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How physicians respond to negative emotions in high-risk preoperative conversations

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ABSTRACT

Objective: To investigate physicians' responses to negative emotions in high-risk preoperative conversations; and to explore the influencing factors of these responses.
Methods: One hundred and sixty-two audio recordings were coded using the Chinese Verona Coding Definition of Emotional Sequences (VR-CoDES). Big Five Personality Inventory Brief Version and Emotional Intelligence Scale were administered to explore the influencing factors of physicians' responses. SPSS 24.0 and R 3.6.3 LME4 Package were used for data analysis.
Results: Reduce Space (83%), referring to physicians' responses reducing the opportunities of patients to disclose emotions, was physicians' most frequent response to patients or families' emotions. The main responses were Information-advice (ERIa) and Ignoring (NRIa). Younger age, female, Agreeableness and Openness were factors positively associated with Explicit Provide Space (EP); Neuroticism was negatively correlated with EP. Extroversion was negatively correlated with Explicit Reduce Space (ER); Conscientiousness was negatively correlated with both EP and ER responses. Emotional intelligence had no significant influence on physicians' responses.
Conclusion: The majority of physicians were inclined to reduce space by providing information advice or ignoring. Physicians' responses were correlated with their gender, age and personality traits.
Practice implications: The trainees' gender, age and personality should be considered when conducting doctor-patient communication skills training.

1. Introduction

High-risk procedures are those operations, treatments or examinations with a high possibility of unexpected negative outcomes during or after the procedures. These are often linked with high medical cost but may result in serious complications, dissatisfying therapeutic effects, and higher death rate [1–4]. Pearse et al. found that high-risk surgery accounts for only 12.5% of the total surgeries but more than 80% of its deaths [4]. Medical conflicts, referring to misunderstanding and confrontations between health care providers and patients on medical process or outcomes [5], were more often observed among high-risk procedures [6]. One explanation for this phenomenon is that patients and their families experience more negative emotions and are prone to anxiety and depression [7–9]. Negative emotions are known to be the result of dissatisfying medical care experience [3] and are also a possible signal that may trigger medical conflicts. In the last two decades in China, physicians have witnessed a poor doctor-patient relationship with increasing medical complaints in high-risk procedures [6,10]. To cope with these problems, Chinese hospitals have taken varied measures including the implementation of high-risk preoperative conversation program. For example, the Third Hospital of Peking University established the "In-Advance Intervention" to interpret these concerns and to help patients and their families cope with stress and anxiety [6]. Research indicated that high-risk preoperative conversation can increase the patients and their families' satisfaction, reduce medical

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conflicts, and promote a harmonious doctor-patient relationship [6,11].

Active responses from physicians to subtle hints of patients could alleviate patients' psychological distress, and were correlated with positive physician-patient relationship and health outcomes [12,13]. However, there are large variations in how physicians respond to patients' emotional speech. The responses range from ignoring or providing no acknowledgment of emotions to active and explicit responses [14]. The Verona Coding Definitions of Emotional Sequence (VR-CoDES) is a valid and theoretically underpinned coding tool focusing on physician-patient communication sequences which has been used to identify patients' negative emotions (cues and concerns) and code the accompanying health providers' responses to these emotions [14,15]. The VR-CoDES has been applied in various medical consultations including multiple sclerosis [7], cancer [16,17], psychiatry [18], primary care [19], and other settings. The Chinese version of VR-CoDES has been approved as a reliable tool and has been utilized in standardized patients [20] and ophthalmic consultations [21]. In this body of work there were individual differences in how physicians responded to patients and families' emotional cues and concerns [22]. Zhou et al. found that patient's multimorbidity and economic level might affect physicians' responses in general practice conversations [23]. Piccolo et al.'s study reported an association between the increased psychiatrist's practice years and the diminished cues of the patients, which would be consistent with the influence of the personal characteristics and clinical experience of this specialist staff [18]. Additionally, female physician used more emotional talk than male doctors [24], and physicians' responses were affected by their own personalities and emotional intelligence [19,25].

The Five-Factor Model has been used to develop scales to evaluate people's personality, and the scales designed to assess the five components have been widely applied. The model includes five dimensions: Openness, which means having esthetic sensitivity and active imagination; Conscientiousness, which means having persistence, self-discipline and striving for achievement; Extroversion, which means energetic behavior, positive affect and sociability; Agreeableness, which means affective, altruistic, and collaborative behaviors; and Neuroticism, which means fearfulness, anxiety, and insecurity in relationships [26,27]. Patients were more satisfied with physicians who were relatively high in Openness [25]. An important study has indicated that empathetic physicians who obtained higher score on Conscientiousness and Agreeableness had a better physician-patient relationship [10]. Emotional intelligence (EI) is defined by Mayer and Salovey as "a type of social intelligence that involves the ability to monitor one's own and other's emotions, to discriminate among them, and to use this information to guide one's own thinking and actions' the ability to perceive, understand, use and manage themselves and emotions" [28]. Physicians with high EI may be better able to identify and respond to expressions of psychosocial distress and hence improve their communication with patients [19,29].

To our knowledge, there are no research reports studying patients and families' negative emotions and physicians' responses to these emotions in high-risk preoperative conversations. In addition, studies focusing more generally on the relationship between the physicians' responses and their personality traits are very few. To fill this gap, we conducted the following study to achieve three objectives: (1) to explore patients and families' negative emotions in the high-risk preoperative conversations; (2) to explore how physicians respond to these negative emotions; (3) to investigate the potential influencing factors of physicians' responses.

2. Methods

2.1. Participants and procedures

2.1.1. Participants

Audio tapes of high-risk preoperative conversations, recorded from January 2017 to May 2019, at a tertiary hospital in Hunan province, China were included in this study. After excluding those tapes with insufficient patient information or with too much extraneous noise, 162 conversations in total were analyzed. One hundred and fifty-nine patients scheduled for major surgeries or medical procedures were involved in these conversations. However, only 26 of them participated in the conversations in person, due to reasons of the patients were too sick to participate or their families were unwilling to let them participate. In total, 250 family members and 41 physicians were involved in the conversations. The consultations were held in a meeting room at the hospital, and no researchers of this study were present. A voice recorder was used to record the conversations, and the audio tapes were scheduled to be saved for ten years.

Nineteen clinical departments were included, namely: Transplantation (n = 30), Urology (n = 27), Gynecology (n = 21), General Surgery (n = 12), Obstetrics (n = 11), Orthopedics (n = 10), ENT (n = 8), Hematology (n = 8), Ophthalmology (n = 8), Gastrointestinal Surgery (n = 6), Cardiothoracic Surgery (n = 6), Intensive Care Unit (n = 3), Hepatobiliary Surgery (n = 3), Gastroenterology (n = 3), Neurology (n = 2), Respiratory (n = 1), Traditional Chinese Medicine (n = 1), Oncology (n = 1), and Gerontology (n = 1). The main features of the 159 patients were critically ill with complex diagnoses, long duration of sickness or hospitalization, with two or more complications. According to the difficulty of the operations (grade 1–4 from easy to difficult, stipulated by the government Health Administration), the majority of the surgeries in this study were labeled 3 or above. Procedures of those internal medicine departments were all intrusive physical exams or treatments. Operations for special groups such as elderly patients, pregnant women rated with high-risk and neonatal patients with severe diseases were also included.

2.1.2. Coding procedures

Three co-authors of this study transcribed the 162 conversations. Two raters (M Yin and Y Zhao) rated all the transcripts in three steps by using the VR-CoDES Chinese manual. To begin with, the two raters (R1/R2) selected 12 transcripts randomly and rated them together. A common coding criterion was reached and a coding guidance framework was developed to accompany the manual. Secondly, the two raters randomly picked out 30 transcripts of the 162 conversations and rated them independently in order to examine inter-rater reliability. Two weeks later, R1 rated the same transcripts again to establish intra-rater reliability. Finally, R1 rated the rest of the transcripts and discussed with R2 to clarify some ambiguous coding.

2.1.3. Implementation of questionnaires

Each physician was contacted alone and given the same instructions for completing the questionnaires including the Emotional Intelligence Scale (EIS) and the Chinese Big Five Personality Inventory brief version (CBF-PI-B). Researcher explained to them the objectives of the study and emphasized the voluntary and confidential nature. Questionnaires were completed on-line within 10–15 min.

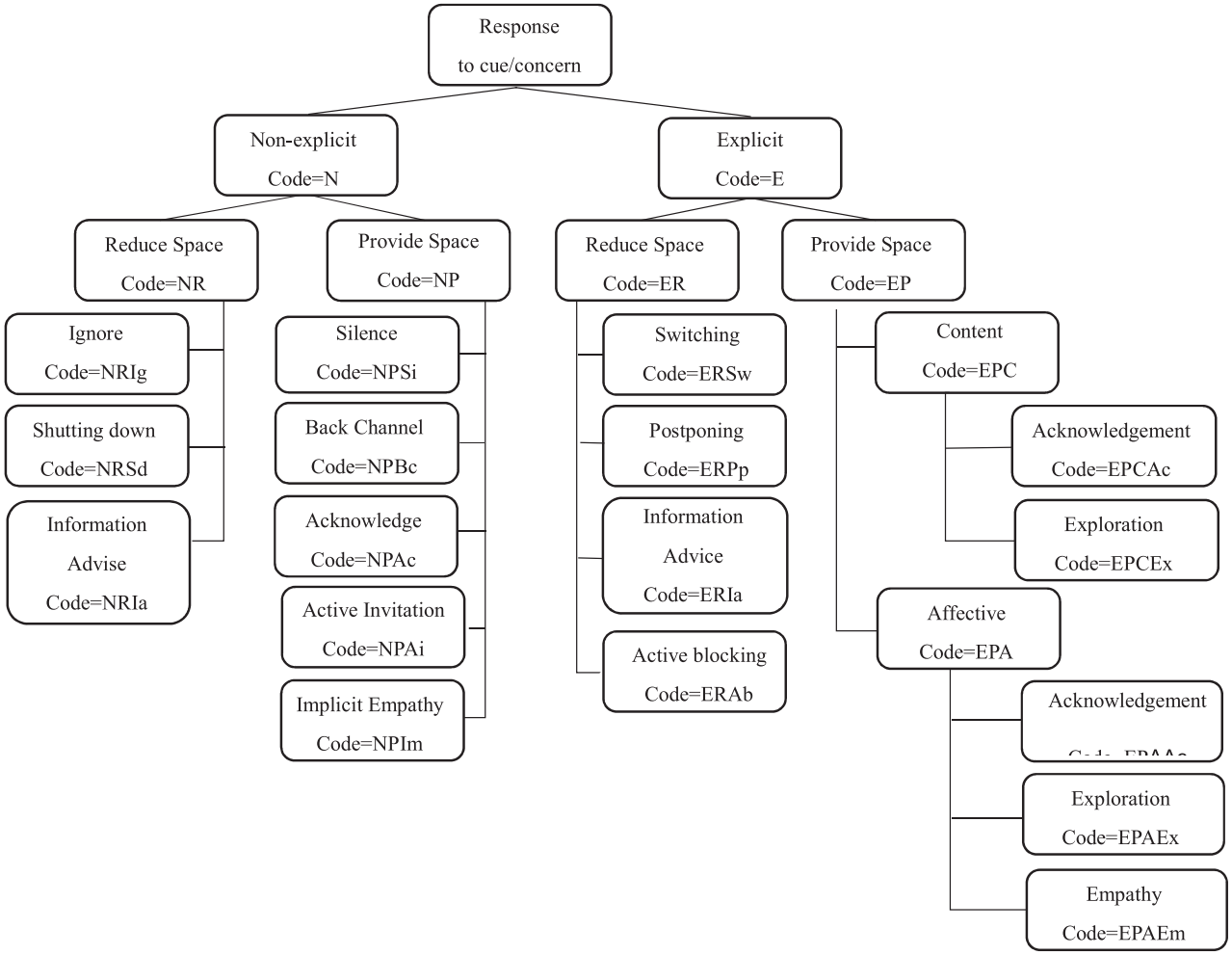

Fig. 1. The Verona coding definitions of emotional sequences for the health provider (VR-CoDES-P) flow chart.

2.2. Measures

2.2.1. Coding tool

The Chinese version of VR-CoDES was applied to code patients and families' cues and concerns and the physicians' responses in high-risk preoperative conversation. The VR-CoDES-C, coding the negative emotion from patients, defines a cue as "a verbal or non-verbal hint which suggests an underlying unpleasant emotion that lacks clarity", and a concern as "a clear and unambiguous expression of an unpleasant current or recent emotion that is explicitly verbalized with or without a stated issue of importance" [15]. The VR-CoDES-P codes the responses from physician to each cue or concern which revealed or expressed by the patient. Each response was coded into two dimensions: explicitness and space provision for further disclosure of worries [14]. In addition, responses were divided into 4 sub-categories and 17 specified categories (see Fig. 1). More details can be found in the online coding manual (www.each.eu).

The Chinese VR-CoDES obtained acceptable reliability (ICC = 0.79) and validity (specificity = 0.99, sensitivity = 0.96) when applied to standardized Chinese medical consultations for the first time [20]. The ICCs of inter-rater reliability for cues/concerns and responses were 0.78 and 0.81, and intra-rater reliability were 0.87 and 0.99 in ophthalmic clinical consultations in China [21].

2.2.2. Emotional Intelligence Scale

Emotional Intelligence Scale (EIS), developed by Schutte et al., is based on the model of emotional intelligence to measure emotional intelligence [30]. EIS consists of 33 items using a five-point Likert scale in which 1 represents total disagreement and 5 as total agreement, with high scores indicating high levels of emotional intelligence. The scale has been shown to have high internal consistency (Cronbach's $\alpha = 0.87$) and high test-retest reliability (Cronbach's $\alpha = 0.78$) [30]. The Chinese version of EIS, translated by Wang et al., shows good reliability (Cronbach's $\alpha = 0.84$) and validity [31,32]. For this study we obtained a high internal consistency (Cronbach's $\alpha = 0.87$), which is very close to previous studies. We used the Chinese version of EIS was used to evaluate physicians' emotional intelligence.

2.2.3. The Chinese Big Five Personality Inventory brief version

The Chinese Big Five Personality Inventory brief version (CBF-PI-B) which described with five dimensions: Openness, Conscientiousness, Extroversion, Agreeableness and Neuroticism was introduced and adapted by Wang et al. and has been used to assess the personalities of the Chinese population [10,33,34]. Each dimension has eight items with the six-point Likert ranking (1 = definitely false to 6 = definitely true). The scores of each dimension ranges from 8 to 48, and a higher score indicates a stronger tendence to certain personality dimension. The scale has good internal consistency (Cronbach's α between 0.764 and 0.814) and good test-retest reliability (Cronbach's α between 0.672 and 0.811) in each personality dimension [35]. Our study also yielded a good reliability (Cronbach's α arranged between 0.72 and 0.87). We used the CBF-PI-B to evaluate the physicians' personalities.

2.3. Data analysis

SPSS 24.0 was used to analyze the data. The intra-class correlation coefficient (ICC) was used to calculate inter/intra-rater reliability for the coding of the VR-CoDES. Multilevel Generalized Linear Model was used to explore the affecting factors of physicians' responses. In order to satisfy the nested relationship between the physicians and the patients' families, only 30 physicians who had appeared in more than one conversation were kept in the analysis. Therefore, 151 conversations that included the 30 physicians were left to be performed for the regression analysis. The outcome variable was physicians' responses. A two-level random intercept Poisson model was established. The first level explored the differences among physicians' responses, and the second level explored the demographic variables, emotional intelligence and Big Five personality scores regarded as independent variables. R 3.6.3 LME4 Package was used to perform the regression analysis, following three steps: (1) Model 1 was constructed to explore if there existed differences between physicians' responses. (2) Model 2 was constructed to explore the influence of demographic variables including age and gender on physicians' responses. (3) Model 3 was constructed to explore the influence of emotional intelligence and Big Five personality on physicians' responses. σ_u^2 represents the proportion of the variation of the dependent variable that can be explained by the independent variable through regression analysis. As the Non-Explicit Provide responses were very scarce, we didn't explore the regression analysis on this category.

2.4. Ethics

This study was approved by the Ethics Committee of the Third Xiangya Hospital of Central South University (2019-S259). All the patients and families voluntarily participated in the conversations. Informed consents of audio recordings for further research were obtained. Written informed consents were obtained from all the physicians.

3. Results

3.1. Samples

Of the forty-one physicians, twenty-one were male (51.2%), with a mean age of 41.1 years (SD = 6.02, range 30–52). The mean number of conversations per physician was 3.95 (SD = 3.38, range 1–15); mean conversation length was 27.58 min (SD = 11.92 min, range 7.27–70.2 min). Of the 250 families, the mean number per conversation was 1.54. Of the 26 patients, the mean number per conversation was 0.16. Table 1 displays the EIS and CBF-PI-B scores of the 30 physicians who were included in the regression analysis.

3.2. Inter-rater reliability and intra-rater reliability

The ICCs of inter-rater reliability for the identification of cues/concerns and the physicians' responses were 0.87 and 0.89 respectively. The ICCs of intra-rater reliability were 0.88 for cues/concerns and 0.91 for the physicians' responses respectively.

3.3. Patients and families' emotional expressions and physicians' responses

3.3.1. Patients and families' cues/concerns

The mean number of cues/concerns per conversation was 6.22 (SD = 7.81, range 0–50); 19 conversations (11.73%) contained no cues. Of the 26 patients, only 14 patients' conversations were coded with cues (n = 55) or concerns (n = 4). The number of cues was significantly higher than concerns. As for sub-categories of cues, cue-b accounted for 64.3% of the total cues and concerns (n = 648), which was the most followed by cue-d accounting for 17.9% (n = 180). Cue-a was almost absent. Table 2 shows detailed definitions of cue and concern from VR-CoDES coding manual and examples of each category. Table 3 displays the frequencies of different categories of cues and concerns.

Table 1
Physicians' EIS and CBF-PI-B scores (n = 30).

Scales	Mean (SD)	Range
EIS total	132.07 ± 11.12	113–159
CBF-PI-B		
Conscientiousness	33.37 ± 3.76	27–40
Agreeableness	33.37 ± 3.51	28–40
Openness	26.27 ± 5.83	14–40
Extroversion	22.60 ± 4.62	12–33
Neuroticism	18.83 ± 5.97	8–31

Note: EIS: Emotional Intelligence Scale. Higher score indicates the higher level of emotional intelligence.
CBF-PI-B: The Chinese Big Five Personality Inventory brief version. Higher score indicates the higher intention of certain personality dimension.

3.3.2. Physicians' responses

The maximum response category to cues and concerns was Reduce Space (83%) which including Explicit Reduce Space (43.2%) and Non-explicit Reduce Space (39.8%). Explicit Provide Space (13.5%) and Non-explicit Provide Space (3.5%) composed the rest of the responses. As for specified individual categories, the Information Advice (ERIa, 40.5%) and Ignoring (NRIg, 32.2%) composed the majority of the physicians' responses of Reduce Space. Acknowledge (NPAc) and Silence (NPSi) were not identified. Table 4 displays frequencies of physicians' responses.

3.4. Regression analysis of physicians' responses

In Explicit Reduce Space (ER) dimension, responses were different among physicians (Model 1, σ_u^2 = 0.55). In Model 2, gender ($\beta = -0.54$, $p > 0.05$) and age ($\beta = 0.03$, $p > 0.05$) were not significantly correlated with responses. In Model 3, female physicians had significantly fewer ER responses than male physicians ($\beta = -1.03$, $p < 0.01$). Regarding the Big Five Inventory, Conscientiousness and Extroversion were significantly negatively correlated with ER ($\beta = -0.20$, $p < 0.001$; $\beta = -0.08$, $p < 0.05$). Model 3 increased the interpretation rate of the variance by 3.3% over Model 1 (calculated using proportionate change in log likelihood). Table 5 displays regression results of Explicit Reduce Space.

In Explicit Provide Space (EP) dimension, responses were different among physicians (Model 1, σ_u^2 = 0.32). In Model 2, female physicians had significantly more EP responses than male physicians ($\beta = 0.02$, $p < 0.001$). In Model 2 and Model 3, younger physicians had significantly more EP responses than older physicians ($\beta = -0.01$, $p < 0.001$;$\beta = -0.08$, $p < 0.01$). Neuroticism and Conscientiousness were significantly negatively correlated with EP ($\beta = -0.05$, $p < 0.05$; $\beta = -0.18$, $p < 0.001$). Agreeableness and Openness were significantly positively correlated with EP ($\beta = 0.08$, $p < 0.05$;$\beta = 0.08$, $p < 0.01$). Model 3 increased the interpretation rate of the variance by 4.2% over Model 1 (calculated using proportionate change in log likelihood). Table 6 displays regression results of Explicit Provide Space.

In dimensions of Non-explicit Reduce Space (NR) and Non-explicit Provide Space (NP), responses were diverse among physicians (Model 1, $\sigma_u^2 = 0.75$, $\sigma_u^2 = 0.88$). In Model 2, gender and age were not significantly correlated with NR ($\beta = -0.39$, $p > 0.05$; $\beta = 0.05$, $p > 0.05$). In Model 3, female physicians had significantly fewer NR responses than male physicians ($\beta = -0.79$, $p < 0.05$). As to NP, gender and age were not significantly correlated with it both in

Table 2
Examples of cues and concerns presented in conversations.

Expression	Definition	Example in high-risk preoperative conversation
Concern	A clear and unambiguous expression of an unpleasant current or recent emotion that is explicitly verbalized with or without a stated issue of importance	F: I am worried about this problem.
Cue-a	Words or phrases in which the patient uses vague or unspecified words to describe his/her emotions	F: I'm resigned to this. This is life.
Cue-b	Verbal hints to hidden concerns (emphasizing, unusual words, unusual description of clinical signs, profanities, exclamations, metaphors, ambiguous words, double negatives, expressions of uncertainties and hope)	P: I will die soon, right? F: After the gastric anastomosis, there should be no problem, right?
Cue-c	Words or phrases which emphasize (verbally or non-verbally) physiological or cognitive correlates (regarding sleep, appetite, physical energy, for example) of unpleasant emotional states.	F: I have not slept for many days.
Cue-d	Neutral expressions that mention issues of potential emotional importance which stand out from the narrative background and refer to stressful life events and conditions	F: My brother lives in the rural area, how to prevent him from infection?
Cue-e	A patient-elicited repetition of a previous neutral expression (repetitions, reverberations or echo of a neutral expression within a same turn are not included)	F: That physician is not responsible, for he has no sense of responsibility.
Cue-f	Non-verbal expressions of emotion	F: (Sighing)
Cue-g	Clear expression of an unpleasant emotion, which occurred in the past(more than one month ago) or is without time frame.	P: I couldn't take it at first, but now I adjust myself to accept it.

Note: P: patient; F: family member.

Table 3
Frequencies of different categories of cues and concerns (conversation N = 162).

Variables	Frequency	Percentage (%)	Mean (SD)	Range
Cue-a	1	0.1	0.01	0–1
Cue-b	648	64.3	4.00 ± 5.57	0–34
Cue-c	67	6.7	0.41 ± 2.55	0–12
Cue-d	180	17.9	1.11 ± 1.78	0–12
Cue-e	24	2.4	0.15 ± 0.74	0–3
Cue-f	37	3.7	0.23 ± 1.73	0–6
Cue-g	5	0.5	0.03	0–1
Total Cues	962	95.5	5.94 ± 7.53	0–50
Total Concerns	45	4.5	0.28 ± 1.97	0–9
Total Cues and Concerns	1007	100.0	6.22 ± 7.81	0–50

Note: Percentage(%) means that the number of variable accounts for total cues and concerns.
Mean refers to the number of cue or concern per conversation.

Table 4
Frequencies of physicians' responses (conversation N = 162).

Responses	Given patient's cue and concern	Percentage (%)
Non-explicit Reduce Space (NR)	401	39.8
Ignore (NRIg)	324	32.2
Shutting down (NRSd)	10	1.0
Information Advise (NRIa)	67	6.7
Non-explicit Provide Space (NP)	35	3.5
Back channel (NPBc)	20	2.0
Active invitation (NPAi)	15	1.5
Empathy (NPIm)	1	0.1
Explicit Reduce Space (ER)	435	43.2
Switching (ERSw)	5	0.5
Postponing (ERPp)	8	0.8
Information Advice (ERIa)	408	40.5
Active blocking (ERAb)	14	1.4
Explicit Provide Space (EP)	136	13.5
Content acknowledgment (EPCAc)	66	6.6
Content exploration (EPCEx)	13	1.3
Affective acknowledgment (EPAAc)	20	2.0
Affective exploration (EPAEx)	1	0.1
Affective empathy (EPAEm)	35	3.5
Total	1007	100.0

Note: Every percentage (%) means that the number of responses accounts for total responses.

Model 2 and Model 3. Personality characteristics were not significantly correlated with NR or NP.

In addition, Emotional Intelligence was not significant correlated with any of the above responses including ER, EP, NR and NP.

4. Discussion and conclusion

4.1. Discussion

From this study, we found that the occurrence of negative emotions among patients and their families were high. Furthermore, the majority of negative emotions were disclosed in a vague way. As Explicit Reduce Space was the mostly identified coding, it indicated that the physicians provided little opportunity for the patients and families to convey their emotions. Physicians' responses were correlated with their gender, age and personality traits. Female physicians, younger doctors and those physicians with Extroversion, Agreeableness, or Openness traits demonstrated more space providing, while physicians with Neuroticism characteristics provided less space to patients and families' emotional overflow.

4.1.1. Patients and families' negative emotions

The mean numbers of cues and concerns per conversation in this study were higher than some previous studies [7,19,36–38], implying a higher level of negative emotions among patients and families. In addition to the surgery itself, high medical cost [1], high incidence of complications [1,2] and high mortality risk [1,2,4] during or soon after the operation, are all key elements making the patients and families prone to expressing negative emotion such as anxiety and worry.

Patients and families expressed more implicit cues compared to explicit concerns indicating that patients and families' emotions may not get attention from the physicians easily. This finding is in line with previous research [7,9,12,17,37–39]. Cue-b (verbal use of metaphors or unusual words to hidden negative emotion) [23,39] was the most frequently code followed by cue-d (neutral words or narrations of life events), which was similar to Piccolo et al.'s study [7]. Cue-a (vague words) only appeared once in this study, which was different from previous research results [7,36,39]. We interpret this phenomenon as the following: as the physicians were highly focused in the disclosure of medical information rather than emotional support [40], patients and families indirectly conveyed worries or directly expressed concerns which were closely related to the diseases and treatment options, instead of using vague or unspecified words.

4.1.2. Physicians' responses to cues/concerns

Explicit Reduce Space (ER) was the most identified response, which is consistent with our previous studies [20,21]. This finding suggested that the physicians were prone to switch, postpone or actively block the patients and families' emotional expression. If they gave feedback, treatment advice for the disease was always

Table 5
Multiple regression results of *Explicit Reduce Space* (ER).

		Model 1		Model 2		Model 3	
		Coefficient (β)	Standard error	Coefficient (β)	Standard error	Coefficient (β)	Standard error
Fixed effect	Intercept	0.68	0.16	0.48	1.18	10.68***	2.88
	Gender			-0.54	0.29	-1.03**	0.34
	Age			0.03	0.03	-0.03	0.03
	EIS					0.24	0.24
	Neuroticism					-0.04	0.02
	Conscientiousness					-0.20***	0.06
	Agreeableness					0.02	0.04
	Openness					0.04	0.03
	Extroversion					-0.08*	0.03
Random effect	σ_u^2	0.55	0.74	0.47	0.68	0.42	0.65
Log-likelihood		-378.21		-375.92		-365.70	

bσ_u^2 ‡ 0 indicates an existence of variation
cEIS: Emotional intelligence scale
* a = significant at P < 0.05,
** = significant at P < 0.01,
*** = significant at P < 0.001.

their first choice of response type. However, many studies conducted in Western countries obtained opposite findings demonstrating a high trend of providing space [8,18,36,38]. In our opinion, the possible reasons for this may lay on the physician's understanding of the purpose for the conversation, and the deficiency of Chinese medical systems, and education. As most of the physicians in this study had a common appreciation that the main objectives of their conversation with patients were informing them of the risks and concentrating on obtaining consent from the patients and families, hence dealing with emotional issues might not be their priority. Under the Chinese medical system, the workload of physicians in the tertiary hospital (setting where our samples collected from) is always overwhelming because of the large numbers of patients, hence, limited time yields a "come straight to the point" communication pattern. Furthermore, China has long been insufficient on focusing on medical humanities education and doctor-patient communication skills training [5]. However, Reduce or Provide Space should not be considered simply in terms of being "good or bad", as in certain situations, a Reduce Space response might be appropriate, even beneficial [41]. While concentrating on medical aspects, physicians might not realize that emotional exploration sometimes is of great assistance and is needed to understand the implications of a disease for a patient and to tailor management accordingly [41].

Among the 17 sub-responses, Information Advice (ERIa) and Ignoring (NRIg) were the most coded responses, a set of findings consistent with previous studies [18,20]. Giving information advice mainly includes providing medical information relating to the treatment. One way to understand the approach taken by the physicians in this study of the 'ignoring' response is that the physicians tend to overlook that patients and families' emotional content, in addition to selectively using more frequently an informational content in their conversations with patients [7]. However, patients and their families benefit not only with sufficient medical information, but also attention to emotional content as well.

4.1.3. Influencing factors on physicians' responses

Female physicians had significantly fewer responses in Explicit Reduce Space (ER) dimension but more in Explicit Provide Space (EP) dimension than male physicians. This finding is in line with previous study [18]. Female physicians performed in a more patient-centered way [24,42,43]. They engaged in more psychosocial question asking, active partnership behaviors, and emotional focused conversation [42]. On the other hand, male physicians are more likely to display a more emotionally disconnected, task-oriented conversation [43]. Furthermore, patients communicating with female physicians expressed more comprehensively, disclosed more psychological information and make more positive statements than do the patients with male physicians [42]. These findings imply a need for male physicians to focus on patients' emotion more, or in addition to medical information and provide 'more space' to patients and families.

Table 6
Multiple regression results of *Explicit Provide Space* (EP).

		Model 1		Model 2		Model 3	
		Coefficient (β)	Standard error	Coefficient (β)	Standard error	Coefficient (β)	Standard error
Fixed effect	Intercept	-0.38	0.01	-0.04***	0.01	5.95	3.16
	Gender			0.02***	0.01	-0.08	0.26
	Age			-0.01***	0.01	-0.08**	0.03
	EIS					0.36	0.25
	Neuroticism					-0.05*	0.02
	Conscientiousness					-0.18***	0.05
	Agreeableness					0.08*	0.03
	Openness					0.08**	0.03
	Extroversion					-0.03	0.02
Random effect	σ_u^2	0.32	0.57	0.32	0.56	0.27	0.61
Log-likelihood		-205.84		-375.92		-197.20	

bσ_u^2 ‡ 0 indicates an existence of variation
cEIS: Emotional intelligence scale
* a = significant at P < 0.05,
** = significant at P < 0.01,
*** = significant at P < 0.001.

Younger physicians tended to provide more EP responses and patients expressed more emotions when they communicate with younger doctors, which is in line with previous studies [7,18]. Previous work has indicated that older physicians may be more directive in assessing affective symptoms in the manner of reducing patients' need or opportunities to express cues [18]. In contrast, young physicians are inexperienced and need to get enough information by providing space when communicating with patients and families.

Physicians scoring higher in Extroversion had fewer ER responses. Due to the high level of interpersonal involvement, they tended to provide space in order to be more open to the discussion. In previous studies, physicians with extroverted personality traits usually responded in a positive way [44]. These physicians, with sufficient space provision and emotional exploration, can provide necessary medical information to the patients and families in order to meet their needs in both physical and psychological aspects. Physicians scoring higher in Neuroticism had fewer EP responses. Those with high neuroticism scores have greater psychological pressure and are more likely to experience negative emotions such as depression or anxiety, and experience difficulty in coping. Wu et al. found that physicians' personality traits influenced coping approaches, and highly neurotic physicians often adopted negative coping strategies [44]. Therefore, they may find it difficult to provide space for patients and families to convey more emotions. Physicians scoring higher in Agreeableness had more EP responses in our study. Individuals with high agreeableness are more favorable on building better physician-patient relationships and training proficiency [45]. Therefore, they can explicitly pay attention to patients and families' negative emotions and provide space for them, which is a more ideal way of physician-patient communication. We also found that physicians scoring higher in Openness had more EP responses. Open people are more sensitive to emotional nuances [25], and they are perceived to be more empathetic and able to respond emotionally [46]. Therefore, they are usually open to the negative emotions and provide space for further exploration. Physicians scoring higher in Conscientiousness had both fewer ER and EP responses. We speculate that these physicians may have a strong sense of self-awareness and tend to respond in a balanced way. In other words, neither providing nor reducing too much space, hence, both ER and EP were negatively correlated with Conscientiousness. Physicians with different personalities demonstrated various responses in our study, which supported Holmes et al.'s finding that specific personality traits could affect physicians communication skills [47].

Emotional intelligence had no significant influence on the above responses. This finding is inconsistent with previous studies that physicians with high emotional intelligence might be better able to identify patients and families' negative emotions and response actively [19]. Future studies are needed therefore to explore the correlation between emotional intelligence and Chinese physicians' responses.

4.1.4. Study strengths and limitations

Our study has several strengths. First, this is the first study using the VR-CoDES to analyze the high-risk preoperative conversation. Second, we found interesting correlations between the responding patterns and different personality traits among Chinese physicians. However, limitations of this study are considered. First, because of the culture differences between the Chinese version and the original VR-CoDES, we still met some challenges during the coding process [20,21], for instance, euphemistic expressions may imply one's blame or concerns, self-mocking may imply certain worry. Future study is needed to improve the Chinese VR-CoDES and to make it more adapted into Chinese culture. Second, the negative emotions of patients and families were mixed in this study. As the written records of the included audiotapes were uncompleted, details such as who was speaking and the family' relation to the patient was absent. Hence, we could not distinguish exactly the identification of the speakers. In future studies, we suggest that all the details of the information should be written and video recorded in order to improve the accuracy of the identification of the participants' identities.

4.2. Conclusion

High occurrence of negative emotions was found among patients and their family members in high-risk preoperative conversation, and implicit cues were their main emotional disclosure. When responding to negative emotions, physicians were inclined to reduce space by providing information advice or ignoring. Female and younger doctors were more open to patient emotional expression. Physicians with Extroversion, Openness or Agreeable personality traits provided more space to patients and their families during the conversations. Emotional intelligence was not correlated with physicians' response style in our study.

4.3. Practice Implications

The Chinese version of VR-CoDES can, not only, be used to identify the hidden worries and anxiety of patients and their families, but may also be used to assess physicians' responses to negative emotions. Triggered from this study, we suggest that individualized communication skills training model should be developed with a consideration of the trainees' gender, age and personality traits. It would be interesting to further explore gender differences in more detail, and it might also be interesting to explore the impact of different communication profiles on patient outcomes in the future.

Ethical Approval

This study was approved by the Ethics Committee of the Third Xiangya Hospital of Central South University (2019-S259). All the patients and families voluntarily participated in the conversations. Informed consents of audio recordings for further research were obtained. Written informed consents were obtained from all the physicians.

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CRediT authorship contribution statement

Bingyu Tie: Responsible for research design and implementation, Data processing, Essay writing. **Xinchun Liu:** Direct research design, Supervise study implementation, Guide the revision of the paper. **Meng Yin:** Responsible for research design and implementation, Data processing, Participate in essay writing. **Gerald Humphrisc:** Participate the revision of the paper. **Yi Zhang:** Participate in research implementation, Data collection. **Huaqing Liu:** Participate in research implementation, Data collection. **Ya Zhao:** Data processing, Participate in essay writing. **Qingyan Wang:** Participate in research implementation.

Declarations of Interest

None.

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References

[1] Kongpakwattana K, Dilokthornsakul P, Dhippayom T, Chaiyakunapruk N. Clinical and economic burden of postsurgical complications of high-risk surgeries: a cohort study in Thailand. J Med Econ 2020;0:1–7. https://doi.org/10.1080/13696998.2020.1787420
[2] Gray TF. Variation in hospital mortality associated with surgery. N Engl J Med 2010;362:78. https://doi.org/10.1056/NEJMc0910310
[3] Greenley JR, Young TB, Schoenherr RA. Psychological distress and patient satisfaction. Med Care 1982;20:373–85. https://doi.org/10.1097/00005650-198204000-00003
[4] Pearse RM, Harrison DA, James P, Watson D, Hinds C, Rhodes A, Grounds RM, Bennett ED. Identification and characterisation of the high-risk surgical population in the United Kingdom. Crit Care 2006;10:10–5. https://doi.org/10.1186/cc4928
[5] H. Peng, A Researchment on the Doctor-patient Game and the Harmonization of their communication, 2008. (In Chinese).
[6] Lei Y, Zhou L, Zhou H, Yang X, Liu X. Research on the function of in-advance intervention in prevention medical dispute. Chin Hosp 2008;12:62–3. (In Chinese).
[7] Del Piccolo L, Pietrolongo E, Radice D, Tortorella C, Confalonieri P, Pugliatti M, Lugaresi A, Giordano A, Heesen C, Solari A, Drulovic J, Kasper J, Köpke S, Van Nunen A, Degner L, Gaissmaier W, Goss C, Ferrari G, Antozzi C, Farina D, Piscedda V, Trojano M, Paolicelli D, Backhus I, Poettgen J, Pirard M, Symons A, Vahter L, Kannel K, Clanet M, Viala F, Pekmezovic T. Patient expression of emotions and neurologist responses in first multiple sclerosis consultations. PLoS One 2015;10:1–12. https://doi.org/10.1371/journal.pone.0127734
[8] Korsvold L, Mellblom AV, Lie HC, Ruud E, Loge JH, Finset A. Patient-provider communication about the emotional cues and concerns of adolescent and young adult patients and their family members when receiving a diagnosis of cancer. Patient Educ Couns 2016;99:1576–83. https://doi.org/10.1016/j.pec.2016.03.028
[9] Mjaaland TA, Finset A, Jensen BF, Gulbrandsen P. Patients' negative emotional cues and concerns in hospital consultations: a video-based observational study. Patient Educ Couns 2011;85:356–62. https://doi.org/10.1016/j.pec.2010.12.031
[10] Wan Q, Jiang L, Zeng Y, Wu X. A big-five personality model-based study of empathy behaviors in clinical nurses. Nurse Educ Pract 2019;38:66–71. https://doi.org/10.1016/j.nepr.2019.06.005
[11] Wang Z, Ji G, Qian M, Shen J, Zhu W, Li W. Exploration of new measures for prevention of medical disputes over surgery of grade 4. Mod Hosp Manag 2019;17. https://doi.org/10.3969/j.issn.1672 - 4232.2019.02.012. (In Chinese).
[12] Eide H, Eide T, Rustøen T, Finset A. Patient validation of cues and concerns identified according to Verona coding definitions of emotional sequences (VR-CoDES): a video- and interview-based approach. Patient Educ Couns 2011;82:156–62. https://doi.org/10.1016/j.pec.2010.04.036
[13] Adams K, Cimino JEW, Arnold RM, Anderson WG. Why should I talk about emotion? Communication patterns associated with physician discussion of patient expressions of negative emotion in hospital admission encounters. Patient Educ Couns 2012;89:44–50. https://doi.org/10.1016/j.pec.2012.04.005
[14] Del Piccolo L, de Haes H, Heaven C, Jansen J, Verheul W, Bensing J, Bergvik S, Deveugele M, Eide H, Fletcher I, Goss C, Humphris G, Kim YM, Langewitz W, Mazzi MA, Mjaaland T, Moretti F, Nübling M, Rimondini M, Salmon P, Sibbern T, Skre I, van Dulmen S, Wissow L, Young B, Zandbelt L, Zimmermann C, Finset A. Development of the Verona coding definitions of emotional sequences to code health providers' responses (VR-CoDES-P) to patient cues and concerns. Patient Educ Couns 2011;82:149–55. https://doi.org/10.1016/j.pec.2010.02.024
[15] Zimmermann C, Del Piccolo L, Bensing J, Bergvik S, De Haes H, Eide H, Fletcher I, Goss C, Heaven C, Humphris G, Kim YM, Langewitz W, Meeuwesen L, Nuebling M, Rimondini M, Salmon P, van Dulmen S, Wissow L, Zandbelt L, Finset A. Coding patient emotional cues and concerns in medical consultations: the Verona coding definitions of emotional sequences (VR-CoDES). Patient Educ Couns 2011;82:141–8. https://doi.org/10.1016/j.pec.2010.03.017
[16] Korsvold L, Mellblom AV, Finset A, Ruud E, Lie HC. A content analysis of emotional concerns expressed at the time of receiving a cancer diagnosis: an observational study of consultations with adolescent and young adult patients and their family members. Eur J Oncol Nurs 2017;26:1–8. https://doi.org/10.1016/j.ejon.2016.10.005
[17] Finset A, Heyn L, Ruland C. Patterns in clinicians' responses to patient emotion in cancer care. Patient Educ Couns 2013;93:80–5. https://doi.org/10.1016/j.pec.2013.04.023
[18] Del Piccolo L, Mazzi MA, Goss C, Rimondini M, Zimmermann C. How emotions emerge and are dealt with in first diagnostic consultations in psychiatry. Patient Educ Couns 2012;88:29–35. https://doi.org/10.1016/j.pec.2012.01.010
[19] Cherry MG, Fletcher I, Berridge D, O'Sullivan H. Do doctors' attachment styles and emotional intelligence influence patients' emotional expressions in primary care consultations? An exploratory study using multilevel analysis. Patient Educ Couns 2018;101:659–64. https://doi.org/10.1016/j.pec.2017.10.017
[20] Yin L, Yin M, Wang Q, Yan Y, Tang Q, Deng Y, Liu X. Can Verona Coding Definitions of Emotional Sequences (VR-CoDES) be applied to standardized Chinese medical consultations? – a reliability and validity investigation. Patient Educ Couns 2019;102:1460–6. https://doi.org/10.1016/j.pec.2019.03.025
[21] Yin M, Cheng W, Liu X. Applying Chinese Verona Coding Definitions of Emotional Sequences (VR-CoDES) in ophthalmic consultations: an observational study. Patient Educ Couns 2020;103:1335–42. https://doi.org/10.1016/j.pec.2020.01.018
[22] Finset A. "I am worried, Doctor!" Emotions in the doctor-patient relationship. Patient Educ Couns 2012;88:359–63. https://doi.org/10.1016/j.pec.2012.06.022
[23] Zhou Y, Lundy JM, Humphris G, Mercer SW. Do multimorbidity and deprivation influence patients' emotional expressions and doctors' responses in primary care consultations? – an exploratory study using multilevel analysis. Patient Educ Couns 2015;98:1063–70. https://doi.org/10.1016/j.pec.2015.05.026
[24] Shin DW, Roter DL, Roh YK, Hahm SK, Cho BL, Park HK. Physician gender and patient centered communication: the moderating effect of psychosocial and biomedical case characteristics. Patient Educ Couns 2015;98:55–60. https://doi.org/10.1016/j.pec.2014.10.008
[25] Duberstein P, Meldrum S, Fiscella K, Shields CG, Epstein RM. Influences on patients' ratings of physicians: physicians demographics and personality. Patient Educ Couns 2007;65:270–4. https://doi.org/10.1016/j.pec.2006.09.007
[26] Goldberg LR, John OP, Kaiser H, Lanning K, Peabody D. Personality processes and individual differences – an Alternative " Description of Personality ": The Big-Five Factor Structure. J Pers Soc Psychol 1990;59:1216–29.
[27] Goldberg LR. The structure of phenotypic personality traits. Am Psychol 1993;48:26–34. https://doi.org/10.1037/0003-066X.48.1.26
[28] Mayer JD, Salovey P. Emotional intelligence. Imagin Cogn Pers 1990;9:185–211.
[29] Cherry MG, Fletcher I, O'Sullivan H, Shaw N. What impact do structured educational sessions to increase emotional intelligence have on medical students? BEME Guide No. 17. Med Teach 2012;34:11–9. https://doi.org/10.3109/0142159X.2011.614293
[30] Schutte NS, Malouff JM, Hall LE, Haggerty DJ, Cooper JT, Golden CJ, Dornheim L. Development and validation of a measure of emotional intelligence. Pers Individ Dif 1998;25:167–77. https://doi.org/10.1016/S0191-8869(98)00001-4
[31] Zheng X, Gu H, Zhu P. A study of the emotional intelligence scale (EIS) by the multivariate generalizability theory. Psychol Sci 2009;32:181–3. https://doi.org/10.16719/j.cnki.1671-6981.2009.01.042
[32] Wang C, He Z. The relationship between parental rearing styles with general self-efficacy and emotional intelligence in middle school students. Chin Ment Heal J 2002;16:781–782+785. https://doi.org/10.1017/CBO9781107415324.004. (In Chinese).
[33] Wang M, Yao S, Dai X. Development of Chinese Big Five Personality Inventory (CBF-PI) : theoretical framework and relability analysis. Chin J Clin Psychol 2010;18:545–8. https://doi.org/10.16128/j.cnki.1005-3611.2010.05.012. (In Chinese).
[34] Wang M, Dai X, Yao S. Development of the Chinese Big Five Personality Inventory (CBF-PI)II : validity analysis. Chin J Clin Psychol 2010;18:687–90. https://doi.org/10.16128/j.cnki.1005-3611.2010.06.030. (In Chinese).
[35] Wang M, Dai X, Yao S. Development of the Chinese Big Five Personality Inventory (CBF-PI) III: psychometric properties of CBF-PI brief version. Chin J Clin Psychol 2011;19:454–7. https://doi.org/10.16128/j.cnki.1005-3611.2011.04.004. (In Chinese).
[36] Heyn L, Ruland CM, Finset A. Effects of an interactive tailored patient assessment tool on eliciting and responding to cancer patients' cues and concerns in clinical consultations with physicians and nurses. Patient Educ Couns 2012;86:158–65. https://doi.org/10.1016/j.pec.2011.04.024
[37] Butalid L, Verhaak PFM, Bensing JM. Changes in general practitioners' sensitivity to patients' distress in low back pain consultations. Patient Educ Couns 2015;98:1207–13. https://doi.org/10.1016/j.pec.2015.07.027
[38] Mellblom AV, Finset A, Korsvold L, Loge JH, Ruud E, Lie HC. Emotional concerns in follow-up consultations between paediatric oncologists and adolescent survivors: a video-based observational study. Psychooncology 2014;23:1365–72. https://doi.org/10.1002/pon.3568
[39] Vatne TM, Finset A, Ørnes K, Ruland CM. Application of the Verona Coding Definitions of Emotional Sequences (VR-CoDES) on a pediatric data set. Patient Educ Couns 2010;80:399–404. https://doi.org/10.1016/j.pec.2010.06.026
[40] Butow PN, Brown RF, Cogar S, Tattersall MHN, Dunn SM. Oncologists' reactions to cancer patients' verbal cues. Psychooncology 2002;11:47–58. https://doi.org/10.1002/pon.556
[41] Mjaaland TA, Finset A, Jensen BF, Gulbrandsen P. Physicians' responses to patients' expressions of negative emotions in hospital consultations: a video-based observational study. Patient Educ Couns 2011. https://doi.org/10.1016/j.pec.2011.02.001
[42] Roter DL, Hall JA. Physician gender and patient-centered communication: a critical review of empirical research. Annu Rev Public Health 2004;25:497–519. https://doi.org/10.1146/annurev.publhealth.25.101802.123134
[43] Hall JA, Gulbrandsen P, Dahl FA. Physician gender, physician patient-centered behavior, and patient satisfaction: a study in three practice settings within a hospital. Patient Educ Couns 2014;95:313–8. https://doi.org/10.1016/j.pec.2014.03.015
[44] Wu X, Qiu D, Ye B, Ye F, Chen Y. Relationship between personality traits anxiety depression and coping style in clinicians. Sichuan Ment Heal 2015;28:260–2. https://doi.org/10.11886/j.issn.1007-3256.2015.03.021

[45] Abe K, Niwa M, Fujisaki K, Suzuki Y. Associations between emotional intelligence, empathy and personality in Japanese medical students. BMC Med Educ 2018;18:1–9. https://doi.org/10.1186/s12909-018-1165-7
[46] Larson EB, Yao X. Clinical empathy as emotional labor in the patient-physician relationship. J Am Med Assoc 2005;293:1100–6. https://doi.org/10.1001/jama.293.9.1100
[47] Holmes KS, Zuckerman JD, Maculatis MC, Friedman AM, Lawrence E, Phillips DP. Personality predictors of communication skills among orthopedic surgery residents. J Surg Educ 2020;77:202–12. https://doi.org/10.1016/j.jsurg.2019.08.012