

The Provision of Health Care by Family Physicians in Taiwan as Illustrated With Population Pyramids

INQUIRY: The Journal of Health Care Organization, Provision, and Financing
Volume 56: 1–10
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DOI: 10.1177/0046958019834830
journals.sagepub.com/home/inq



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Abstract

Family physicians serve as personal doctors for individuals and their families and also act as gatekeepers of the health care system. If no special status is accorded to family physicians, however, then the rates at which health care recipients utilize their service might be affected. In the present cross-sectional study, representative claims data sets for 2010 from Taiwan's National Health Insurance program, a health care system in which beneficiaries are not required to register with a family physician, were used to investigate the provision of health care to the population by family physicians. Among 919 206 beneficiaries with a total of 13713 199 ambulatory visits, 49.1% had visited family physicians, 34.1% had visited internists, 24.3% had visited pediatricians, and 38.9% had visited otolaryngologists. Women ($\chi^2(1) = 538, P < .001$) and patients aged 65 and above ($\chi^2(1) = 16000, P < .001$) had a higher proportion of visiting family physicians rather than visiting other specialties. The onion-shaped population pyramid with family medicine visits was compatible with the general population, and the proportion of visiting family physicians increased with increasing age. Among 112 289 patients with essential hypertension, 63 379 patients with diabetes mellitus, and 80 090 patients with hyperlipidemia, only 35.3%, 32.0%, and 31.1%, respectively, had visited family physicians. The age and sex distributions of these patients were illustrated with population pyramids for data visualization and direct comparisons. Taken together, the results of this study indicate that the utilization of family physicians in Taiwan and the effectiveness of their associated role in chronic disease management still have room for improvement.

Keywords

ambulatory care, chronic disease, family physicians, national health programs, population pyramid

Introduction

Health care in technologically advanced nations is now so highly specialized that patients often face difficulty in finding suitable treatment modalities. Ideally, everyone would have a family physician who could serve as their personal doctor, while every health care system would place family physicians in the role of gatekeepers for the system.^{1,2} In reality, however, the roles of family physicians within the health care systems of different countries vary substantially. In some countries, for example, the United Kingdom, the Netherlands, and Canada, every citizen is required to register with a family physician and is not allowed to visit specialists without a referral from said physician.^{3–5} In most countries, however, for example, Germany, Japan, and Taiwan, family medicine is itself only regarded as one of the various specialties, and patients can visit specialists of any type directly (ie, without a referral).^{6–8} In such systems in which family physicians are not tasked with the special role of acting as gatekeepers to specialists, that is when they are effectively treated as no different from those specialists, the degree to which

they are accepted and used by the population in question will determine the long-term development of family medicine.

In the 1970s, Taiwan faced maldistribution of health care resources and shortage of primary care providers. Family medicine, also known as general practice, was then introduced to provide qualified holistic care instead of fragmented care by multiple specialties. The board of family medicine in Taiwan was established in 1988 and was officially recognized as one of the 18 medical specialties next year.⁹ In 2015, 7.8% ($n = 3447$) of the Taiwan's physicians were practicing as family physicians.¹⁰ Being trained as the mainstay of

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Received 7 December 2016; revised 28 October 2018; revised manuscript accepted 26 January 2019

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primary care, family physicians are capable of managing most common diseases for people of all ages,¹¹ including acute upper respiratory infections, essential hypertension, diabetes mellitus, and hyperlipidemia.¹² However, without a mandated referral system or referral-related remuneration within the National Health Insurance (NHI) program which covers 99.9% of the population of approximately 23 million, fierce competition occurs between family physicians and specialists in expanding the volume of services to maximize the share of the budget. Taiwan's NHI program, as a single-payer system which imposes global budget with fixed annual expenditure cap on each sector of medical service (eg, hospital care, primary ambulatory care at independent physician offices), currently employed fee-for-service (FFS) reimbursement scheme for most medical services.¹³ Previous studies had found that acute upper respiratory infections, a minor ailment and the most common disease of ambulatory care, were treated largely by specialists including internists (22.6%), pediatricians (26.4%), and otolaryngologists (45.2%); meanwhile, family physicians only accounted for 36.5% of all the 13 616 354 outpatients during ambulatory visits in a year.¹⁴ Moreover, pediatricians were reported to treat not only children but also adults; otolaryngologists were incentivized to increase the rates of medical services for receiving extra reimbursement fees by providing local treatment privileged under the current NHI system.^{15,16} Specialists specialize in providing care for complicated cases and/or hospitalized patients, but the cost-effectiveness and quality of outpatient visits may have been affected for dealing with such high rates of primary care service consumption on the part of the population, most of whose problems could be effectively managed by family physicians.¹⁷ Hence, Taiwan's government took initiatives by promoting pilot programs based on other reimbursement schemes: pay-for-performance (P4P) for certain chronic disease management on registration such as diabetes mellitus and hypertension since 2001 and 2006 and a mixture of case payment and quality improvement bonuses for patients registered under certain community medical group within "Family Physician Integrated Care Project" since 2010. Patients enrolled in these pilot programs, however, could still visit any physician of varied specialties at various medical facilities without a formal referral or extra surcharges and FFS remains the reimbursement mechanism for their rest medical services out of set conditions.¹⁸

Although considerable measures have been devoted to improve the role family physicians play in Taiwan's primary care, rather less attention has been paid to the provision of primary care with a focus on noncommunicable diseases provided by family physicians. As Taiwan faces a rapid demographic transition—population aging and low birth rate—with an increasing prevalence and burdens of noncommunicable diseases,¹⁹ the provision of such primary care provided by family physicians and the characteristics of their patients deserve detailed exploration. This study aimed to investigate

the difference of age-sex distribution, if any, of the population in Taiwan using ambulatory care with a focus on chronic disease management of essential hypertension, diabetes mellitus, and hyperlipidemia by family physicians as compared with those for internists, pediatricians, and otolaryngologists using population pyramids as data visualization.

Materials and Methods

Data Sources

Our data came from Taiwan's National Health Insurance Research Database (NHIRD), which collected complete claims from the NHI program and provided data sets to academic researchers on request.²⁰ We used data sets from the Longitudinal Health Insurance Database 2010 (LHID 2010), which consisted of claims of 1 million beneficiaries selected from all people registered within the NHI in 2010. The data sets from LHID 2010 were longitudinal in nature which ranged from 1996 to 2013, but we used only the subset in 2010 as a cross-sectional design in our study. The number of ambulatory visits made by these patients in 2010 amounted to 13 713 199 in total.

This study and its procedures were approved by the institutional review board (2013-04-005E) of Taipei Veterans General Hospital, Taipei, Taiwan.

Study Design

First, we computed the age and sex distribution of the 1 million patients' LHID 2010 according to the registry data sets. Cross-sectional study was done using the subset in 2010. The patients were categorized by age using 5-year spans ranging from 0 to 4 years up to 85 years and older. From the ambulatory data sets for 2010, we further identified all the patients who had made any ambulatory visit to a health care provider, with the total number of such visits subsequently serving as the denominator in calculating the percentages of visits handled by family physicians and the investigated specialist physicians, namely, internists, pediatricians, and otolaryngologists. These 3 specialties were chosen for comparison because they are the specialties who handle the largest service volumes in the ambulatory sector in Taiwan.⁸

Furthermore, we chose essential hypertension, diabetes mellitus, and hyperlipidemia as the diseases to investigate in determining the level of family physicians' involvement in chronic disease management. These 3 diseases were chosen because they are highly prevalent in Taiwan and because they require long-term primary care, which is a feature of family medicine.^{18,21} Specifically, we identified any health care visits made, respectively, by people with a diagnosis of hypertension, diabetes mellitus, or hyperlipidemia among the 3 diagnosis codes provided by NHIRD. Among these patients, we further identified those with each disease who made visits patients to family physicians for treatment of the

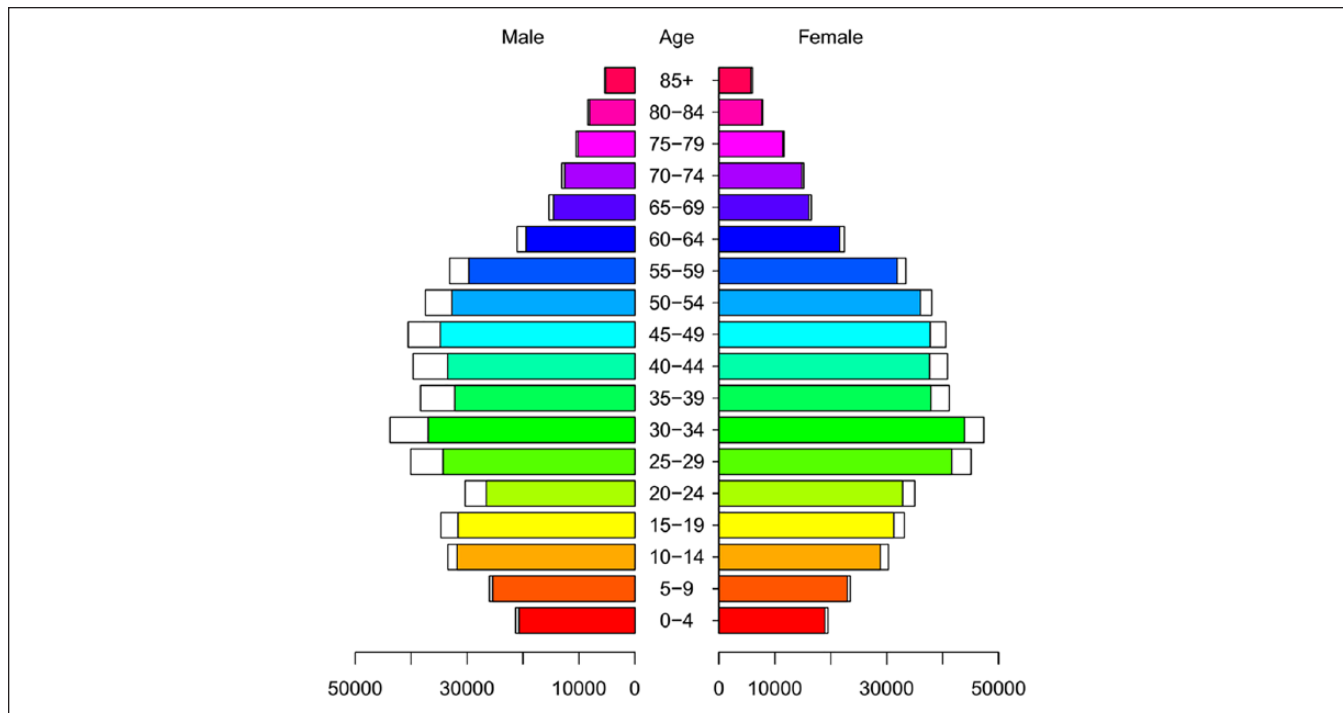


Figure 1. Age and sex structure of the 1 million LHID 2010 (Longitudinal Health Insurance Database 2010) beneficiaries in 2010. Note. Colored areas denote beneficiaries who made ambulatory visits in 2010.

disease in question. The diagnoses of these patients were all based on the coding in the *International Classification of Diseases, Ninth Revision, Clinical Modification*: essential hypertension (401.XX), diabetes mellitus (250.XX), and hyperlipidemia (272.XX).

Statistical Analysis

The data extraction and computations were performed with the programming software Perl (version 5.20.1). Descriptive statistics were calculated using Excel 2010. For better data visualization, we plotted population pyramids using the statistical programming software R (version 3.2.4). Inferential statistical analysis was conducted using STATA 12.0 to compare patients visiting family physicians and those visiting other specialties in age and sex groups. Age group was divided into 2 groups (0-64 years and 65 years and above) to explore further the preference of ambulatory care visits by the patients. The Pearson χ^2 test was conducted. A *P* value of $<.05$ was regarded as being significant.

Population Pyramid

Population pyramids are graphical images that are frequently used in the field of demography to illustrate age and sex distributions and to forecast the future development of a specific population. For a given pyramid, the x-axis indicates the population number for each sex with back-to-back histograms,

and the y-axis indicates the age group in question, with the youngest at the bottom and the oldest age group at the top.²² Our study used this graphic tool to display the health care utilization numbers or proportions of the study population, with a particular focus on the provisions of health care visits for overall and major chronic diseases handled by family physicians. The plotted pyramids allow easy comparison of the proportions and sizes in ambulatory care visits at different age and sex groups. The shape of a pyramid implies the burden and associated demographic factors including age and sex of a given disease of the population.

Results

Within the 1 million patient cohort, a total of 80 794 (8.1%) people made no ambulatory visits in 2010. Percentage of children aged less than 20 years who had contact with a health care professional in the year was 95.4%, and those of adults aged more than 20 years was 90.9%. Among the 919 206 (91.9%) people who did make at least one ambulatory visit, 440 266 (47.9%) were men and 478 940 (52.1%) were women. The population pyramid of the overall cohort was onion shaped (Figure 1). The percentages of men in each age group from 10 to 84 years who made no visits in 2010 were higher than those for the corresponding women in each age group (Supplementary Material 1).

Among the people who made at least one visit, 451 687 (49.1%) of the patients had visited a family physician during

Table 1. Age and Sex Structure of Patients Visiting Family Physicians.

Age, y	Patients with FM visits		P value	χ^2
	Male No. (%)	Female No. (%)		
≥85	3269 (62.9)	3434 (60.1)	.003	9
80-84	5489 (67.8)	5078 (66.5)	.087	3
75-79	7004 (68.9)	8002 (70.1)	.67	3
70-74	8500 (67.6)	10280 (69.2)	.004	8
65-69	9498 (65.3)	11093 (69.0)	<.001	47
60-64	10977 (56.4)	13385 (61.9)	<.001	129
55-59	15847 (53.4)	19076 (59.8)	<.001	260
50-54	16528 (50.5)	20414 (56.7)	<.001	257
45-49	16117 (46.3)	18951 (50.2)	<.001	108
40-44	14606 (43.6)	17327 (46.0)	<.001	40
35-39	13440 (41.7)	16325 (43.1)	<.001	13
30-34	15396 (41.7)	19024 (43.4)	<.001	23
25-29	14229 (41.5)	18172 (43.6)	<.001	35
20-24	11145 (41.9)	14866 (45.3)	<.001	67
15-19	13671 (43.3)	13953 (44.6)	<.001	12
10-14	12984 (40.9)	11657 (40.4)	.249	1
05-09	11905 (46.8)	10597 (46.2)	.153	2
00-04	10183 (49.1)	9265 (48.9)	.654	0
Total	210788 (47.9)	240899 (50.3)	<.001	538

Note. P value of <.05 was considered significant. The Pearson χ^2 test was used. All degrees of freedom = 1. FM = family medicine (family physician).

the year. Significant differences in age and sex were found between the patients visiting family physicians and those visiting other specialties. Among patients who had any ambulatory visit, the proportion of visiting family physicians among women (240 899/478 940 or 50.3%) was significantly higher than those among men (210 788/440 266 or 47.9%) ($\chi^2(1) = 538, P < .001$). More specifically, women had statistically significant higher proportions of visiting family physicians at the age groups from 15-19 to 70-74 compared with those of men (Table 1). Moreover, the proportions of visiting family physicians among all age groups who had ambulatory visits were significantly different from those having other specialties visits ($\chi^2(17) = 11 000, P < .001$). In particular, patients aged 65 and above had a higher proportion (71 647/106 269 or 67.4%) of visiting family physicians compared with those aged less than 65 (380 040/812 937 or 46.8%) ($\chi^2(1) = 16 000, P < .001$). The shape of the pyramid illustrating family physician ambulatory care visits was also onion shaped (Figure 2).

In contrast, 313 478 (34.1%) patients had visited an internist, 223 344 (24.3%) patients had visited a pediatrician, and 357 503 (38.9%) patients had visited an otolaryngologist (Figure 2). The percentages of people who made visits to family physicians were higher than those who made visit to internists in all the sex and age groups. Although the utilization rates of family physician for children aged less than 14 years were lower than those of pediatricians, the utilization

rates of family physicians among middle-aged and elderly people were higher than those of otolaryngologists. Pediatricians accounted for 15.5% of the ambulatory care visits among population more than 20 years. The population pyramids for the patients who made ambulatory visits to family physicians, internists, and otolaryngologists were onion shaped, whereas the pyramid for the patients who made visits to pediatricians had a classic pyramid shape with a wide base. Among the 3 onion-shaped population pyramids, otolaryngologists had younger patient composition with the largest patient group at age 30 to 34 years (Figure 2 and Supplementary Material 1).

Among the people who made at least one visit, 112 289 (12.2%) patients had essential hypertension, 63 379 (6.9%) patients had diabetes mellitus, and 80 090 (8.7%) patients had hyperlipidemia. Of these patient groups, 39 585 (35.3%), 20 306 (32.0%), and 24 918 (31.1%) patients, respectively, had visited a family physician for treatment of the given diseases (Supplementary Material 2; Figure 3). The age-sex structures of patients with essential hypertension, diabetes mellitus, or hyperlipidemia that had ever visited family physicians were mainly composed of the middle-aged group (age 55-59 years). Generally, women had a higher proportion of visiting family physicians than men for these 3 chronic diseases, with the exceptions in 15 to 19 and 30 to 39 age groups of the hypertensive patients, 15 to 29 age groups of the diabetic patients, and 5 to 9 age groups of the patients with hyperlipidemia.

Discussion

The results of this study showed that the overall utilization of primary health care among the general population was high, and the age-sex distribution of such utilization was coupled with the onion-shaped demographic profile. Nearly half of the studied population had visited a family physician during the year, whereas more than one-third of the patients had visited an internist or an otolaryngologist, and nearly one-fourth had visited a pediatrician. As to chronic disease management of essential hypertension, diabetes mellitus, and hyperlipidemia, only one-third of the adult patients with each disease had visited a family physician.

In our study, the onion-shaped population pyramid plotted for the 1 million beneficiaries who had made any ambulatory care visit in 2010 was compatible with the age-sex distribution of the general population. In comparison with the United States with 93.0% of children and 83.6% of adults making contact with a health care professional in the year 2015,²³ the percentages of people who made ambulatory visits were high among all age-sex groups especially for women, children, and older people in Taiwan. Women in Taiwan were more likely in general to have made such visits, a phenomenon that has also been observed in other countries. Possible causes for these higher rates of health care utilization include lower rates of employment, more help-seeking behavior, and

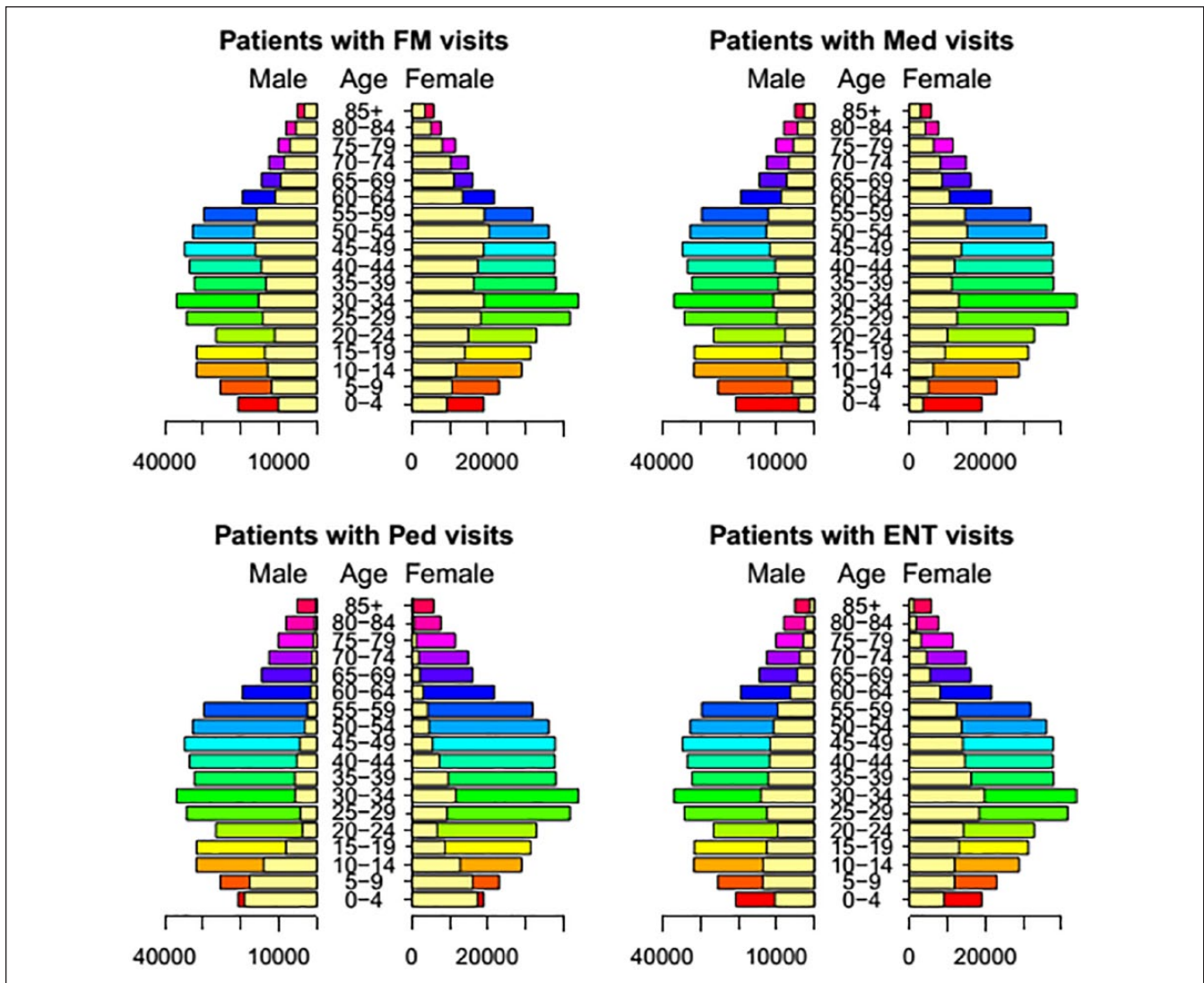


Figure 2. Age and sex structures of patients who made visits to family physicians, internists, pediatricians, or otolaryngologists among beneficiaries making at least one ambulatory visit in 2010.

Note. Yellow areas denote patients who made visits to family physicians, internists, pediatricians, or otolaryngologists, respectively. Full bars denote all beneficiaries who made ambulatory visits in 2010. FM = family medicine (family physician); Med = medicine (internist); Ped = pediatrician; ENT = ear, nose, throat (otolaryngologist).

greater illness awareness among women.^{24,25} On the contrary, men aged 20 to 24 composed the group most likely to have made no ambulatory visits in 2010 within the NHI system; a possible explanation for this is the obligatory military service for men in Taiwan, with health coverage for those engaged in such service being provided by the military. That said, young men in general had less ambulatory care utilization, a finding which may be related to certain masculine beliefs regarding the need for such care.²⁴ The high utilization rate of ambulatory care among the elderly suggested the increasing need for medical services coupled with aging, and such need would even accelerate for this shrinking and aging demographic structure as a consequence of low birth rates and long life expectancy in Taiwan. The magnitude of the

prospective expenditure for health care increases associated with aging of the nation's population; further study should be conducted for detailed exploration of the characteristics in using medical services among older people. By contrast, rather than relying on the medical system for chronic or acute disease management, young people might be relatively robust or lack time for physician visits.

In addition, our study showed that the use of ambulatory care at family physicians also varied by age and sex. Despite women, the elderly people had a higher proportion to visit family physicians. Possible explanations included that geriatric patients are the vulnerable subset of the population to have multiple comorbidities and frailty, so family physicians characterized as easy accessibility in the community,

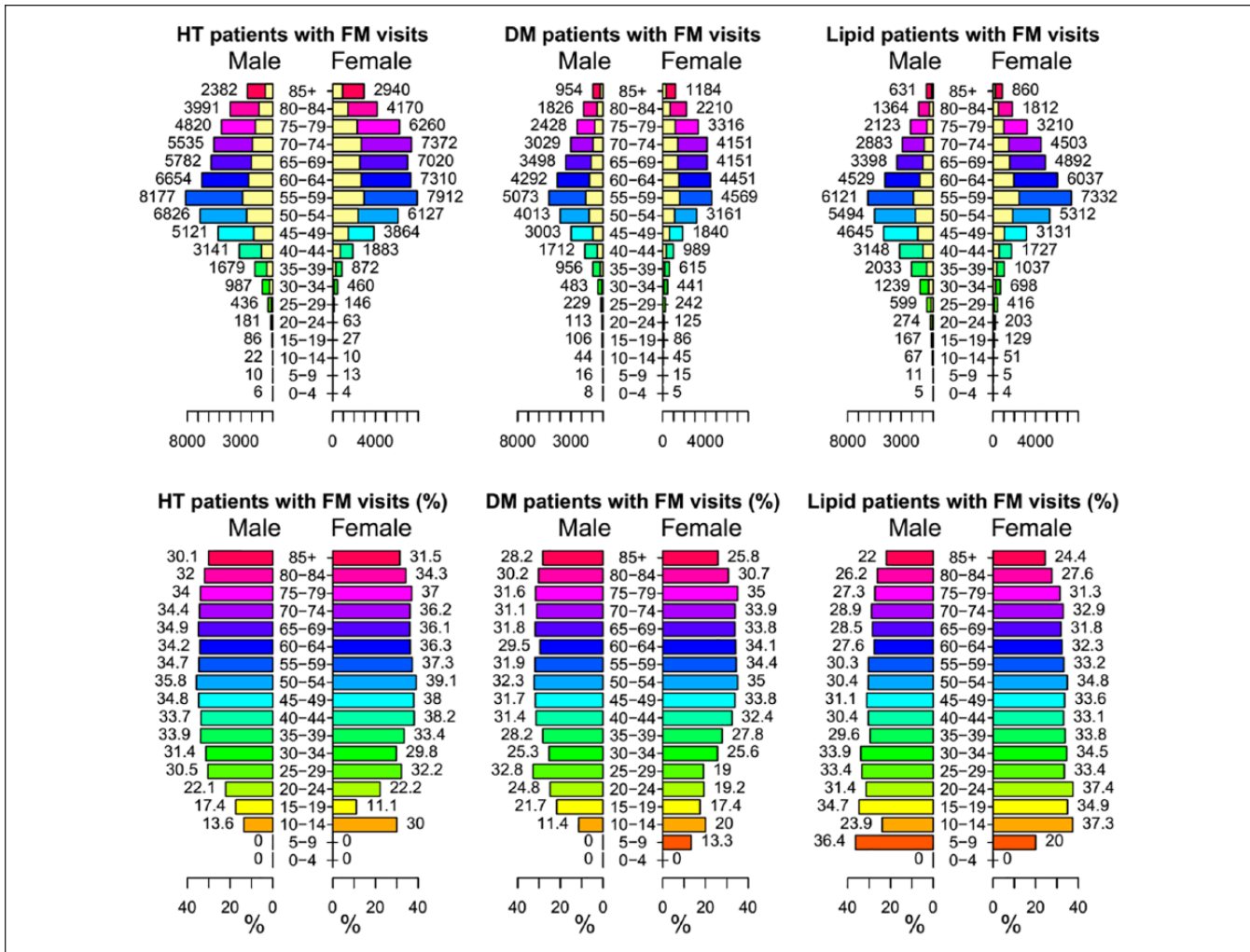


Figure 3. Age and sex structures of patients with essential hypertension, diabetes mellitus or hyperlipidemia in 2010 (upper graphs) and the proportions of these patients managed by family physicians (lower graphs).
 Note. In upper graphs denote patients who made visits to family physicians, and full bars denote patients diagnosed with essential hypertension, diabetic mellitus, or hyperlipidemia, respectively. HT = (essential) hypertension; FM = family medicine (family physician); DM = diabetes mellitus; lipid = hyperlipidemia.

comprehensive bio-psycho-social evaluation, coordinative and continuous treatment, and holistic care may be suitable for managing substantial diseases and the related complications. Other possible reasons might be it is more time-saving and cost-saving to visit a family physician for managing most common diseases at one time with single outpatient copayment, in contrast to visiting several specialties with a series of waiting lines and multiple charges under the current NHI system. Moreover, a higher prevalence of polypharmacy for the disabled Taiwanese elderly who tend to visit multiple health care providers found by previous study²⁶ may also add to the explanation that the older people tend to visit family physicians as mainstream of medical consultation in terms of patient safety. However, detailed motivations of such ambulatory visits and the quality of care should be determined further.

We found that more than half of the study population visited specialists other than family physicians in 2010. Despite large proportions of ambulatory care at specialists for treating upper respiratory infections,¹⁴⁻¹⁶ the results of this study further showed that specialties accounted for around two-thirds of the patient ambulatory visits for treating essential hypertension, diabetes mellitus, and hyperlipidemia. Children with essential hypertension or diabetes mellitus were more likely to make visits to specialties which indicated their need for specialties care. A surge in visits to pediatricians by women aged 25 to 39 years was also found in this study, a phenomenon which may be due to mothers making one-stop visits together with their children. The health care of adulthood by pediatricians should explore further in terms of quality and patient safety. Such high utilization rate of specialists as primary care providers was not surprising in

comparison with countries requiring mandated referrals that the average referral rate from general practitioners to specialists was 4% to 13.9%,^{4,27} which might reflect the genuine need for specialized or secondary care. Those proportions of managing common chronic diseases at family physicians were also lower than the 35.5% of hypertension-related visits made to general practitioners/family physicians,²⁸ the 48.4% of diabetes-related visits made to primary care physicians,²⁹ and the 38.3% of hyperlipidemia-related visits made to family physicians in comparison with the United States,³⁰ which places primary care physicians as gatekeepers to advanced care. On the contrary, the lower numbers of ambulatory care visits to family physicians can also be taken as evidence of patients' preferences. In Taiwan, the national health care system allows people open, convenient, and affordable access to specialist physicians without even requiring an extra consulting fee. However, the low public utilization of family physicians in Taiwan requires further exploration.

Nevertheless, the underutilization of primary care coupled with the overutilization of specialized care found in this study raises various concerns. First, the efficiency and the appropriateness of specialty care may be problematic.¹⁸ "Doctor shopping" help-seeking behaviors, including frequent visits to and quick switching among different physicians and facilities, has been confirmed by one nationwide study, which showed that the average person had 13.4 consultations per year, including visits to 3.4 specialties, 5.2 physicians, and 3.9 health care facilities.⁸ As compared with the United Kingdom and Germany, with 5 and 9.2 outpatient contacts per person per year in 2009,³¹ the Taiwanese people had more frequent outpatient visits. Overcrowding in outpatient clinics is thus a common scenario in Taiwan, especially in medical centers, and each practicing physician ($n = 44\,192$) handled an average of 8160.9 ambulatory care visits ($n = 360\,647\,907$) within the NHI in 2015, and this included disproportionate shares of visits handled by various specialists.^{8,10,14} While patients of minor ailments occupy the outpatient care, the patients who truly need specialized consultations are more likely to be affected. Second, the referral system loosens resulting from nonintegrated care under the current FFS reimbursement system employed by the NHI program for the most medical services. Each physician of various specialties work hard to maintain and enlarge the volumes of patients that they treat rather than making referrals to other physicians to reduce the enormous financial pressure.¹⁷ Relatedly, studies from the United States, Canada, and Norway have indicated that fewer referrals occur in FFS systems than in salary and capitation-based payment systems.³²⁻³⁴ Third, the expenditure on primary care might potentially increase for the specialists would have higher average cost claimed per ambulatory visit as compared with family physicians.¹² One study in the United States found that family physicians ordered laboratory tests, chest x-ray studies, and electrocardiograms 2 to 4 times less; performed Papanicolaou tests 2 times more; and charged lower fees on

average per visit for diagnostic tests for hypertensive patients (\$5.67 versus \$11.97) than did internists.³⁵ Comparisons of different health care systems regarding cost-effectiveness deserve to explore further.

Our data showed that family physicians nonetheless played a vital role in chronic disease management and that they were accounted for around one-third of the patient ambulatory visits. As such, the role played by family physicians in chronic disease care should be strengthened further in Taiwan, especially since increasing trends of hypertension, diabetes, and dyslipidemia have been reported over recent decades.¹⁹ Not only is aging positively correlated with most of the chronic diseases, but younger populations have also been found to be exhibiting growing prevalence of metabolic syndrome and other chronic diseases.³⁶ The financial and systemic burdens thus caused will inevitably increase over time due to increasing numbers of patients with multiple comorbidities.¹⁹ For chronic diseases requiring sustained and long-term medical management, sequential diagnostic tests, and the monitoring of comorbidities, studies in other countries concluded that family physicians are able to provide good quality and continuity of care which can contribute to decreased rates of comorbidities and complications, fewer emergency admissions, and lower all-cause mortality rates.^{21,37} Government in Taiwan had amended the reimbursement policies, initiated family physician integrated care system, and taken measures to facilitate the referral system. Taiwan Association of Family Medicine also continues to organize conferences and conduct studies to promote policy implementation. Some studies evaluating the effectiveness of the Family Physician Integrated Care Project in Taiwan supported the argument that family physicians provide better quality of care in terms of more utilization of preventive services, better patient satisfaction with medical and health services, fewer hospitalizations and ambulatory visits and saved 7.5% to 20% fee for hospitalized care and 5.4% to 8% for ambulatory care, among the patients enrolled in the integrated health care system in comparison with the nonenrollees.^{38,39} However, regarding the role of family physicians in primary health care, there is still room for improvement. Despite countries like the United Kingdom where patients are not likely to make self-referrals to specialties, other countries that have faced increasing costs of health care have placed an emphasis on gatekeeping infrastructure requiring preauthorization for specialty care. Whether gatekeeping mechanism is applicable to Taiwan deserves further discussion.

Another reason for the low utilization of family physicians in Taiwan might be the relative shortage of such physicians; only 3447 family physicians (7.8% of all practicing physicians) were registered in 2015, with the number of family physicians per capita being 0.15 per 1000 residents ($n = 23\,492\,074$), far below the average (0.9 per 1000 residents) for countries in the Organisation for Economic Co-operation and Development (OECD) in 2009.^{10,40} In

contrast, the ratio of primary care providers to specialists was 40.4:59.6 in the United States in 2005²⁷ and of ambulatory generalists to specialists was 41:59 in Germany in 1994.⁴¹ Relatedly, one review article showed that increasing the supply of primary care physicians by 15% to 20% per 10 000 residents was associated with better overall health outcomes, including a 6% decrease in mortality, in England.⁴² The need for increasing the number of family physicians in the health care supply chain in Taiwan is thus clearly evident. For health disparities such as the geographically disproportionate delivery of health care affecting children in rural areas and offshore islands due to the overall shortage of pediatricians,¹⁶ family physicians would offer one means of fixing the insufficient supply of medical services. For better health care equity, one study by the Medical Expenditure Panel Survey in the United States concluded that family physicians are essential for providing ambulatory care, especially for disadvantaged populations.⁴³

In a highly specialized health care system undergoing rapid transformation, family physicians are more important than ever for guaranteeing better health equity and quality of care with affordable costs.^{11,38} The plotted population pyramids implied the sequential changes of the general population and the burden of certain diseases. Understanding the patterns of patient clinical visits and health care utilization should help policymakers to formulate improved health care policies. The government should make decision regarding whether to place family physicians as gatekeepers to specialists as a whole. If so, providing adequately distributed and sufficient supply of family physicians and constructing a sound and effective referral system would be crucial. If not, nationally recognized trainings in chronic disease management should be included and examined regularly among other specialists. The remuneration system should be reorganized to reduce the financial burden without gatekeeping system. However, the precise ways in which policymakers in Taiwan can proceed to ensure increased cost-effectiveness and more equitable health care delivery require further discussion.

Study Limitations

This was a retrospective study, and some variables that may affect health care service utilization, such as individuals' socioeconomic situations,⁴⁴ were not included in the sample data. In addition, certain demographic factors, such as clinic accessibility, which would affect patients' choices regarding the use of medical services, were also not available. Also, coverage differences among family physicians and other specialties, as well as differences among various levels of medical facilities, could be studied further. This study also did not include patients' clinical presentations and disease control over time, and multiple ambulatory

visits to the same doctors per beneficiary were not counted. The relationship between the numbers of ambulatory visits and specific patient characteristics or disease severities should be evaluated further. In addition, the effects of chronic disease-related comorbidities such as stroke or coronary artery disease, which may contribute to the increases in some specific specialties' medical consultations numbers, were not taken into account. Finally, the referrals, treatments, and management patterns of individual doctors could provide more detailed illustration of patients' clinical visit patterns, but such data were not discussed in the present study.

Conclusions

Despite the fact that Taiwan has an increasingly aged population with increasing prevalence rates of various chronic diseases, the proportion of ambulatory visits handled by family physicians in comparison with physicians in other specialties remains unsatisfactory. Health care utilization of family physicians was low among patients with 3 major chronic diseases. The ongoing reform of the NHI should take into consideration the supply of family physicians and the regulation of the gatekeeping and referral system to enhance the efficient utilization of health care resources.

Authors' Note

This study was based in part on data from the National Health Insurance Research Database provided by the Bureau of National Health Insurance, Department of Health and managed by the National Health Research Institutes in Taiwan. The interpretation and conclusions contained herein do not represent those of the Bureau of National Health Insurance, Department of Health, or the National Health Research Institutes.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was supported by grants from the Ministry of Science and Technology, Taiwan (MOST 104-2410-H-010-015) and Taipei Veterans General Hospital, Taiwan (V105E10-002-MY2-1).

Supplemental Material

Supplemental material for this article is available online.

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