

RESEARCH

Open Access



# Factors influencing changes in health related quality of life of caregivers of persons with multiple chronic conditions

Wendy Duggleby<sup>1\*</sup>, Allison Williams<sup>2</sup>, Sunita Ghosh<sup>3</sup>, Heather Moquin<sup>4</sup>, Jenny Ploeg<sup>5</sup>, Maureen Markle-Reid<sup>6</sup> and Shelley Peacock<sup>7</sup>

## Abstract

**Background:** The majority of care for older adults with multiple chronic conditions (MCC) is provided by family (including friends) caregivers. Although caregivers have reported positive benefits to caregiving they also experience decreases in their physical and mental health. As there is a critical need for supportive interventions for this population, it is important to know what influences the health of family caregivers of persons with MCC. This research examined relationships among the changes from baseline to 6 months in health related quality of life (SF12v2) of family caregivers caring for older adults with multiple chronic conditions and the following factors: a) demographic variables, b) gender identity [Bem Sex Role Inventory (BSRI)] c) changes in general self-efficacy [General Self Efficacy Scale (GSES) (baseline to 6 months) and d) changes in caregiver burden [Zarit Burden Inventory (ZBI)] baseline to 6 months. Specific hypothesis were based on a conceptual framework generated from a literature review.

**Methods:** This is a secondary analysis of a study of 194 family caregivers who were recruited from two Canadian provinces Alberta and Ontario. Data were collected in-person, by telephone, by Skype or by mail at two time periods spaced 6 months apart. The sample size for this secondary analysis was  $n = 185$ , as 9 participants had dropped out of the study at 6 months. Changes in the scores between the two time periods were calculated for SF12v2 physical component score (PCS) and mental component score (MCS) and the other main variables. Generalized Linear Modeling was then used to determine factors associated with changes in HRQL.

**Results:** Participants who had significantly positive increases in their MCS (baseline to 6 months) reported lower burden (ZBI,  $p < 0.001$ ), and higher general self-efficacy (GSES,  $p < 0.001$ ) and Masculine BSRI ( $p = 0.025$ ). There were no significant associations among variables and changes in PCS (baseline to 6 months).

**Conclusions:** Our findings suggest that a masculine gender identity (which incorporates assertive and instrumental approaches to caregiving), and confidence in the ability to deal with difficult situations was positively related to improvement in mental health for caregivers of persons with MCC. Decreases in perceptions of burden in this populations was also associated with improvements in mental health. Further research is needed to explore ways to support caregivers of older persons with multiple chronic conditions living at home.

**Keywords:** Caregivers, Quality of life, General self efficacy, Gender identity

\* Correspondence: wendy.duggleby@ualberta.ca

<sup>1</sup>Faculty of Nursing, University of Alberta, 3rd Level ECHA, 11405 - 87th Ave, Edmonton, AB T6G 1C9, Canada

Full list of author information is available at the end of the article



## Background

With increasing numbers of persons over the age of 65 there is an increasing demand in Canada for family/friends to provide care in the home [1]. This care is complex as the prevalence of multiple chronic conditions (at least two chronic physical or behavioral health problems that have lasted 6 months or longer) increases with age [2]. The care provided by family/friends is critical for maintaining the health of Canadians older adults with chronic health conditions [1]. However, caring for older adults impacts the daily lives of caregivers and can result in adverse physical and psychological health outcomes. For example, caregivers experiencing caregiver burden and strain have a 63 % higher risk of mortality than non-caregivers [3], which in many cases is greater than the risk for care recipients [4]. There are large gaps in knowledge regarding family caregivers of an increasing population of older adults with MCC [5]. Identifying factors impacting the lives of caregivers for older adults with MCC will help to inform appropriate supportive interventions for this vulnerable population.

Very little research has focused specifically on the health related quality of life (HRQOL) of family caregivers providing care to individuals with MCC. However, in general, caring for patients with multiple comorbidities has been associated with increased burden and poor HRQOL for caregivers [4, 6, 7]. Among caregivers of persons with long-term neurological conditions, HRQOL is poorer when the person they are caring for has more severe symptoms, or depression, or if the amount of time providing care increases [8]. Heuvel et al. suggested that caregiver stress is increased by the severity of chronic condition [9]. Along with the specific challenges encountered in providing care for those with particular chronic conditions, caregivers of persons with MCC face corresponding complexities that they must negotiate with their care partners. These include *siloed* health care [10] as well as potential disease progression at faster rates, difficulties in diagnosing new conditions and interactions between treatments for different conditions [5].

### Caregiver demographics and health related quality of life

Many caregivers' characteristics also are associated with their HRQOL. For example women who are caregivers reported lower well-being or health status, particularly as related to mental health, [11–14] and experienced higher levels of depression than men [7, 14–18]. Male caregivers often reported higher levels of well-being, both physically [16] and mentally [16, 19] than female caregivers. Moreover, female caregivers also tend to be at a greater risk for comorbidities and chronic illnesses, regardless of the care recipient's disease [20, 21].

The age of the caregiver, may also be associated with their HRQOL. Older caregivers of persons with stroke

or dementia were found to more likely be living with chronic illnesses compared to their younger counterparts [22–26]. The physical health of older caregivers can be compromised by caregiving demands, biological vulnerabilities associated with age, and psychological factors such as feelings of loss and distress [7]. Contributors to poor HRQOL among caregivers of patients with a variety of chronic diseases also include: having a lower monthly income [4] and being a spouse of the care recipient [4, 27].

### Gender identity and caregiver health related quality of life

Studying gender roles in relation to caregiving and HRQL is important as both women and men spouses have been found to cross gender role boundaries when providing care for their partners by doing tasks originally undertaken by their spouses [28–30]. Caregiving has been viewed predominantly as a feminine role within society [28]. Because of the focus on caring as 'women's' work, a number of studies have considered how men negotiate this stereotypically female role and the 'feminine' traits associated with caregiving [28]. However, in a study of gender identity of widowed male those who scored higher on the masculine subscale of the Bem Sex Roles Inventory (BSRI) reported higher psychological well-being [29]. This suggested that masculine approaches to caregiving were associated with higher mental health HRQOL. However no reported studies have examined gender identity and its relationship to the HRQOL of caregivers of persons with MCC.

### Self-efficacy and caregiver health related quality of life

General self-efficacy is defined as confidence in the ability to deal with difficult situations [31]. Literature related to self-efficacy concerning HRQL of caregivers of patients with multiple comorbidities is lacking. However, self-efficacy has been found to be related to higher quality of life in caregivers of persons with cancer [32]. Self-efficacy is inversely associated with depression in caregivers of persons with dementia [33–38]. Although the association of self-efficacy with HRQOL has not been reported in caregivers of persons with MCC, it may be associated with their mental HRQOL.

### Caregiver burden and health related quality of life

Caregiver burden can be described as the hardships associated with caring for a person who is often suffering from a medical condition [39]. Depression among caregivers has also been closely linked with their perceived burden [6, 40–44]. Moreover caregiver burden has been found consistently to be inversely associated with caregiver quality of life [25, 45–47].

Much of the research on family caregiving has focused on caregiver burden [48, 49]. Burden, however, is not as inclusive a measure [49, 50] and may offer an overly

negative picture of caregiver experience [49, 51]. As well it does not reflect the health status of the caregivers, although burden has been found to be associated with quality of life [49, 51–54]. McConaghy and Caltabiano [55] found that predictors for psychological and physical well-being among dementia caregivers included perception of higher burden. This finding suggested a negative association between burden and HRQOL [55]. It is unknown if this relationship between burden and HRQOL changes over time. The studies of caregivers' HRQL have typically been cross-sectional and not examined factors influencing changes in HRQOL of caregivers of persons with MCC.

### Purpose

Overall the literature suggests that demographic characteristics, gender identity, general self-efficacy and burden may influence the HRQOL of caregivers of older persons with MCC. Gaining greater understanding of factors impacting HRQOL of family caregivers has been recognized as a priority for comprehensive health care for both patients who are ill and their family caregivers [3]. This study reports the results of a secondary analysis of data from a study whose primary purpose was to investigate how social location (e.g., sex, gender, age, education) of family caregivers of older adults with MCC impact caregiver burden overtime [56]. The purpose of the secondary analysis reported herein, was to examine relationships among the changes from baseline to 6 months in health related quality of life (SF12v2) of family caregivers caring for older adults with multiple chronic conditions and the following factors: a) demographic variables, b) gender identity [Bem Sex Role Inventory (BSRI)] c) changes in general self-efficacy [General Self Efficacy Scale (GSES) (baseline to 6 months) and d) changes in caregiver burden [Zarit Burden Inventory (ZBI)] baseline to 6 months. Based on the review of the literature the following were the hypotheses for the secondary analysis:

1. Demographic variables (caregiver sex, age, relationships) and caregiver gender identity scores would have a significant association with changes in caregivers' HRQOL scores from baseline to 6 months,
2. Changes in caregiver general self-efficacy scores from baseline to 6 months would have a positive significant association with participants' change in HRQOL scores from baseline to 6 months.
3. Changes in caregiver burden scores from baseline to 6 months would be significantly and negatively associated with changes in caregivers' HRQOL scores from baseline to 6 months.

### Methods

This study is a quantitative secondary analysis of data from a study of caregivers of persons with MCC in

Alberta and Ontario Canada. The original study used a mixed methods repeated - measures design. Details of this study are reported elsewhere [56]. The original study received ethical approval from the University of Alberta and McMaster University Research Ethics Review Boards.

Using convenience sampling 194 participants were recruited to the original study through a variety of means. Inclusion criteria for study participants were as follows: a) informal caregivers actively providing care to an older adult (65 or older) with MCC living in the community, b) 18 years of age or older, and c) English speaking. Informal caregivers were defined as family and or friends providing any form of assistance to an older persons (65 years of age and older) with MCC (two or more) living in the community. Exclusion criteria were as follows: a) paid caregivers, b) caregiving for a person who was residing in an institution, and c) non-English speaking.

Participants completed questionnaires between July 2013 and June 2014 at two time periods 6 months apart. A subset of 40 participants completed qualitative interviews. Following obtaining consent, demographic information was collected. Twice (6 months apart) caregivers were asked to complete the SF-12v2, the General Self Efficacy Scale, the BEM Sex Role Inventory and the Zarit Burden Inventory. A description of the measures are below:

#### 12-item short-form health survey (SF-12v2) (dependent variable)

The SF12v2 is a shortened version of the 36-item Short Form Health Survey (SF-36) and has been used previously to measure caregiver health related quality of life (HRQOL) [57]. The SF-12v2 consists of 12 questions, with two to six response level options, depending on the question [58]. Both a Physical Component Summary (PCS) and Mental Component Summary (MCS) are produced from the SF-12, with a higher score indicating better physical or mental health, and therefore an overall improved perceived HRQOL. The MCS and PCS have been shown to have high internal consistency ( $\alpha = 0.80$ ) [59]. Test-retest reliability for the PCS was ( $r = 0.78$ ) and for the MCS  $r = 0.60$  [59]. The SF-12v2 PCS and MCS convergent validity with the SF 36 was  $r = 0.95$  and  $0.96$  [60].

#### General self-efficacy scale (GSES)

The GSES is a measure of a persons' confidence in their ability to deal with novel, adverse and difficult situations [61]. The GSES is a Likert-type scale with 10 items scored using a 4-point scale (1 "not true at all" to 4 "exactly true") which are summed to produce a total score (minimum 10 and maximum 40). A higher score indicates that a participant is feeling greater self-efficacy. The GSES has been found to be a reliable and valid measure across a number of populations and countries [59]

with internal consistency ranging from  $\alpha = 0.75$ –  $0.91$ . Test-retest reliability has been found to be  $r = 0.82$  [62].

#### Zarit burden interview (ZBI)

The ZBI is a 12-item reliable ( $r = 0.92$ ) and valid measure of caregiver burden [63]. The items are scored using a 5-point Likert scale (1 “never” to 5 “nearly always”) with higher scores indicating greater burden [64].

#### Bem Sex role inventory (BSRI)

The BSRI is a commonly used measure of gender role that has internal consistency ( $\alpha = 0.80$ – $.82$ ) and high test retest reliability ( $r = 0.89$ ) and has been validated with populations from many cultures and age groups [65]. It consists of 30 personality characteristics on which respondents are asked to rate themselves on a 7-point Likert scale ranging from 1 (never or almost never true) to 7 (almost or almost always true) [66]. Ten items on the scale reflect masculine personality traits such as assertive, strong personality and dominant. For the feminine personality traits, 10 of the items reflect traits such as affectionate, sympathetic and sensitive to others. Examples of the 10 neutral items reflect conscientious, and unpredictable personality traits [66]. The scores are presented as mean and standard deviations in each category for the participants. The maximum score in each category is 70.

#### Secondary data analysis

A power analysis for the secondary data analysis was calculated post hoc, using Cohen’s [67] formula for calculating sample size. A medium effect size (0.15) and a power of 80 % for regression with six independent variables (age, sex, relationships, gender identity, general self-efficacy, and caregiver burden), the required sample size was 96. The dependent variables were participants’ mental (SF12v2MCS) and physical (SF12v2PCS) HRQOL.

All data had been entered into SPSS v22 and anonymized. Using descriptive statistics mean and standard deviation scores for the main variables were calculated. Frequency and proportions were reported for categorical variables. No issues were noted regarding multi-collinearity.

To address the three hypotheses, changes (baseline to 6 months) for continuous variables (GSES, ZBI, SF12 MCS, and PCS) were calculated. General linear modeling (GLM) was utilized to determine what factors predicted changes in HRQL (baseline and 6 months). GLM is an extension of linear regression method and can handle categorical, count and continuous data as the response variable [68]. Each independent variable (age, sex, and relationships, BSRI, and changes in GSES and ZBI) was entered separately for the univariate analysis. Those variables that were significant at the  $p \leq 0.10$  were included into the multivariate model as well as the hypothesized variables: age, sex, relationships, BSRI, and change in GSES and ZBI.

A  $p$ -value  $\leq 0.05$  was used for statistical significance, unless otherwise stated and two sided tests were used for all comparisons.

## Results

### Participants

One hundred and ninety-four participants were enrolled in the study and completed the first data collection. Nine participants (4.6 %) did not participate in the second data collection for a variety of reasons (e.g. overwhelmed with caregiving, person they were caring for was admitted to long term care or died, unable to be reached). Only those who completed baseline and 6 months data were included in this secondary analysis ( $n = 185$ ).

The majority of participants (83.2 %) were female ( $n = 154$ ) and over the age of 65 ( $n = 116$ ; 60 %). Eighty participants (43 %) were spouses and 105 (57 %) had other relationships with the care recipient (e.g. sons, daughters, and friends). Participants were caring for people who had a mean of 6.17 (SD = 2.78, range 2–14) chronic conditions. They had been caregiving on average 77.17 months (SD = 87.9, range 3–613). Participants reported a higher score in the BSRI feminine category (mean 59.93, SD = 6.64) than other BSRI categories (Table 1). Table 1 describes other demographic characteristics.

The mean, standard deviations and range of the ZBI, GSES, SF12 PCS and MCS at baseline and six months and change scores are presented in Table 2. When comparing the PCS scores at baseline and 6 months to Canadian SF36 normative values [69], both scores were below the Canadian average of 50.5 (SD = 9.0). In regards to the MCS at baseline and 6 months both scores were also below the Canadian average of 51.7 (SD = 9.1).

### Factors influencing changes in physical component score (SF12v2) baseline to Six months

Using univariate analysis none of the variables had a significant association with change in PCS, as the dependent variable. While not significant at  $p < 0.10$  in the univariate analysis, the following variables were included in the final model based on the literature: caregiver age, sex, and relationship to the care recipient and changes in the caregiver rated scores for GSES, ZBI, and BSRI. The results of the multivariate analysis (Table 3) suggested that there were no significant factors influencing changes in PCS scores (baseline to 6 months).

### Factors influencing changes mental component scores (SF12v2) baseline to Six months

In the univariate analysis, with change in MCS scores (baseline to 6 months) as the dependent variable, the following variables were statistically significant: Changes in GSES ( $p < 0.001$ ) and ZBI ( $p < 0.001$ ) scores (baseline to 6 months) and Masculine BSRI ( $p = 0.025$ ). No other

**Table 1** Caregiver Demographic Characteristics and BSRI Scores *n* = 185

Variables	Categories	Frequency	Percentage
Age (years)	65+	127	68.6
	>65	58	31.4
Sex	Female	154	83.2
	Male	31	16.8
Ethnicity/Race	Caucasian	167	90.3
	Chinese	6	3.2
	Black	2	1.1
	Filipino	2	1.1
	Arab	1	0.5
	South East Asia	1	0.5
	Other	6	3.2
Marital Status	Single	28	15.1
	Married	127	68.6
	Widowed	4	2.2
	Divorced/separated	18	9.7
	Other	8	4.3
Employed	Yes	66	35.7
	No	117	63.2
Annual Income (\$)	>10,000	2	1.1
	10,000–19,999	9	4.9
	20,000–29,999	16	8.6
	30,000–39,999	21	11.4
	40,000–49,999	25	13.5
	50,000–59,999	13	7.0
	60,000–69,999	10	5.4
	70,000 or more	58	31.4
Finances meet needs	Yes	119	63.2
	No	66	35.7
Education	Post-secondary education	133	71.8
	Apprenticeships	4	2.0
	No secondary education	48	25.9
Residence	Urban	174	94.1
	Rural	11	5.9
Relation to recipient	Husband/wife/partner	80	43.1
	Parent	7	3.3
	Son/daughter	83	44.9
	Sister/brother	2	1.1
	Other	13	7.0
Variable		X (SD)	Range
BSRI (Time 1)	Masculine	49.05 (9.07)	27–67
	Feminine	59.93 (6.64)	41–70
	Neutral	45.57 (4.30)	32–57

variables were significant. The variables significant at the univariate analysis stage, as well as the hypothesized variables of age, sex, relationship and masculine, feminine and neutral BSRI, were entered into the multivariate model (presented in Table 4). Participants who had significantly positive increases in their MCS reported lower burden (ZBI,  $p < 0.001$ ), and higher general self-efficacy (GSES,  $p < 0.001$ ) and Masculine BSRI ( $p = 0.025$ ) changes in scores.

## Discussion

The purpose of this study was to identify factors that significantly influenced the changes in health related quality of life of caregivers caring for older persons with MCC. Changes from baseline to 6 months in mental health were significantly associated with burden, general self-efficacy and masculine gender identity. None of the variables were significantly associated with changes in physical health.

Increases in mental health were associated with decreases in burden. This is similar to the results from other studies as caregiver burden has been consistently found to be inversely associated with caregiver mental health [6, 40–44]. However, changes in burden scores were not a significant predictor of changes in physical health as we had hypothesized, suggesting its influence may be limited to the mental health of caregivers of persons with MCC. Another possible explanation is that the majority of our participants (56.7 %) were not spouses. In a meta-analysis study of factors influencing the physical health of caregivers, Pinquart and Sorensen [70] suggested that burden was more strongly associated with spousal caregivers' physical health than in non-spousal caregivers. As well our time frame of 6 months might be too short to identify significant changes and additional patient factors such as functional status were not controlled. This is the first study that we know of to look at factors that influence changes in health related quality of life in caregivers of older persons with MCC living in the community. More research is needed to examine why changes in burden scores baseline to 6 months were not significantly associated with physical health.

Masculine gender identity had a significant influence on improvements in mental health, which is similar to the findings of a study of family caregivers that found masculine gender identity was significantly associated with psychological well-being [29]. Our findings suggested that a masculine gender identity, which includes personality traits of assertiveness, independence, and self-sufficiency, was positively associated with improvements in participants' mental health. However, the literature suggests that when undertaking the role of caregiver, men renegotiate their conceptions of masculinity tempering the more dominant masculine personality trait with feminine traits of

**Table 2** Means, Standard Deviations at Baseline and 6 months and Changes (Baseline to Six Months)

Measure	N	Baseline Mean (SD) (Range)	6 months Mean (SD) (Range)	Change Mean (SD) (Range)
Zarit Burden Inventory-Total Score	185	21.27 (9.14) (1.00–47.00)	19.63 (9.16) (0.00–43.00)	1.60 (6.24) (–21.00–17.00)
General Self-Efficacy Scale (GSES) - Total Score	185	32.31 (4.33) (18.00–40.00)	32.33 (4.54) (16.00–40.00)	–0.15 (4.06) (–10.00–12.00)
SF12 Physical Component (PCS)	185	48.83 (9.49) (23.57–66.02)	48.68 (9.78) (21.03–66.46)	–0.02 (7.44) (–26.44–20.64)
SF12 Mental Component (MCS)	185	44.12 (10.42) (21.55–70.21)	43.33 (11.52) (11.21–66.75)	0.63 (9.89) (–28.99–28.59)

empathy and compassion [66]. It is unclear from the literature, however, when this renegotiation may occur and our findings suggest that assuming the personality traits associated with a feminine role identity may have unintended consequences of decreasing caregivers' mental health. Our participants reported more feminine traits than masculine, which maybe one explanation for their physical and mental health being below the average Canadian. None of the categories of gender role identify were found to be significantly associated with changes (declines or improvements) in physical health. More research is needed to determine the association of gender identity and physical health and why masculine gender identity is significantly associated with improvements in caregivers' mental health. There is at this time a paucity of research with respect to gender identity and caregivers' of persons with MCC health related quality of life. Future research should consider further exploration into this area.

Increases (baseline to 6 months) in general self-efficacy were a significant predictor for improvements in mental health. The finding of the significant positive relationship of general self-efficacy (the confidence in their ability to deal with difficult situations) with mental health is similar to the findings from other studies. In particular caregivers of persons with dementia have reported a significant negative

relationship between general self-efficacy and depression [33–38]. Self-efficacy has been found to help control upsetting thoughts experienced by burdened and distressed caregivers [71, 72]. We had also hypothesized positive changes in general self-efficacy scores would predict improvements in physical health. In contrast, in a review of cognitive behavioral interventions, Graves found that interventions, focusing on a component of Social Cognitive Theory (increasing self-efficacy) had an influence on a person's psychological and physiological functioning (health status) [73]. It is unclear why positive changes in general self-efficacy scores did not also increase physical health. Further research is needed to determine the mechanisms through which positive changes in self-efficacy influences improvements in mental health and not in physical health.

When compared to Canadian normative health related quality of life [69], the participants' physical and mental health at baseline and 6 months were lower than the norms. These findings underscore the concerns regarding caregivers' physical and mental health as their poor HRQOL was evident at baseline and 6 months later. More research is needed to examine trends over time in the HRQOL of caregivers of persons with MCC as most of the research conducted with caregivers has been cross-sectional.

**Table 3** Multivariate Analysis Change in SF12V2 PCS from Baseline to Six Months

Parameter	B	Std. Error	95 % Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	–5.004	7.046	–18.814	8.806	0.504	1	0.478
Caregiver_ Sex Male	–0.023	1.543	–3.047	3.002	0.000	1	0.988
Caregiver Sex = Female	0 <sup>a</sup>						
Caregiver age <65	0.891	1.617	–2.278	4.059	0.303	1	0.582
Caregiver age ≥65	0 <sup>a</sup>						
Relationship spouse/partner	–0.187	1.565	–3.253	2.879	0.014	1	0.905
Relationship [other]	0 <sup>a</sup>						
Change General Self Efficacy Scale (baseline – six months)	0.117	0.139	–0.156	0.390	0.710	1	0.399
Change Zarit Burden Inventory (baseline-six months)	0.105	0.087	–0.067	0.276	1.426	1	0.232
Masculine Bem Sex Role Inventory	–0.027	0.063	–0.150	0.097	0.177	1	0.674
Feminine Bem Sex Role Inventory	–0.003	0.087	–0.174	0.169	0.001	1	0.974
Neutral BSRI (Scale)	0.127	0.135	–0.137	0.392	0.893	1	0.345
(Scale)	54.078	5.653	44.059	66.375			

<sup>a</sup>reference category

**Table 4** Multivariate Analysis with Change in SF12v2 MCS (Baseline to Six Months) as the Dependent Variable

Parameter	B	Std. Error	95 % Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	-11.722	8.034	-27.468	4.025	2.129	1	0.145
Caregiver Sex = male	-2.413	1.759	-5.861	1.036	1.880	1	0.170
Caregiver Sex = female	0 <sup>a</sup>						
Caregiver age < 65	-2.317	1.843	-5.930	1.296	1.580	1	0.209
Caregiver age ≥ 65	0 <sup>a</sup>						
Relationship spouse/partner	-0.208	1.7839	-3.704	3.288	0.014	1	0.907
Relationship [other]	0 <sup>a</sup>						
Change General Self-efficacy (baseline to six months)	0.728	0.159	0.417	1.040	21.019	1	0.001*
Change Zarit Burden Inventory (baseline to six months)	-0.570	0.099	-0.765	-0.374	32.556	1	0.001*
Masculine Bem Sex Role Inventory	0.162	0.072	0.020	0.303	5.027	1	0.025*
Feminine Bem Sex Role Inventory	0.079	0.099	-0.117	0.274	0.621	1	0.431
Neutral Bem Sex role Inventory	0.058	0.154	-0.243	0.359	0.142	1	0.706
(Scale)	70.309	7.3502	57.283	86.297			

<sup>a</sup>reference

\*Significant ≤0.05

### Limitations

There are several limitations associated with this study in regards to sample and methodology. The majority of the sample was Caucasian although some participants represented different ethnicities. There are limitations for the generalizability of the findings. For example as multiple methods of recruitment were used the response rate could not be calculated and a convenience sampling approach was used. Another limitation was data were only collected at two points in time. There may be more fluctuation in the scores that would be captured if data were collected more frequently. Moreover, very little information was collected about the care recipient which may also have a significant impact on caregiver quality of life.

Another limitation of the study that may have influenced the findings was the use of a health related quality of life tool (SF12v2). Although the SF12v2 is a well-established measure it has been criticized for not measuring important aspects of quality of life for caregivers such as relationships and existential quality of life [74]. Thus the use of another HRQOL measure may have resulted in different findings. In review of the literature of instruments used to measure caregivers' HRQOL the authors concluded that diverse instruments have been used with diverse outcomes [75].

### Conclusions

The study findings suggest that caregivers of older persons with multiple chronic conditions who have positive changes in their general self-efficacy, decreases in their perception of burden and identify with a masculine gender identity role, have positive changes in their mental health. This suggests that health care providers should

consider ways to support caregivers increase their confidence in their ability to deal with difficult situations and decrease perceptions of caregiver burden.

Future research should examine ways to decrease perceptions of burden and increase caregiver's confidence in their ability to problem solve difficult situations. Understanding the best strategies to accomplish this would be important information needed to support caregivers of older persons with MCC. More research is also needed to examine what influences changes in health related quality of life over time. By looking at the changes, researchers and health care professionals can understand the best way to bring about improvements over time in physical and mental health for this vulnerable group of caregivers. As such the findings of this study are a foundation for future research.

### Acknowledgements

We would like to acknowledge and thank our study participants and the many research assistants who worked on this project. This work is part of a program of research (Aging, Community and Health Research Unit) (Ploeg/Markle-Reid CoPIs) supported by the Canadian Institutes of Health Research Signature Initiative in Community-Based Primary Healthcare (<http://www.cihr-irsc.gc.ca/e/43626.html>) (Funding Reference Number: TTF 128261).

### Authors' contributions

WDD was responsible for the development, design, coordination of data collection in Alberta, interpretation of data and drafting of the manuscript. AW was responsible for the development, design and overview of the study data collection in Ontario. SG was responsible for the statistical analysis. HM collected data in Alberta and completed the literature review for this manuscript. JP and MMM were the Co-PIs who received funding to support this research study and contributed to the design and revision of the manuscript. SP contributed to the revisions of the manuscript. All authors read and approved the final manuscript.

### Competing interests

The authors declare that they have no competing interests.

**Author details**

<sup>1</sup>Faculty of Nursing, University of Alberta, 3rd Level ECHA, 11405 - 87th Ave, Edmonton, AB T6G 1C9, Canada. <sup>2</sup>School of Geography and Earth Sciences, McMaster University, 1280 Main Street West, Hamilton, ON L8S 4K1, Canada. <sup>3</sup>Alberta Health Services-Cancer Care, University of Alberta, Edmonton, AB, Canada. <sup>4</sup>Faculty of Nursing, University of Alberta, 3rd Level ECHA, 11405 - 87th Ave, Edmonton, AB T6G 1C9, Canada. <sup>5</sup>School of Nursing, McMaster University, Room H5C3N25C, 1280 Main Street West, Hamilton, ON L8S 4K1, Canada. <sup>6</sup>School of Nursing, McMaster University, 1280 Main Street West, Hamilton, ON L8S 4K1, Canada. <sup>7</sup>College of Nursing, University of Saskatchewan, E-Wing, 4340, 104 Clinic Place, Saskatoon, SK S7N 2Z4, Canada.

Received: 21 August 2015 Accepted: 20 May 2016

Published online: 27 May 2016

**References**

- Sinha M. Portrait of caregivers. Social and Aboriginal Statistics Division. Ottawa: Statistics Canada; 2012. p. 1–21.
- Canadian Institutes of Health Information Seniors and the Health Care System: What is the impact of multiple chronic conditions. CIHI 2011. [https://www.secure.cihi.ca/free\\_publications/air-chronic\\_disease](https://www.secure.cihi.ca/free_publications/air-chronic_disease). Accessed 24 May 2016.
- Schulz R, Beach S. Caregiving as a risk factor for mortality: the Caregiver Health Effects Study. *JAMA*. 1999;282(23):2215–9.
- Yang X, Hao Y, George SM, Wang L. Factors associated with health-related quality of life among Chinese caregivers of the older adults living in the community: a cross-sectional study. *Health Qual Life Outcomes*. 2012;10(1):143.
- Norris SL, High K, Gill TM, Hennessy S, Kutner JS, Reuben DB, Unützer J, Landefeld CS. Health care for older Americans with multiple chronic conditions: a research agenda. *J Am Geriatr Soc*. 2008;56:149–59.
- Saunders MM. Factors associated with caregiver burden in heart failure family caregivers. *Western J Nurs Res*. 2008;30(8):943–59.
- Schulz R, Martire LM. Family caregiving of persons with dementia: prevalence, health effects and support strategies. *Am J Geriatr Psychiatry*. 2004;12(3):240–9.
- Peters M, Jenkinson C, Doll H, Playford ED, Fitzpatrick R. Carer quality of life and experiences of health services: a cross-sectional survey across three neurological conditions. *Health Qual Life Outcomes*. 2013;11(103):1–8.
- van den Heuvel ET, de Witte LP, Schure LM, Sanderman R, Meyboom-de JB. Risk factors for burn-out in caregivers of stroke patients and possibilities for intervention. *Clin Rehabil*. 2001;15:669–77.
- Parekh AK, Goodman RA, Gordon C, Koh HK. Managing multiple chronic conditions: a strategic framework for improving health outcomes and quality of life. *Public Health Rep*. 2011;126(4):460–71.
- Arnsberger P, Lynch U, Li F. The effects of caregiving on women's self-assessed health status: an international comparison. *Health Care Women Int*. 2012;33(10):878–95.
- Akosile CO, Okoye EC, Nwankwo MJ, Akosile CO, Mbada CE. Quality of life and its correlates in caregivers of stroke survivors from a Nigerian population. *Qual Life Res*. 2011;20(9):1379–84.
- Larson J, Franzén-Dahlin Å, Billing E, von Arbin M, Murray V, Wredling R. The impact of gender regarding psychological well-being and general life situation among spouses of stroke patients during the first year after the patients' stroke event: A longitudinal study. *Int J Nurs Stud*. 2008;45(2):257–65.
- Pinquart M, Sörensen S. Gender differences in caregiver stressors, social resources, and health: An updated meta-analysis. *J Gerontol B Psychol Sci Soc Sci*. 2006;61(1):33–45.
- Ashley NR, Kleinpeter CH. Gender differences in coping strategies of spousal dementia caregivers. *J Hum Behav Soc Environ*. 2002;6(2):29–46.
- Gibbons C, Creese J, Tran M, Brazil K, Chambers L, Weaver B, Bédard M. The psychological and health consequences of caring for a spouse with dementia: A critical comparison of husbands and wives. *J Women Aging*. 2014;26(1):3–21.
- Kao HF, McHugh ML. The role of caregiver gender and caregiver burden in nursing home placements for elderly Taiwanese survivors of stroke. *Res Nurs Health*. 2004;27(2):121–34.
- Kim H, Chang M, Rose K, Kim S. Predictors of caregiver burden in caregivers of individuals with dementia. *J Adv Nurs*. 2012;68(4):846–55.
- Tommis Y, Seddon D, Woods B, Robinson CA, Reeves C, Russell IT. Rural-urban differences in the effects on mental well-being of caring for people with stroke or dementia. *Aging Ment Health*. 2007;11(6):743–50.
- Neri AL, Yassuda MS, Fortes-Burgos ACG, Mantovani EP, Arbex FS, de Souza Torres SV, Perracini MR, Guariento ME. Relationships between gender, age, family conditions, physical and mental health, and social isolation of elderly caregivers. *Int Psychogeriatr*. 2012;24(3):472–83.
- Wang XR, Robinson KM, Carter-Harris L. Prevalence of chronic illnesses and characteristics of chronically ill informal caregivers of persons with dementia. *Age Aging*. 2014;43(1):137–41.
- Lim YM, Son GR, Song JA, Beattie E. Factors affecting burden of family caregivers of community-dwelling ambulatory elders with dementia in Korea. *Arch Psychiatr Nurs*. 2008;22(4):226–34.
- Carter JH, Lyons KS, Stewart BJ, Archbold PG, Scobee R. Does age make a difference in caregiver strain? Comparison of young versus older caregivers in early-stage Parkinson's disease. *Mov Disord*. 2010;25(6):724–30.
- Harwood D, Barker W, Ownby RL, Bravo M, Aguero H, Duara R. Predictors of positive and negative appraisal among Cuban American caregivers of Alzheimer's disease patients. *Int J Geriatr Psychiatry*. 2000;487(July 1998):481–7.
- McCullagh E, Bridgstocke G, Donaldson N, Kalra L. Determinants of caregiving burden and quality of life in caregivers of stroke patients. *Stroke*. 2005;36:2181–6.
- Rinaldi P, Spazzafumo L, Mastriforti R, Mattioli P, Marvadi M, Polidori M, Cherubini A, Abate G, Bartorelli L, Bonaiuto S, et al. Predictors of high level of burden and distress in caregivers of demented patients: Results of an Italian multicenter study. *Int J Geriatr Psychiatry*. 2005;20(2):168–74.
- Chung MH, Hsu N, Wang YC, Lai KL, Kao S. Exploration into the variance in self-reported health-related quality of life between the chronically-ill elderly and their family caregivers. *J Nurs Res*. 2007;15(3):175–82.
- Calasanti T, Bowen ME. Spousal caregiving and crossing gender boundaries: Maintaining gendered identities. *J Aging Stud*. 2006;20:253–63.
- Bowers SP. Gender role identity and the caregiving experience of widowed men. *Sex Roles*. 1999;41(9/10):645–55.
- Davidson K, Arber S, Ginn J. Gendered meanings of care work within late life marital relationships. *Can J Aging*. 2000;19(4):536–53.
- Au A, Lau KM, Sit E, Cheung G, Lai MK, Wong SKA, Fok D. The role of self-efficacy in the Alzheimer's family caregiver stress process: A partial mediator between physical health and depressive symptoms. *Clin Gerontol*. 2010;33(4):298–315.
- Duggleby WD, Doell H, Cooper D, Thomas R, Ghosh S. The quality of life of male spouses of women with breast cancer: Hope, self-efficacy, and perceptions of guilt. *Cancer Nurs*. 2013;37(1):E28–35.
- Márquez-González M, Losada A, López J, Peñacoba C. Reliability and validity of the Spanish version of the Revised Scale for Caregiving Self-Efficacy. *Clin Gerontol*. 2009;32(4):347–57.
- Fortinsky R, Kercher K, Burant C. Measurement and correlates of family caregiver self-efficacy for managing dementia. *Aging Ment Health*. 2002;6(2):153–60.
- Gallagher D, Ni Mhaolain A, Crosby L, Ryan D, Lacey L, Coen RF, Walsh C, Coakley D, Walsh JB, Cunningham C, et al. Self-efficacy for managing dementia may protect against burden and depression in Alzheimer's caregivers. *Aging Ment Health*. 2011;15(6):663–70.
- Gilliam CM, Steffen AM. The relationship between caregiving self-efficacy and depressive symptoms in dementia family caregivers. *Aging Ment Health*. 2006;10(2):79–86.
- Rabinowitz YG, Saenz EC, Thompson LW, Gallagher-Thompson D. Understanding caregiver health behaviors: depressive symptoms mediate caregiver self-efficacy and health behavior patterns. *Am J Alzheimers Dis Other Demen*. 2011;26(4):310–6.
- Lopez J, Romero-Moreno R, Marquez-González M, Losada A. Spirituality and self-efficacy in dementia family caregiving: trust in God and in yourself. *Int Psychogeriatr*. 2012;24(12):1943–52.
- Garlo K, O'Leary JR, Ness PHV, Fried TR. Burden in caregivers of older adults with advanced illness. *J Am Geriatr Soc*. 2010;58:2315–22.
- Moretti R, Torre P, Antonello RM, Cazzato G, Bava A. Depression and Alzheimer's disease: Symptom or comorbidity? *Am J Alzheimers Dis Other Demen*. 2002;17(6):338–44.
- Van Puymbroeck M, Hinojosa MS, Rittman MR. Influence of sense of coherence on caregiver burden and depressive symptoms at 12 months poststroke. *Top Stroke Rehabil*. 2008;15(3):272–82.
- Parrish M, Adams S. Caregiver comorbidity and the ability to manage stress. *J Gerontol Soc Work*. 2004;42(1):41–57.



43. Mausbach BT, Roepke SK, Chattillion EA, Harmell AL, Moore R, Romero-Moreno R, Bowie CR, Grant I. Multiple mediators of the relations between caregiving stress and depressive symptoms. *Aging Ment Health*. 2012;16(1):27–38.
44. Schreiner AS, Morimoto T, Arai Y, Zarit S. Assessing family caregiver's mental health using a statistically derived cut-off score for the Zarit Burden Interview. *Aging Ment Health*. 2006;10(2):107–11.
45. Morimoto T, Schreiner AS, Asano H. Caregiver burden and health-related quality of life among Japanese stroke caregivers. *Age Aging*. 2003;32:218–23.
46. Riedijk SR, De Vugt ME, Duivenvoorden HJ, Niermeijer MF, Van Swieten JC, Verhey FRJ, Tibben A. Caregiver burden, health-related quality of life and coping in dementia caregivers: A comparison of Frontotemporal dementia and Alzheimer's disease. *Dement Geriatr Cogn Disord*. 2006;22:405–12.
47. Hughes SL, Giobbie-Hurder A, Weaver FM, Kubal JD, Henderson W. Relationship between caregiver burden and health-related quality of life. *Gerontologist*. 1999;39(5):534–45.
48. Rees J, O'Boyle C, MacDonagh R. Quality of life: Impact of chronic illness on the partner. *J Royal Soc Med*. 2001;94:563–6.
49. McPherson CJ, Wilson KG, Chyurlia L, Leclerc C. The caregiving relationship and quality of life among partners of stroke survivors: A cross-sectional study. *Health Qual Life Outcomes*. 2011;9(29):1–10.
50. Canam C, Acorn S. Quality of life for family caregivers of people with chronic health problems. *Rehabil Nurs*. 1999;24(5):192–6.
51. Vickrey BG, Hays RD, Maines ML, Vassar SD, Fitten J, Strickland T. Development and preliminary evaluation of a quality of life measure targeted at dementia caregivers. *Health Qual Life Outcomes*. 2009;7(56):1–12.
52. Duggleby WD, Swindle J, Peacock S, Ghosh S. A mixed methods study of hope, transitions, and quality of life in family caregivers of persons with Alzheimer's disease. *BMC Geriatr*. 2011;11(88):1471–2318.
53. Roach AR, Averill AJ, Segerstrom SC, Kasarskis EJ. The dynamics of quality of life in ALS patients and caregivers. *Ann Behav Med*. 2009;37(2):197–206.
54. Woo J, Lo R, Cheng JOY, Wong F, Mak B. Quality of end-of-life care for non-cancer patients in a non-acute hospital. *J Clin Nurs*. 2011;20(13–14):1834–41.
55. McConaghy R, Calabiano ML. Caring for a person with dementia: Exploring relationships between perceived burden, depression, coping and well-being. *Nurs Health Sci*. 2005;7:81–91.
56. Ghosh S, Yong W, Williams A, Duggleby WD, Ploeg J, Markle-Reid M, Peacock S. The association between caregiver burden and age, gender, residence, education and social intrusion in caregivers of older adults with multiple chronic conditions. *Can J Aging* submitted March. 2016;11.
57. Vilagut G, Forero CG, Pinto-Meza A, Haro JM, de Graf R, Bruffaerts R, Kovess V, de Girolamo G, Matschinger H, Ferrer M, et al. The mental component of the short-form 12 health survey (SF-12) as a measure of depressive disorders in the general population: Results with three alternative scoring methods. *Value Health*. 2013;16(4):564–73.
58. Scuffman PA, Synnott R, Turkstra E, Hegney D. Present and past carers' health: Some considerations. *Int J Nurs Pract*. 2010;16(6):609–15.
59. Cheak-Zamora N, Wyrwich K, McBride T. Reliability and Validity of the SF12v2 in the medical expenditure panel survey. *Qual Life Res*. 2009;18(6):727–35.
60. Ware J, Kosiniski M, Keller S. SF-12. How to score the SF-12 Physical and mental health summary scale. 3rd ed. Lincoln RI: Quality Metric Incorporated; 1998.
61. Luszczaynska A, Gutierrez-Dona B, Schwarzer R. Generalized self-efficacy in various domains of human functioning: evidence from five countries. *Int J Psychol*. 2005;40(2):80–9.
62. Leganger A, Kraft P, Roysamb E. Perceived self-efficacy in health behaviour research: conceptualisation, measurement and correlates. *Psychol Health*. 2000;15(1):51–69.
63. Hébert R, Bravo G, Préville M. Reliability, validity, and reference values of the Zarit Burden Interview for assessing informal caregivers of community-dwelling older persons with dementia. *Can J Aging*. 2000;19:494–507.
64. Bédard M, Molloy DW, Squire L, Dubois S, Lever JA, O'Donnell M. The Zarit Burden Interview: A new short version and screening version. *Gerontologist*. 2001;41(5):652–7.
65. Vafaei A, Alvarado B, Tomás C, Muro C, Martinez B, Zunzunegui MV. The validity of the 12-item Bem Sex Role Inventory in older Spanish population: An examination of the androgyny model. *Arch Gerontol Geriatr*. 2014;59(2):257–63. doi:10.1016/j.archger.2014.05.012.
66. Ohm SC, Auster C. J. Masculinity and femininity in contemporary American society: A re-evaluation using the Bem sex-role inventory. *Sex Roles*. 2000;43(7/8):499–28.
67. Cohen J. *Statistical power analysis for the behavioral sciences*. New York: Academic; 1977.
68. Nelder JA, Wedderburn R. Generalized linear models. *J Res Stat Soc Ser A (General)*. 1972;135(3):370–84.
69. Hopman WM, Towheed T, Anastassiades T, Tenenhouse A, Poliquin S, Berger C, Joseph L, Brown JP, Murray TM, Adachi JD, et al. Canadian normative data for the SF-36 health survey. *CMAJ*. 2000;8(163):265–71.
70. Pinquart M, Sorensen S. Correlates of physical health of informal caregivers: a meta-analysis. *J Gerontol*. 2007;62B(2):126–P137.
71. Romero-Moreno R, Losada A, Mausbach BT, Márquez-González M, Patterson TL, López J. Analysis of the moderating effect of self-efficacy domains in different points of the dementia caregiving process. *Aging Ment Health*. 2011;15(2):221–31.
72. Romero-Moreno R, Márquez-González M, Mausbach BT, Losada A. Variables modulating depression in dementia caregivers: a longitudinal study. *Int Psychogeriatr*. 2012;24(8):1316–24.
73. Graves K. Social cognitive theory and cancer patients' quality of life: A meta-analysis of psychosocial intervention components. *Health Psych*. 2003;22(2):210–9.
74. Duggleby WD, Williams A, Cooper D, Holtslander L, Ghosh S, Hallstrom L, Thomas R. Evaluation of the Living with Hope Program for rural women caregivers of persons with advanced cancer. *BMC Palliat Care*. 2013;12(1):36.
75. Lim J-W, Zebrack B. Caring for family members with chronic physical illness: A critical review of caregiver literature. *Health Qual Life Outcomes*. 2004;2(50):1–9.

Submit your next manuscript to BioMed Central and we will help you at every step:

- We accept pre-submission inquiries
- Our selector tool helps you to find the most relevant journal
- We provide round the clock customer support
- Convenient online submission
- Thorough peer review
- Inclusion in PubMed and all major indexing services
- Maximum visibility for your research

Submit your manuscript at  
[www.biomedcentral.com/submit](http://www.biomedcentral.com/submit)

