



Original Article

# Ambulatory practice of dermatologists in Taiwan: A nationwide survey

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## Abstract

**Background:** Skin diseases are among the most common public health problems and cause a significant burden. For policymakers and clinicians, comprehensive and detailed information is necessary to better allocate resources needed to care for skin diseases. This study was conducted to characterize the ambulatory practice of dermatologists in Taiwan.

**Methods:** The study data were drawn from the datasets of Taiwan's National Health Insurance Research Database for 2013, with 623,614 records of ambulatory care visits representing 1/500 of all the claims in Taiwan for 2013. The analysis of these visits included the patient demographics, diagnoses, prescriptions, and procedures.

**Results:** We identified 31,547 visits to dermatologic clinics, which accounted for 5.1% of all the ambulatory care visits in 2013. The three most commonly encountered diseases were contact dermatitis and other eczema, unspecified cause (34.3%, n = 10,811), acne (17.3%, n = 5452), and dermatophytosis (12.9%, n = 4065). Topical glucocorticoids (38.8%, n = 12,248), systemic antihistamines (35.4%, n = 11,172), and systemic antibiotics (15.2%, n = 4809) were the three most commonly prescribed drug categories. Clobetasol, a very potent glucocorticoid, was the most commonly prescribed medication (20.9%, n = 6579). In 22.9% of visits (n = 7248), combined glucocorticoid/antifungal preparations were prescribed.

**Conclusion:** This study characterizes the current state of ambulatory dermatologic care in Taiwan. The results raise concerns about the misuse of very potent glucocorticoids and combined glucocorticoid/antifungal preparations in dermatologic practices.

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**Keywords:** Dermatology; Health care systems; Outpatient care; Skin diseases; Taiwan

## 1. Introduction

Skin diseases are among the most common public health problems and cause a significant burden.<sup>1–4</sup> Morbidity and mortality from skin diseases are expected to increase, and the prevalence of these diseases and related health care spending are considered to be among the fastest growing for any medical

condition.<sup>5</sup> Dermatologists are recognized as the specialists most qualified for managing skin diseases and performing cutaneous cosmetic and surgical procedures.<sup>6–8</sup> With ongoing innovations in the treatment of skin diseases, continuing growth in the utilization of surgical and cosmetic procedures, and reforms to health care insurance systems, dermatologic practice has changed substantially in recent years.<sup>9–12</sup> In the context of these dramatic changes, comprehensive and detailed information regarding the current state of dermatologic services is important for better allocating the resources needed in caring for skin diseases.<sup>13</sup> In Taiwan, most of the dermatologic care is provided in ambulatory settings. In 2013, 52.6% of the patients with skin diseases visited dermatologists for help, compared with 32.6% who visited nondermatologists and 14.8% who

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visited both.<sup>14</sup> The purpose of this study was to investigate the patterns of ambulatory visits to dermatologists in Taiwan. To that end, data from Taiwan's National Health Insurance Research Database (NHIRD) for 2013 were analyzed to determine the practice patterns of dermatologic clinics in Taiwan.

## 2. Methods

### 2.1. Data collection

We analyzed NHIRD dataset files sampled from those for the year 2013. These files—containing a total of 623,614 medical records—were acquired by a 0.2% sampling ratio from the datasets for 2013, excluding the datasets for dentistry and traditional Chinese medicine. In this study, the data encompassed visits to the emergency and outpatient departments of hospitals and office-based clinics. All the diagnosis codes, prescriptions, and procedures in every medical record were analyzed. Disease categories based on the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) classification were used to analyze the diagnosis distributions. The Anatomical Therapeutic Chemical (ATC) classification system was used to assess prescription patterns. Visits were stratified according to patient gender, age, diagnoses, medications, and procedures.

### 2.2. Statistical analysis

The data were analyzed using the programming software Perl version 5.20.2 (Perl, Walnut, CA, USA) for data processing and using the statistical software SPSS version 22.0 (IBM, Armonk, NY, USA) for statistical analysis. Descriptive statistics was applied to assess the distributions of visits according to patient demographics, diagnoses, prescriptions, and procedures. The study was approved by the institutional review board of Taipei Veterans General Hospital according to the laws of the Republic of China (VGHIRB No.: 2013-10-001CE).

## 3. Results

### 3.1. The distribution of visits according to demographics of patients

We identified 31,547 visits to dermatologic clinics, which accounted for 5.1% of all the ambulatory care visits (n = 623,614) in 2013. Of those dermatologic visits, 52.9% (n = 16,684) were made by female patients, and 47.1% (n = 14,863) were made by male patients. In terms of age, patients aged 20–29 years (17.5%), 30–39 years (17.5%), 40–49 years (14.2%), and 50–59 years (14.2%) comprised the majority of the outpatients in 2013 (Table 1). Collectively, patients under the age of 60 (79.6%) were the major sources of outpatients. A predominance of male patients in the visits was found among patients aged older than 60, with a male-to-female ratio of 1.23, while male-to-female ratios ranging between 0.74 and 0.93 were observed in patients in various age groups younger than 60.

Table 1  
The distribution of cases according to age and gender.

Age group (years)	Male		Female		Total	
	n	%	n	%	n	%
0–9	765	2.4	710	2.3	1475	4.7
10–29	1845	5.9	1815	5.8	3660	11.6
20–29	2340	7.4	3166	10.0	5506	17.5
30–39	2274	7.2	3240	10.3	5514	17.5
40–49	1919	6.1	2549	8.1	4468	14.2
50–59	2160	6.9	2312	7.3	4472	14.2
60–69	1599	5.0	1443	4.5	3042	9.6
≥70	1961	6.2	1449	4.5	3410	10.8
Total	14,863	47.1	16,684	52.8	31,547	100.0

### 3.2. The distribution of visits according to patient diagnosis

Table 2 shows the distribution of skin disease groups encountered in dermatologic clinics. The most common diagnosis groups were dermatitis and eczema, diseases of the sebaceous and apocrine glands, and diseases due to microbial agents. As shown in Table 3, the three most commonly encountered diseases were contact dermatitis and other eczema, unspecified cause (34.3%), acne (17.3%), and dermatophytosis (12.9%). Contact dermatitis and other eczema, unspecified cause, and acne were the two most common disorders in both genders. However, dermatophytosis was the third most common disorder among male patients, whereas urticaria was the third most common disorder among female patients. In the pediatric population ( $\leq 20$  years old), acne (n = 1,196, 23.3%); contact dermatitis and other eczema, unspecified cause (n = 1,051, 20.5%); and viral warts (n = 514, 10.0%) were the three most common diagnoses, whereas the three most common diagnoses in the geriatric population ( $\geq 60$  years old) were contact dermatitis and other eczema, unspecified cause (n = 2,008, 31.1%), dermatophytosis (n = 876, 13.6%), and urticaria (n = 339, 5.3%).

### 3.3. The distribution of visits according to prescriptions and procedures

In terms of pharmacological treatments, 95.5% (n = 30,112) of the outpatients were managed with medications, and 37.4% (n = 11,824) of the outpatients received three or more medications. As shown in Table 4, the most commonly prescribed category of drugs was topical glucocorticoids (38.8%), followed by systemic antihistamines (35.4%), systemic antibiotics (15.2%), topical antifungals (11.2%), topical antibiotics (14.0%), and systemic glucocorticoids (13.0%). On the ATC 5th level, clobetasol was the most commonly prescribed medication (20.9%, n = 6579), followed by betamethasone (12.0%, n = 3783) and clindamycin (10.9%, n = 3426). Further analysis showed that clobetasol was most commonly prescribed to treat contact dermatitis and other eczema, unspecified cause (n = 2721, 41.4%). It is noteworthy that combined glucocorticoid/antifungal agents and combined glucocorticoid/antifungal/antibacterial agents comprised 6.5% (n = 2047) and

Table 2  
The distribution of visits according to skin disease groups.

Diagnosis group	No. of visits	%
Dermatitis and eczema		
Contact dermatitis and other eczema, unspecified cause	10,811	34.3
Prurigo nodularis	1274	4.0
Lichenification and lichen simplex chronicus	1113	3.5
Seborrheic dermatitis	946	3.0
Pompholyx	775	2.5
Atopic dermatitis & related conditions	649	2.1
Dermatitis due to substances taken internally	532	1.7
Diseases of sebaceous and apocrine glands	5978	18.9
Acne	5452	17.3
Rosacea	387	1.2
Sebaceous cyst	249	0.8
Diseases due to microbial agents		
Fungal infections		
Dermatophytosis	4065	12.9
Pityriasis versicolor	366	1.2
Candidiasis	196	0.6
Other dermatomycoses	85	0.3
Viral infections		
Viral warts	2549	8.1
Herpes zoster	679	2.2
Herpes simplex	460	1.5
Molluscum contagiosum	19	0.1
Other viral exanthemata	12	0.0
Hand, foot, and mouth disease	6	0.0
Bacterial infections		
Folliculitis	995	3.2
Carbuncle & furuncle	816	2.6
Cellulitis	668	2.1
Impetigo	62	0.2
Parasitic infections		
Scabies	334	1.1
Pediculosis	13	0.0
Unspecified infections	948	3.0
Urticaria and erythema		
Urticaria	2595	8.2
Erythema multiforme	10	0.0
Erythema nodosum	4	0.0
Papulosquamous diseases		
Psoriasis & similar disorders	734	2.3
Bullous dermatoses	50	0.2
Pemphigus	18	0.1
Pemphigoid	14	0.0
Dermatitis herpetiformis	3	0.0
Other bullous dermatoses	14	0.0
Neoplasms		
Malignant melanoma of skin	2	0.0
Other malignant neoplasms	54	0.2
Benign neoplasm of skin	547	1.7
Neoplasms of unspecified nature	33	0.1
Miscellaneous groups		
Disorders of sweat glands	1305	4.1
Diseases of hair & hair follicles	1300	4.1
Wound	1104	3.5
Keloids	396	1.3
Disorders of mouth	138	0.4
Diseases of nail	75	0.2
Connective tissue diseases	36	0.1
Burn	19	0.1

Table 3  
The distribution of the ten most common diseases.

ICD-9-CM	Diagnosis Group	No. of visits	%
692.9	Contact dermatitis and other eczema, unspecified cause	10,811	34.3
706.1	Acne	5452	17.3
110	Dermatophytosis	4065	12.9
708.9	Urticaria	2595	8.2
078.1	Viral warts	2549	8.1
698.2	Prurigo nodularis	1274	4.0
698.3	Lichen simplex chronicus	1113	3.5
704.8	Folliculitis	995	3.2
690.1	Seborrheic dermatitis	946	3.0
705.81	Pompholyx	775	2.5

16.5% (n = 5201) of the prescriptions, respectively. Overall, combined agents were prescribed in 22.9% of the visits to dermatologic clinics.

Table 5 shows the distribution of topical glucocorticoids according to the ATC classification system. Among topical glucocorticoids, clobetasol, betamethasone, and fluocinonide were the three most commonly ingredients prescribed. According to the ATC classification system, topical glucocorticoids are categorized into “very potent”, “potent”, “moderately potent”, and “weak”. These three topical glucocorticoids are all potent or very potent. Among systemic antihistamines, mequitazine was the most commonly used medication, followed by cetirizine, fexofenadine, dexchlorpheniramine, and loratadine (Table 6). Among visits during which systemic antihistamines were prescribed, contact dermatitis and other eczema, unspecified cause (n = 3,941, 35.3%) and urticaria (n = 1,869, 16.7%) were the two most common diagnoses. Ketoconazole was the most commonly prescribed topical

Table 4  
The distribution of prescribed drug categories.

Drug classification	No. of visits	%
Topical glucocorticoids	12,248	38.8
Systemic antihistamines	11,172	35.4
Combined glucocorticoid/antifungal/antibacterial preparations	5201	16.4
Systemic antibiotics	4809	15.2
Topical antibiotics	4427	14.0
Systemic glucocorticoids	4097	13.0
Topical antifungals	3520	11.2
Combined glucocorticoid/antifungal preparations	2047	6.5
Topical retinoids	1720	5.5
Nonsteroidal anti-inflammatory drugs	1650	5.2
Emollients and protectives	1310	4.2
Antiacids	1282	4.1
Antipruritics	855	2.7
Psychotropic drugs	545	1.7
Systemic antifungals	498	1.6
Ophthalmological drugs	448	1.4
Drugs for functional gastrointestinal disorders	411	1.3
Tars	204	0.6
Vitamin D analogues	173	0.5
Systemic retinoids	41	0.1

Table 5  
The distribution of topical glucocorticoids according to ATC classification system.

	No. of visits	%	Group	Potency
Clobetasol	6579	20.9	IV	Very potent
Betamethasone	3783	12.0	III	Potent
Fluocinonide	761	2.4	III	Potent
Clobetasone	449	1.4	II	Moderately potent
Mometasone	367	1.2	III	Potent
Hydrocortisone	314	1.0	I	Weak
Desoximetasone	313	1.0	III	Potent
Fluticasone	223	0.7	III	Potent
Triamcinolone	196	0.6	II	Moderately potent
Diflucortolone	184	0.6	III	Potent
Fluocinolone acetonide	21	0.1	III	Potent
Beclometasone	15	0.0	III	Potent
Fluclorolone	9	0.0	III	Potent
Hydrocortisone butyrate	8	0.0	II	Moderately potent
Flumetasone	2	0.0	II	Moderately potent

antifungal, followed by bifonazole, butenafine, naftifine, and sulconazole. In the treatment of acne, topical clindamycin, adapalene, and benzoyl peroxide were the most commonly prescribed medications, with adapalene (n = 1,129, 3.9%), tretinoin (n = 131, 0.4%), and isotretinoid (n = 29, 0.1%) being the three most commonly prescribed topical retinoids. Among visits during which adapalene was prescribed, acne was the most common diagnosis (n = 1,229, 74.8%).

As shown in Table 7, liquid nitrogen cryosurgery was the procedure most commonly performed during the dermatologic visits (8.0%), followed by intradermal injection (2.2%), incision and drainage (0.9%), and phototherapy (0.8%). Other procedures, including skin biopsy, excision of skin or subcutaneous tumors, and electrocauterization, were infrequently performed. More than half of the biopsy (68.3%) and excision of skin or subcutaneous tumors (55.1%) procedures were performed in academic medical centers.

#### 4. Discussion

In 2013, visits to dermatologic clinics accounted for 5% of all the ambulatory care visits in Taiwan, a proportion somewhat higher than the 3.6% rate in the United States (US).<sup>15</sup>

Table 6  
The distribution of systemic antihistamines prescribed in ambulatory care visits.

	No. of visits	%
Mequitazine	2051	6.5
Cetirizine	1910	6.1
Fexofenadine	1771	5.6
Dexchlorpheniramine	1644	5.2
Loratadine	1078	3.4
Levocetirizine	1073	3.4
Diphenylpyraline	998	3.2
Mebhydrolin	947	3.0
Buclizine	739	2.3
Cyproheptadine	684	2.2
Chlorphenamine	438	1.4
Desloratadine	332	1.1

The development of skin diseases is multifactorial in nature, and can be associated with genetic, environmental, mechanical, climate-related, and even cultural factors.<sup>15,16</sup> Previous studies have shown that the utilization of dermatologic care services depends on the prevalence of skin diseases, seasonal variation, and patients' geographical origins.<sup>16–19</sup> The differences in utilization of dermatologic services between Taiwan and the US require further investigation. The present study found that more ambulatory care visits were made by females than males (52.9% vs. 47.1%). Gender differences have been recognized in the susceptibility to a variety of skin diseases. Males are generally more commonly afflicted with infectious diseases, basal cell carcinoma, and squamous cell carcinoma, while women are more susceptible to pigmentary disorders, certain hair diseases, allergic diseases, and, in particular, autoimmune diseases.<sup>20–22</sup> However, more research is needed to clarify the mechanisms underlying gender differences in the utilization of skin care services.

The most commonly encountered disease group in the study was dermatitis and eczema. This finding is consistent with previous studies conducted in Japan, Iraq, Turkey, Saudi Arabia, Yemen, Mali, South Africa, Egypt, Nigeria, Peru, and Greece that also found dermatitis and eczema to be the most common skin diseases in dermatologic clinics.<sup>22–32</sup> In a 2015 study from the US, adults with eczema were found to be associated with higher health care costs, more workdays lost, poorer overall health, and more healthcare utilization compared with those without eczema.<sup>33</sup> However, only limited information is available concerning the national burden of contact dermatitis in Taiwan, a subject which thus deserves greater attention in the future. The rate of fungal infections encountered in dermatologic clinics was found to be 15.0% in this study. The three most common fungal diseases were dermatophytoses, pityriasis versicolor, and candidiasis. *Tinea pedis* (5.5%), *onychomycosis* (3.1%), and *tinea cruris* (3.1%) were the three most common types of dermatophytoses. The World Health Organization estimates the global prevalence of dermatophytoses to be approaching 20%.<sup>34</sup> The distribution of cutaneous fungal infections and their causative agents vary with geographical, climatic factors, hygiene conditions, and socioeconomic status.<sup>35–38</sup>

In terms of prescriptions, clobetasol, betamethasone, and fluocinonide were the three topical glucocorticoids most commonly prescribed during visits to dermatologic clinics. These three topical glucocorticoids are all potent or very potent. Relatedly, prior studies have shown that dermatologists are more likely to prescribe very potent steroids than non-dermatologists.<sup>39–41</sup> According to the data from the National Ambulatory Medical Care Survey (NAMCS) conducted in the 1990s, very potent glucocorticoids were prescribed during nearly 3% of all skin disease-related visits, with prescription rates being highest for psoriasis (22%).<sup>39</sup> Compared with these data from the US, the much higher prescription rate of very potent glucocorticoids in Taiwan found in the present study suggests the misuse of glucocorticoids, a problem which has previously been reported in Iraq and India.<sup>42,43</sup> Such common prescription of very potent glucocorticoids raises significant

Table 7  
The distribution of procedures performed during visits according to facility levels.

Procedure	No. of visits				Total	%
	Academic medical centers	Metropolitan hospitals	Local community hospitals	Physician clinics		
Liquid nitrogen cryosurgery	112	215	112	2088	2527	8.0
Intradermal injection	37	60	13	570	680	2.2
Incision and drainage	27	20	6	241	294	0.9
Phototherapy	118	91	19	12	240	0.8
Removal of stitches	51	40	6	15	112	0.4
Excision of skin or subcutaneous tumor	59	31	7	10	107	0.3
Electrocauterization	1	5	0	30	36	0.1
Skin biopsy	28	9	3	1	41	0.1
Chemical cauterization	10	5	1	16	32	0.1
Low level Helium-Neon laser therapy	12	14	1	0	27	0.1
Nail extraction	2	0	0	4	6	0.0

concerns regarding their adverse effects, including skin atrophy, hirsutism, acne, and telangiectasia. However, the safety of glucocorticoids is associated with the amount and duration of use. Besides, ethnic differences in response to treatment for skin diseases could be associated with the amount of glucocorticoid use. Therefore, further investigation is needed to explore the potential problem of glucocorticoid misuse.

The finding that combined glucocorticoid/antifungal agents and combined glucocorticoid/antifungal/antibacterial agents were quite commonly prescribed in dermatologic clinics deserves attention, as the inappropriate use of combined agents may be associated with treatment failure and adverse effects.<sup>44,45</sup> Prior studies have shown that nondermatologists are more likely than dermatologists to prescribe combined glucocorticoid/antifungal agents.<sup>41,45</sup> Further investigations are necessary, however, to explore the impact and underlying causes of such prescription patterns in Taiwan.

Systemic antihistamines are the second most commonly prescribed category of drugs in dermatologic clinics. Pruritus is a frequent symptom associated with various systemic diseases and dermatoses, including atopic dermatitis, urticaria, and psoriasis.<sup>46</sup> Systemic antihistamines are thus commonly used in dermatologic clinics. Compared with the first generation antihistamines, the second generation agents are safer, less sedative, and more efficacious.<sup>47</sup> In this study, however, half of the ten most commonly prescribed antihistamines were found to be the first generation agents. Among the topical retinoids prescribed in dermatologic clinics, adapalene was the most commonly prescribed. The use of topical retinoids is limited by side effects such as dryness, peeling, erythema, and irritation.<sup>48</sup> The third generation topical retinoids, such as adapalene have fewer side effects.<sup>49,50</sup> Tazarotene was much less frequently prescribed ( $n = 16$ , 0.1%), probably because it is only reimbursed to treat psoriasis under Taiwan's National Health Insurance drug reimbursement scheme. According to the data from NAMCS, surgical and cosmetic procedures were performed in 40% of the dermatology visits in 2001, with skin biopsy being performed in 21.5% of the visits.<sup>11</sup> Compared with the above data in the US, dermatologists in Taiwan tend to perform surgical procedures much less commonly. Previous studies have shown that most

dermatology programs teach essential surgical skills in the US, while cosmetic techniques were viewed as unimportant by most program directors.<sup>51,52</sup> With the increasing trend of surgical and cosmetic dermatology, more attention should be focused on surgical procedures in residency training in Taiwan.

There were some limits to this study. First, this was a cross-sectional study. The changes and potential trends vary across time. Thus, they could not be identified due to the lack of longitudinal data. Second, the patterns of prescriptions for different diagnoses were not examined. Third, data regarding the services provided by nondermatologists were not included in this study. Fourth, the ATC classification system is not accurate enough to specify the concentration, ingredient, and formulation of topical medications. For example, the topical glucocorticoids with the same ATC code could have different concentrations and formulations. Fifth, medications and procedures not reimbursed by National Health Insurance practices were not included in this study. Considering the increasing trend of surgical and cosmetic dermatology, the lack of such data in this study limits the degree to which dermatologic practices can be assessed accurately for outpatient populations. Finally, the diagnoses listed in the medical claims in the insurance system might not accurately represent patients' true conditions, and their validity was rarely examined.

In conclusion, this study characterizes the current ambulatory practice of dermatologists in Taiwan, and provides epidemiologic insights into the dermatologic health care system. The results raise concerns about the misuse of very potent glucocorticoids and combined glucocorticoid/antifungal preparations in dermatologic practices.

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