



Original Article

Factors that infertile couples from mainland China may take into consideration for cross-border reproductive care – A cross-sectional questionnaire study



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ABSTRACT

Objective: Cross-border reproductive care (CBRC) has become popular in the world, including mainland China. We designed a questionnaire and aimed to determine the main factors that infertile couples from mainland China may consider for CBRC.

Materials and methods: In this cross-sectional questionnaire-based study, we retrospectively analyzed the data from questionnaires collected at the Reproductive Center of Beijing BaoDao Obstetrics and Gynecology Hospital from January 2018 to June 2018. The questionnaire contained 38 items that belonged to six different categories (environment and equipment, service quality, patient safety, medical quality, information acquisition channel and overseas medical services). The item scores for each factor were calculated and then weighted using principal component analysis.

Results: A total of 297 infertile couples were identified. Most of the infertile women were aged 31–35 years, were married 1–3 years, and had a bachelor's degree. In the weighted factor analysis, “clean outpatient clinic and medical equipment” had the highest weight in the dimension of environment and equipment. The item with the highest weight in the dimension of service quality was “wait time for examination”. In the dimension of patient safety, “health education on medication and surgery by counselors” had the highest weight. The item with the highest weight in the dimension of medical quality was “fee charged for ART treatment”. The items with the three highest weights in the dimension of information acquisition channel were “other (seminar, exhibition, dissertation ...)”, “introduction from friends and relatives”, and “telephone inquiry”. In the dimension of overseas medical services, the two items with the highest weights were “cultural similarities” and “language similarities”.

Conclusion: For CBRC, infertile couples from mainland China may take following significant factors into consideration: a high success rate and inexpensive treatment, cultural and linguistic familiarity, high-quality service and short wait time.

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Introduction

Cross-border reproductive care (CBRC) has grown rapidly over the past decade and has become a global phenomenon [1,2]. The CBRC industry, including commercial infrastructures designed to support CBRC travelers and clinics providing CBRC services, has merged commerce, medicine, and tourism [3,4]. The four main categories of patient motivation for CBRC are as follows [1,5,6]: (i) legal and religious prohibitions (laws and religious bans and denial of treatment to certain groups of people); (ii) resource considerations (high costs, lack of expertise and equipment, resource shortages, and waiting lists); (iii) quality and safety concerns (low-quality or unsafe care and low success rates); and (iv) personal preferences (desire for cultural competency, proximity to support networks, and privacy concerns). Moreover, the CBRC phenomenon also includes seeking donors or surrogates across borders [7]. Of the above reasons, resource constraints may be the single most important worldwide promoter of CBRC [8]. However, most patients indicate a combination of factors leading them to seek CBRC [9].

In mainland China, due to legal restriction, high costs of in vitro fertilization (IVF), shortage of IVF clinics and doubtful

quality and safety [8], CBRC has developed rapidly. Additionally, the universal two-child policy was enforced in mainland China in 2016 [10]. The demand for assisted reproductive services has emerged since the enactment of this new policy [11], resulting in the development of CBRC as well. Because of excellent assisted reproductive techniques (ARTs), high healthcare quality and professionalism, Taiwan has been an optimal place for infertile couples from mainland China to seek ARTs. In fact, in the competitive ART market of Taiwan, attracting infertile couples from mainland China to travel to the Taiwanese reproductive medicine center for ARTs has become a pivotal way to attract customers from overseas.

Therefore, we aim to identify the factors that infertile couples from mainland China may consider for CBRC. Based on the SERVQUAL scale [12,13] and balanced scorecard [14], which have been commonly used to evaluate healthcare services [15,16] or hospital systems [17,18], we designed a questionnaire to investigate the factors that infertile couples from mainland China may take into account for CBRC. The questionnaires were completed by infertile couples from mainland China who had ever undergone IVF cycles at the Reproductive Center of Beijing BaoDao

Table 1

Questionnaire of factors attracting infertile couples from mainland China to Taiwan's reproductive medicine centers.

Categories and items	Not very important	Not important	Neutral	Important	Very important
Environment and equipment					
Moderate air-conditioning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sufficient lighting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comfortable environment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spacious space	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Smooth traffic flow	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Laboratory equipment and instruments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clear indicators for direction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean outpatient clinic and medical equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Privacy of the clinic and examination room	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Service quality					
Wait time for physician examination	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Time of physician examination	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wait time for registration, charging fees, and receiving medication	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wait time for examination	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wait time for counseling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High-quality service from medical personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Detailed health education	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Suitable responses when service is needed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Patient safety					
Health education on medication and surgery by counselors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Privacy is highly respected by medical personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Patients' conditions are well explained by the doctor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Medical quality					
Professional achievement of health personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Success rate of the reproductive medicine center	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quality certification	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fee charged for ART treatment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Information acquisition channel					
Search engine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Facebook page and website	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TV media	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Newspapers and magazines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telephone inquiry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Introduction from friends and relatives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (seminar, exhibition, dissertation, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other					
Language similarities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cultural similarities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Complexity of applying for medical visa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Convenient transportation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Professional agency	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reasonable agency fee	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Appropriate attitude and real-time service provided by agents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ART, assisted reproductive technique; TV, television.

Obstetrics and Gynecology Hospital. The aim of this study was to retrospectively collect and analyze data from the questionnaires to identify the key factors that infertile couples from mainland China may concern for CBRC.

Materials and methods

Patients and design

This was a retrospective cross-sectional questionnaire-based study conducted at the Reproductive Center of Beijing BaoDao Obstetrics and Gynecology Hospital, a cooperative hospital of Kaohsiung Veterans General Hospital, from January 2018 to June 2018. The patients who had ever undergone at least one IVF cycle at the Reproductive Center of Beijing BaoDao Obstetrics and Gynecology Hospital, had a tendency to take CBRC and completed the questionnaire were included in the study. The patients who had incomplete questionnaires were excluded from the study. Data were collected anonymously using questionnaire-based interviews by a trained reproductive consultant. This study was approved by the institutional review board at Kaohsiung Veterans General Hospital (VGHS18-CT11-05).

Questionnaire

The questionnaire included sociodemographic items, such as age, years of marriage, education, occupation and income. Additionally, items from six categories that possibly affect infertile couples from mainland China in thinking over CBRC were included in the questionnaire, as follows (Table 1):

- 1) Environment and equipment: moderate air-conditioning, sufficient lighting, comfortable environment, spacious space, smooth traffic flow, laboratory equipment and instruments, clear indicators for direction, clean outpatient clinic and medical equipment, and privacy of the clinic and examination room.
- 2) Service quality: wait time for physician examination; time of physician examination; wait time for registration, charging fees, and receiving medication; wait time for examination; wait time for counseling, high-quality service from medical personnel; detailed health education; and suitable responses when service is needed.
- 3) Patient safety: health education on medication and surgery by counselors, privacy is highly respected by medical personnel, and patients' conditions are well explained by the doctor.
- 4) Medical quality: professional achievement of health personnel, success rate of the reproductive medicine center, quality certification, and fee charged for ART treatment.
- 5) Information acquisition channel: search engine, Facebook page and website, TV media, newspapers and magazines, telephone inquiry, introduction from friends and relatives, and other (seminar, exhibition, dissertation, etc.).
- 6) Overseas medical services: language similarities, cultural similarities, complexity of applying for medical visa, convenient transportation, professional agency, reasonable agency fee, and appropriate attitude and real-time service provided by agents.

The five-point scale (1-not very important, 2-not important, 3-neutral, 4- important and 5-very important) was adopted in the questionnaire to quantify the degree of importance.

Statistical analysis

The Statistical Package for Social Sciences (SPSS) version 20.0 (Chicago, IL, USA) was used for all analyses. The average scores were

calculated for all questionnaire items and compared based on age and occupation using the independent Student's t-test. Data are presented as the mean \pm the standard deviation (SD). Furthermore, principal component analysis was used for weighted factor analysis to compute the relative importance of each category and its items in the overall evaluation. Comparisons with a p value < 0.05 were considered significant.

Results

Of the 360 participants, a total of 297 infertile couples who underwent IVF cycles and completed the questionnaire at the Reproductive Center of Beijing BaoDao Obstetrics and Gynecology Hospital were identified. The acceptance rate was 82.5%. Table 2 shows the sociodemographic characteristics of the infertile couples from this study. Most women were aged 31–35 years (44%), were married 1–3 years (44%) and had a university education (82%). The occupations of most women were in the nonservice industry (58%). The monthly household income of most couples was more than 6000 China yuan (CNY) (39%).

Comparisons of the item scores between younger women (< 36 years) and older women (≥ 36 years) are shown in Table 3. The younger women received higher scores on the items of “health education on medication and surgery by counselors”, “privacy is highly respected by medical personnel”, “patients' conditions are well explained by the doctor” and “professional agency” than the older women. Regarding the category of information acquisition channel, the younger women received higher scores on the items of “search engine” and “Facebook page and website” than the older women. In Table 4, we compared the item scores between different occupations. Regarding the category of environment and equipment, women not in the service industry presented higher scores on “clean outpatient clinic and medical equipment” and “privacy of the clinic and examination room” than women in the service industry. For the category of service quality, higher scores on “wait time for physician examination”, “wait time for registration, charging fees, and receiving medication”, “wait time for examination”, “wait time for counseling” and “detailed health education”

Table 2
The sociodemographic characteristics of infertile couples.

	Number	Percentage
Age, years		
20–25	8	3%
26–30	45	15%
31–35	132	44%
36–40	72	24%
41–45	30	10%
> 45	10	4%
Duration of marriage, year(s)		
< 1	22	7%
1–3	129	44%
3–5	93	31%
> 5	53	18%
Education		
Junior high school	2	1%
High school	28	9%
College	244	82%
Graduate school	23	8%
Occupation		
Service industry	124	42%
Nonservice industry	173	58%
Monthly household income, CNY		
$< 20,000$	18	6%
20,000–40,000	65	22%
40,000–60,000	97	33%
$> 60,000$	116	39%

CNY, China yuan.

Table 3

Comparison of the factors that infertile couples from mainland China may take into consideration for cross-border reproductive care between younger women and older women.

Categories and items	Age < 36 years (n = 185)	Age ≥ 36 years (n = 112)	p value
Environment and equipment			
Moderate air-conditioning	3.69 ± 0.61	3.58 ± 0.69	0.15
Sufficient lighting	3.65 ± 0.55	3.58 ± 0.69	0.35
Comfortable environment	3.68 ± 0.54	3.69 ± 0.66	0.97
Spacious space	3.63 ± 0.56	3.62 ± 0.63	0.88
Smooth traffic flow	3.64 ± 0.58	3.62 ± 0.67	0.85
Laboratory equipment and instruments	3.85 ± 0.62	3.79 ± 0.66	0.44
Clear indicators for direction	3.79 ± 0.60	3.84 ± 0.65	0.50
Clean outpatient clinic and medical equipment	3.87 ± 0.61	3.89 ± 0.68	0.77
Privacy of the clinic and examination room	3.89 ± 0.65	3.94 ± 0.70	0.53
Service quality			
Wait time for physician examination	4.12 ± 0.70	4.06 ± 0.73	0.51
Time of physician examination	4.15 ± 0.69	4.14 ± 0.75	0.97
Wait time for registration, charging fees, and receiving medication	4.13 ± 0.69	4.03 ± 0.70	0.22
Wait time for examination	4.15 ± 0.67	4.08 ± 0.72	0.39
Wait time for counseling	4.14 ± 0.70	4.12 ± 0.72	0.82
High-quality service from medical personnel	4.16 ± 0.70	4.19 ± 0.73	0.77
Detailed health education	4.18 ± 0.72	4.15 ± 0.71	0.71
Suitable responses when service is needed	4.26 ± 0.71	4.27 ± 0.71	0.92
Patient safety			
Health education on medication and surgery by counselors	4.86 ± 0.39	4.70 ± 0.48	<0.01
Privacy is highly respected by medical personnel	4.80 ± 0.45	4.57 ± 0.61	<0.01
Patients' conditions are well-explained by the doctor	4.85 ± 0.39	4.68 ± 0.51	<0.01
Medical quality			
Professional achievement of health personnel	4.30 ± 0.52	4.39 ± 0.62	0.18
Success rate of the reproductive medicine center	4.55 ± 0.55	4.55 ± 0.61	0.95
Quality certification	4.34 ± 0.58	4.31 ± 0.64	0.70
Fee charged for ART treatment	4.49 ± 0.59	4.39 ± 0.65	0.18
Information acquisition channel			
Search engine	3.95 ± 0.52	3.80 ± 0.68	0.04
Facebook page and website	3.90 ± 0.59	3.69 ± 0.78	0.01
TV media	3.88 ± 0.56	3.77 ± 0.79	0.17
Newspapers and magazines	3.88 ± 0.62	3.72 ± 0.77	0.06
Telephone inquiry	4.11 ± 0.66	3.95 ± 0.77	0.05
Introduction from friends and relatives	4.26 ± 0.66	4.17 ± 0.73	0.28
Other (seminar, exhibition, dissertation, etc.)	4.22 ± 0.73	4.10 ± 0.84	0.20
Overseas medical services			
Language similarities	4.03 ± 0.56	4.07 ± 0.65	>0.05
Cultural similarities	3.97 ± 0.58	4.02 ± 0.68	0.55
Complexity of applying for medical visa	3.98 ± 0.57	4.04 ± 0.67	0.43
Convenient transportation	4.08 ± 0.61	4.02 ± 0.73	0.42
Professional agency	4.42 ± 0.69	4.21 ± 0.76	0.01
Reasonable agency fee	4.43 ± 0.71	4.34 ± 0.67	0.31
Appropriate attitude and real-time service provided by agents	4.56 ± 0.67	4.43 ± 0.64	0.10

Mean ± standard deviation.

ART, assisted reproductive technique; TV, television.

were observed for women in the service industry than for those not in the service industry. For the category of patient safety, women in the service industry had higher scores than those not in the service industry for the items of “health education on medication and surgery by counselors”, “privacy is highly respected by medical personnel” and “patients' conditions are well explained by the doctor”. With regard to the category of medical quality, women in the service industry had a higher score for “fee charged for ART treatment” than those outside the service industry. For the category of overseas medical services, higher scores for “professional agency”, “reasonable agency fee” and “appropriate attitude and real-time service provided by agents” were found for women in the service industry than for those not in the service industry.

The weighted factor analysis of the six categories and their items is shown in Table 5. Using principal component analysis, the most pivotal factor was service quality (0.251), followed by environment and equipment (0.202), medical quality (0.180), patient safety (0.179), overseas medical services (0.140) and information acquisition channel (0.048). The three items with the greatest

weight in the category of service quality were “wait time for examination” (0.129), “wait time for counseling” (0.128), and “high-quality service from medical personnel” (0.127). In the category of environment and equipment, the three items with the greatest weight were “clean outpatient clinic and medical equipment” (0.147), “clear indicators for direction” (0.146), and “privacy of the clinic and examination room” (0.145). The two items with the greatest weight in the category of medical quality were “fee charged for ART treatment” (0.256) and “success rate of the reproductive medicine center” (0.255). In the category of patient safety, “health education on medication and surgery by counselors” (0.337) had the highest weight. In the category of overseas medical services, the three items with the greatest weight were “cultural similarities” (0.187), “language similarities” (0.185) and “complexity of applying for medical visa” (0.180). The three items with the highest weight in the category of information acquisition channel were “other (seminar, exhibition, dissertation, etc.)” (0.198), “introduction from friends and relatives” (0.191), and “telephone inquiry” (0.187).

Table 4

Comparison of the factors that infertile couples from mainland China may take into consideration for cross-border reproductive care between women in the service industry and nonservice industry.

Categories and items	Nonservice industry (n = 173)	Service industry (n = 124)	p value
Environment and equipment			
Moderate air-conditioning	3.64 ± 0.67	3.66 ± 0.60	0.79
Sufficient lighting	3.60 ± 0.63	3.66 ± 0.58	0.36
Comfortable environment	3.69 ± 0.62	3.69 ± 0.55	0.99
Spacious space	3.62 ± 0.61	3.62 ± 0.55	0.96
Smooth traffic flow	3.63 ± 0.67	3.64 ± 0.55	0.88
Laboratory equipment and instruments	3.89 ± 0.68	3.75 ± 0.56	0.06
Clear indicators for direction	3.86 ± 0.68	3.73 ± 0.53	0.08
Clean outpatient clinic and medical equipment	3.95 ± 0.66	3.77 ± 0.58	0.02
Privacy of the clinic and examination room	3.98 ± 0.71	3.81 ± 0.61	0.03
Service quality			
Wait time for physician examination	4.01 ± 0.71	4.23 ± 0.70	0.01
Time of physician examination	4.10 ± 0.71	4.21 ± 0.70	0.18
Wait time for registration, charging fees, and receiving medication	4.00 ± 0.67	4.22 ± 0.70	0.01
Wait time for examination	4.05 ± 0.68	4.23 ± 0.69	0.02
Wait time for counseling	4.05 ± 0.69	4.23 ± 0.71	0.03
High-quality service from medical personnel	4.12 ± 0.71	4.25 ± 0.71	0.11
Detailed health education	4.08 ± 0.73	4.30 ± 0.67	0.01
Suitable responses when service is needed	4.23 ± 0.72	4.31 ± 0.68	0.28
Patient safety			
Health education on medication and surgery by counselors	4.72 ± 0.50	4.91 ± 0.29	<0.01
Privacy is highly respected by medical personnel	4.60 ± 0.61	4.88 ± 0.33	<0.01
Patients' conditions are well-explained by the doctor	4.70 ± 0.51	4.90 ± 0.31	<0.01
Medical quality			
Professional achievement of health personnel	4.35 ± 0.60	4.31 ± 0.50	0.56
Success rate of the reproductive medicine center	4.50 ± 0.62	4.63 ± 0.50	0.06
Quality certification	4.32 ± 0.66	4.34 ± 0.52	0.83
Fee charged for ART treatment	4.37 ± 0.66	4.57 ± 0.53	<0.01
Information acquisition channel			
Search engine	3.87 ± 0.66	3.93 ± 0.48	0.38
Facebook page and website	3.77 ± 0.75	3.89 ± 0.56	0.16
TV media	3.82 ± 0.75	3.86 ± 0.52	0.54
Newspapers and magazines	3.77 ± 0.77	3.89 ± 0.54	0.14
Telephone inquiry	3.94 ± 0.74	4.20 ± 0.64	<0.01
Introduction from friends and relatives	4.17 ± 0.69	4.30 ± 0.67	0.12
Other (seminar, exhibition, dissertation, etc.)	4.05 ± 0.83	4.35 ± 0.65	<0.01
Overseas medical services			
Language similarities	4.06 ± 0.67	4.02 ± 0.48	0.50
Cultural similarities	4.01 ± 0.70	3.97 ± 0.49	0.60
Complexity of applying for medical visa	4.03 ± 0.69	3.96 ± 0.48	0.34
Convenient transportation	4.05 ± 0.74	4.07 ± 0.51	0.87
Professional agency	4.21 ± 0.76	4.52 ± 0.63	<0.01
Reasonable agency fee	4.25 ± 0.74	4.60 ± 0.57	<0.01
Appropriate attitude and real-time service provided by agents	4.40 ± 0.73	4.67 ± 0.50	<0.01

Mean ± standard deviation.

ART, assisted reproductive technique; TV, television.

Discussion

This retrospective cross-sectional questionnaire-based study analyzed the data collected from the Reproductive Center of Beijing BaoDao Obstetrics and Gynecology Hospital from January 2018 to June 2018 and identified central factors that infertile couples from mainland China may take into consideration for CBRC. “Fee charged for ART treatment” and “success rate of the reproductive medicine center” are critical factors that infertile couples from mainland China may concern to seek IVF treatment. With professional knowledge, proficient techniques and advanced instruments, the live birth rate of IVF cycles in Taiwan is excellent in the world; furthermore, the cost of IVF cycles in Taiwan is relatively low. “High-quality service from medical personnel”, “health education on medication and surgery by counselors”, “wait time for examination” and “wait time for counseling” are other key factors that infertile couples from mainland China may consider for CBRC. Certainly, shorter wait times are one of the positive factors resulting in a high level of patient satisfaction with CBRC [7]. In addition to CBRC, short wait times are positively

associated with client satisfaction in family planning services [19,20]. Medical staffs in Taiwan are always friendly, patient and careful with patients. Moreover, to promote CBRC, each infertile couple is cared for by a specially assigned person who provides excellent-quality service and short wait times in the reproductive medicine center. Furthermore, language and general communication problems have been identified as the greatest potential problems for patients participating in CBRC [21]. Emerging evidence has indicated that treatment in a culturally and linguistically familiar country was the prime reason why patients were satisfied with CBRC [9,22,23]. Taiwan has similar culture and language to mainland China, which plays an important role in attracting infertile couples from mainland China for CBRC. As mentioned above, Taiwan seems to be an optimal place for infertile couples from mainland China to take CBRC.

However, “complexity of applying for medical visa” is an imperative reason why infertile couples from mainland China are unwilling to take CBRC. Indeed, this administrative problem has been identified as one of the largest obstacles to accessing CBRC [21]. In fact, the process of applying for medical visas in Taiwan is

Table 5

The weighted factor analysis of each category and its items in the questionnaire.

Categories and items	Weights for categories	Weights for items
Environment and equipment	0.202	
Moderate air-conditioning		0.091
Sufficient lighting		0.079
Comfortable environment		0.100
Spacious space		0.080
Smooth traffic flow		0.077
Laboratory equipment and instruments		0.135
Clear indicators for direction		0.146
Clean outpatient clinic and medical equipment		0.147
Privacy of the clinic and examination room		0.145
Service quality	0.251	
Wait time for physician examination		0.123
Time of physician examination		0.122
Wait time for registration, charging fees, and receiving medication		0.126
Wait time for examination		0.129
Wait time for counseling		0.128
High-quality service from medical personnel		0.127
Detailed health education		0.123
Suitable responses when service is needed		0.123
Patient safety	0.179	
Health education on medication and surgery by counselors		0.337
Privacy is highly respected by medical personnel		0.329
Patients' conditions are well-explained by the doctor		0.333
Medical quality	0.180	
Professional achievement of health personnel		0.243
Success rate of the reproductive medicine center		0.255
Quality certification		0.246
Fee charged for ART treatment		0.256
Information acquisition channel	0.048	
Search engine		0.078
Facebook page and website		0.087
TV media		0.116
Newspapers and magazines		0.145
Telephone inquiry		0.187
Introduction from friends and relatives		0.191
Other (seminar, exhibition, dissertation, etc.)		0.198
Overseas medical services	0.140	
Language similarities		0.185
Cultural similarities		0.187
Complexity of applying for medical visa		0.180
Convenient transportation		0.162
Professional agency		0.106
Reasonable agency fee		0.086
Appropriate attitude and real-time service provided by agents		0.093

ART, assisted reproductive technique; TV, television.

highly complicated, and the documents requirements are too strict. Therefore, we hope that the government can simplify the process and requirements for obtaining a medical visa for ARTs to increase the willingness of infertile couples from overseas to come to Taiwan. Regarding the information acquisition channel, the channels by which infertile couples from mainland China obtain ART-related information are all nonmainstream ones. This implies that our international marketing and promotion campaigns are seriously insufficient. Therefore, in addition to the effort of a single reproductive medicine center, we hope that the government can help us establish international marketing and promotion strategies to support the advanced ARTs of Taiwan to other countries.

According to the subgroup analysis by age (Table 3), younger women (<36 years) from mainland China consider “privacy is highly respected by medical personnel”, “detailed health education” and “patients' conditions are well explained by the doctor” to be more important than older women did (≥ 36 years). Indeed, ethical guidelines strongly state that physicians have the responsibility to value and protect the privacy and confidentiality rights of patients' health information [24]. In addition, more younger women than older women have access to the Internet. Therefore, younger women are able to easily acquire more

information and knowledge about their diseases and treatment and may have more interest in thoroughly understanding their conditions. Certainly, regarding the category of the information acquisition channel, younger women receive more information from Facebook pages and websites than older women. Hence, hospitals should incorporate more social media, such as Facebook pages and websites, into their marketing and promotion strategies and use social media to educate patients, acknowledge staff, promote specific services and share hospital news. Through this approach, hospitals can improve patient recruitment and retention, enhance customer service and quality of care, and augment customer satisfaction [25,26]. Based on the subgroup analysis by occupation (Table 4), clean and private clinics draw more women outside the service industry than women working in the service industry. Shorter wait times, detailed health education and explanations of patients' conditions, strong respect for privacy, low fees for ART treatment, professional agency and kind agents were more attractive factors for women in the service industry than for those not in the service industry.

The retrospective design and relatively small sample size were main limitations of this study. Moreover, this study was performed at a single overseas institute. Multicenter, large-scale prospective

studies are needed to validate the results from this study. In addition, the questionnaires have not been fully validated by questionnaire and reproductive experts. Thus, the data of this study should be interpreted cautiously.

In conclusion, this study identified several factors that infertile couples from mainland China may take into account for CBRC. Some critical factors are a high success rate, low cost of IVF, and familiar language and culture. Another important factors include high-quality service and short wait times. However, barriers to access, such as complicated visa applications, and a lack of marketing and promotion strategies are impeding the development of CBRC.

Declaration of competing interest

None.

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