

Patterns of Skin Disease in a Canadian Prison Population: a Retrospective Study

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1 **Abstract**

2 **Background**

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4 Dermatology in incarcerated citizens is under-researched. To the best of our knowledge, there are no
5 studies examining skin diseases in prisoners in Canada. Our objectives were: 1) to analyse the most
6 common referred skin diseases affecting the inmates of Correctional Service Canada in Ontario,
7 Canada, 2) to assess the value of teledermatology in this setting, and 3) to recommend potential system
8 improvements.

10 **Methods**

11 An observational, cross-sectional, retrospective chart review of inmate patients seen from 2008 until
12 2013 was performed. Two groups of patients were analyzed: those assessed in-person, and those
13 evaluated by store-forward teledermatology.

15 **Results**

16 In the in-person patient group, the 3 most common diagnoses were acne vulgaris, psoriasis, and
17 seborrheic dermatitis. For the teledermatology group, the 3 most frequent diagnoses were acne
18 vulgaris, psoriasis, and dermatophyte infection. There was a clear bias towards more inmates being
19 seen in-person where the service was provided (Collins Bay Institution) than from other correctional
20 institutions in Eastern Ontario.

22 **Interpretation**

23 The majority of skin diseases that affected the incarcerated population studied were common
24 afflictions, similar to the general population, which is in agreement with other studies. There is an
25 opportunity to provide improved dermatologic care for this patient population by further utilizing

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26 teledermatology and by having a dermatologist visit various institutions to reduce inmate transport.
27 Limitations of this study include that the study population was restricted to adult male inmates of
28 Correctional Service Canada in Ontario, Canada, who were referred to dermatology by a prison
29 physician.

31 **Keywords**

- 32 • Vulnerable population
- 33 • Prison
- 34 • Correctional Service Canada
- 35 • Dermatology

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37 **Introduction**

38 Dermatology in vulnerable populations is under-researched. When focusing on the incarcerated
39 population, there are few studies that have described skin disease in prisoners. To the best of our
40 knowledge, only one of these studies was from North America, and none examined the Canadian
41 inmate population.

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43 In 2008, Bayle et al. studied the prison population in Toulouse, France. Of the 178 men who were seen
44 in a 12-week period, they found the 5 most frequent diagnoses to be disorders of the pilosebaceous
45 follicle, fungal diseases, benign skin tumors, warts, and eczemas. They also evaluated the impact of the
46 skin disease on the prisoner's life, and found that most (72%) felt that their skin disease was related to
47 their detention. [1]

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49 Oninla et al. reported specifically on skin infections and infestations in prison inmates in Nigeria.

50 Almost half of all inmates acquired infectious dermatoses, including dermatophytes (64%), pityriasis
51 versicolour (27%), bacterial infections (3. 4%), and others (5. 6%). [2] A second study analyzing the
52 same inmate population found a significant relationship between overcrowding and the development of
53 skin infections, suggesting that prison conditions likely facilitate the pattern of dermatoses. [3]

54
55 Coury and Kelly reviewed the skin conditions seen in a dermatology referral clinic for inmates in the
56 Texas Department of Criminal Justice System. The three most common diagnoses in this outpatient
57 prison population included (in descending order): psoriasis, actinic keratosis, and hair diseases. [4]

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59 More recently, there have been two studies that have analyzed the dermatologic skin conditions found
60 in male and female inmate populations, respectively. A cross-sectional study on dermatological

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61 diseases among male prisoners in Italy, found the most common diseases were nonspecific dermatitis,
62 acne, mycosis, and scabies. [5] Furthermore, associations of skin diseases with substance addiction
63 status and age were identified, as well as an association between the length of detention and the rate of
64 dermatological disease. [5]

66 Kocaturk et al. analyzed the prevalence of skin diseases and the psychological impact of these
67 conditions on female prisoners in Turkey. Over a 6-week period, acne was the most prevalent condition
68 (34%), followed by hair loss (19%), dry skin (16%), and eczema (12%). They concluded that prisoners
69 might have common skin conditions similar to the general population. [6]

71 To the best of our knowledge, there are currently no published studies that have examined the
72 prevalence of skin disease in the Canadian incarcerated population. The objective of this study was to
73 investigate the most common skin diseases affecting male inmates in Correctional Service Canada
74 institutions in Eastern Ontario, Canada.

76 **Methods**

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78 Ethics approval was obtained from both the Ottawa Hospital Research Ethics Board and Correctional
79 Service Canada. Starting in May 2008, six dermatology clinics per year were conducted only at Collins
80 Bay Institution (CBI) (Kingston, Ontario, Canada). Consultation requests were placed by referring
81 prison physicians. Patients were escorted and transported to and seen at Collins Bay Institution from
82 any of the following Eastern Ontario institutions to attend their dermatology appointment: the former
83 Kingston Penitentiary, Bath Institution, Millhaven Institution, Pittsburgh Institution, Frontenac
84 Institution, Regional Treatment Centre, and Joyceville Institution. Inmates at CBI were escorted to
85 their appointments, but there was no transport of prisoners beyond the prison confines. Table 1
86 summarizes the facility characteristics of the institutions involved; the capacities listed approximate
87 those at the time of consultation. [7,8]

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89 An additional subset of patients was seen in store forward teledermatology from the non-CBI
90 institutions plus the more distant Warkworth Institution (Ontario, Canada). In store forward
91 teledermatology, the dermatologist examines clinical photographs of patients that accompany a history
92 provided by the referring physician, which are sent over a secure internet connection. The
93 dermatologist then provides written descriptions, and diagnostic and therapeutic instructions to the
94 referring physician. There is no direct interaction between the dermatologist and the patient and there
95 is no transport of prisoners outside of their host institutions.

96
97 In Canada, essential physician services are paid for by governments (federal inmates are insured by the
98 federal government), therefore patients evaluated in both in-person consultation and by
99 teledermatology had access to care, free of charge. The study patient population was limited to males

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3 100 18 years of age or older, with a sentence of two years or longer, as the correctional facilities included in
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5 101 this study exclusively housed this demographic. It is noteworthy that all patients were evaluated by a
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7 102 single dermatologist, and no other dermatology consultation service was provided to this population
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10 103 over this timeframe.

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14 105 The charts of all patients who had an in-person dermatology or teledermatology assessment while they
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17 106 were inmates at a federal correctional facility between May 1, 2008 and June 30, 2013 were reviewed
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19 107 for this observational, cross-sectional study. For every patient, each new diagnosis was recorded. As
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21 108 there may be less certainty in diagnoses made through teledermatology, the in-person and the
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24 109 teledermatology groups were analyzed separately in order to determine the most frequent dermatologic
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26 110 conditions. When a patient was evaluated in both in-person consultation and via teledermatology for
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29 111 the same diagnosis, the diagnosis was only recorded for the first encounter (either in-person or
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31 112 teledermatology). However, when a patient was evaluated in both in-person consultation and via
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33 113 teledermatology for different diagnoses, each of these diagnoses was recorded separately (depending
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36 114 on where each diagnosis was made).

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40 116 To assess the most frequent dermatologic conditions, similar diagnoses were grouped together (Table
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43 117 2). In addition, the five most common specific diagnoses were reported.

44 45 118 46 47 119 **Results**

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49 121 A total of 320 patients were assessed. Table 3 summarizes demographic data on the patient population.
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52 122 258 patients were seen exclusively in-person, 60 were evaluated exclusively through teledermatology,
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54 123 and 2 patients were assessed in both settings with different diagnoses made in each type of encounter.
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57 124 Each patient received an average of 1.5 dermatologic diagnoses (range 0-6), and were seen an average
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59 125 of 1.5 times (range 1-16) times.
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5 127 In the in-person patient group, a total of 401 dermatologic diagnoses were provided, whereas 85
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7 128 diagnoses were given to teledermatology patients. In the in-person patient population, the 3 most
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10 129 frequent diagnostic groupings were dermatitis (73), acneiform eruptions (68), and benign neoplasms
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12 130 and hyperplasias (52), whereas in the teledermatology population acneiform eruptions (17), dermatitis
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14 131 (15), and infections (8) were the three most commonly encountered groupings. Table 4 outlines the
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17 132 frequency of the grouped dermatologic diagnoses.

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21 134 With respect to the specific dermatologic diagnoses, acne vulgaris (61), psoriasis (45), and seborrheic
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24 135 dermatitis (19) were the top three diagnoses in the in-person population. Acne vulgaris (12), psoriasis
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26 136 (6), and dermatophyte infection (5) were the three most common specific diagnoses in the
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29 137 teledermatology population. This data is summarized in Table 5.

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33 139 Of the 258 in-person new encounters, 117 (45.3%) of these were performed at CBI, yet this institution
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36 140 where the dermatology service was provided, housed only 225 of the 2965 (7.6%) inmates in Eastern
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38 141 Ontario federal prisons.

42 143 **Interpretation**

43 144
44 145 Previous studies have found that prisoners are mostly afflicted by common skin diseases and skin
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47 146 infections. [1-6] Our results support these conclusions. When comparing our grouped dermatologic
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49 147 diagnoses, others have also found that dermatitis [1,5,6,10], acneiform eruptions [1,3,5,6,10], benign
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52 148 neoplasms and hyperplasias [1], and infections [1,2,3,5,10], were among the most frequently diagnosed
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54 149 dermatologic diseases. The most common specific diagnoses including: acne vulgaris [1,3,5,6,10],
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56 150 psoriasis [1,4], seborrheic dermatitis [1,3], and dermatophyte infection [1,2,3,5], were also comparable
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59 151 to previous reports.
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Although the most frequent dermatologic diagnoses in the in-person population and the teledermatology population were analyzed separately, the results of the two groups were comparable. Specifically, for the grouped diagnoses; dermatitis, acneiform eruptions, and benign neoplasms and hyperplasias, were the 3 most frequently seen in the in-person group, whereas acneiform eruptions, dermatitis, and infections were the 3 most frequent in the teledermatology group. However, if this is extended to the 4 most frequent diagnoses, they are identical. An explanation why more benign neoplasms and hyperplasias were diagnosed in the in-person group versus the teledermatology group might have been because the referring physician was concerned about possible malignancy in a lesion and preferred to have it assessed in-person. With respect to the specific diagnoses, psoriasis and seborrheic dermatitis were the 2 most frequent diagnoses in both groups.

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Although these diagnoses are common in the non-incarcerated population, some factors in the prison environment may contribute. Bayle et al. suggested that stress in the prison environment and smoking may contribute to the high frequency of disorders of the pilosebaceous unit. [1] The smoking habits of our study population were not assessed. In addition, age, substance addiction, and length of detention have been associated with dermatologic disease. [5] Finally, some studies have suggested that personal hygiene and overcrowding may play a role. [2,3,5,10] Brauner and Goodheart highlighted some of the potential difficulties executing dermatologic treatments in prisoners, including limitations to the dosing frequency of pills and the dispensing of topical compounds, or the use of harsh soaps and skin care products. [10] Furthermore, in the Eastern Ontario correctional facilities, there is a limited formulary of available products.

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3 175 Collins Bay Institution, where all of the in-person dermatologic assessments were performed, housed
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5 176 7.6% (225/2965) of prisoners in Eastern Ontario federal institutions (see Table I), but 45.3% (117/258)
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7 177 of the in-person encounters occurred at CBI. (see Table III). This may indicate a referral bias. Because
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10 178 of concerns with inmate transport and security and complexities of communication between
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12 179 institutions, it may be that the “in-house” inmates at CBI inadvertently received increased dermatologic
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14 180 care and that inmates in other institutions were relatively underserved.
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19 182 The concept that teledermatology is an effective tool to provide care to vulnerable populations is not
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21 183 novel. [9] Coates et al. reviewed the accuracy and reliability of teledermatology, and suggested that
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23 184 outcomes were comparable to live encounters. [11] This study supports the use of teledermatology to
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25 185 manage skin disease in prisoners. Teledermatology could be a cost savings means of providing health
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28 186 care. For example, prisoners not housed at Collins Bay Institution were required to travel with escorts
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31 187 to CBI for in-person dermatology appointments. There are also safety concerns with transporting
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33 188 prisoners outside of the institutions. The most common dermatologic conditions treated in our study
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35 189 would likely be amenable to teledermatology, thereby decreasing costs and increasing security.
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40 191 There are several limitations to this study. While, to our best knowledge, this is the first attempt to
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42 192 characterize the dermatologic disease seen in the incarcerated population in Canada, the population
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45 193 examined is strictly adult males in Ontario facilities. A broader study examining both males and
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47 194 females across Canada might provide more generalizable data. In addition, the majority of patients
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50 195 included were from Collins Bay Institution, which may have skewed the results towards one population
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52 196 of inmates. Furthermore, only inmates referred for dermatologic consultation were included, therefore
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54 197 the sample was not randomized and the incidence or prevalence of dermatologic disease in the
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56 198 incarcerated population cannot be calculated. In addition, any skin diseases treated successfully by
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199 other physicians, such the prison physician, would not have been included. Likely this would bias our
200 studies' results to capture more complex or treatment resistant skin diseases.

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202 In conclusion, the skin diseases that affected the federally incarcerated population in Ontario, Canada
203 were in general common skin diseases, which is in agreement with other studies. Teledermatology
204 provides a useful means of delivering dermatologic care to this vulnerable population, and it's use
205 could be expanded. Thirdly, it could be of value to move the dermatologist to various correctional
206 institutions, rather than moving the inmates, in order to provide higher quality and safer service at a
207 lower cost.

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Abbreviations

CSC: Correctional Service Canada

CBI: Collins Bay Institution

Other Information

Conflicts of Interest: This study was not funded. JW was contracted by CSC during the study time frame as a consultant dermatologist. GG and AM have no conflicts of interest to declare.

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246 Tables

247 **Table I - Institutions**

	Security Level	Approximate Capacity*
Kingston Penitentiary	Maximum	500
Collins Bay Institution	Medium	225
Bath Institution	Medium	330
Millhaven Institution	Maximum	430
Pittsburgh Institution	Minimum	200
Frontenac Institution	Minimum	150
Joyceville Institution	Medium	450
Regional Treatment Centre	Multi-level	143
Warkworth Institution	Medium	537
TOTAL		2965

*The capacities listed approximate those at the time of consultation. [7,8]

Table II - Dermatologic diagnostic groupings

Acneiform Eruptions:	Disorders of the Mouth:	Mechanical Injuries and Wound Care:
<ul style="list-style-type: none"> •Acne Vulgaris •Hidradenitis Suppurativa •Perioral Dermatitis •Rosacea 	<ul style="list-style-type: none"> •Chelitis •Epulis •Fordyce Spot •Glossodynia •Mucocoele 	<ul style="list-style-type: none"> •Callus •Excoriation (Compulsive) •Wound and Ulcer
Benign Neoplasms and Hyperplasias:	Hair Disorders:	Miscellaneous Inflammatory Disorders:
<ul style="list-style-type: none"> •Acrochordon •Angiofibroma: Pearly Penile Papule •Angiokeratoma •Angiolipoma •Becker's Nevus •Benign Melanocytic Nevus •Cherry Hemangioma •Cyst (Epidermal) •Cyst (Pilar) •Cyst (Sclerosed) •Dermatofibroma •Dermatosis Papulosa Nigra •Keloid •Lipoma •Pyogenic Granuloma •Scar •Sebaceous Hyperplasia •Seborrheic Keratosis •Vascular Malformation 	<ul style="list-style-type: none"> •Cicatricial Alopecia •Folliculitis •Folliculitis Decalvans •Keloid (Acne Keloidalis Nuchae) •Keratosis Pilaris •Non-cicatricial Alopecia •Perifollicular Inflammation •Pseudofolliculitis •Pseudofolliculitis (Barbae) 	<ul style="list-style-type: none"> •Granuloma Annulare •Lichen Planus •Lichen Nitidus •Lichen Sclerosus •Pityriasis Rosea
	Ichthyosis:	Nail Disorders:
	•Ichthyosis Vulgaris	•Nail Loss
	Infections:	Pigmentary Disorders:
	<ul style="list-style-type: none"> •Abscess •Bacterial (Secondary) •Dermatophyte •Human Papilloma Virus •Scabies •Tinea Versicolour •Viral •Yeast 	<ul style="list-style-type: none"> •Confluent and Reticulated Papillomatosis •Dermatoheliosis •Melasma •Post-Inflammatory Hyperpigmentation •Vitiligo
Dermatitis:	Internal Diseases (Autoimmune, Endocrine, Genetic, Metabolic, Rheumatologic):	Precancerous Lesions and Cutaneous Carcinomas:
<ul style="list-style-type: none"> •Atopic Dermatitis •Contact Dermatitis •Dermatitis •Dyshidrotic Dermatitis •Hand Dermatitis •Lichen Simplex Chronicus •Neurodermatitis •Nummular Dermatitis •Prurigo Nodularis •Seborrheic Dermatitis •Stasis Dermatitis 	<ul style="list-style-type: none"> •Acanthosis Nigricans •Dermatitis Herpetiformis •Hypertension (Venous or Lymphatic) •Neurofibromatosis Type 1 •Sarcoidosis •Ulcerative Colitis associated Pustular Eruption •Vasculitis (Small Vessel) •Xanthelasma 	<ul style="list-style-type: none"> •Actinic Keratosis •Basal Cell Carcinoma •Dysplastic Nevus •Malignant Melanoma •Squamous Cell Carcinoma
		Psoriasis:
		•Psoriasis
		Urticaria:
		<ul style="list-style-type: none"> •Dermographism •Urticaria (Cholinergic) •Urticaria (Cold) •Urticaria (Drug) •Urticaria (Idiopathic) •Urticaria (Pressure) •Urticaria (Solar) •Urticaria (Viral)

255 **Table III - Demographic data**

	Demographic data
Total Number of Patients	320
•Patients seen only in in-person encounters	258
•Patients seen only in teledermatology	60
•Patients seen in both in-person and teledermatology (for different diagnoses)	2
Age:	
•Average Age	38. 8 years (Range 20-89)
•Median	36 years
•Mode	30 years
Skin Phototype:	
•1-3	150
•4-6	97
•Not Recorded	73
Institutions:	
•Kingston Penitentiary	17
•Collins Bay Institution	117 (all in-person)
•Bath Institution	34
•Millhaven Institution	30
•Pittsburgh Institution	15
•Frontenac Institution	33
•Joyceville Institution	27
•Regional Treatment Centre	2
•Warkworth Institution	40
•Not Recorded	5
Number of Encounters per Patient (Average)	1. 5 (Range: 1-16)
Number of Diagnoses per Patient (Average)	1. 5 (Range 0-6)

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257 **Table IV - Frequency of grouped dermatologic diagnoses**

Grouped Dermatologic Diagnoses	Number of Cases	
	In-Person	Teledermatology
Acneiform Eruptions	68	17
Benign Neoplasms and Hyperplasias	52	7
Dermatitis	73	15
Disorders of the Mouth	6	2
Hair Disorders	29	6
Ichthyosis	3	1
Infections	48	8
Internal Diseases	12	2
Mechanical Injuries and Wound Care	13	0
Miscellaneous Inflammatory Disorders	15	5
Nail Disorders	2	3
Pigmentary Disorders	8	5
Precancerous Lesions and Cutaneous Carcinomas	19	7
Psoriasis	45	6
Urticaria	8	1

Grouped Dermatologic Diagnoses	Number of Cases	
	In-Person	Teledermatology
Total	401	85

Table V - Most common specific dermatologic diagnoses

Rank	In-Person		Teledermatology	
	Specific Diagnoses	Number of Cases	Specific Diagnoses	Number of Cases
1	Acne Vulgaris	61	Acne Vulgaris	12
2	Psoriasis	45	Psoriasis	6
3	Seborrheic Dermatitis	19	Dermatophyte	5
4	Pityriasis Versicolour Contact Dermatitis	17	Atopic Dermatitis Lichen Planus	4
5	Human Papilloma Virus	16	Actinic keratosis Basal cell carcinoma Nail loss Rosacea Seborrheic dermatitis	3

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Authors should specify, in the acknowledgements section, contributions to the paper that should be recognized but do not justify authorship, for example critical review of the study proposal or assistance with statistical analysis. The *Canadian Medical Association Journal (CMAJ)* requires that these people give their written permission for their names to appear in print.

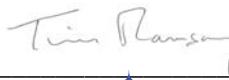
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