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Latent profile analysis of empathy ability and its relationship with professional quality of life among hospice nurses in China

Yaling Wang[1†], Chuntao Wang[1†], Ziwei Yang[2], Yuezhong Tang[3], Wen Chen[3], Yawen Zheng[4], Zhiming Wei[1*] and Huiling Li[5*]

Abstract

Background Empathy is important in hospice nursing clinics and may influence nurses' professional quality of life (ProQOL). However, present studies ignoring each empathic dimension, and few researches have explored the correlation between empathy and ProQOL in hospice nurses in Asia. To better understand hospice nurses' empathy abilities in China and its relationship with ProQOL, the aim of this study was to identify the latent profiles and its influencing factors of hospice nurses' empathy ability, as well as differences in ProQOL across each latent profile.

Methods A cross-sectional study was conducted from October 2021 to September 2022, and a total of 725 hospice nurses were recruited from different geographic regions in China. Participants completed the Empathy Ability Scale for Hospice Nurses and the Brief Professional Quality of Life Scale. Latent profile analysis (LPA) was employed to identify latent profiles of empathy ability among hospice nurses in China. The predictors of hospice nurses' empathy ability in different latent profiles were assessed using multinomial logistic regression analysis. One-way ANOVA test and the Kruskal–Wallis test were used to compare the ProQOL scores in each latent profile of nurses' empathy ability.

Results This study identified three latent profiles of hospice nurses' empathy ability, and those profiles labelled "poor empathy ability-high surface empathy expression" ($n=216$, 29.8%), "moderate empathy ability" ($n=359$, 49.5%) and "high empathy ability-high deep empathy expression" ($n=150$, 20.7%). Multinomial logistic regression analysis suggested that age, hospital level, whether income meets expectations, interests in hospice care work, hospice work experience, and receiving psychological counselling were predictors of hospice nurses' profile membership of empathy ability. The scores of compassion satisfaction (CS) and burnout (BO) in ProQOL were significantly different across each profile ($P<0.001$), while scores of secondary traumatic stress (STS) in ProQOL were not different across each profile ($P=0.294$).

Conclusions Hospice nurses' empathy ability was divided into three latent profiles, and enhancing empathy ability may be conducive to improving hospice nurses' CS, while reducing BO, thus fostering their overall quality of life.

†Yaling Wang and Chuntao Wang contributed equally to this work.

*Correspondence:
Zhiming Wei
4826537@qq.com
Huiling Li
lhl8543@126.com

Full list of author information is available at the end of the article

Nursing managers should identify hospice nurses at higher risk of BO and implement targeted interventions focused on enhancing nurse's empathy abilities.

Keywords Empathy, Hospice nurse, Professional quality of life

Introduction

Hospice care is a model of care that can improve the quality of life for patients at the end of life [1–3] and alleviate the grief of their family members [4]. Currently, China is facing the severe dilemma of an increasing ageing population [5]. Based on the data reported by the National Bureau of Statistics of China, there were more than 280 million people aged 60 years or over (accounting for 19.8% of the total population) at the end of 2022 [6]. With this rate of growth, it is projected that China's population of older individuals aged ≥ 60 years will be to be 400 million by 2032 [7]. In addition, cancer incidence and mortality rates have increased rapidly in China; the number of new cancer cases in China was reported to be 4.57 million in 2020, accounting for 23.7% of the global cancer incidence, and the number of cancer deaths in China was reported to be 3 million, accounting for 30.2% of the global cancer deaths [8]. Thus, the demand for hospice care is growing commensurately. To align itself with the 2030 United Nations Sustainable Development Goals, China has released the "Healthy China 2030 Planning Outline" [9] and committed to improving the health service system for older people and other end-stage populations. Despite the Chinese government has gradually enhanced its support for hospice care and implemented a pilot project of hospice care in five regions in 2017 [10], the Quality of Death and Dying in China is still ranked low globally [11], which mainly reflects inadequate composition of hospice care teams, low public awareness of hospice care, and shortage of hospice nurses [12, 13].

Nurses undertake a variety of care tasks, such as patient assessment and symptom management, and play an important role in multidisciplinary collaborative teams [14]. Empathy is a vital core competency in hospice care that reflects professional help and caring relationships, requiring nurses to be able to think from the patients' perspective [15]. According to the theory of empathy, nurses can use empathy to make patients feel respected and recognized, which helps to improve trust and caring relationship between nurses and patients [16]. There is growing evidence that enhancing empathy during clinical practice can improve patient satisfaction [17], treatment adherence [18], immune function [19], and decrease patient pain [18], psychological distress [20, 21]. Moreover, nurses can apply empathy to make effective nurse-patient communication, establish positive treatment relationships between nurses and patients [22], and provide the highest quality of care in clinical nursing [23]. Therefore, empathy can bring more effective psychological and physical outcomes for patients, which is worth investigating.

Empathy as care is rising in palliative and hospice medicine [15]. Previous studies have found that hospice nurses in Chile and South Korea in have higher empathy capacity than nurses in other departments [24, 25]. And age [26], gender [27] and personal traits such as cognition, courage, and patience [28] were reported related to the empathy ability in hospice care work. In China, studies have also reported on the empathy ability of hospice nurses and its influencing factors [28, 29]. However, the results showed that due to the late start of hospice care in China, empathy ability has not been included in the core competency training of hospice nurses [30, 31], and hospice nurses have received less empathy training. Therefore, there is still great potentials for making further progress in the level of empathy ability of hospice nurses in China. Despite many advances in research on the current status, and predicting factors of empathy in hospice nurses, studies on empathy still have several limitations. For example, previous studies on hospice nurses' empathy have tended to address empathy as a whole and use the total scores to assess the current status of nurses' empathy ability and its related predictors [32, 33], often ignoring the unique role of each empathic dimension.

According to a previous study focusing on the development of the empathy ability scale for hospice nurses [34], hospice nurses' empathy ability consists of three interrelated but relatively independent components: cognitive empathy, emotional empathy, and behavioural empathy. Cognitive empathy is nurses' ability to imagine others' roles and perceive others' feelings. Emotional empathy refers to nurses' ability to regulate their own emotional expression when aware of others' emotional state, taking the form of natural emotional empathy, surface emotional empathy, and deep emotional empathy. Behavioural empathy refers to behaviours that are presented during the empathy process, such as altruistic behaviours and empathic skills. However, the level of empathy ability among hospice nurses in previous studies was usually classified according to thresholds, making it difficult to identify heterogeneity among individuals in a group and leading to a lack of precision in empathy-related interventions. Latent profile analysis (LPA) is an individual-centred method to analyse the characteristics of different groups of people and the differences in various indicators between different categories, which is helpful for identifying high-risk groups and provides a basis for targeted and more accurate intervention measures [35]. Based

on maximum likelihood estimation, this classification method not only minimizes indicator variability within groups and maximizes indicator variability between groups but also uses objective statistical indicators to measure the accuracy and validity of classification [36]. To better understand hospice nurses' empathy ability, a key purpose of our research was to explore different empathy profiles of hospice nurses through LPA and help nursing administrators and policy-makers tailor targeted empathy ability training programs.

Hospice care workers' professional quality of life (ProQOL) in general is a topic of increasing interest in both the scientific and clinical fields [37]. ProQOL reflects the overall quality of caring work experienced by nurses and contains three structures: compassion satisfaction (CS), the positive side, secondary traumatic stress (STS) and burnout (BO), the negative side. Previous research confirms that empathy is related to ProQOL [38, 39]. Empathy was an important contributor to CS in nurses [40], and a high level of empathy was positively and significantly correlated to CS [38]. Furthermore, a high level of empathy was negatively and significantly correlated to ST and BO [41]. Although significant associations between empathy and ProQOL in clinical nurses have been demonstrated across previous studies, few researches have explored the correlation between empathy and ProQOL in hospice nurses. Currently, China is facing a serious shortage of hospice nursing staff. Additionally, most hospice nurses start working in this speciality after only a short period of orientation training [42], making it difficult for them to cope with negative emotional events such as patients' death and suffering. Thus hospice nurses commonly experience sadness, depression, and other emotions. Our prior qualitative research also revealed that the empathy of hospice nurses has a negative impact, including negative emotional contagion, negative emotions involved in life, and empathy fatigue [10]. Therefore, another key aim of the current research was to explore the relationship between ProQOL and different empathy ability latent profiles in hospice nurses.

Methods

Participants

This nationwide, cross-sectional study was approved by the medical ethics committee of the First Affiliated Hospital of Soochow University, China. From October 2021 to September 2022, participants were selected from four provincial-level administrative regions in each geographic regions of China (including 5 geographical regions: eastern China, southern China, western China, northern China, and central China) by convenience sampling. The inclusion criteria were as follows: (a) registered nurses, (b) direct care of terminally ill patients with at least one year of hospice work experience, and (c) informed consent and willingness to participate in the study. The exclusion criteria were as follows: (a) nurses on shifts, and currently not in the hospice nursing position, (b) probationer nurses, (c) newly graduated registered nurses with standardized training, and (d) nurses who were not on duty for various reasons (such as further training, maternity leave or vacation, and health problems). Through the assistance of hospice care professional committee of each provincial nursing association in distributing questionnaires, 725 hospice nurses came from 97 hospice units (tertiary hospitals, secondary hospitals, primary hospitals, and community health service centers) in 20 provincial administrative regions were included.

Sample

For descriptive cross-sectional studies of quantitative variables, the sample size was calculated as follows [43]:

$$n = \frac{u_{\alpha/2}^2 \sigma^2}{\delta^2}$$

At the 95% confidence interval, $u_{\alpha/2}=1.96$, δ represents the absolute error or precision, which was 2 in this study, and σ is the standard deviation of the variable that can be based on the data from our previous research [34] on the development of the empathy scale for hospice nurses (which was 23 here). According to the formula, the theoretical sample size was 508. Considering an invalid response rate of 20% during the study, it was concluded that at least 610 hospice nurses need to be investigated.

Data collection

Due to the need for COVID-19 prevention and control, this study used a combination of offline and online methods to collect questionnaires. For nearby cities that were not affected by the epidemic, this study used onsite surveys to collect questionnaires. For cities where the epidemic occurred or remote areas such as Hebei and Chongqing, this study used an online questionnaire through the Questionnaire Star platform (Wenjuanxing, http://www.wjx.cn) for data collection. Whether conducting an offline or online survey, researchers submitted the ethical review approval documents and obtained the permission of the person in charge of the surveyed hospital before the investigation began. The investigators for this study comprise the research team, heads of hospice care professional committee of each provincial nursing association and the administrators of hospital hospice department. All the investigators received unified training and were responsible for selecting participants who met the inclusion criteria, informing the participants of the aim, significance, and content of the research. The research was anonymous. For offline questionnaires, after

obtaining informed consent from the participants, the investigators introduced the questionnaire filling requirements to participants and then collected and reviewed the questionnaire on the spot. If any missing items were found, the respondent was invited to confirm again and complete them in a timely manner. For online questionnaires, the investigators sent the questionnaire link to the nursing WeChat group of each provincial hospice care professional committee, explained the purpose and filling requirements of the questionnaire survey to the participants through the WeChat group. After obtaining their informed consent, participants can click on the link to fill out the questionnaire and submit it themselves. To improve the quality of online data collection, we set each IP address to only fill out the questionnaire once, and the respondent could submit questionnaire successfully when all options were completed. When the answers provided in a questionnaire are all the same option or the online questionnaire completion time is less than 300 s, the completed questionnaire will be rejected.

Measurements

Participants' general characteristics

Demographic data (age, gender, marital status, educational level, region) and work-related information (i.e., professional title, hospital level, monthly salary income, whether income meets expectations, employment status, do you participate in clinical teaching, whether have experience witnessing the death of family members or friends, number of annual training sessions in hospice care, number of end-of-life patient care daily, years of hospice work experience, reasons for choosing hospice care work, interest in hospice care work, whether receiving psychological counselling, turnover intention) were collected.

Empathy ability scale for hospice nurses

Nurses' empathy ability was measured using the Empathy Ability Scale for Hospice Nurses, which was developed by Wang et al. [34]. This scale includes three dimensions with a total of 33 items and a cumulative variance contribution of 72.317%. This instrument measures the cognitive, emotional, and behavioural dimensions of empathy through a 5-point Likert response set, ranging from 1 (never) to 5 (always). The cognitive empathy dimension is composed of 11 items that include the subdimensions of imagining others' roles (e.g., "I try to understand others' thoughts by seeing things from their point of view") and perceiving others' feelings (e.g., "I can perceive the patient's need to be listened to and accompanied"). The emotional empathy dimension is composed of 8 items that include the subdimensions of natural emotional empathy (e.g., "The emotions I expressed were automatic and natural at the time, without any processing or adjustment"), surface emotional empathy (e.g., "I can restrain my emotions and respond with a positive external attitude when the patient or their caregivers make me feel sad or angry, during the process of empathy"), and deep emotional empathy (e.g., "I can proactively adjust my inner feelings and attitudes according to the emotional changes of the patients and their family caregivers during the process of empathy"). The behavioural empathy dimension is composed of 14 items that include the subdimensions of empathic behaviour (e.g., "I can do my best to help patients achieve their dying wishes in collaboration with a multidisciplinary team") and empathic skills (e.g., "I can alleviate the negative emotions of patients or their caregivers through timely communication or silent companionship"). Higher scores on the scale indicate higher levels of empathy ability with hospice nurses. The scale in our study showed good internal consistency and reliability, with a Cronbach's alpha of 0.979 and a retest reliability of 0.954.

Brief professional quality of life scale

Professional quality of life (ProQOL), by definition, is the quality one feels at work as a caregiver, including both the positive and negative aspects [44]. The ProQOL scale version 5 (ProQOL-5) is a self-report scale developed by Stamm [45] to assess one's compassion satisfaction (CS), burnout (BO), and secondary traumatic stress (STS), however, there are frequent reports of factorial and internal structure problems with the ProQOL-5 [46–51]. The Brief ProQOL-12 is a 12-item version of the above ProQOL-5 that resolves the reliability and validity concerns of ProQOL-5 [52]. ProQOL-12 using existing items from the three independent factors: Items 12,18, 24, and 30 for CS; Items 10, 19, 21, and 26 for BO and Items 9, 13, 14, and 25 for STS. The reliability and validity of the Brief ProQOL-12 were significantly improved over the ProQOL-5, with the 5-point Likert scale and time context modified as: 1=Never (0 days), 2=Rarely (1 day), 3=Sometimes (2–3 days),4=Often (4–5 days), 5=Always (6–7 days) [52]. High CS scores mean that a nurse gains more fulfilment or pleasure in her ability to be an effective caregiver; high BO scores mean that a nurse is at higher risk for burnout; and high ST scores suggest that nurses may face increased stress from helping suffering patients, which will be harmful to their health and wellbeing. The Cronbach's alpha of the CS, BO and STS in ProQOL-12 in this study are 0.874, 0.819, and 0.776, respectively.

Ethical considerations

This research was approved by the medical ethics committee of the First Affiliated Hospital of Soochow University (approval no. 2020−258). Purpose of the study were informed to all participants before the recruitment,

Table 1 Fit statistics of the latent profile analysis ($n = 725$)

Model	k	AIC	BIC	aBIC	Entropy	LMR	BLRT	Proportion
1 -Profile	66	63133.694	63436.382	63226.812	—	—	—	—
2 -Profile	100	51389.560	51848.177	51530.648	0.979	<0.001	<0.001	0.426/ 0.574
3 -Profile	134	46854.480	47469.027	47043.537	0.977	<0.001	<0.001	0.298/0.495/0.207
4 -Profile	168	45014.475	45784.952	45251.501	0.976	0.666	<0.001	0.297/0.428/0.085/0.190
5 -Profile	202	43713.718	44640.125	43998.715	0.977	0.190	<0.001	0.055/0.206/0.172/0.388/0.179

Note k, number of free parameters; AIC, akaike information criteria; BIC, bayesian information criteria; aBIC, adjusted bayesian information criterion; LMR, lo-mendell-rubin test; BLRT, bootstrapped likelihood ratio test

Table 2 Distribution of empathy ability in the 3-profile model ($n = 725$)

Dimensions	Total sample ($n = 267$) M ± SD	C1 ($n = 216$) M ± SD	C2 ($n = 359$) M ± SD	C3 ($n = 150$) M ± SD	H	*P*
Cognitive empathy	42.45 ± 8.19	33.40 ± 5.66	43.62 ± 4.08	52.67 ± 3.53	502.592	< 0.001
Emotional empathy	30.61 ± 5.86	23.83 ± 3.82	31.76 ± 2.69	37.64 ± 3.01	513.996	< 0.001
Behavioral empathy	50.23 ± 11.36	37.77 ± 6.80	51.48 ± 5.72	65.17 ± 5.29	529.425	< 0.001
Total	123.29 ± 23.45	95.00 ± 11.89	126.86 ± 8.30	155.48 ± 8.27	609.326	< 0.001

Note M: Mean, SD: standard deviation

and all participants were asked to sign a written consent form voluntarily. Only individuals who consented to take part in this anonymous study were invited to fill in the questionnaire, and informed consent was obtained from all participants. To protect the individual's privacy, all the collected data were preserved anonymously and confidentially.

Data analysis

Mplus version 8.3 was used to explore the latent profiles of nurses' empathy ability. Data for each item in the three dimensions were entered into the LPA, and in this study, one to five potential profile models were explored sequentially from the initial model (1 profile) until the most appropriate model was determined with a log-likelihood test. The LPA model fit test indices included the Akaike information criterion (AIC), the Bayesian information criterion (BIC), and the adjusted Bayesian information criterion (aBIC), lower value indicating a better-fitting model [53]. The classification accuracy is evaluated with entropy values (varying between 0 and 1, with values close to 1 are better). The Lo–Mendell–Rubin Test (LMR) and Bootstrap Likelihood Ratio Test (BLRT) were used to assess the *P*-values in the comparisons among models with a different number of classes [53]. A low *P*-value means that the k-class model fits better than the k -1-class model [54]. To explore the differences between demographic characteristics and work-related information of the subtypes based on LPA, IBM SPSS Statistics, version 25.0 was used (IBM Corp., Armonk, NY, USA). Nurses' demographic characteristics and work-related information were analysed using descriptive statistics, including the mean, standard deviation, frequency, and percentage; and the differences between categorical variables of the different subtypes of nurses' empathy ability were analysed using the chi-square test (χ^2). Furthermore, a multinomial logistic regression analysis was performed to investigate the predicting factors on the groups. One-way ANOVA, the Student–Newman–Keuls (SNK) test, and the Kruskal–Wallis test were conducted to determine the differences in the ProQOL scores in each latent profile. Statistical significance was accepted at a two-tailed *P*-value < 0.05.

Results

Characteristics of participants

A total of 800 nurses participated in the study, after excluding 75 ineligible questionnaires (e.g., options all offered the same choice), this study finally analysed 725 valid questionnaires, with an effective recovery rate of 90.63%. In total, 60.41% of the participants came from North China. Most of the participants were female (99.45%), 90.76% were under the age of 45, and 71.17% of the participants were married. The majority of them (79.86%) held a university degree, 46.90% held a charge nurse professional title or above, approximately 6.34% of the nurses had over 11 years of hospice care experience, and 64.69% had a monthly salary of more than ¥5000. More details can be found in Table 3.

Latent profiles of empathy ability

To identify the best model, five models were separately estimated in this study, and Table 1 displayed the fit statistics results of each model. As seen in Table 1, although the entropy value of the 2-profile model was highest (0.979), the AIC, BIC, and aBIC values continued to decline but tended to stabilize after the 3- profile model. Meanwhile, the LMR *P*-values in 4-profile model and 5-profile model were not significant. Therefore, considering the proportion of each model and the practical significance of the results, we found the 3-profile model was the best appropriate model.

Table 2 described the distribution of three dimensions of empathy ability in the 3-profile model and Fig. 1 showed the score of 3-profile model on 33 items. Class 1 was the second largest group, accounting for 29.8% (n=216) of all nurses, and hospice nurses in this class reported the lowest score for empathy ability. Meanwhile, the mean scores of Items B2 and B3, representing subdimensions of surface emotional empathy, were higher than those of Items B4-B8, representing subdimensions of deep emotional empathy. Therefore, this subgroup was labelled the "poor empathy ability-high surface empathy expression" group, which means that hospice nurses in this group may hide their true emotions and present superficial empathy in order to comply with professional norms in nursing clinical work, so their empathy ability is actually at a low level. Class 2 was the largest group, accounting for 49.5% (n=359), and was named the "moderate empathy ability" group, which indicates hospice nurses have an average level of empathy ability in this group. Finally, class 3 was the smallest group, accounting for 20.7% (n=150), and reported the highest scores for empathy ability. Meanwhile, the mean scores of the surface emotional empathy subdimension were lower than those of the deep emotional empathy subdimension. Therefore, class 3 was named "high empathy ability-high deep empathy expression", which means that hospice nurses in this group may perceive and understand patients from the depths of their hearts in clinical work, exhibit proactive altruistic behavior and demonstrate deeper levels of empathy, so their empathy ability is actually at a high level.

Comparison of demographic and work-related variables between the three profiles

Table 3 presented the results of comparing demographic and work-related characteristics between the three profiles. Significant differences were found between groups in age, marital status, professional title, region, hospital level, whether income meets expectations, employment status, participation in clinical teaching, witnessing the death of family members or friends, hospice work experience, reasons for choosing hospice care work, interest in hospice care work, receiving psychological counselling, and turnover intention (all P<0.05). It was notable that the class 3 group has the largest percentage of hospice nurses who were 36~45 years old, married, assistant director nurses, from northern China, from secondary hospitals, had income that met expectations, had permanent employment status, participated in clinical teaching, had experience of witnessing the death of family members or friends, had more than 11 years of hospice work experience, actively applied hospice care work, were very interested in hospice care work, received psychological counselling, and had no turnover intention.

Predictor of the latent profile membership

To identify the demographic and work-related variables affecting empathy ability in hospice nurses across different profiles, a multinomial logistic regression analysis was used with the class 1 group as the reference. This research used profile membership as the outcome variable, and the predictor variables included age, marital status, professional title, region, hospital level, whether income meets expectations, employment status, participation in clinical teaching, the experience of witnessing the death of family members or friends, hospice work experience, reasons for choosing hospice care work, interest in hospice care work, receiving psychological counselling, and turnover intention.

Table 4 presented the results of influencing factors of the latent profile membership and all the predictors are highlighted in bold. It can be seen that age, hospital level, whether income meets expectations, interest in hospice care work, whether one is receiving psychological counselling, and hospice work experience impacted profile membership. In terms of age and whether income meets expectations, hospice nurses aged 26~35 were more likely to be placed in class 1 than nurses aged≥46, and nurses whose income did not meet expectations were more likely to belong to class 1. Comparing between class 1 and class 3, first, hospice nurses who worked in primary/community hospitals were more likely to be placed in class 1 than those who worked in tertiary hospitals, while nurses who worked in secondary hospitals were more likely to be placed in class 3 than those who worked in tertiary hospitals. Second, hospice nurses who were not interested, slightly interested, or interested in hospice work were more likely to appear in class 1 than nurses who were very interested in hospice work. Third, nurses who had not received psychological counselling tended to belong to class 1. Finally, nurses with ≤3 years, 4–5 years, or 6–10 years of hospice work experience tended to be placed in class 1 than those with hospice work experience > 11 years. However, there was no tendency to profile membership for comparisons between class 1 and class 2 in terms of hospital level, interest in hospice care work, whether receiving psychological counselling, and hospice work experience.

Professional quality of life with latent profile membership

Table 5 shows the results of the differences in the three dimensions of the ProQOL of the three profiles. The mean CS scores of hospice nurses in Classes 1, 2, and 3 were 12.64 (SD=2.51), 14.97 (SD=2.50), and 17.67 (SD=2.67), respectively. The mean BO scores of hospice nurses in Classes 1, 2, and 3 were 11.52 (SD=2.63), 10.71 (SD=2.72), and 9.40 (SD=3.98), respectively. The mean ST scores of hospice nurses in Classes 1, 2, and 3 were 9.96 (SD=2.88), 10.32 (SD=2.70), and 10.37 (SD=3.50),

Table 3 Comparison of demographic and work-related characteristics between the three profiles by latent profile membership ($n = 725$)

Variables	Total sample ($n = 267$) *n* (%)	C1 ($n = 216$) *n* (%)	C2 ($n = 359$) *n* (%)	C3 ($n = 150$) *n* (%)	χ^2	*P*
Age (years)					66.210	<0.001
≤ 25	135 (18.62)	53 (24.54)	58 (16.16)	24 (16.00)		
26~35	351 (48.41)	134 (62.04)	169 (47.07)	48 (32.00)		
36~45	172 (23.73)	22 (10.18)	96 (26.74)	54 (36.00)		
≥ 46	67 (9.24)	7 (3.24)	36 (10.03)	24 (16.00)		
Gender					2.148	0.342
Female	721 (99.45)	215 (99.54)	356 (99.16)	150 (100.00)		
Male	4 (0.55)	1 (0.46)	3 (0.84)	0 (0.00)		
Marital status					15.446	0.004
Married	516 (71.17)	132 (61.11)	268 (74.65)	116 (77.34)		
Single	200 (27.59)	81 (37.50)	87 (24.23)	32 (21.33)		
Widowed or separated	9 (1.24)	3 (1.39)	4 (1.12)	2 (1.33)		
Education level					5.676	0.225
College or below	123 (16.97)	44 (20.37)	51 (14.21)	28 (18.67)		
University	579 (79.86)	168 (77.78)	294 (81.89)	117 (78.00)		
Masters or above	23 (3.17)	4 (1.85)	14 (3.90)	5 (3.33)		
Professional title					51.568	<0.001
Nurse	121 (16.69)	46 (21.30)	52 (14.49)	23 (15.33)		
Nurse practitioner	264 (36.41)	103 (47.69)	122 (33.98)	39 (26.00)		
Charge nurse	261 (36.00)	59 (27.31)	145 (40.39)	57 (38.00)		
Assistant director nurse	62 (8.55)	5 (2.31)	35 (9.75)	22 (14.67)		
Director nurse	17 (2.35)	3 (1.39)	5 (1.39)	9 (6.00)		
Region					18.261	0.019
Northern China	119 (16.42)	40 (18.52)	48 (13.37)	31 (20.67)		
Western China	60 (8.28)	11 (5.09)	36 (10.02)	13 (8.67)		
Eastern China	438 (60.41)	129 (59.72)	229 (63.79)	80 (53.33)		
Central China	42 (5.79)	11 (5.09)	16 (4.46)	15 (10.00)		
Southern China	66 (9.10)	25 (11.58)	30 (8.36)	11 (7.33)		
Level of hospital					19.127	0.001
Tertiary hospital	490 (67.59)	154 (71.30)	231 (64.34)	105 (70.00)		
Secondary hospital	126 (17.38)	32 (14.81)	58 (16.16)	36 (24.00)		
Primary/community hospital	109 (15.03)	30 (13.89)	70 (19.50)	9 (6.00)		
Monthly income (RMB)					7.281	0.122
≤ 3000	52 (7.17)	18 (8.33)	24 (6.68)	10 (6.66)		
3001~5000	204 (28.14)	74 (34.26)	93 (25.91)	37 (24.67)		
≥ 5001	469 (64.69)	124 (57.41)	242 (67.41)	103 (68.67)		
Whether income meets expectations					37.469	<0.001
Yes	290 (40.00)	53 (24.54)	154 (42.90)	83 (55.33)		
No	435 (60.00)	163 (75.46)	205 (57.10)	67 (44.67)		
Employment status					14.642	0.001
Contract	450 (62.07)	161 (74.54)	222 (61.84)	85 (56.67)		
Permanent	275 (37.93)	55 (25.46)	137 (38.16)	65 (43.33)		
Do you participate in clinical teaching					12.699	0.002
Yes	303 (41.79)	75 (34.72)	148 (41.23)	80 (53.33)		
No	422 (58.21)	141 (65.28)	211 (58.77)	70 (46.67)		
Whether have experience of witnessing the death of family members or friends					11.281	0.004
Yes	426 (58.76)	108 (50.00)	218 (60.72)	100 (66.67)		
No	299 (41.24)	108 (50.00)	141 (39.28)	50 (33.33)		
Number of annual training sessions in hospice care					4.814	0.568
≤ 5	663 (91.45)	199 (92.13)	330 (91.92)	134 (89.33)		

Table 3 (continued)

Variables	Total sample (*n* = 267) *n* (%)	C1 (*n* = 216) *n* (%)	C2 (*n* = 359) *n* (%)	C3 (*n* = 150) *n* (%)	χ^2	*P*
6~10	41 (5.66)	10 (4.63)	19 (5.29)	12 (8.00)		
11~15	10 (1.38)	4 (1.85)	3 (0.84)	3 (2.00)		
≥ 16	11 (1.52)	3 (1.39)	7 (1.95)	1 (0.67)		
Number of end-of-life patient care daily					3.350	0.764
≤ 5	592 (81.66)	177 (81.95)	289 (80.50)	126 (84.00)		
6~10	97 (13.38)	26 (12.04)	52 (14.49)	19 (12.67)		
11~15	14 (1.93)	5 (2.31)	6 (1.67)	3 (2.00)		
≥ 16	22 (3.03)	8 (3.70)	12 (3.34)	2 (1.33)		
Hospice work experience (years)					33.008	<0.001
≤ 3	465 (64.14)	160 (74.07)	218 (60.72)	87 (58.00)		
4–5	106 (14.62)	23 (10.65)	57 (15.88)	26 (17.33)		
6–10	108 (14.90)	29 (13.43)	63 (17.55)	16 (10.67)		
≥ 11	46 (6.34)	4 (1.85)	21 (5.85)	21 (14.00)		
Reasons for choosing hospice care work					9.773	0.008
Arranged by the hospital	663 (91.45)	208 (96.30)	323 (89.97)	132 (88.00)		
Active application	62 (8.55)	8 (3.70)	36 (10.03)	18 (12.00)		
Interest in hospice care work					118.276	<0.001
Not at all interested	27 (3.72)	16 (7.41)	9 (2.51)	2 (1.33)		
Slightly interested	288 (39.72)	114 (52.78)	139 (38.72)	35 (23.33)		
Interested	329 (45.38)	78 (36.11)	187 (52.09)	64 (42.67)		
Very interested	81 (11.17)	8 (3.70)	24 (6.69)	49 (32.67)		
Whether receiving psychological counselling					24.077	<0.001
Yes	311 (42.90)	65 (30.09)	164 (45.68)	82 (54.67)		
No	414 (57.10)	151 (69.91)	195 (54.32)	68 (45.33)		
Turnover intention					21.956	<0.001
Yes	236 (32.55)	89 (41.20)	120 (33.43)	27 (18.00)		
No	489 (67.45)	127 (58.80)	239 (66.57)	123 (82.00)		

Note C1: Poor empathy ability- high surface empathy expression group, C2: Moderate empathy ability group, C3: High empathy ability- high deep empathy expression group

respectively. The scores of CS and BO significant different across the three subgroups ($P<0.001$). In addition, the SNK test results shows that the mean score of class 3 was significantly higher than that of class 1 and class 2 when concerning CS, whereas that of class 1 was the lowest. Meanwhile, in terms of BO, the mean score of class 3 was significantly lower than that of class 1 and class 2, whereas class 1 was the highest.

Discussion

This research aimed at analysing the differences in empathy ability among hospice nurses according to latent profiles. The findings of this research identified three distinct potential profiles of empathy for hospice nurses according to the score responses for each item, namely, the "poor empathy ability-high surface empathy expression", "moderate empathy ability" and "high empathy ability-high deep empathy expression" groups. This categorisation reflects the heterogeneity of empathy of hospice nurses in each latent profile, complements previous studies that treat hospice nurses as a homogeneous whole and provides guidance for developing targeted intervention measures in further research to enhance their empathy ability.

The "poor empathy ability-high surface empathy expression" group consisted of 29.8% ($n=216$) of the sample. The total mean scores of empathy ability in this group were 95.00±11.89, while the average scores of items representing the surface emotional empathy subdimension were greater than the items representing the deep emotional empathy subdimension in the emotional empathy dimension of hospice nurses in class 1. The empathy ability assessment instrument adopted in this study was constructed on the basis of emotional labour theory [34]. This theory suggests that individuals can regulate their emotional expression at work to meet organizationally based expectations according to emotional display rules and can express any specific emotion at any of the three levels of natural acting, surface acting, and deep acting [55]. Therefore, our findings reflected that hospice nurses in this profile not only had poor empathy ability but also tended to display surface forms

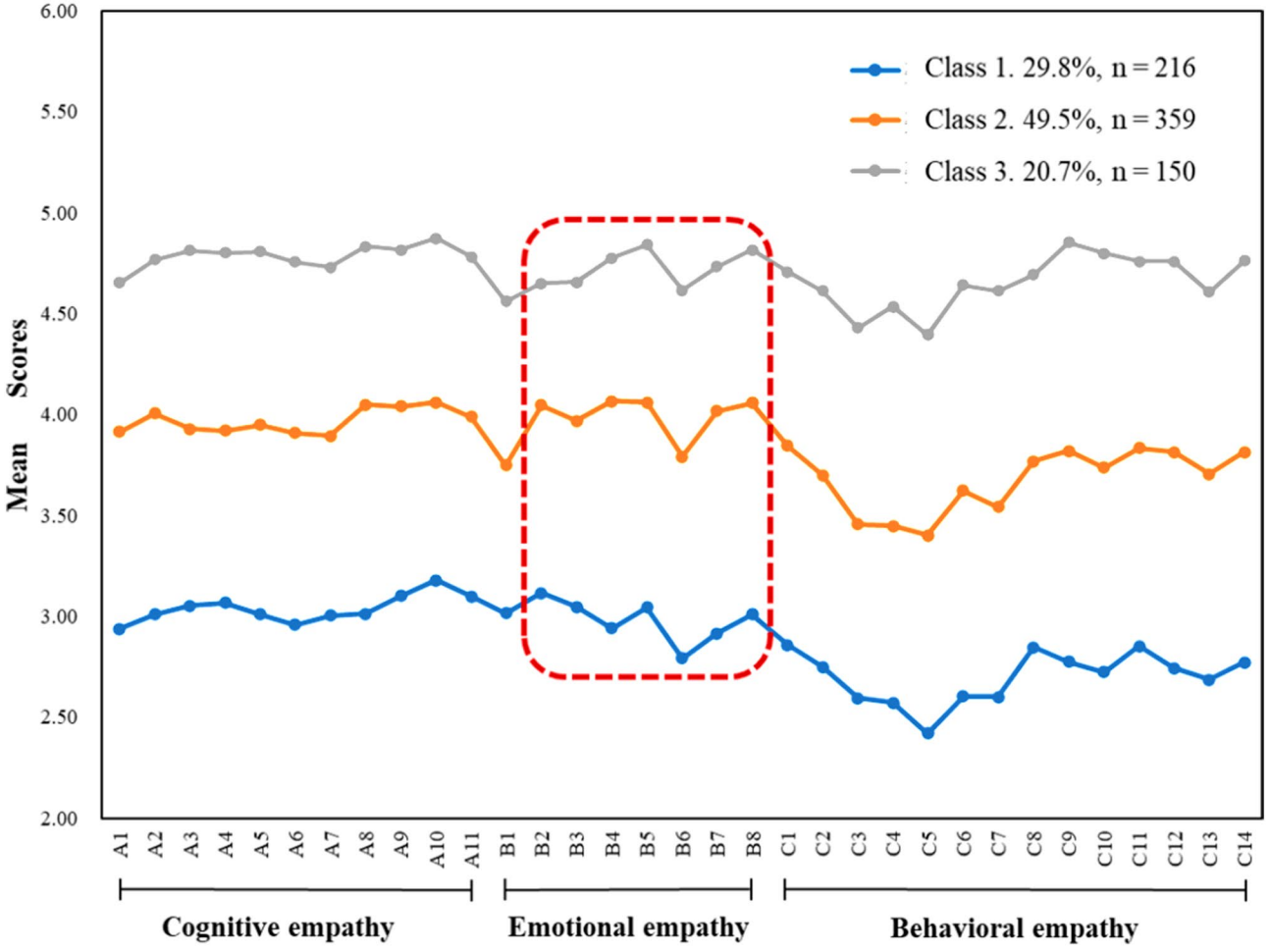

Fig. 1 Latent profiles of empathy ability among hospice nurses. *Note* items (A1-A11) for cognitive empathy ability dimension, items (B1-B8) for emotional empathy ability dimension, and items (C1-C14) for behavioral empathy ability dimension

of emotional empathy ability. The "moderate empathy ability" group represented 49.5% (n=359) of the sample, and the total mean score of empathy ability in this group was 126.86±8.30. More than three-quarters of the nurses were in the class 1 and class 2, indicating that the empathy ability of most hospice nurses in China is at a moderate or even low level. The "high empathy ability-high deep empathy expression" group only accounted for 20.7% (n=150), and the total mean score of empathy ability was 155.48±8.27. Contrary to class 1, the average scores of items representing the surface emotional empathy subdimension were lower than the items representing the deep emotional empathy subdimension, which means that hospice nurses in this profile have good empathy ability and tend to exhibit deep forms of emotional empathy ability. Therefore, we can consider that the empathy ability of most hospice nurses in China is currently at a moderate or even low level, with significant room for improvement. The particularity of the service recipients of hospice care determines that hospice nurses need to put in more emotional effort than other department nurses to meet the emotional needs of terminally ill patients. Meanwhile, considering the rapid development of hospice care in China in recent years, nursing managers should pay more attention to the practical problem of low empathy ability among hospice nurses and strive to cultivate their empathy skills.

This phenomenon can be ascribed to several factors. First, our previous study revealed that hospice nurses' empathy is also an emotional labour process that encompasses cognitive empathy and affective empathy, and the affective components of empathy include dimensions of natural empathy, surface empathy, and deep empathy [10]. However, the current nursing curriculum system of empathy ability is still focused on improving the cognitive empathy, neglecting the affective aspects [56]; thus, the majority of nurses with poor empathy ability may be at a low level in both cognitive and emotional components. This is especially the case for low level emotional empathy, which is more pronounced; nurses tend to

Table 4 Multinomial logistic regression analysis of predictor of the latent profile membership ($n = 725$)

Variables	Class 2: Moderate empathy ability (vs. Class 1: Poor empathy ability- high surface empathy expression)					Class 3: High empathy ability- high deep empathy expression (vs. Class 1: Poor empathy ability- high surface empathy expression)				
	B	SE	OR	95% CI	*P*	B	SE	OR	95% CI	*P*
Age (years) (ref: ≥46)										
≤ 25	-1.046	0.742	0.351	0.082–1.504	0.158	-0.753	0.923	0.471	0.077–2.875	0.415
26~35	**-1.347**	**0.641**	**0.260**	**0.074–0.913**	**0.035**	**-1.487**	**0.736**	**0.226**	**0.053–0.957**	**0.043**
36~45	-0.331	0.609	0.718	0.218–2.369	0.587	0.216	0.667	1.241	0.336–4.585	0.746
Marital status (ref: Widowed or separated)										
Married	0.313	0.929	1.368	0.222–8.444	0.736	0.846	1.184	2.330	0.229–23.730	0.475
Single	0.579	0.899	1.785	0.307–10.389	0.519	1.206	1.132	3.341	0.364–30.691	0.286
Professional title (ref: Director nurse)										
Nurse	0.985	1.031	2.679	0.355–20.211	0.339	-0.053	1.155	0.948	0.099–9.120	0.963
Nurse practitioner	1.090	0.975	2.974	0.440–20.100	0.264	0.027	1.041	1.027	0.134–7.896	0.979
Charge nurse	1.347	0.940	3.844	0.609–24.259	0.152	0.137	0.969	1.147	0.172–7.667	0.888
Assistant director nurse	1.542	0.943	4.675	0.736–29.701	0.102	0.263	0.963	1.300	0.197–8.592	0.785
Region (ref: Southern China)										
Northern China	-0.253	0.388	0.776	0.363–1.661	0.514	0.192	0.559	1.212	0.405–3.629	0.731
Western China	0.432	0.495	1.541	0.585–4.061	0.382	0.695	0.678	2.005	0.531–7.567	0.305
Eastern China	0.113	0.330	1.120	0.587–2.137	0.731	0.607	0.509	1.835	0.677–4.975	0.233
Central China	-0.007	0.511	0.993	0.365–2.703	0.990	1.124	0.663	3.077	0.839–11.285	0.090
Level of hospital (ref: Tertiary hospital)										
Primary/community hospital	0.069	0.294	1.072	0.602–1.908	0.814	**-1.171**	**0.486**	**0.310**	**0.120–0.803**	**0.016**
Secondary hospital	0.301	0.281	1.351	0.779–2.3422	0.284	**0.844**	**0.349**	**2.325**	**1.173–4.608**	**0.016**
Whether income meets expectations										
No (ref: Yes)	**-0.644**	**0.219**	**0.525**	**0.342–0.807**	**0.003**	**-0.735**	**0.282**	**0.479**	**0.276–0.833**	**0.009**
Employment status										
Permanent (ref: Contract)	-0.119	0.266	0.888	0.527–1.496	0.655	0.063	0.355	1.065	0.532–2.135	0.858
Do you participate in clinical teaching										
No (ref: Yes)	0.423	0.238	1.526	0.957–2.432	0.076	0.424	0.321	1.529	0.815–2.867	0.186
Whether have experience of witnessing the death of family members or friends										
No (ref: Yes)	-0.205	0.194	0.815	0.557–1.192	0.292	-0.368	0.267	0.692	0.410–1.167	0.168
Interest in hospice care work (ref: Very interested)										
Not at all interested	-1.147	0.650	0.318	0.089–1.135	0.078	**-3.209**	**0.923**	**0.040**	**0.007–0.246**	**0.001**
Slightly interested	-0.555	0.483	0.574	0.223–1.479	0.251	**-2.747**	**0.514**	**0.064**	**0.023–0.176**	**0.000**
Interested	-0.166	0.468	0.847	0.338–2.121	0.723	**-2.092**	**0.479**	**0.123**	**0.048–0.316**	**0.000**
Whether receiving psychological counselling										
No (ref: Yes)	-0.424	0.217	0.654	0.428-1.000	0.050	**-0.677**	**0.280**	**0.508**	**0.294–0.880**	**0.016**
Turnover intention										
No (ref: Yes)	-0.052	0.212	0.950	0.626–1.440	0.808	0.602	0.311	1.825	0.993–3.356	0.053
Hospice working experience (years) (ref: ≥11)										
≤ 3	-0.947	0.607	0.388	0.118–1.275	0.119	**-1.871**	**0.648**	**0.154**	**0.043–0.548**	**0.004**
4–5	-0.737	0.648	0.479	0.135–1.703	0.255	**-1.467**	**0.702**	**0.231**	**0.058–0.914**	**0.037**
6–10	-0.640	0.636	0.527	0.152–1.835	0.315	**-1.929**	**0.713**	**0.145**	**0.036–0.587**	**0.007**
Reasons for choosing hospice care work										
Active application (ref: Arranged by the hospital)	0.582	0.448	1.789	0.744–4.304	0.194	-0.099	0.541	0.906	0.313–2.617	0.855

Note SE: Standard Error, OR: Odds Ratio, 95% CI: 95% Confidence Interval

Table 5 Professional quality of life difference of three profiles ($n=725$)

Variable	C1 ($n=216$) M ± SD	C2 ($n=359$) M ± SD	C3 ($n=150$) M ± SD	F/H	SNK
Compassion satisfaction	12.64 ± 2.51	14.97 ± 2.50	17.67 ± 2.67	174.283**	C3> C2> C1
Burnout	11.52 ± 2.63	10.71 ± 2.72	9.40 ± 3.98	22.222**	C1> C2> C3
Secondary traumatic stress	9.96 ± 2.88	10.32 ± 2.70	10.37 ± 3.50	1.227*	—

Note **means $P<0.001$, *means $P=0.294$, C1: Poor empathy ability- high surface empathy expression group, C2: Moderate empathy ability group, C3: High empathy ability- high deep empathy expression group, M: Mean, SD: standard deviation, SNK: Student–Newman–Keuls

passively inhibit their emotional express and adopt surface empathy when they face negative emotional events from patients during the empathy process. In contrast, nurses with good empathy ability tend to positively self-regulate their inner emotions and respond to those negative emotional events with deep empathy, such as displaying humanistic care and a professional attitude from their heart. Second, hospice nurses work in a constant emotionally challenging context, they may always be confronted with recurrent distressing events, such as exposure to death and dying, and observing extreme suffering events, including physical pain in patients [57], resulting in nurses exhibiting two different responses of emotional empathy (surface empathy and deep empathy) due to their level of empathy ability during the empathy process. Third, 64.14% of participants had less than 3 years of hospice working experience, indicating that they may lack experience in hospice care and even lack empathy skills. Moreover, China has implemented a pilot project of hospice care in five regions in 2017, and the quality ranking of death and dying in China jumped from 71st globally in 2015 to 53rd in 2021 [11]. However, the hospice care in China is not yet sufficiently developed [12, 13]; some areas of hospice care work still focus on the exploration and practice of hospice policy research, and empathy has not yet been included in the core competency development of hospice nurses [30]. Therefore, there is a lower level of empathy among hospice nurses. In addition, our study also strongly suggests that nursing managers should immediately cultivate empathy as one of the core competencies of hospice nurses. At the same time, attention should be paid to the inner emotional state of hospice nurses. For example, emotional regulation courses can be added to the cultivation of empathy ability among hospice nurses to enhance their psychological resources and help them have stable psychological resources to regulate their inner emotions when working in a constant emotionally challenging work environment, promoting the transformation of nurses' empathy ability towards a form of "high empathy ability-high deep empathy expression" in the future.

The demographic and work-related influencing factors of profile membership include age, hospital level, whether income meets expectations, interest in hospice care work, whether receiving psychological counselling, and hospice work experience. In this study, hospice nurses aged 26~35 and with less than 10 years of hospice work experience tended to be in the "poor empathy ability-high surface empathy expression" group. Our results were consistent with previous studies [24, 58] in which the level of care quality was found to differ according to age and clinical experience. Age [59] and hospice work experience were the most likely predictors of nurses' attitudes towards hospice care. Compared to younger nurses, older nurses, especially those with more hospice work experience, have more experience in life and can better respect and understand life, therefore they can easier understand dying patients' demands, and communicate better with them and their families [32]. Therefore, younger nurses as well as nurses with less hospice work experience may have poor empathy ability and tend to show forms of surface empathy when caring for dying patients than older nurses. Meanwhile, nurses whose income did not meet expectations were more likely to appear in the "poor empathy ability-high surface empathy expression" group. Previous studies revealed that salary is an important predictor in empathy ability [60]. High-income nurses tend to have higher levels of job satisfaction and subjective well-being; they are more likely to be actively involved in services delivery, place themselves in the patient's position, and provide more nursing care [61]. This may be an important reason why nurses whose income does not meet expectations were more likely to display "poor empathy ability- high surface empathy expression". Hospice nurses who worked in primary/community hospitals were more likely to appear in the "poor empathy ability-high surface empathy expression" group, as most hospice and palliative care services are still currently provided in secondary and tertiary hospitals in China [62], and nurses who work in secondary and tertiary hospitals have more opportunities for hospice training, more experience caring for terminally ill patients, and better empathy ability. In addition, hospice nurses who were very interested in hospice work and had the chance to receive psychological counselling were more likely to appear in the "high empathy ability-high deep empathy expression" group. Unsurprisingly, the more interested nurses are in hospice care, the more likely they are to be motivated to take the initiative to learn hospice knowledge and skills and improve their own empathic abilities. Studies have reported that nurses are accustomed to experiencing

negative emotions, such as sadness, anxiety, and depression, when dealing with events such as patients' suffering and death [63], and these negative emotions are likely to cause nurses to lack empathy [64] towards hospice care for dying patients; thus, the provision of psychological counselling helps reduce the negative emotional experiences of nurses and to some extent improves their empathy ability [65].

Our study found that the latent profile membership of hospice nurses' empathy had a significant impact on both CS and BO aspects of their ProQOL. Hospice nurses with "high empathy ability- high deep empathy expression" have better CS and lower BO, whereas nurses with "poor empathy ability-high surface empathy expression" have lower CS and higher BO. This may be because nurses with "high empathy ability-high deep empathy expression" are more able to think from the patient's point of view, perceive the patient's needs, and generate corresponding emotional responses and active altruistic behaviours from their hearts; therefore, they have more positive psychological feelings during the process of empathy and have higher CS and lower BO. However, nurses with "poor empathy ability-high surface empathy expression" have poor empathy ability, and if they are asked to give emotional care to others, they are more likely to show surface empathy expression in the process of empathy, thus inhibiting their true emotional expression, which is likely to increase the incidence of BO and decrease the level of CS. Empathy can be seen as a double-edged sword; it can be a weakness for nurses, also can be a core quality and professionalism in the work of nurses [40]. Previous researches also demonstrated that nurses' empathy was associated with CS and BO [66, 67], and nurses' empathy was reported as a protective factor against burnout [40] and has been recognised as a characteristic of nurses with a higher level of CS [68]. Hospice care has a relatively specialised working environment, and compared to other nurses, hospice nurses may experience more work-related stress [42]. Therefore, nursing managers should timely identify hospice nurses with high risk of BO. In addition to encouraging nurses to use methods such as expressive writing for emotional expression [69], creating emotional release activities for nurses, and helping nurses receive targeted training in emotional perception, recognition, expression, control, and application, empathy ability training such as education [70, 71], mindful self-care practices [72], peer support [73] and narrative medicine interventions [74] can also be conducted to enhance their emotional regulation ability, and reduce the occurrence of BO.

Limitations

This research still has some limitations. First, due to the uneven development of hospice care in China and the impact of COVID-19, we used convenience sampling, thus the representative of sample and the generalizability of study findings may have some limits, varied and stratified samples need to provide in the further studies. In addition, due to this reason, an online questionnaire platform to recruit some of the participants and collect part of the data. The number of questionnaires distributed and the differences between nurses who participated and those who refused to participate were unknown. However, our research team carried out offline data collection as much as possible and collected online data as a supplement, strictly following quality control to maximize the scientific validity and credibility of the data. Second, the use of self-reported measures to assess nurses' empathy ability might have led to possible bias; In addition, we applied the Brief ProQOL-12 to assess nurses' CS, BO and STS, although the Brief ProQOL-12 has significantly improved over the 30-item ProQOL and has been verified with Asian samples, it still needs to be further verified in the language and environment of Chinese Mainland. Third, as a cross-sectional study, the results of this research cannot be employed to identify causality; therefore, the causal relationship between hospice nurses' empathy ability and ProQOL cannot be determined. Further longitudinal studies are needed in the future to track the trajectory of hospice nurses' empathy over time.

Conclusion

This research innovatively identified the subgroup characteristics and predictors of hospice nurses' empathy ability through LPA. We found three obvious profiles of empathy ability among hospice nurses, consisting of the "poor empathy ability-high surface empathy expression" group, the "moderate empathy ability" group, and the "high empathy ability-high deep empathy expression" group, and proposed the role advantages of nurses with "high empathy ability-high deep empathy expression". Meanwhile, we revealed potential predictors of profile membership include age, hospital level, whether income meets expectations, interest in hospice care work, whether receiving psychological counselling, and hospice work experience. This study is beneficial in suggesting that nursing administrators can design targeted interventions and specific training programs based on the heterogeneity of nurses' empathy abilities in future hospice care practices. For example, nursing administrators can first select nurses suitable for hospice care positions based on these demographic and work-related characteristics. Secondly, they can provide targeted incentives and psychological empowerment such as peer support and narrative medicine to nurses who have already engaged in hospice care work based on these characteristics and needs of each subgroup, thereby improving nurses' empathy ability. In addition, promoting hospice nurses' empathy

ability can be an effective approach to affect both CS and BO aspects of their ProQOL. In a word, improving empathy ability is crucial for nurses to meet the demands of the hospice health care system and conducive to improving hospice nurses' CS while reducing BO, thus fostering their overall quality of life.

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Author contributions
Huiling Li and Yaling Wang designed the study. Yaling Wang, Ziwei Yang, Yuezhong Tang, Wen Chen, and Yawen Zheng collected the data. Yaling Wang and Chuntao Wang contributed to data analysis and produced the original draft. Huiling Li and Zhiming Wei took responsibility for revising the manuscript. All authors contributed to the article and approved the submitted version.

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Data availability
The data supporting the conclusions of this research will be made available from the corresponding authors upon reasonable request.

Declarations

Ethics approval and consent to participate
The research was approved by the Medical Ethics Committee of the First Affiliated Hospital of Soochow University (approval no. 2020 – 258). All methods were carried out in accordance with relevant guidelines and regulations. Informed consent was obtained from all participants. To protect the individual's privacy, all the collected data were preserved anonymously and confidentially.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Author details
[1]School of Nursing, Jiangsu Vocational College of Medicine, No. 283, South Jiefang Road, Yancheng 224005, China
[2]Nursing Department, Dushu Lake Hospital Affiliated to Soochow University, No. 9, Chongwen Road, Suzhou 215006, China
[3]Hospice Department, KangJian Community Health Service Center, No. 88, Jiangan Road, Shanghai 200233, China
[4]Hospice Department, The Second People's Hospital of Lianyungang, No. 161, South Xingfu Road, Lianyungang 222023, China
[5]School of Nursing, Soochow University, No. 1, Shizi Street, Suzhou 215000, China

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