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Managing multimorbidity: Profiles of integrated care approaches targeting people with multiple chronic conditions in Europe

Mieke Rijken[a,*], Anneli Hujala[b], Ewout van Ginneken[c,d], Maria Gabriella Melchiorre[e], Peter Groenewegen[a,f], Franζois Schellevis[a,g]

[a] NIVEL (Netherlands institute for health services research), P.O. Box 1568, 3500 BN Utrecht, The Netherlands
[b] Department of Health and Social Management, University of Eastern Finland, P.O. Box 1627, FI-70211 Kuopio, Finland
[c] Berlin University of Technology, Faculty of Economics and Management, Department of Health Care Management, Straße des 17. Juni 135, 10623 Berlin, Germany
[d] European Observatory on Health Systems and Policies, Berlin Area, Germany
[e] Centre for Socio-Economic Research on Ageing, National Institute of Health and Science on Ageing (INRCA), Via S.Margherita 5, 60124 Ancona, Italy
[f] Utrecht University, Faculty of Geoscience, Faculty of Social Science, P.O. Box 80125, 3508 TC Utrecht, The Netherlands
[g] Department of General Practice and Elderly Care Medicine, EMGO Institute for Health and Care Research, VU University Medical Centre, Van der Boechorststraat 7, 1081 BT Amsterdam, The Netherlands

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ABSTRACT

In response to the growing populations of people with multiple chronic diseases, new models of care are currently being developed in European countries to better meet the needs of these people. This paper aims to describe the occurrence and characteristics of various types of integrated care practices in European countries that target people with multimorbidity.

Data were analysed from multimorbidity care practices participating in the *Innovating care for people with multiple chronic conditions* (ICARE4EU) project, covering all 28 EU Member States, Iceland, Norway and Switzerland.

A total of 112 practices in 24 countries were included: 65 focus on patients with any combination of chronic diseases, 30 on patients with a specific chronic disease with all kinds of comorbidities and 17 on patients with a combination of specific chronic diseases. Practices that focus on a specific index disease or a combination of specific diseases are less extensive regarding the type, breadth and degree of integration than practices that focus on any combination of diseases. The latter type is more often seen in countries where more disciplines, e.g. community nurses, physiotherapists, social workers, work in the same primary care practice as the general practitioners.

Non-disease specific practices put more emphasis on patient involvement and provide more comprehensive care, which are important preconditions for person-centered multimorbidity care.

1. Introduction

European countries, as many other countries worldwide, face a rapid increase in the number of inhabitants living with chronic conditions, which puts a high pressure on their health systems [e.g. 1,2]. Awareness has raised that multimorbidity, i.e. the co-existence of two or more chronic diseases in a person, may be an even greater challenge for healthcare [e.g. 3,4]. Not only do data show that an increasing proportion of the chronically ill is multimorbid [e.g. 4,5], caring for people with multimorbidity also seems to be more complicated.

As a response to the rising numbers of people with (single) chronic diseases such as diabetes and COPD, many European countries have implemented disease management programs (DMPs) over the last decades [e.g. 6,7]. Although definitions of disease management differ, it is generally considered a programmatic approach to care provided by multidisciplinary teams of care providers, supporting patients' self-management and collecting data on patient outcomes to monitor individual progress and program results [e.g. 8,9]. However, most DMPs are not designed to meet the various health needs of people with multimorbidity, as they focus on single diseases [6,7,10]. In countries where people are enlisted with a general practitioner in primary care, patients with multimorbidity

* Corresponding author.
E-mail address: m.rijken@nivel.nl (M. Rijken).

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may be better off, as the principles of primary care, i.e., first contact, continuous, comprehensive and coordinated care [11], may better fit their needs. Hansen and colleagues [12] found better (self-rated) health outcomes in people with multimorbidity living in countries with a strong primary care structure, high continuity of care and a comprehensive primary care system. Nevertheless, many people with multimorbidity (also) need specialized care, and inter-sectoral coordination as well as collaboration between primary care and specialized care still show many obstacles to overcome [e.g. 13]. In addition, ambulatory specialist and hospital care in European countries are almost entirely organized around medical specialties focusing on specific organ systems, which carries with it the risk of losing sight of a patient's integral health condition. The so-called vertical silos are an important reason why care for people with multimorbidity is suboptimal in many countries.

To reduce fragmentation of care and better meet the needs of people with multimorbidity, alternative care models have been developed [e.g. 14–16] and several of these models are currently being implemented at a local level in European countries [17]. A commonality of these models is that they all capture the notion of integrated care. The concept of care integration may refer to various theoretically distinguished dimensions, such as the type of integration (e.g. functional, organizational, clinical), the breadth of services provided and the degree of integration (from collaboration of separate services to full integration) [9,11]. As these dimensions illustrate the wide range of approaches covered by the concept, we adopt the broad working definition of Nolte & Pitchforth [18] that builds on the goal of integrated care: "any initiative seeking to improve outcomes for those with (complex) chronic health problems and needs, by overcoming issues of fragmentation through linkage or coordination of services of different providers along the continuum of care."

Nolte and McKee [9] initially suggested that disease management and integrated care might reflect two ends of a spectrum of approaches, with on the one hand disease management targeting persons with a single chronic disease and on the other integrated care programs targeting persons with multiple chronic diseases who often experience functional impairments as well. However, this unidimensional view may not fit the variety of current care approaches targeting people with multiple chronic conditions, as Nolte and Pitchforth later recognized [18]. Moreover, it may not do justice to the various needs of people with multimorbidity. Hopman and colleagues [19] showed that people with multimorbidity vary greatly regarding their needs for care and support: many of them do not experience more health problems than people with one chronic disease, whereas others have many problems and in different domains of life, which may ask for more extensive (integrated) care and support, e.g. including mental health care, social care or community services. As subpopulations of people with multimorbidity have different needs for care and support, we also expect care approaches targeting these subgroups to show different characteristics.

The aim of this paper is to gain more insight in various integrated care practices that have been developed in European countries to improve care for populations with multiple chronic conditions. Rather than profiling these practices according to dimensions of theoretical models of integrated care, we describe and profile them according to the way multimorbidity is approached in these practices. Roughly speaking, three types of multimorbidity care practices could be distinguished in this respect:

1. practices that focus on a specific chronic disease ('index disease') with other chronic conditions considered as (related or unrelated) comorbidities; such practices may develop from single DMPs by providing additional care and support services for patients who need extra care or support because of their comorbidities;
2. practices where the focus is on a specific combination of two or three chronic diseases, in which this combination of diseases could be considered as a specific condition and its management might follow disease management principles;
3. practices that do not focus on specific (combinations of) chronic diseases, but have adopted principles of person-centered care, in which assessing and prioritizing the health needs of persons with multimorbidity guide individual care trajectories.

In this paper we explore the occurrence of these types of practices in European countries and examine whether they show specific characteristics, for instance whether practices with a disease-specific focus of multimorbidity (type 1 and 2) have different objectives or involve other types of care providers than practices with a non-disease specific focus (type 3). Therefore, our first research questions are:

1 Which types of multimorbidity care practices, distinguished according to their multimorbidity focus, occur in European countries?
2 Do these different types of multimorbidity care practices show specific characteristics, i.e. do they differ regarding their objectives, provided care or care providers involved?

In addition to this profiling of integrated care practices for patients with multimorbidity, we aim to explore whether characteristics of the national context relate to the type of practices that occur in European countries. Ideally, one would expect the health needs of a population to determine, at least to some extent, the type of care practices that have been developed in a certain context. For instance, in countries with a relatively high prevalence of specific chronic diseases, disease-specific multimorbidity care practices may be developed more often. And in countries with a relatively high proportion of the population aged 80 and over, one might expect non-disease specific approaches to dominate, as especially among the elderly a multiplicity of interrelated health problems requiring a more holistic approach is often seen. Schäfer and colleagues [20] found some evidence that European countries have indeed responded to changes in their populations over the period 1993–2012 by increasing the involvement of general practitioners in the treatment of (mainly) chronic diseases in the last decade.

Apart from population characteristics or needs, characteristics of the health system and its health workforce may also relate to the type of multimorbidity care practices that occur in a country. For instance, we expect non-disease specific practices to occur more often in countries where primary care services contribute more substantially to the management of chronic diseases and in countries with a relatively large proportion of generalist medical practitioners, such as general practitioners or primary health care physicians. Non-disease specific practices may also be seen more often in countries with a tax based financing system than in countries with an insurance based system, as there may be less barriers between different sectors of the health system and the range of services they cover (e.g. social services) in tax based systems. Different types of multimorbidity care practices may also be seen in centralized and decentralized health systems, although it is difficult to formulate any hypotheses in this respect, given the great variety in decentralized health systems. Local governance might facilitate inter-sectoral integration, which could support the implementation of non-disease specific practices. For the purpose of this part of our study we formulated a third research question:

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3 Do different types of multimorbidity care practices relate to characteristics of the countries in which they occur; more specifically, to characteristics of their population, health workforce and health system?

2. Methods

For this study we used data from the European ICARE4EU (Innovating care for people with multiple chronic conditions) project [21]. This project was initiated in 2013 to contribute to the innovation of care for European citizens with multiple chronic conditions by gaining more insight into potentially effective and efficient patient-centered, multi-disciplinary care approaches that have been developed and implemented in European countries or regions.

2.1. Data collection

Expert organizations in 31 European countries identified practices or programs (further referred to as 'practices') that provided care for people with multimorbidity. Inclusion criteria for these practices were:

1. target adult people with multimorbidity, defined as two or more medically (i.e. somatic and/or psychiatric) diagnosed chronic (not fully curable) or long lasting (at least six months) diseases, of which at least one of a (primarily) somatic nature;
2. include formalized collaboration(s) between at least two services, including medical services;
3. evaluated or planned to be evaluable in some way;
4. currently running or finished less than 24 months ago or starting within the next 12 months.

The eligibility of the identified practices was checked by the ICARE4EU project team. Subsequently, expert organizations were asked to send information about the ICARE4EU project and a link to an online questionnaire to the managers of all eligible practices they had identified in their country. These managers were asked to fill in the questionnaire, which was available in eleven languages and contained questions on the multimorbidity focus of the practice and a broad variety of characteristics, including its objectives, the care providers involved and the types of care provided.

For the purpose of this study (research question 3), we also retrieved data from European databases with country characteristics, such as characteristics of their population, health workforce and health system.

2.2. Measures

2.2.1. Multimorbidity focus

After an open question to describe briefly how multimorbidity was defined in the practice, respondents on the survey were asked to indicate whether in the practice multimorbidity referred to 'multimorbidity in general', 'a combination of specific diagnoses, namely . . .' (e.g., type 2 diabetes and depression) or 'a specific diagnosis ("index disease") with a variety of possible comorbidities, namely . . .' (e.g., type 2 diabetes with any other chronic condition(s)).

2.2.2. Practice characteristics

2.2.2.1. Main objectives. We composed a list of 22 objectives that covered several areas for improvement of chronic care, such as access to services, identification of target groups, evidence-based practice, integration of services, quality of care, patient-centeredness, patient outcomes, service utilization and costs (see Table 1 for specific items). Respondents were asked to tick all boxes that applied to the main objectives of the practice.

2.2.2.2. Provided care. Respondents were asked to indicate which types of care for people with multimorbidity were provided by the practice. The 18 included types of care related to prevention, diagnostics, medical care, nursing care, social care, informal care, home care, medical and non-medical treatments, medication management, adherence, case management, care after discharge from

Table 1
Main objective(s) of the multimorbidity care practices.

	Total (N = 112) %	Disease-specific multimorbidity approach (N = 47) %	Non-specific multimorbidity approach (N = 65) %	P-value (Chi-square te st)
Improving accessibility of services	59.8	51.1	66.2	0.108
Reducing inequalities in access to care and support services	47.3	40.4	52.3	0.214
Identification of target group patients	52.7	53.3	52.3	0.926
Promoting evidence-based practice	51.8	63.8	43.1	0.030
Improving care coordination	71.4	70.2	72.3	0.809
Increasing multi-disciplinary collaboration	78.6	76.6	80.0	0.665
Improving integration of different units (within an organization)	54.5	46.8	60.0	0.167
Improving integration of different organizations	48.2	34.0	58.5	0.011
Improving patient involvement	73.2	61.7	81.5	0.019
Improving involvement of informal carers (e.g. family, friends, neighbours and/or volunteers)	46.4	40.4	50.8	0.279
Improving patient safety	56.3	46.8	63.1	0.087
Improving early detection of additional/co-morbid diseases	42.0	48.9	36.9	0.204
Decreasing/delaying complications	64.3	70.2	60.0	0.266
Improving functional status (preventing or reducing functional disability)	55.4	57.4	53.8	0.705
Decreasing morbidity	59.8	66.0	55.4	0.260
Decreasing mortality	47.3	55.3	41.5	0.149
Preventing or reducing misuse of services	38.4	36.2	40.0	0.681
Preventing or reducing over-use of services	50.0	44.7	53.8	0.338
Reducing hospital admissions	67.9	66.0	69.2	0.714
Reducing emergency/acute care visits	58.9	57.4	60.0	0.786
Reducing (public) costs	60.7	59.6	61.5	0.834

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hospital, rehabilitation and reintegration, and monitoring. Respondents were asked to tick all boxes that applied to the practice.

2.2.2.3. Care providers involved. The ICARE4EU survey contained one question about the types of services involved in the practice (10 types specified and an option to add other types; e.g., university hospital, general hospital, primary care practice, nursing home, social care service, pharmacy). In addition, the survey contained a question about the types of care providers involved (12 options; e.g., general practitioners, medical specialists, physiotherapists, social workers, informal caregivers). Respondents were asked to tick all boxes that applied to the practice. Two additional items were included to assess whether some types of care integration applied to the practice, i.e., coordination of medical care services and collaboration between medical and non-medical services (answering options: yes/no).

2.2.3. Country characteristics

2.2.3.1. Population characteristics/needs. We included three indicators to assess the needs for integrated care of a country's population. First, the *proportion of the population aged 80 and over in 2013*. This indicator was retrieved from the set of European Core Health Indicators (ECHI) provided by Eurostat [22]. Second, the *(age-adjusted) prevalence of diabetes among men and women aged 18 and over in 2014*. This indicator was retrieved from the NCD Risk Factor Collaboration (NCD-RisC) database [23]. And third, the estimated *mean number of self-reported chronic conditions among a country's population*. This indicator was computed from individual-level data from the Eurobarometer survey of the European Commission, wave 66.2, conducted in 2006 in 29 European countries (26,778 respondents in 27 EU Member States) [24]. To assess the mean number of self-reported chronic conditions 13 health problems of the Eurobarometer survey were taken into account: diabetes; allergies; asthma; hypertension (high blood pressure); long-standing problems with muscles, bones, and joints (rheumatism or arthritis); cancer; cataract; migraines or frequent headaches; chronic bronchitis or emphysema; osteoporosis; stroke or cerebral hemorrhage; peptic ulcer (gastric or duodenal ulcer); and chronic anxiety or depression.

2.2.3.2. Health workforce characteristics. We included three characteristics of a country's health workforce. First, the *proportion of generalist medical practitioners among the total number of physicians in 2013*. This indicator was computed from Eurostat data: the number of generalist medical practitioners in a country in 2013 divided by the total number of physicians in a country on January 1, 2013 [25]. For Bulgaria and Cyprus we used data of 2014, as the number of generalist medical practitioners in these countries was not available for 2013.

Second, the *median number of disciplines working in the same primary care practice in 2012*, in addition to general practitioner(s) (GP(s)). This variable was derived from the QUALICOPC study [26] and based on a survey among general practitioners in 28 European countries (response target 220 GPs per country) [e.g. 27]. The survey question was: 'Which of the following disciplines are working in your practice/centre?' GPs could select from a list of 12 professional groups: receptionist/medical secretary; practice nurse; community/home care nurse; psychiatric nurse; nurse practitioner (function between physician and nurse); assistant for laboratory work; manager of the centre or practice (not a physician); midwife; physiotherapist; dentist; pharmacist; social worker. For each country the median number of disciplines working in the primary care practice, in addition to the GP(s), was computed (theoretical range: 0–12). The third workforce characteristic we included was derived from the same survey among GPs: *involvement of general practitioners in the treatment of diseases in 2012*. GPs were asked to rate their involvement, on a scale from 1 'seldom or never' to 4 '(almost) always', in the treatment and follow-up of patients belonging to their practice population with the following 12 diseases: chronic bronchitis/COPD, hordeolum (stye), peptic ulcer, herniatic disclesion, congestive heart failure, pneumonia, peritonsillar abcess, Parkinson's disease, uncomplicated diabetes (type 2), rheumatoid arthritis, depression, and myocardial infarction. A scale score for each country was calculated using ecometric analysis (latent multilevel variable analysis), correcting for differences in the number of respondents per country and in individual differences among the respondents, and for variation due to measurement error [28,29]. Scale scores could range between 1 and 4; a higher score indicated more involvement of GPs in the treatment of these diseases.

2.2.3.3. Health system characteristics. We also included three basic characteristics of a country's health system. The first one was the *total expenditures on health care* as proportion of the gross domestic product of a country in 2013. This variable was retrieved from the WHO Health Accounts database [30]. Second, we used a rough typology of a country's level of *(de)centralization of its health system*: either a (more) centralized or a (more) decentralized health system. This variable was based on what level decision making and executive powers were situated in a country. The third variable was a rough typology of a country's *financing system* of health care: either (predominantly) tax based or insurance based/mixed. The last two variables were derived from descriptive data in countries' latest (in 2013) health system review published in the Health System in Transition series [31].

2.3. Statistical analyses

We conducted univariate (frequencies) and bivariate analyses (crosstabs with chi-square tests) to answer research questions 1 and 2 respectively. To answer research question 3, we conducted multilevel logistic regression analyses. We estimated a two-level regression model (level 1: integrated care practices; level 2: countries) predicting the type of practice: disease-specific versus non-specific (dependent variable). Starting with a null model, we estimated the total variance at country level. Subsequently, we estimated a second model including a country characteristic (standardized in case of a continuous or count variable) as a predictor variable at country level. The odds ratio with 95% confidence interval, the Z-statistic and resulting P-value were provided for the fixed effect of the country characteristic. In addition, we computed the proportion of variance at country level explained by the country characteristic included in the model. This was done by subtracting the remaining variance at country level of the second model from the total variance at country level of the null model, dividing this by the variance at country level of the null model and multiplying the result with 100 (proportional change of variance (PCV)) [32]. Analyses were conducted for each country characteristic separately.

3. Results

3.1. Occurrence of multimorbidity care practices in European countries

The 31 expert organizations identified 123 practices that met all inclusion criteria in 25 countries. In six countries no eligible practices were found; these were all Eastern European countries. Most practices were found in Spain (15), the UK (12) and France (11). However, due to staff problems of the French expert organization, data of the 11 practices identified in France are missing, resulting in data of 112 practices available for analysis. These practices were operational in south Europe (n = 42), northwest Europe (n = 26),

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Table 2
Types of prevention and care provided by multimorbidity care practices.

	Total (N = 112) %	Disease-specific multimorbidity approach (N = 47) %	Non-specific multimorbidity approach (N = 65) %	P-value (Chi-square test)
Lifestyle and health behaviour	65.2	63.8	66.2	0.799
Early detection of new comorbidities	43.8	44.7	43.1	0.866
Prevention/delay of deterioration	68.8	74.5	64.6	0.267
Prevention/reduction of functional disability	57.1	59.6	55.4	0.658
Diagnostics	47.3	57.4	40.0	0.068
Medical care	73.2	76.6	70.8	0.492
Nursing care	64.3	55.3	70.8	0.092
Social care	43.8	34.0	50.8	0.078
Informal care, working with carers as co-care providers	26.8	23.4	29.2	0.492
Informal care, targeting carers as co-clients	19.6	8.5	27.7	0.012
Home care	48.2	36.2	56.9	0.030
Medical treatment interventions	62.5	68.1	58.5	0.299
Non-medical treatment interventions	50.0	51.1	49.2	0.848
Adherence to medication	63.4	63.8	63.1	0.935
Adherence to non-pharmaceutical interventions	48.2	51.1	46.2	0.608
Polypharmacy management	44.6	38.3	49.2	0.251
Case management	39.3	29.8	46.2	0.080
Care after discharge	45.5	42.6	47.7	0.590
Rehabilitation and reintegration	50.9	48.9	52.3	0.725
Monitoring	55.4	57.4	53.8	0.705

Scandinavia (n = 23), central Europe (n = 10), the Baltic states (n = 6) and eastern Europe (n = 5).

3.2. Multimorbidity focus

Regarding their focus on multimorbidity, 65 practices (58%) focused on multimorbidity in general, thus targeting people with any combination of chronic diseases or conditions. Thirty practices (27%) focused on a specific chronic disease (index disease) in combination with some or any other chronic conditions. Diabetes mellitus (type 2) was by far the most frequently reported index disease, followed by COPD, asthma and obesity. Mental disorders and/or behavioral problems were reported three times as the index disease and cancer two times. Hypertension, ischemic heart disease, renal disease, osteoarthritis, anxiety and depression were the most frequently reported comorbidities that were taken into account. Finally, 17 practices (15%) focused on a specific combination of two or three chronic diseases. Combinations most often included diabetes mellitus, ischemic heart disease, heart failure, hypertension, renal disease, COPD and/or asthma. Depression and dementia were both reported twice in these combinations.

For further analyses, the practices focusing on a specific index disease or on a combination of specific chronic diseases were taken together, allowing us to distinguish two types of practices according to their multimorbidity focus: disease-specific (n = 47) versus non-specific (n = 65) practices. People aged 65 and over as well as frail elderly were significantly more often reported to be specific target groups of the latter type; respectively 55% versus 29% ($P = 0.007$) and 49% versus 30% ($P = 0.039$).

3.3. Characteristics of disease-specific versus non-specific integrated care practices

3.3.1. Main objectives

In general, most frequently reported main objectives of the practices were to increase multidisciplinary collaboration (79%), improve patient involvement (73%) and care coordination (71%) (see Table 1). Practices with a disease-specific multimorbidity focus also had the promotion of evidence-based practice often as one of their main objectives (64%), whereas this was significantly less the case for practices with a non-specific multimorbidity focus (43%). In contrast, the latter practices significantly more often aimed to improve the integration of different organization (59% vs 34%) and they also more frequently aimed to improve patient involvement (82% vs 62%).

3.3.2. Prevention and care included

Regarding the types of prevention and/or care provided by the practices, Table 2 shows no significant differences in preventive activities (first four items) and diagnostics (fifth item) between the two types of multimorbidity care practices, although there seemed to be slightly more emphasis on prevention and diagnostics in the practices with a disease-specific multimorbidity focus. Regarding the care provided, the practices with a non-specific multimorbidity focus seemed to be more comprehensive, as these practices more often provided support for informal carers (28% vs 9%) and home care (57% vs 36%). Nursing and social care were also relatively frequently provided by the practices targeting a non-specific multimorbidity population, but the differences with the practices with a disease-specific focus were not significant. The same holds for case management, which was provided by almost half of the practices with a non-specific multimorbidity focus (46%).

3.3.3. Services and care providers involved

Primary care was most often involved in both types of multimorbidity care practices (71%), but there was a trend towards a more frequent involvement of primary care in the practices with a non-specific multimorbidity focus (77% vs 62%). On the other hand, in practices that were targeting patients with a specific index disease or combination of diseases university hospitals were relatively frequently involved (47%), while these were involved in only one third (34%) of the non-specific multimorbidity practices. Significant differences between the two practice types existed with regard to the involvement of pharmacy (29% vs 13%, P = 0.039), social services (39% vs 19%, P = 0.028), community or home care services (43% vs 17%, P = 0.004) and nursing homes (31% vs 13%, P = 0.026). These differences reflect the comprehensiveness of the care provided by the non-specific type of multimorbidity care practice.

With regard to the care providers involved, the same picture comes to the fore. GPs were most often involved in the multimorbidity care practices (81%), regardless of their multimorbidity focus. Medical specialists were significantly more often involved in the practices focusing on a specific index disease or combination of diseases (81% vs 54%, P = 0.003), whereas home helps and district

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Table 3
Relationships between country-level characteristics and the multimorbidity focus of the care practice; results of two-level logistic regression model; separate analyses for each country characteristic.

	Number of countries	Number of practices	Dependent variable: disease specific focus (versus non-specific focus)				
			Odds ratio (95%-CI)	Z-statistic (P-value)	Variance at country level		
					Null model	Model with country characteristic as predictor variable	Proportion of variance explained by country characteristic
Population characteristics							
Proportion of population aged 80 and over in 2013	24	112	1.417 (0.696–2.887)	0.96 (.337)	1.431	1.401	2.2
- Prevalence of diabetes in population aged 18 and older in 2014:	24	112	0.741 (0.388–1.415)	−0.91 (.364)	1.431	1.201	16.1
- Men							
- Women	24	112	0.753 (0.403–1.406	−0.89 (.373)	1.431	1.289	10.0
Mean number of self-reported chronic conditions in 2006	20	98	0.755 (0.324–1.759)	−0.65 (.515)	1.625	1.568	3.5
Health workforce characteristics							
Proportion of generalist medical practitioners in 2013	24	112	1.046 (0.534–2.050)	0.13 (.895)	1.431	1.436[a]	0.0
Median number of extra disciplines in the primary care practice in 2012	23	108	0.465 (0.249–0.868)	−2.40 (.016)	1.477	0.684	53.7
Involvement of GPs in treatment of diseases in 2012	23	108	0.818 (0.404–1.658)	−1.12 (.262)	1.477	1.420	3.9
Health system characteristics							
Health expenditures as proportion of gross DMP in 2013	24	112	1.250 (0.670–2.329)	0.70 (.483)	1.431	1.358	5.2
Centralized health system (versus decentralized)	23	111	2.029 (0.547–7.530)	1.06 (.290)	1.424	1.169	17.9
Tax based financing (versus insurance based/mixed)	23	111	0.551 (0.140–2.173)	−0.85 (.395)	1.424	1.340	5.9

[a] Due to estimation, this variance component is slightly larger than the estimated variance component of the null model.

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or community nurses were more often involved in the practices with a non-specific multimorbidity focus, respectively 49% versus 19% (P = 0.001) and 66% versus 36% (P = 0.002).

Coordination of medical services was more often part of the practices with a non-specific multimorbidity focus (68% vs 49%, P = .046). Also, collaboration between medical and non-medical services was more often part of practices of the non-specific type (69% versus 47%, P = 0.017).

3.4. Country characteristics related to type of multimorbidity care practice

The intraclass correlation coefficient computed from the two-level logistic regression model was 0.303 (se 0.150), indicating that the way multimorbidity was approached in the 112 practices (either disease-specific or non-specific) could be explained to some extent by the countries in which they occur. This implies that practices with a disease-specific focus on multimorbidity (compared to a non-specific focus) were more often found in some countries than in others. Table 3 shows that the only characteristic that was of predictive value in this respect was the number of disciplines working in the same primary care practice as the GP(s). In countries in which more other disciplines work in the primary care practice, it is more likely that multimorbidity care approaches with a non-disease specific focus occur.

4. Discussion

4.1. Occurrence of multimorbidity care practices

In many European countries integrated care practices that target people with multiple chronic diseases occur, but not already on a large scale. In most countries only a few of such practices could be identified. In six of the 31 countries included in this study, no such practices were found. These were all Eastern European countries, where multimorbidity may be even more prevalent than in other European regions. For instance, results from the European SHARE survey 2010/2011 show the highest proportions of people aged 50 or older reporting multiple chronic conditions in Hungary (58%), Estonia (56%) and Poland (55%) [33], all countries where no multimorbidity practices had been identified by national expert organisations.

4.2. Multimorbidity focus

More than half of the identified practices (58%) provide care for multimorbid patients with any combination of chronic diseases. Half of these specifically target (frail) older people with multiple chronic conditions. Thirty practices (27%) focus on a specific chronic disease ('index disease') in combination with some or any other chronic condition, and 17 practices (15%) focus on a combination of two or three specific chronic diseases.

4.3. Non-specific multimorbidity care practices

Practices of the non-specific type show characteristics that reflect a person-centered care approach. Key elements of person-centered care are (1) active participation of patients in goal-setting and decision-making about the care provided and self-management of their conditions, (2) involvement of informal carers, and (3) provision of coordinated multidisciplinary care [34]. This study shows that practices with a non-specific multimorbidity focus put more emphasis on patient involvement, involvement of informal carers as co-clients, involvement of non-medical disciplines such as nursing, home care and social care, and on inter-organizational collaboration. As such, they may be well prepared to address social problems as well, and take variations in patients' needs over the patient journey into account.

4.4. Disease-specific multimorbidity care practices

Practices that focus on multimorbidity in people with a specific chronic disease ('index disease') most often target patients with type 2 diabetes who develop complications or comorbidities. As diabetes type 2 is highly prevalent in all European countries [35], this is not surprising. The reported comorbidities suggest that many of the practices of this type, regardless of their specific index disease, focus on comorbidities related to the index disease. This finding supports the surmise that these multimorbidity care practices have developed from single disease DMPs.

Practices that focus on a combination of specific chronic diseases (without considering one of them as the index disease) do not deviate much from the previous type of practices with regard to the chronic diseases they focus on, which makes distinguishing the two types arbitrary. Therefore, combining these two types into one category of disease-specific multimorbidity practices, as we did in our bivariate analyses, seems justified.

Disease-specific multimorbidity practices are integrated care practices just as well, as are DMPs for single chronic diseases. However, regarding the type, breadth and degree of integration [9,11], these practices reflect a less extensive integration of care. Clinical integration, i.e. coordination of care and multidisciplinary collaboration for individual patients, seems as frequent as in the non-specific multimorbidity care practices, but integration of organizations is less often seen and the breadth of services provided is more limited. Collaboration seems to be confined to medical disciplines; non-medical services such as social care and home care are less often involved. As many people with type 2 diabetes [e.g.,35,36] and/or cardiovascular disease [e.g.,37] and/or COPD [e.g.,38] are older people, it is unlikely that these people are less in need of social care or community services than other people with multiple chronic conditions. For instance, a study in the Netherlands showed that only a limited part of the total care consumption of type 2 diabetes patients was covered by the Dutch care standard for diabetes type 2, which defines the care included in the regional DMPs [39]. The high rate of multimorbidity (60%) among the diabetes patients was an important explanation for this finding. DMPs aim to improve care coordination for chronic disease patients, but focusing on a single disease or, in our case, on a limited number of related comorbidities might increase the risk of neglecting health needs that require care and coordination beyond the DMP. As such, DMPs or other integrated care models with a limited scope may even be counter-productive to improve care for people with multiple chronic conditions.

4.5. Multimorbidity focus in relation to characteristics of a country

The current study shows that non-disease specific approaches are more likely to occur in countries where more disciplines work in the same primary care practice. In fact, the median number of disciplines working in the primary care practice, in addition to GPs, was the only country characteristic included in this study that significantly related to the multimorbidity focus of the practices we found in European countries. For people with multiple health (and social) problems, who are often mistakenly labeled as complex patients, such primary care practices might reduce care fragmentation, as these could function as a 'one-stop shop'.

Other characteristics of the health system and health workforce were not distinctive. Population characteristics such as the proportion of people aged 80 or older or the prevalence of diabetes in a country did not make a difference either. This might reflect a lack

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of policy regarding multimorbidity care at a national or regional level in many European countries [40]. Future planning and priority setting regarding the implementation of integrated care for people with multimorbidity in European countries could benefit from regular population needs assessments.

4.6. Strengths and limitations

The (lack of) findings mentioned above may be due to the limited number of practices we could include, which resulted in a lack of power to demonstrate small effects of the included country characteristics. Moreover, the limited number of practices did not allow us to conduct analyses with more refined country characteristics as predictor variables, for instance more refined measures of a country's health system or its financing system.

A strength of this study is that expert organizations from 31 European countries were involved, which resulted in a broad overview of multimorbidity care practices in Europe. Nevertheless, we cannot be sure that all practices that met our criteria were identified in a country. However, we do believe that the multimorbidity care practices identified in the ICARE4EU project give a good impression of the relative occurrence and distribution of such practices across European countries, as a call to report on multimorbidity care practices in European countries as part of the EU Joint Action on chronic diseases and healthy ageing across the life cycle (JA-CHRODIS) resulted in many practices already identified by the ICARE4EU expert organizations [41]. Additional practices (N = 18) identified by the JA-CHRODIS partners mostly occurred in Spain, which had already been identified as the country with the most multimorbidity care practices in Europe in the ICARE4EU project. A limitation already mentioned in the Results section is that the data collection of the multimorbidity care practices identified in France failed due to staff problems.

Furthermore, the fact that we did not use validated questionnaires to assess the practice characteristics (e.g. objectives, care providers involved) could be considered a weakness of the study. In 2014, when we collected the data, questionnaires covering our research themes were neither available in the many languages spoken in the EU nor validated in all countries. Therefore, we had to develop the survey questions ourselves, which was done by a stepwise approach, in which the research themes (e.g. person-centeredness, integrated care, financing) were first identified by all project partners together, then operationalized based on theoretical models and empirical studies by the project partner with expert knowledge of the particular theme, and subsequently formulated in survey questions, which were commented upon by all project partners. The (adapted) survey questions were then pretested by the ICARE4EU project partners in their own country, and translated in eleven languages.

In this study we used a quantitative analytical approach to answer our research questions, which suited the exploratory purpose we had. In this way, we were able to describe and compare different types of multimorbidity care practices according to a number of basic characteristics. To get a better understanding of how these multimorbidity care practices have developed, how they perform and which factors facilitate or hinder their implementation, we also made site visits to eight of these practices and collected qualitative data by means of interviews, observation and document analysis. The results of the qualitative data-analysis provide more detailed insights in the actual performance and implementation status of these eight practices [42–49] (available from www.icare4eu.org), which could support further development and implementation of multimorbidity care in European countries.

4.7. Considerations for future research and policy

Although the limited number of practices included in this study cannot be considered a weakness of the study itself (it simply reflects the current state of multimorbidity care in Europe), it restricted our options to answer the third research question. However, as the burden of multimorbidity and the challenge of providing good-quality, effective and efficient care for multimorbid patients is rapidly rising on the policy agenda in many European countries, we expect the number of multimorbidity care practices to increase in the near future. This would allow studying the relationships between characteristics of European countries and the characteristics of the multimorbidity care practices found in these countries in more detail. However, for this purpose complete and comparable data on characteristics of European countries are also needed. In addition, there is a lack of data allowing cross-country comparisons on important indicators of multimorbidity (e.g. prevalence, health care quality indicators), both in the European Union and worldwide. As long as such data are not available, it is very difficult to monitor developments in the occurrence and distribution of multimorbidity across countries and to collaborate, for instance in the European Union, on multimorbidity prevention and management.

5. Conclusions

In many European countries integrated care approaches that target people with multiple chronic conditions have been developed. Practices that focus on a specific index disease or a combination of specific chronic diseases are less extensive regarding the type, breadth and degree of integration than practices that focus on any combination of chronic diseases. These non-disease specific practices put more emphasis on patient involvement and provide more comprehensive care, which are important preconditions for person-centered care. This type of multimorbidity care is more often seen in countries where more disciplines work in the primary care practice where GPs are working. Countries could benefit from the development of indicators that can be used to monitor and compare the prevalence and burden of multimorbidity in countries or regions as well as the processes and outcomes of multimorbidity care.

Conflict of interest statement

The authors declare that they have no competing interests.

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