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## Original Article

## Factors that influence infertile couples' selection of reproductive medicine centers—A cross-sectional questionnaire study

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## ABSTRACT

**Objective:** The number of infertile women undergoing in vitro fertilization (IVF) cycles has increased annually. Due to this competitive environment, we designed a questionnaire and aimed to investigate factors affecting the choice of reproductive medicine center among infertile couples.

**Materials and methods:** This was a retrospective cross-sectional study that analyzed questionnaires provided by the reproductive medicine center of the Kaohsiung Veterans General Hospital from January 2018 to June 2018. In the questionnaire, there are six categories (environment and equipment, service quality, patient safety, medical quality, information acquisition channel and other) and 36 items. The identified factors were scored and then weighted using principal component analysis.

**Results:** Most of the 100 identified infertile women were aged 31–35 years, were married 1–3 years, and had a university education level. In the weight analysis, “Clean outpatient clinic and medical equipment” had the greatest weight in the dimension of environment and equipment. The item with the greatest weight in the dimension of service quality was “Waiting time for registration, charging, and receiving medicine”. In the dimension of patient safety, “Privacy is highly respected by medical personnel” had the highest weight. The item with the greatest weight in the dimension of medical quality was “Success rate of reproductive medicine center”. The three items with the highest weights in the dimension of information acquisition channel were “Newspapers and magazines”, “TV media”, and “Facebook page and website of our hospital”. In the other dimensions, the two with the greatest weights were “Reputation of the hospital” and “Reputation of physicians”.

**Conclusion:** In the infertile couples' view, optimal reproductive medicine centers should have a high success rate and great reputation on the internet and in mass media. Additionally, a short waiting time and high levels of privacy and confidentiality are also imperative.

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## Introduction

Due to delayed marriage and childbirth, high levels of stress in work and life, and various types of environmental pollution in modern society, the prevalence of infertility has increased annually [1]. Generally, infertile couples seek a qualified reproductive medicine center for help. At the reproductive medicine center, infertility counseling, evaluations, examinations, and artificial reproductive technology, including intrauterine insemination and in vitro fertilization (IVF), are provided. Before infertile couples decide to undergo IVF cycles in a specific reproductive medicine center, they

usually take numerous categories into consideration, including the success rate, cost, and service quality.

IVF is a highly individualized, patient-centered treatment approach. In a competitive environment, patients' perception of healthcare service quality is the most important factor when choosing a hospital. Therefore, we were eager to understand which factors would affect the infertile couples' choice of reproductive medicine center from the patients' perspective. However, relevant literature regarding this topic is lacking. Therefore, we designed a questionnaire based on the SERVQUAL scale and a balanced scorecard. The SERVQUAL scale was proposed by Parasuraman, Zeithaml and Berry and provides an instrument for measuring service quality [2,3]. There are five dimensions of service quality in this scale, namely, tangibles, reliability, responsiveness, assurance and empathy. The SERVQUAL scale has become a common and valuable tool for assessing the quality of health care services [4–6]. The balanced scorecard, proposed by Kaplan and Norton, translates an organization's mission and strategy into a comprehensive set of performance measures related to finance, customers, internal processes, and learning and growth [7]. The balanced scorecard strategy has been successfully applied in healthcare provider organizations, enabling them to improve financial results, customer satisfaction and competitive market positioning [8–10].

In a competitive market, providing services based on patients' expectations and needs plays a key role in the success of a healthcare provider organization. Identifying patients' expectations and needs is the first step to meeting this end. However, studies that provide relevant information are lacking. Therefore, we performed an anonymous questionnaire-based analysis in our reproductive medicine center beginning in January 2018 to investigate the reasons why infertile couples choose a reproductive medicine center. The aim of this study was to retrospectively collect and analyze these questionnaires to identify the factors that influence infertile couples' selection of a reproductive medicine center.

## Materials and methods

### Patients and design

This was a retrospective cross-sectional questionnaire-based study performed at the reproductive medicine center of the Kaohsiung Veterans General Hospital from January 2018 to June 2018. A total of 115 patients who underwent IVF cycles in our reproductive medicine center and completed the questionnaire during the study period were identified. Patients who had missing data in the questionnaire were excluded from the study. Hence, the final analyses enrolled 100 subjects (an acceptance rate of approximately 87%). Data were anonymously collected using questionnaire-based interviews by the trained reproductive consultants. The institutional review board at Kaohsiung Veterans General Hospital approved this study, with the identifier VGHKS18-CT11-05.

### Questionnaire

The questionnaire contained sociodemographic characteristics, such as age, duration of marriage, education, occupation and monthly household income. The questionnaire also elicited information on six categories that play key roles in patients' selection of a reproductive medicine center. The details of 36 items of the six categories are as follows (Supplementary Table 1):

- 1) Environment and equipment: moderate air-conditioning, sufficient lighting, comfortable environment, spacious area, smooth traffic flow, laboratory equipment and instruments, clear

indicator of direction, clean outpatient clinic and medical equipment, and privacy of the clinic and examination room.

- 2) Service quality: waiting time for physician inspection; time of physician inspection; waiting time for registration, charging, and receiving medicine; waiting time for examination; waiting time for counseling; high-quality service of medical personnel; detailed health education; and suitable responses when service is needed.
- 3) Patient safety: health education regarding medication and surgery by counselors, privacy is highly respected by medical personnel, and patients' conditions are explained well by the doctor.
- 4) Medical quality: professional attainment of health personnel, success rate of reproductive medicine center, quality certification, and charging fee for ART treatment.
- 5) Information acquisition channel: website search, Facebook page and website of our hospital, TV media, newspapers and magazines, telephone inquiry, introduction by friends and relatives, and other (seminar, exhibition, dissertation, etc.).
- 6) Other: convenient transportation, professional physicians, academic degree of physicians (ex. PhD), reputation of physicians, and reputation of the hospital.

The questionnaire used a five-point Likert scoring scale (1-not very important, 2-not important, 3-neutral, 4-important and 5-very important) as to the degree to which participants would think it is important.

### Statistical analysis

For the patients' characteristics, data are expressed as the number and percentage. Regarding questionnaire scores, the average of all scores was calculated for each item. Additional comparisons based on different ages, occupations and monthly household incomes were performed using the independent Student's t-test for quantitative data. Data are presented as the mean  $\pm$  standard deviation (SD). Principal component analysis was used to explore the relative importance of each factor in the overall evaluation. A two-tailed *p*-value  $< 0.05$  was considered statistically

**Table 1**

The sociodemographic characteristics of infertile couples.

	Number	Percentage
<b>Age, years</b>		
20–25	1	1%
26–30	18	18%
31–35	33	33%
36–40	29	29%
41–45	16	16%
>45	3	3%
<b>Duration of marriage, year(s)</b>		
<1	12	12%
1–3	34	34%
3–5	21	21%
>5	33	33%
<b>Education</b>		
Junior high school	2	2%
High school	14	14%
College	70	70%
Graduate school	14	10%
<b>Occupations</b>		
Service industry	35	35%
Nonservice industry	65	65%
<b>Monthly household incomes, TWD</b>		
<50,000	15	15%
50,000–100,000	49	49%
100,000–150,000	31	31%
>150,000	5	5%

TWD, Taiwan Dollars.

significant. All statistical analyses were conducted using the statistical package SPSS 20.0 (SPSS, Chicago, IL, USA).

## Results

The distribution of the sociodemographic characteristics of the infertile couples is shown in Table 1. Among our study subjects, most women were aged 31–35 years (33%), were married 1–3 years (34%) and had a bachelor's degree (70%). The occupations of most women were in the nonservice industry (65%). The monthly income of most couples was 50,000–100,000 Taiwan dollars (49%).

Table 2 shows the comparisons of the questionnaire scores between younger women (<36 years) and older women ( $\geq 36$  years). Older women paid more attention to “Waiting time for registration, charging, and receiving medicine” and received more information from the channels “TV media”, “Telephone inquiry”, “Introduction from friends and relatives” and “Other (seminar, exhibition, dissertation, etc.)” than younger women ( $p < 0.05$ ). Moreover, older women had higher scores in “Convenient transportation”, “Academic degree of physicians (ex. PhD)” and “Reputation of the hospital” than younger ones ( $p < 0.05$ ).

With regard to different occupations (Table 3), nonservice industry women presented higher scores in “Spacious area” and

“Smooth traffic flow” than service industry women ( $p < 0.05$ ). In addition, women with nonservice industry cared more about service quality, namely, “Waiting time for physician inspection”, “Time of physician inspection”, “Waiting time for registration, charging, and receiving medicine”, “Waiting time for examination”, “Waiting time for counseling” and “Suitable responses when service is needed” than women in the service industry ( $p < 0.05$ ). “Academic degree of physicians (ex. PhD)” and “Reputation of the hospital” had higher scores for nonservice industry women than for service industry women ( $p < 0.05$ ). Table 4 shows that there was no significant difference in any items between couples with high monthly income and low monthly income.

The relative importance of each category and its items is shown in Table 5. Using principal component analysis, the most important factor was service quality (0.180), following by other (0.179), environment and equipment (0.175), medical quality (0.174), information acquisition channel (0.170) and patient safety (0.122). For service quality, “Waiting time for registration, charging, and receiving medicine” (0.135), “Waiting time for examination” (0.135), and “Waiting time for counseling” (0.132) were the factors with higher weight. In the category of other, the two factors with the greatest weight were “Reputation of the hospital” (0.220) and “Reputation of physicians” (0.217). The subjects generally cared

**Table 2**

Comparison of the factors affecting infertile couples' selection of reproductive medicine centers between younger women and older women.

Categories and items	Age <36 years (n = 52)	Age $\geq 36$ years (n = 48)	p value
<b>Environment and equipment</b>			
Moderate air-conditioning	3.73 $\pm$ 0.12	3.98 $\pm$ 0.12	0.15
Sufficient lighting	3.83 $\pm$ 0.11	4.10 $\pm$ 0.13	0.10
Comfortable environment	4.10 $\pm$ 0.11	4.21 $\pm$ 0.13	0.51
Spacious area	3.79 $\pm$ 0.12	4.02 $\pm$ 0.12	0.18
Smooth traffic flow	3.94 $\pm$ 0.12	4.08 $\pm$ 0.13	0.43
Laboratory equipment and instruments	4.50 $\pm$ 0.10	4.71 $\pm$ 0.08	0.13
Clear indicators for direction	4.00 $\pm$ 0.11	4.19 $\pm$ 0.10	0.22
Clean outpatient clinic and medical equipment	4.65 $\pm$ 0.08	4.77 $\pm$ 0.07	0.28
Privacy of the clinic and examination room	4.75 $\pm$ 0.07	4.79 $\pm$ 0.07	0.66
<b>Service quality</b>			
Waiting time for physician inspection	3.92 $\pm$ 0.13	4.04 $\pm$ 0.11	0.49
Time of physician inspection	4.37 $\pm$ 0.08	4.44 $\pm$ 0.09	0.55
Waiting time for registration, charging, and receiving medicine	3.60 $\pm$ 0.12	3.94 $\pm$ 0.12	<0.05
Waiting time for examination	3.75 $\pm$ 0.12	4.06 $\pm$ 0.12	0.07
Waiting time for counseling	3.79 $\pm$ 0.11	4.04 $\pm$ 0.12	0.11
High-quality service of medical personnel	4.21 $\pm$ 0.10	4.27 $\pm$ 0.11	0.69
Detailed Health education	4.40 $\pm$ 0.07	4.46 $\pm$ 0.08	0.63
Suitable responses when service is needed	4.50 $\pm$ 0.08	4.50 $\pm$ 0.08	1.00
<b>Patient safety</b>			
Health education of medication and surgery by counselors	4.58 $\pm$ 0.08	4.60 $\pm$ 0.08	0.81
Privacy is highly respected by medical personnel	4.60 $\pm$ 0.08	4.63 $\pm$ 0.08	0.81
Patients' conditions are well-explained by the doctor	4.77 $\pm$ 0.07	4.71 $\pm$ 0.07	0.53
<b>Medical quality</b>			
Professional attainment of health personnel	4.54 $\pm$ 0.07	4.67 $\pm$ 0.07	0.21
Success rate of reproductive medicine center	4.48 $\pm$ 0.08	4.58 $\pm$ 0.09	0.39
Quality certification	4.27 $\pm$ 0.11	4.33 $\pm$ 0.12	0.70
Charging fee for ART treatment	4.19 $\pm$ 0.11	4.46 $\pm$ 0.10	0.08
<b>Information acquisition channel</b>			
Website search	3.88 $\pm$ 0.11	4.10 $\pm$ 0.10	0.16
Facebook page and website of our hospital	3.77 $\pm$ 0.11	3.90 $\pm$ 0.12	0.44
TV media	3.38 $\pm$ 0.10	3.73 $\pm$ 0.14	0.04
Newspapers and magazines	3.38 $\pm$ 0.10	3.71 $\pm$ 0.14	0.06
Telephone inquiry	3.56 $\pm$ 0.11	4.02 $\pm$ 0.11	<0.01
Introduction from friends and relatives	3.62 $\pm$ 0.11	3.98 $\pm$ 0.12	0.03
Other (seminar, exhibition, dissertation, etc.)	3.13 $\pm$ 0.13	3.58 $\pm$ 0.13	0.02
<b>Other</b>			
Convenient transportation	3.62 $\pm$ 0.13	4.06 $\pm$ 0.10	<0.01
Professional physicians	4.44 $\pm$ 0.11	4.69 $\pm$ 0.07	0.07
Academic degree of physicians (ex. PhD)	3.29 $\pm$ 0.13	3.71 $\pm$ 0.14	0.04
Reputation of physicians	3.54 $\pm$ 0.13	3.83 $\pm$ 0.13	0.11
Reputation of the hospital	3.81 $\pm$ 0.13	4.27 $\pm$ 0.11	0.01

Data were presented as mean  $\pm$  standard deviation.

ART, assisted reproductive technology; TV, television; PhD, Doctor of Philosophy.

**Table 3**

Comparison of the factors affecting infertile couples' selection of reproductive medicine centers between women in the service industry and nonservice industry.

Aspects and items	Non-service industry (n = 65)	Service industry (n = 35)	p value
<b>Environment and equipment</b>			
Moderate air-conditioning	3.94 ± 0.88	3.69 ± 0.83	0.17
Sufficient lighting	3.98 ± 0.87	3.91 ± 0.82	0.70
Comfortable environment	4.22 ± 0.87	4.03 ± 0.79	0.29
Spacious area	4.05 ± 0.87	3.63 ± 0.81	0.02
Smooth traffic flow	4.18 ± 0.88	3.69 ± 0.83	0.01
Laboratory equipment and instruments	4.69 ± 0.58	4.43 ± 0.81	0.06
Clear indicators for direction	4.17 ± 0.74	3.94 ± 0.76	0.15
Clean outpatient clinic and medical equipment	4.72 ± 0.52	4.69 ± 0.58	0.74
Privacy of the clinic and examination room	4.75 ± 0.47	4.80 ± 0.47	0.64
<b>Service quality</b>			
Waiting time for physician inspection	4.18 ± 0.75	3.60 ± 0.91	<0.01
Time of physician inspection	4.52 ± 0.56	4.17 ± 0.62	<0.01
Waiting time for registration, charging, and receiving medicine	3.92 ± 0.82	3.46 ± 0.85	0.01
Waiting time for examination	4.06 ± 0.81	3.60 ± 0.88	0.01
Waiting time for counseling	4.05 ± 0.76	3.66 ± 0.80	0.02
High-quality service of medical personnel	4.32 ± 0.75	4.09 ± 0.70	0.13
Detailed Health education	4.43 ± 0.59	4.43 ± 0.50	0.99
Suitable responses when service is needed	4.58 ± 0.53	4.34 ± 0.59	0.04
<b>Patient safety</b>			
Health education of medication and surgery by counselors	4.57 ± 0.53	4.63 ± 0.60	0.61
Privacy is highly respected by medical personnel	4.58 ± 0.58	4.66 ± 0.59	0.56
Patients' conditions are well-explained by the doctor	4.77 ± 0.42	4.69 ± 0.58	0.41
<b>Medical quality</b>			
Professional attainment of health personnel	4.60 ± 0.52	4.60 ± 0.50	1.00
Success rate of reproductive medicine center	4.58 ± 0.56	4.43 ± 0.65	0.21
Quality certification	4.37 ± 0.76	4.17 ± 0.92	0.25
Charging fee for ART treatment	4.38 ± 0.70	4.20 ± 0.83	0.24
<b>Information acquisition channel</b>			
Website search	4.05 ± 0.84	3.89 ± 0.63	0.32
Facebook page and website of our hospital	3.88 ± 0.84	3.74 ± 0.78	0.44
TV media	3.63 ± 0.91	3.40 ± 0.74	0.20
Newspapers and magazines	3.60 ± 0.92	3.43 ± 0.78	0.35
Telephone inquiry	3.74 ± 0.82	3.86 ± 0.81	0.49
Introduction from friends and relatives	3.82 ± 0.85	3.74 ± 0.82	0.68
Other (seminar, exhibition, dissertation, etc.)	3.48 ± 0.95	3.11 ± 0.90	0.07
<b>Other</b>			
Convenient transportation	3.92 ± 0.83	3.66 ± 0.87	0.14
Professional physicians	4.62 ± 0.65	4.46 ± 0.74	0.27
Academic degree of physicians (ex. PhD)	3.65 ± 0.89	3.20 ± 1.16	0.03
Reputation of physicians	3.80 ± 0.92	3.46 ± 0.85	0.07
Reputation of the hospital	4.18 ± 0.86	3.74 ± 0.89	0.02

Data were presented as mean ± standard deviation.

ART, assisted reproductive technology; TV, television; PhD, Doctor of Philosophy.

about “Clean outpatient clinic and medical equipment” (0.127), “Smooth traffic flow” (0.117), “Laboratory equipment and instruments” (0.116), and “Privacy of the clinic and examination room” (0.116) in the category of environment and equipment. The main factor influencing medical quality was the “Success rate of the reproductive medicine center” (0.263). “Newspapers and magazines” (0.161), “TV media” (0.156), and “Facebook page and website of our hospital” (0.147) had higher weights in the category of information acquisition channel. In terms of the patient safety, the factor with the highest weight was “Privacy is highly respected by medical personnel” (0.343).

## Discussion

This was a retrospective cross-sectional study conducted in the reproductive center of Kaohsiung Veterans General Hospital from January 2018 to June 2018. The analysis by questionnaire was performed to determine the key factors that play a role in infertile couples' choice of a reproductive medicine center. In the weight analysis (Table 5), infertile couples valued the item “Success rate of reproductive medicine center” highly. Therefore, we must do our best to advance our technique, knowledge and profession; introduce advanced equipment; and control laboratory quality to

improve our IVF outcomes. This was an imperative factor affecting infertile couples' choice of reproductive medicine center. Furthermore, the items of “Reputation of the hospital” and “Reputation of physicians” received high weight, suggesting that external marketing is also important, in addition to internal promotion. The three most common channels for infertile couples to obtain information about reproduction were “Newspapers and magazines”, “TV media”, and “Facebook page and website of our hospital”. Social media has had a strong influence on our daily life in recent years. Internet users spend increasing amounts of time daily on social networking worldwide. Social media are often used as a tool by healthcare organizations to communicate with the public online to enhance customer service, improve quality of care, and build loyalty [11–13]. Facebook was the most popular social media platform used among Taiwan's internet users [14]. Therefore, it is important to establish and continually update official Facebook fan pages of our reproductive medicine center to make our center better known and attract more people. Additionally, doctors are encouraged to participate in newspaper, magazine and television interviews to broaden the reputation and improve the image of the center. Infertile couples place a high value on “Waiting time for registration, charging, and receiving medicine”, “Waiting time for examination”, “Waiting time for counseling”, “Waiting time for physician

**Table 4**

Comparison of the factors affecting infertile couples' selection of reproductive medicine centers between lower income and higher income.

Aspects and items	Income <100,000 TWD (n = 64)	Income ≥ 100,000 TWD (n = 36)	P value
<b>Environment and equipment</b>			
Moderate air-conditioning	3.83 ± 0.11	3.89 ± 0.14	0.84
Sufficient lighting	3.94 ± 0.11	4.00 ± 0.13	0.84
Comfortable environment	4.14 ± 0.11	4.17 ± 0.14	0.46
Spacious area	3.88 ± 0.11	3.94 ± 0.14	0.41
Smooth traffic flow	3.97 ± 0.12	4.08 ± 0.14	0.14
Laboratory equipment and instruments	4.52 ± 0.09	4.75 ± 0.08	0.48
Clear indicators for direction	4.09 ± 0.10	4.08 ± 0.12	0.20
Clean outpatient clinic and medical equipment	4.67 ± 0.07	4.78 ± 0.08	0.39
Privacy of the clinic and examination room	4.73 ± 0.06	4.83 ± 0.06	0.50
<b>Service quality</b>			
Waiting time for physician inspection	3.92 ± 0.10	4.08 ± 0.15	0.80
Time of physician inspection	4.31 ± 0.08	4.56 ± 0.09	0.60
Waiting time for registration, charging, and receiving medicine	3.80 ± 0.10	3.69 ± 0.15	0.81
Waiting time for examination	3.91 ± 0.10	3.89 ± 0.15	0.89
Waiting time for counseling	3.91 ± 0.10	3.92 ± 0.14	0.97
High-quality service of medical personnel	4.23 ± 0.09	4.25 ± 0.13	0.29
Detailed Health education	4.44 ± 0.07	4.42 ± 0.09	0.13
Suitable responses when service is needed	4.45 ± 0.07	4.58 ± 0.08	0.48
<b>Patient safety</b>			
Health education of medication and surgery by counselors	4.55 ± 0.07	4.67 ± 0.08	0.30
Privacy is highly respected by medical personnel	4.58 ± 0.08	4.67 ± 0.09	0.51
Patients' conditions are well-explained by the doctor	4.70 ± 0.07	4.81 ± 0.07	0.10
<b>Medical quality</b>			
Professional attainment of health personnel	4.56 ± 0.07	4.67 ± 0.08	0.59
Success rate of reproductive medicine center	4.48 ± 0.07	4.61 ± 0.10	0.84
Quality certification	4.28 ± 0.10	4.33 ± 0.15	0.85
Charging fee for ART treatment	4.25 ± 0.09	4.44 ± 0.12	0.65
<b>Information acquisition channel</b>			
Website search	4.00 ± 0.10	3.97 ± 0.12	0.71
Facebook page and website of our hospital	3.86 ± 0.10	3.78 ± 0.14	0.35
TV media	3.53 ± 0.10	3.58 ± 0.15	0.69
Newspapers and magazines	3.55 ± 0.10	3.53 ± 0.16	0.97
Telephone inquiry	3.72 ± 0.10	3.89 ± 0.14	0.78
Introduction from friends and relatives	3.80 ± 0.10	3.78 ± 0.15	0.17
Other (seminar, exhibition, dissertation, etc.)	3.36 ± 0.11	3.33 ± 0.17	0.98
<b>Other</b>			
Convenient transportation	3.80 ± 0.10	3.89 ± 0.15	0.51
Professional physicians	4.59 ± 0.09	4.50 ± 0.12	0.13
Academic degree of physicians (ex. PhD)	3.47 ± 0.12	3.53 ± 0.18	0.77
Reputation of physicians	3.69 ± 0.10	3.67 ± 0.17	0.87
Reputation of the hospital	4.00 ± 0.11	4.08 ± 0.15	0.72

Data were presented as mean ± standard deviation.

TWD, Taiwan dollar; ART, assisted reproductive technology; TV, television; PhD, Doctor of Philosophy.

inspection" and "Smooth traffic flow". A long waiting time for public hospital care is a common problem. However, waiting time has been identified as a factor determining quality of care in family planning services [15–17]. Therefore, it is our goal to shorten the waiting time for each service. Increasing service staff and improving circulation are ways to reduce waiting time. However, the best method is to establish a reproductive medicine zone where all processes are integrated into the same region. Moreover, "Privacy of the clinic and examination room" and "Privacy is highly respected by medical personnel" received high scores in the weight analysis. In the department of Gynecology and Obstetrics, privacy and confidentiality have always been a central part of the physician-patient relationship. Ethical guidelines regarding privacy and confidentiality in reproductive medicine strongly endorse the obligation of the physician to respect and guard the individual patient's right to privacy and confidentiality in terms of their health information [18]. A systematic review showed that maintaining privacy and confidentiality is one of the critical factors determining quality of care in family planning services [16]. However, a cross-sectional survey conducted by Budimir and colleagues revealed that dentists display a lack of awareness and had a poor attitude toward respecting patients' rights to confidentiality and privacy [19]. Therefore, all medical personnel need to be well educated

about their responsibilities to respect the individual patient's right to privacy and confidentiality.

Because people are getting married and giving birth increasingly later in life, the mean age of infertile women seeking treatment at the reproductive outpatient clinic has increased annually. Older women have gradually become the main population at the reproductive outpatient clinic. Therefore, we compared the differences in factors affecting infertile couples' selection of reproductive medicine centers between older women (≥36 years) and younger women (<36 years) (Table 2). Compared to the younger women, the older women significantly valued "Waiting time for registration, charging, and receiving medicine". Older women may be less tolerant of lengthy waiting times because they may be responsible for more tasks in life than younger women and may thus have more time constraints than younger women. The older women cared more about "Convenient transportation" than the younger women. Older women probably choose a hospital close to home or to public transportation. That is, geographic accessibility may be a more important factor for older women in choosing a reproductive medicine center. As the study performed by Jia et al. indicates, optimal healthcare centers should be located in areas that have optimal spatial accessibility, enhanced service, and a reasonable spatial pattern [20]. In addition, older women pay more attention to



**Table 5**

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

Aspects and items	Weights for aspects	Weights for Items
<b>Environment and equipment</b>	<b>0.175</b>	
Moderate air-conditioning		0.100
Sufficient lighting		0.102
Comfortable environment		0.109
Spacious area		0.106
Smooth traffic flow		0.117
Laboratory equipment and instruments		0.116
Clear indicators for direction		0.107
Clean outpatient clinic and medical equipment		0.127
Privacy of the clinic and examination room		0.116
<b>Service quality</b>	<b>0.180</b>	
Waiting time for physician inspection		0.132
Time of physician inspection		0.112
Waiting time for registration, charging, and receiving medicine		0.135
Waiting time for examination		0.135
Waiting time for counseling		0.132
High-quality service of medical personnel		0.125
Detailed health education		0.109
Suitable responses when service is needed		0.120
<b>Patient safety</b>	<b>0.122</b>	
Health education of medication and surgery by counselors		0.331
Privacy is highly respected by medical personnel		0.343
Patients' conditions are well-explained by the doctor		0.326
<b>Medical quality</b>	<b>0.174</b>	
Professional attainment of health personnel		0.254
Success rate of reproductive medicine center		0.263
Quality certification		0.260
Charging fee for ART treatment		0.223
<b>Information acquisition channel</b>	<b>0.170</b>	
Website search		0.131
Facebook page and website of our hospital		0.147
TV media		0.156
Newspapers and magazines		0.161
Telephone inquiry		0.135
Introduction from friends and relatives		0.134
Other (seminar, exhibition, dissertation, etc.)		0.136
<b>Other</b>	<b>0.179</b>	
Convenient transportation		0.197
Professional physicians		0.171
Academic degree of physicians (ex. PhD)		0.195
Reputation of physicians		0.217
Reputation of the hospital		0.220

ART, assisted reproductive technology; TV, television; PhD, Doctor of Philosophy.

the educational background of physicians and hospital reputation than younger women.

We compared the service industry to the nonservice industry to determine differences in the factors that influence infertile couples' selection of a reproductive medicine center (Table 3). Compared to the women in the service industry, women in the nonservice industry placed a high value on service quality, especially on waiting time. The service providers may have had greater empathy for other hard-working people and a more tolerant attitude in terms of service quality. However, regardless of the characteristics of the infertile couple, we must continually have high standards for medical care. Studies have shown that service quality perceptions are positively associated with patient satisfaction with overall hospital care [21–23]. Therefore, maintaining high-quality service is always one of our chief goals. Additionally, women in the nonservice industry paid higher attention to the educational background of physicians and the hospital's reputation than those in the service industry.

There were several limitations in this study. First, this was a retrospective study with limited sample sizes. Second, this study only included one single institute. Multicenter, large-scale prospective studies are required to provide more clear data. However, the strengths of this study were as follows. The questionnaire was revised and confirmed by four experts. The trained reproductive consultants guided the participants to complete the questionnaire

to avoid misunderstandings. Additionally, to increase the reliability of this study, we chose only couples who had undergone IVF cycles.

In conclusion, this study identified several main factors that affect infertile couples' selection of a reproductive medicine center. According to the results, to attract infertile couples to our center, we must continuously advance our knowledge, technique and equipment to raise the live birth rate of IVF. We need to promote ourselves via the internet and mass media. Moreover, we should commit to shortening the waiting time and respecting patient privacy and confidentiality.

#### Conflicts of interest statement

All authors declare that they have no competing interests.

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#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.tjog.2019.07.009>.

## References

- [1] Datta J, Palmer MJ, Tanton C, Gibson LJ, Jones KG, Macdowall W, et al. Prevalence of infertility and help seeking among 15 000 women and men. *Hum Reprod* 2016;31:2108–18.
- [2] Parasuraman A, Zeithaml VA, Berry L. A conceptual model of service quality and its implications for future research. *J Mark* 1985;49:41–50.
- [3] Parasuraman A, Zeithaml VA, Berry L. SERVQUAL: a multiple-item scale for measuring consumer perceptions of service quality. *J Retail* 1988;64:12–40.
- [4] Babakus E, Mangold WG. Adapting the SERVQUAL scale to hospital services: an empirical investigation. *Health Serv Res* 1992;26:767–86.
- [5] Aghamolaei T, Eftekhaari TE, Rafati S, Kahnouji K, Ahangari S, Shahrzad ME, et al. Service quality assessment of a referral hospital in southern Iran with SERVQUAL technique: patients' perspective. *BMC Health Serv Res* 2014;14:322.
- [6] Teshnizi SH, Aghamolaei T, Kahnouji K, Teshnizi SMH, Ghani J. Assessing quality of health services with the SERVQUAL model in Iran. A systematic review and meta-analysis. *Int J Qual Health Care* 2018;30:82–9.
- [7] Kaplan RS, Norton DP. The balanced scorecard—measures that drive performance. *Harv Bus Rev* 1992;70:71–9.
- [8] Inamdar N, Kaplan RS, Bower M. Applying the balanced scorecard in health-care provider organizations. *J Healthc Manag* 2002;47:179–95.
- [9] Pink GH, McKillop I, Schraa EG, Preyra C, Montgomery C, Baker GR. Creating a balanced scorecard for a hospital system. *J Health Care Financ* 2001;27:1–20.
- [10] Curtright JW, Stolp-Smith SC, Edell ES. Strategic performance management: development of a performance measurement system at the Mayo Clinic. *J Healthc Manag* 2000;45:58–68.
- [11] Thielst CB. Using social media to engage patients: many tools exist to connect, communicate and build loyalty. *Healthc Exec* 2011;26:66–70.
- [12] Thaker SI, Nowacki AS, Mehta NB, Edwards AR. How U.S. hospitals use social media. *Ann Intern Med* 2011;154:707–8.
- [13] Richter JP, Muhlestein DB, Wilks CE. Social media: how hospitals use it, and opportunities for future use. *J Healthc Manag* 2014;59:447–60.
- [14] Yang PC, Lee WC, Liu HY, Shih MJ, Chen TJ, Chou LF. Use of Facebook by hospitals in Taiwan: a nationwide survey. *Int J Environ Res Public Health* 2018;15.
- [15] Hutchinson PL, Do M, Agha S. Measuring client satisfaction and the quality of family planning services: a comparative analysis of public and private health facilities in Tanzania, Kenya and Ghana. *BMC Health Serv Res* 2011;11:203.
- [16] Tessema GA, Streak Gomersall J, Mahmood MA, Laurence CO. Factors determining quality of care in family planning services in Africa: a systematic review of mixed evidence. *PLoS One* 2016;11:e0165627.
- [17] Tessema GA, Mahmood MA, Gomersall JS, Assefa Y, Zemedu TG, Kifle M, et al. Client and facility level determinants of quality of care in family planning services in Ethiopia: multilevel modelling. *PLoS One* 2017;12:e0179167.
- [18] Cain JM. Ethical guidelines regarding privacy and confidentiality in reproductive medicine. Testing for genetic predisposition to adult onset disease. Guidelines in emergency contraception. *Int J Gynaecol Obstet* 2002;77:171–5.
- [19] Budimir V, Cerjan-Letica G, Budimir J, Macan D. Knowledge, attitudes, and awareness of Croatian dentists concerning patients' confidentiality and privacy. *J Dent Educ* 2013;77:370–6.
- [20] Jia T, Tao H, Qin K, Wang Y, Liu C, Gao Q. Selecting the optimal healthcare centers with a modified P-median model: a visual analytic perspective. *Int J Health Geogr* 2014;13:13–42.
- [21] Bakan I, Buyukbese T, Ersahan B. The impact of total quality service (TQS) on healthcare and patient satisfaction: an empirical study of Turkish private and public hospitals. *Int J Health Plan Manag* 2014;29:292–315.
- [22] Andaleeb SS. Service quality perceptions and patient satisfaction: a study of hospitals in a developing country. *Soc Sci Med* 2001;52:1359–70.
- [23] Atinga RA, Abekah-Nkrumah G, Domfeh KA. Managing healthcare quality in Ghana: a necessity of patient satisfaction. *Int J Health Care Qual Assur* 2011;24:548–63.