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What are the Costs of Improving Access to Specialists through eConsultation? The Champlain BASE Experience

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Abstract. Excessive wait times and poor access to care are among the most significant problems facing health care service delivery in Canada and beyond. We implemented the Champlain BASE eConsult service in the region of Ottawa, Canada to increase access to specialist care. We have collected ongoing utilization data and provider surveys over a three year period, providing a unique opportunity to explore the economic aspects of this multispecialty eConsult service. This is an economic evaluation from the perspective of the payer: the Ministry of Health and Long-Term Care of Ontario. All eConsults submitted during April 1, 2011 to March 31, 2014 were included. We attributed cost savings only to those cases where an eConsult led to the avoidance of a face-to-face specialist visit. A total of 2606 eConsults directed to 27 different speciality groups were included. In 40.3% (n=1051) of cases processed, a face-to-face specialist visit was originally planned but avoided as a result of eConsult, while 29% led to a referral. The estimated cost per eConsult for Years 1, 2, and 3 were $131.05, $10.34, and $6.45 respectively. Results from a sensitivity analysis project that the eConsult service will break even once we reach 7818 eConsults. This is one of the first studies to examine costs across a multispecialty eConsult service. We saw a marked decrease in the cost per eConsult over each annual period. Future research is needed to identify and examine similar outcomes that may lead to cost savings.

Keywords. Referral, eConsult, electronic consultation, cost savings, economic analysis, wait times

Introduction

Poor access to specialist care is a common problem faced by many countries [1,2]. Excessive wait times and inequitable access lead to patient anxiety, delays in diagnosis, and potentially the further deterioration of the patient's condition [2].

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There is an opportunity to improve access to specialist care through the use of innovative e-health platforms such as electronic consultation (eConsult). eConsult is a form of asynchronous communication whereby primary care providers (PCP) and specialists can communicate through the use of a secure web based platform, thus enabling PCPs to receive advice from specialists in a timely manner.

Several countries have implemented eConsult systems to improve access to dermatology, neurology, nephrology, and pulmonology, and have shown positive impact with regard to quality of images, improved access to care, and provider and patient satisfaction [3-7]. However, few studies have reported on the financial and economic aspects of eConsult systems, and those that have report on a multiple outcome measures and economic perspectives [8-12]. A systematic review done on synchronous telemedicine (video) systems concluded these systems are not cost effective from the health system perspective between primary care and hospital specialists, noting high staffing and technology costs [13]. There is a need to further explore the costs and potential economic benefits of eConsult systems.

In our region of 1.2 million people, we have implemented an eConsult service, which has reduced the wait-times for accessing specialist advice from months to days [14]. Over 40% of our cases resulted in avoidance of an unnecessary face-to-face referral, meaning hundreds of patients are no longer waiting to see a specialist [15]. We have collected ongoing utilization data and provider surveys over a three year period, providing a unique opportunity to explore the economic aspects of this service. Our results will not only inform ongoing discussions about scale up but are also generalizable to other regions as they consider implementing their own eConsult services to address wait time issues.

1. Methods

1.1. Study Design

This is an economic evaluation using cost analysis from the perspective of the payer: the Ministry of Health and Long-Term Care of Ontario. Patient cost savings have been reported elsewhere [15]. The study took place in the Champlain region of Eastern Ontario, Canada. The region is culturally and linguistically diverse with a population of 1.2 million people and includes Ottawa and its surrounding rural communities [16]. There is one main urban referral centre and the region has disease burdens and health outcomes similar to the rest of the province. In Canada, the healthcare system is publicly funded and freely available to the population. Administration of healthcare services occurs at the provincial level.

1.2. The eConsult Service

The Champlain BASE eConsult service is a web-based application designed to allow PCPs (family doctor or nurse practitioner) and specialists to communicate electronically. PCPs log on to the system, fill out a simple electronic form detailing their question, attach any pertinent electronic files deemed helpful for the specialist, and then send the eConsult to a specialty service. At the conclusion of each eConsult, PCPs complete a brief five question close-out survey about the case. Specialists receive

quarterly remuneration at a rate of $200 per hour prorated to their self-reported time it takes to complete the eConsult.

The service was built on a secure platform that was already in use as the "regional collaboration space" in our health area. The main component of this platform is Microsoft SharePoint, a versatile, commercially available off-the-shelf product that is widely deployed in the industry, with many useful resources and references freely available on the worldwide web. As such, implementation costs for the eConsult service were primarily for development of the forms and workflows, leveraging much of the existing shared infrastructure. There were two iterations of the design: a) the first one in 2010 for the proof-of-concept phase, and b) the second one in 2011 for the current phase.

1.3. Data Collection

We used data routinely collected by the system (number of eConsults directed to each specialty type, self-reported time for specialists to complete the eConsult) and impact data (avoidance of a face-to-face referral or a new referral initiated) for three consecutive one-year periods: April 1, 2011 to March 31, 2012 (Year 1); April 1, 2012 to March 31, 2013 (Year 2); and April 1, 2013 to March 31, 2014 (Year 3).

We used the management records of the project to identify resources required to provide eConsult services for patients, and used detailed expenditure information to identify costs associated with the delivery of eConsult.

1.4. Cost Analysis

We calculated both direct and variable costs associated with the service. Our direct costs were only start-up costs, which included developing the electronic forms, workflows, and web page design. Our variable costs were ascertained based on interviews with key stakeholders and involved the tasks required to support a fully operational eConsult service.

Variable costs consisted of delivery costs and consultation-specific costs. The delivery costs included user setup/registration, support, and administration costs. Support costs consisted of daily interactions with PCPs and included password resets, as well as addressing specific issues/queries for individual providers or cases, particularly related to the multitude of operating systems and browser types used by providers to access the service from their devices. Administrative costs included reporting, billing, analysis, specialist scheduling, and following up with PCPs and specialists on outstanding cases. The consultation-specific costs were calculated based on: (a) payments made to specialists and (b) assignment costs for staff to direct each eConsult to the appropriate specialist.

Investments in equipment and related software were not carried forward into subsequent years, as we considered them sunk (i.e., one-time) costs. They are included only in the evaluation of the period in which they occurred (i.e. Year 1). In addition, costs incurred by patients, PCPs, and patients' accompanying persons, as well as other societal costs, were not included in this analysis.

We tabulated all the costs associated with running a fully operational eConsult service. We reviewed the eConsult delivery process in detail from the conception of the project to its completed implementation. Every activity that occurred as a direct result of eConsult and would not have happened otherwise was recorded as an additional

activity. Conversely, specialist payments that would have been made if every activity relating to the traditional referral-consultation had occurred but were avoided as a result of eConsult were considered an avoided activity.

For costs directly related to patient referrals, we used responses from a short survey that PCPs completed at the conclusion of each eConsult to tally the number of avoided referrals (i.e. instances where eConsult was able to resolve a situation without leading to a face-to-face referral that was originally contemplated) and added referrals (i.e. situations in which eConsult led to a referral that would not have otherwise been made) and multiplied each item by the cost of the relevant specialist consultation using the Ontario Fee Schedule. We calculated the total savings attributable to eConsult by taking the difference between the total costs avoided and the total additional costs as shown in Eq. (1).

[Costs Avoided] – [Added Referral Costs + Operational Costs] = [Costs Saved] (1)

The routine use of an eConsult service can lead to cost savings in numerous different ways, including quicker response times (which can decrease patient anxiety and lead to earlier diagnoses which may prevent further degradation of a patient's condition), improved communication between providers (which can reduce costly, unnecessary medical tests), and avoidance of face-to-face specialist visits. For the purpose of this analysis, we attributed cost savings only to the proportion of cases where the outcome was the avoidance of a face-to-face referral. Our estimate is conservative in that it does not attribute cost savings to any other outcomes nor those cases where PCPs: (a) confirmed their original decision not to refer, or (b) still needed to refer but were able to use specialist advice to more effectively manage their patients' care in the meantime.

1.5. Sensitivity Analysis

A break-even analysis was performed in order to predict how many eConsults would be required in order for the system to generate cost savings based on our assumptions. For this analysis, we excluded the specialties clinical pharmacy, diabetes dducation, and radiology, as they do not represent medical specialties that a PCP would normally refer to in a traditional clinic setting. Costs were tabulated to find the total avoided costs, costs attributed to the specialists who responded to the eConsults, the total added costs, and the associated delivery costs. The average avoided and total costs per eConsult were then plotted against a varying number of total eConsults.

2. Results

A total of 235 PCPs completed 2606 cases refered to 27 different speciality groups over the entire study period. The specialty groups providing the highest number of eConsults were dermatology (17.7%), endocrinology (9.9%), neurology (9.1%), hematology (8.6%), obstetrics/gynecology (7.4%), and cardiology (7.3%). In 40.3% (n=1051) of cases processed, a face-to-face specialist visit was originally planned but

avoided as a result of eConsult (in fact, only 29% of all eConsult cases led to a referral). In 3.6% (n=93) of cases, a referral was initiated where one was not originally planned.

In Year 1, PCPs initiated 190 eConsults related to 14 different specialty services. During this period, 42% (n=79) of referrals were avoided and 2.6% (n=5) were added. In Year 2, PCPs initiated 787 eConsults related to 20 different specialty services. Here, 41.1% (n=324) of referrals were avoided and 2.8% (n=22) were added. In Year 3, 1629 eConsults were directed to 27 different specialty services. During this time, 40% of referrals (n=648) were avoided and 4.1% (n=66) were added.

The start-up costs for eConsult were $10,000.00, representing 28.4% of the costs during the first year (estimated to be $35,264.81). Once added referrals ($634.65 in additional costs) and avoided referrals ($10,364.50 in savings) were factored in, eConsult had a net cost of $24,900.31 in its first year. In its second year, eConsult saved $43,976.85 in avoided referrals while incurring $52,123.38 in costs, of which 63% were payments to specialists. In its final year, eConsult saved $85,182.25 in avoided referrals while incurring $95,687.66 in costs, of which 72.4% were payments to specialists. After taking into account the added and avoided referral cost, the estimated cost per eConsult for Year 1, Year 2, and Year 3 was $131.05, $10.34, and $6.45 respectively. The average cost across all three years was $16.71 per eConsult.

Assuming the traditional cost of a face-to-face visit is $150 and specialists take an average of 13 minutes to answer each eConsult, we predict our service will break even once we reach 7818 eConsults (see Figure 1).

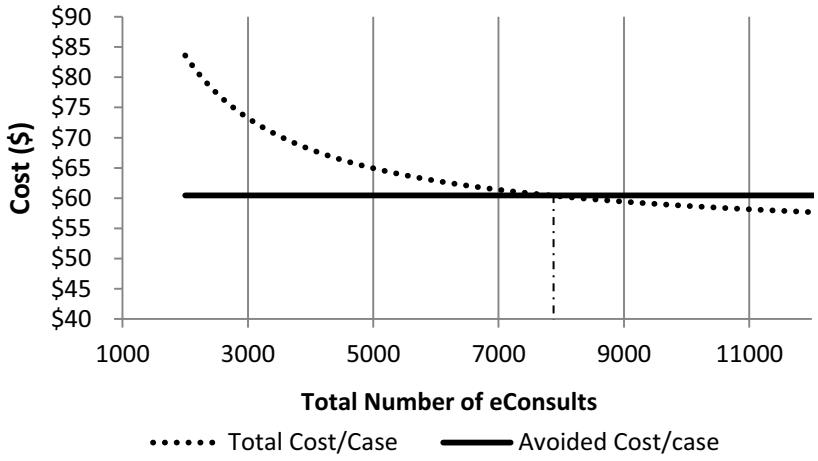

Figure 1. Break-even plot for total costs per case against those where the PCP reported a face-to-face visit was avoided. We project eConsult will break even at 7818 eConsults.

3. Interpretation

eConsult represents an innovative, inexpensive way of improving access to specialist care. Our findings suggest that an eConsult system will generate cost savings within four years of implementation based only on potential cost savings from a public payer

perspective attributed to avoided specialist visits. If factoring in additional economic aspects from a patient perspective such as more rapid access to care, reduced likelihood of more deterioration, avoided travel costs, time off work for a visit, parking, and food, the potential overall costs savings for eConsult is tremendous and will be realized earlier. Although the start-up can be capital intensive, this will vary in health regions depending on presence of existing infrastructure which meets security and privacy requirements. The program cost significantly more in its first year. However, by its second and third year, we saw a marked decrease in the cost per case as the bulk of the costs shifted from operational costs to specialist remuneration. In contrast to telemedicine synchronous systems, many eConsult services including ours do not require additional equipment, either centrally or in the provider's office [17]. This enables adoption costs including training to be low. This is reflected in our low operational costs.

Few studies have performed economic analyses of asynchronous eConsult systems and those that have are mostly dermatology store and forward eConsult systems [18]. Whited et al. found that teledermatology did not result in cost savings when compared to usual care but that it had the potential to result in cost savings if the proportion of avoided visits were higher or if societal costs were included [12]. Similarly, Eminovic et al. found that teledermatology can reduce costs if patients had to travel further to see the specialist or if more than 37% of eConsults result in avoidance of a face-to-face referral [8]. Moreno-Ramirez found a negative correlation between the unit cost of an eConsult and the volume of eConsults processed [10]. However, this "break-even point" can vary considerably depending on the specialty.

There are many ways that an eConsult service can lead to cost savings for the patient and for the payer. We chose to use a conservative estimate and only attribute cost savings to avoided face-to-face specialist visits. Other potential areas for cost savings that are not captured in our analysis include avoiding duplication of laboratory tests, preventing further degradation of patient condition and/or choice of less effective treatment options, more effective future specialist visits if needed, and associated savings to patients each time a visit was avoided.

Future research should examine the different outcomes that may lead to greater cost savings as more eConsult services are developed and implemented. Expediting access to specialist advice may lead to decreased emergency department visits and medication use as well as avoiding costly unnecessary tests. This should be examined. In addition, the risks associated with delayed care should be quantified from both the patient and payer perspective. Patient avoided costs in terms of lost wages, productivity, and transportation should also be examined within a multispecialty eConsult service.

Another important consideration in the assessment of cost savings is whether the care provided by eConsult is comparable in quality to what would be provided by traditional consultation. In our pilot study, several physicians provided positive feedback on the eConsult system, noting its simplicity and effectiveness and reporting high satisfaction ratings on end of consult surveys [14,19]. Participants also perceived some benefits from the system, including quicker responses from specialists and the educational value of submitting eConsults; this may likely reduce future referrals or eConsults for a similar condition [14,20].

Our study has some limitations. Its findings can only be generalized to health systems with technical infrastructure sufficient to harbor a secure transmission of health information. Without this infrastructure, start-up costs would be considerably

greater. Second, our methodology included direct financial costs; an evaluation using economic costs would make our results more generalizable to other settings.

Conclusion

This is one of the first studies to examine costs across a multispecialty eConsult service. We showed a marked decrease in the cost per eConsult over each annual period with a projected break-even point at 7818 cases. Future research is needed to identify and examine similar outcomes that may lead to cost savings, as well as patient and provider perspectives on eConsult and evaluate the program's effect on quality of care outcomes.

References

[1] Viberg N, Forsberg BC, Borowitz M, Molin R. International comparisons of waiting times in health care--limitations and prospects. *Health Policy* 2014;112(1-2):53-61.
[2] Barua B, Esmail N. *Waiting Your Turn: Wait Times for Health Care in Canada.* Vancouver: Fraser Institute; 2013.
[3] Williams L, O'Riordan S, McGuigan C, Hutchinson M, Tubridy N. A web-based electronic neurology referral system: a solution for an overburdened healthcare system? *Ir Med J* 2012;105(9):301-3.
[4] Whited JD, Warshaw EM, Edison KE, Kapur K, Thottapurathu L, Raju S, et al. Effect of store and forward teledermatology on quality of life: a randomized controlled trial. *JAMA Dermatol* 2013;149(5):584-91.
[5] Moreno-Ramirez D, Ferrandiz L, Nieto-Garcia A, Carrasco R, Moreno-Alvarez P, Galdeano R, et al. Store-and-forward teledermatology in skin cancer triage: experience and evaluation of 2009 teleconsultations. *Arch Dermatol* 2007;143(4):479-84.
[6] Scherpbier-de Haan ND, van Gelder VA, Van WC, Vervoort GM, Wetzels JF, de Grauw WJ. Initial implementation of a web-based consultation process for patients with chronic kidney disease. *Ann Fam Med* 2013;11(2):151-6.
[7] Thijssing L, van der Heijden JP, Chavannes NH, Melissant CF, Jaspers MW, Witkamp L. Telepulmonology: effect on quality and efficiency of care. *Respir Med* 2014;108(2):314-8.
[8] Eminovic N, Dijkgraaf MG, Berghout RM, Prins AH, Bindels PJ, de Keizer NF. A cost minimisation analysis in teledermatology: model-based approach. *BMC Health Serv Res* 2010;10(1):251.
[9] Harno K, Paavola T, Carlson C, Viikinkoski P. Patient referral by telemedicine: effectiveness and cost analysis of an Intranet system. *J Telemed Telecare* 2000;6(6):320-9.
[10] Moreno-Ramirez D, Ferrandiz L, Ruiz-de-Casas A, Nieto-Garcia A, Moreno-Alvarez P, Galdeano R, et al. Economic evaluation of a store-and-forward teledermatology system for skin cancer patients. *J Telemed Telecare* 2009;15(1):40-5.
[11] Pak HS, Datta SK, Triplett CA, Lindquist JH, Grambow SC, Whited JD. Cost minimization analysis of a store-and-forward teledermatology consult system. *Telemed J E Health* 2009;15(2):160-5.
[12] Whited JD, Datta S, Hall RP, Foy ME, Marbrey LE, Grambow SC, et al. An economic analysis of a store and forward teledermatology consult system. *Telemed J E Health* 2003;9(4):351-60.
[13] Wade VA, Karnon J, Elshaug AG, Hiller JE. A systematic review of economic analyses of telehealth services using real time video communication. *BMC Health Serv Res* 2014;10(10).
[14] Keely E, Liddy C, Afkham A. Utilization, benefits, and impact of an e-consultation service across diverse specialties and primary care providers. *Telemed J E Health* 2013;19(10):733-8.
[15] Liddy C, Afkham A, Drosinis P, Keely E. Improving quality of care delivery across multiple specialities through eConsultation in Canada. *JAMA* 2014. (submitted)
[16] Bains N, Dall K, Hay C, Pacey M, Sarkella J, Ward M. *Population Health Profile: Champlain LHIN*. Toronto, ON: Ministry of Health and Long-Term Care; 2008.
[17] Wootton R, Bloomer SE, Corbett R, Eedy DJ, Hicks N, Lotery HE, et al. Multicentre randomised control trial comparing real time teledermatology with conventional outpatient dermatological care: societal cost-benefit analysis. *BMJ* 2000;320:1252-6.
[18] Deshpande A, Khoja S, Lorca J, McKibbon A, Rizo C, Husereau D, et al. Asynchronous telehealth: a scoping review of analytic studies. *Open Med* 2009;3(2):e69-e91.

[19] Liddy C, Rowan MS, Afkham A, Maranger J, Keely E. Building access to specialist care through e-consultation. *Open Med* 2013;7(1):e1-e8.
[20] Liddy C, Afkham A, Drosinis P, Joschko J, Keely E. Impact and satisfaction with a new eConsult service: a mixed methods study of primary care providers. *J Am Board Fam Med* 2014. (submitted).