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Research Article

Stressors and Resources Related to Medication Management: Associations With Spousal Caregivers' Role Overload

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Abstract

Background and Objectives: Managing medications can be stressful for spousal caregivers, but little is known about particular aspects of medication management that are most consequential for caregiving outcomes. We examined care stressors and resources related to medication management, their associations with role overload among spousal caregivers, and whether these links vary by care recipients' number of chronic health conditions and dementia status.
Research Design and Methods: This cross-sectional study included 377 spousal caregivers of adults aged 65 and older from the 2011 National Health and Aging Trends Study and National Study of Caregiving. Linear regressions were estimated to evaluate how medication-related stressors (ordering medication, keeping track of medications, giving injections) and resources (medication reminder systems, shared medication management within the spousal dyad) are associated with caregivers' role overload. Care recipients' number of chronic health conditions and dementia status were considered as moderators. Models controlled for caregivers' sociodemographic characteristics, chronic health conditions, and other care tasks.
Results: Caregivers who administered injections reported more role overload, whereas those who worked with care recipients to jointly manage medications reported less role overload. Keeping track of medications was linked to caregivers' greater role overload when care recipients had 5 or more chronic health conditions. Finally, care recipients' use of medication reminder systems was linked to less role overload for caregivers of a partner with dementia.
Discussion and Implications: Devising strategies to assist spousal caregivers in the more onerous components of medication management and promote resources that mitigate medication-related stress may improve caregiver well-being.

Keywords: Caregiving—informal, Caregiver stress, Family issues, Marriage and divorce

Approximately 90% of U.S. adults aged 65 and older take prescription medication, with over one-third (39%) reporting the use of five or more drugs (Kantor, Rehm, Haas, Chan, & Giovannucci, 2015). Medication management covers a variety of tasks, such as ordering medications, keeping track of medications (i.e., making sure medications are taken at the correct dose and time), and administering injections (Look & Stone, 2017). Spouses are a primary source of medication-related assistance in later life and commonly perceive managing their partner's medications as stressful (Reinhard, Levine, & Samis, 2014); however little is known about the aspects and conditions of medication management that are most consequential for spousal caregiving outcomes. In this study, we considered how care stressors and resources related to medication management are associated with role overload (i.e., feeling that there is insufficient time to carry out everyday activities) among spouses caring for an older adult with functional disability. We also determined whether these associations vary by two known indicators of care complexity: the care recipient's number of chronic health conditions and dementia status.

According to stress process models of caregiving, objective care stressors (e.g., care tasks) can heighten subjective care-related stress that negatively impacts caregivers' well-being (Lawton, Moss, Kleban, Glickman, & Rovine, 1991; Pearlin, Mullan, Semple, & Skaff, 1990). Role overload is a critical indicator of subjective caregiving stress because it is linked to detrimental outcomes, including higher depression, lower personal mastery and self-efficacy, and increased avoidance coping (Mausbach et al., 2012; Pearlin et al., 1990). The related construct of caregiver burden encompasses broad subjective caregiving stress in numerous life domains (e.g., health, social relationships, work, finances) which traditionally incorporate items that are similar to those used to measure role overload (i.e., a sense of not having enough time for self-care and other daily responsibilities). Yet, role overload is distinct from burden in that it specifically pertains to caregivers' feelings of exhaustion, having more to do than they can handle, and lacking adequate time for themselves. As such, role overload captures perceived time and energy costs from caregiving that interfere with everyday activities.

Most research has examined the total number of activities of daily living (ADLs; e.g., bathing, dressing) and instrumental activities of daily living (IADLs; e.g., shopping, preparing meals) during which caregivers provide assistance and associated subjective caregiving stress. Prior work reveals that medical care tasks are linked to spouses' greater perceptions of emotional and physical caregiving difficulties even after accounting for help with ADLs and IADLs (Polenick, Leggett, & Kales, 2017). Hence, it is plausible that specific medication management activities have unique implications for role overload among spousal caregivers, beyond their provision of other care tasks.

We propose that ordering medications, keeping track of medications, and giving injections are stressors uniquely associated with spousal caregivers' role overload. We focus on spousal caregivers for three main reasons. First, compared with nonspouse caregivers (e.g., adult children), caregiving spouses tend to have less education and lower incomes (Pinquart & Sörensen, 2011; Reinhard et al., 2014). As a result, spousal caregivers may be less equipped with the skills, knowledge, and access to quality care that aids them in effectively managing medication-related care tasks. Second, spousal caregivers generally live with the care recipient, and so they are chronically exposed to stressors linked to medication management. Third, caregiving spouses frequently report having their own chronic health problems, which could compete with limited resources to manage their partner's medication (Oldenkamp et al., 2016; Piette, Rosland, Silveira, Kabeto, & Langa, 2010; Polenick, Leggett, Webster, et al., 2017). As a whole, these vulnerabilities suggest that medication-related care stressors may be especially challenging for caregiving spouses in ways that intensify their feelings of role overload.

Stress process models hold that resources within care dyads may attenuate subjective caregiving stress (Lawton et al., 1991; Pearlin et al., 1990). We consider two types of resources pertaining to medication-related caregiving: the care recipient's use of medication reminder systems and his or her reports of shared medication management (i.e., working with the spousal caregiver to manage medications). Medication reminder systems span from pill organizers to devices with one or more signals (e.g., beeps, flashing lights) that alert users when to take drugs that are automatically dispensed at the proper dose. Medication reminder system use has been associated with more compliance with drug regimens and lower caregiver burden, indicating that these tools can be a valuable resource for both care dyad members (Kamimura, 2017; Kamimura & Ito, 2014; Kamimura, Ishiwata, & Inoue, 2012; Tao, Xie, Wang, & Wang, 2015). Previous work suggests that caregivers and care recipients often share day-to-day responsibilities linked to medication management (Francis, Smith, Gray, & Denham, 2006). Couples who cope with illness-related stressors using joint strategies (e.g., managing illness together as a team) report greater psychological well-being (Berg et al., 2008; Zajdel, Helgeson, Seltman, Korytkowski, & Hausmann, 2018) and better medication adherence (Zajdel et al., 2018) on a daily basis relative to those who do not use these approaches. Spousal caregivers who work with their partner to manage his or her medications may therefore encounter lower levels of role overload.

Medication management is likely to pose particular challenges when spouses are faced with complex care situations such as those involving the care recipient's higher number of chronic health conditions and the presence of a dementia diagnosis. Managing medications for someone with high medical morbidity typically involves a larger quantity of prescription drugs taken at different doses and times (Buttorff, Ruder, & Bauman, 2017; Lehnert et al., 2011). Caregivers also must watch for a multitude of side effects and drug–drug interactions that are potentially harmful or fatal (Magro, Moretti, & Leone, 2012; Sutherland et al., 2015), further adding to caregiving stress. Persons living with dementia (PLWDs) experience progressive cognitive declines (e.g., losses in memory and executive function) that hinder their capacity to manage medications and increase caregiving demands (Hudani & Rojas-Fernandez, 2016; Look & Stone, 2017; Smith, Grijseels, Ryan, & Tobiansky, 2015). PLWDs' difficulty with adhering to medication is a source of worry and burden for both members of the care dyad (Kamimura & Ito, 2014). Additionally, PLWDs may resist taking medications because they forget or are unable to comprehend their purpose (Smith et al., 2015). Taken together, this literature raises the question of whether medication-related care stressors and resources are more strongly linked to spousal caregivers' role overload when their partner has a higher number of chronic health conditions or a dementia diagnosis.

Drawing from a nationally representative U.S. sample, we evaluated how stressors and resources specific to medication management are associated with role overload among spousal caregivers, over and above their background characteristics and additional caregiving stressors. We hypothesized that medication-related care stressors (ordering medications, keeping track of medications, and giving injections) would be associated with higher role overload, whereas medication-related care resources (the care recipient's medication reminder system use and shared medication management) would be linked to lower role overload. We further predicted that medication-related stressors and resources would be more strongly associated with caregiver role overload when care recipients had a higher number of chronic health conditions or a diagnosis of dementia.

Method

The sample included 377 community-dwelling adults aged 65 and older with functional disability and their caregiving spouses drawn from the 2011 National Health and Aging Trends Study (NHATS) and National Study of Caregiving (NSOC). In line with the University of Michigan's policies, ethical approval for this study was not required because we used publicly available secondary data with no individual identifiers.

Participants were eligible for NHATS if they were Medicare enrollees aged 65 and older, resided in the contiguous United States, and received health-related assistance in the last month with mobility, personal care, and/or household chores. Participants were recruited from a Medicare enrollment database with a stratified three-stage sampling design. In total, 14,643 enrollees were sampled. Of 12,411 contacted enrollees, 8,245 (71%) were interviewed (Montaquila, Freedman, Edwards, & Kasper, 2012).

NHATS participants were eligible for NSOC if they reported having at least one family or unpaid nonfamily caregiver who provided health-related assistance with mobility, self-care, household chores, and/or medical care activities. The 2,423 NHATS participants who were eligible for NSOC had 4,935 eligible caregivers and provided contact information for 3,362 (68.1%). Of these caregivers, 2,007 (59.7%) completed a 30-min telephone interview.

In total, 422 spousal caregivers participated in NSOC. We were interested in spousal care dyads living together in the community, and so we removed 32 dyads in which the care recipient was in residential care and two who did not co-reside. Of the 388 remaining spousal care dyads, 8 were removed due to missing data and 3 were removed because the care recipient did not report taking prescription medication in the last month. The analytic sample included 377 spousal caregivers and their care recipients with complete data on study variables. This widely used method for handling missing data is the simplest approach and appropriate for fairly large samples with a small number of incomplete responders (Schafer & Graham, 2002). Couples were in heterosexual marriages, with the exception of one caregiving wife in a same-sex marriage. Couples had been married for 42.42 years (standard error = 1.11, range = 0–72) on average.

Measures

Caregiver Role Overload

Role overload included three items assessing how much caregivers feel they (a) are exhausted when they go to bed at night; (b) have more things to do than they can handle; and (c) do not have time for themselves (1 = *very much*, 2 = *somewhat*, 3 = *not so much*). Items were reverse coded and averaged ($\alpha = .74$).

Medication-Related Care Stressors

Caregivers reported whether they assisted their care recipient with each of the following medication-related care tasks in the last month (1 = *yes*, 0 = *no*): ordering medications, keeping track of medications, and giving injections.

Medication-Related Care Resources

Care recipients ($n = 326$) or their proxies ($n = 49$ spouses; $n = 1$ adult daughter; $n = 1$ adult son) reported how frequently they used reminders (e.g., pill organizer, box, dispenser, or calendar) in the last month (1 = *every time*, 2 = *most times*, 3 = *sometimes*, 4 = *rarely*, 5 = *never*) to keep track of medications. We considered reported use of medication reminder systems most times or every time (1 = *yes, 0 = no*) as a resource. Care recipients who reported that their medications were always managed by someone else ($n = 112$) did not use reminders to manage their own medications, and so these respondents were coded as not using medication reminder systems. Most of these care recipients ($n = 97$) named their spouse as their helper.

Shared medication management was derived from two separate items. Care recipients or their proxies reported how they managed their prescribed medications in the last month (1 = *always did it by self*, 2 = *always did it together with someone else*, 3 = *someone else always did it*, 4 = *it varied*) and were then asked who helped them with medication management. We created a variable to indicate whether care recipients always worked together with someone to manage medications and named their spouse as their helper (1 = *managed medications with spouse*, 0 = *did not manage medications with spouse*).

Indicators of Care Complexity

Care recipients or their proxies reported whether they had received a physician diagnosis of eight chronic health conditions (1 = *yes*, 0 = *no*): arthritis, cancer, diabetes, heart disease, hypertension, lung disease, osteoporosis, and stroke. We created a summed score for care recipients' total number of chronic health conditions.

Care recipients or their proxies also reported whether they had been diagnosed with Alzheimer's disease or dementia by a physician (1 = *yes*, 0 = *no*). We considered care recipient's dementia status (1 = *diagnosed dementia*, 0 = *no diagnosed dementia*).

Covariates

Caregivers reported their age in years, gender (1 = *female*, 0 = *male*), and educational attainment (1 = *no schooling completed* to 9 = *masters, professional, or doctoral degree*). Caregivers also reported whether they had been diagnosed with seven chronic health conditions (1 = *yes*, 0 = *no*): arthritis, cancer, diabetes, heart disease, hypertension, lung disease, and osteoporosis. Summed scores were calculated to assess the total number of conditions.

Caregivers reported the ADLs and IADLs with which they helped care recipients in the last month. ADLs included bathing, dressing, eating, toileting, getting in/out of bed, and mobility inside and outside the house. IADLs included laundry, shopping, preparing meals, banking, and managing money. Summed scores were determined for total ADL/IADL assistance (range = 0–12).

We controlled for medical care activities involving tasks that are not directly related to medication management. Health system interaction tasks included scheduling appointments, speaking to providers, changing/adding insurance or drug plans, and other medical insurance matters. Medical/nursing tasks included skin wound/sore care, teeth/denture care, foot care (e.g., clipping nails), managing medical tasks (e.g., ostomy care, IVs, testing blood), helping with prescribed exercises, and assisting with a special diet. Caregivers reported whether they provided each task in the last month (1 = *yes*, 0 = *no*). Summed scores were created for health system interaction tasks (range = 0–4) and medical/nursing tasks (range = 0–6).

In a post hoc analysis, we considered positive caregiving relationship quality as a covariate. Caregivers reported (a) how much they enjoy being with the care recipient; and (b) how much the care recipient appreciates what they do for him or her (1 = *a lot*, 2 = *some*, 3 = *a little*, 4 = *not at all*). Items were reverse coded and averaged. The Spearman–Brown coefficient, which is recommended for two-item scales (Eisinga, Grotenhuis, & Pelzer, 2013), was .72.

Statistical Analysis

We used hierarchical linear regressions to consider the amount of variance in role overload that is explained with each step of the model. We entered covariates in the first step, including the care recipient's number of chronic health conditions and dementia status. In the second step, we added medication-related care stressors (ordering medications, keeping track of medications, and giving injections) and resources (care recipients' medication reminder system use and shared medication management) to examine their independent associations with role overload. We included an interaction term (e.g., ordering medications × dementia status) in the third step to determine whether each of these links differed by either of the two indicators of care complexity (the care recipient's number of chronic health conditions and dementia status). Interaction terms were analyzed separately. The continuous covariates (caregivers' age, educational attainment, number of chronic health conditions, ADL/IADL assistance, health system interaction tasks, and medical/nursing tasks) and care recipients' number of chronic health conditions were mean centered before the analysis. To investigate the nature of significant interactions with care recipients' number of chronic health conditions, we used the Johnson-Neyman region of significance approach (Johnson & Fay, 1950; Preacher, Curran, & Bauer, 2006). This method identified the range of conditions at which medication-related care stressors and resources are significantly linked to role overload. Simple slopes were estimated for spouses caring for partners with and without a dementia diagnosis to evaluate how medication-related care stressors and resources are associated with role overload for each subgroup. Models were conducted with SAS version 9.4 (SAS Institute, Inc., Cary, NC) using the NSOC analytic weight and statistical procedures to account for the complex survey design (Kasper, Freedman, & Spillman, 2013).

Results

Table 1 presents background characteristics and scores on major study variables among spousal caregivers. Caregivers most often reported ordering medications (64.9%), followed by keeping track of medications (56.1%), and giving injections (12.4%). Almost half of caregivers (47.7%) had care recipients who used medication reminder systems every time or most times and about 1 in 10 (9.4%) had care recipients who participated in shared medication management. The majority of care recipients who did not use medication reminder systems every time or most times always had someone else manage their medication (49.7%) or never used medication reminder systems (43.2%), whereas the rest used reminders rarely (5.6%) or sometimes (1.5%). Of the care recipients who did not always manage medication collaboratively with their spouse, most reported that they always managed by themselves (65.4%), with the remainder reporting that their spouse always managed their medication (28.7%), that it varied (5.5%), or that they always managed their medication with another caregiver (0.4%).

Table 1. Background Characteristics and Key Variables for Spousal Caregivers

	Spousal caregivers (N = 377)		
Variable	*M*	*SE*	Range
CG age in years	72.29	0.51	41–95
CG chronic health conditions	2.00	0.08	0–6
CG ADL/IADL assistance	4.99	0.17	0–12
CG health system interaction tasks	1.72	0.07	0–4
CG medical/nursing tasks	1.62	0.11	0–6
CG role overload	1.58	0.04	1–3
CG positive caregiving relationship quality	3.81	0.03	1–4
CR chronic health conditions	3.04	0.09	0–7
	%		
CG gender (female)	50.9		
CG educational attainment			
High school graduate	27.6		
Some college	21.7		
College graduate	9.0		
Postgraduate	6.6		
CR dementia status	13.3		
Medication-related care stressors			
CG ordering medications	64.9		
CG keeping track of medications	56.1		
CG giving injections	12.4		
Medication-related care resources			
CR medication reminder system use	47.7		
CR shared medication management	9.4		

Note. CG = caregiver. CR = care recipient. ADL/IADL = activities of daily living and instrumental activities of daily living. Values are weighted to produce nationally representative estimates.

We tested bivariate associations between study variables and caregiver role overload in preliminary analyses. Caregivers' greater role overload was correlated with female gender (r = .29, p < .001), younger age (r = −.10, p = .05), more chronic health conditions among caregivers (r = .15, p = .004) and care recipients (r = .11, p = .04), care recipients' diagnosed dementia (r = .19, p < .001), and more medical/nursing tasks (r = .29, p < .001), health system interaction tasks (r = .31, p < .001), and ADL/IADL assistance (r = .27, p < .001). Ordering medications (r = .24, p < .001), keeping track of medications (r = .23, p < .001), and giving injections (r = .20, p < .001) were correlated with caregivers' higher role overload. Finally, care recipients' medication reminder system use was correlated with caregivers' lower role overload (r = −.11, p = .04).

Medication-Related Care Stressors and Resources: Links to Caregiver Role Overload

Table 2 displays the hierarchical linear regression model. Estimates are presented from Step 2, which includes the predictors along with the covariates from Step 1. For simplicity of presentation, interaction terms analyzed in Step 3 are not shown in the table; but we report significant interactions in the text. Caregivers who gave injections reported significantly greater role overload than those who did not perform this care task (B = .26, β = .14, p = .01, 95% CI [0.05, 0.46]). By contrast, spousal caregivers with partners who engaged in shared medication management reported significantly less role overload than their counterparts who did not manage collaboratively (B = −.20, β = −.10, p = .03, 95% CI [−.39, −.02]). These associations were not moderated by care recipients' number of chronic health conditions or dementia status.

The link between keeping track of medications and role overload was moderated by care recipients' number of chronic health conditions (B = .09, β = .17, p = .03, 95% CI [.01, .17]; not shown in Table 2). The region of significance was −7.39 to 1.67 for mean centered scores of care recipients' total number of chronic health conditions, which corresponds to raw scores ranging from −4.33 to 4.73. Scores above and below this region are statistically significant at p < .05. The lower bound is outside the possible range of chronic health condition scores and cannot be interpreted. Thus, spousal caregivers who kept track of their partner's medications reported significantly greater role overload when their partner had five or more chronic health conditions (Figure 1).

The association between medication reminder system use and role overload was moderated by care recipients' dementia status (B = −.44, β = −.10, p = .02, 95% CI [−.80, −.09]; not shown in Table 2). Figure 2 shows that care recipients' use of medication reminder systems was significantly associated with their caregiver's lower levels of role overload when they had dementia (B = −.37, β = −.31, p = .03, 95% CI [−.69, −.04]) but not in the absence of a dementia diagnosis (B = .08, β = .07, p = .21, 95% CI [−.04, .20]).

Post Hoc Test

Positive aspects of the caregiving relationship might explain in part why shared medication management is linked to lower caregiver role overload. To investigate this possibility, we estimated the second step of the model from the main analysis with caregiver reports of positive caregiving relationship quality included as a covariate. Positive caregiving relationship quality was significantly associated with lower role overload (B = −.22, β = −.16, p = .003, 95% CI [−.35, .08]). The link between shared medication management and role overload was reduced to marginal significance (B = −.19, β = −.09, p = .06, 95% CI [−.38, .01]), suggesting that positive caregiving relationship quality may partly account for this association.

Discussion

This study demonstrates that medication-related care stressors and resources are consequential for role overload

Table 2. Linear Regressions Examining Medication-Related Care Stressors and Resources and Their Associations With Spousal Caregivers' Role Overload

	Spousal caregivers' role overload				
Estimate	*B*	*SE*	β	95% CI	R^2
Intercept	1.34***	0.07	–	1.20, 1.47	
Step 1					0.24
CG gender (female)	0.24***	0.06	0.20	0.12, 0.36	
CG age in years	−0.004	0.01	−0.05	−0.01, 0.01	
CG educational attainment	0.03*	0.02	0.11	0.002, 0.06	
CG chronic health conditions	0.01	0.02	0.02	−0.03, 0.05	
CG ADL/IADL assistance	0.02	0.01	0.08	−0.01, 0.05	
CG health system interaction tasks	0.07*	0.03	0.15	0.01, 0.12	
CG medical/nursing tasks	0.04	0.02	0.11	−0.003, 0.09	
CR chronic health conditions	0.04*	0.02	0.10	0.003, 0.08	
CR dementia status (diagnosis)	0.12	0.10	0.07	−0.07, 0.32	
Step 2					0.27
CG ordering medications	0.11	0.08	0.09	−0.05, 0.27	
CG keeping track of medications[a]	0.03	0.08	0.03	−0.13, 0.20	
CG giving injections	0.26*	0.10	0.14	0.05, 0.46	
CR medication reminder system use[b]	0.04	0.06	0.04	−0.07, 0.16	
CR shared medication management	−0.20*	0.09	−0.10	−0.39, −0.02	

Notes: $N = 377$ spousal caregivers. CG = caregiver; CR = care recipient; ADL/IADL = activities of daily living and instrumental activities of daily living. Estimates are presented from Step 2, which includes the covariates from Step 1 and the predictors in the same model. Interaction terms analyzed in Step 3 (R^2 range = 0.27–0.28) are not shown in the table for simplicity of presentation.

[a] Significant interaction with care recipients' number of chronic health conditions in Step 3 (not shown in table). [b] Significant interaction with care recipients' dementia status in Step 3 (not shown in table). $^*p < .05$. $< .01$. $^{***}p < .001$.

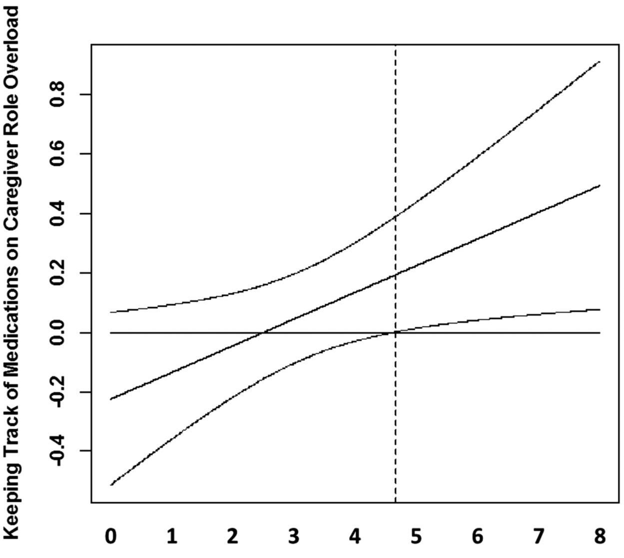

Figure 1. Confidence bands for the observed sample values of care recipients' number of chronic health conditions and the simple slope for keeping track of medications on caregiver role overload. The area to the right of the dotted line represents statistical significance at $p < .05$.

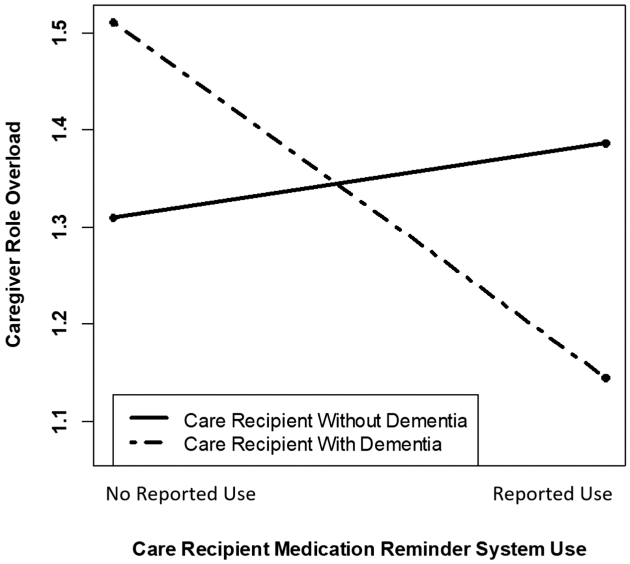

Figure 2. Significant moderating effect of care recipient dementia status on the association between care recipient medication reminder system use and caregiver role overload. Care recipient use of medication reminders was significantly linked to lower caregiver role overload among caregivers of a partner diagnosed with dementia.

among spousal caregivers of an older adult with functional disability. We extend the literature by considering multiple types of stressors and resources specific to the care recipient's medication management, and whether they are more strongly linked to caregiver role overload in the presence of complex care needs. Whereas caregivers reported greater role overload when they gave injections to their partner, sharing medication management within the dyad was associated with less role overload. Keeping track of medications and the care recipient's use of medication reminder systems were associated with role overload in ways that varied by his or her number of chronic health conditions and dementia status, respectively. These links were observed when accounting for caregiver background characteristics, chronic health conditions, and an array of other care tasks. Stressors and resources specific to managing medications therefore appear to have distinct implications for spousal caregivers' perceptions of role overload. Given that roughly two-thirds of spousal caregivers in the United States perform at least one medication management task, the design of comprehensive strategies to reduce role overload stemming from medication-related care should be a priority for researchers who study caregiving.

Giving injections may intensify role overload among caregiving spouses for several reasons. First, this care task is time consuming. Caregivers who deliver injections often need to arrange their schedules around preparing and administering multiple doses (Francis, Smith, Gray, & Graffy, 2002; Travis, Bethea, & Winn, 2000). Second, these specialized care activities are traditionally performed by health care professionals, and so many family caregivers lack training in their safe and proper delivery (Donelan et al., 2002; Mollica, Litzelman, Rowland, & Kent, 2017; Reinhard et al., 2014). Third, injections can be painful and/or upsetting for care recipients, which contributes to caregiver strain (Reinhard et al., 2014). Fourth, caregivers providing injections commonly worry about making a life-threatening mistake or medical complications, such as infection or overdose (Israel, Reymond, Slade, Menadue, & Charles, 2008; Reinhard et al., 2014). The present findings suggest that routine clinical care and interventions to improve caregiver well-being would be optimized by guiding spousal caregivers in their provision of injections. Ongoing assistance in managing both the emotional and practical elements of this care may be particularly beneficial.

By contrast, spousal caregivers may feel less overloaded when the care recipient is able to engage in shared medication management, perhaps partly from sharing the responsibility of monitoring medications. This finding mirrors research showing that couples who use joint strategies to manage chronic illness report more positive psychological adjustment (Berg et al., 2008; Zajdel et al., 2018). Spousal care dyads who manage medications together may also use joint approaches to cope with related stressors (e.g., shared decision making about drug combinations and doses) that attenuate caregiving stress. In addition, this management style likely reflects qualities of the marital relationship (e.g., closeness) that support adaptive coping and mitigate role overload. Notably, the link between shared medication management and role overload did not vary by indicators of care complexity (i.e., the care recipient's number of chronic health conditions and dementia status), implying that this resource confers advantages across care situations.

Although the critical ingredients of effective shared medication management for caregiving dyads are yet to be determined, encouraging couples to work together in managing medications may be a useful strategy for dyadic interventions. Future studies should examine mechanisms that explain the current findings. Pinpointing the conditions under which shared medication management buffers or exacerbates role overload would also identify spousal caregivers who are likely to benefit from this approach. Some couples, for example, may have difficulty with shared medication management due to factors such as negative spousal interactions (e.g., criticism), individual differences in personality, or cognitive impairment. Indeed, only one in 10 couples in this study included care recipients who always worked with their spousal caregiver to manage medications, suggesting that these strategies might be infrequently used. Understanding barriers to couples' shared medication management and methods to promote adaptive collaboration between partners may help guide clinicians in the successful management of their medical care.

Spousal caregivers who kept track of medications reported greater role overload only when their partner had a minimum of five chronic health conditions. In the United States, people managing five or more chronic conditions use twice as many prescription drugs and average about two times the number of yearly physician visits than those with three or four conditions (Buttorff et al., 2017). Consequently, monitoring medications for a care recipient with five or more chronic health conditions is likely to be highly complicated and demanding, also placing him or her at an increased risk of adverse drug events and drug–drug interactions (Magro et al., 2012; Sutherland et al., 2015) that amplify caregiving stress. With about one in 10 Americans (12%) reporting at least five chronic conditions (Buttorff et al., 2017), it will be important for future work to devise strategies that make keeping track of medications less burdensome for spousal caregivers in the context of multiple chronic health problems.

The care recipient's medication reminder system use was linked to lower overload only among spouses caring for a partner with dementia. When PLWDs are able to participate in their medication management with the use of reminders that compensate for cognitive impairment, this may relieve some of the time and energy burden on caregiving spouses. Prior research shows that PLWDs are capable of using medication reminder systems (e.g., devices that sound an alarm and dispense the correct dose as a reminder to take medication) during the early stages of dementia (Kamimura, 2017; Kamimura et al., 2012; Kamimura & Ito, 2014). Furthermore, medication reminder system use among PLWDs has been found to improve their medication adherence and alleviate caregiver burden (Kamimura, 2017; Kamimura et al., 2012; Kamimura & Ito, 2014). Findings from this and other studies collectively suggest that supporting the use of medication reminder systems among PLWDs may help to preserve their autonomy and minimize caregiver role overload. With eventual assistance from caregivers in refilling the device and monitoring for mistakes such as missed doses, medication reminder systems may yield lasting benefits for PLWDs' medication management (Kamimura, 2017).

We acknowledge several limitations. First, medication-related resources were reported by care recipients, whose perspectives may have differed from their caregivers. Second, we lacked information on care recipients' medication adherence along with their number, dosage, and type of prescribed medications. Third, couples were married and the vast majority was heterosexual, limiting generalization to cohabiting or same-sex partners. Fourth, caregivers reported low role overload on average, and so the findings may not generalize to more distressed caregivers. Fifth, shared medication management may be a proxy for other features of the caregiving situation that lessen role overload. Care recipients who work with their spouse to manage medication, for instance, may have less severe impairments and particularly close marriages that enhance caregiver well-being. The association between shared medication management and lower role overload was present when controlling for indicators of illness severity (i.e., number of chronic conditions, ADL/IADL assistance, and other medical care activities) and dementia status. This link was marginally significant after controlling for positive caregiving relationship quality in post hoc tests, however, revealing the potential importance of positive marital interactions as a contributing factor. Finally, the effect sizes were modest, with medication-related stressors and resources collectively accounting for 3% of the variance in role overload beyond caregiver background characteristics and additional care tasks; but even small effects may have a substantial clinical and public health impact (Rutledge & Loh, 2004). This study nevertheless lays groundwork for subsequent research to generate more nuanced knowledge of stressors and resources related to medication management and associated caregiving outcomes.

In summary, the present study provides evidence that stressors and resources related to medication management have implications for role overload among spousal caregivers, over and above their background characteristics and other caregiving stressors. Spousal caregivers play a vital part in the increasingly complex long-term medical care of community-dwelling older adults (Reinhard et al., 2014). As a consequence, clinical care and interventions developed to sustain the well-being of both care dyad members should proactively address the multifaceted needs of spousal caregivers managing their partner's medications.

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Conflict of Interest

None reported.

References

Berg, C. A., Wiebe, D. J., Butner, J., Bloor, L., Bradstreet, C., Upchurch, R.,…Patton, G. (2008). Collaborative coping and daily mood in couples dealing with prostate cancer. *Psychology and Aging*, **23**, 505–516. doi:10.1037/a0012687

Buttorff, C., Ruder, T., & Bauman, M. (2017). *Multiple chronic conditions in the United States*. Santa Monica, CA: RAND Corporation. Retrieved March 15, 2018 from https://www.rand.org/content/dam/rand/pubs/tools/TL200/TL221/RAND_TL221.pdf

Donelan, K., Hill, C. A., Hoffman, C., Scoles, K., Feldman, P. H., Levine, C., & Gould, D. (2002). Challenged to care: Informal caregivers in a changing health system. *Health Affairs (Project Hope)*, **21**, 222–231. doi:10.1377/hlthaff.21.4.222

Eisinga, R., Grotenhuis, M. T., & Pelzer, B. (2013). The reliability of a two-item scale: Pearson, Cronbach, or Spearman-Brown? *International Journal of Public Health*, **58**, 637–642. doi:10.1007/s00038-012-0416-3

Francis, S. A., Smith, F., Gray, N., & Denham, M. (2006). Partnerships between older people and their carers in the management of medication. *International Journal of Older People Nursing*, **1**, 201–207. doi:10.1111/j.1748-3743.2006.00032.x

Francis, S. A., Smith, F., Gray, N., & Graffy, J. (2002). The roles of informal carers in the management of medication for older care-recipients. *International Journal of Pharmacy Practice,* **10**, 1–9. doi:10.1111/j.2042–7174.2002.tb00581.x

Hudani, Z. K., & Rojas-Fernandez, C. H. (2016). A scoping review on medication adherence in older patients with cognitive impairment or dementia. *Research in Social & Administrative Pharmacy: RSAP*, **12**, 815–829. doi:10.1016/j.sapharm.2015.11.011

Israel, F., Reymond, L., Slade, G., Menadue, S., & Charles, M. A. (2008). Lay caregivers' perspectives on injecting subcutaneous medications at home. *International Journal of Palliative Nursing*, **14**, 390–395. doi:10.12968/ijpn.2008.14.8.30774

Johnson, P. O., & Fay, L. C. (1950). The Johnson-Neyman technique, its theory and application. *Psychometrika*, **15**, 349–367. doi:10.1007/BF02288864

Kamimura, T. (2017). Older adults with Alzheimer's disease who have used an automatic medication dispenser for 3 or more years. *Clinical Gerontologist.* Advance online publication. doi:10.1080/07317115.2017.1347594

Kamimura, T., Ishiwata, R., & Inoue, T. (2012). Medication reminder device for the elderly patients with mild cognitive impairment. *American Journal of Alzheimer's Disease and Other Dementias*, **27**, 238–242. doi:10.1177/1533317512450066

Kamimura, T., & Ito, H. (2014). Glycemic control in a 79-year-old female with mild cognitive impairment using a medication reminder device: A case report. *International Psychogeriatrics*, **26**, 1045–1048. doi:10.1017/S1041610213002408

Kantor, E. D., Rehm, C. D., Haas, J. S., Chan, A. T., & Giovannucci, E. L. (2015). Trends in prescription drug use among adults in the United States from 1999–2012. *JAMA*, **314**, 1818–1831. doi:10.1001/jama.2015.13766

Kasper, J. D., Freedman, V. A., & Spillman, B. (2013). *National Study of Caregiving user guide*. Baltimore, MD: Johns Hopkins University School of Public Health. Retrieved February 26, 2018 from https://www.nhats.org/scripts/documents%5CNSOC_Round_1_User_Guide.pdf

Lawton, M. P., Moss, M., Kleban, M. H., Glicksman, A., & Rovine, M. (1991). A two-factor model of caregiving appraisal and psychological well-being. *Journal of Gerontology*, **46**, P181–P189. doi:10.1093/geronj/46.4.P181

Lehnert, T., Heider, D., Leicht, H., Heinrich, S., Corrieri, S., Luppa, M.,…König, H. H. (2011). Review: Health care utilization and costs of elderly persons with multiple chronic conditions. *Medical Care Research and Review*, **68**, 387–420. doi:10.1177/1077558711399580

Look, K. A., & Stone, J. A. (2017). Medication management activities performed by informal caregivers of older adults. *Research in Social & Administrative Pharmacy*, **14**, 418–426. doi:10.1016/j.sapharm.2017.05.005

Magro, L., Moretti, U., & Leone, R. (2012). Epidemiology and characteristics of adverse drug reactions caused by drug–drug interactions. *Expert Opinion on Drug Safety*, **11**, 83–94. doi:10.1517/14740338.2012.631910

Mausbach, B. T., Roepke, S. K., Chattillion, E. A., Harmell, A. L., Moore, R., Romero-Moreno, R.,…Grant, I. (2012). Multiple mediators of the relations between caregiving stress and depressive symptoms. *Aging & Mental Health*, **16**, 27–38. doi:10.1080/13607863.2011.615738

Mollica, M. A., Litzelman, K., Rowland, J. H., & Kent, E. E. (2017). The role of medical/nursing skills training in caregiver confidence and burden: A CanCORS study. *Cancer*, **123**, 4481–4487. doi:10.1002/cncr.30875

Montaquila, J., Freedman, V. A., Edwards, B., & Kasper, J. D. (2012). *National Health and Aging Trends Study round 1 sample design and selection*. NHATS Technical Paper #1. Baltimore, MD: Johns Hopkins University School of Public Health. Retrieved February 26, 2018 from https://www.nhats.org/scripts/sampling/NHATS%20Round%201%20Sample%20Design%2005_10_12.pdf

Oldenkamp, M., Hagedoorn, M., Slaets, J., Stolk, R., Wittek, R., & Smidt, N. (2016). Subjective burden among spousal and adult–child informal caregivers of older adults: Results from a longitudinal cohort study. *BMC Geriatrics*, **16**, 208. doi:10.1186/s12877-016-0387-y

Pearlin, L. I., Mullan, J. T., Semple, S. J., & Skaff, M. M. (1990). Caregiving and the stress process: An overview of concepts and their measures. *The Gerontologist*, **30**, 583–594. doi:10.1093/geront/30.5.583

Piette, J. D., Rosland, A. M., Silveira, M., Kabeto, M., & Langa, K. M. (2010). The case for involving adult children outside of the household in the self-management support of older adults with chronic illnesses. *Chronic Illness*, **6**, 34–45. doi:10.1177/1742395309347804

Pinquart, M., & Sörenson, S. (2011). Spouses, adult children, and children in-law as caregivers of older adults: A meta-analytic comparison. *Psychology and Aging*, 26(1), 1–14. doi:10.1037/a0021863

Polenick, C. A., Leggett, A. N., & Kales, H. C. (2017). Medical care activities among spouses of older adults with functional disability: Implications for caregiving difficulties and gains. *The American Journal of Geriatric Psychiatry: Official Journal of the American Association for Geriatric Psychiatry*, **25**, 1085–1093. doi:10.1016/j.jagp.2017.05.001

Polenick, C. A., Leggett, A. N., Webster, N. J., Han, B. H., Zarit, S. H., & Piette, J. D. (2017). Multiple chronic conditions in spousal caregivers of older adults with functional disability: Associations with caregiving difficulties and gains. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*. Advance online publication. doi:10.1093/geronb/gbx118

Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interactions in multiple linear regression, multilevel modeling, and latent growth curve analysis. *Journal of Educational and Behavioral Statistics,* **31**, 437–448. doi:10.3102/10769986031004437

Reinhard, S. C., Levine, C., & Samis, S. (2014). *Family caregivers providing complex chronic care to their spouses*. Washington, DC: AARP Public Policy Institute and United Hospital Fund. Retrieved November 21, 2017 from https://www.aarp.org/home-family/caregiving/info-04-2014/family-caregivers-providing-complex-chronic-care-to-spouses-AARP-ppi-health.html

Rutledge, T., & Loh, C. (2004). Effect sizes and statistical testing in the determination of clinical significance in behavioral medicine research. *Annals of Behavioral Medicine: A Publication of the Society of Behavioral Medicine*, **27**, 138–145. doi:10.1207/s15324796abm2702_9

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods*, **7**, 147–177. doi:10.1037/1082-989X.7.2.147

Smith, F., Grijseels, M. S., Ryan, P., & Tobiansky, R. (2015). Assisting people with dementia with their medicines: Experiences of family carers. *The International Journal of Pharmacy Practice*, **23**, 44–51. doi:10.1111/ijpp.12158

Sutherland, J. J., Daly, T. M., Liu, X., Goldstein, K., Johnston, J. A., & Ryan, T. P. (2015). Co-prescription trends in a large cohort of subjects predict substantial drug–drug interactions. *PLoS One*, **10**, e0118991. doi:10.1371/journal.pone.0118991

Tao, D., Xie, L., Wang, T., & Wang, T. (2015). A meta-analysis of the use of electronic reminders for patient adherence to medication in chronic disease care. *Journal of Telemedicine and Telecare*, **21**, 3–13. doi:10.1177/1357633X14541041

Travis, S. S., Bethea, L. S., & Winn, P. (2000). Medication administration hassles reported by family caregivers of dependent elderly persons. *The Journals of Gerontology, Series A: Biological Sciences and Medical Sciences*, **55**, M412–M417. doi:10.1093/gerona/55.7.M412

Zajdel, M., Helgeson, V. S., Seltman, H. J., Korytkowski, M. T., & Hausmann, L. R. M. (2018). Daily communal coping in couples with type 2 diabetes: Links to mood and self-care. *Annals of Behavioral Medicine,* **52**, 228–238. doi:10.1093/abm/kax047