

## Report

# The association between question type and the outcomes of a Dermatology eConsult service

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**Introduction**

Access to specialist care is a point of concern for primary care providers (PCPs) and their patients in Canada.<sup>1,2</sup> There is an annual increase in the number of Canadians being referred to a specialist.<sup>3</sup> In the province of Ontario alone, approximately 54,000 consults are referred to specialists each day.<sup>4</sup> This has dramatically extended the wait time from referral by a PCP to consultation with a specialist from 3.7 weeks in 1993 to 8.5 weeks by 2015. Similarly, the median wait time from a specialist's consultation to treatment increased significantly from 9.3 weeks in 1993 to 18.3 weeks in 2015.<sup>5</sup> Currently, Canada holds the dubious honor of the second longest average wait time to see a specialist.<sup>6</sup> The lengthy wait time for a specialist consultation is not a benign inconvenience. It can result in

**Abstract**

**Background** eConsult is a web based service that facilitates communication between primary care providers (PCPs) and specialists, which can reduce the need for face-to-face consultations with specialists. One example is the Champlain BASE (Building Access to Specialist through eConsultation) service with dermatology being the largest specialty consulted.

**Methods** Dermatology eConsults submitted from July 2011 to January 2015 were reviewed. Post eConsult surveys for PCPs were analyzed to determine the number of traditional consults avoided and perceived value of eConsults. The time it took the PCP to receive a reply and the amount of time reported by the specialist to answer eConsult were proactively recorded and analyzed. A subset of 154 most recent eConsults was categorized for dermatology content and question type (e.g. diagnosis or management) using a validated taxonomy.

**Results** A total of 965 eConsults were directed to dermatology from 217 unique PCPs. The majority of eConsults (64%) took the specialist between 10 and 15 minutes to answer. The overall value of this service to the provider was rated as very good or excellent in 95% of cases. In 49%, traditional in-person assessments were avoided. In the subset of the most recent cases, diagnosis was the most common question type asked (65.2%) followed by management (29%) and drug treatment (10.6%). The top five subject areas (40%) were: Dermatitis, Infections, Neoplasm, Nevi, and Pruritus.

**Conclusion** eConsults was feasible and well received by PCPs, which improves access to dermatology care with a potential to reduce wait times for traditional consultation.

significant negative psychological and functional impacts on patients' well-being. These include but are not limited to patients with serious undiagnosed or suboptimally managed diseases and effects on their daily functioning.<sup>7,8</sup> The Fraser Institute demonstrated worsening of all-cause morbidity and mortality with increased wait times in both males and females.<sup>9</sup>

In an effort to improve access to care, alternatives to traditional consultation have been explored such as telephone consultation, live video conferencing, and email consultation. However, each alternative has its own limitations including the need for providers to synchronize their schedules and failure to meet privacy and security standards respectively.<sup>10,11</sup> To overcome these limitations and improve access to specialty expertise for patients and providers, electronic consultation (eConsult) services have been developed. eConsults provide asynchronous,

consultative, provider-to-provider communications within a shared electronic health record (EHR), or web-based platform.<sup>12</sup> These systems allow PCPs to electronically submit a consult to a specialist who can provide advice without the need for a face-to-face consultation. This approach has been implemented successfully in several jurisdictions in other parts of the world including New Zealand and the United States.<sup>13–17</sup> A recent systematic review examined 36 peer-reviewed articles from single and multispecialty based telemedicine systems based in the United Kingdom, United States, Finland, Netherlands, Ireland, Spain, and Colombia. The majority of the studies was conducted in the United States and evaluated the impact of a single-specialty based telemedicine system, commonly dermatology. Overall, telemedicine has shown to decrease wait times and improve access to specialist care with high patient satisfaction.

Although a number of published studies have evaluated efficiency and effectiveness of a dermatology telemedicine system, they were primarily from the United States, and clinical topics and question type asked through the telemedicine system were rarely evaluated.<sup>12</sup> To date, no specific analysis has been undertaken to further delineate the nature of dermatology telemedicine consults in Canada.

In this study, we describe the use and impact of the Champlain BASE (**B**uilding **A**ccess to **S**pecialists through **e**Consultation) eConsult service in the field of dermatology, highlighting its impact on the need for face-to-face consultations, provider satisfaction, and feasibility. Furthermore, we characterize each dermatology eConsult to determine the most common clinical topics and types of questions asked by PCPs, in attempt to better understand clinical problems faced by PCPs with the potential to inform need-driven Continued Medical Education (CME) events.

## Materials and methods

The project was approved by the Ottawa Health Science Network – Research Ethics Board (OHSN – REB). All the eConsult cases directed to dermatology specialists using the Champlain BASE Service from July 1, 2011, to January 31, 2015, were reviewed. Two dermatologists who had been in independent practice for over 77 combined years (range 32–45 years) answered all dermatology eConsults.

### Setting

The majority of cases were from the Champlain Local Health Integration Network, which is a large health region located in Eastern Ontario, Canada. This catchment area of 17,600 square miles serves 1.2 million people.<sup>18</sup>

### Champlain BASE eConsult service

The Champlain BASE service, launched as a proof of concept in 2010, is now considered one of the largest multispecialty telemedicine services worldwide. As of May 2016, the service

has completed over 15,000 eConsults across 84 different specialties. The Champlain BASE service uses a secure web-based platform that allows PCPs to consult various specialties asynchronously. The service is used for nonurgent consultations. Details of the design and integration specifics can be found in a previous publication.<sup>11</sup>

Using a secure web-based tool, the PCP submits a specific patient question to a specialty along with the patient's demographic information, medical history, and the reason for consultation. The PCP may decide to include diagnostic images, laboratory test reports, pictures, or any other information that may aid the specialist in understanding the problem and help the PCP in expressing the reason for consultation. Once the eConsult is submitted, a case is assigned to a specialist based on availability/rotation, resulting in a notification email to that specialist, with the expectation that it will be completed within 7 days. The specialist may respond with clinical advice, request for additional information if necessary, or suggest that the patient be referred for a face-to-face consultation.<sup>19</sup> There is an opportunity for back-and-forth asynchronous dialogue between the specialist and PCP using the eConsult service, until the PCP decides to close the case. Once a case is closed, the PCP is presented with a brief close out survey.

### Data collection and analysis

A secure, encrypted database containing all dermatology eConsults completed between the periods of July 1, 2011, to January 31, 2015, was created and maintained by the project manager. Access to the database was limited to study investigators. A total of 965 dermatology eConsults were received between November 2011 and January 2015 and included in the overview.

Following each eConsult, the PCP completed a mandatory survey. The PCP could not close a case and receive a transcript of the consultation without completing the survey. The survey was comprised of five questions (Table 1). Questions ranged from assessing the value of the eConsult service to determining whether a referral was avoided as a result of the eConsult.

The time it took the PCP to receive a reply (response time) and the amount of time reported by the specialist to complete each eConsult was recorded and analyzed. The specialist was given four time frames to choose from: fewer than 10 minutes, 10–15 minutes, 15–20 minutes, and more than 20 minutes.

Of the total of 965 eConsults received, a subset of the most recent 154 dermatology eConsults received between October 2014 and January 2015 were reviewed and categorized retrospectively by clinical topic and type of question by two raters.

A predefined list of clinical topics (based on modification of the International Classification for Primary Care [ICPC-2] taxonomy) and types of questions (based on validated taxonomy) asked by the PCPs was created. A total of 56

**Table 1** Mandatory post eConsult survey for PCPs - Detailed questions and answers

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Q1: Which of the following best describes the outcome of this eConsult for your patient:

- 1 I was able to confirm a course of action that I originally had in mind
- 2 I got good advice for a new or additional course of action
- 3 I did not find the response very helpful
- 4 None of the above (please comment)

Q2: As a result of this eConsult, would you say that:

- 1 Referral was originally contemplated but now avoided at this stage
- 2 Referral was originally contemplated and is still needed –this eConsult likely leads to a more effective visit
- 3 Referral was not originally contemplated and is still not needed – this eConsult provided useful feedback/information
- 4 Referral was not originally contemplated, but eConsult process resulted in a referral being initiated
- 5 There was no particular benefit to using eConsult in this case
- 6 6.Other (please comment)

Q3: Please rate the overall value of the eConsult service in this case for your patient:  
Minimal 1 2 3 4 5 Excellent

Q4: Please rate the overall value of the eConsult service in this case for you as a primary care provider:  
Minimal 1 2 3 4 5 Excellent

Q5: We would value any additional feedback you provide

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different clinical topics were included (Table 2). There were five general question types including: diagnosis, management, drug treatment, procedure, and nonclinical. The general question types were further subdivided into a total of 12 specific types of questions (Fig. 1).

To ascertain agreement on the categorization of each eConsult, a random selection of 20 eConsults were independently reviewed by two specialists. Disagreements between the specialists were resolved through re-reviewing and discussing the eConsult in detail until agreement was achieved. All data were exported into an Excel database (Microsoft Excel 2013) for analysis.

## Results

Of the 5597 eConsults submitted to the service, 965 (17.2%) were directed to Dermatology. Dermatology was the largest specialty consulted. A total of 217 different PCPs consulted the Dermatology service during the study period, comprised of 174 (80.1%) physicians and 43 (19.9%) nurse practitioners. The majority of patients included in the study was female (58.5%) with a mean age of  $40.7 \pm 24.1$  years (range 0.1–98 years old).

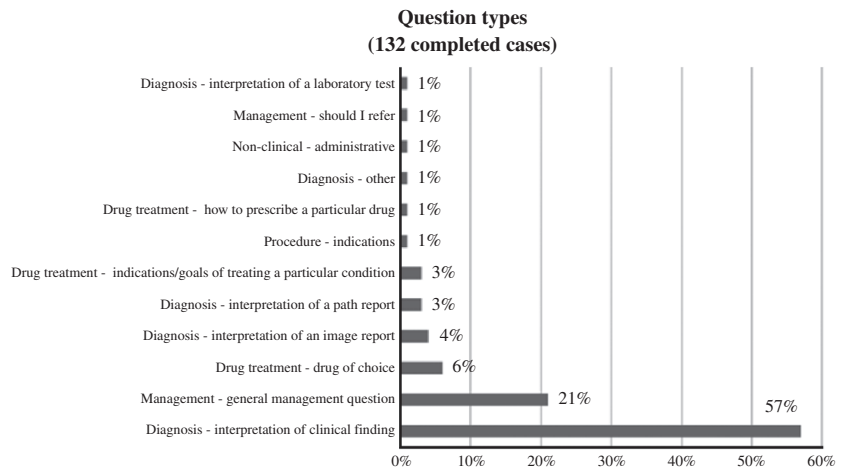
### Time efficiency, specialist time

In 64% ( $n = 618$ ) of eConsults, dermatologists took between 10 and 15 minutes to answer Nineteen percent ( $n = 181$ ) of cases

**Table 2** List of clinical topics inquired through dermatology eConsults

Content topic	Number of eConsults
Dermatitis (e.g. eczema, contact, irritant, seborrheic, etc.)	19
Infections (bacterial, fungal, viral, other)	17
Neoplasms other than nevi (benign, malignant)	12
Nevi	11
Pruritus	10
Acneiform diseases (e.g. acne, folliculitis, rosacea)	8
Seborrheic Keratosis	8
Urticaria (including bites)	7
Pigmentation disorders	5
Papulosquamous diseases (e.g. Psoriasis)	5
Herpes Simplex	4
Nail diseases	4
Cutaneous markers of systemic disease	3
Psoriasis	2
Basal Cell Carcinoma	2
Neurodermatitis	2
Bowen's Disease	2
Transient Neonatal Pustular Melanosis	1
Prurigo Nodularis	1
Peri-orificial/perioral dermatitis	2
Impetigo	1
Herpes Zoster	1
Patch testing	1
Keratosis Pilaris	1
Pityriasis Amiantacea	1
Lichen Planus	1
Aphthous Ulcers	1
Lyme disease	1
Angioedema	1
Melanonychia striata	1
Bullous Pemphigoid	1
Melasma	1
Molluscum Contagiosum	1
Acne Conglobata	1
Pityriasis Rosea	1
Granuloma Annulare	1
Hair Diseases	1
Grover's Disease	1
Scar	1
Erythrasma	1
Vascular Diseases	1
Tinea Capitis	1
Vitiligo	1
Hyperhidrosis	1
Vasculitis	1
Nevus Sebaceous	1
Mucocele	1
Fungal KOH and culture	1
Other	1

required less than 10 minutes, and 17% ( $n = 160$ ) required between 15 and 20 minutes for dermatologists to respond. In 0.6% ( $n = 6$ ) of cases, dermatologists required more than 20 minutes to complete.



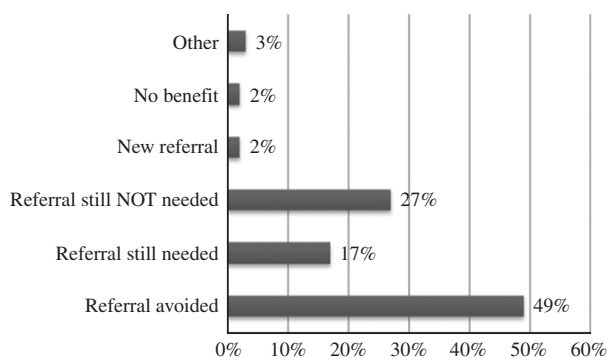
**Figure 1** Classification of question types asked by PCPs through Dermatology eConsults

**Impact of dermatology eConsults**

In the post eConsult survey, PCPs were asked whether referral was originally contemplated and the impact of eConsults on the decision to make a referral (Table 1). In 49.4% ( $n = 477$ ) of eConsults, a referral was originally contemplated but now avoided as a result of the eConsult. In 27.5% ( $n = 261$ ) of cases, a referral was not planned, but the eConsult provided useful feedback. In 17.3% ( $n = 167$ ) of cases, a referral was still needed based on specialist advice, but the eConsult allowed for a more effective visit as the specialist provided recommendations for necessary workup prior to referring the patient (Fig. 2).

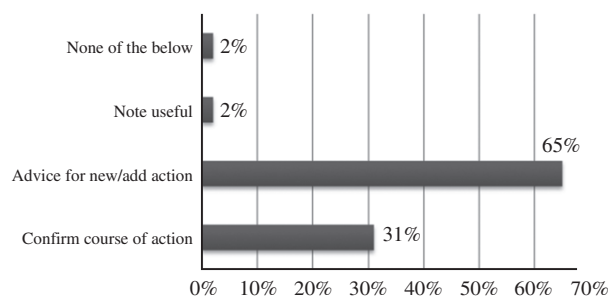
In 65.4% ( $n = 631$ ) of cases, eConsults provided useful advice on a new or additional course of action necessary to PCPs, while in 31.2% ( $n = 301$ ) of cases, the current treatment plan was validated (Fig. 3).

**Impact of eConsults on traditional referral (965 completed cases)**



**Figure 2** Post eConsults survey – Impact of eConsults on traditional referral

**Impact of eConsults on course of treatment (965 completed case)**



**Figure 3** Post eConsults survey – Impact of eConsults on course of treatment

our scope of practice without worrying about quality of care provided. Thank you for this support.”

- “Excellent response. It is great to be able to get back to my patient so quickly and reassure her about the possible diagnosis. This will be very reassuring for her.”
- “Incredibly timely advice and very practical. Dermatology is often challenging when the patient is acutely unwell and as a family physician including myself needs some clarification in terms of diagnosis and treatment. Very appreciated!”

### Clinical topics and question type analysis

In a subset of the most recent cases, diagnosis was the most common question type asked by the PCPs, accounting for 65.2% ( $n = 86$ ) of the Dermatology eConsults followed by management (29%) and drug treatment (10.6%). Questions on procedure (1.5%) and nonclinical, administrative aspect (0.8%) made up a very small portion.

Specific question types under diagnosis included interpretation of clinical finding (87.2%), interpretation of an image report (5.8%), histopathology report (4.6%), and a laboratory test (1.2%), and others (1.2%). Overall, 56.8% ( $n = 75$ ) of cases were related to interpretation of a clinical finding, making it the most common specific question type asked by PCPs. Under management, specific question types included general management (96.6%) and whether a referral was necessary (3.4%). Overall, 21.2% ( $n = 28$ ) of cases were pertinent to general management, making it the second most common specific question type asked by PCPs. Drug treatment questions were subdivided into inquiries on choice of drug (57.1%), indications/goals of treatment (28.6%), and prescription of a specific drug (14.3%) (Fig. 1).

The five most common clinical topics referred to the Dermatology eConsult services, representing 40% of the cases, included: dermatitis (10.4%), infections (9.7%), neoplasm (7.8%), nevi (6.5%), and pruritus (6.5%).

### Discussion

To our knowledge, this is the first study evaluating an eConsult's secure web-based electronic consultation service in Dermatology in Canada. This highly valued, efficient system demonstrated improved care for patients by reducing the need for face-to-face referrals to specialists and facilitating provision of appropriate care in a timely manner. This may have significant implications in the future as e-health becomes more integrated into the Canadian healthcare system.

The eConsult service demonstrated a significant impact on PCP referral patterns and clinical courses of action. The proportion of cases where referral was originally contemplated but avoided as a result of the eConsults was 49.4% in this study, which was similar across all specialties within the Champlain BASE service with a mean of 40%.<sup>1</sup> If this service becomes

widely available, there would be huge potential savings for the healthcare system by avoiding unnecessary face-to-face consultations. As well, it would allow care to be delivered to patients in a more timely manner, potentially avoiding medical complications. An economic analysis of the overall Champlain BASE service showed that its cost and the cost of traditional referral prevented is expected to break even after approximately 7800 eConsults.<sup>1</sup>

Our study showed that PCPs highly valued the eConsult service. In 65.4% of cases, a suggestion for a new or additional course of action was provided through eConsult regardless of whether a traditional referral was eventually recommended or not. In 31.2% of the cases, it confirmed an action that PCPs already had in mind, which helped provide reassurance for both PCPs and patients. The eConsult service was recognized as a valuable educational tool by PCPs as they were more engaged in patient care through participating in the process of case review.

Analysis of the question types and clinical topics received through eConsults from PCPs provides information on knowledge gaps between PCPs and specialists and could direct attention to these areas through CME. Additionally, eConsults are not only an efficient way of consulting a specialist, but may be used as a forum to share knowledge and increase the capacity of PCPs to manage clinical problems independently. Future research is required to help evaluate and compare efficacies of focused, directed PCP education through eConsults and other focused medical education sessions on the improvement of overall PCP knowledge in Dermatology.

Finally, it is important to note that the eConsult service did not utilize much of the specialist's time as it took less than 15 minutes to finish 82.8% of eConsults in this study.

This is important as it can be used to inform feasibility of eConsults and the estimated time commitment for services similar to eConsults.

A limitation of this study is that only a subset of cases (132) was reviewed for question type and disease classification.

### Conclusion

Virtual consultation services such as eConsults facilitate access to dermatology care in a timely manner and have the potential to reduce current wait times for traditional referral by avoiding unnecessary face-to-face consultations. The service was feasible and well received by PCPs. The gathered information can be of assistance to CME providers in setting up “need-driven” CME events for PCPs.

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