CPEG Fellowship Progress Report

NUGENT, Colleen

Dear CPEG Fellowship Committee,

Thank you for your generous support, awarding me with the CPEG Fellowship in 2016. This Fellowship has provided me with the opportunity to pursue a Master's degree in Medical Education from Dundee University, while working on two research projects supervised by Dr. Shazhan Amed. She has provided me with invaluable mentorship and guidance during my clinical fellowship in Pediatric Endocrinology, and more recently, during this past year as a Research Fellow.

The primary focus of my research work this past year has been on two different projects:

PROJECT 1: Evaluation of the Endocrine and Diabetes Unit 24-hour telephone paging service at BC Children's Hospital.

Overview: This is a 12-month prospective observational study reviewing outcomes of patients who have a diagnosis of a chronic endocrine or diabetes related health problem, and who contacted the 24-hour on call telephone paging service for the Endocrine and Diabetes Unit at BC Children's Hospital for acute endocrine/diabetes related health issues. The primary objective of this study was to determine whether provision of this service prevents emergency department visits for these patients. Secondary objectives were to complete a cost benefit analysis, determine patient/parent satisfactions with the paging service, and describe the users of this service based on patient condition (i.e. diabetes vs endocrine patients), specific socio-demographic variables.

Project timeline:

- Research Ethics Board application
    - April 2016 – October 2016
- Data collection
    - November 2016 – October 2017
- Data analysis
    - November 2017
- Manuscript completion and submission to a peer reviewed journal
    - Spring 2018

Project status: Data collection and analysis is complete. However, this project is linked to another trainee's research project, which is retrospectively reviewing the 24-hour on call telephone paging service. Data collection for the retrospective study is currently underway. Once the data collection and analysis for this study is complete, I will have the information I need to be able to complete the cost benefit analysis for my study. I have summarized this project in Appendix 1.

An abstract for this project has been submitted, and accepted for a poster presentation at the ENDO 2018 Conference, March 17-20, 2018 in Chicago, Illinois, and for an oral presentation at the CPEG Meeting, February 23-25, 2018 in Vancouver, BC:

ABSTRACT
Evaluation of a 24-hour telephone paging service: Are we preventing emergency department visits for pediatric diabetes and endocrine patients?

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INTRODUCTION: Studies have shown that 24-hour paging services can prevent emergency department (ED) visits for pediatric diabetes patients, but no studies have evaluated outcomes of pediatric endocrine patients. The Endocrinology and Diabetes Unit (EDU) at British Columbia Children's Hospital (BCCH) is the only tertiary level pediatric center in British Columbia (BC) and provides a 24-hour paging service for parents and patients.

OBJECTIVE: To determine if a physician staffed 24-hour paging service prevents ED visits for pediatric endocrine and diabetes patients.

METHODS: In this 12-month prospective observational study, we recruited endocrine and diabetes patients whose caregivers used the EDU call service and met pre-defined set of criteria for a 'preventable' ED visit in the absence of access to an on-call line (i.e. diabetes patients with ketones and hyperglycemia or persistent hypoglycemia, or endocrine patients requiring stress dose steroids). Callers that met criteria were invited to complete a telephone survey that collected demographic data and ED visits within 72 hours of the call. Data were analyzed using descriptive statistics.

RESULTS: Of the 1238 calls made to the EDU paging service during the study period, 199 met study inclusion criteria (83% diabetes, 17% endocrine). Recruitment rate was 33% (n=66), of which 44 callers completed the survey. Most calls were from diabetes patients (84%) who needed advice for non-routine insulin dose adjustment, illness management, or persistent/severe hypoglycemia (69%); endocrine callers were patients with adrenal insufficiency, hypoglycemia disorders or hypocalcemia, needing urgent illness management advice (57%) or had an adverse drug reaction (43%). The majority of callers were located within a one hour drive of BCCH (61%), Canadian born (81%) and had some post-secondary level education (84%). Nearly 100% of callers were satisfied/very satisfied with the paging service, and only 2/44 (4.5%) patients visited an ED within 72 hours of making the call.

CONCLUSIONS: This is the first Canadian study showing that a 24-hour paging service used by pediatric endocrine and diabetes patients with an urgent/emergent medical issue prevented 95.5% of potential ED visits. Extrapolating this to all calls that met study criteria (N=199), 190 ED visits may have been prevented over the 12-month period.

PROJECT 2: Live 5-2-1-0 at BC Children's Hospital

This project will be the focus of my work during my second CPEG Fellowship year (2017), and my Masters in Medical Education thesis. This past year, I have completed Phase 1 of this project.

Project overview: The aim of this project is to develop and implement a training program and toolkit for pediatric healthcare providers (HCPs) working at BC Children's Hospital, using the Live 5-2-1-0 messaging, that will support HCPs follow best practice guidelines related to childhood obesity prevention and health promotion, and increase their capacity to adequately support patients/families in adopting healthy behaviours. This project has four phases:

- Phase 1: Completion of a healthcare provider needs assessment to identify barriers and facilitators faced by care providers when completing lifestyle assessments and providing healthy lifestyle counselling to patients and families. Methods used for this needs assessment included an online questionnaire and focus groups. A needs assessment of patients/families was also done in parallel with the HCP needs assessment (online questionnaire and focus groups). Outcomes of the needs assessment are being used to inform Phase 2 of this study. Of note, given the scope of my Master's thesis, I have only been peripherally involved with the patient/family needs assessment.
- Phase 2: Development of a training program and toolkit using the Live 5-2-1-0 messaging, and informed by Phase 1.
- Phase 3: Implementation of this training program and toolkit into two pilot ambulatory clinics at BC Children's Hospital.
- Phase 4: Evaluation of the pilot program.

Project Timeline:

- Research Ethics Board application
  - February 2017 – April 2017
- Phase 1 data collection
  - May 2017 – June 2017

- Phase 1 data analysis
    - July 2017 – August 2017
- Phase 2
    - October 2017 – present
- Phase 3
    - Spring 2018 – Fall/Winter 2018
- Phase 4
    - Winter 2018 – Spring 2019

Project status: I have completed Phase 1 of this project, and am currently working on Phase 2, designing the training program and toolkit resources.

An abstract for Phase 1 of this project was submitted and accepted for a poster presentation at the 10th International Meeting of Pediatric Endocrinology in Washington, DC., September 14-17, 2017 [10th Individual Abstracts for International Meeting of Pediatric Endocrinology: Free Communication and Poster Sessions, Abstracts. Washington, DC, USA. *Hormone Research in Paediatrics*, 2017; 88(suppl 1): 1-628.]

ABSTRACT

Are we doing enough? Assessing practice patterns and identifying challenges to providing healthy living counselling at a tertiary level care pediatric hospital in Canada

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OBJECTIVE: Childhood obesity rates are increasing and treatment has been largely ineffective. Pediatric healthcare providers (HCP) have a key role to play in primary and secondary prevention. The study objective was to gather pediatric HCP views on: (i) barriers and facilitators to providing healthy lifestyle counselling (HLC) during clinic visits; (ii) current practice patterns and knowledge of healthy active living recommendations; and (iii) preferred methods for improving knowledge and skills related to HLC.

METHODS: A needs assessment survey, designed based on themes from the literature and reviewed by key stakeholders, was distributed via email to 705 HCPs at a large tertiary care pediatric center in Canada. Descriptive statistics and thematic analysis were performed.

RESULTS: Response rate was 31.2% (40% physicians, 17% nurses, 25% allied health, 16% social workers/psychologists, 2% other). Most HCPs self-reported assessing height (82%) and weight (89%) at least half of the time; however, only 56% calculated body mass index (BMI) half of the time and 26% reported that BMI was useful only when the patient was already overweight/obese. Physical activity (69%) and sugary drink intake (80%) were assessed more frequently than screen time (52%), junk food (44%), and fruit/vegetable intake (51%). Although 88% of participants provided HLC, only 46% believed they were meeting their patient's needs, and 40% reported moderate/high levels of confidence when discussing weight issues. Barriers to counselling included: time constraints, finding the "right time," poor perceived self-efficacy, and having unhealthy personal lifestyle habits. Factors that might facilitate HLC included: additional human resources, a hospital environment that supports healthy habits, and the ability to refer patients to community-based programs. Most (90%) respondents believed they could improve their HLC skills, and 81% were interested in additional training.

CONCLUSIONS: We report a gap in pediatric HCP practice and low confidence in discussing weight. Next steps will be to develop a toolkit that will address the barriers and knowledge gaps, with the aim of increasing HCP capacity to integrate HLC into their daily practice.

APPENDIX 1: Project 1 summary report

Utility and cost benefit of a 24-hour emergency telephone paging service for pediatric endocrinology patients: Are we preventing emergency room visits?

INTRODUCTION

Urgent telephone calls for medical advice after routine working hours have been a stressful part of primary care medical practices for many years, which prompted the development of centralized telephone based triage systems in the 1980s. These call centers have largely been staffed by nurses, who have been trained in the use of standardized protocols and guidelines, with the goal of alleviating the burden of after-hours calls on physicians (1-3). Several studies have been done evaluating the safety and outcomes of these types of services, as well as their cost benefit, but the majority of these studies have been done in the United States or the United Kingdom (1,2, 4-7).

A few studies have shown that both non-physician and physician-led on call paging services can prevent emergency room visits for pediatric patients with diabetes (8-12). A study by Chiari *et al*., (2003) retrospectively reviewed 9,125 calls received by a 24-hour toll free physician advice telephone service in Parma, Italy, which was designed to provide service for pediatric patients with Type 1 diabetes. Of the calls received, 24% were for urgent diabetes related medical advice, such as management of diabetes during an intercurrent illness or hypoglycemia. There were no known associated hospital admissions in Parma for the patients who utilized the telephone service. However, incidentally, due to the novelty of the service provided, almost 60% of all calls were received from patients living outside of the study region (10). Based on this study, The Diabetes Canada 2013 Clinical Practice Guidelines have recommended that a 24-hour telephone service be made available to pediatric patients with type 1 diabetes and their caregivers, to help prevent diabetic ketoacidosis (DKA) (13). However, similar recommendations are not available for patients with non-diabetes related chronic endocrine health conditions, such as adrenal insufficiency or hypopituitarism.

Studies evaluating medical advice telephone services for pediatric diabetes care have been limited by several factors, including retrospective analysis, small sample sizes and reliance on parent/guardian recall. Furthermore, none of these studies have been done in Canada. Finally, there are no studies evaluating physician-led telephone medical advice services for pediatric patients with non-diabetes related chronic endocrine health conditions.

The Endocrinology and Diabetes Unit (EDU) at British Columbia Children's Hospital (BCCH) provides multidisciplinary healthcare services for approximately 4200 pediatric patients and their families, who live in British Columbia (BC) and the Yukon, and is the only regional tertiary level pediatrics care center in British Columbia. Six Pediatric Endocrinologist work at BCCH, and five Pediatric Endocrinologists work in the community, and are located primarily in the lower mainland, and Vancouver Island, and provide care independent of BCCH. The number of endocrine/diabetes patients who are currently followed in the community is not known.

Given that diabetes and most endocrine conditions are life-long diseases that require ongoing health care support, a 24-hour on-call paging service, available through the main hospital switchboard at BCCH is provided. This service is accessible to all patients with a diagnosis of an endocrine problem or diabetes, their parents/guardian, and other health care providers working in BC and the Yukon, who require urgent endocrinology or diabetes related medical advice. The patients who are followed by the community based Pediatric Endocrinologists are also able to use the paging services for the EDU at BCCH, when they are unable to contact their primary endocrinology care provider. The first point of contact with the paging service is always a physician, either an endocrinology Subspecialty Resident/Fellow or a General Pediatrics Resident, both of whom work under the supervision of one of the staff Pediatric Endocrinologists at BCCH.

Hypothesis:

A physician staffed 24 hour on-call telephone paging service for the EDU at BCCH prevents emergency department (ED) visits for patients having an urgent health issue related their chronic endocrine or diabetes condition, within a 72-hour period of the initial contact with the paging service.

Aims and objectives:

The primary goal of this study was to determine whether a 24-hour on-call telephone paging service prevents ED visits or hospitalizations in patients who have diabetes or a chronic endocrine disorder, and are currently followed by a Pediatric Endocrinologist.

Secondary outcomes were to:

a) Determine whether provision of the 24-hour on call paging service is providing a cost benefit to the healthcare system.
b) Determine patient/parent satisfaction with the 24-hour on call paging telephone service.
c) Determine who is utilizing the paging service, based on the patient's underlying endocrine medical condition, and/or specific socio-demographic variables.

METHODS

This is a prospective observational study reviewing outcomes of patients who have a diagnosis of a chronic endocrine or diabetes related health problem, and who have contacted the 24-hour on call telephone paging service for the EDU at BCCH during a one-year period (November 1, 2016 to October 31, 2017). All calls made to this service were documented in a standardized EDU on-call logbook. Collected logbook data included the patient's age, caller's name/relationship to patient and contact information, medical diagnoses of the patient, endocrine/diabetes related medications, the reason for calling the paging service, and the medical advice that was provided.

Inclusion Criteria:

1. Patients who are actively followed at the BC Children's Hospital Endocrinology and Diabetes Unit (BCCH EDU), or are followed by one of the community based Pediatric Endocrinologist in BC, and whose primary residence is in BC or the Yukon. These patients must have been given a diagnosis of a chronic endocrine problem, or diabetes, and are calling for urgent medical advice pertaining to management of his/her underlying endocrine/diabetes care. Acute health problems included the following:
    A. Diabetes related:
        i. Illness management
        ii. Broken/lost diabetes supplies (e.g. insulin pump failure)
        iii. Persistent hypoglycemia, and/or the use of mini/rescue dose glucagon
        iv. Non-routine insulin dose adjustments, persistent hypoglycemia, or hyperglycemia with ketones
        v. Insulin administration error
        vi. Other, as specified by the caller
    B. Endocrine condition related (hypopituitarism, diabetes insipidus, adrenal insufficiency, hyperinsulinism, or other hypoglycemia disorder, hyperthyroidism, hypocalcemia, other):
        i. Adverse/allergic reaction to endocrine related medication
        ii. Acute illness management
        iii. Other, as specified by the caller
1. Family member(s)/legal guardian calling for advice pertaining to his/her child's diabetes or endocrine care, if that child meets the inclusion criteria outlined in (1).

Exclusion Criteria:

1. All calls asking for medical advice for patients who are no longer actively followed by the BCCH EDU or a community based Pediatric Endocrinologist in BC, or for patients whose primary residence is outside of BC or the Yukon.

2. All calls regarding pediatric patients previously diagnosed with an endocrinology/diabetes problem, currently admitted to BCCH or other hospital institution in BC or the Yukon.
3. All calls requesting a Pediatric Endocrinology or Diabetes consult for a patient already admitted to the emergency room or an inpatient ward at BCCH.
4. All calls from healthy pediatric patients, newly diagnosed with diabetes (< 8 weeks from diagnosis), or from their parents/guardians, inquiring about routine insulin dose adjustments, in the absence of illness, ketones, or severe hypoglycemia.
5. All calls from physicians inquiring about general Endocrinology/Diabetes advice for one of their patients, or the appropriateness of referral to the Endocrinology and Diabetes Department at BCCH.
6. All calls pertaining to administrative requests, including the following: review blood test results, prescription refills, completion of forms etc.
7. All calls from patients or parents/guardians, who are referred directly to their local emergency room, or instructed to call 911, for urgent medical assessment.
8. All calls from patients or parents/guardians, who are calling for medical advice for a health problem unrelated to the patient's endocrine/diabetes diagnosis
9. All calls from non-English speaking patients, parents or family members and/or guardians.
10. All calls made directly by a patient, who are under the age of 16 years, and who do not have a parent/guardian available to speak with at the time of the on-call telephone paging advice (this is a very rare occurrence).

For all calls that met the inclusion criteria, and if it was deemed to be an appropriate time to recruit the caller for this study, the on-call physician briefly introduced the study, and invited the caller to participate in a follow-up telephone based survey. The name and contact phone number of all invited and consented callers was provided to a research assistant, who contacted the caller a few weeks later. Formal verbal consent was obtained by the research assistant at the time of the follow-up telephone call. Consented patients completed the survey by telephone.

The survey contained the following questions:

- 11 questions pertaining to patient demographics, access to Family Physician/General Pediatrician and whether the patient is followed by the EDU at BCCH.
- 9-10 disease specific questions related to the patient's underlying endocrine or diabetes health condition, and reason for contacting the paging service.
- 3 questions regarding whether the patient visited an ED or was admitted to hospital within 72 h of contacting the paging service.
- 7 questions related to socioeconomic variables.
- 6 questions related to caller satisfaction with the paging service.
- Any final qualitative comments/feedback.

All survey data collected was de-identified, and directly entered into the REDCap™ platform, available through the BC Children's Hospital Research Institute (BCCHR) Clinical Research Support Unit.

Statistical analysis

Descriptive statistics methods were applied to all quantitative data, and the qualitative data was reviewed, and coded by thematic analysis, where appropriate. The data were aggregated, and not analyzed by cohort (endocrine versus diabetes patients), due to the small sample size of endocrine patients.

Cost-benefit analysis

Because healthcare costs are relatively standardized throughout BC, the average cost of an ED visit for a pediatric patient, outside of BCCH, can be extrapolated. The total costs of providing the 24 hour on-call paging service for the EDU at BCCH are known, and relatively fixed annually. Thus, a *cost benefit analysis* comparing the cost of the 24-hour on call paging service versus the savings from prevented ED visits can be determined. A comprehensive cost effectiveness analysis is not possible because measurement of long term patient outcomes is not the objective of this study, and because of the difficulties involved with linking other indirect benefits arising from the

use of the 24-hour on call paging service (e.g. economic benefit of preventing a parental work absence due to child being treated at home; psychosocial benefits of the patient and family of being able to stay at home).

However, the cost benefit analysis part of this study has not been able to be completed at the present time, but will be completed in the near future. The data required to complete the cost-benefit analysis is being collected from a linked retrospective study of the EDU paging service, which is currently underway by another trainee. Data collected from the retrospective study is critical to being able to access the Performance Measurement & Reporting (PMR) database, which is part of the Provincial Health Services Authority (PHSA). PMR stores specific patient information for all ED visits at BCCH, including the following: age and sex of individual visiting the ED, the reason for the ED visit, patient disposition/triage score, all investigations or consults requested in the ED, length of stay in the ED, and whether the patient was admitted to hospital from the ED. Based on this PMR data, the average cost for a typical endocrine/diabetes related ED visit can be determined.

RESULTS

During the study period (November 1, 2016 to October 31, 2017), 1238 calls were documented in the EDU on-call logbooks. Of these calls, 199 pertained to outpatients, who had an acute diabetes or endocrine related health problem that was a potentially preventable emergency room visit, as defined by the study inclusion criteria. Of these 199 calls, 166 were for diabetes patients (83.4%), and 33 were for endocrine patients (16.6%); 66 callers were recruited to participate in the study (recruitment rate 33.2%). The other 133 eligible callers were excluded for a variety of reasons (Table 1).

Table 1. Reasons callers were excluded from the study (n=133)

Reason for study exclusion	Number (%)
Unknown/Not documented	96 (72.2)
Physician unaware of study (e.g. New rotating trainee took paging call before orientation to study)	13 (9.8)
Patient lives in Group Care Home, or in new foster care home	12 (9.0)
Invited but declined to participate	5 (3.8)
Inappropriate time to do study consent (e.g. urgent care needs)	4 (3.0)
Challenging family circumstances/limited capacity of caregiver	3 (2.3)

Of the 66 callers that were recruited for this study, 46 completed the survey (completion rate 69.7%). Of these 46 calls, 84.8% were for patients who have diabetes and 15.2% were for patients who have a chronic endocrine condition. These percentages align with the proportion of total eligible calls defined by health condition (diabetes versus endocrine).

The time the calls were made were relatively evenly split between weekdays and weekends (46.7% Monday to Friday, 53.3 % Saturday/Sunday and statutory holidays). Nearly 70% of calls were made after the regular work hours of the EDU staff physicians and 20.0% were made overnight (22:00-08:00).
Based on the data collected from the 46 participants, patient characteristics, and their accessibility to different types of care providers have been described (Table 2).

Table 2. Patient characteristics, and their accessibility to care providers

Descriptor	
Sex a) Female b) Male	 41.3% (n=19) 58.7% (n=27)
Age of patient (mean)	8.34 ± 4.34 y (range 1-18 y)
Access to a Family Physician	100% (n=46)

Access to a General Pediatrician	63.0% (n=29)
Followed in the EDU clinic at BCCH	97.8% (n=45)

For the endocrine related calls, the endocrine conditions reported were: adrenal insufficiency (42.9%), hypocalcemia (28.6%), and a hypoglycemia disorder (28.6%). For the diabetes related calls, 97.4% of patients were reported to have Type 1 diabetes, and the mean age at diagnosis with diabetes was 5.2 ± 3.3 y (range 1-14 y). All diabetes patients were currently using insulin, and the types of insulin regimens reported were pump therapy (38.5%), multiple-daily injections/basal bolus (33.3%), and conventional insulin regimen (i.e. combination of rapid and intermediate acting insulins) (28.1%). The reasons for using the EDU paging service at BCCH are listed in Table 3 and 4.

Table 3. Reasons for contacting the paging service, for diabetes patients (n=39)

Reason for paging ("*Check all that apply*")	**Percentage (n)**
Non-routine insulin dose adjustment OR unexplained hypo/hyperglycemia	32.0 (16)
Acute illness management	22.0 (11)
Broken or lost diabetes supplies	14.0 (7)
Persistent or severe hypoglycemia requiring use of use of mini/rescue dose glucagon	14.0 (7)
Insulin administration error	14.0 (7)
Other (e.g. acute mental health issue related to diabetes)	4.0 (2)

Table 4. Reasons for contacting the paging service, for endocrine patients (n=7)

Reason for paging	**Percentage (n)**
Acute illness management	57.1 (4)
Adverse/allergic reaction to endocrine related medication	42.9 (3)

Condition specific background information

For the diabetes related calls, 41.0% of callers reported that the patient had an ED visit or hospitalization in the past year for an acute diabetes related health issue. The mean number of reported ED visits/hospitalizations over the past year was 1.38 (range 1-3). The patient's most recent A1C was known by 81.6% of callers, and the mean reported A1C was 7.61±1.02% (range 6.1% -10.1%).

For the three callers who selected adrenal insufficiency as the specific endocrine health condition for which they were calling, two callers (66.7%) reported that the patient had at least one episode of adrenal crisis and was given intramuscular hydrocortisone, or needed a course of stress dose glucocorticoids in the past year.

Sociodemographic characteristics

All recruited callers were categorized by their reported geographical location of primary residence, as defined by their health authority catchment area (Table 5; Figure 1). BCCH is located within the Vancouver Coastal Health Authority catchment area, but is the only tertiary level pediatrics hospital in BC. The estimated ground transportation time to BCCH, under ideal travel conditions, was used to stratify callers based their city of primary residence (Table 6).

Table 5. Geographical location of caller by health authority catchment area in British Columbia (n=46)

Health Authority	Percentage of callers (n)
Fraser Health Authority	58.7 (27)
Vancouver Coastal Health Authority	30.4 (14)
Vancouver Island Health Authority	4.3 (2)
Northern Health Authority	4.3 (2)
Interior Health Authority	2.2 (1)

Figure 1. Health Authorities of British Columbia (14).

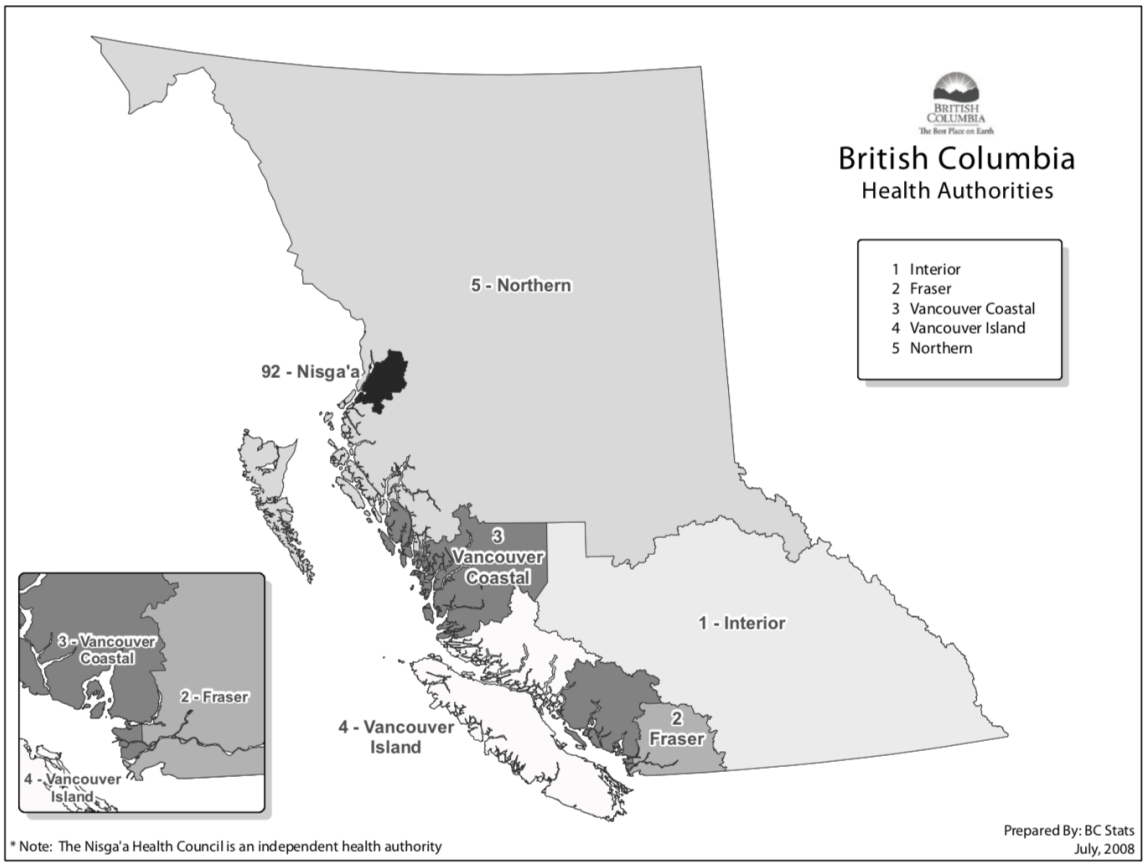

Table 6. Most callers have a primary residence located in close proximity to BCCH (n=46)

Estimated ground travel time to BCCH	Percentage of callers (n)
< 1 hour	67.4 (31)
1–3 hours	21.7 (10)
> 3 hours but < 6 hours	6.5 (3)
6–12 hours	0 (0)
> 12 hours	4.3 (2)

All callers were the primary caregivers, and the majority were the patient's parent (82.6% mother, 10.9% father), but 6.5 % were either an adoptive parent, or long-term foster parent/legal guardian. None of the recruited calls were from the patient directly.

The mean age of the caregivers was 41.1 ± 5.9 y (range 30-53 y), and they care for a mean of 2.3 ±1.2 children and youth, under the age of 18 y (range 1-8 children), in their household. Nearly 80% of callers were born in Canada, and 13.0% were born in the United States or the United Kingdom. The remaining 8.3% were born in Asia or the Middle East. Reported ethnicity was 77.8% Euro-Canadian, and 13.3% Asian, and 4.4% First Nations. Only 19.5% of callers have not achieved an educational level greater than a high school diploma (Table 7). Nearly 80% of callers reported a net family income of greater than $65,000 (Table 8).

Table 7. The majority of caregivers have some post-secondary level education (n=46)

Highest level of education achieved	Percentage of callers (n)
Did not graduated high school	4.3 (2)
High school diploma	15.2 (7)
College	6.5 (3)
Some university	13.0 (6)
Undergraduate level university degree	41.3 (19)
Postgraduate level university degree	19.6 (9)

Table 8. The majority of callers have an annual net family income above $65,000 (n=42)

Annual net income category	Percentage of callers (n)
< $25,000	9.5 (4)
$25,000 to $45,000	2.4 (1)
$46,000 to $65,000	9.5 (4)
> $65,000	78.6 (33)

Caller satisfaction with the paging service

The vast majority of callers expressed that they were either satisfied or very satisfied with the timeliness of the physician's returning their page, and his/her communication (97.9% and 97.8%, respectively); 95.6% of callers reported that they were satisfied or very satisfied with the medical advice and management plan they received, and 95.7% reported that all of their questions were answered to their satisfaction. Overall, 73.9% of callers reported that they would have gone to their local ED, if the paging service was not available to them, and 100% would recommend the paging service to other parents who have a child with the same medical condition.

Several qualitative comments were provided to the research assistant. Examples of some of the specific feedback are as follows:

> *"We love it. It can be a scary thing when something goes wrong so it's nice to have someone on the other end of the phone who knows what they're doing to help guide us."*

> *"It's so valuable to have this service. It gives a parent a greater sense of peace of mind and allows them to feel more comfortable... Just being able to know that there's a reaction plan to situations that come up instead of having to go to emergency is great. It saves time as well when you can immediately contact the right person to answer the question instead of having to go to the triage nurse, then ER physician, then labs, then endocrinologist… This telephone line definitely prevented a crisis and saved an ER visit…"*

Constructive feedback was also provided by the research assistant:

> *"The caller wasn't clear how the physician on call would be notified that they called. Since she called after hours, she didn't know if the doctor would be notified in a timely manner"*

Prevention of ED visits and hospitalizations

Only 2 of the 46 recruited callers reported that the patient ended up visiting an ED within 72 hours of the contact with the paging service. Both of these patients have Type 1 diabetes, and required hospital admission (duration of admission 1-3 days). Their reported most recent A1C values were 7.1% and 8.1%, and they use an insulin pump and a basal bolus insulin regimen, respectively. Overall, 95.6% of calls made to the paging service resulted in a prevented ED visit. Extrapolating this trend to the entire cohort of 199 calls to the paging service that met the study inclusion criteria, 190 ED visits/hospitalizations may have been prevented over the past year.

DISCUSSION AND CONCLUSIONS

This study has demonstrated that provision of a 24-hour physician staffed telephone paging service can effectively prevent ED visits and hospitalizations for pediatric patients who have diabetes or a chronic endocrine health condition. Additionally, users of the paging service have overwhelming expressed high levels of satisfaction with the service. The qualitative feedback was likewise very supportive and indicated that some callers were unfamiliar with the logistics of the paging service or unsure of when to use the service. These findings prompted the development of an informational handout for families, which explains when to use the paging service, and how to use it. This handout has been added to the BCCH EDU website.

This study is limited by its small sample size, in particular the calls pertaining to endocrine patients. Additionally, the survey questionnaire was completed retrospectively, which risks recall bias, but given the proximity of the follow-up call by the research assistant to the initial contact with the paging service, recall bias was minimized.

Interestingly, the sociodemographic data collected from the survey participants suggests that more affluent, and highly educated caregivers are using the paging

service. Geographically, greater Vancouver and the lower mainland regions are serviced by the Vancouver Coastal Health and Fraser Health Authorities. The population in this region has tremendous ethnic diversity, and accounts for 62.1% of the total population of BC, based on the BC Stats Sub-Provincial Population Estimates from 2016 (15). Based on the detailed Socio-Economic Profiles from 2006, 37.5% and 24.6% of the provincial population lives within the catchment regions of the Fraser Health Authority (FHA), and Vancouver Coastal Health Authority (VCH), respectively. Furthermore, visible minorities, predominantly Chinese and South Asian, represent 32.7% and 45.0% of the population living in the FHA and VCH regions, respectively (16). Thus, at first glance, our study would appear to have a selection bias based on the vast majority of survey participants reporting that they are of Euro-Canadian ethnicity. However, epidemiological studies have consistently shown that the prevalence of Type 1 diabetes is substantially higher in Caucasians, especially those from northern European countries such as Finland, and Great Britain. Since the vast majority of calls made to the 24-hour paging were for patients who have Type 1 diabetes, the reported ethnicity in this study aligns with the reported Type 1 diabetes prevalence rates based on ethnicity and geographical heritage (17).

The cost benefit analysis part of this study is pending, and will be very interesting, as we expect the paging service is providing a significant cost benefit to the provincial healthcare system. More will follow on this part of the study.

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