Investigation of the status and influence factors of caregiver's quality of life on caring for patients with chronic wound during COVID-19 epidemic

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Abstract
The objectives of this study were to investigate the status and influence factors of caregiver’s quality of life (QOL) on caring for patients with chronic wound during COVID-19 epidemic. A prospective cross-sectional study of 83 informal caregivers was included. The characteristics of informal caregivers as well as their QOL assessment by the Family Dermatology Life Quality Index (FDLQI) were measured, respectively. Single-factor analysis and multiple regression analysis were carried out to explore the independent influence factors of QOL of caregiver on caring for patient with chronic wound. 62.65% of the caregivers were female with a mean age of (54.24 ± 12.6) years, and 34.9% of the caregivers were parents. The mean FDLQI score was 13.01 ± 7.53 at a high level. The following variables influenced the FDLQI scores of caregivers: self-care ability of patients, patient’s satisfaction of home-based wound care, and home-based wound care need of caregivers. The model was able to explain 29.9% of variance in QOL of caregiver (F = 6.561, P = .000, R² = 0.299, adjusted R² = 0.253). In conclusion, the impact of chronic wound disease on the QOL of caregivers is heavy during COVID-19 epidemic. Wound professionals are suggested to pay attention to wound care need at home and QOL of caregiver on caring for patients with chronic wound during COVID-19 epidemic and develop tailored wound health education and support programme in order to improve the QOL of caregivers.

Keywords
chronic wound, influence factors, informal caregiver, quality of life, wound care need
INTRODUCTION

The sudden outbreak of Corona virus disease 2019 (COVID-19) has already caused heavy losses in the world. Under the sustained impact of COVID-19 epidemic, it is noteworthy that global tensions have further intensified and the situation of the epidemic in many countries is not optimistic. China is one of the first countries to be seriously affected by the epidemic. In the early stage, almost all hospitals have reduced or shut down outpatient services, meanwhile controlling the number of inpatients to prevent and control the COVID-19 epidemic. However, we should be noticed the fact that other equally deadly medical conditions and diseases are not taking a break. In terms of chronic wound disease, the decision to close wound care departments “will result in unintended negative consequences,” including increased patient visits to emergency departments and the potential for complications from unmanaged, non-healing wounds. The conflict between the need for managing wound and the risk of suffering COVID-19 disease appears to be a particular dilemma for patients with chronic wounds.

It is recommended that patients do not come to the hospital unless absolutely necessary and manage chronic wounds at home to reduce the risk of infection with the virus during the way to medical treatment. Needless to point out, those patients with chronic wounds depend mainly on family care in the particular period and are mostly supported by informal caregivers, like family members in Eastern culture. What’s more, patients with chronic wounds were afraid to seek medical treatment because they are frightened and susceptible to COVID-19. So caregivers replace patients for outpatient medical consultation. Informal caregivers are responsible for the quality of home-based wound care to a large extent. But under the double attack of caring tasks and epidemic, caregivers may face the physical, psychological, emotional, social, and financial challenges when caring for patients. They have great concern on home care, which urges us to collect more information and investigate on this since we are not only caring patients but also caregivers. Furthermore, it is important for wound staff to understand the factors that affect the QOL of caregiver to help professionals developing tailored interventions to better support the caregivers and improve the patient outcomes as far as possible during COVID-19 epidemic.

The aims of the study were to investigate the status and influence factors of caregiver’s quality of life (QOL) on caring for patients with chronic wound during COVID-19 epidemic in Shanghai, China.

Key messages

- patients with chronic wounds depend mainly on family care in the particular period and are mostly supported by informal caregivers in Eastern culture
- it is important for wound staff to understand the status and the factors that affect the quality of life (QOL) of caregiver to help professionals developing tailored interventions to better support the caregivers and improve the patient outcomes as far as possible during COVID-19 epidemic, but we found little related studies
- the study covers the ability of the caregivers and their needs on caring chronic wound patients at home during COVID-19 epidemic
- caregivers of patients with chronic wound experience a high level of home-based wound care need and the impact of chronic wound disease on the QOL of caregivers are heavy during COVID-19 epidemic
- self-care ability of patients, patient's satisfaction of home-based wound care, and home-based wound care need of caregivers were the major determinants of caregivers' QOL

MATERIALS AND METHODS

2.1 Design

We conducted a prospective cross-sectional study.

2.2 Samples

Outpatient services were strictly restricted from February to April 2020 in Shanghai, China, for COVID-19 outbreak, so we selected samples from this period. Consecutive caregivers of patients with chronic wounds were investigated from one single wound healing centre of a teaching hospital in Shanghai, China, from March 2020 to April 2020. Samples were included if they (a) were informal caregivers of patients with wounds more than 4 weeks and were older than 18 years, (b) had no professional nursing training, (c) were aged at least 18 years old, (d) provided unpaid home care. The exclusion criteria for the caregivers were (a) had malignant disease or mental disorder, (b) had overwhelming changes in life within a month (eg, loss child or spouse), and (c) refused to participate in the study.
The study was approved by the hospital’s Ethics Committees. Study objectives and details were explained to all eligible samples. Participants who agreed to take part in the study were asked to scan quick response (QR) code by their phone to finish an online survey like SurveyMonkey. It allowed caregivers to finish the questionnaires in a short time. Average survey completion time was 7 minutes.

2.3 Measures

We chose the potential variables based on Stress/Health Process model, which emphasised that the stress of caregivers should be explored from a multidimensional perspective and included primary stressors and secondary stressors. Then we screened out dependent variables according to clinical experience, literature review, and brain storming as well as our related research of caregivers’ burden. In this study, the primary stressors included patients’ wound-related information, self-care ability, and patient’s satisfaction of home-based wound care; the secondary stressors included caregivers’ sociodemographic information, caregiving-related information, and home-based wound care need.

Caregivers were asked to provide (a) sociodemographic information including age, sex, educational status, marital status, employment status, and health status; (b) caregiving-related information including relationship with the patient, whether living with the patient, the number of persons sharing care tasks, whether changing the dressing at home during COVID-19 epidemic; 3) patients’ information including aetiology of wound, number of wound, and self-care ability and patients’ satisfaction of home-based wound care. Caregivers were also asked to complete two instruments to measure their home-based wound care need (self-designed inventory) and QOL (Family Dermatology Life Quality Index, FDLQI). The Chinese FDLQI is a 10-item questionnaire measuring QOL of caregivers. All items are scored on a four-point scale, from 0 (never) to 3 (very much). Each question inquires about the caregiver’s perception of a certain specific impact on his/her QOL over the last 1 month. The total scores of FDLQI range from 0 to 30. Higher total FDLQI scores indicate greater impairment of the caregivers’ QOL.

2.4 Statistical analysis

Data analysis was carried out by using the SPSS17.0 statistics software. The main outcomes in this study were wound care need and QOL status of caregivers. Continuous variables and categorical variables were calculated as (means±SD) and (frequencies and percentages), respectively. Meanwhile, t-test or analysis of variance (ANOVA) was used for categorical independent variables analysis. Spearman correlation coefficients were calculated for continuous variables to explore the correlation between the characteristics of caregivers and their QOL. Furthermore, variables considered as significant by univariate analyses were entered into multiple linear regression analysis to identify influencing factors associated with caregivers’ QOL. Significance was considered as P < .05.

3 RESULTS

3.1 Caregiver characteristics

During the study period, five potential informants refused to participate in the study because their phones could not scan the QR code. Finally, a total of 83 caregivers met the inclusive criterion and completed the investigation. The characteristics of caregivers are shown in Table 1. 62.65% was female and the mean age was 54.24 (range 24–88) years. 84.3% of the caregivers were married and 59% considered their healthy status were good. The relationship between caregiver and patient was as follows: 34.9% were parents, 32.5% were children, 22.9% were spouse, and 9.7% were recognised as “other”. With respect to the caregivers “educational and employment status, 37.3% received higher education and 55.4% were unemployed or retired. In the meantime, 69.9% of caregivers were living with the patients and 15.66% hadn’t any others to share care tasks. Besides, 72.3% of caregivers had changed the wound dressing of patients at home during COVID-19 epidemic. In point of patients’ self-care ability, 39.76% were complete dependence, 28.92% were partial self-care, and 31.33% were complete self-care. The result of wound aetiology was as follows: pressure injury (44.6%), diabetic foot ulcer (13.3%),
| Characteristic                          | Mean | SD  | Range  | Number | %    |
|----------------------------------------|------|-----|--------|--------|------|
| Age                                    | 54.24| 12.60| 24 to 88 | /      | /    |
| Sex                                     |      |     |        | 31     | 37.3 |
| Male                                   | /    | /   | /      | 31     | 37.3 |
| Female                                 | /    | /   | /      | 52     | 62.7 |
| Education level                        |      |     |        |        |      |
| Junior middle school or below          | /    | /   | /      | 24     | 28.9 |
| Senior high school                     | /    | /   | /      | 28     | 33.7 |
| College/university or above            | /    | /   | /      | 31     | 37.3 |
| Marital status                         |      |     |        |        |      |
| Single                                 | /    | /   | /      | 13     | 15.7 |
| Married                                | /    | /   | /      | 70     | 84.3 |
| Employment status                      |      |     |        |        |      |
| Full-time job                          | /    | /   | /      | 31     | 37.3 |
| Part-time job                          | /    | /   | /      | 48     | 57.8 |
| Unemployed or retired                  | /    | /   | /      | 4      | 4.8  |
| Health status                          |      |     |        |        |      |
| Good                                   | /    | /   | /      | 49     | 59.0 |
| Fair                                   | /    | /   | /      | 31     | 37.3 |
| Poor                                   | /    | /   | /      | 3      | 3.6  |
| Relationship with the patient          |      |     |        |        |      |
| Spouse                                 | /    | /   | /      | 19     | 22.9 |
| Parents                                | /    | /   | /      | 29     | 34.9 |
| Son or daughter/in-law                 | /    | /   | /      | 27     | 32.5 |
| Other                                  | /    | /   | /      | 8      | 9.6  |
| Living with the patient                |      |     |        |        |      |
| No                                     | /    | /   | /      | 25     | 30.1 |
| Yes                                    | /    | /   | /      | 58     | 69.9 |
| Number of persons sharing care tasks   |      |     |        |        |      |
| None                                   | /    | /   | /      | 13     | 15.7 |
| One person                             | /    | /   | /      | 36     | 43.4 |
| Two person                             | /    | /   | /      | 27     | 32.5 |
| Three person and above                 | /    | /   | /      | 7      | 8.4  |
| Changing the dressing                  |      |     |        |        |      |
| No                                     | /    | /   | /      | 23     | 27.7 |
| Yes                                    | /    | /   | /      | 60     | 72.3 |
| Patient’s satisfaction of home-based wound care |      |     |        |        |      |
| Completely satisfied                   | /    | /   | /      | 18     | 21.7 |
| Partially satisfied                    | /    | /   | /      | 43     | 51.8 |
| Completely dissatisfied                | /    | /   | /      | 22     | 26.5 |
| Home-based wound care need score       | 48.64| 10.134| 20–60 | /      | /    |
| FDLQI score                            | 13.01| 7.538| 0–30   | /      | /    |

Note: “/” means “not available”.
venous leg ulcer (10.8%), trauma (10.8%), and others (20.5%). Furthermore, 57.8% of patients had one wound. In terms of patients’ satisfaction of home-based wound care, 21.69% were completely dissatisfied.

The results of score of caregivers’ home-based wound care need are shown in Figure 1. The mean wound care need score was 48.64 ± 10.13 at a high level during COVID-19 epidemic. Furthermore, the highest caregivers’ demand of wound care at home was on the instruction for prevention of wound complications, followed by instruction for management of wound complications, instruction for periwound skin care, instruction for judging the improvement of wounds, instruction for selecting wound dressing. This meant that the first 30% of the caregivers’ demand during COVID-19 epidemic were focused on prevention and management of complications, instruction for selecting wound dressing, and follow-up instruction on chronic wounds.

3.2 Current status and influencing factors of caregiver’s QOL on caring for patients with chronic wound

The mean FDLQI score was 13.01 ± 7.53, which was at a high level. Through single-factor analysis, caregiver’s relationship with the patient, caregiver’s educational status, and patient’s self-care ability, patient’s satisfaction of home-based wound care, and caregiver’s home-based wound care need were associated with caregiver’s QOL (Table 2). In the analysis of influencing factors, three factors were included in the final multiple linear regression model (Table 3) and were considered to be independently associated with caregiver’s QOL. The independent impact factors were self-care ability of patient, patient’s satisfaction of home-based wound care, and home-based wound care need of caregiver. In addition, the model was able to explain 29.9% of variance in QOL of caregiver ($F = 6.561$, $P = .000$, $R^2 = 0.299$, adjusted $R^2 = 0.253$). A lower level of patient’s self-care ability, a lower degree of patient’s satisfaction of home-based wound care, and higher home-based wound care need of caregiver were associated with greater impairment of the caregivers’ QOL.

4 DISCUSSION

The COVID-19 pandemic will certainly shape the future of health care in general. Undoubtedly, home-based care services play a unique role in the treatment of patients with chronic disease in this particular period. We have to notice that the shift from hospital to home care places may increase demands and burden on family caregivers, especially for those patients with chronic wounds. The data showed that most of caregivers changed the wound dressing for patients at home during COVID-19 epidemic. Being conscious of the unprecedented challenges and the special demand of home care that patients and caregivers face during their recovery is the first step we can take to help them maintain resilience and get back on track. This study attempted to explore the current condition of caregiver’s home-based wound care need and QOL.
The results indicated that caregivers of patients with chronic wound had a high level of home-based wound care need. What's more, 21.69% of patients were completely dissatisfied on the outcome of home-based wound care. This probably meant that family caregivers were not prepared enough and equipped necessary knowledge and skills to provide home-based wound care. Chronic wounds require persistent management from providers as patients with mismanaged wounds can suffer

### Table 2
Comparison of caregiver's QOL and various variables by single-factor analysis

| Independent variable | Caregiver's QOL | t/F/correlation | P   |
|----------------------|-----------------|----------------|-----|
| Caregiver            |                 |                |     |
| Age                  | 12.00           | 0.115          | .302|
| Sex                  |                 |                |     |
| Male                 | 13.62           |                |     |
| Female               |                |                |     |
| Educational status   |                 |                |     |
| Junior middle school or below | 15.46 | 3.795 | .027* |
| Senior high school   | 10.07           |                |     |
| College/university or above | 13.77 |          |     |
| Marital status       |                 |                |     |
| Single               | 12.62           | −0.205         | .838|
| Married              | 13.09           |                |     |
| Employment status    |                 |                |     |
| Full-time job        | 11.19           | 2.056          | .135|
| Part-time job        | 14.42           |                |     |
| Unemployed or retired | 10.25          |                |     |
| Health status        |                 |                |     |
| Good                 | 13.08           | 0.014          | .986|
| Fair                 | 12.97           |                |     |
| Poor                 | 12.33           |                |     |
| Home-based wound care need | /      | 0.327          | .003**|
| Caregiving-related   |                 |                |     |
| Relationship with the patient |       |                |     |
| Spouse               | 15.89           | 3.374          | .022*|
| Parents              | 9.97            |                |     |
| Son or daughter/in-law | 14.74          |                |     |
| Other                | 11.38           |                |     |
| Living with the patient |            |                |     |
| No                   | 13.28           | 0.211          | .833|
| Yes                  | 12.90           |                |     |
| Number of persons sharing care tasks |       |                |     |
| None                 | 14.31           | 1.023          | .387|
| One person           | 13.86           |                |     |
| Two person           | 12.30           |                |     |

**Note:** In the single-factor analysis, the independent variables were considered to be associated with caregiver's QOL at the level of $P \leq .05$. *$P \leq .05$, **$P \leq .01$.**

(Continues)
from unintended negative consequences including increased patient visits to emergency departments and the possibility for complications from unmanaged, non-healing wounds including wound infection, sepsis, limb amputation, and even death. The first 30% of the caregivers’ demand during COVID-19 epidemic were focused on prevention and management of complications, instruction for selecting wound dressing, and follow-up instruction on chronic wounds. The wound staff may take into account these major demands of caregivers during the short course of their clinic visits and impart on caregivers the related knowledge and assessment skills. Besides, consider treatments that can be applied safely and easily while decreasing dressing change frequency and helping to reduce the risk of complications at home. Healthcare providers can provide more detailed health guidance with video tutorials or by the telemedicine. We have to reinforce education of patients and family caregivers to promote independence and help them face the unprecedented challenges posed by the illness of COVID-19.

Some studies had showed that chronic wounds had negative impact on patients’ QOL, but their caregiver’s QOL had received less attention and little known about the determinants. The finding was consistent with previous reports on caregivers of chronic skin disease. The sudden outbreak of COVID-19 epidemic broke the caregiver’s life arrangement. They had to take the role of home-based wound care, such as implementation of dressing change, daily life care, monitoring wound prognosis, and so on. If caregivers lacked effective support and information input, they may experience a major impact on their lives such as physical and mental exhaustion, social disruption, and financial problems. The result of this study indicated that the effect of chronic wounds on family caregivers was significantly high and should not be underestimated. Wound professionals need to quickly and accurately assess caregiver’s QOL to identify those in need of intervention. According to the result of multiple linear regression analysis, finally three factors were identified to be associated with caregiver’s QOL. We find that the lower the patient’s self-care ability, the greater the impact on the caregiver’s life. Patients with lower level of self-care ability may be more dependent on caregivers during COVID-19 epidemic. For example, 44.6% of the wound aetiology was pressure injury. Those patients not only need wound dressing, more importantly, they need frequent position management to improve the prognosis of wound. Patient’s satisfaction of home-based wound care and home-based wound care need of caregiver were other contributory factors of caregiver’s QOL. The possible explanations for the relationship may be that, on the one hand, patients “dissatisfaction increased the psychological impact on caregivers and on the other hand complex wound condition was beyond caregivers” capacity and made them have a sense of uselessness and lack of confidence. Wound staff may improve the confidence and caring experience of caregivers by considering the easiest solution for independent application for caregivers and reducing confusion and the demand for additional supply procurement. Furthermore, wound outpatient service should give priority to patients with complicated wounds like at high risk for infection, those that require sharp or surgical debridement, or being treated with advanced adjuvant therapy (eg, negative pressure wound therapy). Family caregivers may adapt to the role change more quickly to provide better home-care service for patients with chronic wound with targeted medical support. It is very important that wound staff keep balance of the need for patient and caregiver safety while coordinating patient care in a productive way to reduce emergency condition or severe complications and to improve the patient outcome during COVID-19 epidemic. In view of the study limitation, the study was limited by a relatively small sample size due to the impact of COVID-19 epidemic. Besides, for caregivers who did not have phone or cannot scan QR code, they would be excluded from the study, which may affect the generalisation of the results.

| Model                                      | Unstandardised coefficients | Standardised coefficients |   |   |
|---------------------------------------------|-----------------------------|--------------------------|---|---|
| (Constant)                                  | −6.627                      | 4.576                    | / |   |
| Self-care ability of patient                | 3.041                       | 0.896                    | 0.341 | 3.395 | .001 |
| Patient’s satisfaction of home-based wound care | 2.423                      | 1.092                    | 0.224 | 2.220 | .029 |
| Home-based wound care need of caregiver     | 0.221                       | 0.074                    | 0.296 | 2.970 | .004 |

Note: In the multiple linear regression analysis, variables were considered to be associated with caregiver’s QOL at the level of $P \leq .05$ ($F = 6.561, P = .000, R^2 = 0.299, \text{adjusted } R^2 = 0.253$).
In conclusion, caregivers of patients with chronic wound experience a high level of home-based wound care need, and the impact of chronic wound disease on the QOL of caregivers is heavy during COVID-19 epidemic. In particular, self-care ability of patients, patient’s satisfaction of home-based wound care, and home-based wound care need of caregivers were the major determinants of caregivers’ QOL. Wound professionals are suggested to pay attention to wound care need at home and QOL of caregiver of patients with chronic wound during COVID-19 epidemic and develop tailored wound health education and support programme in order to enhance the QOL of caregivers and thereby improve patient outcome.

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AUTHORS’ CONTRIBUTIONS
Yao Huang, BeiQian Mao: study design. Yao Huang, PengWen Ni: data collection. Yao Huang, BeiQian Mao: data analysis. Yao Huang, Qi Wang: drafting of the manuscript. Lili Hou, Ting Xie: critical modification to the paper. Lili Hou, Ting Xie: supervised the study.

CONFLICT OF INTEREST
The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

DATA AVAILABILITY STATEMENT
The data that support the findings of this study are available from the corresponding author upon reasonable request.

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