

Prevalence and Correlates of Caregiver Anxiety in Family Caregivers of Patients With Advanced Cancer: a Cross-Sectional Study in a Palliative Care Unit in Hong Kong

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CME

Abstract

Objectives: To assess the prevalence of caregiver anxiety and to identify correlates of caregiver anxiety in family caregivers of patients with advanced cancer in a palliative care unit in Hong Kong.

Methods: Family caregivers of patients admitted to the palliative care ward for the first time between July 2019 and September 2019 were screened for recruitment. Caregiver demographics (age, sex, marital status, occupation, education level, housing condition, relationship with the patient, known diagnosis of anxiety or depression, and Charlson comorbidity index) were collected, as were caregiver understanding of patient's diagnosis and prognosis, perceived patient's distress, frequency of witnessing confusion or delirium of patients in past month, perceived adequacy of psychological support (other than general social support), and perceived anxiety towards patient's approaching death. Caregiver anxiety was assessed using the 7-item Generalised Anxiety Disorder scale (GAD-7). Caregiver depression status was assessed using the 9-item Patient Health Questionnaire (PHQ-9). Caregiver psychological well-being was assessed using the 11-item Psychological Well-being Scale for Family Caregivers (PWS-C). Caregiver overall burden was assessed using the Chinese version of the 13-item Modified Caregiver Strain Index (C-M-CSI).

Results: 70 caregivers (of 66 patients) were included, with a response rate of 98.6%. 16 (22.9%) caregivers had moderate to severe anxiety (GAD-7 score of ≥ 10). The GAD-7 score was higher in female caregivers than in male caregivers (mean rank: 39.26 vs 27.83, $p = 0.026$). 26 (37.1%) caregivers had depression (PHQ-9 score of ≥ 7). The GAD-7 score of caregivers was associated with the PHQ-9 score ($r_s = 0.834$, $p < 0.01$), the four subscales of PWS-C: social support ($r_s = -0.308$, $p = 0.01$), life meaning ($r_s = -3.30$, $p < 0.01$), emotional distress ($r_s = 0.615$, $p < 0.01$), and caregiver inadequacy ($r_s = 0.41$, $p < 0.01$), and the C-M-CSI score for caregiver overall burden ($r_s = 0.332$, $p < 0.01$). In multiple linear regression, predictors for GAD-7 score were the PHQ-9 score, caregiver's feeling of anxiety towards patient's approaching death, and caregiver sex.

Conclusions: 22.9% of family caregivers of patients with advanced cancer have moderate to severe anxiety. Anxiety of caregivers was associated with depression, caregiver's feeling of anxiety towards patient's approaching death, psychological support, and life meaning. All these are potentially amendable by interventions. A structured screening of anxiety in family caregivers of patients with advanced cancer should be considered as routine practice.

Key words: Anxiety; Caregivers; Caregiver burden; Depression; Hospice and palliative care nursing; Patient Health Questionnaire

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Introduction

Caregivers play an important role in supporting patients with terminal disease who have complex needs.¹ Anxiety of family caregivers may surpass that of patients.² Caregiving

affects the caregiver's physical and mental health, family communication, social activities, work and finances, and social identity.³⁻⁵

According to the Multinational Association of Supportive Care in Cancer, caregivers are at risk of anxiety regardless of sex, age, or ethnicity.⁶ In a cross-sectional study of 345 caregivers of advanced cancer patients, 34.1% of caregivers had anxiety and increased caregiver burden, and spouse and parent caregivers were more prone to anxiety symptoms.⁷ Among 1711 community-dwelling people in France over 12 years, anxiety was associated with female sex, recent adverse life events, chronic physical illness, and chronic mental disorder (depression, phobia,

and past generalised anxiety disorder).⁸ Among 112 family caregivers of patients with terminal cancer in Portugal, age and sex of caregiver and relationship with the patient played an important role in developing psychological morbidity.⁹ The prevalence of anxiety is high among caregivers.^{7,10,11} In 74 family caregivers of patients with advanced cancer in Germany, 43% of caregivers had anxiety as assessed by the 7-item General Anxiety Disorder scale (GAD-7).¹² In 345 caregivers of patients with advanced cancer in Austria, 34.1% of caregivers had anxiety as assessed by the Hospital Anxiety and Depression Scale (HADS).⁷ The prevalence of anxiety in caregivers of cancer patients was 34.9% as measured by the 2-item General Anxiety Disorder scale.¹⁰

The effect of caregiving on emotional well-being in Chinese populations has been reported.¹³⁻¹⁷ In 21 caregivers of patients with advanced cancer, perceived difficulties in caregiving included relationship with care receiver, emotional reactions to caring, physical demands, and restricted social life.¹⁴ Structured interview and interpretive phenomenology analysis of seven widows revealed insights for psychosocial care in hospice settings.¹⁵ The present study aims to determine the prevalence and correlates of anxiety among family caregivers of patients with advanced cancer in a palliative care unit in Hong Kong.

Methods

This prospective cross-sectional study was approved by the Kowloon Central / Kowloon East Cluster Research Ethics Committee (reference: KC/KE-18-0293/ER-1). Written informed consent was obtained from each patient and family caregiver. According to the National Institute for Health and Clinical Excellence, a caregiver is defined as a lay person in a close supportive role who shares in the illness experience and undertake vital care work and emotion management of the patient.¹⁸ Family caregivers include those related through committed heterosexual or same sex partnerships, birth and adoption, and others who have strong emotional and social bonds with the patient.

Family caregivers of patients who admitted to the palliative care ward for the first time between July 2019 and September 2019 were screened for recruitment. Those who were aged >18 years and bore the most responsibility in daily caring in home or institution settings as suggested by the patient and/or family were included. When more than one caregiver was suggested, all were invited to participate. Caregivers who were unable to communicate in Chinese or understand the questionnaires were excluded, as were paid caregivers including domestic helpers or aged home staff. Assuming the monthly number of caregivers recruited was 30 and the estimated response rate was 77.4%,¹³ the number of caregivers recruited in 3 months was estimated to be 70.

Patient data such as age, sex, site of primary tumour, medical and psychiatric conditions were collected, as were the Palliative Performance Scale (a cutoff of <70% is defined as appropriate for hospice care) and the 10-item Edmonton Symptom Assessment Scale¹⁹ (each item is rated

from 0 to 10; higher scores indicate worse symptoms).

Caregiver demographics (age, sex, marital status, occupation, education level, housing condition, relationship with the patient, known diagnosis of anxiety or depression, and Charlson comorbidity index) were collected, as were caregiver understanding of patient's diagnosis and prognosis,³ perceived patient's distress,²⁰ frequency of witnessing confusion or delirium of patients in past month,²¹ perceived adequacy of psychological support (other than general social support),⁹ and perceived anxiety towards patient's approaching death.²²

Caregiver anxiety was assessed using the GAD-7, which was validated to diagnose generalised anxiety disorder among 2740 primary care patients.²³ A cut-off score of 10 has 89% sensitivity and 82% specificity.²³ In Chinese outpatients, the cut-off score of 10 has 86% sensitivity and 95.5% specificity when compared with structured clinical interview for DSM-IV.^{24,25} A score of 0 to 4 is defined as minimal anxiety, whereas 5 to 9 as mild, 10 to 14 as moderate, and 15 to 21 as severe.²³

Caregiver depression status was assessed using the 9-item Patient Health Questionnaire (PHQ-9).²⁶ Each item was rated in a Likert scale of 0 to 3; higher scores indicate poorer health. The Chinese version was validated; the cut-off score of 7 has 86% sensitivity and 86% specificity in detecting major depression.²⁷

Caregiver psychological well-being was assessed using the 11-item Psychological Well-being Scale for Family Caregivers (PWS-C), which was developed and validated by clinical psychologists in the Caritas Medical Centre in Hong Kong.²⁸ The 11 items are grouped in five subscales: social support, life meaning, caregiving inadequacy, emotional distress, and hospital care. Each item statement is rated from 0 (completely disagree) to 10 (completely agree). The cut-off points for different domains are based on the 1.5 standard deviation of the mean from the original sample. The PWS-C scores are moderately correlated with the HADS scores.

Caregiver overall burden was assessed using the Chinese version of the 13-item Modified Caregiver Strain Index (C-M-CSI). The C-M-CSI can be administered by caregivers themselves or by interviewer to assess caregivers' reactions to impairment and objective (changing personal plans) and subjective (feeling completely overwhelmed) impacts of caregiving.^{29,30} Each item is rated from 0 (none) to 2 (often); total scores range from 0 to 26; higher scores indicate higher overall burden level. Although there is no validated cut-off score, the C-M-CSI helps in the assessment of overall burden of caregiving.

Caregivers at low risk of anxiety or depression were provided with general support by the palliative care team; those at moderate and high risks were referred to medical social worker or clinical psychologist for interventions.

Data were analysed using the SPSS (Windows version 21; IBM Corp, Armonk [NY], US). Normality was tested using the Shapiro-Wilk test. Association of GAD-7 score with PHQ-9 score, PWS-C score, and caregiver

demographics were assessed using the Spearman rank correlation coefficient, the Mann-Whitney *U* test, or the Kruskal-Wallis test, as appropriate. Factors with significant association with GAD-7 score were analysed using multiple linear regression to determine independent factors. All *p* values were two-tailed; a *p* value of <0.05 was considered statistically significant. Bonferroni correction was used for repeated testing.

Results

85 consecutive patients admitted to the palliative care ward were screened. 13 deteriorated rapidly and were unable to give consent; three had no family caregivers; and two were non-cancer patients. The remaining 67 patients had 71 family caregivers, of whom one was unable to understand Chinese and was excluded. Thus, 70 caregivers (of 66 patients) were included, with a response rate of 98.6% (70/71).

The mean age of 33 female and 33 male patients was 70.1±13.2 years. The three most common sites of primary cancer were the gastrointestinal tract (34.8%), hepatobiliary tract (21.2%), and lung (18.2%). The three most common comorbidities were hypertension (45.5%), diabetes (25.8%), and dyslipidaemia (21.2%). One patient had a history of anxiety and one had a history of depression. The median duration of receiving palliative care service was 64 (interquartile range [IQR], 14-212.5) days. The median Palliative Performance Scale was 50% (IQR, 40%-60%); a cutoff of <70% is defined as appropriate for hospice care. The median Edmonton Symptom Assessment Scale score was 24 (IQR, 11.5-35); the four worse symptoms were pain (5 [IQR, 0-7.5]), poor appetite (5 [IQR, 1-8]), tiredness (4 [IQR, 0-7]), and feeling of well-being (5 [IQR, 2.5-7]).

The mean age of 47 female and 23 male family caregivers was 54.2±12.8 years (Table 1). 50% of caregivers were spouse of the patients and 41.4% were children. 48.6% of caregivers were unemployed, 12.9% had a part-time job, and 38.6% had a full-time job. 78.6% of caregivers were living with patients, and 95.7% of patients were cared for at home. Only one caregiver had a history of depression, and none had a history of anxiety. The median Charlson Comorbidities Index was 1.4 (IQR, 0.6-2.7).

70% of caregivers perceived patients having severe distress. 45.7% of caregivers had ever witnessed confusion in past 1 month. 54.3% of caregivers felt anxious towards patient's approaching death to a certain extent. 81.4% of caregivers perceived having adequate psychological support. 81.4% of caregivers had good understanding of patient's illness and prognosis.

The median PHQ-9 score was 5 (IQR, 2-9); 26 (37.1%) caregivers had depression (PHQ-9 score of ≥7). The median PWS-C score was high in subscales of social support (9.5 [IQR, 7.5-10]), life meaning (9.2 [IQR, 8-10]), and hospital care (10 [IQR, 10-10]) and was low in caregiver inadequacy (2 [IQR, 0-5]) and emotional distress (2 [IQR, 0-5]). <10% of caregivers had score beyond normal cut-off in subscales of life meaning, caregiver inadequacy, and hospital care.

Table 1. Demographics, health status, and psychological status of caregivers (n=70)

	Value*
Age, y	54.2±12.8 (18-88)
Sex	
Male	23 (32.9)
Female	47 (67.1)
Marital status	
Single	12 (17.1)
Married	55 (78.6)
Divorced	3 (4.3)
Occupation status	
Full time	27 (38.6)
Part time	9 (12.9)
Unemployed	34 (48.6)
Education level	
Never	3 (4.3)
Primary	14 (20.0)
Secondary	40 (57.1)
Tertiary	13 (18.6)
Living with patient	55 (78.6)
Hours per week spent in caregiving	45.5 (14-168)
Fulltime (168 hours/week)	30 (42.9)
Place for care of patient	
Home	67 (95.7)
Institution	3 (4.3)
Housing	
Private	22 (31.4)
Public	48 (68.6)
Financial status	
Salary	35 (50)
Saving	19 (27.1)
Comprehensive Social Security Assistance	5 (7.1)
Support by family members	11 (15.7)
Relationship with patient	
Spouse	35 (50)
Child	29 (41.4)
Others	6 (8.6)
Having other caregiver	39 (55.7)
Religion	
Christian	8 (11.4)
Catholic	2 (2.9)
Buddhism	7 (10)
Tradition Chinese	12 (17.1)
No formal religion	41 (58.6)
Past psychiatric history	
Depression	1 (1.4)
Anxiety	0 (0)

* Data are presented as mean ± standard deviation (range), No. (%) of caregivers, or median (interquartile range)

Table 1. (cont'd)

	Value*
Past medical history	
Diabetes mellitus	11 (15.7)
Myocardial infarction	4 (5.71)
Mild liver disease	1 (1.4)
Cerebrovascular disease	1 (1.4)
Solid cancer	1 (1.4)
Charlson Comorbidities Index	1.4 (0.6-2.7)
Patient Health Questionnaire-9 score (cut-off ≥ 7)	5 (2-9)
Psychological Well-being Scale for Family Caregivers	
Social support (cut-off < 7)	9.5 (7.5-10)
Life Meaning (cut-off < 6)	9.2 (8-10)
Emotional distress (cut-off > 7)	2 (0-5)
Caregiver inadequacy (cut-off > 7)	2 (0-5)
Hospital care (cut-off < 8)	10 (10-10)
Chinese version of the Modified Caregiver Strain Index score	8 (4-14.3)
Q3: It is a physical strain	0 (0-1)
Q8: Emotional adjustments	1 (0-1)
Q9: Some behaviour upsetting	0 (0-1)
Q13: Feeling completely overwhelmed	0 (0-1)

The median C-M-CSI score for caregiver overall burden was 8 (IQR, 4-14.3).

16 (22.9%) caregivers had moderate-to-severe anxiety symptoms, and 22 (31.4%) caregivers had mild anxiety symptoms. The GAD-7 score of caregivers was not associated with patients' age, site of primary cancer, medical history, palliative performance scale, Edmonton Symptom Assessment Scale, or duration of receiving palliative care service. The GAD-7 score was higher in female caregivers than in male caregivers (mean rank: 39.26 vs 27.83, $p = 0.026$, Table 2).

The GAD-7 score of caregivers was associated with the frequency of witnessing patient confusion or delirium in previous month ($p = 0.017$), caregivers' feeling of anxiety towards patient's approaching death ($p = 0.001$), and caregivers' perceived adequate psychological support ($p < 0.05$) [Table 2].

The GAD-7 score of caregivers was associated with the PHQ-9 score ($r_s = 0.834$, $p < 0.01$), the four subscales of PWS-C: social support ($r_s = -0.308$, $p = 0.01$), life meaning ($r_s = -3.30$, $p < 0.01$), emotional distress ($r_s = 0.615$, $p < 0.01$), and caregiver inadequacy ($r_s = 0.41$, $p < 0.01$), and the C-M-CSI score for caregiver overall burden ($r_s = 0.332$, $p < 0.01$) [Table 2]. However, after Bonferroni correction, association was significant only for question 13 "I feel completely overwhelmed" ($r_s = 0.471$, $p < 0.00004$).

In multiple linear regression with forward selection

Table 2. Correlation of the Generalised Anxiety Disorder scale score of caregivers with demographics, health status, and psychological status of caregivers

	p Value or r_s (p value)
Age	0.502
Sex	0.026 ($Z = -2.219$)
Marital status	0.193
Occupation status	0.346
Education level	0.626
Living with patient	0.165
Hours per week spent in caregiving	0.66
Place for care of patient	0.62
Housing (private vs public)	0.529
Financial status	0.74
Relationship with patient	0.84
Having other caregivers	0.10
Religion	0.828
Charlson Comorbidities Index	0.83
Patient Health Questionnaire-9 score	0.834 ($p < 0.01$)
Psychological Well-being Scale for Family Caregivers	
Social support	-0.308 ($p = 0.01$)
Life meaning	-3.30 ($p < 0.01$)
Emotional distress	0.615 ($p < 0.01$)
Caregiver inadequacy	0.41 ($p < 0.01$)
Chinese version of the Modified Caregiver Strain Index	0.332 ($p < 0.01$)
Q3: It is a physical strain	0.27 ($p = 0.024$)
Q8: Emotional adjustments	0.318 ($p = 0.007$)
Q9: Some behaviour upsetting	0.313 ($p = 0.008$)
Q13: Feeling completely overwhelmed	0.471 ($p = 0.00004$)
Perceived patient's distress	H(3) = 3.3 ($p = 0.354$)
Witnessed patient's confusion, delirium in previous month	H(3) = 10.2 ($p = 0.017$)
Feeling of anxiety towards patient's approaching death	H(3) = 17.5 ($p = 0.001$)
Perceived adequate psychological support	
No	Mean rank = 48.4 ($p < 0.05$)
Yes	Mean rank = 32.6
Perceived understanding of illness and prognosis of the patient condition	H(3) = 3.7 ($p = 0.30$)

method, predictors for GAD-7 score were the PHQ-9 score, caregiver's feeling of anxiety towards patient's approaching death, and caregiver sex (Table 3).

Discussions

The prevalence of anxiety in caregivers was 22.9%, which is less than the 34% to 43% reported in oversea studies.^{6,9,11} The difference in prevalence of anxiety may be due to differences in cultural background and social norms³¹ as well as differences in methods of assessment, exclusion of imminently dying patients, and palliative care support before admission.

Caregiver anxiety level was not associated with patient Palliative Performance Scale ($p = 0.412$) or patient symptomatology measured by the Edmonton Symptom Assessment Scale ($p = 0.21$), except for poor appetite ($p = 0.07$). In a study of 33 caregivers in a palliative care setting, patient symptoms were not associated with caregiver anxiety.³² In contrast, a study of 85 caregivers reported that higher patient symptom burden was associated with greater caregiver psychological distress.³³ The patients and caregivers were recruited in an oncology clinic during the first chemotherapy evaluation. Differences in disease trajectory of patients might result in differences in symptoms and management approaches and hence anxiety level of caregivers. In addition, the psychosocial impact of cancer cachexia on caregivers has been reported.³⁴

Caregiver anxiety level was not associated with the duration of receiving palliative care service. Patients admitted to palliative care usually have moderate-to-severe symptoms or complex psychosocial issues, which may be a new stressor to the family caregiver and may confound the effect of the duration of receiving palliative care service. Nonetheless, supportive interventions may help reduce caregiver psychological distress.¹

Relationship with the patient, especially the spouse,

has been reported to be associated with higher caregiver anxiety.^{3,6,10} Although the present study reported no such association, more awareness in supporting the spouse of patients may be needed.

One predictor for GAD-7 score of caregivers was the PHQ-9 score of caregivers. The prevalence of depression in family caregivers was 37.1%, compare with 21.3% and 82.2% reported elsewhere.^{4,7} The prevalence of anxiety and depression among caregivers varies widely.^{8-11,35} A study attempted to identify anxiety and depression as top correlates of caregiver burden by dissecting the caregiving roles and different factors contributing to caregiver burden.³⁶ However, there is no consensus for the positive correlation between anxiety and depression. Early psychological assessment and support should be provided to lessen the psychological burden of family caregivers and to prevent long-term complications.

The GAD-7 score of caregivers was associated with four subscale scores of the PWS-C for caregiver psychological well-being. The subscales of social support and life meaning are grouped as the same factor.²⁸ Higher anxiety level is associated with inadequate social support³⁵ and weak perception of life meaning.³⁷ Meaning in life plays an important role in cancer patients' psychological adjustment.³⁷ Finding a meaning in the experience as a caregiver may buffer against caregiver burden.² The subscale caregiver inadequacy refers to the caregiver's perceived inability to physically and psychologically care for the patient. Imbalance between care demands and perceived resources (internal and external) contributes to the burden of caregiving and is associated with anxiety.²

Higher GAD-7 scores of caregivers were associated with higher C-M-CSI scores for overall caregiver burden. Although the C-M-CSI yields only a single factor in factor analysis, individual items indicate different dimensions of strain in caregiving.²⁹ The financial burden item was not associated with caregiver anxiety in the present study, but

Table 3. Multiple linear regression for predictors of Generalised Anxiety Disorder scale score of caregivers

	B	Standard error	Standardised beta	R²
Step 1				0.689
Constant	0.740	0.559		
Patient Health Questionnaire-9 (PHQ-9) score	0.868	0.071	0.830 ($p < 0.001$)	
Step 2				0.716
Constant	0.091	0.597		
PHQ-9 score	0.810	0.072	0.774 ($p < 0.001$)	
Feeling anxiety towards patient approaching death	1.848	0.735	0.173 ($p < 0.05$)	
Step 3				0.736
Constant	0.753	0.648		
PHQ-9 score	0.798	0.070	0.763 ($p < 0.001$)	
Feeling anxiety towards patient approaching death	1.744	0.715	0.163 ($p < 0.05$)	
Caregiver sex	-1.639	0.721	-0.145 ($p < 0.05$)	

it is a correlate of emotional distress (including anxiety) of caregivers of cancer patients.^{10,36} The positive correlation of caregiver anxiety with item 13 “feeling completely overwhelmed / concerns about how I will manage” echoes the subscale of caregiver inadequacy in the PWS-C.

The GAD-7 score of caregivers was associated with caregivers witnessing patient confusion or delirium, who are 12 times more likely to develop anxiety symptoms.²¹ High level of distress in caregivers is related to the irreversible nature of delirium, especially during palliative care, and hence a sense of helplessness.³⁸

Another predictor of GAD-7 score of caregivers was caregivers’ feeling of anxiety towards patient’s approaching death. Physical deterioration and pain of patients might awaken family caregivers’ own death anxiety.²² Caregivers who expressed greater death anxiety were less accepting the patient’s impending death. Associations between death anxiety, depression, coping, and duration of caregiver experience have been reported.²² Patient’s own death anxiety may be related to fear of distress in dying trajectory or actual moment of death or afterlife and uncertainty.³⁹ The underlying concerns or fears of caregivers warrant further studies.

Caregivers who perceived inadequate psychological support had higher anxiety level. This question aims to assess perceived psychological support as a factor in contrast to the overall social support subscale (“I have adequate support from someone close to me”) in PWS-C. In a study of 188 caregivers, 22% reported having unmet needs in psychological support (which is associated with caregiver anxiety), and 48.3% of caregivers intended to take part in psychosocial support programmes if provided.¹⁰ This indicates that a lower-threshold access to psychological counselling should be provided to caregivers in need.

There are limitations to the present study. Patients and caregivers were recruited from a palliative care ward of an extended care hospital. Our findings may not be generalised to other settings. According to the Hong Kong Cancer Statistics in 2016, the three most common primary sites of cancer were the gastrointestinal tract, lung, and breast, whereas in the present study, the three most common primary site of cancer were the gastrointestinal tract, lung, and hepatobiliary system. Patients referred to palliative care ward usually have difficult symptoms control and complicated psycho-social-spiritual issues, compared with patients in other settings. 13 potential caregivers of terminally ill patients were excluded owing to rapid deterioration of patients after admission. When facing impending death of patients, these caregivers might have a higher level of anxiety, owing to worsening of distressing symptoms (delirium or dyspnoea)⁴⁰ and their fear towards patient’s approaching death. Further studies of this group of caregivers are warranted. Although the questionnaire covered different important domains of caregiving, it was far from comprehensive. Factors should have covered include the coping style of caregiver²⁰ and the attachment style of the patient and the caregiver.⁴¹

Conclusions

22.9% of family caregivers of patients with advanced cancer have moderate to severe anxiety. Anxiety of caregivers was associated with depression, caregiver’s feeling of anxiety towards patient’s approaching death, psychological support, and life meaning. All these are potentially amendable by interventions. A structured screening of anxiety in family caregivers of patients with advanced cancer should be considered as routine practice.

Contributors

All authors designed the study, acquired the data, analysed the data, drafted the manuscript, and critically revised the manuscript for important intellectual content. All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflicts of interest

All authors have disclosed no conflicts of interest.

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Data Availability

All data generated or analysed during the present study are available from the corresponding author on reasonable request.

Ethics approval

The study was approved by the Kowloon Central / Kowloon East Cluster Research Ethics Committee (reference: KC/KE-18-0293/ER-1). The patients were treated in accordance with the tenets of the Declaration of Helsinki. The patients and caregivers provided written informed consent for all treatments and procedures and for publication.

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