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Prioritizing the level of negative emotional coping strategies of cancer patients' family members by using extended hierarchical analysis method

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A B S T R A C T

Caring for cancer patients may create several negative emotions for their family members. Therefore, reducing or alleviating negative feelings are essential in improving mental and physical health of cancer patients' family members. This research aims to identify the priority levels of the strategies used by cancer patients' family members to cope with negative emotions, utilizing Analytic Hierarchy. Next, the proposed model is applied in the cases of Vietnamese cancer patients' family members. Four groups of coping strategies against negative emotions of cancer patients' family members are used in the model, including: (1) positive emotion-focused coping strategies; (2) negative emotion-focused coping strategies; (3) positive action-focused coping strategies; (4) negative action-focused coping strategies.

1. Introduction

Cancer is one of the most common groups of diseases with high mortality rate in the world. According to statistics in 2018 from the World Cancer Research Fund International, an average of 8.2 million deaths and 14.1 million new cases are recorded annually. Approximately 65% of patients live in countries with low to mid-level income. Vietnam is one of the countries with a notable number of patients, with roughly 165,000 new cancer patients and 115,000 deaths in 2018 (WHO, 2018). Some of the common types of cancer nowadays include lung cancer, breast cancer, stomach cancer, colon cancer, cervical cancer, prostate cancer, nasopharynx cancer, etc. (McDonnell et al., 2019; Makena & Rao, 2020). Being diagnosed with a type of cancer will have numerous influences and implications to the emotions of the patient and his/her family members. Additionally, personal habits, daily activities and assigned responsibilities within the family will have to change accordingly. Depending on the current stage of the cancer, family members of the patient will also have to suffer equally, if not significantly more than the cancer patient him/herself. Family members may use different coping strategies in hopes of providing assistance to the patient as well as giving themselves a form of support. When a family member is diagnosed with cancer, it may put the family at risk due to the changes forced

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on relationships among family members, between marriage partners, as well as emotional shock on small children within the family. Cancer diagnosis may also bring personal risks to concerned individuals' mental and physical health. Individuals in charge of taking care of the cancer patient may frequently feel overloaded with their responsibilities and newly assigned roles, and hence they may feel burdened having to provide full-time support as well as emotional support to patients(Woźniak and Iżycki, 2014). Therefore, mental measures against negative emotions of cancer patients' family members have as crucial role as prevention and treatment measures to the patients. Research in prioritizing the level of negative emotional coping strategies of cancer patients' family members help researchers have sufficient understandings on the reality and have necessary support in order to help them get over negative emotions and have positive mental status. Hence, the caring activities of family members can be more effective which enables the treatment effectiveness to the patient.

Nowadays, the analytic hierarchy process (AHP) - developed by Saaty in 1980 - is being utilized widely as a multi-criteria tool in identifying priority levels of evaluative factors in different fields such as business, management, healthcare, education, psychology, etc. The AHP method includes: (i) establishing a pairwise comparison matrix among criteria; (ii) identifying priority weights among factors based on individual values vector according to the highest value; (iii) calculating priority wieghts to select the best alternative. Traditionally, AHP is used with crisp number.However, due to the complexity and unreliability related to decision-making matters in reality, one may feel more confident making decision basing on qualitative evaluation rather than clear, quantitative one. To address this limitation, Laahorven and Pedrycz (1983) expanded the AHP method by applying it on fuzzy number, Chang (1996) applied the AHP method on triangular fuzzy number to construct pairwise comparison matrix and identify vector weights, factor priority ranking. Due to the simplicity in the calculation, the AHP method presented by Chang (1996) was used in many studies to solve decision-making matters in reality. Nevertheless, in some special cases, Chang's AHP method (1996) has led to some errors as pointed out by Wang et al. (2008). To overcome the limitations of Chang's AHP method (1996), this study integrated Chang's AHP method (1996) with that of Wang et al. (2008) to prioritize the level of strategies that family members of cancer patients often apply to deal with negative emotions. Next, the proposed model is employed to identify the priority of the responding strategies used by family members of cancer patients in Vietnam to deal with negative emotions. In this study, the negative emotional coping strategies of family members of cancer patients are classified into four groups: (1) positive responses focusing on emotions; (2) negative responses focusing on emotions; (3) positive responses focusing on action; (4) negative responses focusing on action.

2. An overview on studies on negative emotions and negative emotional coping strategies of patients' family members

2.1. An overview on studies on negative emotions of patients' family members

The duration of treatment for cancer patients will create different negative emotions to patients and their family members. Negative emotions that a family member of cancer patients can have include many types, such as: stress, anxiety, anger, uncertainty, fear, depression and frustration (Płaszewska-Żywko & Dorota, 2012). Fumis et al. (2015) pointed out that family members of cancer patients in intensive care suffer from anxiety, depression and later stress symptoms in a greater level than the patients themselves. These negative emotions in patients also decreased significantly, while in family members, they persisted after three months of hospital discharge. Negative emotions of family members of cancer patients such as anxiety, depression, uncertainty and depressive symptoms can be observed in families of children with cancer after being diagnosed by a doctor (Van Schoors et al. 2019; Vrijmoet-Wiersma et al., 2008). Hagedoorn et al. (2011) carried out a research studying the negative emotions of parents and siblings of children with cancer; children of cancer parents and spouses of adults with cancer. The results show that a small number of relatives are at risk of developing mental disorders. The loss of a loved one has an impact on their mental health in the short term, but this is not a major risk factor for serious mental illness. However, there is an exception with the case when the

child dies, which often has a strong and lasting effect on parents, especially for women. The article also stated that the response to cancer is the problem of the whole family. Not only patients but also their relatives have to cope with the consequences of the illness and its treatment. These include interruptions in daily life, anxiety, having some symptoms of depression, anxiety about cancer recurrence, fear of loss and death, etc. Studies around the world have shown that taking care of cancer patients can seriously affects the lives of caregivers, especially their family members. A number of studies have presented a positive relationship between cancer patients and family members in the negative emotions (McDonnell et al. 2019; Kim & Schulz, 2008). The effects can be classified into three categories: physical health effects, mental health effects, and financial burden. Caring for cancer patients causes more negative emotions than other chronic diseases because of the sudden cancer progress, the high possibility of recurrence, and the life-threatening nature of the disease (Kim & Schulz, 2008). Some studies have shown that parents who have to look after their sick children are under higher psychological pressure than the parents of healthy children (Baker-Ericzen et al., 2005). Culture is also a mediator variable that controls the relationship between the caregiving of patients' family members and their mental health. Gardner et al. (2004) showed that Panamanian grandmothers with disabled grandchildren were less likely to suffer from negative emotions than American grandmothers with disabled grandchildren. Compared to Americans, Panamanians are less focused on the loss, sadness and prejudice against a disabled grandchild, but more on the grandchildren 'current needs and resources. Only 10% of Panamanian women is worried about their grandchildren's ability of being discriminated against or alienated. Blacher and McIntyre (2006) have shown that Latin mothers have a higher level of depression than European American mothers with disabled children.

2.2. An overview on studies on negative emotional coping strategies of patients' family members

In recent years, there have been numerous studies showing that negative emotions that patients and their family members often have strong influence in the treatment process of the patient, as well as the life of the patient's family (McDonnell et al., 2019; Howell et al., 2016). Therefore, finding out strategies and ways to cope with the negative emotions of the patient's family members plays an important role in improving the treatment outcomes and health care for patients (McColl-Kennedy et al., 2017). Response is defined as an individual's efforts and behaviors aimed at overcoming, minimizing threats, harm and loss, or at reducing misery in life (Carver & Connor-Smith, 2010). A number of studies have shown the responses to cope with negative emotions utilized by family members of patients in general and by family members of cancer patients in particular. Taylor (1991) divided these responses to negative feelings into 2 types. The first one is problem-focused coping strategy: directly resolving the stress and pressure inducing factors through concrete and practical real-world actions. The problem-focused coping strategy encouraging meaningful efforts in solving problems shows its effectiveness as it impacts observable and controllable stress-causing agents. The second one is emotion-focused coping strategy: reducing the adverse impacts of negative emotional responses arisen when facing with difficult and stressful situations. The coping strategy has been found to be effective when dealing with difficult-to-control issues such as emotional stages but ineffective in handling external emotional triggers. Therefore, this coping strategy, while cannot completely remove the negative feelings when family members have to face difficulties and pressure, can help ease them. According to Lazarus and Folkman (1984), problem-focused coping strategy is characterized by 3 steps: (1) facing the problems, (2) seeking social support, (3) solving the problem strategically; emotional-focused coping strategy is characterized by 4 steps: (1) controlling oneself, (2) keeping distance, (3) looking at the positive, (4) accepting responsibilities, (5) avoiding/running away.

Other researchers have divided the coping strategies into 4 types: (1) Problem-focused confrontation; (2) Emotions confrontation; (3) Problems avoidance; (4) Emotions avoidance. Avoidance, in this case, can be understood as retreating, moving away from pressure or trying to forget the stressful situation in hope that it will pass away eventually (Ebata & Moos, 1991). Confrontation indicates the action of

taking direct responses against the stressors or the action of taking and facing information and the reality of the situation (Taylor, 1991). According to these researchers, the steps involved in problem-focused confrontation consist of: (1) solving the problems; (2) restructuring the perception. Whereas, in emotion-focused confrontation, the steps are: (1) seeking social support; (2) expressing emotions. The behaviors of problem avoidance coping strategy include: (1) avoiding the topic; (2) day-dreaming. For emotions avoidance, these behaviors are: (1) self-blame; (2) self-isolation. Some researchers have pointed out that problem-focused and emotion-focused confrontation method work well in behavior adjustment. On the other hand, the problem and emotion avoidance is considered to be an effective behavior adaptation method in circumstances of uncontrollable stressors such as parental conflict (O'Brien et al, 1997) and sexual assault (Chaffin et al., 1997). Problem-focused coping strategy is only effective when the individual is capable of controlling and suppressing the stressors. This depends on personal assessment of the stressful events and the person's ability of coping with them.

In a different approach, the coping strategies with negative emotions of family members of cancer patients are categorized into 3 types: active responses, passive responses and adaptive responses. Active responses include: (1) solving the problems; (2) seeking social support; passive responses include: (1) self-isolation; (2) avoidance behaviors; and adaptive responses include: (1) Acceptance; (2) problems avoidance; (3) self-encouragement (Connor-Smith et al., 2000). Carver and Connor-Smith (2010) have developed a scale measuring 15 behaviors of different coping strategies with negative emotions. These behaviors are: (1) positive and mature awareness; (2) spiritual avoidance; (3) emotional expressions; (4) relying on information support from community; (5) direct handling; (6) denying difficult circumstances; (7) reliance on religion; (8) humoring and ridiculing action on difficulties; (9) behavior avoidance; (10) emotions and behaviors control; (11) relying on community emotional support; (12) using stimulant; (13) difficulty acceptance and adaptation; (14) reducing priorities for other activities; (15) planning.

In general, the research overview has shown that there are many ways to categorize the coping strategies with negative emotions from patients' family members. In particular, the categorization focusing on actions and emotions are commonly used. Mainly adopting the Carver and Connor-Smith's negative emotion responses scale (2010), this study proposes a new scale detailing the coping strategies of cancer patient's family members to cope with negative emotions.

3. Fuzzy number

There are various ways of defining fuzzy numbers. This paper defines the concept of fuzzy numbers as follows (Dubois and Prade, 1978).

Definition 1. A real fuzzy number A is described as any fuzzy subset of the real line R with membership function $A(x)$ that can be generally be defined as:

(a) f_A is a continuous mapping from R to the closed interval $[0, \omega]$.

(b) $f_A(x) = 0$, for all $x \in (-\infty, a]$;

(c) f_A is strictly increasing on $[a, b]$;

(d) $f_A(x) = \omega$, for all $x \in [b, c]$;

(e) f_A is strictly decreasing on $[c, d]$;

(f) $f_A(x) = 0$, for all $x \in (d, \infty]$,

where a, b, c and d are real numbers. Unless elsewhere specified, this research assumed that A is convex and bounded (i.e. $-\infty < a, d < \infty$).

Definition 2. The fuzzy number $A=(a,b,c,d;\varpi)$ isa trapezoidal fuzzy number if its membership function is given by:

$$f_A(x)=\begin{cases} f_A^L(x), & a\le x\le b,\\ \varpi, & b\le x\le c,\\ f_A^R(x), & c\le x\le d,\\ 0, & \text{otherwise,}\end{cases} \tag{1}$$

where $f_L^A(x)$ and $f_A^R(x)$ are the left and right membership functions of A, respectively [33]. If $\varpi=1$, then A is a normal fuzzy number; otherwise, it is said to be a non-normal fuzzy number. If $b\neq c$, A is referred to as a fuzzy interval or a flat fuzzy number. If $f_A^L(x)$ and $f_A^R(x)$ are both linear, then A is referred to as a trapezoidal fuzzy number and is usually denoted by $A=(a,b,c,d;\varpi)$ or simply $A=(a,b,c,d)$ if $\varpi=1$. In particular, when $b=c$, the trapezoidal fuzzy number is reduced to a triangular fuzzy number, and can be denoted by $A=(a,b,d;\varpi)$ or $A=(a,b,d)$ if $\varpi=1$. So, triangular fuzzy numbers are special cases of trapezoidal fuzzy numbers.

4. Fuzzy analytic hierarchy process

In 1996, Chang proposed an extent analysis method on fuzzy AHP to obtain a crisp priority vector from a triangular fuzzy comparison matrix. The method is briefly discussed as follows:

Let $X=\{x_1,x_2,\ldots,x_n\}$ be an object set, and $U=\{u_1,u_2,\ldots,u_m\}$ be a goal set. According to Chang's extent analysis, each object is taken and an extent analysis for each goal (g_i) is performed respectively. Therefore, m extent analysis values for each object can be obtained as $M_{g_i}^1, M_{g_i}^2, ..., M_{g_i}^n$, i=1, 2, ..., n, where $M_{g_i}^j$ $(j=1,2,...,m)$ are triangular fuzzy numbers (TFNs). Assume that $M_{g_i}^j$ be values of extent analysis of ith object for m goals. The value of fuzzy synthetic extent, S_i is defined as:

$$S_i=\sum_{j=1}^{m}M_{g_i}^j\otimes\left[\sum_{i=1}^{n}\sum_{j=1}^{m}M_{g_i}^j\right]^{-1} \tag{2}$$

where, $\sum_{j=1}^{m}M_{g_i}^j=\left(\sum_{j=1}^{m}l_{ij},\sum_{j=1}^{m}m_{ij},\sum_{j=1}^{m}u_{ij},\right),\ j=1,2,...m,\ i=1,2,...n.$

Let $M_1=(l_1,m_1,u_1)$ and $M_2=(l_2,m_2,u_2)$ be two TFNs, the degree of possibility of $M_1\ge M_2$ is defined as follows:

$$V(M_1\ge M_2)=\sup_{x\ge y}\left[\min(\mu_{M_1}(x),\mu_{M_2}(x))\right] \tag{3}$$

The membership degree of possibility can be expressed as in Eq. (3)

$$V(M_1\ge M_2)=hgt(M_1\cap M_2)=\mu_{M_2}(d)=\begin{cases}1 & \text{if } m_1\ge m_2\\ 0 & \text{if } l_1\ge u_2\\ \dfrac{l_1-u_2}{(m_2-u_2)-(m_1-l_1)} & \text{otherwise}\end{cases} \tag{4}$$

where d is the ordinate of the highest intersection point two membership functions $\mu_{M_1}(x)$ and $\mu_{M_2}(x)$, as shown in Fig. 1.

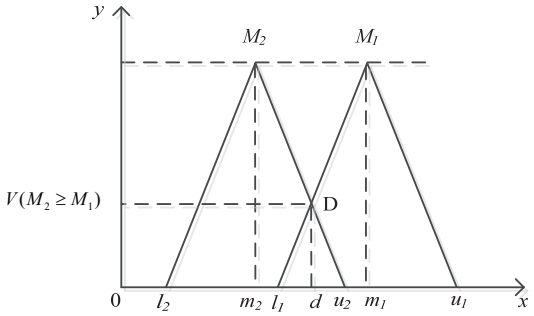

Fig.1. The comparison two fuzzy numbers

The degree of possibility for a convex fuzzy number to be greater than k convex fuzzy numbers can be defined as:

$$V(M \geq M_1, M_2, ..., M_k) = \min V\left(M \geq M_i\right), \quad i = 1, 2, ..., k. \tag{5}$$

The weight vector is given by:

$$\mathrm{W}' = \left(d'(A_1), d'(A_2), ..., d'(A_n)\right)^T \tag{6}$$

$$\text{where, } A_i (i = 1, 2, ..., n),\ d'(A_i) = \min V\left(S_i \geq S_k\right),\ \ k = 1, 2, ..., n;\ \ k \neq i \tag{7}$$

Via normalization, weight vectors can be obtained as:

$$\mathrm{W} = \left(d(A_1), d(A_2), ..., d(A_n)\right)^T \tag{8}$$

where, W is a non-fuzzy number. Although extent analysis method is a commonly used approach that is highly cited and has wide applications, there are some shortcomings shortcomingsassociated with Chang's (1996) method. It is found that Chang's (1996) method cannot estimate the true weights from a fuzzy comparison matrix. Wang et al. (2008) proved that the normalization formula in Eq. (2) is wrong and their proposed the revised normalization formula for a set of triangular fuzzy weights as follows:

$$S_i = \left(\sum_{j=1}^{m} l_{ij}, \sum_{j=1}^{m} m_{ij}, \sum_{j=1}^{m} u_{ij}\right) \otimes \left[\left(\sum_{k=1, k\neq i}^{n}\sum_{j=1}^{m} l_{kj} + \sum_{j=1}^{m} u_{ij}\right), \left(\sum_{k=1}^{n}\sum_{j=1}^{m} m_{kj}\right), \left(\sum_{k=1}^{n}\sum_{j=1}^{m} u_{kj} + \sum_{j=1}^{m} l_{ij}\right)\right]^{-1} \tag{9}$$

This study adopts a "Likert Scale" of fuzzy numbers to transform the linguistic values into TFNs, as shown in Table 1.

Table 1
Triangular fuzzy conversation scale (Anagnostopoulos et al., 2007)

Order	Linguistic values	Triangular fuzzy numbers	Reciprocal triangular fuzzy scale
1	Unimportant (U)	(1,1,1)	(1,1,1)
3	Slightly important (SL)	(2,3,4)	(1/4,1/3,1/2)
5	Moderately important (MI)	(4,5,6)	(1/6,1/5,1/4)
7	Seriously important (SI)	(6,7,8)	(1/8,1/7,1/6)
9	Very seriously important (VSI)	(8,9,9)	(1/9,1/9,1/8)

5. Application of proposed fuzzy AHP approach

In this section, Chang's (1996) and Wang et al. (2008) methodsare applied to define the priority of negative emotional coping strategies in the cases of Vietnamese cancer patients' family members. Based on a questionnaires and in-depth interviews for three Vietnamese cancer patients' family members (CPFM), this study applies the proposed method to identify the priority levels of four coping strategieswith negative emotions and twenty sub-coping strategies. Table 2 defines the coping strategies of cancer patients' family members to cope with negative emotions.

Table 2
Coping strategies with negative emotions

Coping strategies	Sub-coping strategies
Positive emotion-focused coping strategies (PECS)	Trying to see the problem in a different light, to make it seem more positive(PECS1)
	Finding the positive side of the current situation(PECS2)
	Saying to yourself that everything is normal in order to accept the reality(PECS3)
	Expressing and letting the uneasy feelings out(PECS4)
	Making fun of the situation(PECS5)
Negative emotion-focused coping strategies (NECS)	Refusing to believe that such a thing has happened to yourself (NECS1)
	Confining yourself, tormenting yourself(NECS2)
	Criticizing yourself for what happened(NECS3)
	Thinking hard to come up with a strategy about what to do(NECS4)
Positive action-focused coping strategies (PACS)	Trying tokeep yourself from getting distracted by other thoughts or activities(PACS1)
	Trying to get emotional support from friends or relatives(PACS2)
	Making plan to overcome the difficulties (PACS3)
	Relieving yourself by sharing your problems with others(PACS4)
	Entertaining and relaxing yourself by playing sports, going for a walk, going shopping, listening to music, reading books, playing computer games, surfing the Internet(PACS5)
	Learning to live with the problems and difficulties (PACS6)
	Finding comfort in my religion and meditate more(PACS7)
Negative action-focused coping strategies (NACS)	Taking sedatives to make you feel better(NACS1)
	Surrendering, doing nothing(NACS2)
	Using alcohol or cigarettes and stimulant drugs to help getting through the problems(NACS3)
	Giving up the attempt to change the situation(NACS4)

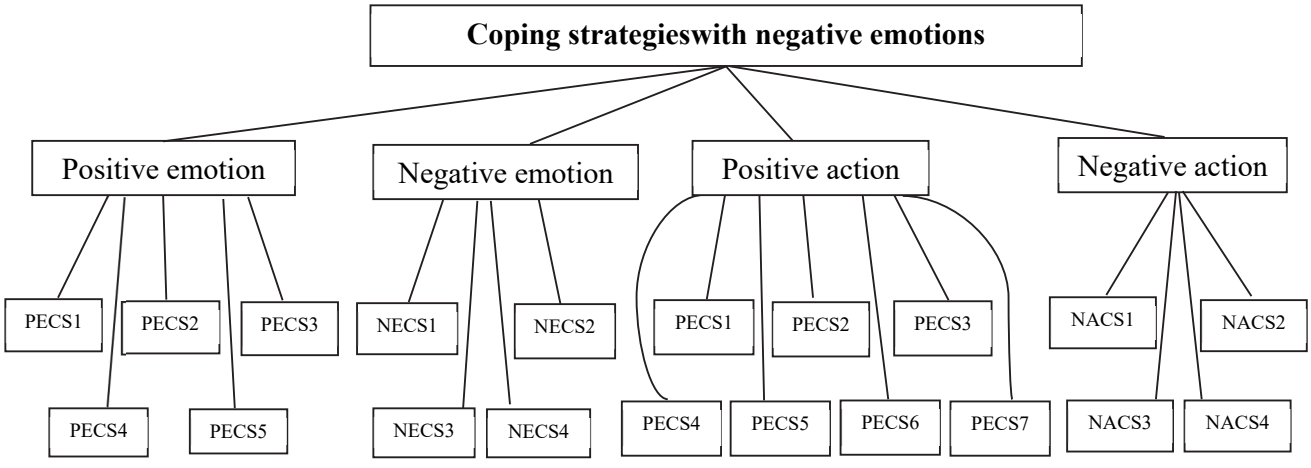

Fig. 1. Hierarchy of coping strategies with negative emotions

The proposed fuzzy AHP is applied to rank the priorities of of four coping strategieswith negative emotions and twenty sub-coping strategies following two steps: establishing fuzzy judgment matrices

and aggregating decision from informants based on geometric mean. By using the collected data from questionnairesand the triangular fuzzy conversation scale (as shown in Table 1), comprehensive pair-wise comparisons for the two levels of hierarchical system are built, as shown in Tables 3-7.

Table 3

Fuzzy comparison matrix of coping strategies with negative emotions

Coping strategies		PECS			NECS			PACS			NACS		
CPFM 1	PECS	1.00	1.00	1.00	0.25	0.33	0.50	2.00	3.00	4.00	4.00	5.00	6.00
	NECS	2.00	3.00	4.00	1.00	1.00	1.00	2.00	3.00	4.00	2.00	3.00	4.00
	PACS	2.00	3.00	4.00	0.25	0.33	0.50	1.00	1.00	1.00	2.00	3.00	4.00
	NACS	0.17	0.20	0.25	0.25	0.33	0.50	0.25	0.33	0.50	1.00	1.00	1.00
CPFM 2	PECS	1.00	1.00	1.00	2.00	3.00	4.00	4.00	5.00	6.00	0.25	0.33	0.50
	NECS	0.25	0.33	0.50	1.00	1.00	1.00	2.00	3.00	4.00	6.00	7.00	8.00
	PACS	0.25	0.33	0.50	0.25	0.33	0.50	1.00	1.00	1.00	0.17	0.20	0.25
	NACS	2.00	3.00	4.00	0.13	0.14	0.17	4.00	5.00	6.00	1.00	1.00	1.00
CPFM 3	PECS	1.00	1.00	1.00	4.00	5.00	6.00	0.17	0.20	0.25	2.00	3.00	4.00
	NECS	0.17	0.20	0.25	1.00	1.00	1.00	0.17	0.20	0.25	2.00	3.00	4.00
	PACS	4.00	5.00	6.00	4.00	5.00	6.00	1.00	1.00	1.00	1.00	1.00	1.00
	NACS	0.25	0.33	0.50	0.25	0.33	0.50	6.00	7.00	8.00	1.00	1.00	1.00
Average	PECS	1.00	1.00	1.00	2.08	2.78	3.50	2.06	2.73	3.42	2.08	2.78	3.50
	NECS	0.81	1.18	1.58	1.00	1.00	1.00	1.39	2.07	2.75	3.33	4.33	5.33
	PACS	2.08	2.78	3.50	1.50	1.89	2.33	1.00	1.00	1.00	1.06	1.40	1.75
	NACS	0.81	1.18	1.58	0.21	0.27	0.39	3.42	4.11	4.83	1.00	1.00	1.00

Table 4

Average fuzzy comparison matrix of positive emotion-focused coping strategies

PECS	PECS1			PECS2			PECS3			PECS4			PECS5		
PECS1	1.00	1.00	1.00	2.75	3.44	4.17	1.44	1.80	2.17	2.04	2.71	3.39	1.47	1.84	2.25
PECS2	0.78	1.13	1.50	1.00	1.00	1.00	1.50	1.89	2.33	1.47	1.84	2.25	1.42	2.11	2.83
PECS3	2.72	3.40	4.08	1.39	2.07	2.75	1.00	1.00	1.00	0.79	1.16	1.56	2.72	3.40	4.08
PECS4	2.14	2.51	2.92	2.06	2.73	3.42	2.75	3.44	4.17	1.00	1.00	1.00	0.81	1.18	1.58
PECS5	2.06	2.73	3.42	0.83	1.22	1.67	1.44	1.80	2.17	2.08	2.78	3.50	1.00	1.00	1.00

Table 5

Average fuzzy comparison matrix of negative emotion-focused coping strategies

NECS	NECS1			NECS2			NECS3			NECS4		
NECS1	1.00	1.00	1.00	1.47	1.84	2.25	3.33	4.33	5.33	0.78	1.13	1.50
NECS2	2.06	2.73	3.42	1.00	1.00	1.00	0.50	0.56	0.67	2.08	2.78	3.50
NECS3	0.81	1.18	1.58	1.67	2.33	3.00	1.00	1.00	1.00	3.42	4.11	4.83
NECS4	2.75	3.44	4.17	0.81	1.18	1.58	0.76	1.11	1.47	1.00	1.00	1.00

Table 6

Average fuzzy comparison matrix of positive action-focused coping strategies

PACS	PACS1			PACS2			PACS3			PACS4			PACS5			PACS6			PACS7		
PACS1	1.00	1.00	1.00	0.81	1.18	1.58	1.50	1.89	2.33	4.00	5.00	6.00	0.81	1.18	1.58	0.79	1.16	1.56	2.06	2.73	3.42
PACS2	2.08	2.78	3.50	1.00	1.00	1.00	3.42	4.11	4.83	3.39	4.07	4.75	1.39	2.07	2.75	2.72	3.40	4.08	0.81	1.18	1.58
PACS3	1.39	2.07	2.75	0.76	1.11	1.47	1.00	1.00	1.00	1.46	1.83	2.22	2.08	2.78	3.50	0.83	1.22	1.67	0.22	0.29	0.42
PACS4	0.17	0.20	0.25	1.43	1.78	2.14	2.72	3.40	4.08	1.00	1.00	1.00	2.14	2.51	2.92	2.04	2.71	3.39	5.33	6.33	7.33
PACS5	2.08	2.78	3.50	1.50	1.89	2.33	0.81	1.18	1.58	2.04	2.71	3.39	1.00	1.00	1.00	1.50	1.89	2.33	1.39	2.07	2.75
PACS6	2.75	3.44	4.17	1.44	1.80	2.17	1.42	2.11	2.83	2.14	2.51	2.92	1.39	2.07	2.75	1.00	1.00	1.00	0.81	1.18	1.58
PACS7	1.47	1.84	2.25	2.08	2.78	3.50	2.67	3.67	4.67	0.14	0.16	0.19	1.50	1.89	2.33	2.08	2.78	3.50	1.00	1.00	1.00

Table 7

Average fuzzy comparison matrix of negative action-focused coping strategies

NACS	NACS1			NACS2			NACS3			NACS4		
NACS1	1.00	1.00	1.00	0.83	1.22	1.67	2.71	3.38	4.06	2.71	3.38	4.06
NACS2	1.42	2.11	2.83	1.00	1.00	1.00	0.76	1.11	1.47	0.76	1.11	1.47
NACS3	2.14	2.51	2.92	3.42	4.11	4.83	1.00	1.00	1.00	1.00	1.00	1.00
NACS4	1.47	1.84	2.25	2.14	2.51	2.92	1.39	2.07	2.75	1.39	2.07	2.75

Using Eq. (9) and Tables 3-7, fuzzy synthetic extentvalues of coping strategies and sub-coping strategieswith negative emotions are calculated (as shown in Table 8).

Table 8
Fuzzy synthetic extent values of coping strategies and sub-coping strategies

Coping strategies	Fuzzy synthetic extent	Sub- Coping strategies	Fuzzy synthetic extent
PECS	(0.211, 0.295, 0.393)	PES1	(0.157, 0.220, 0.300)
		PSE2	(0.101, 0.144, 0.205)
		PSE3	(0.128, 0.187, 0.263)
		PSE4	(0.173, 0.238, 0.321)
		PSE5	(0.142, 0.210, 0.294)
NECS	(0.190, 0.272, 0.368)	NECS1	(0.195, 0.270, 0.361)
		NECS2	(0.164, 0.230, 0.314)
		NECS3	(0.204, 0.281, 0.373)
		NECS4	(0.155, 0.219, 0.301)
PACS	(0.159, 0.224, 0.309)	PACS1	(0.105, 0.150, 0.213)
		PACS2	(0.143, 0.198, 0.272)
		PACS3	(0.065, 0.100, 0.147)
		PACS4	(0.075, 0.106, 0.150)
		PACS5	(0.093, 0.142, 0.208)
		PACS6	(0.112, 0.164, 0.232)
		PACS7	(0.092, 0.140, 0.204)
NACS	(0.150, 0.208, 0.287)	NACS1	(0.187, 0.259, 0.345)
		NACS2	(0.148, 0.215, 0.296)
		NACS3	(0.225, 0.295, 0.383)
		NACS4	(0.167, 0.230, 0.310)

Using Eqs. (3-8), the weight vector of coping strategies and sub-coping strategies with negative emotions are obtained (as shown in Table 9).The results indicate that family members of cancer patients used emotion-focused coping strategies more than action-focused coping strategies. Specifically, the weight vectors of positive emotion, negative emotion, positive action, negative action-focused coping strategies are 0.342, 0.299, 0.199, 0.160, respectively. These findings are consistent with previous findings in the literature (Papastavrou et al., 2012; Gaafer et al., 2013; Hildenbrand et al., 2014). Emotion-focusedcoping strategies have been found to be more effective when dealing with difficult-to-control issues but ineffective in handling external emotional triggers. Family members of cancer patients used "trying to see the problem in a different light, to make it seem more positive", "expressing and letting the uneasy feelings out", "refusing to believe that such a thing has happened to yourself" and "criticizing yourself for what happened" more frequently. This fits with previous finding which stated that family members of cancer patients use various forms of avoidance and denial coping style due to emotional distress (Maurice-Stam, 2008; Bauld et al., 1998).

Furthermore, the results also show that "trying to get emotional support from friends or relatives" and "learning to live with the problems and difficulties" were used more frequently than the other coping strategies by family members of cancer patients. This finding is similar to the findings of Sharma et al. (2018) where the old people used to seek social support strategy more than others. Family members of cancer patients used to take sedatives to make them feel better or alcohol or cigarettes and stimulant drugs to help getting through the problems.

Table 9
Weight vector of coping strategies and sub-coping strategies

Coping strategies	Weight score	Sub-Coping strategies	Weight score
PECS	0.342	PES1	**0.245**
		PSE2	0.071
		PSE3	0.179
		PSE4	**0.280**
		PSE5	0.226
NECS	0.299	NECS1	**0.290**
		NECS2	0.211
		NECS3	**0.309**
		NECS4	0.189
PACS	0.199	PACS1	0.171
		PACS2	**0.287**
		PACS3	0.013
		PACS4	0.021
		PACS5	0.154
		PACS6	**0.207**
		PACS7	0.148
NACS	0.160	NACS1	**0.273**
		NACS2	0.168
		NACS3	**0.357**
		NACS4	0.202

6. Conclusion

Coping with cancer is always burdensome for the family members. The negative impact of cancer on family members of patients is well evident. Therefore, it is important to determine the prioritizing of negative emotional coping strategies of cancer patients' family membersin order to help them get over negative emotions and have positive mental status. This study utilized the AHP method that proposed by Chang (1996) and Wang et al. (2008) to identify the priority levels of the strategies used by cancer patients' family members to cope with negative emotions. The proposed model was applied in the cases of Vietnamese cancer patients' family members. In this study, four groups of coping strategies against negative emotions of cancer patients' family members were used, including: (1) positive emotion-focused coping strategies; (2) negative emotion-focused coping strategies; (3) positive action-focused coping strategies; (4) negative action-focused coping strategies. The results found that family members of cancer patients used emotion-focused coping strategies more than action-focused coping strategies to cope with negative emotions. Specifically, they used to: (i) see the problem in a different light; (ii) express the uneasy feelings out; (iii) refuse to believe that such a thing has happened to themselves; (iv) criticizethemself for what happened; (v) get emotional support from friends or relatives; (vi) live with the problems and difficulties; (vii) take sedatives to make you feel better or alcohol or cigarettes,(viii) and stimulant drugs to help getting through the problems. Therefore, it is important to support the effective coping attitudes of cancer patients' family members in order to change the ineffective coping strategies.

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