

## Chinese Consumers' Perceptions of Medical Emergency Identification Systems

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### Abstract

The paper explored Chinese consumers' behavior with specific focus on categories of "mass consumers" and "new mainstream consumers" who together constitute the vast majority of consumers, using an online questionnaire hosted on a Chinese survey website called "So jump" was used. Through email and social networking, personal requests were sent to known associates across the six strata of the Chinese populations to complete the online questionnaire as well as forward it to their extended networks. It became evident that the consumers have extremely low levels of knowledge about MEISs; they ranked the best method of storing MEIS data as "database storage" such as a cloud service that was managed by an emergency Call Centre operation, followed by "personal portable electronic storage", and then "printed format." An overwhelming majority of the respondents believed that a MEIS would offer considerable benefit to their families in an emergency.

**Keywords:** Medical emergency; Identification; Personal information; Medical information

### Introduction

In the context of China, the potential contributors to medical emergencies include the effect of China's One Child Policy, the vulnerability of the elderly, domestic and international travel, daily commuting, and health-care system in China, trauma incidents, the "pay-or-die" principle, and patient distrust in doctors. Identifying casualties, contacting their loved ones, accessing their medical history, and providing payment guarantees for their treatment, are highlighted as the general importance of Medical Emergency Identification Systems (MEIS). As a novel concept and medical emergency identification system (MEIS), MedicAlert® was established in 1956 and officially endorsed by the American Medical Association and received open support from the Canadian Medical Association [1]. New member adoption was promoted by insurance underwriters, doctors, and through government initiatives such as the sign up of the Canadian Forces Divers, and by 1975, MedicAlert had spread to sixteen countries. However, the foundation has since been reduced from sixteen to nine international affiliates [2], and this down scaling is perhaps an indicator of the many challenges facing the mass adoption of a MEIS. Gorlin, Hooke, and Leonard [3] revealed that safety, and concerns about possible choking and strangulation were the biggest barriers to adoption of MEIS by parents for their young children, closely followed by sizing and cost issues. Furthermore, in older adolescent children, the greatest barrier to adoption was that children did not want to be singled out as being "different". However, across all age groups, cost remained a significant barrier to adoption. Collier [4] posited several additional reasons for people not wearing jewellery type MEISs, and these included that jewellery-type products were not suitable for the work environment (such as electricians), bracelets and necklaces were easily broken or lost during certain sporting activities (such as surfing), while others stated that they simply did not like the look of the jewellery. Even in cases where MEISs were implemented at a government level, essentially forcing the adoption of the MEIS by the consumer, barriers were created by the system itself. In July of 2003, Taiwan's Bureau of National Health Insurance launched a smart card known as "NHI-IC". This card contained embedded computer memory chips that were used to digitally store critical patient information and enable electronic access to medical services [5]. These smart cards required each hospital to have the necessary electronic card readers, software, and network infrastructure to access and update the patient's information. The aforementioned researchers found that medical service times actually

deteriorated after the implementation of the system. The reasons cited were that the workflow became more complex, cards failed to authenticate, cards failed to read, card readers malfunctioned, and interfaces between hospital systems and card readers were unstable. For similar future projects, the study recommended better public education programmes on how to store and use the smart cards, improving the quality of the cards, conducting more comprehensive system testing, and developing tools to quickly identify and rectify problems. Although this was a government initiative that required all hospitals to integrate into the network, the implementation process provided a relevant case study for the adoption of a MEIS. Against the above background, this paper aimed to ascertain the Chinese consumers' perception of MEIS. A brief discussion of Chinese consumer behaviour is provided so as to provide a better context to consumer product adoption, and then the discussion will focus on perception of MEIS.

### Chinese Consumer Behaviour

The innate characteristics of Chinese people is that they are risk averse, long-term oriented, and focused on the collective family unit [6]. Therefore, as consumers they tend to be conservative, researching their prospective purchases, and considering the requirements of their families. "Mass consumers" mostly spend on essential goods and still seek basic value, focusing on price and durability in their decision making. "New mainstream consumers" have extended their purchasing to include discretionary goods such as electronics, jewellery, and entertainment, and are more inclined to seek emotional benefits such as self-expression. They are also more brand loyal, trade up for quality, and often use online tools to investigate other user's experiences [7,8]. China's aging population is growing as a result of their One Child Policy, and from 2010 to 2020, the percentage of over 65 year olds will increase from 10% to 15% of the population. At the same time, the workforce is shrinking and the majority of China's elderly will

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not be adequately covered by social security. Younger workers will therefore be faced with an increasing burden to support the senior population [9]. Thus, the user and the purchaser of a MEIS will often not necessarily be the same person, since working adults may purchase a MEIS for their young children or elderly parents. This could result in a potential dilemma for product design aimed at mass adoption because Chinese consumer behaviour profiles vary significantly across age groups. There is a growing market for health services in China, as larger portions of household income are being allocated to this area. According to Atsmon et al. trading up opportunities exist within semi-necessity categories such as healthcare. Baidu, one of China's largest internet companies has recently diversified from search into healthcare with a pay for service called "DuLife" which offers health related wearables that upload user data to the cloud for analysis and returns health reports and advice [10]. There has also been a small scale rollout of remote patient monitoring services in China for the elderly or those with chronic conditions, where alerts are triggered to physicians in the event of the onset of any abnormal risk factors. These services require the patient to purchase monitoring equipment and pay a subscription fee for ongoing monitoring. Due to the earlier communist system in China, there were some 'spaces' in the market and customer habits were less ingrained. As a result, Chinese consumers remain relatively forgiving and more open to new product experimentation [11]. Originality and usefulness have been identified as the two product attributes that significantly impact the successful adoption of a new offering [12]. Consumers demonstrate greater intention if they perceive the new product to be advantageous and compatible with their needs [13]. Highly original products often require a period of learning and adjustment by the consumer and this tends to slow the adoption process [14]. Chinese consumers are generally more comfortable with familiar products that don't require a change of habit [15,16]. The aforementioned however found that where high degrees of novelty are accompanied by high levels of usefulness, then Chinese consumers may perceive the new product to be superior, resulting in increased positive adoption. According to Li et al. there is a positive correlation between product usefulness and product adoption. MEISs are a novel concept in China and the literature therefore suggests that "usefulness" as an attribute of product design will have a significant impact on its adoption in China. China has the largest mobile communication market in the world and the internet has had a considerable influence on consumers' behavior [17]. The current generations of Chinese consumers are content to experiment with personal electronic gadgets, and use the internet to ascertain other user's feedback as well as contribute their own user experiences [18]. Smartphones and APPs are playing an important role in consumerism, with the number of internet users in China expected to top 800 million by 2015. Song [17] found that the adoption of mobile innovation by Chinese consumers was influenced by offering's of utilitarian and hedonic functions, positive word-of-mouth feedback from their interpersonal networks, and their perceived change in face resulting from adoption of the innovation. At the same time, cost and quality were found to be two major constraints inhibiting Chinese consumers from adopting mobile innovation. Several healthcare opportunities have resulted from the extensive use of the internet and mobile communications in China. Hospital booking APPs have saved patients from long, sometimes overnight queues. The widespread growth and development in the area of mobile communications is a clear indicator that this phenomenon should be considered in the product design of a MEIS.

### Adoption of MEIS in China

In 2012, the First Hospital of Nanjing Geriatrics distributed

emergency identification cards to the elderly to display their contact information in case they got lost or disorientated [19]. Similarly, in 2013 the community police in Changzhou distributed waterproof identity badges to elderly people living alone and those with dementia (Changzhou Municipal Public Security Bureau, 2013). Both of these initiatives were widely welcomed and celebrated in the media. In addition, there has been evidence of willingness by the Chinese government to initiate some form of MEIS. For example, in 2009, China's Ministry of Health called for the implementation of electronic health records to create a standard method of collecting and storing patient data. In 2012, the Ministry of Health announced that they would issue a nationwide medical information card to store people's health records and settle medical expenses [20]. The intention was to facilitate patient identification together with their medical history, and reduce errors and fraud. However to date, little progress has been made on these initiatives [21]. Despite the above, it is apparent that not much information is available on the Chinese consumers' knowledge of and attitude towards MEISs. Thus, this paper is an attempt to address the aforementioned, by reporting on research conducted on the perceptions of consumers, using the methodology discussed below.

### Methodology

A descriptive survey method was deemed appropriate for this study because the aim of the research was to explore the broader Chinese population's knowledge of and attitude towards MEIS by surveying a sample of that population.

### Research Instrument

An online questionnaire hosted on a Chinese survey website called "Sojump" was used. The questionnaire comprised twenty three closed-ended questions that required the respondents to choose from pre-set options [22]. The questionnaire comprised questions on the respondent's demographics; their knowledge about MEISs; and the perceived level of importance of a MEIS. The questionnaire was initially drafted in English and tested on a pilot sample of three respondents to firstly verify that the completion time did not exceed twenty minutes, and secondly to check for any potential threats to the instrument's internal validity because unreliable instruments can influence results. After conducting the pilot study, four questions were found to be ambiguous and were re-worded to clearly express the correct context. The questionnaire was then translated into Chinese by a professional translation company and further reviewed for localisation. In this regard, localisation included not only translation of text, but also adaptation of the user interface and the content to suit the Chinese cultural conventions and norms [23]. Some of the issues that were taken into consideration included the age of majority and retirement in China, the purchasing power parity of the Chinese Renminbi, and the sensitivity of information disclosure amongst the Chinese. Four constructs relating to the Chinese citizens' attitude toward a MEIS were measured using a Cronbach's alpha coefficient to test various inter-item correlations. The perceived importance of a MEIS in assisting an unconscious casualty, their family, and the doctors or hospital produced a Cronbach alpha value of 0.813; the perceived benefit that a MEIS provided in an emergency 0.768; the perceived value of a MEIS as an emergency aid yielded a Cronbach's alpha of 0.711; and the importance of various MEIS product criteria produced a Cronbach's alpha of 0.814, all values indicating a high levels of internal consistency.

### Sample and Sampling

The target population included all Chinese citizens over the age of

eighteen, which translated to around 900 million people [24]. However, since the online questionnaire was hosted on the "Sojump" website, only the segment of target population with internet access could be invited to participate in the survey, and this according to Carsten [25] amounted to almost 50% of the Chinese population. The aim was to use stratified sampling to secure a sample of around four hundred respondents across six strata, representing the main administrative regions of China. However, due to financial and time constraints and challenges associated with selecting a random sample across China, it was not possible to use random stratified sampling. Instead, the stratified sample was selected using a snowball sampling technique to leverage a network of associates to distribute the questionnaires. The researchers used email and social networking to send personal requests to known associates across the six strata to complete the online questionnaire and forward it to their extended networks. One of the biggest sampling challenges was achieving proportional representation across the six strata and this was especially true for several regions where the researcher did not have a strong personal network. The fear was that this could give rise to sampling bias [26], as a result, the researchers chose to increase the sample size in order to reduce the risk of any sampling bias. Both descriptive and inferential statistical analysis techniques were applied to the data using the IBM SPSS software.

## Ethical Considerations

Although some questions pertained to personal health and medical history, respondents were not asked to provide their names, and care was taken to ensure that the questions did not subject them to any undue stress, embarrassment, or physiological discomfort. Furthermore, respondents were presented with an informed consent statement at the start of the online questionnaire that guaranteed anonymity, and clearly stated that participation was voluntary with the right to withdraw at any time. Further disclosure included a description and purpose of the study; nature of the participant's involvement; and the researchers' contact details. Access to the completed online questionnaires was secured by password protection known only to the researcher. The data was used solely for the purpose of statistical analysis, and all statistical analysis was conducted by the researcher himself. No raw data was shared with any other party.

## Research Findings

### Respondents demographics

A total of 157 males (30%) and 369 females (70%) responded, with the vast majority (84%) being between 25 and 54 years. The high response from the 25-54 year age range was expected and could be attributed to the fact that those under the age of 18 were excluded from the sample population, and secondly those over the age of 55 were less likely to participate in the survey due to lower familiarity with the internet and online surveys. Although participants were represented from across the various regions in China, there was high (48%) participation from East China, since the primary researcher had strong personal networks in this region. The vast majority (60%) of the respondents indicated that their household income was in the range of 106 000 to 229000 Renminbi.

More than 50% of the respondents had never heard of a MEIS, while a further 33% knew very little except, that such a device existed. Using a 4-point Likert scale where 1 represented "nothing" and 4 represented "lots", the mean of 1.65 (SD=0.76) represented a variable between "nothing" and "very little". The median and mode of 1, and skewness value of 0.82 indicated a concentration of

responses around the "nothing" option. The kurtosis of -0.36 showed widespread distribution around the mean. The upper and lower limit of the mean at a 95% confidence level  $M=1.65$ , 95% CI (1.58, 1.71), implied a high probability that the average level of knowledge about MEISs amongst the Chinese consumers is less than "very little". The majority (59%) of the respondents indicated that they never carried any form of contact information on them which could be used in case of an emergency. Using a 5-point Likert scale where 1 represented "never" and 5 represented "almost always", the mean of 1.85 (SD=1.30) represented a variable between "never" and "hardly ever". Only 21% of the respondents stated that they "sometimes", "often" or "always" carried some form of contact information. The median and mode value of 1 together with a skewness of 1.45 indicated a high proportion of "never" responses, while the kurtosis of 0.81 indicated a widespread distribution around the mean. The overwhelming majority (97%) of the respondents did not personally know of anyone who had used a commercial MEIS device/product. On a 5-point Likert scale, where 1 represented "0 people" and 5 represented "4+ people", the median and mode value of 1 together with skewness of 4.01 and kurtosis of 16.36 confirmed a high proportion of "0 people" responses and a tight distribution around the mean of 1.21 (SD=0.72) which represented a variable between "0 people" and "1 person". With regard to their health status, 8% of the respondents indicated that they were currently taking medication for periods exceeding 4 weeks, 17% had been diagnosed with a chronic or long term medical condition, and 17% were allergic to certain food or drugs. Thirty three percent of respondents had children under 18 years old, of which 4% were currently taking medication for a period exceeding 4 weeks, 5% had been diagnosed with a chronic or long term medical condition, and 13% were allergic to certain food or drugs. Seventy four percent of respondents had parents who were over 55 years old, of which 44% were currently taking medication for periods exceeding 4 weeks, 62% had been diagnosed with a chronic or long term medical condition, and 10% were allergic to certain food or drugs. Thirty three percent (33%) of the respondents stated that they had some kind of health issue - either that they are currently taking medication for a period exceeding four (4) weeks, or are suffering from a chronic or long term medical condition, or are allergic to certain food or drugs. By comparison, their children under 18 were relatively healthier with only 18% of respondents highlighting a health issue, while their parents over 55 had substantially poorer health, with 76% of respondents indicating a health issue. Thirty four percent (34%) of the respondents or their loved ones had previously experienced a medical emergency that resulted in them being unconscious. Using a 5-point Likert scale where 1 represented "0 times" and 5 represented "4+ times", the median and mode value of 1 and skewness of 1.86, all indicated that a high proportion of respondents had never previously experienced a medical emergency resulting in unconsciousness. The mean value was 1.50 (SD=0.82) representing a variable between "0 times" and "1 time". The skewness of 1.86 and kurtosis value of 3.67 indicated a higher concentration of responses toward "0 times" and a slightly narrow to reasonably normal distribution spread around the mean.

### Perception of the Importance of a MEIS

Respondents were probed about the perceived importance of various issues if they were to be admitted to hospital in an unconscious state. A 5-point Likert scale was used where 1 represented "not important" and 5 represented "absolutely essential." Of the issues probed, the respondents perceived doctors being immediately informed about their blood type, allergies (if any), and current medication use (if any), to be

the most important issue. As is evident from Table 1, an overwhelming majority (91%) of the respondents felt that this was “very important” or “absolutely essential” with a mean of 4.47, standard deviation of 0.92 and kurtosis of 5.73, which indicated a tight dispersion around the mean. The median and mode ratings of 5, and skewness value of -2.33 all indicated a high proportion of ratings were leaning towards “absolutely essential.” The next most important issue selected was that their family should be immediately contactable, where the vast majority (88%) of the respondents felt that this was either “very important” or “absolutely essential”, with a mean score of 4.43 (SD=0.94). In third place, a notable proportion (86%) felt that it was “very important” or “absolutely essential” that doctors should have immediate access to their medical history. The mean was 4.30 (SD=1.01). This was followed by the importance of immediately being able to provide payment (or guarantee payment) for medical treatment when they were admitted to hospital, where 67% of respondents considered this to be either “very important” or “absolutely essential,” with a mean value of 3.82 representing a rating between “moderately important” and “very important”. The lowest ranked issue in terms of importance was that ‘the hospital should immediately be able to identify them if they were unconscious and only 47% of respondents felt that this was “very important” or “absolutely essential” (Table 1 and Figure 1). It illustrates the ranked means of the respondent’s perceived level of importance of the aforementioned issues if they were admitted to hospital in an unconscious state. The average perceived importance across the five criteria was “very important” (M=4.03). In terms of identifying the ‘most vulnerable groups,’ the majority (76%) of the respondents ranked retired adults over 55 years old, followed by 23% who ranked adults aged 18 to 55 years old, and 10% who ranked children under 18 years old as the most vulnerable group. A 5-point Likert scale was used where 1 represented “no benefit at all” and 5 represented “immense benefit,” to determine the perceived benefit of a MEIS in a medical emergency. The overwhelming majority (90%) of the respondents indicated that a MEIS would offer “considerable benefit” or “immense benefit” with a mean rating of 4.49 (SD=0.82). The median and mode values of 5 and skewness of -1.95 indicated a high proportion of ratings leaning towards “immense benefit”. Similarly, 85% of the respondents believed that a MEIS would offer “considerable benefit” or “immense benefit” to their families, with a mean rating of 4.32 (SD=0.91). The median and mode values of 5 and the skewness of -1.51 indicated a high concentration of “immense benefit” responses. Although 75% of the respondents indicated that a MEIS would offer “considerable benefit” or “immense benefit” to the doctors or hospital treating them in an emergency, they were of the view that the doctors and hospital would benefit less from the MEIS, compared to their families. While the mode

value was 5, the mean and median was lower at 4.10 (SD=1.03) and 4 respectively.

With regard to how much the respondents were willing to spend on a MEIS that met their criteria, the modal response (48%) was “up to CNY 150”. Using a 6-point Likert scale where 1 represented “I would not use it” and 6 represented “more than CNY 1000”, the mean was calculated at 3.27 (SD=0.99) representing a range between “up to CNY 150” and “between CNY 151 to CNY 500”. Most respondents (56%) indicated that they “might” acquire a MEIS for personal use, (47%) indicated that they “might” acquire it for their children under 18; however, only 26% indicated that they would “definitely” use a MEIS for their parents over 55, compared to 12% who indicated that they would ‘definitely’ acquire it for their children under 18, and only 6% stated that they would “definitely” use a MEIS. The skewness value of -0.37 indicated that a slightly higher proportion of respondents were leaning toward “very likely” or “definitely” using a MEIS for their parents over 55, while the kurtosis value of -0.01 indicated a widespread distribution around the mean.

### Preferred MEIS Product Design

When ranking “database”, “personal portable electronic storage”, and “printed format” as means to store and disseminate emergency information, 64% of the respondents were of the opinion that “database storage” such as a cloud service, managed by an emergency Call Centre was the best way to store their personal information which would be accessed in case of an emergency. Weighted average scores were calculated by allocating a value of 3, 2, and 1 to rankings #1, #2, and #3 respectively, and database storage scored highest with 2.47 points, followed by “personal portable electronic storage” devices such as a USB drive or a mobile phone with a weighted average score of 1.99. In third place was a “print format” such as a wallet card, or a tag attached to a wristband with an average weighted score of 1.54. The “wristband ID,” was ranked as most effective and the “key holder ID” the least effective. Rankings were calculated based on the average weighted scores with ranking #1 to #5 being assigned a value from 5 to 1 point respectively. “Wristband IDs” ranked highest with 3.64 points, “wallet card ID” was second with 3.18 points, “mobile phone emergency app icon” was third with 2.99 points, “necklace ID” was fourth with 2.67 points, and “key holder ID” was fifth with a weighted average score of 2.52 points.

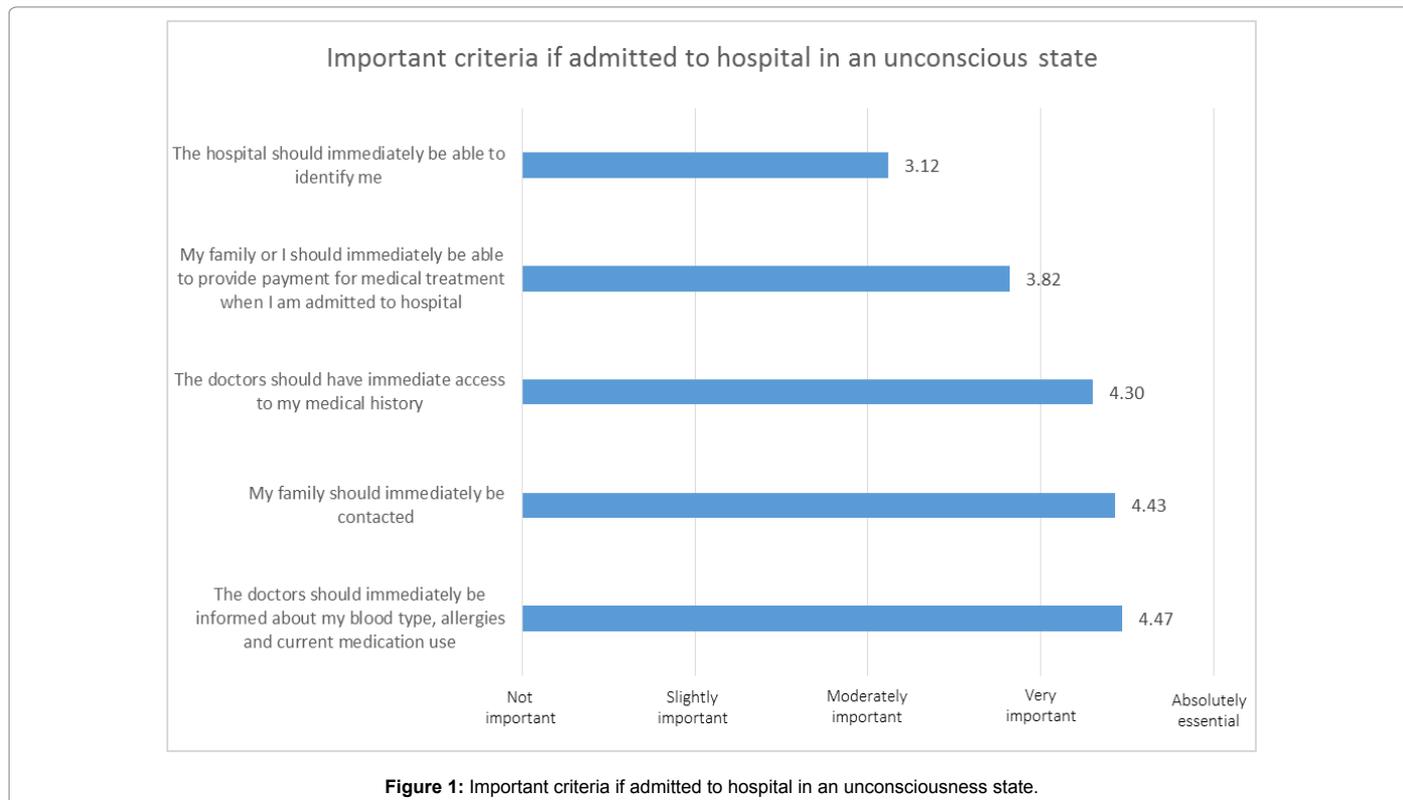
### Discussion and Conclusions

The fact that the overwhelming majority (87%) of respondents stated that they knew “nothing” or “very little” about a MEISs, and

	Likert Scale					Mean	Median	Mode	SD	Skew	Krtsis
	1	2	3	4	5						
The doctors should immediately be informed about my blood type, allergies and current medication use	4%	1%	4%	27%	64%	4.47	5.00	5.00	0.92	-2.33	5.73
My family should immediately be contacted	3%	2%	6%	26%	62%	4.43	5.00	5.00	0.94	-2.07	4.40
The Doctors should have immediate access to my medical History	4%	3%	8%	30%	56%	4.30	5.00	5.00	1.01	-1.75	2.83
My family or I should immediately be able to provide payment for medical treatment when I am admitted to Hospital	6%	8%	19%	32%	35%	3.82	4.00	5.00	1.17	-0.86	-0.05
The Hospital should immediately be able to identify me	24%	11%	19%	22%	25%	3.12	3.00	5.00	1.50	-0.19	-1.38

1: Not Important 2: Slightly Important 3: Moderately Important 4: Very Important 5: Absolutely Essential

Table 1: Important criteria if admitted to hospital in an unconsciousness state.



89% did not know anyone who had used such a device, validates the research assumption, namely that there are no known commercially available MEISs in China. The literature by Gorlin et al. alluded to cost being a major barrier to adoption of a MEIS. However, an overwhelming majority (82%) of the respondents indicated that they were willing to pay for a MEIS, with almost 50% willing to pay up to CNY 150, and approximately 25% willing to pay up to CNY 500. This suggests that it is more than likely that the low levels of knowledge about MEISs and related benefits, rather than the cost, is the main reason why most Chinese consumers do not know of anyone who have used a commercially available MEIS. With regard to the identification of a casualty in an emergency, the literature discussed two important issues relating to the benefits of using a MEIS. The first was naming conventions that were implemented by hospitals to process and record medical procedures on unidentified patients, and the second was the concept of “missingness” and the intense concern and feelings of grief and loss for family members who were missing [27]. It became evident that the respondents considered the need for their families to be contactable in an emergency, far more important than the issue of the hospital being able to identify them or their medical history. This suggests that the concept of “missingness” is of great concern [28], in that people can generally relate to the trauma associated with “missingness” while few would probably ever consider the challenges faced by hospitals in treating unidentified patients, or even the risk to themselves of receiving incorrect treatment from a hospital as a result of cross matching of medical tests or treatment. This was consistent with the finding in this study, namely, that the respondents perceived a MEIS to be more beneficial to their families, than the hospital and doctors treating them. It was also ascertained that the perceived benefit of a MEIS in an emergency is extremely high, and this was consistent with the literature alluding to the benefits of expedited medical care, inter -alia, [29]. The literature revealed that there were

a growing number of Chinese overseas travellers, many of whom were requiring consular assistance [30]. Accidents were a reality of the high number of commuter trips [31-35]. The benefit of a MEIS for Chinese commuters and international travellers cannot be downplayed. Parents of single children in China (under the OCP) were found to be more protective and conservative in raising their children, who in turn were significantly less likely to take risks [36]. These children were also usually taken care of by grandparents when not in school. The Chinese consumers’ perception is that although children under the age of 18 are the least vulnerable group with regard to medical emergencies, adults over 55 years are most vulnerable. The aforementioned affirms the view of respondents who also stated that they were more likely to use a MEIS for their parent’s over 55, rather than for themselves.

### Data Storage and the Importance of a MEIS

Considering the extremely low levels of knowledge about MEISs in China, it was interesting that the respondents ranked the best method of storing MEIS data as “database storage” such as a cloud service that was managed by an emergency Call Centre operation. This was followed by “personal portable electronic storage”, and then “printed format”. These results were in line with the literature that tracked MEIS development from static information types to electronic information types [37-41].

With regard to the perceived most effective way to display a MEIS to a rescuer in an emergency, the respondents ranked the top three methods as: wristband, wallet card, and app icon. These methods are consistent with the common MEIS design types that are currently on offer.

### Limitations of the Study

As with all research, the findings need to be tempered with limitations before wholesale generalizations can be made. Due to cost

constraints imposed on the researcher in securing a random sample from across China by employing a commercial research company. Those without access to internet would have been excluded from participation. Being an online survey, it is not known whether the respondents fully understood all of the questions that they answered. Furthermore, all questions posed were closed ended and the responses therefore lacked the rich data usually associated with open ended questions.

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