

# A text-mining analysis of nursing care for overseas visitors in Japan

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## Research article

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# Abstract

**Background** The provision of health and nursing care for overseas visitors to Japan is becoming more important for nurses and hospitals owing to the sharp increase in visitor numbers. We investigated the attitudes and concerns of Japanese nurses when caring for overseas visitors, focusing on preparedness.

**Methods** We carried out a cross-sectional text-mining study. The analysis was both qualitative and quantitative with a descriptive aim, including two open-ended questions to nurses. A total of 513 nurses participated, representing 350 hospitals from eight prefectures across Japan. We collected data from nurses enrolled in a first-level management course from August 2011 to February 2012. We analyzed the responses to the open-ended question with Text Mining Studio 5.1, and numeric data with JMP 11.0.

**Results** Only 32.8% (167) of the nurses affirmed that their hospitals were prepared to care for overseas visitors. Nurses from hospitals that had prepared for overseas visitors were more concerned about culture and lifestyle differences. In contrast, nurses from hospitals that lacked appropriate preparation were strongly concerned about their foreign language skills. Among all hospitals, many nurses were most concerned about language communication, informed consent, and payment of medical expenses.

**Conclusion** Hospitals in Japan should require that their nurses be better prepared to care for overseas visitors. We conclude that formal preparation will help nurses take into consideration various unique characteristics of overseas visitors to provide necessary healthcare. Japanese nursing professionals need greater knowledge of global health issues to understand patients from foreign countries.

## Backgrounds

In modern times, many people move across borders of countries as part of the globalization of goods and services. In Japan, the numbers of overseas visitors have increased from 19.74 million in 2015 to over 31 million in 2018, as a result of the successful "*Visit Japan Campaign*" since 2003 [1]. The Japanese government has set a goal of attracting millions of additional visitors, including medical tourists, by 2020 [2]. In addition to overseas visitors, the number of foreign students and workers has grown sharply during the last decade [3]. Over 2.5 million foreigners were registered as living in Japan [4]; this represents 1.99% of the total population of Japan in 2018.

Caring for overseas visitors is a challenge for Japanese nurses because of differences in language, lifestyle and culture. In this regard, providing equivalent care for these visitors has become a formidable task [5, 6]. Currently, visits to healthcare facilities by overseas visitors often increases the anxiety level of healthcare professionals, particularly nurses. Indeed, nurses often have difficulty understanding the attitudes and concerns of overseas visitors, but few studies have documented these concerns. Consequently, when an overseas visitor is admitted to a hospital, the medical staff is often unable to provide appropriate care [7, 8]. Nurses are primarily concerned with the language barrier, informed consent, and payment options [8].

Although there are language support systems for communication problems in some Japanese healthcare facilities [9, 10], nurses strongly desire better English language skills [8, 11]. Examples of better

communication tools are mobile terminals of online systems to prepare for a medical examination [10], but this does not compensate for a lack of speaking ability and cultural sensitivities.

Studies carried out in various countries have determined that nurses must adjust their attitudes to provide safe care to overseas visitors in a culturally sensitive manner, for example, as in Canada [12, 13], Sweden [14, 15], Norway [16], Iran [17], and Korea [18]. In Geneva, Switzerland, however, where approximately 60% of the residents are non-native, hospitals have faced challenging care of overseas visitors, especially those patients who do not speak French, because of the difficulty in retaining trained interpreters who contribute to the quality of care and patient safety [6].

Taking care of overseas visitors involves processes to build a trust relationship with patients, and thus nurses need practical preparations to establish such relationships [19]. Indeed, Nonaka & Higuchi (2010) noted the importance of developing relationships between nurses and overseas visitors. When this is achieved, nurses report that they are more satisfied with the care they provide [20, 21].

With respect to the care of overseas visitors, some studies have investigated the attitudes and concerns of Japanese nurses, most of whom lack an international background [8, 22]. Problems with verbal communication and inadequate preparation were cited as key elements in taking care of those visitors [11]. However, the effectiveness of preparations was not considered. Therefore, we investigated the attitudes and concerns of nurses who care for overseas visitors in Japan, focusing especially on the effectiveness of preparation. We also reassessed nurses' concerns across prefectures and in popular tourist areas.

## Methods

### Eligibility, study design and procedures

We conducted a cross-sectional study from August 2011 to February 2012. Data were collected from nurses via a questionnaire, hereafter referred to as *Mari Meter* [8], provided during a first-level nursing management course conducted by the Japanese Nursing Association for nurses in eight prefectures. We targeted both staff nurses and nurse managers who are involved in providing direct healthcare at their hospitals, which are located in prefectural capitals and popular tourist sites for overseas visitors in Japan. One or two nurses from each of 592 hospitals participated in the course, and we received the data from the respondents within one month by regular mail.

### Questionnaire

The questionnaire contained three parts, including a nine-item demographic section, open-ended questions 1 and 2, and *Mari Meter* [8]. The demographic information collected included age, gender, profession, educational level completed, current professional position, current ward, number of years as a

professional nurse, experience taking care of overseas visitors, and preparedness for taking care of them (Table 1).

The second part of the questionnaire included two open-ended questions. Question 1: “Could you please imagine and write down whatever responsibility you feel that you have to take care of overseas visitors in your hospital today? Your opinions will be useful when you write as much as possible.” Question 2: “Could you please write down what kind of the preparedness is in your hospital if you know or have it?”

The third part of the questionnaire, *Mari Meter*, contained 15 items: choosing a hospital, paying medical expenses, language communication, informed consent, eye contact, treatments given to patients, quality of medical care, quality of nursing care, picking up an infection, protection of privacy, lifestyle difference, emergency care, medical system, foreign language direction in a hospital, and dealing with medical staff. At the top of the *Mari Meter* section, two sentences read: “Listed below are issues that concern some but not all participants. Please read each statement and group the response that best suits your experience.” Responses were assessed using a five-point Likert-scale: not at all concerned; not very concerned; neutral; somewhat concerned; or, very concerned.

## Text-mining analysis method

The responses to the open-ended questions were examined with language analysis software called Text Mining Studio, version 5.1, developed in Japan [23]. In Text Mining Studio, the function of unifying the words is in the reference value. This study attempts to analyze the words for their reference value [23] and not only the frequency. The text-mining method objectively assists the subjective interpretation of results. A similar example of the use of Text Mining Studio is an analysis of the post-trauma emotional status of 161 Japanese children administered from 2011 to 2012 after the *Fukushima* nuclear disaster resulting from the devastating earthquake in 2011; the analysis was carried out on essays written by Japanese children [24].

In this study, we used Text Mining Studio to summarize and understand the feelings of 513 nurses responsible for caring for overseas visitors at their various hospitals. We analyzed their viewpoints. The text-mining analysis counted words only once based on context even if one nurse wrote that word more frequently. We followed these five steps to analyze the open-ended questions.

1. Word frequency analysis (Figures 1 and 2): This quantifies the frequency of each word written in each response.
2. Word frequency analysis, request verbs (Figure 3): This technique quantifies the requested words. Requests were from nurses who take care of overseas visitors at their hospitals.
3. Positive/negative viewpoints from the reputation analysis (Figure 4): This analysis quantifies the number of negative and positive words. When nurses write a word that has a negative connotation, it counts as a negative [25]. When nurses write a word that suggests a positive opinion, it counts as a

positive. This helps determine which words the nurses assign as having a positive or negative connotation.

4. Word relationship network and through co-occurrence (Figure 5): The word-network was derived using the total number of words from all the data. The full-text analyses could be used to support or disprove our results. The relationship network plot that shows the relationship between words and words and attributes are illustrated in a network diagram. In a network diagram, words and attributes are represented by nodes, and words and words and attributes are combined by links based on the relationship between them. We would like to see the relationships. Extracted results is in Text Mining Studio manuals and based on what the idea is natural determined to be meaningful.
5. Correspondence analysis (Figure 6): We used both closed-ended question and open-ended question for the correspondence analysis. Closed-ended questions are limited to express the beliefs or opinions of the nurses. Here, the sample unit had mix of both 'word' from text and 'respondent' from the questioner. In closed-ended question, the nurses responded to preparedness, non-preparedness and unknowns. It was classified as "response" variable. All the other "words" were text from open-ended question. Text Mining Studio has the ability to analyze "words" from open-ended questions by respondents from closed-ended question. We use this method for the correspondence analysis[26].
6. For the question concerning preparations for overseas visitors, there were three possible responses, namely "prepare-yes", "prepare-no", and "prepare-unknown". A word is deemed to have a close meaning with another word if it is consistent with the nurses' choice of "prepare-yes", "prepare-no" and "prepare-unknown" This question is based on correspondence analysis with text by attribution of preparations for overseas visitors.

## Analysis of numeric data

Baseline characteristics for nurses and *Mari Meter* were summarized using descriptive statistics in JMP 11.0 [27].

## Results

### Results from participants

Among 870 nurses, 513 (59%) returned the questionnaire. The 513 nurses were employed at 350 hospitals in eight prefectures in Japan: Hiroshima (152), Hyogo (117), Hokkaido (106), Chiba (37), Nagano (35), Kyoto (27), Aichi (26) and Osaka (13). All nurses were of Japanese ethnicity, and none had taken a course on international culture or global health as part of their education. Table 1 shows the mode of nurse age was 40 to 49 years (range 20–59). Most the nurses were female (91.6%, 470). Their profession was mainly Registered Nurse (99.8%, 477), with the lone exception being one Licensed Practical Nurse. For educational background, most had a three-year nursing school diploma (93.1%, 450). The average duration of work experience was 20.4 years (SD 5.6), and the majority of the nurses served as either a unit chief or deputy chief (82.3%, 413).

Of the respondents, many (92.3%, 469) had experience taking care of overseas visitors, mainly at inpatient units (83.2%, 427). They responded to whether their hospitals are prepared to take care of overseas visitors: Yes (32.8%, 167), No (42.6%, 217) and Do not know (24.6%, 125).

## Results from open-ended questions

### *Basic information*

Question 1: The response rate was 513 (100%), comprising a total of 7420 words and 1651 sentences.

Question 2: The response rate was 513 (100%), comprising a total of 2551 words and 760 sentences.

## Question 1: Responsibility for taking care of overseas visitors

### *Word frequency analysis (Figure 1)*

The four words the nurses mentioned most frequently concerning the care of overseas visitors at their hospitals were: languages (*kotoba*) mentioned 252 times, worry (*sinpai*) 170 times, understanding (*rikai*) 142 times, and difference (*chigai*) 135 times.

### *Other words mentioned by the nurses, as assessed with word frequency analysis (Figure 3)*

The nurses also mentioned the following words: bring word (*tutaeru*) 14 times, relate (*kankeisuru*) 12 times, contact (*fureai*) 12 times, understanding (*rikai*) 7 times, and not charge (*motomenai*) 2 times. These five words emerged from the 7420 total words as having importance when caring for overseas visitors.

### *Positive/negative viewpoints from the reputation analysis (Figure 4)*

The nurses mentioned only three words having a negative connotation, namely emotion (*kanjo*), pain (*itami*), and feeling, compared with eight words having a positive connotation.

### *Word relationship network and through co-occurrence (Figure 5)*

The nurses' concerns were analyzed using word relationship networks and through co-occurrence. The size of each circle or oval in Figure 5 indicates words mentioned at greater frequency pertaining to language (*kotoba*) and communication (*komyunikasion*). The thickness of each line indicates the strength of the relationship with the words and each other.

The concerns could be classified into six groups that were denoted by letters: (A) language (*kotoba*), (B) communication (*komyunikasion*), (C) people (*hitobito*), (D) Japanese (*nihongo*), (E) anxious (*sinpai*), and (F) difference (*chigai*). In Group A, language was related to several other words (very thick lines in Figure 5) and had a large frequency for the words "not understand" (*rikaidekinai*), "important" (*taiset*), "inpatient" (*nyuin-kanjya*), and "good" (*yoi*). Many other words also were classified in Group A. For Group B, communication was related to "cannot do" (*dekinai*), "can do" (*dekiru*), "proficiency" (*umai*),

“language” (*kotoba*), “conversation” (*kaiwa*) and “self” (*honnin*).. In Group C, the concept *people*, was related to “exist” (*iru*) and “interpreting” (*tuyaku*).. In Group D, the word *Japanese* was related to “can speak” (*hanasu-dekiru*).. In Group E, *anxious* was related to “transmitted” (*tutawaru*).. In Group F, *difference* was related to “culture” (*bunka*) and “trouble” (*toraburu*)..

*Correspondence analysis by preparation* (Figure 6)

The largest circle shown in Figure 6 was *language* (*kotoba*), which was almost the same distance from “prepare-yes”, “prepare-no”, and “prepare-unknown”. The words “communication” (*komunikeshion*) and “problem” (*mondai*) were at almost similar distances from prepare-yes, and prepare-no in two squares. The response “prepare-yes” was closely related to “difference” (*chigai*), “culture” (*bunka*), “life style” (*lifu-stail*) and “explain” (*hyogen*). The word “Japanese” (*nihongo*) was closely related to “prepare-no” as well as to “interpreting” (*tuyaku*), “anxiety” (*sinpai*), “no understanding” (*wakaranai*) and “need” (*youkyu*).. The nurses who answered that they did not know if their hospitals were prepared for non-Japanese patients were close in distance from the word “concern” (*sinpai*)..

## Question 2: Preparations for taking care of overseas visitors

*Word frequency analysis for preparedness* (Figure 2)

Accordingly, “speak-staff” (*hanasu-sutafu*) was, for both “prepare-yes” and “prepare-no”, a strong key element. The top five words from nurses whose hospitals had prepared for overseas visitors were: “speak staff” (*hanasu-sutafu*), “English” (*eigo*), “interpreting” (*tuyaku*), “foreign language” (*gaikokugo*), and “language” (*kotoba*)..

## Results from closed-ended questions

*Descriptive statistics analysis*

The results for each item of *Mari Meter* are presented in terms of a percentage in a bar graph with descriptive statistics in all nurses (Figure 7). On average, 80% of nurses responded as *very concerned* or *somewhat concerned*. Of the 15 items for *concerned*, the top 5 terms were: language communication, informed consent, payment of medical expenses, lifestyle difference, and dealing with medical staff. The reliability of the 15 multi-item questions of *Mari Meter* was confirmed by calculating Cronbach’s alpha, which was 0.82.

*Regression analysis*

Results from our Text Mining analyses found that those nurses from hospitals that had preparations for foreign patients were more concerned about the patients’ cultural background. On the other hand, nurses whose hospitals had no preparation for foreign patients were concerned about language. In categorical logistic regression, we aim for the analysis to predict the nurses in the “yes” or “no” for preparation at their

hospitals to take care of foreigners, as a concerning factor of *Mari Meter* questionnaire. The following hypotheses were set.

H<sub>0</sub>: There is no relationship between having or not having preparation to take care of foreigners and *Mari Meter*.

H<sub>1</sub>: There is relationship between having or not having preparation to take care of foreigners and *Mari Meter*.

Results showed a relationship between “yes” and “no” to take care of foreign patients with all 15 items of significance; lifestyle difference, emergency care and protection of privacy ( $p < 0.001$ ) which were more concern the nurses who had preparation to take care of foreigners at their hospitals (Table 2). The nurses whose hospital made preparations were more concerned about the patients’ backgrounds. By contrast, the nurses who did not make preparation to take care of foreign patients had a greater concern about other 12 items significantly ( $p < 0.001$ ). The nurses who did not make preparations to take care of foreign patients most two concerns were language communication and informed consent.

## Discussion

This study has five main findings. First, in all, 92.3% of the nurses had experienced caring for international patients. Second, only one of three nurses responded that their hospitals had made preparations for overseas visitors. Non-preparedness was associated with more anxiety related to taking care of overseas visitors. Third, many of the nurses expressed strong concern about their foreign language skills with respect to caring for overseas visitors. Fourth, the nurses were more inclined to blame themselves for not understanding overseas visitors. Finally, the nurses were concerned about foreign language communication, informed consent, payment of medication expenses, and lifestyle differences.

The majority of the nurses had cared for international patients despite not having any previous nursing-related education pertinent to international cultures. This result raises concerns about the true ability of Japanese nurses to effectively care for overseas visitors.

A total of 32.8% of the nurses answered that their hospitals had made preparations to care for overseas visitors. Participants who answered that their hospitals were prepared noted that the preparation had focused on differences in culture and lifestyle. Non-preparedness was associated with anxiety and expression of words having a negative connotation. Most of the nurses were strongly concerned about their foreign language skills with.

Many of the nurses expressed strong concern about their foreign language skills with respect to caring for overseas visitors. These results echo conclusions reached by other investigators [7, 11, 22]. From a global perspective, our results mirror what has been documented in other nations. Professional interpreters are vital to communicating medical treatment and healthcare processes. Patient-centered

communication is key to successful care of foreigner patients, as clearly demonstrated in Sweden [28]. A study in Switzerland found that immigrants were at a disadvantage for psychiatric inpatient care [29]. However, the local populations of most European countries can speak English or more than one language, so at least there is the possibility of a common-language solution. This is not the case, however, for Japan, where there is less of an opportunity to speak English. This manifests as high stress for many nurses who are assigned the responsibility of directly caring for overseas visitors.

The nursing nurses in this study tended to blame themselves for not understanding overseas visitors. When a nurse participant takes care of a foreign visitor but cannot fully communicate with them, they feel ashamed of their lack of communication skills.

In this study, the majority of Japanese nurses were most concerned about foreign language communication, informed consent, payment of medication expenses, and lifestyle differences. This result is consistent with that from previous research [8].

This study has several strengths. First, our responses were numerous and reflected the nursing population of the most densely populated prefectures in Japan. Indeed, our data were collected from over 500 nurses at more than 300 hospitals in eight prefectures across Japan. Second, we used a text-mining method to analyze the responses to two open-ended questions. Hence, our results can be interpreted both visually and objectively. Third, we tested the results from the text mining analyses and the categorical logistic regression analyses to arrive at the same conclusion. In categorical logistic regression, we examined whether the concerns might be different between the nurses who prepared to take care of foreign patients against those who have not. There is a difference between “yes” and “no” to have preparation to take care of foreign patients with all items being significant ( $p < 0.001$ ). The nurses whose hospital made preparations were more concerned about the patients’ backgrounds instead of language communication. The nurses whose hospital had not made preparations were more concerned to care for foreign patients related to the 12 questions asked.

This study also has some limitations. First, we compared groups based on whether their hospitals made preparations for overseas visitors. We did not conduct an intervention study. Second, this study does not distinguish a specific target population of overseas visitors. For example, the type of care provided to patients might differ for tourists, foreign students, temporary workers, and immigrants. Finally, our survey did not include the amount of time the nurses felt they spent caring for non-Japanese patients, as it might have led to recall biases.

## Conclusions

Our results reveal that text mining of written information provided by a nursing cohort could help with understanding the attitudes and concerns of nurses who take care of overseas visitors. Although hospitals in Japan require that a system be in place to facilitate the treatment of overseas visitors, data obtained from our nursing cohort suggest that not all such systems are effective. Future studies may

require an intervention study to obtain stronger evidence for the effectiveness of systems currently in place in Japanese hospitals to prepare for the care of patients from various nations.

## **Declarations**

## **Acknowledgements**

The authors would like to thank all nurses who participated to this study.

## **Ethical approval and consent to participate**

This research was conducted according to ethics standards approved by Hiroshima International University Ethics Committee. Informed consent to participate in the study was obtained from all nurses.

## **Consent for publication**

Not applicable.

## **Availability of data and materials**

Please contact the first author for raw data.

## **Competing interests**

None of the authors have any conflict of interest to declare.

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## **Authors' contributions**

MN; MOK; YT; and KN designed and planned the study, MN; MOK and YT carried out the data collection. MN and MOK analyzed the data. MN wrote the manuscript. All authors regularly reviewed manuscript drafts and approved the final version.

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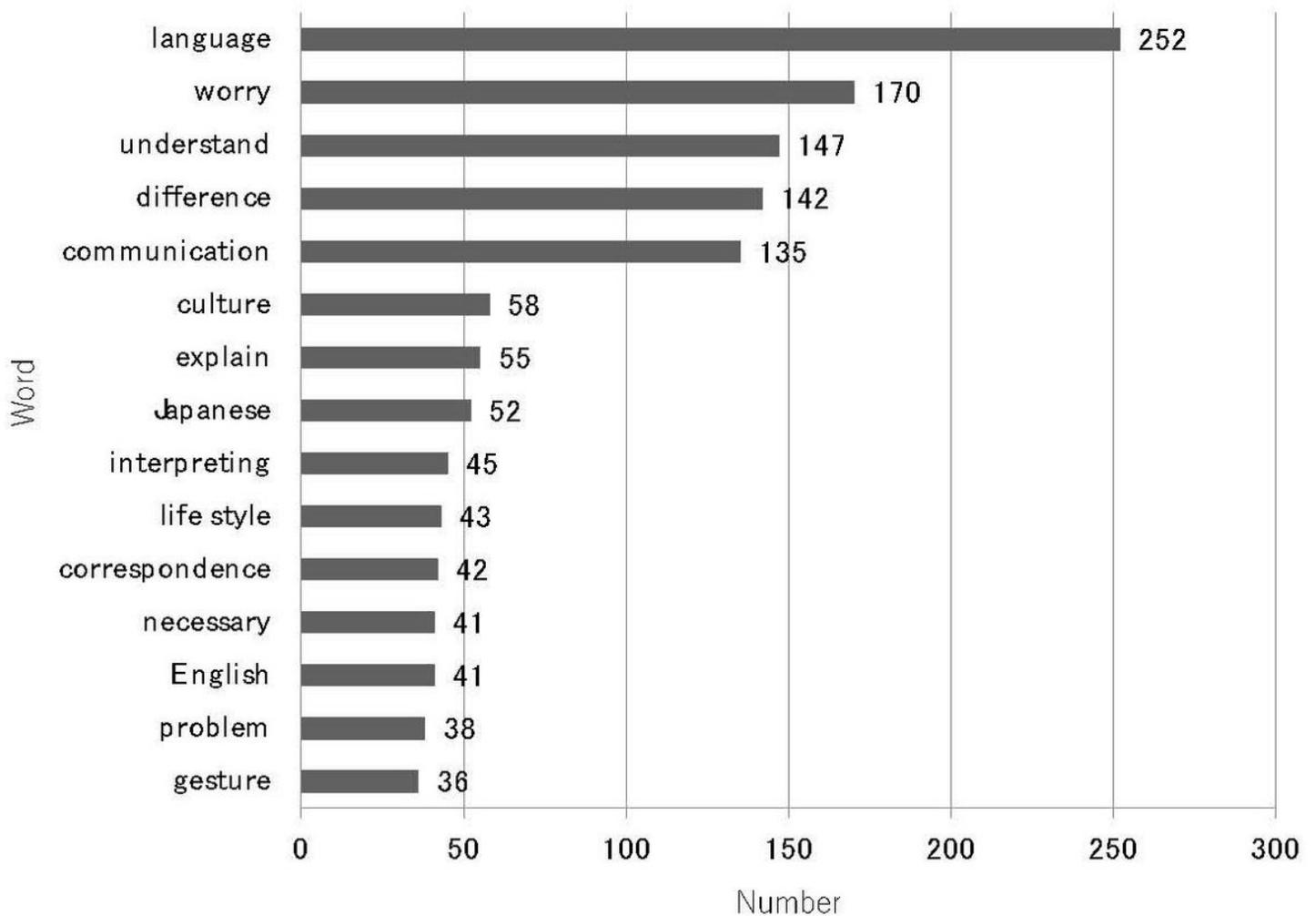
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## Tables

Due to technical limitations, all Table(s) are only available as a download in the supplemental files section.

## Figures



**Figure 1**

Words most frequently used by participants concerning the care of overseas visitors

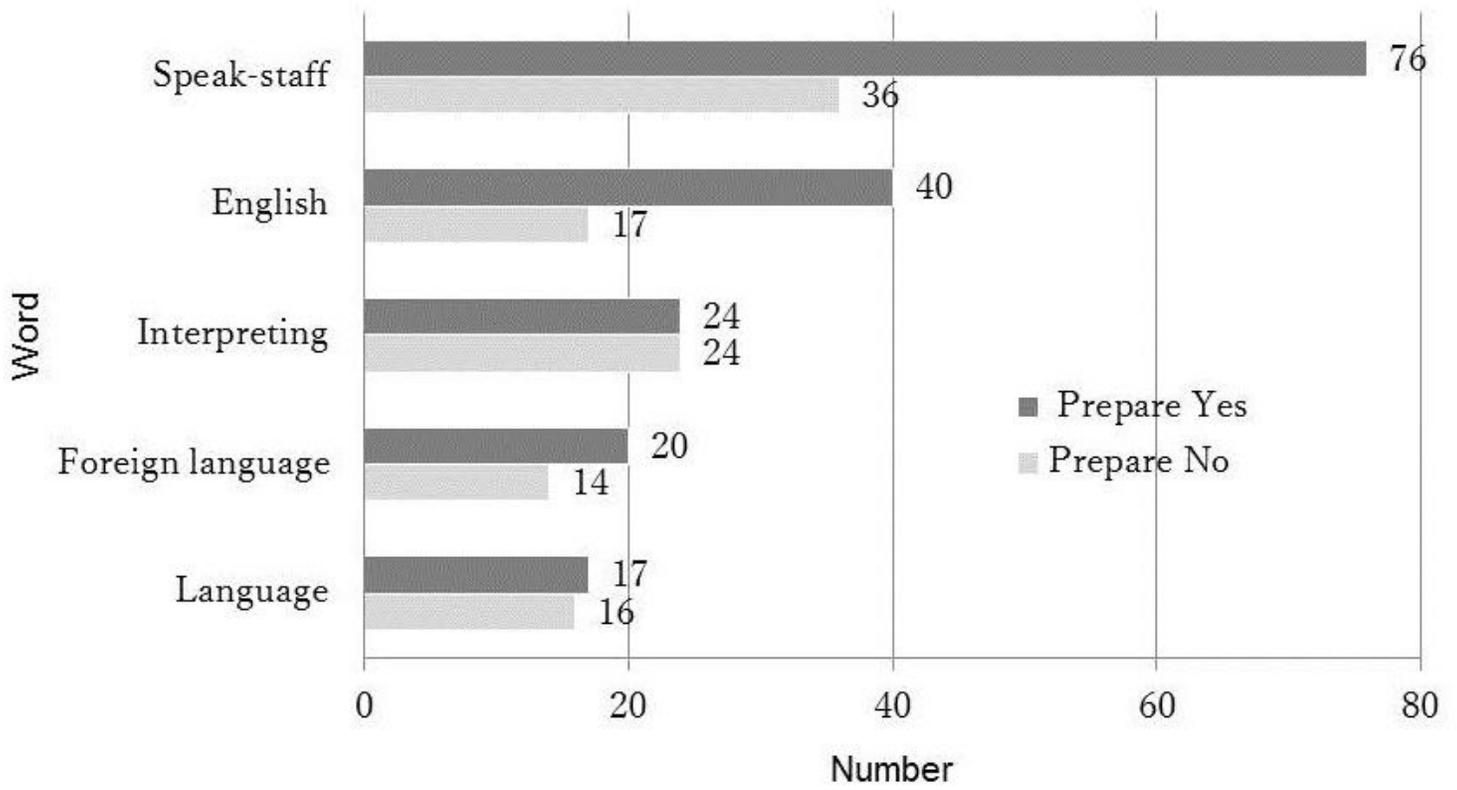


Figure 2

Relative frequency of the use of words pertaining to preparedness

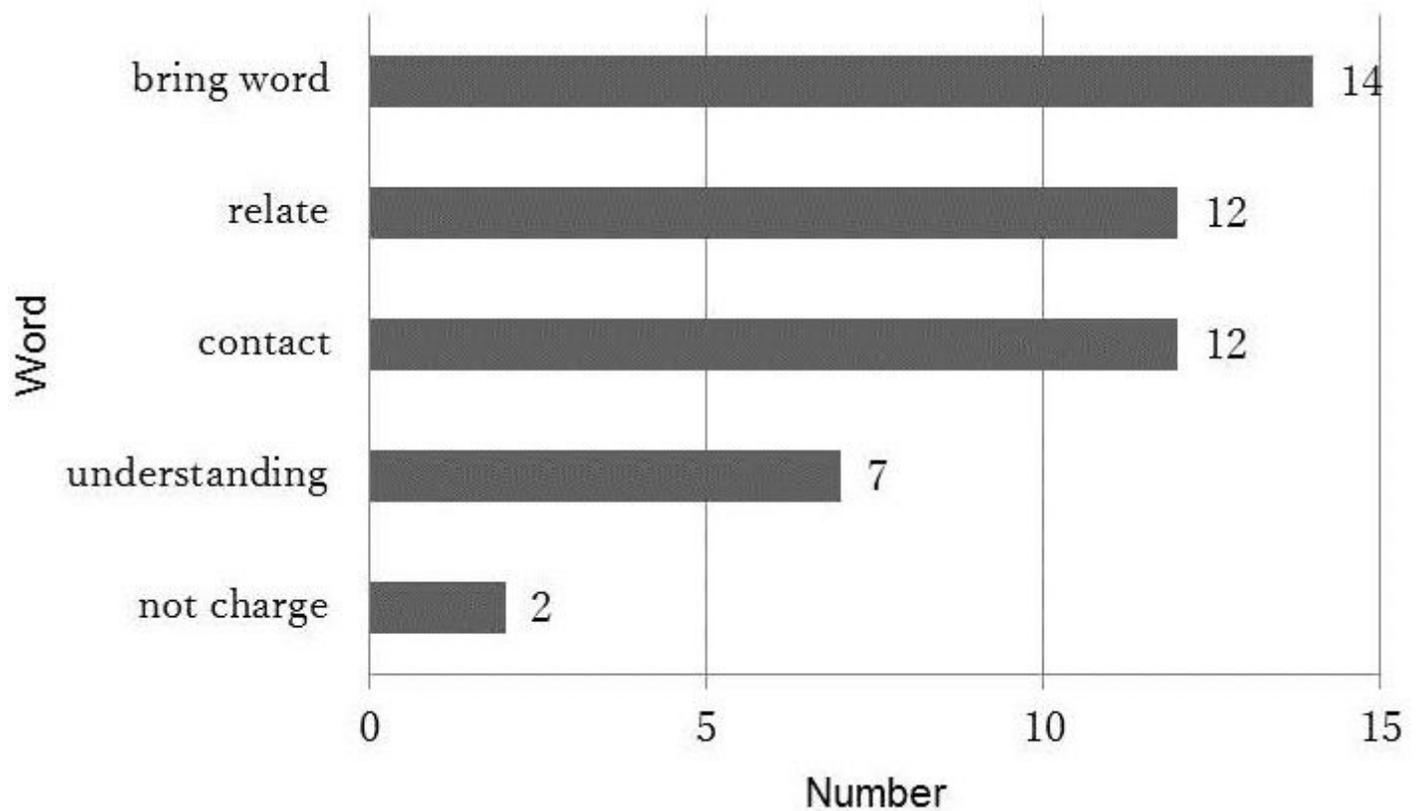
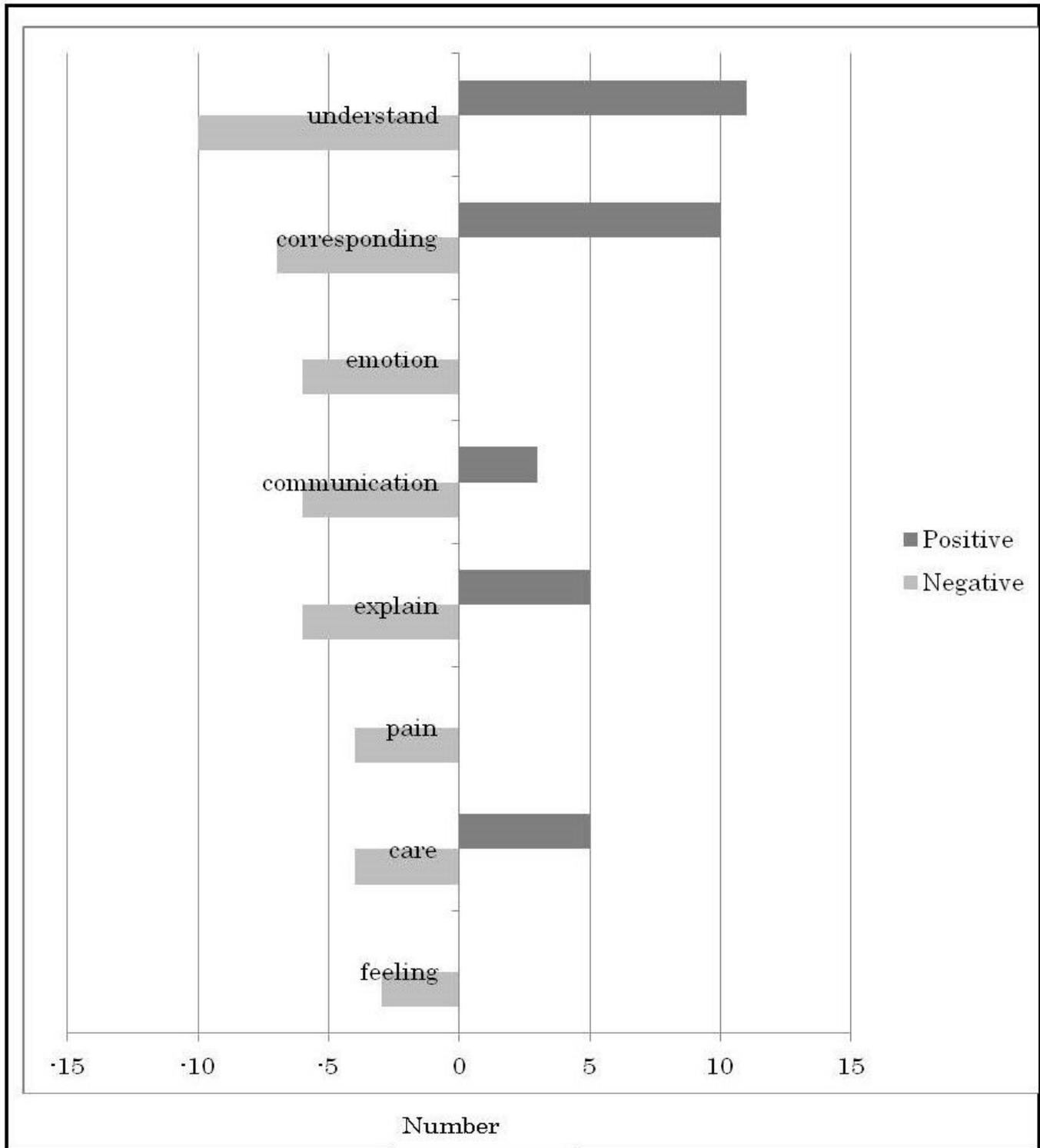


Figure 3

Words most frequently used by nurses when making requests of foreign patents



**Figure 4**

Positive/negative viewpoints from the reputation analysis: Words nurses use that have a positive or negative connotation

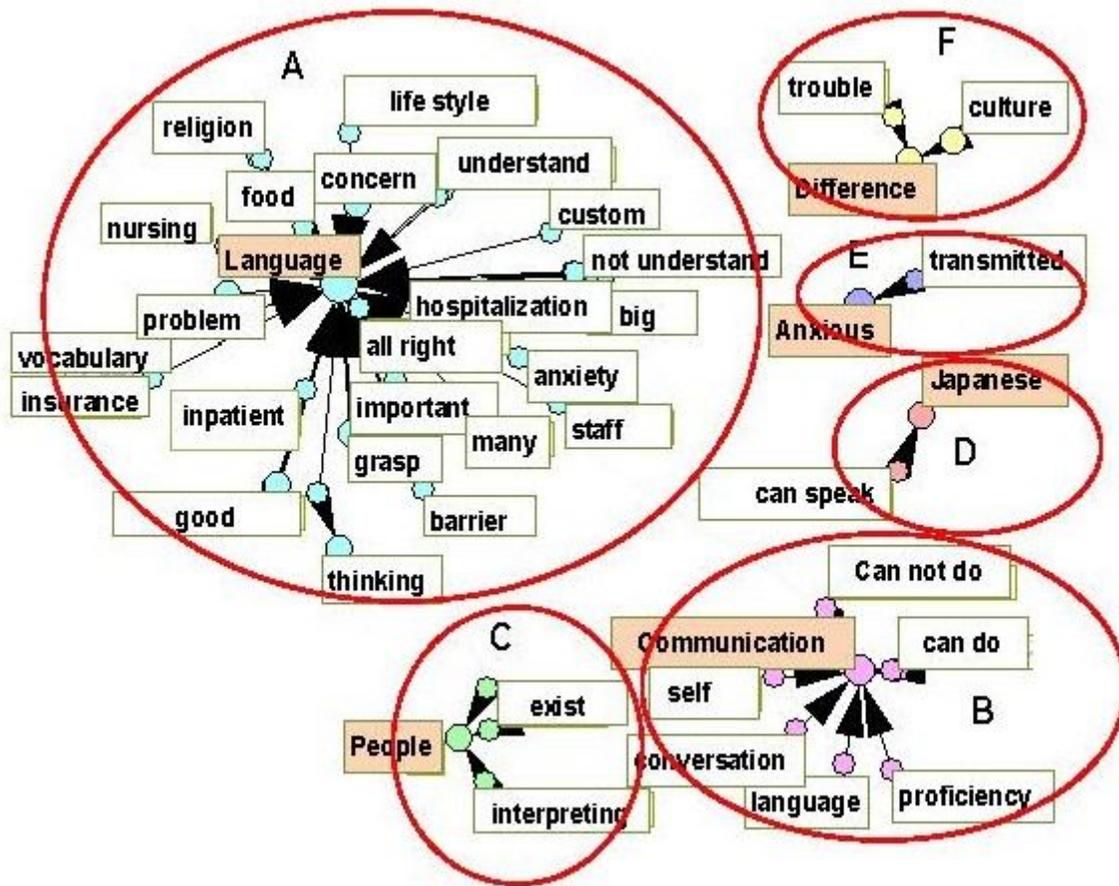
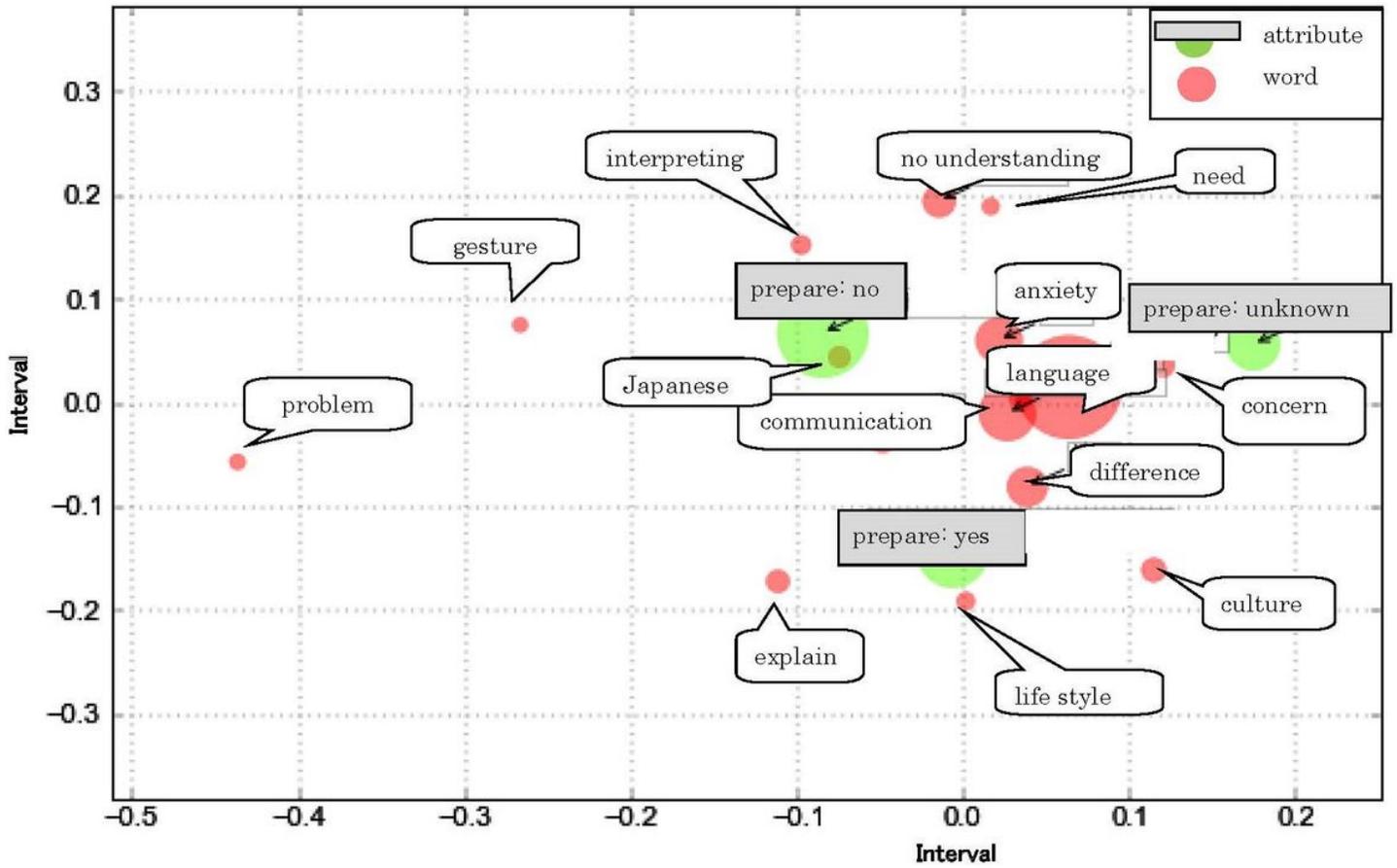


Figure 5

Word relationship network depicting the co-occurrence of words with the five main keywords. The word network shows how one word relates to the other words, particularly the keywords (shaded boxes) shown in the red circles. The size of each circles or oval-shape is directly related to the frequency of word use. The thickness of each line indicates the degree of the strength of the relationship between words. For each keyword, the thickest line denotes the strongest relationship with an associated word.



**Figure 6**

Correspondence analysis of words by attribution with respect to the preparedness of a hospital to care for foreign patients. Words and attributes are indicated by speech bubbles.

(n=513)

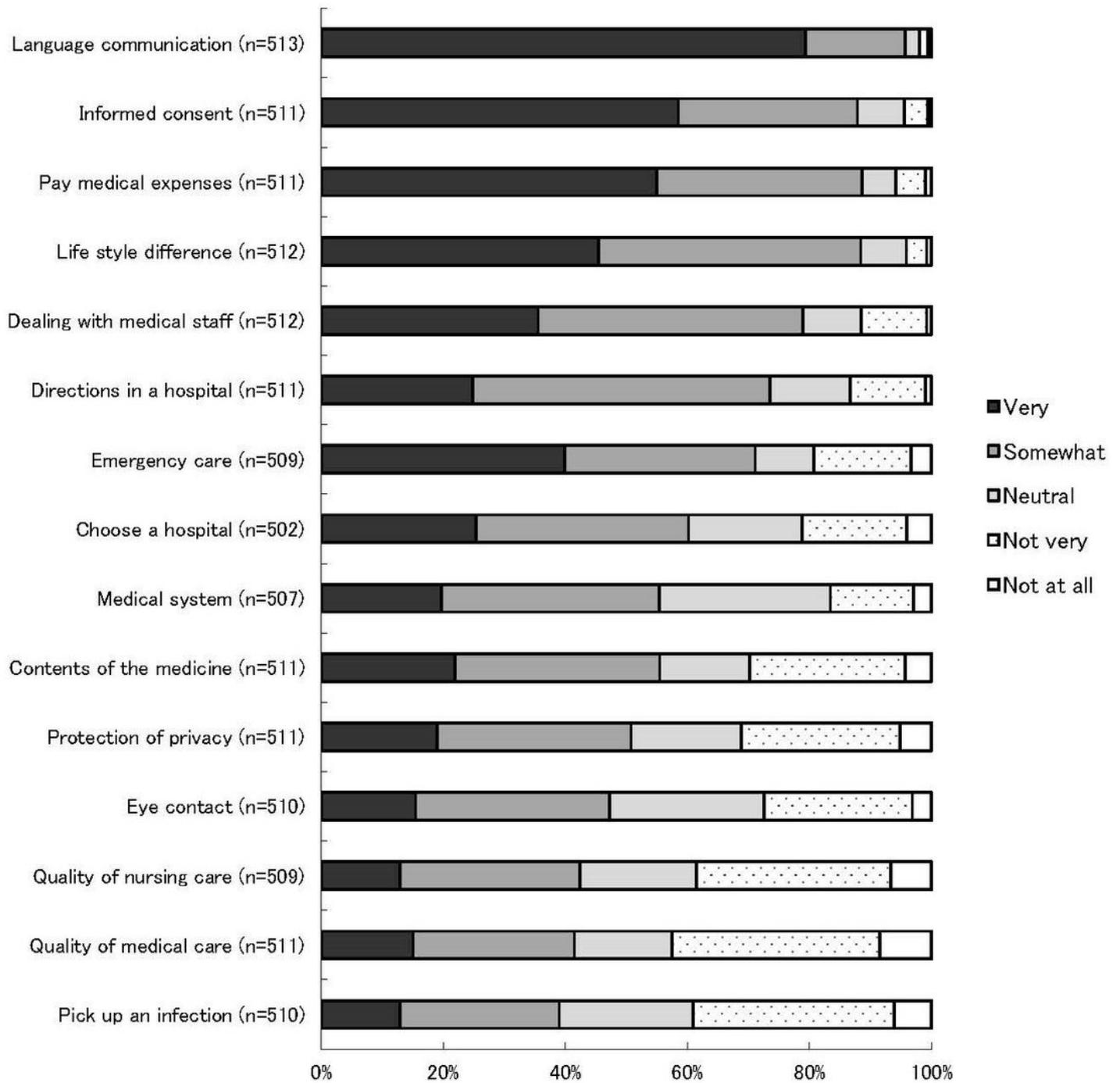


Figure 7

Concerns expressed by nurses pertaining to the care of overseas visitors (Mari Meter)

## Supplementary Files

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- [Table219.xls](#)