COVID-19 pandemic on Dutch home healthcare. *Int J Environ Res Public Health*. 2022;19(4):2252.

- Veldhuizen JD, **van den Bulck AOE**, Elissen AMJ, Mikkers MC, Schuurmans MJ & Bleijenberg N. Nurse-sensitive outcomes in district nursing care: A Delphi study. *PLOS ONE*. 2021;16(5):e0251546.

- **Van den Bulck AOE**, de Korte MH, Elissen AMJ, Metzelthin SF, Mikkers MC & Ruwaard D. A systematic review of case-mix models for home health care payment: Making sense of variation. *Health Policy*. 2020;124(2):121-132.

- Elissen AMJ, Verhoeven GS, de Korte MH, **van den Bulck AOE**, Metzelthin SF, van der Weij LC, Stam J, Ruwaard D & Mikkers MC. Development of a casemix classification to predict costs of home care in the Netherlands: a study protocol. *BMJ Open*. 2020;10(2):035683.

- **Van den Bulck AOE**, Metzelthin SF, Elissen AMJ, Stadlander MC, Stam JE, Wallinga G et al. Which client characteristics predict home-care needs? Results of a survey study among Dutch home-care nurses. *Health Soc Care Comm*. 2019 Jan;27(1):93-104.

Submitted articles

- **Van den Bulck AOE**, Elissen AMJ, Metzelthin SF, de Korte MH, Verhoeven GS, Mikkers MC, Ruwaard D. The Case-Mix Short-Form questionnaire for prospective payment of homecare services: Development and psychometric testing. (under review)

Non-scientific articles in national journals

- **Van den Bulck AOE**, de Korte MH, Vietje T. Wat levert het op voor wijkverpleegkundigen: Nieuwe bekostiging voor de wijkverpleging. *Tijdschrift Maatschappij en Gezondheid*. 2019;19(4):18-20.

- **Van den Bulck AOE**, de Bont M, Huisman A, Stadlander MC. Nieuwe bekostiging wijk-verpleging: Kennis als basis. *Tijdschrift Maatschappij en Gezondheid*. 2017;17(4):8-9.

- **Van den Bulck AOE**, Emmen E, Van den Heuvel D, Hulshof H, Reiring D, Van Vliet M. Een lesje verpleegkunde op z'n Zweeds: Een kijkje over de grens. *Onderwijs en Gezondheidszorg*. 2017;41(2):21-23.

Reports

- Verhoeven GS, de Korte MH, van der Weij LC, **van den Bulck AOE**, Elissen AMJ, de Witte-Breure T, et al. Onderzoeksrapport Pilot cliëntprofielen wijkverpleging: Ontwikkeling van cliëntprofielen in de wijkverpleging. Utrecht: Dutch Healthcare Author (NZa), 2020.
- Elissen AMJ, Metzelthin S, **van den Bulck AOE**, Verbeek H, Ruwaard D. Case-mix classificatie als basis voor bekostiging van wijkverpleging: Een verkennend onderzoek in opdracht van MeanderGroep Zuid-Limburg. Maastricht: Datawyse / Universitaire Pers Maastricht, 2017.

Conference contributions

- **Van den Bulck AOE**, Elissen AMJ, Metzelthin SF, de Korte MH, Verhoeven GS, de Witte-Breure TAT, van der Weij LC, Mikkers MC, Ruwaard D. Towards case-mix based homecare payment: Developing a new Dutch homecare payment system, with and for homecare partners, to reach the Quadruple Aim. *22nd International Conference on Integrated Care*, 23-25 May 2022, Odense, Denmark (oral presentation).
- **Van den Bulck AOE**, de Korte MH, Elissen AMJ, Metzelthin SF, Everink IHJ, Mikkers MC, Ruwaard D. Effects of the COVID-19 pandemic on home health care: Focusgroup results from different perspectives. *First Joint Conference of the German Society of Nursing Science and the European Academy of Nursing Science*, 8 July 2021, online (oral presentation).
- **Van den Bulck AOE**, de Korte MH, Elissen AMJ, Metzelthin SF, Verhoeven GS, Mikkers MC, Ruwaard D. Developing a questionnaire for home care payment with and for community nurses: Bridging the gap between policy and practice. *European Academy of Nursing Science Winter Summit*, 19 February 2021, online (oral poster presentation).
- Ruwaard D, Veenhoff S, **van den Bulck AOE**, Meertens M, de Korte MH. Deelsessie 1 'Cliënt-gerichte bekostiging'. *Congres Wijkverpleging in de hoofdrol*, 14 November 2019, Utrecht, the Netherlands (oral presentation).
- **Van den Bulck AOE**, de Korte MH, Elissen AMJ, Metzelthin SF, Mikkers MC, Ruwaard D. Case-Mix Based Payment Systems for Home Health Care: A Systematic Review. *Annual Research Meeting Academy Health*, 2-4 June 2019, Washington DC, US (poster presentation).

- **Van den Bulck AOE**, Metzelthin SF, Elissen AMJ, Stadlander MC, Stam JE, Wallinga G, Ruwaard D. Contributing to the development of a new funding model for Dutch home care: a survey study among nurses regarding predictors of home care needs. *17th European Doctoral Conference in Nursing Science*, 22-23 June 2018, Maastricht, the Netherlands (poster presentation).

- **Van den Bulck AOE**, Metzelthin SF, Elissen AMJ, Stadlander MC, Stam J, Ruwaard D. Which client characteristics predict community-based nursing care needs? Results of a survey study among Dutch nurses. *The 1st International Conference of the German Society of Nursing Science*, 4-5 May 2018, Berlin, Germany (oral presentation).

Related magazine and news articles

- Nieuwe bekostiging wijkverpleging moet over inhoud gaan. *Skips Actueel*, 2 August 2021.
- NZa adviseert nieuw experiment met bekostiging wijkverpleging. *Skipr Actueel*, 13 October 2020.
- Proef met integraal tarief wijkverpleging mag door tot nieuwe bekostiging er is. *Skipr Actueel*, 25 February 2020.
- Wijkverpleging gaat vijf jaar experimenteren met cliëntprofielen. *Zorgvisie*, 16 October 2020.
- “Ik vind het heel belangrijk om de stem van wijkverpleegkundigen mee te nemen”. *Jaarverslag Academische Werkplaats Ouderenzorg Limburg 2019*, June 2020.
- Op weg naar een nieuwe bekostiging voor de wijkverpleging. *NZa Magazine Stand van de Zorg 2019*, December 2019.
- Wijkverpleegkundigen hoofdrolspelers bij zorg in de wijk. *NZa Magazine Stand van de Zorg 2019*, December 2019.
- NZa stelt nieuwe bekostiging wijkverpleging uit. *Skipr Actueel*, 21 March 2019.
- MeanderGroep en wetenschap: samenwerken aan kwalitatief goede en betaalbare zorg. *MeanderRapportage*, September 2017.
- Wijkverpleegkundigen denken mee over bekostiging. *Nursing*, 16 June 2017.
- Wijkverpleegkundige legt fundament voor nieuwe bekostiging. *Skipr Actueel*, 15 June 2017.
- NZa wil actieve rol wijkverpleegkundigen in bekostiging. *Zorgvisie*, 5 May 2017.
- NZa betrekt wijkverpleegkundige bij nieuw bekostigingsmodel. *Skipr Actueel*, 5 May 2017.