Patient-centered innovation

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.

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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
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 (CBI-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.
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 α = 0.87) and high test-retest reliability (Cronbach’s α = 0.78) [30]. The Chinese version of EIS, translated by Wang et al., shows good reliability (Cronbach’s α = 0.84) and validity [31,32]. For this study we obtained a high internal consistency (Cronbach’s α = 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 tendency 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.

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Fig. 1. The Verona coding definitions of emotional sequences for the health provider (VR-CoDES-P) flow chart.
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 step 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. \( \sigma^2 \) 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). The mean number of conversations 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.

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, \( \sigma^2 = 0.55 \)). 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 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, \( \sigma^2 = 0.32 \)). 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, \( \sigma^2 = 0.75, \sigma^2 = 0.88 \)). 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>
<thead>
<tr>
<th>Table 1</th>
<th>Physicians' EIS and CBF-PI-B scores (n = 30).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scales</td>
<td>Mean (SD)</td>
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<tr>
<td>EIS total</td>
<td>132.07 ± 11.12</td>
</tr>
<tr>
<td>CBF-PI-B</td>
<td>33.37 ± 3.76</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>33.37 ± 3.51</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>26.27 ± 5.83</td>
</tr>
<tr>
<td>Openness</td>
<td>22.60 ± 4.62</td>
</tr>
<tr>
<td>Extroversion</td>
<td>18.83 ± 5.97</td>
</tr>
</tbody>
</table>

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.
Mean refers to the number of cues or concerns per conversation.

Note: Percentage (%) means that the number of variables accounts for total cues and responses.

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

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 [7,9,36–38], 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 [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
concentrating on medical aspects, physicians might not realize that Space response might be appropriate, even beneficial [41]. While reducing or providing Space should not be considered simply as 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 5

Multiple regression results of Explicit Reduce Space (ER).

<table>
<thead>
<tr>
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<th>Model 1</th>
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β<sub>0</sub> ‡0 indicates an existence of variation
β<sub>EIS</sub>: Emotional intelligence scale
• a = significant at P < 0.05,
• * = significant at P < 0.01,
• *** = significant at P < 0.001.

<table>
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<tr>
<th></th>
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<td>-197.20</td>
</tr>
</tbody>
</table>

β<sub>0</sub> ‡0 indicates an existence of variation
β<sub>EIS</sub>: 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 Humphris: Participate the revision of the paper.
Yi Zhang: Participate in research implementation, Data collection.
Huajing Liu: Participate in research implementation, Data collection.
Ya Zhao: Data processing, Participate in essay writing.
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Declarations of Interest

None.
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References


[27] Cherry MG, Fletcher I, Berridge D, O’Sullivan H. Do doctors’ attachment styles and emotional intelligence influence patients’ emotional expressions in primary
