Cost-effectiveness of the Walcheren Integrated Care Model

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Abstract

Background

An important aim of integrated care for frail elderly is to generate more cost-effective health care. However, empirical research on the cost-effectiveness of integrated care for community-dwelling frail elderly is limited. This study reports on the cost-effectiveness of the Walcheren Integrated Care Model (WICM) after 12 months from a societal perspective.

Methods

The design of this study was quasi-experimental. In total, 184 frail elderly patients from three GP practices that implemented the WICM were compared with 193 frail elderly patients of five GP practices that provided care as usual. Effects were determined by health-related quality of life (EQ-5D questionnaire). Costs were assessed based on questionnaires, GP files, time registrations and reports from multidisciplinary meetings. Average costs and effects were compared using t-tests. The incremental cost-effectiveness ratio (ICER) was calculated, and bootstrap methods were used to determine its reliability.

Results

Neither the WICM, nor care as usual resulted in a change in health-related quality of life. The average total costs of the WICM were higher than care as usual (17,089 euros versus 15,189 euros). The incremental effects were 0.00, whereas the incremental costs were 1,970 euros; indicating an ICER of 412,450 euros.

Conclusions

The WICM is not cost-effective, and the costs per quality-adjusted life year are high. The costs of the integrated care intervention do not outweigh the limited effects on health-related quality of life after twelve months. More analyses of the cost-effectiveness of integrated care for community-dwelling frail elderly are recommended as well as consideration of the specific costs and effects.

Background

Due to population ageing, primary care systems throughout the world are encountering great challenges urging innovation in the organization of elderly care. Elderly individuals will gradually experience complex age-related problems in the physical, psychological, cognitive and social domains of daily functioning. This condition is known as frailty and is found to increase the risk of negative health and social outcomes. Frailty is related to poor quality of life and becoming more care dependent, with an increased likelihood of hospitalization and institutionalization (Gobbens & van Assen, 2014). While budget cuts reduce health and social care expenditures, there is, thus, a strong need for providing high-quality care in order to maintain elderly's quality of life. It is frequently questioned whether the current approach to care delivery provides good value for money, given its fragmentation and its lack of responsiveness to the needs of frail elderly (Gröne & Garcia-Barbero, 2001). Therefore, it is essential to consider alternatives.

Integrated care has been increasingly advocated as a means to deliver value for money. Integrated care is defined as "a well-planned and well-organised set of services and care processes, targeted at multi-dimensional needs/problems of an individual client, or a category of persons with similar needs/problems" (Nies, 2004). The two main features of integrated care are client-centeredness and continuity. First, integrated care is demand-oriented, addressing client's needs by professionals from different disciplines and sectors (Gröne & Garcia-Barbero, 2001). Second, integrated care aims to promote continuity: the set of services is delivered coherently, seamlessly and in accordance with clients' changing needs over time (Nies, 2004). Common elements of integrated care models proven to be effective for community-dwelling frail elderly are a single entry point, geriatric assessments, case management, multidisciplinary teams (Johri, Beland, & Bergman, 2003), multidisciplinary protocols and discussions, web-based patient files and a network structure (Kodner & Kyriacou, 2000).

Even though integrated care largely aims at cost-effectiveness, research comparing the associated costs *and* effects of interventions is scarce, limiting conclusions on the cost-effectiveness of integrated care interventions (Melis et al., 2008). Thus far, studies on cost-effectiveness have also shown mixed results. Some interventions for community-dwelling frail elderly have shown to be cost-effective compared with care as usual (Drubbel, 2014; Fairhall et al., 2015; Melis et al., 2008; Stuck, Aronow, & Steiner, 1995), whereas other studies have shown that integrated care is not cost-effective (Kehusmaa, Autti-Rämö, Valaste, Hinkka, & Rissanen, 2010; Metzelthin et al., 2015). The wide variation in the interventions, costs and effects considered in

these studies, limits the possibility to draw conclusions regarding what promotes cost-effectiveness in integrated care for community-dwelling frail elderly.

This study adds knowledge by exploring the cost-effectiveness of a specific integrated care intervention: the Walcheren Integrated Care Model (WICM). Our study is relevant for two reasons. In contrast to earlier studies that used a narrow health care perspective (Fairhall et al., 2015; Melis et al., 2008; Stuck et al., 1995), we adopted a societal perspective, which is strongly recommended given its policy relevance at the macro level (Drummond, Sculpher, Claxton, Stoddart, & Torrance, 2005). Second, our intervention comprises *all* integrated care elements that have been identified as effective in prior research rather than a selection of elements. Therefore, we provide valuable insights regarding the cost-effectiveness of a comprehensive integrated care model for community-dwelling frail elderly. This study aimed to answer the following research question: Is the WICM cost-effective from a societal perspective after twelve months?

Methods

Design

The design of this study was quasi-experimental and included before and after measurements with a control group providing care as usual (for a more detailed description of the methods, see (Fabbricotti et al., 2013)). The cost-effectiveness analysis was conducted from a societal perspective and thus considered all costs related to the intervention, irrespective of who pays for these expenses (Drummond et al., 2005).

Intervention

In the WICM, the GP functions as care coordinator and as a partner in prevention. The GP practice is a single entry point for the elderly, their informal caregivers and health professionals. GPs detect frailty in their patient population using the Groningen Frailty Indicator, a validated 15-item instrument that measures decreases in physical, cognitive, social and psychological functioning. Elderly patients with a score of 4 or higher are visited by a nurse practitioner who assesses their functional, cognitive, mental and psychological functioning using EASYcare, an evidence-based instrument used to assess care needs. A multidisciplinary treatment plan is then formulated in consultation with the elderly and their informal caregiver(s). Case management is provided by the nurse practitioner. Multidisciplinary meetings are attended by the GP, the nurse practitioner and other professionals, depending on the care required by the frail elderly. The entire process is supported by web-based patient files and

multidisciplinary protocols. The WICM requires task reassignment and delegation between nurses and doctors, and among GPs, nursing home doctors and geriatricians. Consultations occur among primary, secondary, and tertiary care providers. At the organizational level, a steering group serves as an umbrella organization under which the WICM is developed and disseminated. The steering group, which consists of representatives from all involved organizations, forms a Joint Governing Board that provides the necessary provider network. All patient representatives support the project, and the health insurer CZ provides financial support for the project.

Compared with the WICM, care as usual in the Netherlands is fragmented and reactive. In the Dutch health care systems, patients need a referral from their GP to obtain care from the primary, secondary and tertiary echelons. GPs thus play the role of gate keepers. Care as usual is fragmented, as professionals merely communicate bilaterally through referral letters and sporadic telephone calls. Moreover, care as usual is reactive; patients solely receive care for specific (health) problems on their own initiative. The GPs in the control group were unable to implement elements of the integrated model during the study period because they did not receive financial support from the health insurer to implement the integrated care activities of the WICM. Accordingly, participants in the control group were not systematically screened for frailty, their care needs were not assessed, multidisciplinary treatment plan were not formulated and case management was not provided. The GPs in the control group had a monodisciplinary focus; they did not organize multidisciplinary meetings or implement multidisciplinary protocols and web-based files. Furthermore, the GPs in the control group could not treat the frail elderly patients differently, as these GPs were not given information on who participated in the study. Therefore, the probability of bias was minimized.

Participants

The study population consisted of the entire elderly patient population of the GPs in both the experimental and control groups (see figure 5.1). At baseline, 254 frail elderly from three GP practices were included in the experimental group, and 249 frail elderly from six GP practices in the control group. The frail elderly were asked whether they received informal care, including care from non-professionals and unpaid care provided by partners, family, close friends or neighbours. At baseline, 144 frail elderly in the experimental group reported receiving informal care compared with 118 frail elderly in the control group. After 12 months, the final study population included 184 frail elderly and 83 informal caregivers in the experimental group and 193 frail elderly and 76 informal caregivers in the control group.
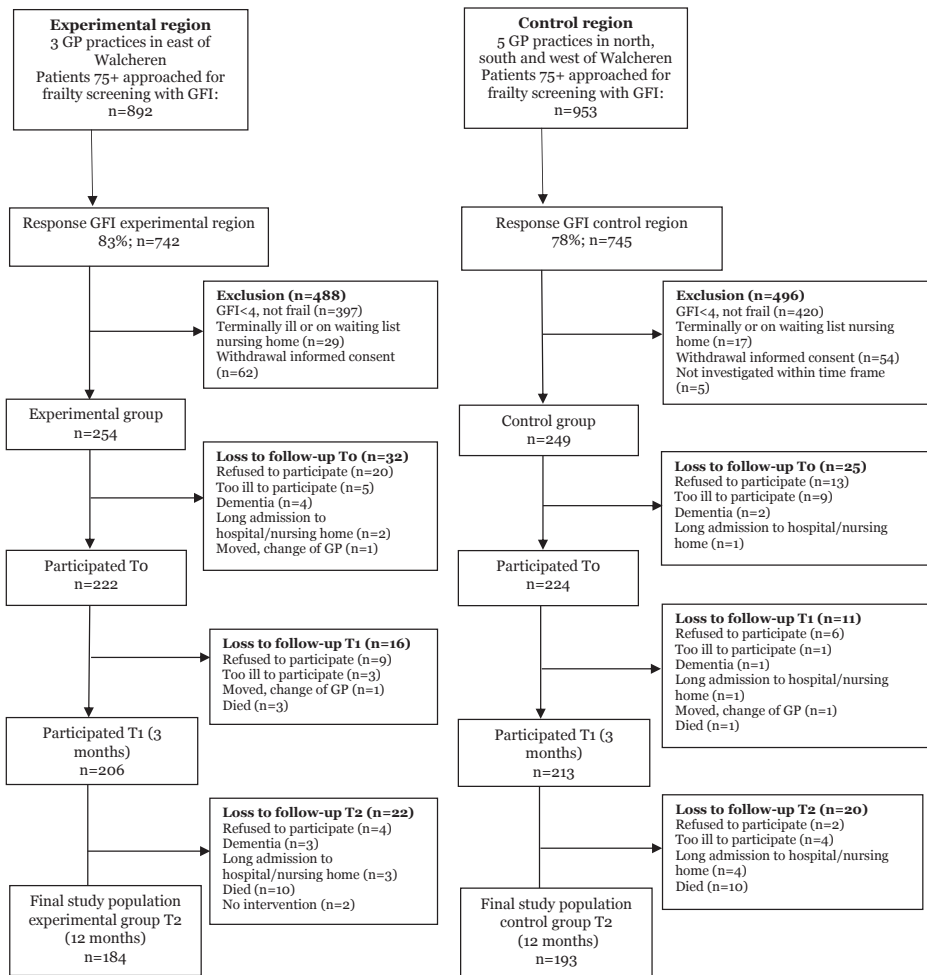
Figure 5.1: Flow chart of selection and loss to follow-up of study participants in experimental and control group

Measures

Effects

The primary outcome of the intervention was quality of life, which was operationalized with health-related quality of life measured with the EQ-5D instrument. The EQ-5D has five dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. Each dimension has three answering categories: (i) no problems; (ii) some problems and (iii) extreme problems. The answer to each of these five dimensions leads to a combination of five numbers and 243 possible health states (e.g. health state 21232 means: having some problems in walking about, having no

problems with self-care; having some problems with performing usual activities; having extreme pain or discomfort; being moderately anxious or depressed). The health states unconscious and dead were added, which makes a total of 245 health states that were valued by the Dutch audience on their desirability. In previous research a general sample of the Dutch audience was asked to indicate what period of time in perfect health (11111) was equal to 10 years in a specific health state (e.g 21232) (Lamers, McDonnell, Stalmeier, Krabbe, & Busschbach, 2006). The weights obtained in this research were used to calculate the utility scores of the frail elderly of our study population. Measurements of these utility scores were obtained at baseline, three and twelve months and were used to calculate quality-adjusted life years (QALYs) for each respondent. QALYs combine both quantity and quality of life in one single measure; 1 QALY means one year in perfect health (Lamers et al., 2006)

Costs

Healthcare costs, intervention costs and informal care costs were calculated by multiplying the volume of care by its corresponding cost price.

Health care volumes were collected through questionnaires and GP file research (see table 5.1). In the questionnaires, the frail elderly were asked to indicate the volume of care in assisted living facilities and nursing homes, in day care centres and in home care. Information on the volume of care in assisted living facilities and nursing homes was sought retrospectively after three and twelve months. The volumes of day care and home care were measured in the questionnaire at baseline, three and twelve months. These volumes were extrapolated with a calculation rule to obtain the volume of care over twelve months. The volume at baseline was considered to be the volume for the first month, the volume at three months was considered the volume for the second and third months, and the volume at twelve months was considered to be the volume for the last nine months. The GP file research led to data regarding the volume of care within GP practices, hospitals, and paramedical and psychological care. Data were not extrapolated, as the files provided the exact date of care consumption.

Information on intervention costs was obtained from time registrations of the case managers and notes from the multidisciplinary meetings. The exact intervention time and therefore intervention costs could be calculated for each individual frail elderly person. The education costs of the GPs and case managers were not considered.

Table 5.1: Costs of care and data collection

Type of care		Source data				Cost price
		Question-naire	GP file	Time registrations	Notes from multi-disciplinary meeting	€
Health care costs						
GP practice						
GP	Telephone consultation			number		14.51
	Consultation			number		29.02
	Consultation long			number		58.04
	Visit at home			number		44.57
	Visit at home long			number		89.13
Practice assistant	Telephone consultation			number		5.48
	Consultation			number		10.97
	Consultation long			number		21.93
	Visit at home			number		16.84
	Visit at home long			number		33.68
Emergency GP	Telephone consultation			number		21.29
	Consultation			number		42.58
	Visit at home			number		63.88
Hospital	Admission – general			days		450.85
	Admission - academic			days		595.95
	Outpatient clinic – general			number		66.33
	Outpatient clinic - academic			number		133.70
	Day surgery			number		260.15
	Emergency ward			number		156.50
	Ambulance			number		271.55
Assisted living facility	Temporary stay assisted living facility	days				93.28
Nursing home	Temporary stay nursing home	days				246.67
	Permanent stay nursing home	days				246.67
	Day treatment in nursing home	days				146.66
Home care	Home care – household activities	hours				24.87
	Home care – personal care	hours				45.60
	Home care – nursing care	hours				67.37
Day care center	Day care	days				26.00
Paramedical	Physiotherapy			sessions		37.31
	Occupational therapy			hours		22.80
	Dietitian			hours		27.98
Psychosocial	Psychological care			sessions		89.83

Table 5.1: (continued)

Type of care	Source data				Cost price
	Question-naire	GP file	Time registrations	Notes from multi-disciplinary meeting	€
Social care		sessions			67.37
Intervention costs					
Preparation multidisciplinary meeting			minutes	minutes	variable*
Multidisciplinary meeting			minutes	minutes	variable*
Time spent per patient by case manager			minutes		variable*
Informal care costs					
Household activities	hours				24.87
Personal care	hours				45.60
Instrumental tasks	hours				13.00

*The cost price differs per group health care professionals and is calculated for each group separately.

Informal care volumes were assessed by questionnaires completed by informal caregivers of the frail elderly at baseline, three and twelve months. The volume of informal care was measured using the Objective Burden of Informal Care Instrument (Van den Berg & Spauwen, 2006) that distinguishes time spent on household, personal care and instrumental tasks. The same calculation rule was applied as for the health care costs assessed in the questionnaire of the frail elderly.

Cost prices were determined using the Dutch guidelines of costing studies (Hakkaart-van Roijen, Tan, & Bouwmans, 2011). Cost prices were determined in euros for the year 2011 and were corrected for inflation.

Statistical analysis

The costs and the effects were compared by conducting a cost-effectiveness analysis. First, the background characteristics of the experimental and control participants at baseline were compared by chi-square tests for the categorical variables and t-tests for the continuous variables. Second, the average volume of care and corresponding costs during the twelve months period were compared between the experimental and control groups with t-tests (Thompson & Barber, 2000). The cost-effectiveness of the WICM was determined by calculating the incremental cost-effectiveness ratio (ICER). The ICER is calculated by dividing the difference between costs of the experimental group and control group (incremental costs) by the difference in effects between the experimental and control group (incremental effects). Missing values

were imputed with the fully conditional specification method. We determined the reliability of the ICER with the bootstrap method, which is a statistical method with repetitive computation to determine the confidence interval of the ICER. By sampling from both the distribution of costs and effects concurrently, multiple estimates from ICER were obtained (n=10,000) (Drummond et al., 2005).

Results

The study population consisted of frail elderly patients with an average age of 82 years and an average score of 6 on the Groningen Frailty Indicator (table 5.2). Women were overrepresented in both groups and the majority of the frail elderly lived alone and independently. Nearly half of the frail elderly patients had an informal caregiver. At baseline, the health-related quality of life was equal in both groups. Compared with the control group, the experimental group consisted of significantly more women and frail elderly who lived in assisted living facilities.

Table 5.2: Characteristics of the study participants in experimental and control group at baseline

	Experimental group (n=184)	**Control group (n=193)**	*T-statistic* or chi square
Groningen Frailty Indicator (0-15)	6.0 (2.0)	5.8 (1.8)	*-1.3*
Age	81.8 (4.7)	82.3 (5.3)	*0.8*
Sex – women	70%	60%	4.1*
Marital status			
Married and living together	37%	42%	0.9
Single and widowed	63%	58%	
Living situation			
Independently	72%	82%	6.1*
Assisted living facility	28%	18%	
Informal caregiver	45%	39%	1.5
Health-related quality of life (0-1)	0.65 (0.2)	0.67 (0.3)	*0.5*

*p<0.05

Frail elderly patients most commonly used care from the GP, hospital and home care (table 5.3). All experimental participants used GP care, as it was the single entry point of care for the intervention. In the control group, 4% of the frail elderly did not use any GP care over the one-year period. Three-quarters of the frail elderly visited the hospital within one year. The highest expenses in both groups were for home care and informal care. Only limited differences were observed in the health care utilization of the experimental and control group. For two types of care, the cost differences

were significant. The first type was GP care: the costs were significantly higher in the experimental group than in the control group. Furthermore, because the intervention costs were 0 in the control group, these costs were significantly higher in the experimental group.

Table 5.3: Volume and mean costs of care after 12 months

Costs of care	Experimental group (n=184)			Control group (n=193)			95% CI	p-value
	% frail elderly using care	Mean €	SD €	% frail elderly using care	Mean €	SD €		
Health care costs								
GP	100	315	229	96.4	245	191	-133, -27	0.001***
Emergency GP	25.5	20	50	16.6	12	37	-16, 1	0.104
Hospital care	76.6	1096	3304	77.7	709	1628	-918, 146	0.154
Nursing home & assisted living	5.4	1244	8389	3.1	820	6987	-1985, 1136	0.593
Home care	69.0	7084	9573	71.0	6410	10902	-2756, 1408	0.525
Day care	5.4	205	1157	8.3	239	1216	-207, 274	0.786
Paramedical care	42.4	166	361	35.8	136	295	-96, 37	0.380
Psychosocial care	8.2	10	56	4.1	78	535	-8, 144	0.087
Intervention costs	100	340	188	0	0	0	-368, -313	0.000***
Informal care costs	41.8	6608	15269	35.2	6469	14778	-3182, 2904	0.929

***p<0.001

The average total costs in the experimental group were 17,089 euros for each frail elderly person over a one-year period (table 5.4). The costs were lower in the control group, with an average of 15,189 euros for each frail elderly person. The dispersion of costs was high: 21,000 euros in both groups. The total costs did not significantly differ between the two groups. The effects were explored in terms of health-related quality of life. The average effect in the experimental group was 0.00 compared with -0.01 in the control group; this difference was not significant.

Table 5.4: Effects and total costs of care after twelve months

	Experimental group	**Control group**	95% Confidence interval	p-value
Effects – EQ-5D	0.00 (0,19)	-0.01 (0,17)	-0.04, 0.03	0.80
Total costs	17089 (21.468)	15189 (21.709)	-6344, 2405	0.38

The WICM was not found to be cost-effective after twelve months. The intervention does not achieve incremental effects, meaning that no additional effects were gained.

The incremental costs of the intervention are 1,970 euros so the WICM is more expensive than care as usual. The costs do not outweigh the effects of the intervention after one year. The results indicate an ICER of 412,450 euros, implying that on average 412,450 should be spent to gain 1 additional QALY (one year in perfect health). The 95% confidence interval of the ICER is -4,131,743 to 4,210,593. The results of the bootstrap analysis are presented in the cost-effectiveness plane (figure 5.2). Very few of the bootstrap results, 0,21%, appear in the southeast quadrant, meaning that the intervention is more effective and generates lower costs than care as usual.
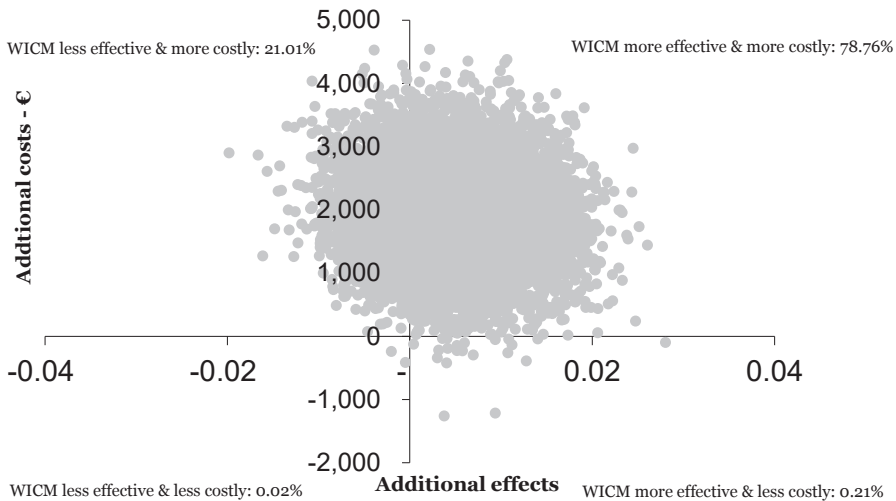

Figure 5.2: Cost-effectiveness plane - costs (euros) vs effects (QALY) of WICM vs care as usual

Discussion

In this study, we performed an economic evaluation of the WICM, a comprehensive integrated care intervention for community-dwelling frail elderly including several effective integrated care elements and differing considerably from standard care (in the Netherlands). The main conclusion is that the WICM is not cost-effective from a societal perspective over a twelve-month period, as the costs do not outweigh the effects and the costs per QALY are high.

Because studies of the cost-effectiveness of integrated care show mixed results, our study both confirms and contradicts current evidence. With regard to the effects, our study corroborates the limited effects of integrated care interventions (Drubbel, 2014; Fairhall et al., 2015; Kehusmaa et al., 2010). These limited effects do not

depend on the effect measures, as studies have adopted different effect measures, e.g. functional performance, mental health (Melis et al., 2008), frailty state (Fairhall et al., 2015) and health-related quality of life (Drubbel, 2014; Fairhall et al., 2015; Kehusmaa et al., 2010; Metzelthin et al., 2015). In our cost-effectiveness analysis, we also chose to explore effects on quality of life because this refers to the subjective appraisal of the frail elderly themselves (Gobbens & van Assen, 2014). Moreover, we focused on health-related quality of life because this measure is primarily used for interventions that expect effects on patient health (Drummond et al., 2005). However, comparability between the studies is limited; it is uncertain what results would have been observed if all studies had chosen the same effect measures.

The main difference between our study and earlier research concerns the costs included (i.e., health care costs, intervention costs and informal care costs). With regard to the health care costs, the types of care that were considered clearly differed among studies. Our study included a wide range of costs because the intervention focused on physical, psychological and social functioning of the elderly. Accordingly, we included costs of both paramedical and psychological care, which were not or partially considered in other studies from a societal perspective (Drubbel, 2014; Metzelthin et al., 2015). Furthermore, intervention costs were calculated differently in our study than in other studies. In these studies, the total intervention costs were calculated and divided by the number of intervention participants (Drubbel, 2014; Fairhall et al., 2015; Kehusmaa et al., 2010; Metzelthin et al., 2015). The WICM involved specific investments, such as case management and time spent on multidisciplinary meetings by all professionals. These costs were studied in detail and calculated for each frail elderly person individually. This approach enhanced the validity of our study. Finally, informal care costs were considered only in studies adopting a societal perspective (Drubbel, 2014; Metzelthin et al., 2015). Three of the interventions that were considered to be cost-effective (Fairhall et al., 2015; Melis et al., 2008; Stuck et al., 1995) adopted a health care perspective that did not include the assessment of informal care costs.

This study has several limitations. Our quasi-experimental design was chosen to ensure that the frail elderly patients could stay with their own GP. As randomization of the frail elderly made this impossible, a quasi-experimental design was the second best choice. However, quasi-experimental designs may risk baseline differences between the experimental and control group. In our study, the experimental group consisted of more women and more elderly living in assisted living facilities compared with the control group. However, these differences did not influence our results, as previous research has shown no clear association between sex and quality

of life (Bowling, 2005) or between living in an assisted living facility and quality of life (Grayson, Lubin, & Van Whitlock, 1995). This also applies to the costs of care, which were not found to be higher for women (Kehusmaa et al., 2012) or for elderly in assisted living (McGrail et al., 2013). Additionally, with the quasi-experimental design, we might have selectively included GPs in the experimental group who initially already had a more proactive attitude toward the delivery of care to frail elderly patients. Because a proactive attitude has an effect on elderly's quality of life (Gobbens & van Assen, 2014), the choice not to randomize the GPs might have led to a smaller effect on the change in quality of life for the experimental group. Although the quality of life at baseline did not significantly differ in the two groups, we have no information regarding changes in the quality of life prior to the beginning of the intervention. The selection of intervention GPs could also mean that these GPs are more likely to participate in care activities for the frail elderly, leading to higher care costs irrespective of the costs associated with the WICM.

The second limitation is related to the calculation of care costs. In this study, precise data on the volume of some types of formal and informal care were lacking, because the elderly patients did not keep records of the care they received; a method which is a commonly used in cost-effectiveness analyses. Instead, we extrapolated the volume based on their health care use at three explicit moments in time (at baseline, after three and after twelve months). This method could have led to an underestimation or overestimation of health care use and informal care and, consequently, of the costs of care. Additional analyses also showed that the volume of care used at the three moments in time rarely differed.

Third, we did not account for all costs in the cost-effectiveness analysis, e.g. costs regarding medication and assistive devices. We selected the seemingly most important types of care because it remains unknown what specific types of health and social care should be considered in cost-effectiveness analyses of integrated care interventions for the frail elderly. Furthermore, the costs of schooling and training were not accounted for because consideration of such costs would lead to unrealistically high costs for the experimental group, as the return on investment for these costs requires more than twelve months.

It remains unclear whether integrated care for the frail elderly can achieve one of its major aims of being cost-effective and thereby providing value for money. In current health care systems, this knowledge is essential in determining whether integrated care can achieve its high expectations. This implies that further research of evaluation studies on integrated care should include a cost-effectiveness analysis from a societal

perspective with similar types of care considered. Adopting a societal perspective, i.e. considering the costs of informal care, is strongly recommended (Drummond et al., 2005). This is necessary because informal caregivers have become increasingly important in the care of frail elderly patients. It is crucial to consider similar costs and effects in cost-effectiveness analyses to ensure comparability among studies. More comparable cost-effectiveness analyses may help researchers to draw conclusions regarding what combinations of integrated care elements are cost-effective. However, performing such research requires determination of the types of care and health issues can be influenced by integrated care interventions for the frail elderly and should thus be considered relevant costs and effects in future cost-effectiveness analyses.

Second, future research may explore whether other goals of the WICM are achieved, such as improvements in the quality of care and consumer satisfaction. Because of a possible trade-off between the various goals of integrated care, focusing solely on cost-effectiveness might impede the implementation of a potentially successful integrated care arrangement for frail elderly patients.

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