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# Evaluation and comparison of the dermatology program for medical students at the University of Chile with other national and foreign universities

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## Abstract:

**BACKGROUND:** The National Examination of Knowledge in Medicine establishes the knowledge profile (PdC) a physician must possess to practice public medicine in Chile. However, no study has evaluated the perception of dermatology training regarding the acquisition of the minimum competencies required. This study described and compared the impressions of the dermatology training received by the University of Chile (UCh) graduates with graduates from other national and international faculties of medicine.

**MATERIALS AND METHODS:** This was a cross-sectional study, based on a single survey model, applied via E-mail to registered physicians in an online database, with emphasis on UCh medicine graduates, from the generations 2012 to 2016. The data were collected anonymously, tabulated, and analyzed in MINITAB.

**RESULTS:** From 908 UCh graduates, 141 surveys were answered (15.5%). Nine of 10 physicians considered "important" to obtain knowledge in dermatology. About 68.8% found the information they received was adequate. When comparing UCh graduates with other Chilean universities, UCh graduates had a slightly better impression of their training. When comparing Chilean versus foreign graduates, the latter presented a better perception of their preparation in cutaneous pathology.

**CONCLUSION:** UCh graduates were satisfied with their dermatological training at the undergraduate level and felt better prepared than colleagues from other Chilean universities when facing cutaneous pathologies.

## Keywords:

Dermatology, medical education, preceptorship

## Introduction

Until 1966 at the University of Chile School of Medicine, teaching activity in dermatology was limited to the undergraduate students receiving limited instruction in selected topics related to social hygiene. There are no reliable data about the beginning of dermatology instruction as an isolated discipline. Dermatology has been traditionally considered a "subordinate and less relevant" discipline in the general

curriculum of medicine in Chile. Even today, students are assigned 5 weeks out of 7 years during their medical training to full-time instruction for practical and theoretical activities. However, this limited exposure was estimated to be insufficient due to the impact and prevalence of dermatoses in the daily practice of general practitioners.<sup>[1-3]</sup>

University of Chile (UCh) was the pioneer and solely responsible for the dermatological training in undergraduate medical students in Chile until 1983. The first classes were at

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San Luis and San Vicente de Paul Hospitals, whom paved the way to the “University Clinic of Skin and Syphilis,” which became what is now known as the University of Chile Clinical Hospital’s Dermatology Service. After some university structural reforms, the Department of Dermatology of the Faculty of Medicine of the UCh was created in 1991 to centralize the undergraduate and postgraduate teaching of dermatology in hospitals that were associated to this university. This structure remains in place until today.

A sustained increase of universities offering medicine occurred at the end of the 20<sup>th</sup> century. Before 1980, there were only four medical schools in Chile: Universidad de Chile, Universidad de Concepción, Pontificia Universidad Católica and Universidad Austral. By the end of the 90s, there were 12 programs with continued expansion to the 32 physician training programs currently available. Given this situation, it became relevant to perform a critical analysis of the professional’s characteristics trained from different medical schools. Moreover, this situation is present in the teaching of specialties with less representation in training time such as dermatology, which, compared to the rest of medical specialties, it lacks teachers and clinical campuses to train medical students.

On the other hand, the emergence of new universities and medical schools, both public and private in Chile, has made undergraduate dermatology education evolve. The incorporation of new techniques and technologies for teaching, along with dermatologists’ teaching improvement, has allowed updating the curriculum according to the needs of undergraduate students.

Nowadays, in the School of Medicine of the UCh, dermatology is taught only twice during the entire medical training program. The first instance was the course named “Dermatology” a compulsory subject taught to 5<sup>th</sup>-year students of the medical career over two weeks, where expository classes and miscellaneous sessions (case studies) were combined, and students could put into practice the transmitted knowledge. The second instance of dermatology training takes place during the internship. With a duration of 3 weeks, the course that consists on participation in the outpatient unit, the preparation of a report on dermatological diseases and a final theoretical test.

In addition, the Association of Medical Faculties of Chile has established in 2010 a “Knowledge Profile (PdC) of the National Single Knowledge in Medicine Examination (EUNACOM)” which establishes a set of medical knowledge to be taught by all associated medical schools to create curricular planning according to the contents required for every physician in Chile.<sup>[4]</sup>

Regarding the above, every educational program requires an evaluation system, hopefully, based on competencies, and should include students, teachers, and university authorities. When the students constitute the basic element in the evaluation process, it is essential to know their opinion about the practical teaching they have received. Based on this reflection, measuring the perception that trained professionals have by confronting them with their own experience is the first step toward evaluating how physicians were being trained in dermatology.

In 2012, the UCh started a process of curriculum reform to establish a graduation profile based on competencies.<sup>[5]</sup> Therefore, in the context of recent changes, it was necessary to evaluate the perception of UCh graduated physicians regarding their knowledge and performance in relation to the most frequently seen skin’s pathologies in clinical practice.

### Objectives

The main objective was to analyze the perception that medical doctors trained in UCh had about the knowledge and skills acquired during their dermatological training from generations 2012–2016.

The secondary objectives were:

- To characterize the demography and working condition of UCh physicians regarding their patients’ dermatological consultation
- Make a dermatology training comparison between graduates of UCh versus physicians trained in other medical schools in Chile
- Make a comparison of the perceptions of dermatology training between medical doctors who graduated from Chilean universities versus doctors trained abroad.

### Materials and Methods

This was a semi-quantitative cross-sectional study based on a survey of closed, short, electronic questions, applied via the internet through E-mails of participants of the electronic platform “Synthesis of knowledge in Medicine” (SCM) from “Medichi program,” which is currently defined as a “Dynamic digital library for students and health professionals,” where there are registered physicians from throughout Chile and abroad. As SCM is very popular in recent physicians and medical students (5000 physicians registered), the population subscribed to the platform includes medical doctors who studied in other Chilean and international schools of medicine.

All medical students of UCh are automatically registered in SCM. Subsequently, through filters, the study’s sample

for the analysis was isolated to 908 medical doctors who graduated from the medical career of the UCh between 2012 and 2016.

All who completed surveys were considered as a "participant."

### Ethical considerations

The study design was evaluated by the investigation commission of the Department of Dermatology of UCh. The population universe was obtained from the E-mail database of the SCM platform. Each form sent to the database was assigned a blind code making the answers anonymous. The project obtained the final approval of the ethical committee on May 17, 2017. The authors and collaborators did not declare having conflicts of interest in any aspect of the research.

The survey's instrument was divided into 6 sections: "Demographic and professional practice data," "Clinical practice and dermatological pathology," "Curriculum of undergraduate dermatology," "Elective Internship and preceptorships," "Perception of competences" and "Clinical situations."

Before launching the survey to the physicians, a trial group of 5 UCh medical graduates who were not related to the research project answered the whole questionnaire. Some questions were modified because of their difficulty to be understood. The modified instrument was reapplied to another five graduates under the same conditions above.

To continue with the instrument's improvement, additional trial application was carried out. A group of 30 dermatology residents was chosen, and the introductory message was adjusted to be as attractive as possible to get the most interested in answering the instrument. This activity also allowed the researchers to check the security of the chosen electronic platform and reduce the risk of information loss.

### Application

After being approved by the investigation committee of the Department of Dermatology UCh, the final survey was distributed through an electronic platform designed to obtain data called "Lime Survey" and sent by electronic mail with an induction message. The target population was any medical doctor who received the E-mail and answered the entire questionnaire. Physicians who did not answer the entire survey were excluded.

### Collection and analysis

Data collection was done anonymously through the same platform. The data was subsequently tabulated in Microsoft Excel 2016 version 16.0.2101.2209 (Microsoft Corporation, Redmond, WA, USA) and analyzed in the

MINITAB version 17.3.1 program (Minitab Inc., State College, PA, USA). Descriptive statistics were performed for demographic variables using measures of central tendency and dispersion for the main target group (UCh graduates 2012–2016).

In addition, in consideration of the participation and diversity of the rest of the SCM members, statistical comparisons were made to see if there were differences in the perception of dermatology training between the various groups of interest. Two comparisons were made: The first between the main target group against a group of graduates from other Chilean universities of the same generations. The second compared graduates from Chilean universities against foreign universities.

For this analysis, the Chi-square test was used in the case of categorical variables and Students' *t*-test for two independent samples in the case of numerical variables, with a 95% confidence, considering statistically significant values  $P < 0.05$ .

## Results

### General results

From the total of 5000 physicians registered in the "Synthesis of Knowledge in Medicine" platform, a 14.12% rate of response was obtained, the equivalent to approximately 706 surveys being fully answered.

### Demographic and clinical practice data

Table 1 shows the demographic data of the sample of medical doctors who answered completed surveys. The average age of the participants was 34.15 years, with a participant age range from 23 to 81 years, and 52.41% younger than 30 years of age. Regarding gender response, 54.67% were women. The main nationality was Chilean (68.56%); however, only 62.61% graduated in Chile. This is explained because 43 Chilean physicians obtained their degree abroad, which represents 6.09%, while one foreign participant obtained his degree in Chile (0.14%). When asked about the main activity they were engaged in, the answers were "Primary Care Physician (PHC)" (25.50%), then "specialists" (25.07%) and thirdly "physicians in the Destination and Training Stage (Etapa de Destinación y Formación "EDF") (16.71%).

### Medical doctors who graduated from the University of Chile between 2012 and 2016

Of 908 graduates from the School of Medicine of the UCh between 2012 and 2016, a total of 141 surveys were fully answered, with a response rate of 15.5%.

### Demographic and clinical practice data

The characteristics of the "target" group of graduates who answered the survey were as follows: 89.4%

**Table 1: Demographic and clinical practice data (n=706)**

Characteristics	n (%)
Age (years)	34,15±10,35
Age groups	
≤30	370 (52,41)
31-40	205 (29,04)
41-50	57 (8,07)
51-60	53 (7,51)
≥61	21 (2,97)
Gender	
Feminine	386 (54,67)
Masculine	320 (45,33)
Nationality	
Chilean	484 (68,56)
Other	222 (31,44)
Year of graduation of Med School	
≤1980	20 (2,83)
1981-1990	37 (5,24)
1991-2000	59 (8,36)
2001-2010	150 (21,25)
≥2011	440 (62,32)
Country of graduation	
Chile	442 (62,61)
Other	264 (37,39)
University of graduation	
University of Chile	238 (33,71)
Other Chilean universities	204 (28,90)
Foreign universities	264 (37,39)
Actual clinical practice	
General practitioner - private practice	103 (14,59)
General practitioner from Public health system	180 (25,50)
General practitioner EDF	118 (16,71)
Resident	69 (9,77)
Specialist	177 (25,07)
Others	59 (8,36)

Physicians "Synthesis of knowledge in Medicine." EDF=Etapa de Destinación y Formación

of respondents were under 30 years old ( $n = 126$ ), being the average 28.2 years of age, with a female predominance (53.9%,  $n = 76$ ) versus men (46.1%,  $n = 65$ ). The graduates were distributed equally between the years of graduation and universities (2012:  $n = 20$ ; 14,2% - 2013:  $n = 28$ ; 20,6% - 2014:  $n = 26$ ; 18,4% - 2015:  $n = 32$ ; 22,75% - 2016:  $n = 34$ ; 24,1%).

About the actual clinical practice, the majority were in destination and training stage (EDF) representing 41.8% ( $n = 59$ ), followed by residents with 23.4% ( $n = 33$ ) followed by physicians who were already specialists 9.9% ( $n = 14$ ) and others, with 9.2% ( $n = 14$ ), general practitioner working in a private practice with 8.5% ( $n = 12$ ), and finally Primary care doctors with 7.1% ( $n = 10$ ).

### Clinical practice and dermatological pathology

Regarding the actual professional practice of the respondents, Table 2 characterizes their relationship with

**Table 2: Clinical practice and dermatological pathology. University of Chile 2012-2016**

	n (%)
What percentage of patients you see in a daily basis have a problem related to dermatology?	
0	4 (2,8)
1-25	108 (76,6)
26-50	21 (14,9)
51-75	0 (0)
>75	3 (2,1)
Does not see patients	5 (3,5)
Among the patients who consult for dermatological diseases, approximately what percentage do you refer to the specialist?	
0	5 (3,5)
1-25	98 (69,5)
26-50	24 (17)
51-75	3 (2,1)
>75	5 (3,5)
Does not see patients	5 (3,5)
currently dermatologist or dermatology resident	1 (0,7)
Indicate the reasons why you refer your patients to a dermatologist	
Does not know the diagnosis	67 (47,5)
Diagnostic confirmation	78 (55,3)
Study	75 (53,2)
Treatment	87 (61,7)
Surgical resolution of the condition	49 (34,8)
Question does not apply to my activity	10 (7,1)

patients who consulted for dermatological pathology. 3 out of 4 respondents had up to 25% of dermatological consultations on a usual day. The second question in this section addresses the referrals frequency, standing out that 7 of 10 respondents (69.5%) referred up to 25% of dermatological consultations they attend, and seeing it from a global perspective, 92.5% referred to dermatology with some frequency.

Among the causes of referral, treatment (61.7%), diagnostic confirmation (55.3%) and study (53.2%) were the most frequent causes. It should be noted that 47.5% mention referring their patients to the secondary level because they were unaware of the pathology they faced.

### Undergraduate dermatology curriculum

The following section referred to the graduates' opinion in reference to the training received during their undergraduate period [Table 3]. It highlighted that 9 out of 10 participants are "in agreement" (13.5%) and "strongly agree" (76.6%) on the importance of acquiring knowledge and skills in dermatology.

When asked about what teaching methodologies would improve their confidence in dealing with dermatological diseases, 75.1% believe that real patient demonstration should be the main tool, followed by work in "Clinical cases analysis in small groups" (71.6%).

**Table 3: Undergraduate dermatology curriculum. University of Chile 2012-2016**

	<i>n (%)</i>
Is it important to acquire dermatology expertise (knowledge and skills) as an undergraduate?	
Strongly disagree	10 (7,1)
In disagreement	3 (2,1)
Neither agree nor disagree	1 (0,7)
Agree	19 (13,5)
Strongly agree	108 (76,6)
What methodologies do you consider would improve your confidence to develop skills in managing prevalent pathologies in dermatology?	
Demonstration with real patients	106 (75,1)
Practice with real patients	91 (64,5)
Analyze procedural videos	31 (22)
Practice with mannequins	14 (9,9)
Face-to-face classes	51 (36,2)
Online instruction (e-learning)	47 (33,3)
Semi face-to-face instruction (blended or e-learning)	78 (55,3)
Small group seminars on clinical case analysis	101 (71,6)
Other	5 (3,5)
Was the dermatology training you received in medical undergraduate adequate?	
Strongly disagree	3 (2,1)
In disagreement	17 (12,1)
Neither agree nor disagree	24 (17)
Agree	83 (58,9)
Strongly agree	14 (9,9)
Is it relevant to expose students during undergraduate studies to surgical experience in dermatology?	
Strongly disagree	8 (5,7)
In disagreement	40 (28,4)
Neither agree nor disagree	25 (17,7)
Agree	42 (29,8)
Strongly agree	26 (18,4)

In addition, they were asked if they found the training they received in dermatology was adequate during their undergraduate course. 2 out of 3 participants (68.8%) "Agreed" (58.9%) and "Strongly agreed" (9.9%).

Finally, they were asked about the relevance of exposing students to surgical experiences in dermatology during their undergraduate period, although it is not formally part of their training. 48.2% "agreed" or "strongly agreed," versus 34.1% who "disagreed" or "strongly disagreed."

Then, physicians were consulted about the enforcement of elective internship in dermatology during their undergraduate course and/or participation in preceptorships. 5.7% ( $n = 8$ ) performed elective internships in dermatology) and 8.5% ( $n = 12$ ) a preceptorship. Among their motivations, the interest in entering the dermatology residency and the interest in improving the dermatology expertise were expressed.

### Perception of competencies

The perception of competencies was made based on the EUNACOM PdC.

First, they were asked to rate from "1 to 7" the level of knowledge and skills acquisition in dermatology during the undergraduate program, "1" was the lowest level and "7" the highest. Their perception rated "Perform a Complete History with dermatological emphasis" with a 5.66, followed by "Perform a physical examination of the skin and integuments" and "VDRL-MHA TP Interpretation" with a 5.48 as the top 3 best expertise acquired. Among the worst evaluated, "Tzanck Test interpretation" scored 2.91, followed by "To perform, interpret and employ scraping" 3.08 and "Patch Test Interpretation" with a 3.84.

Subsequently, they were asked to evaluate their ability to propose differential diagnoses in a series of different clinical scenarios. The five best evaluated were: Sexually transmitted infections (5.60), cutaneous infectiology (5.38), cutaneous tumors (5.09), Erythematous/Inflammatory diseases (5.07) and acneiform eruptions (5.04). The worst evaluated was the Tzanck test interpretation (2,91).

### Clinical situations

Finally, graduates were asked to choose the top five most frequent reasons for dermatological consultation in their usual clinical practice [Table 4]. Most frequent consultations were about atopic dermatitis (60.28%), superficial mycoses (51.06%), contact dermatitis (47.52%), viral infections such as warts, herpes simplex, herpes zoster, molluscum contagiosum (36.88%), and acute urticaria (30.50%).

### Comparison of physicians who graduated from the University of Chile versus other Chilean universities between 2012 and 2016

A competence's perception comparison was made between medical graduates of UCh versus a group of graduates from other Chilean universities between 2012 and 2016.

Before the analysis, the comparability of these groups in demographic terms (age, gender and graduation year) was evaluated, and no significant differences were found in the selected data (data not showed in this manuscript).

Table 5 shows the results of this comparison. In relation to the acquisition of knowledge and skills in dermatology during the undergraduate period, UCh graduates had a trend toward to a better perception in all the items evaluated. This difference was statistically significant in "To perform a complete history with dermatological emphasis" ( $5.66 \pm 1.15$  vs.  $5.34 \pm 1.13$ ;  $P = 0.023$ ) and in "VDRL-MHATP Interpretation" ( $5.48 \pm 1.77$  vs.  $4.73 \pm 1.94$ ;  $P = 0.001$ ) topics.

**Table 4: Clinical situations. University of Chile. 2012-2016**

The five main reasons for dermatological consultation on daily basis	n (%)
Atopic dermatitis	85 (60,28)
Superficial mycoses	72 (51,06)
Contact dermatitis	67 (47,52)
Warts, herpes simplex, herpes zoster, molluscum contagiosum	52 (36,88)
Acute urticaria	43 (30,50)
Diaper rash	42 (29,79)
Benign skin tumors: Cysts, lipomas, seborrheic keratosis	42 (29,78)
Acne	40 (28,37)
Scabies	39 (27,66)
Child and adult seborrheic dermatitis	34 (24,11)
Superficial and deep (nonlymphatic) pyoderma	27 (19,15)
Acute infantile prurigo, insect sting	26 (18,44)
Skin cancer (basal cell and epidermoid)	23 (16,31)
Drug skin reactions: Rash, fixed drug eruption	22 (15,60)
Rosacea	21 (14,89)
Psoriasis	20 (14,18)
Sexually transmitted diseases	18 (12,77)
Pediculosis	16 (11,35)
Alopecia	14 (9,93)
Infantile cutaneous hemangiomas	6 (4,26)
Lichen planus	6 (4,26)
Pyogenic granuloma	5 (3,55)
Gilbert's pityriasis rosea	4 (2,84)
Chronic cutaneous lupus erythematosus (discoid lupus)	4 (2,84)
Minor polymorphic erythema	4 (2,84)
Photodermatitis	3 (2,13)
Bazill erythema nodosum/indurated erythema	3 (2,13)
Premalignant tumors: Actinic keratoses, Bowen disease	2 (1,42)
Malignant melanoma	2 (1,42)
Pemphigus	1 (0,71)
Cutaneous lymphomas	1 (0,71)
Vitiligo	0 (0)

University of Chile. 2012-2016

When the perception about having the ability to raise differential diagnoses in various clinical situations was compared, there were no significant differences in any of the proposed categories. However, the trend toward a better performance by graduates of the UCh was maintained.

### Comparison of physicians who graduated from Chilean universities versus physicians graduated from other international universities subscribed to the "Synthesis of Knowledge in Medicine-Medichi" platform

Statistical comparison was made about the perception of competencies among graduates of Chilean universities versus graduates of foreign universities, regardless of their year of graduation, who were registered in the "Synthesis of Knowledge in Medicine" initiative of the "Medichi" platform.

Before the analysis, the comparability of these groups in demographic terms (Age, gender and graduation year) was evaluated, and no significant differences were found in the selected data (data not showed).

In relation to training certain skills in dermatology during undergraduate study, foreign doctors had a slightly better perception, only statistically significant in "to interpret mycological test of the skin, hair, and nails" (Chilean doctors:  $3.76 \pm 1.94$  vs. Foreign doctors:  $4.17 \pm 1.91$ ;  $P = 0.006$ ).

When comparing how they evaluated their diagnostic capacity with respect to certain clinical situations, a clear tendency could also be observed: Foreign-trained medical doctors tended to perceive that they possessed better differential diagnoses than their Chilean peers. This was statistically significant in 7 clinical situations: *Pigmentation disorders* (Chilean doctors:  $4.55 \pm 1.30$  vs. Foreign doctors:  $4.78 \pm 1.56$ ;  $P = 0.045$ ), *Adverse drug reactions of the skin* (Chilean doctors:  $4.27 \pm 1.43$  vs. Foreign doctors:  $4.93 \pm 1.47$ ;  $P = 0.000$ ), *Scalp lesions* (Chilean doctors:  $4.42 \pm 1.38$  vs. Foreign doctors:  $4.78 \pm 1.59$ ;  $P = 0.002$ ), *Palmoplantar lesions* (Chilean doctors:  $4.23 \pm 1.42$  vs. Foreign doctors:  $4.56 \pm 1.58$ ;  $P = 0.005$ ), *Mucosal lesions (oral, tongue, conjunctival)* (Chilean doctors:  $4.06 \pm 1.39$  vs. Foreign doctors:  $4.64 \pm 1.53$ ;  $P = 0.000$ ), *Female and Male genital lesions* (Chilean doctors:  $4.58 \pm 1.51$  vs. Foreign doctors:  $5.14 \pm 1.51$ ;  $P = 0.000$ ), and *axillary and skin folds lesions* (Chilean doctors:  $4.19 \pm 1.46$  vs. Foreign doctors:  $4.75 \pm 1.57$ ;  $P = 0.000$ ). On the other hand, Chilean doctors perceived a better diagnostic capacity in the topic of "Cutaneous tumors", this difference was statistically significant (Chilean doctors:  $4.87 \pm 1.34$  vs. Foreign doctors:  $4.63 \pm 1.54$ ;  $P = 0.039$ ).

## Discussion

Regarding the participation rate obtained in this work, which was 15.5% in the main target group (UCh physicians generations 2012–2016), it was comparable and even higher than the 12.9% obtained in a study conducted to graduates of medicine in the United Kingdom.<sup>[6]</sup>

When reviewing the answer: *What percentage of patients you see in a daily basis have a problem related to dermatology?* Skin diseases represented a common and transversal reason for consultation in the clinical practice and were between 1 and 25% of daily appointments. This was consistent with literature available in Chile, where 6.3% of the primary care consultation focuses on dermatological pathology<sup>[7]</sup> but is lower than other countries, for example in Australia was 11%,<sup>[8]</sup> or in India, where in some studies showed dermatological consultation in primary care were up to 17%,<sup>[9]</sup> or even higher, like in the UK and Wales,<sup>[10]</sup> showing that dermatology was

**Table 5: Skill perception**

Questions	Grade (± ds)		Statistic analysis	
	U CHILE (141)	Other Chilean university (124)	t-test	P
In your opinion, how do you assess your dermatology knowledge and skills acquisition during undergraduate training?				
To perform a complete history with dermatological emphasis	5,66±1,15	5,34±1,13	2,29	0,023*
To perform physical examination of skin and integuments	5,48±1,13	5,30±1,19	1,28	0,200
To perform, interpret, and use the scraping	3,08±1,83	3,08±1,72	-0,01	0,990
To interpret gram and culture	4,67±1,88	4,60±1,84	0,30	0,764
To interpret direct mycology of skin, hair and nails	4,01±1,93	3,63±1,92	1,62	0,106
To interpret Patch Test	3,84±1,85	3,66±1,90	0,79	0,430
To interpret Tzanck Test	2,91±1,80	2,90±1,90	0,06	0,956
To interpret VDRL-MHATP	5,48±1,77	4,73±1,94	3,30	0,001*
How do you evaluate your ability acquired in undergraduate training to make differential diagnoses in the following clinical situations?				
Acneiform eruptions	5,04±1,44	4,73±1,51	1,70	0,090
Erythematous squamous/inflammatory	5,07±1,28	4,91±1,28	1,02	0,311
Skin infectology	5,38±1,31	5,10±1,33	1,71	0,088
Skin tumors	5,09±1,34	4,78±1,38	1,85	0,065
Pigmentation disorders	4,59±1,42	4,60±1,23	-0,05	0,960
Photosensitive dermatoses	4,26±1,42	4,04±1,46	1,21	0,227
Sexually transmitted infections	5,60±1,28	5,30±1,23	1,93	0,055
Adverse reactions to skin medications	4,32±1,51	4,14±1,43	1,01	0,315
Frequent childhood dermatoses	4,91±1,58	4,65±1,56	1,36	0,175
Scalp lesions	4,41±1,46	4,52±1,38	-0,65	0,519
Palmoplantar lesions	4,48±1,39	4,27±1,29	1,27	0,206
Mucosal lesions (oral, tongue, conjunctival)	4,21±1,41	4,06±1,30	0,90	0,371
Female and male genital injuries	4,87±1,56	4,69±1,35	1,01	0,315
Axillary and crease injuries	4,28±1,58	4,27±1,36	0,10	0,922

\*statistically significant

an essential part of primary care consultations. For this reason, in other countries, such as the UK, Spain, and the United States of America dermatological institutions like the *British Association of Dermatologists*, the *Academia Española de Dermatología y Venereología*, and the *American Academy of Dermatology* have created the undergraduate curriculum in dermatology.<sup>[11-13]</sup>

Among the main causes for referrals, therapeutic and diagnostic reasons stood out (61.7% and 55.3%, respectively). However, 47.5% referrals were due to the physician did not know the diagnosis of the patient, what could show a lack of dermatological knowledge, therefore a reason to strengthen the dermatology curriculum for undergraduate students or to strengthen dermatological preceptorships. More than 90% of medical doctors highlighted the importance of dermatological training during their undergraduate period, similar to other study in Brazil, where more than half of the graduates conclude that the relevance of dermatological knowledge is “high,”<sup>[14]</sup> learning by “demonstration with real patients” and working in “clinical case analysis in small groups,” which were the preferred teaching methodologies. However, the results of a similar study conducted in the United States showed their students preferred “interactive reading” methodologies over a closer clinical

experience,<sup>[15]</sup> but it was similar to other study placed in India, where undergraduates preferred case-based learning,<sup>[16]</sup> as well as in other study in Canada,<sup>[17]</sup> being one of most the effective approaches in medical education that helped students to develop various skills such as problem-solving, critical thinking, teamwork, and other communication skills.<sup>[18]</sup> Unfortunately, in the UCh dermatology program, there was no utilization of role-plays or simulators, which also plays a significant role in the development of essential clinical skills,<sup>[19]</sup> and usually students were not exposed to patients outside the faculty to enrich their dermatologic semiology, like in the University of California, San Francisco, where they had great outcomes for the students.<sup>[20]</sup>

In addition, 68.8% of UCh graduates reported that they were satisfied with the education received, which was far from the 87.6% reported in the same US study cited above.<sup>[15]</sup> Regarding the dermatology program satisfaction reported by graduates of other Chilean universities, this was much lower than the expressed by UCh graduates (44.4% vs. 68.8%,  $P = 0.000$ ); the national average was as low as 57.4%.

On another topic, elective internships in dermatology are useful in increasing the confidence of general

practitioners in diagnosing and treating common skin diseases, what could suggest that hours devoted to patient care may improve the professional training of medical students in dermatology. Despite this evidence, only 5.7% of respondents reported performing this activity, and their main motivations were applying for the residency, as their American peers in other study,<sup>[21]</sup> and/or to improve their skills in the area. In addition, 8.5% completed a preceptorship after graduation with the intention to improve their knowledge and skills. Accordingly, the clinical hours in dermatology should not be reduced during the undergraduate course. The results showed the importance given to this training by the students, as well as the demonstrated usefulness they had for better professional performance. Furthermore, they prevented the need for graduates to subsequently “return” to learn what their training lacked.

When making a qualitative analysis of the training received, graduates of UCh had a favourable perception of their preparation in dermatology when asked about the dermatological scenarios presented in the PdC. It was noteworthy that only 3 items of 22 were evaluated as insufficient (ranked below): “To perform, interpret and use scraping” (scored 3.08), “Patch Test interpretation” (scored 3.84) and “Tzanck Test Interpretation” (scored 2.91). When these results were compared against those physicians from other Chilean universities, we could observe that the graduates of UCh perceived themselves better prepared and this was statistically significant in 2 items: “Perform a complete history with dermatological emphasis” ( $P = 0.023$ ) and in “VDRL-MHATP interpretation” ( $P = 0.001$ ). This was partly since medical students at the UCh had the opportunity to study in the largest dermatology and venereology residency training center in the country, and the opportunity to participate in several public hospitals associated to UCh. However, Chilean students were not exposed to practice cryotherapy, not like students from different centers in the United States, where they felt to have a high level of proficiency doing this,<sup>[22]</sup> so this competence was not asked in our study.

Considering the three most frequent diagnoses reported by graduates: Atopic dermatitis (60%), Mycosis (51%) and Contact dermatitis (4%), these were similar to those reported by Zemelman *et al.*<sup>[1]</sup> Mycosis (19%), atopic dermatitis (13.5%) and contact dermatitis (5.8%) in a study conducted at the Tiltil Hospital (rural hospital in Central Chile). The percentages are not comparable since in our project was asked about the five most frequent diagnoses, compared to the previous publication that consulted only for the most frequent diagnosis. When reviewing the perception that medical doctors had in relation to these pathologies, it highlighted that frequent childhood dermatoses, as a group of pathologies where

atopic dermatitis is included, had a score of 4.91 out of 7, showing enough preparation but susceptible to improvement. On the other hand, in reference to mycoses, the group of pathologies within “Cutaneous Infectiology” was better positioned with 5.38 out of 7, being the second-best rated subject by the surveys, which was translated as a good perception from the graduates.

Finally, a comparison was made between the medical doctors registered in SCM who had studied in Chile versus the physicians who studied abroad. It was noteworthy that in most of the items evaluated, foreign doctors tended to feel better trained than their Chilean counterparts, being significant in 7 of 22 items. On the other hand, physicians trained in Chile reported that they perceived themselves better prepared only in “Cutaneous tumors.” It was difficult to try to find a cause for this very noticeable difference because it would be necessary to know in detail the type of training received in each foreign medical school to see if they could be comparable. It would be interesting to see the time and activities of the dermatology training of the international graduates having a longer work experience than their national colleagues could explain this situation, but the latter was ruled out when no significant differences were found when comparing the year of graduation.

Among the possible limitations of this investigation, it is worth mentioning the low participation of the selected population, although there are publications with similar or lower participation rates.<sup>[6]</sup> In addition, there could be a possible participation bias due to interest or disinterest over the topics addressed. Another important limitation was that the universe of our participants was a database that may not adequately represent the group of doctors practicing in the country. Inclusion in the database was voluntary, and not all physicians would necessarily be well represented, which could represent an inclusion bias. However, in the case of UCh graduates, they were all part of the SCM database. This tends to strengthen the conclusions in relation to the School of Medicine of UCh, which was our main objective. Comparisons with other graduates in the database were only made to provide an orientation to our overall conclusions.

In relation to dermatology pedagogy research and projections, this work, being the first of its kind, laid the groundwork for a study through clinical vignettes which could address the diagnostic and therapeutic coping capacity of recent graduates versus doctors who have been practicing for many years, or among other groups of interest. The second step of this research would be to carry out a study that includes a section where the diagnostic and therapeutic capacity is measured through clinical cases, which would help us to more objectively confirm the perceptions that have been obtained.



## Conclusions

The main findings of this research showed an important set of indicators to evaluate the quality and relevance of medical training in dermatology taught at the School of Medicine of UCh from the graduates' point of view. This represents a valuable source of information that is generally not available, mainly due to the methodological difficulties presented by graduate follow-up studies.

Medical doctors who trained at the UCh between 2012 and 2016 generally considered their undergraduate training in dermatology to be satisfactory in terms of the acquisition of clinical skills. On the other hand, we must emphasize that graduates of the UCh perceive themselves slightly better prepared than their colleagues from other Chilean universities, especially in relation to the topic of Sexually Transmitted Infections. Therefore, UCh put the infrastructure and the human resources available for students to be able to train general practitioners who have the best skills in consultation for cutaneous pathology. This project will contribute to improvements in the weak perceived aspects of the training at UCh and consolidate the strengths that UCh medical doctors present in the dermatological field, being a source of inspiration for further research on the undergraduate teaching of this specialty.

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## Conflicts of interest

There are no conflicts of interest.

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