

Limitations or Advantages? Gender Differences in Urologists, General Surgeons, and Gynecologists in Taiwan – A Nationwide, Population-based Study

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Abstract

We aimed to examine the differences between female and male surgeons in urology, general surgery, and gynecology by analyzing a nationwide, population-based database in Taiwan. We identified surgeons with a clinical experience of 6 – 13 years, between 1995 to 2013, from the National Health Insurance Research Database. We collected patient volume and revenue per month in outpatient and inpatient services, as well as surgical volumes per month of female and male surgeons for analysis. Student's t-test was used to compare the differences between female and male surgeons. Female urologists and general surgeons had a significantly higher ratio of female patients. Female urologists had comparable patient numbers, revenues, and surgical volumes as male urologists. In contrast, female general surgeons had significantly lesser involvement in outpatient and inpatient care and had lower monthly revenues than males; however, female general surgeons performed more oncological surgeries per month. Female gynecologists had similar outpatient services and outpatient revenue but significantly lesser inpatient services and surgical volume per month. A gender-based gap exists among surgeons in Taiwan; this gap is narrower in urology than in general surgery and gynecology. Gender stereotypes should be reduced to ensure that patients receive the best care regardless of surgeons' gender.

Introduction

A significantly large number of women have entered the field of medicine in the past few decades. In Taiwan, 36.6% of the total new medical graduates in 2018 were female. The Taiwan Medical Association estimates that female physicians compose nearly 20% of the total healthcare workforce. As a growing population in the field of medicine, female physicians have their advantages and limitations in clinical practices. For example, female physicians tend to have thorough and empathetic communication patterns that make patients feel understood and improve doctor-patient relationships^{1,2}. However, gender segregation still presents³ and influences the choice of medical specialties for female graduates. A previous study pointed out that female physicians were less likely to specialize in surgery than males⁴. Moreover, the gaps in practice patterns and salaries between male and female physicians have also been documented by other studies^{5–10}. Nevertheless, most studies evaluated surgeons in America and Europe, which are culturally different from Asian countries. There is a lack of studies concerning the gender gap in surgery practice in Asian societies, which are traditionally viewed as more conservative. We assessed the gender gap among surgeons by analyzing a nationwide, population-based database in Taiwan and focused on three sub-specialties that included the management of diseases of female sex organs: urology, general surgery, and gynecology.

Methods

Data source

We consulted the National Health Insurance Research Database (NHIRD), containing registration files and medical data of approximately 23 million Taiwanese residents (98% of the population). All data in the NHIRD are anonymous and scrambled for privacy protection. Researchers who request the use of NHIRD data must sign a written agreement to declare that they will comply with the privacy protection rules for patients and care providers. We also examined the Longitudinal Health Insurance Dataset 2000 (LHID 2000), a sub-dataset of the NHIRD, including all the medical insurance information from one million randomly selected residents in the year 2000. The usage of above database was permitted by Taiwan National Health Insurance (NHI) Bureau.

Study population

Certified urologists, gynecologists, and general surgeons who had practiced medicine for 6 to 13 years, between 1995 to 2013, were identified. Surgeons with clinical practice over 13 years were excluded from our research, since senior surgeons might reduce case complexity and develop specialized practices¹¹. Young surgeons whose clinical experience was less than 6 years were also excluded due to irregularities in establishing a patient base and reputation.

The monthly number of patients and their sex ratio, the total surgical volume, and the revenue from outpatient and inpatient services were obtained from the database. We did not include data on the gender distribution of patients in the gynecology practice since almost all of these patients were female.

The surgical volume of oncological surgeries, which require longer operation time and greater physical strength, was sub-analyzed. Oncological surgeries were defined as: 1) radical surgeries for prostate cancer, urothelial carcinoma of the urinary tract, kidney cancer, penile cancer, testicular cancer, and retroperitoneal tumor in urology; 2) radical surgeries for breast cancer, lung cancer, esophageal cancer, gastric cancer, colon cancer, liver cancer, and pancreatic cancer in general surgery; and 3) radical surgeries for vulvar cancer, vaginal cancer, uterus and cervical cancer, and ovarian cancer in gynecology.

For oncological surgeries in general surgery, we analyzed total surgical volumes as well as total surgical volumes excluding breast cancer because female patients may prefer female surgeons when it comes to sex organ-related diseases. Moreover, radical surgery for breast cancer is not as time-consuming as other oncological surgeries in general surgery, and breast cancer surgery is reportedly the most frequent primary procedure performed by female general surgeons.⁹

Since both urologists and gynecologists performed transvaginal surgeries, including surgeries for urinary incontinence, pelvic organ prolapse, and vaginal fistula, we also sub-grouped these surgeries for evaluation.

Statistical analysis

Student's t-test was used to test differences between the male and female urologists, general surgeons, and gynecologists as continuous variables. All statistical analyses were performed using IBM SPSS

Statistics for Windows, ver. 24 (IBM Corp., Armonk, NY, USA). A p-value of less than 0.05 was considered statistically significant.

Results

A total of 13, 87, and 191 female urologists, general surgeons, and gynecologists, respectively, were included in this study, accounting for 6.7%, 7.0%, and 51.3%, respectively, of surgeons in each specialty. The differences in patient services and revenue as well as surgical volumes between female and male surgeons in urology, general surgery, and gynecology are listed in Tables 1, 2, and 3.

Sex ratio of patients

The ratio of female patients treated by female urologists was significantly higher than that treated by male urologists in both outpatient and inpatient services (male-to-female patient ratio: 3.39 ± 3.07 versus 4.83 ± 3.92 , $p=0.004$; 0.58 ± 0.21 versus 0.73 ± 0.14 , $p=0.030$, respectively). Similar conditions were observed for female general surgeons (male-to-female patient ratio: 0.47 ± 0.19 versus 0.56 ± 0.13 , $p<0.001$ in outpatient service; 0.53 ± 0.25 versus 0.61 ± 0.18 , $p=0.010$ in inpatient service).

Patient service volume and revenue

The monthly patient numbers and revenue generation in outpatient and inpatient services by female urologists were not lower than those by male urologists (Table 1); however, female general surgeons had significantly fewer patient numbers per month in outpatient and inpatient services (66.02 ± 57.11 versus 94.77 ± 98.93 , $p<0.001$; 2.73 ± 2.71 versus 3.98 ± 3.86 , $p<0.001$, respectively). The total revenue per month for female general surgeons was significantly lesser than male surgeons (NTD $\$276,178.19 \pm 259,484.63$ versus NTD $\$425,444.54 \pm 369,009.56$, $p<0.001$; Table 2). The number of outpatients treated by female gynecologists was comparable to that by male gynecologists (174.94 ± 150.84 versus 173.94 ± 143.71 , $p=0.948$); however, the monthly inpatient numbers were less (1.94 ± 2.79 versus 4.72 ± 4.85 , $p<0.001$). Revenue contribution from outpatient services for female gynecologists was comparable to that of male gynecologists ($p=0.328$); however, the revenue from inpatient services for female gynecologists was significantly lesser (NTD $\$71,369.34 \pm 98,667.67$ versus NTD $\$167,483.31 \pm 173,151.48$, $p<0.001$). The total monthly revenue of female gynecologists was also significantly lesser than male gynecologists (NTD $\$171,195.02 \pm 137,490.23$ versus NTD $\$277,742.18 \pm 237,122.05$, $p<0.001$; **Table 3**).

Surgical volume

Regardless of their gender, urologists in Taiwan performed similar number of surgeries per month (3.01 ± 2.78 versus 4.17 ± 3.50 , $p=0.245$). No differences in the number of oncological surgeries and transvaginal surgeries were seen between female and male urologists (Table 1). Although female general surgeons performed fewer surgeries per month than male surgeons (2.30 ± 2.50 versus 3.28 ± 3.33 , $p=0.001$), they performed more oncological surgeries monthly (0.33 ± 0.64 versus 0.17 ± 0.41 , $p=0.030$). Excluding the radical operations of breast cancer, which were performed mostly by female general

surgeons, the number of oncological surgeries performed by male general surgeons was higher than that performed by female general surgeons; however, this was not statistically significant (0.07 ± 0.22 vs. 0.12 ± 0.32 , $p=0.057$) (Table 2). However, female gynecologists had significantly fewer surgeries per month (1.76 ± 2.62 versus 4.37 ± 4.60 , $p<0.001$), fewer oncological surgeries (0.04 ± 0.15 versus 0.12 ± 0.28 , $p=0.002$) and fewer transvaginal surgeries (0.03 ± 0.12 versus 0.08 ± 0.23 , $p=0.005$) than male gynecologists (Table 3).

Discussion

This study showed that female urologists and general surgeons treated significantly more female patients. Although female urologists had comparable patient numbers, revenues, and surgical volumes as their male counterparts, female general surgeons provided significantly lesser patient care in outpatient and inpatient settings and generated lesser monthly revenues. Although female general surgeons performed more oncological surgeries per month than their male colleagues, there was no significant difference in oncological surgical volume after exclusion of breast cancer surgeries. We also observed that female gynecologists had comparable outpatient services and outpatient revenue but significantly lesser monthly inpatient services and surgical volume. To the best of our knowledge, this is the first nationwide study in Taiwan to examine the gender gap in the field of surgery. Exceptionally, gender gaps in service volume, surgical volume, and revenue were not evident in urology. Additionally, female gynecologists did not have advantages over their male counterparts in inpatient service volume, surgical volume, and revenue. These trends vary from those prevalent in western countries¹². These gender gaps are likely multifactorial and warrant further exploration.

Despite the narrowing sex ratio of medical students in the past decades, gender disparity is still present in certain medical specialties. Female physicians, as a growing population in the physical workforce, have greater opportunity to devote themselves to the field of pediatrics, family medicine, internal medicine, and obstetrics-gynecology¹³⁻¹⁵. Surgery is pervasively perceived as a male-dominant field. In the present study, there were less than 10% female urologists and general surgeons. There are several obstacles, including gender discrimination, paucity of female role models, and work-life imbalance, that hinder female physicians from choosing surgery as a career option^{10,16-18}. Gender-based discrimination from patients, trainers, or colleagues is the most bothersome issue for female surgeons. For example, they are frequently labeled as nursing staff or refused by male patients owing to embarrassment^{18,19}. Barnes et al. also reported that female surgical trainees in male-dominant fields have more microaggression experiences than those in female-dominant fields¹⁰. Moreover, female trainees have been reported to be granted less autonomy by faculty than male trainees of the same level in the operation room⁷.

Gender disparity in wages in surgical subspecialties has been well described in several studies, and can be considered as an obstacle for female surgeons to develop their career^{5,6,8,20,21}. We found that female general surgeons and gynecologists generated significantly lesser revenue than male general surgeons. Although we were unable to obtain exact salaries of female and male surgeons directly from the LHID

2000, the revenue from diagnosing and treating patients could reflect the differences in the incomes between female and male surgeons. The cause of gender-based wage gap is multifactorial. For example, the marital status and practice patterns of female and male physicians contribute to the wage gap. Okoshi et al. reported that the annual income of male physicians increased with an increase in the number of siblings, while that of female physicians decreased⁸. In the present study, female gynecologists tended to provide outpatient services more frequently, while male gynecologists offered inpatient services more frequently, which might result in disparities in their wages.

Both female general surgeons and gynecologists performed fewer surgeries than male general surgeons and gynecologists. This indicates that gender stereotypes may have been a negative influence for female surgeons in certain aspects. Sharoky et al. proved that female and male surgeons with similar backgrounds could achieve equivalent postoperative outcomes when treating similar patients²². An online survey by Ashton-James et al. showed that male surgeons received higher ratings for their knowledge, skill, and capability from patients, while female surgeons scored higher in goodwill, empathy, and beneficence²³. Patients chose male rather than female surgeons when they needed surgeries, especially major oncological surgeries. Furthermore, female surgeons voluntarily changed their practice patterns, which affected their patient numbers and surgical volume directly. In the present study, we found that despite a comparable amount of outpatient services, female gynecologists had significantly lesser inpatient services and surgery volume compared to male gynecologists. As observed by Antonoff and Brown, to be a wife and a mother, or even a single woman, female surgeons must modify their practice patterns to achieve work-life balance²⁴.

However, gender stereotypes may contradictorily exert a positive impact on female surgeons to some extent, especially when history-taking, physical examinations, and surgical procedures involve the female sex organs²⁵. No gender preference was observed in other surgical subspecialties not involving sex organs, such as orthopedics or plastic surgery^{26,27}. In the present study, female and male urologists had comparable performances regarding patient service volume, surgical volume, and revenue. This finding is compatible with those of other studies concerning urological patients^{28,29}. Similarly, we found that female general surgeons performed more radical breast cancer surgeries in Taiwan. A Greek study showed that about half of the women who had been previously treated by female surgeons preferred female breast surgeons¹². Patients' feelings of being understood, less embarrassed, and less anxious, as well as previous positive experiences with same-sex surgeons are major advantages for female urologists and breast cancer surgeons in clinical practice.

Interestingly, Nam et al. reported that female urologists in the United States were favored to deliver female-specific care. However, the compensation derived from the care of oncological patients was significantly lower for female urologists compared to male urologists⁶. Female urologists in Taiwan performed a similar volume of transvaginal and oncological surgeries compared to their male counterparts. Oberlin et al. reported that among every subspecialty, female urologists operated on a greater proportion of female patients than their male colleagues³⁰. This might account for the

comparable performance between male and female urologists in Taiwan. Despite the challenges for females to become surgeons, becoming a urologist may be a good choice for women in the Asian culture. The lifestyle, diversity of procedures, and combination of the practice of medicine and surgery might be the most positive influential factors for female physicians to pursue urology^{31–33}.

There are several limitations to the present study. First, the LHID 2000 did not include information on the subspecialties of individual surgeons. Therefore, we included surgeons with 6 to 13 years of experience; this range ensured that the surgeons were well-trained and not subspecialty-focused. Second, data from surgeons who did not join the National Health Insurance despite being few in number was missed in the LHID 2000. Third, the revenue contribution from diagnosing and treating patients may have been underestimated because data regarding self-pay services could not be obtained from the LHID 2000. Fourth, we did not use questionnaires to gather information on the marital status of surgeons, as well as their subjective perceptions, motivation factors, and struggles. These may have influenced their practice.

Conclusion

Female and male urologists showed comparable performances in terms of patient numbers, revenue, and surgical volumes in Taiwan. Except for oncological breast surgery, female general surgeons performed less surgeries than their male counterparts. Female gynecologists did not have any advantages over male gynecologists. Management of diseases concerning female sex organs, including the breasts, showed a preferred choice for female urologists and general surgeons. However, efforts should be made to reduce gender stereotypes in medicine, to ensure that patients receive the best care regardless of the gender of the surgeons.

Declarations

Acknowledgements

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Author Contributions

WMC and YHF conceived and designed the study; WMC and SWC directed the study including data analysis and interpretation; SYL performed statistical analysis; SWC wrote the manuscript; WMC revised it critically for important intellectual content. All authors reviewed the results and approved the final version of the manuscript.

Data availability

Data utilized in our study are available and permitted from the National Health Insurance Research Database (NHIRD) published by Taiwan National Health Insurance (NHI) Bureau. Based on the “Personal Information Protection Act” in Taiwan, data cannot be made publicly available due to legal restrictions imposed by the government of Taiwan. Requests for data can be sent as a formal proposal to the NHIRD (<http://nhird.nhri.org.tw>).

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Tables

Note: NTD: New Taiwan Dollar

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Table 1. Comparison of patient service volumes, surgical volumes, revenue, and sex ratio of patients treated by female and male urologists

	Female urologists		Male urologists		p value
	N=13		N=180		
	Mean	SD	Mean	SD	
Patient number per month					
Outpatient	122.40	64.28	147.25	77.88	0.263
Male to female sex ratio	3.39	3.07	4.83	3.92	0.004
Inpatient service	0.60	0.14	0.74	0.07	0.200
Male to female sex ratio	0.58	0.21	0.73	0.14	0.030
Total revenue per month, NTD	307,062.34	226,963.06	436,644.30	286,157.38	0.112
Outpatient, NTD	193,886.78	116,156.69	266,013.42	161,651.57	0.116
Inpatient, NTD	113,175.56	119,923.88	170,630.89	156,907.16	0.198
Total surgical volume per month	3.01	2.78	4.17	3.50	0.245
Oncological surgery	0.06	0.11	0.09	0.17	0.585
Transvaginal surgery	0.01	0.03	0.01	0.03	0.265

Table 2. Comparison of patient service volumes, surgical volumes, revenue, and sex ratio of patients treated by female and male general surgeons

	Female surgeons		Male surgeons		p value
	N=87		N=1157		
	Mean	SD	Mean	SD	
Patient number per month					
Outpatient	66.02	57.11	94.77	98.93	<0.001
Male to female sex ratio	0.47	0.19	0.56	0.13	<0.001
Inpatient	2.73	2.71	3.98	3.86	<0.001
Male to female sex ratio	0.53	0.25	0.61	0.18	0.010
Total revenue per month, NTD	276,178.19	259,484.63	425,444.54	369,009.56	<0.001
Outpatient, NTD	110,827.09	109,540.88	139,242.61	128,728.28	0.045
Inpatient, NTD	165,351.10	196,125.27	286,201.93	312,943.54	<0.001
Total surgical volume per month	2.30	2.50	3.28	3.33	0.001
Oncological surgery	0.33	0.64	0.17	0.41	0.030
Oncological surgery excluding breast	0.07	0.22	0.12	0.32	0.057

Table 3. Comparison of patient service volumes, surgical volumes, revenue, and sex ratio of patients treated by female and male gynecologists

	Female gynecologist		Male gynecologist		p value
	N=191		N=181		
	Mean	SD	Mean	SD	
Patient number per month					
Outpatient	174.94	150.84	173.94	143.71	0.948
Inpatient	1.94	2.79	4.72	4.85	<0.001
Total revenue per month, NTD	171,195.02	137,490.23	277,742.18	237,122.05	<0.001
Outpatient, NTD	99,825.67	74,559.70	110,258.87	123,435.43	0.328
Inpatient, NTD	71,369.34	98,667.67	167,483.31	173,151.48	<0.001
Total surgical volume per month	1.76	2.62	4.37	4.60	<0.001
Oncological surgery	0.04	0.15	0.12	0.28	0.002
Transvaginal surgery	0.03	0.12	0.08	0.23	0.005

Note: NTD: New Taiwan Dollar