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The hidden patient: chronic physical morbidity, psychological distress, and quality of life in caregivers of older adults

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Abstract

Aim: Increasing demands for care provision to older adults require good physical and mental health among caregivers. Few studies have examined the health status and correlates of quality of life among caregivers of older adults. The present study therefore sought to examine the prevalence of chronic physical conditions, psychological distress, and correlates of physical and mental quality of life among caregivers of older adults (≥ 60 years) in Singapore.

Methods: Participants were 285 informal caregivers who were providing care to an older relative. Participants were recruited at the Institute of Mental Health, Singapore, and they completed self-report measures on chronic physical morbidity, psychological distress, and physical and mental quality of life. Multiple regression models were constructed to examine correlates of physical and mental quality of life.

Results: More than half of the caregivers had at least one chronic physical condition (58.6%) and psychological distress (52.6%). Chronic physical morbidity, psychological distress, and secondary education status were associated with lower physical quality of life. Psychological distress, younger age, primary education status, and more time spent caregiving were associated with lower mental quality of life.

Conclusion: Poor physical and mental health among caregivers may impair their ability to provide adequate care to older adults with progressive medical needs. It is important for medical practitioners not to neglect the physical and mental health of caregivers through continued assessment of chronic physical morbidity, psychological distress, and quality of life.

Key words: caregivers, chronic disease, mental health, quality of life.

INTRODUCTION

Demographic ageing is a shift in the age structure of a country's population towards older ages (age 65 and above) that is usually characterized by an increase in the population's mean and median ages, a decline in the birth rate, and a rise in the proportion of older adults.¹ According to a World Bank report, countries in South-East Asia are undergoing a faster rate of ageing compared to other regions.² Singapore is a multi-ethnic country located at the southern tip of the Malay Peninsula in South-East Asia. It has a resident population of 3.9 million people comprising those of Chinese, Malay, Indian and other ethnicities.

Its population is ageing rapidly, and the number of citizens aged 65 and above is expected to reach a total of 900 000 by 2030, which is more than 25% of the overall population.³

One consequence of an ageing population is the need for informal caregivers for older adults. An informal caregiver is an unpaid or paid person, usually a family member or a friend, who provides assistance with activities of daily living to an individual with ailing physical and/or mental health. The task of caring for an older adult with chronic health conditions requires the caregiver to have good physical and mental health because of the considerable physical and

emotional demands involved in caregiving, which often includes assisting the older adult with personal hygiene, ensuring that medical needs are met, and dealing with the uncertain prognosis on a daily basis.^{4–6}

Caregivers are gradually increasing in age, placing them at an increased risk of developing chronic conditions, which has several implications.^{4,6,7} For instance, caregivers diagnosed with chronic illnesses such as diabetes must maintain their blood sugar level by making sure to take their medication and eat well-balanced meals on time, and they must go for regular medical check-ups, which can be time-consuming and emotionally draining. Caring for their own health needs in turn reduces the amount of physical and psychological resources that caregivers can provide to older adults under their care. Quality of life is defined as a person's insight of his or her position in life in the context of the culture and value systems in which they live and in relation to one's own goals, expectations, standards, and concerns. It comprises various domains such as the person's physical, psychological and social well-being, personal beliefs, level of independence, and environmental relationships.⁸ Burton *et al.* examined the hazards of caregiving and found that increased caregiving activity escalates the possibility of a fatigued caregiver, putting the caregiver at a higher risk of declining physical and mental health.⁹ Other studies have also observed that poor sleep and increased fatigue have negative effects on caregivers' physical and mental health by exacerbating physical and psychological morbidity, and reducing quality of life.¹⁰ Although some studies have recognized the benefits of caregiving,¹¹ most studies have reported a high prevalence of psychological distress, depression, and anxiety.^{5–7} Such detrimental effects on caregivers' health status adversely affect the quality of care that they provide.

Therefore, it is hoped that the findings of the present study will provide additional insight on the prevalence of physical and psychological morbidity, as well as factors associated with caregivers' physical and mental quality of life. Such findings are necessary to better inform holistic interventions that aim to improve both physical and psychological health of caregivers of older adults. The present study thus sought to examine the prevalence of chronic physical conditions and psychological distress and to

evaluate correlates of physical and mental quality of life among a sample of caregivers caring for older adults (≥ 60 years) in Singapore.

METHOD

Sample population and procedure

The present study used a cross-sectional design with convenience sampling to obtain a sample of 285 informal caregivers (mean age \pm SD: 47.23 \pm 10.87 years; range: 21–65 years) who were providing care to older adults. Participants were either referred by medical doctors at the Institute of Mental Health ($n = 106$), which is the only tertiary psychiatric institute in Singapore, or had given prior consent to be re-contacted from an existing research database ($n = 179$) that had been part of an earlier population-based survey that examined the prevalence of dementia in Singapore.¹² Sample size estimation was conducted, and it was found that a sample size of 285 was adequate to achieve a precision level of 3% at 80% power while accounting for 20% of missing data.

The inclusion criteria for the sample were as follows: (i) informal caregiver or family member living with at least one older adult aged 60 years and above and involved in or organized their care; (ii) aged 21–65 years old; (iii) Chinese, Malay, or Indian ethnicity; (iv) the ability to read, write, and speak English fluently; and (v) a Singapore citizen or permanent resident. Older adults were referred to those aged 60 years and above, and some had been diagnosed with chronic conditions, such as dementia. Caregivers who had placed their older relatives in a nursing home at the time of recruitment were excluded. Participants provided written informed consent, and ethics approval was obtained from the Domain Specific Review Board of the National Healthcare Group, Singapore (ref no. 2014/00887).

Measures

Psychological distress

The General Health Questionnaire (GHQ-12) is a self-report instrument that has been designed for use in clinical settings to assess psychological distress.¹³ The 12 items assess the level of psychological distress (e.g. 'Have you recently been feeling unhappy and depressed?') over the past few weeks with a

4-point Likert-type scale (e.g. range: 0 (better than usual)–3 (much worse than usual)). The total score, which was obtained by summing up the individual scores of the 12 items, ranges from 0 to 36. Higher scores indicate greater psychological distress. In addition, a cut-off score of more than 11 on the GHQ-12 indicates possible clinical caseness of depression and anxiety disorders.¹⁴ The GHQ-12 demonstrated good reliability for assessing the level of psychological distress ($\alpha = 0.87$).

Physical and mental quality of life

The 36-item Short-Form Health Survey (SF-36) covers eight health domains: (i) physical functioning; (ii) physical role functioning; (iii) bodily pain; (iv) general health; (v) vitality; (vi) social functioning; (vii) emotional role functioning; and (viii) mental health.¹⁵ This widely validated self-report measure is often used as a measure of health-related quality of life.¹⁵ The SF-36 further looks at the level of physical quality of life (physical component summary (PCS)) and mental quality of life (mental component summary (MCS)) by working out the mean average of the physically relevant items and the emotionally relevant items.¹⁶ Higher scores on the PCS and MCS indicate better physical and mental quality of life, respectively. The PCS and MCS showed good reliability indexes for the levels of physical ($\alpha = 0.79$) and mental ($\alpha = 0.85$) quality of life, respectively.

Sociodemographic characteristics and chronic conditions checklist

Demographic information included the caregivers' age, gender, marital status, ethnicity, education, employment, relationship to the older adult, and total time spent caregiving. To determine the number and type of chronic health conditions, participants were asked to check a list of history of health problems that included arthritis, asthma, back injuries, diabetes, hyperlipidaemia, hypertension, migraine, thyroid disease, mood disorder, anxiety disorders, and schizophrenia spectrum disorders. The total time spent on caregiving was calculated based on the time spent per day (i.e. no time, 1–2 h, 3–5 h, or 6 h or more) assisting or engaging with the older adult in eight areas of care (communicating, using transport, dressing, eating, grooming, supervision, toileting, and bathing).

Statistical Analyses

The means and standard deviations were calculated for continuous variables, while frequencies and percentages were calculated for categorical variables. Multiple regression models were constructed to examine the correlates of physical (PCS) and mental (MCS) quality of life. Correlates examined in the models included age, gender, ethnicity, education, marital status, employment status, caregivers' relationship to the older adult, total time spent caregiving, chronic physical condition of caregivers and care recipients, and psychological distress. Data were analyzed with SPSS version 23.0 (SPSS Inc., Chicago, IL, USA), with statistical significance level set at 0.05 for all procedures.

RESULTS

Sociodemographic and clinical characteristics

The sociodemographic and clinical characteristics of the overall sample are summarized in Table 1. The mean age of the caregivers was 47.23 ± 10.87 years, and the majority were women (64.6%), of Chinese ethnicity (56.1%), married (60.7%), employed (75.8%), and had completed pre-tertiary education (36.6%). In addition, more than half (85.6%) of the caregivers were providing care to an immediate family member.

More than half (58.6%) of the caregivers had at least one chronic physical condition. Frequencies and percentages of each chronic physical condition are presented in Table 1. The most prevalent chronic physical condition was hyperlipidaemia (26.3%), followed by hypertension (22.1%) and back injuries (11.6%). The overall prevalence of psychological distress was 52.6% among this sample of caregivers. We had also assessed the overall level of psychological distress (mean \pm SD: 11.03 ± 5.29) as well as physical (PCS) (mean \pm SD: 52.36 ± 7.11) and mental (MCS) (mean \pm SD: 49.51 ± 9.50) quality of life.

Correlates of quality of life among caregivers of older adults

Tables 2 and 3 present two separate multiple regression models that examined the correlates of physical (PCS) and mental (MCS) quality of life among caregivers. In the first model, which examined the correlates of PCS, participants without any chronic

Table 1 Characteristics of the overall sample

Variable	Total (N = 285) Frequency	%
Age (mean \pm SD: 47.23 \pm 10.87 years)		
21–39	75	26.3
40–65	210	73.7
Gender		
Male	101	35.4
Female	184	64.6
Marital status		
Single/other (separated/divorced/ widowed)	112	39.3
Married	173	60.7
Ethnicity		
Chinese	160	56.1
Malay	38	13.4
Indian	87	30.5
Education		
Primary or below	9	3.2
Secondary	76	26.8
Pre-tertiary	104	36.6
Tertiary and above	95	33.4
Employment		
Unemployed	69	24.2
Employed	216	75.8
Caregiver's relationship to older adult		
Child	224	78.6
Spouse	18	6.3
Other	43	15.1
Total time spent on caregiving (mean \pm SD: 3.60 \pm 3.93 h)		
Psychological distress caseness		
Psychologically distressed	150	52.6
Not distressed	135	47.4
Chronic physical condition diagnosis		
At least one diagnosis	167	58.6
No diagnosis	118	41.4
Chronic physical condition types [†]		
Arthritis	19	6.7
Asthma	19	6.7
Back injuries	33	11.6
Diabetes	25	8.8
Hyperlipidaemia	75	26.3
Hypertension	63	22.1
Migraine	15	5.3
Thyroid disease	10	3.5
Total Scores	Mean	SD
Psychological distress (GHQ-12)	11.03	5.29
Physical quality of life (PCS)	52.36	7.11
Mental quality of life (MCS)	49.51	9.50

[†]Exact percentages based on the total sample were used for each chronic physical condition type. GHQ-12, General Health Questionnaire; MCS, SF-36 mental component summary; PCS, SF-36 physical component summary; SF-36, 36-item Short Form Health Survey.

physical conditions ($\beta = 3.27$, 95%CI: 1.58–4.95, $P < 0.001$) or psychological distress ($\beta = 2.08$, 95% CI: 0.43–3.73, $P = 0.014$) had significantly higher levels of physical quality of life. Participants who had obtained secondary education status had

significantly lower levels of physical quality of life than those who had obtained tertiary education ($\beta = -3.22$, 95%CI: -5.31–-1.14, $P = 0.003$). In the second model, which examined the correlates of MCS, participants without psychological distress ($\beta = 8.88$, 95%CI: 6.85–10.91, $P < 0.001$) and who were older ($\beta = -4.80$, 95%CI: -5.64–-0.23, $P < 0.001$) had significantly higher levels of mental quality of life. Participants who had primary education status had significantly lower mental quality of life than those who had obtained tertiary education ($\beta = -5.89$, 95%CI -11.72–-0.06, $P = 0.05$). Participants whose care recipients needed care occasionally also had a significantly lower level of mental quality of life ($\beta = -2.93$, 95%CI -5.64–-0.23, $P = 0.03$) than participants whose care recipients did not need any care.

DISCUSSION

Extending from previous research on chronic physical morbidity and psychological distress in caregivers,^{6,7} the present study aimed to examine the prevalence of chronic physical morbidity and psychological distress and to evaluate correlates of quality of life in caregivers of older adults in Singapore.

More than half (58.6%) of the caregivers reported at least one chronic physical condition, which is lower than the prevalence rate (81.5%) reported in a study of informal caregivers of older adults in the USA.¹⁷ The caregiver sample in the study by Wang *et al.* had a higher mean age \pm SD (65.4 \pm 12.6 years) than the present study (47.23 \pm 10.87 years), which could account for the higher prevalence rate of chronic physical conditions in the US study.¹⁷ Although the present study had a lower mean age, the majority (73.7%) of caregivers were within the 40–65 age range. One in four Singaporeans above the age of 40 has been diagnosed with at least one chronic physical condition, and the risk of being diagnosed with a chronic physical condition increases with age.¹⁸ The caregivers with at least one chronic physical condition in the present study had a lower physical quality of life than those without any chronic physical conditions. The most prevalent chronic conditions were hyperlipidaemia, hypertension, and back injuries. Chronic conditions, such as hypertension and back injuries, are reported to have a significant negative impact on quality of life,^{19,20} and caregivers

Table 2 Multiple regression model for correlates of physical quality of life (physical component summary)

	β	95%CI		P-value
Age	-0.04	-2.03	1.96	-0.97
Gender (male)	0.74	-0.94	2.42	0.30
Ethnicity (non-Chinese)	-1.41	-3.07	0.25	0.10
Marital status (single/other)	-1.03	-2.73	0.68	0.24
Employment status (unemployed)	-0.89	-2.78	0.10	0.35
Education (primary)	-3.72	0.85	1.03	0.12
Education (secondary)	-3.22	-5.31	-1.14	0.01*
Education (pre-university)	-0.82	-2.79	1.14	0.41
Education (tertiary)	Ref.			
Relationship (child)	1.61	-1.98	5.19	0.34
Relationship (other)	2.43	-1.54	6.39	0.23
Relationship (spouse)	Ref.			
Time spent caregiving (no time)	0.39	-2.17	2.92	0.97
Time spent caregiving (1–2 h)	-0.27	-2.71	2.18	0.83
Time spent caregiving (3–5 h)	-1.17	-3.48	1.13	0.32
Time spent caregiving (>6 h)	Ref.			
Chronic physical condition caregiver (no)	3.27	1.58	4.95	0.001**
Chronic physical condition care recipient (no)	1.11	-1.95	4.17	0.29
Extent of care needed (Needs care much of the time)	-1.96	-4.30	0.39	0.10
Extent of care needed (Needs care occasionally)	0.10	-2.11	2.30	0.93
Extent of care needed (Does not need care)	Ref.			
Psychological distress (no)	2.08	0.43	3.73	0.01*

* $P < 0.01$. ** $P \leq 0.001$. CI, confidence interval.

with back injuries were likely to have had difficulties in their mobility, which may hinder their ability to provide day-to-day care for themselves and those older adults under their care. Other chronic conditions like diabetes were also reported to be associated with emotional distress, and comorbid physical and

mental health conditions are likely to result in poorer physical and emotional outcomes among caregivers.⁶

The present study found that 52.6% of the caregivers had psychological distress. This is similar to previously reported prevalence rates (51–55%) of

Table 3 Multiple regression model for correlates of mental quality of life (mental component summary)

	β	95%CI		P-value
Age (21–39 years)	-4.80	-7.25	-2.35	0.001***
Gender (male)	0.53	-1.53	2.60	0.61
Ethnicity (non-Chinese)	0.70	-1.34	2.73	0.50
Marital status (single/other)	-0.46	-2.55	1.64	0.67
Employment status (unemployed)	-0.08	-2.23	2.40	0.94
Education (primary)	-5.89	-11.72	-0.06	0.05*
Education (secondary)	-1.99	-4.55	0.58	0.13
Education (pre-university)	0.35	-2.06	2.76	0.77
Education (tertiary)	Ref.			
Relationship (child)	-0.65	-5.05	3.75	0.77
Relationship (other)	1.95	-2.93	6.82	0.43
Relationship (spouse)	Ref.			
Time spent caregiving (no time)	1.66	-1.50	4.78	0.30
Time spent caregiving (1–2 h)	0.42	-2.59	3.42	0.79
Time spent caregiving (3–5 h)	0.50	-2.34	3.34	0.73
Time spent caregiving (>6 h)	Ref.			
Chronic physical condition caregiver (no)	0.54	-1.53	2.61	0.61
Chronic physical condition care recipient (no)	1.01	-2.75	4.76	0.60
Extent of care needed (Needs care much of the time)	-1.07	-3.95	1.81	0.47
Extent of care needed (Needs care occasionally)	-2.93	-5.64	-0.23	0.03*
Extent of care needed (Does not need care)	Ref.			
Psychological distress (no)	8.88	6.85	10.91	0.001***

* $P < 0.05$. ** $P < 0.01$. *** $P \leq 0.001$. CI, confidence interval.

psychological distress in caregivers.²¹ As suggested by Hudson *et al.*, caregivers experience multiple negative physical, emotional, social, and financial stressors due to the increased demands of caregiving, leading to overwhelming stress and psychological distress.²¹

The findings of this study corroborate previous research on the distinct properties of the PCS and MCS because of different factors found to be associated with these.^{22,23} First, the present study observed that lower education level, the presence of chronic physical conditions, and the presence of psychological distress were associated with a lower physical quality of life. A higher education status could result in a greater availability of economic resources, which in turn may have a positive influence on physical quality of life. While there have been positive findings on the influence of education on quality of life in other populations,^{24,25} past research has not examined the influence of education status on physical quality of life among caregivers of older adults. Next, the presence of chronic physical conditions and psychological distress may suggest languishing physical and mental health among caregivers. In addition to the burden of caring for an older adult, caregivers are likely to experience multiple daily stressors that may result in a lower physical quality of life.^{4,6,7}

Younger age, lower education level, psychological distress, and care recipients who needed occasional care were associated with a lower mental quality of life. Previous research found that older age was associated with a lower mental quality of life among caregivers, which was contradictory to the present study findings.^{26,27} However, samples of caregivers in previous studies were older (mean range: 60.36–65.7 years) than in the present study (mean age: 47.23 years). In addition, these studies were focused on caregivers of stroke patients who may have faced different challenges and experienced a differential impact on mental quality of life compared to caregivers of older adults.^{26,27} Further research that examines age differences and mental quality of life among caregivers of older adults may clarify this discrepancy; specifically, research may consider exploring differences in mental quality of life between younger (mean: 40 years) and older caregivers (mean: 60 years) of older adults while adjusting for other potential confounding variables. A systematic

review conducted by Farina *et al.* reports that when care recipients demand more care from their caregivers, the quality of life of the latter is negatively affected.²⁸

The present study's findings on psychological distress and mental quality of life are supported by previous studies,^{6,7} which showed that higher levels of psychological distress are associated with poorer mental quality of life among caregivers. Importantly, more time spent dealing with daily challenges associated with caregiving may in turn result in persistent psychological distress with deleterious effects on mental quality of life among caregivers.²⁹ Recognizing these factors is critical as they help to address the caregivers' issues more effectively.

Study limitations

The present study adopted a cross-sectional design to assess the physical and mental health of caregivers. This did not allow for the interpretation of causal relationships such as whether greater psychological distress reduced quality of life. Future longitudinal research should examine potential changes between correlates of physical and mental quality of life over time. Latent growth models may also be constructed to examine the trajectories of quality of life. This will enable researchers to understand the risk and protective factors that influence physical and mental quality of life over time. Study inclusion was limited to caregivers who were able to read and understand the English questionnaire in the study. This limits generalizability for caregivers with low education or those educated in other languages such as Chinese, Malay, or Tamil. The additional use of convenience sampling may have introduced bias into the present study, but this was necessary to achieve an adequate sample size of caregivers who were providing care to older adults.

The GHQ-12 and the SF-36 (MCS) contain similar items, and this may have an implication from a conceptual perspective because of the possibility of measuring a single construct. From a statistical perspective, highly correlated constructs may also increase the risk of multicollinearity, and this may have an implication on the interpretation of our findings. A multicollinearity test was performed for all predictors, and the test revealed acceptable values (close to 1) and low variance inflation factor values. In addition, bivariate correlations were performed that

showed that the GHQ-12 was significantly and negatively correlated with the SF-36 (MCS) score ($r = -0.76$). The inverse relationship may suggest the presence of two distinct constructs (psychological distress and quality of life). However, it should be noted that both the GHQ-12 and SF-36 are self-report measures, and future studies should consider the use of structured clinical interviews to corroborate information obtained from self-report measures.

Although the GHQ-12 was able to detect psychological distress within the present sample, it is limited in identifying the prevalence and symptomatology of specific, underlying psychiatric disorders among caregivers. Future research should consider the use of clinician assessment tools to corroborate screening results on the GHQ-12, as they are able to provide more information on the prevalence and symptomatology of specific psychiatric disorders among caregivers. Because more than half of the present sample of caregivers had chronic physical conditions and/or psychological distress, it is imperative to address their physical and emotional needs. The additional stress and burden from ailing physical and mental health may compromise both the caregiver and older adults' safety and well-being. Importantly, persistent psychological distress may worsen over time and develop into psychiatric disorders such as depression and anxiety.³⁰ Accordingly, chronic psychiatric disorders may negatively affect the prognosis of comorbid chronic physical conditions, which may lead to increased symptomatology, poorer quality of life, and a higher risk of caregiver mortality.³¹ Therefore, clinicians should routinely screen caregivers of older adults for psychological distress and recommend early interventions when psychological distress is detected.

Besides screening for psychological distress, clinicians should assess the level of physical and mental quality of life among caregivers and recommend psychosocial interventions for those presenting with low quality of life. Such psychosocial interventions should focus on alleviating psychological distress, which was observed to be associated with both physical and mental quality of life in the present study. While medical care is focused on treating the care recipient, the present study findings underscore the importance of assessing the caregivers' level of physical and mental health. Accordingly, maintaining an adequate level of health among caregivers will translate to a

reduction of psychological distress, improved physical and mental quality of life, and the ability to provide better care to older adults in need.

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REFERENCES

- Gavrilov LA, Heuveline P. Aging of population. In: Demeny PG, McNicoll G, eds. *The Encyclopedia of Population*. New York: Macmillan Reference USA, 2003; 32–37.
- The World Bank. Rapid aging in East Asia and Pacific will shrink workforce and increase public spending. 9 Dec 2015. [Cited 5 Dec 2017.] Available from URL: <http://www.worldbank.org/en/region/eap/brief/rapid-aging-in-east-asia-and-pacific-will-shrink-workforce-increase-public-spending>
- National Population and Talent Division. *A Sustainable Population for a Dynamic Singapore, Population White Paper*. Singapore: Oxford Graphic Printers Pte Ltd, 2013.
- Penning M, Wu Z. Caregiver stress and mental health: impact of caregiving relationship and gender. *Gerontologist* 2015; **56**: 1102–1113.
- De Fazio P, Ciambone P, Cerminara G *et al.* Depressive symptoms in caregivers of patients with dementia: demographic variables and burden. *Clin Interv Aging* 2015; **10**: 1085–1090.
- Stanley S, Balakrishnan S, Ilangovan S. Psychological distress, perceived burden and quality of life in caregivers of persons with schizophrenia. *J Ment Health* 2017; **26**: 134–141.
- Berglund E, Lytsy P, Westerling R. Health and wellbeing in informal caregivers and non-caregivers: a comparative cross-sectional study of the Swedish general population. *Health Qual Life Outcomes* 2015; **13**: 109.
- The WHOQOL Group. *Measuring Quality of Life: The Development of the World Health Organization Quality of Life Instrument (WHOQOL)*. Geneva: WHO, 1997.
- Burton L, Newsom J, Schulz R, Hirsch C, German P. Preventive health behaviors among spousal caregivers. *Prev Med* 1997; **26**: 162–169. <https://doi.org/10.1006/pmed.1996.0129>.
- Lee K, Yiin J, Lin P, Lu S. Sleep disturbances and related factors among family caregivers of patients with advanced cancer. *Psychooncology* 2015; **24**: 1632–1638.
- Li Q, Loke A. The positive aspects of caregiving for cancer patients: a critical review of the literature and directions for future research. *Psychooncology* 2013; **22**: 2399–2407.
- Subramaniam M, Chong SA, Vaingankar JA *et al.* Prevalence of dementia in people aged 60 years and above: results from the WiSE study. *J Alzheimers Dis* 2015; **45**: 1127–1138.
- Goldberg DP, Williams P. *A User's Guide to the General Health Questionnaire*. London: GL Assessment, 2006.

- 14 Van Hemert AM, Den Heijer M, Vorstenbosch M, Bolk JH. Detecting psychiatric disorders in medical practice using the General Health Questionnaire. why do cut-off scores vary? *Psychol Med* 1995; **25**: 165–170.
- 15 Ware JEJ, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). 1. Conceptual framework and item selection. *Med Care* 1992; **30**: 473–483.
- 16 Ware J, Gandek B. Overview of the SF-36 Health Survey and the International Quality of Life Assessment (IQOLA) Project. *J Clin Epidemiol* 1998; **51**(11): 903–912.
- 17 Wang XR, Robinson KM, Carter-Harris L. Prevalence of chronic illnesses and characteristics of chronically ill informal caregivers of persons with dementia. *Age Ageing* 2014; **43**: 137–141.
- 18 Health Promotion Board. Chronic disease management. [Cited 5 Dec 2017.] Available from URL: http://www.hpb.gov.sg/HOPPortal/health-article/HPBSUEXTAPP1_4022097
- 19 Hamer M, Batty GD, Stamatakis E, Kivimaki M. Hypertension awareness and psychological distress. *Hypertension* 2010; **56**: 547–550.
- 20 Rahmi A, Vazini H, Alhani F, Anoosheh M. Relationship between low back pain with quality of life, depression, anxiety and stress among emergency medical technicians. *Trauma Mon* 2015; **20**: e18686.
- 21 Hudson P, Trauer T, Kelly B *et al.* Reducing the psychological distress of family caregivers of home-based palliative care patients: short-term effects from a randomized controlled trial. *Psychooncology* 2013; **22**: 1987–1993.
- 22 Lopez-Espuela F, Zamorano J, Ramirez-Moreno J *et al.* Determinants of quality of life in stroke survivors after 6 months, from a comprehensive stroke unit. *Biol Res Nurs* 2015; **17**: 461–468.
- 23 Naglie G, Hogan D, Krahn M *et al.* Predictors of family caregiver ratings of patient quality of life in Alzheimer disease: cross-sectional results from the Canadian Alzheimer's disease quality of life study. *Am J Geriatr Psychiatry* 2011; **19**: 891–901. <https://doi.org/10.1097/jgp.0b013e3182006a7f>.
- 24 Knight S, Latini DM, Sadetsky N *et al.* Education predicts quality of life among men with prostate cancer cared for in the department of veterans affairs. *Cancer* 2007; **109**: 1769–1776.
- 25 Drageset J, Eide G, Ranhoff A. Better health-related quality of life (mental component summary), having a higher level of education, and being less than 75 years of age are predictors of hospital admission among cognitively intact nursing home residents: a 5-year follow-up study. *Patient Prefer Adherence* 2016; **10**: 275, 282.
- 26 McCullagh E, Brigstocke G, Donaldson N, Kalra L. Determinants of caregiving burden and quality of life in caregivers of stroke patients. *Stroke* 2005; **36**: 2181–2186.
- 27 Morimoto T, Schreiner AS, Asano H. Caregiver burden and health-related quality of life among Japanese stroke caregivers. *Age Ageing* 2003; **32**: 218–223.
- 28 Farina N, Page T, Daley S *et al.* Factors associated with the quality of life of family carers of people with dementia: a systematic review. *Alzheimers Dement* 2017; **13**: 572–581. <https://doi.org/10.1016/j.jalz.2016.12.010>.
- 29 Duggleby W, Williams A, Wright K, Bollinger S. Renewing everyday hope: the hope experience of family caregivers of persons with dementia. *Issues Ment Health Nurs* 2009; **30**: 514–521.
- 30 Sheline YI, Gado MH, Kraemer HC. Untreated depression and hippocampal volume loss. *Am J Psychiatry* 2003; **160**: 1516–1518.
- 31 Blazquez MH, Cruzado JA. A longitudinal study on anxiety, depressive and adjustment disorder, suicidal ideation and symptoms of emotional distress in patients with cancer undergoing radiotherapy. *J Psychosom Res* 2016; **87**: 14–21.