

TITLE PAGE

Development and early evaluation of HealthLink Emergency iDoctors in-assistance (HEiDi): An integration of virtual physicians into a provincial 811 health information telephone line

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ABSTRACT

Background: British Columbia, like many jurisdictions, has a health information telephone service (811) to provide callers information by nurses and help them decide whether to attend an emergency department (ED), primary care clinic, or manage their concern at home. We developed and evaluated a novel service (HEiDi) that partnered virtual physicians (VP) with 811 nurses to support callers.

Methods: All callers categorized as “seek care within 24 hours” by nurses were eligible for referral to HEiDi. VPs connected directly with callers via desktop videoconferencing software, assessed their health complaint, provided advice, and suggested care disposition. We prospectively collected demographics, health concern, VP-determined disposition, caller feedback, and caller outcomes.

Results: From April 6 to August 2, 2020, HEiDi VPs provided 7687 consultations. Most callers (57.8%) were in the 20-64 age range and 62.9% were female. Common health concerns were related to gastroenterology (16.6%), respiratory (11.4%), and dermatology (11.4%). Of the 7531 calls with available data: 2548 (33.8%, 95%CI=32.8%–34.9%) were advised to attempt home treatment, 2885 (38.3%, 95%CI=37.2%–39.4%) to contact a primary care physician within one week, 1331 (15.0%, 95%CI=14.2%–15.8%) to attend an ED immediately, and 538 (7.1%, 95%CI=6.6%–7.8%) to attend their primary provider now. Three hundred seventeen callers responded to the post-call survey, showing a 97.2% satisfaction rate with their experience.

Interpretation: Virtual physicians can provide an effective complement to a provincial health telephone system that results in 72.1% of callers diverted from urgent in-person care assessment and accelerates 15.0% of callers to seek immediate ED care, while providing high satisfaction.

Keywords: Virtual care; Interprofessional collaboration; Healthcare utilization; Telemedicine; Public health

INTRODUCTION

The novel coronavirus 2019 (COVID-19) pandemic exposed challenges throughout Canada for citizens to access health professionals and health system resources. Unfamiliarity with this disease and its severity prompted many to seek educational information on symptoms to determine whether or not an urgent need existed to access acute care facilities, such as Emergency Departments (ED) or Urgent and Primary Care Centres (UPCC). Visits to EDs during the pandemic decreased,¹ most likely due to fear of disease contraction and concern over appropriateness of ED visits, underscoring a need for patients to have alternative ways to seek care and access health information. In addition, the rules for testing and self-isolation were complex and often changing, thus the public was seeking a consistent source for specific, professional advice.

In 2008, British Columbia (BC) established a province-wide telephone service (811) as an alternative to in-person assessment. Other jurisdictions (e.g., Alberta,² United Kingdom's 111 service³) also have similar services where registered nurses (RN) provide advice to callers regarding their health concerns. The RNs can advise callers to call 911, go to an ED immediately, seek medical care within 24 hours, schedule an in-person appointment with their usual care provider, or continue with home-based management. In 2016, our team conducted a pilot project and found that incorporating emergency physicians to further assess and advise ED-directed callers led to a 15% decrease in ED visits compared with RN advice alone during the same time period one year previously.⁴

In March 2020, the COVID-19 pandemic led to an immediate seven-fold increase in calls to BC's 811 service, overwhelming personnel and telephone lines. In response and in part based on our pilot project experience, 811 rapidly initiated a novel virtual physician (VP) service – *HealthLink BC Emergency iDoctors in-assistance* (HEiDi) – to assist 811 RNs in providing support to callers and triaging. This paper describes the development and four-month early program evaluation of the HEiDi service.

METHODS

Design

This is a prospective cohort study of HEiDi, which commenced on April 6, 2020 to manage COVID-19-related calls and expanded to include all calls starting April 22. We used routinely collected, anonymized data from 811. ~~As this evaluation was for quality assurance and improvement purposes, no ethical approval was sought, in keeping with Tri-Council Policy Statement⁵ and guidance provided by the University of British Columbia's Research Ethics Board.~~

Setting and Sample

BC is a province with over five million residents across five regional health authorities.^{5,6} The 811 telephone service, managed by HealthLink BC (HLBC) in BC Ministry of Health, is available to any BC resident and manages approximately 450,000 calls annually. Callers can discuss their personal health issues, those of a family member, or other individual under their care. Trained RNs determine callers' dispositions using the *healthwise*[®] algorithm (Healthwise, Inc., Boise, USA) and their clinical judgement, triaging callers to one of the following categories: "red" to seek ED care immediately; "yellow" to seek care within 24 hours; "black" to seek primary care within seven days; or "green" to try home treatment.

The HEiDi Service

In mid-March 2020, HLBC established the HEiDi service in partnership with the BC Emergency Medicine Network,^{6,7} Rural Coordination Centre of BC,⁸ and UBC Department of Emergency Medicine. HEiDi

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3 recruited 40 family and emergency physicians to work as VPs. Virtual medical office assistants (VMOA),
4 situated on-site at 811 offices, received referrals from 811 RNs and transferred callers to connect with
5 VPs, who were located off-site throughout BC. VPs provided initially 12 hours of services per day from
6 10:00-22:00, seven days per week, and rapidly increased to 36 hours of daily service per day within four
7 weeks.
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10 As the VP coverage could not accommodate all callers that connected with RNs, HLBC and VP leadership
11 jointly decided on the following callers' eligibility criteria for referral from 811 RNs to HEiDi: (1) basic
12 English-language proficiency as there was no consistent translation services available to VPs; (2)
13 currently residing in BC; and (3) triaged "yellow" by RN, as we felt this group of callers can potentially be
14 given sufficient advice that may render ED or UPCC visits within 24 hours unnecessary.
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16 The HEiDi VPs are either emergency physicians or full-service family physicians licensed in BC, as these
17 physicians have domain expertise in the assessment of whether callers need to be treated in an ED
18 versus being managed in the community. With callers' explicit consent, VMOAs securely sent callers'
19 synopses of the chief complaints and related health information captured by 811 RNs to VPs via an
20 electronic medical record system (MOIS, Bright Health, Prince George, BC). VPs initiated the consults
21 with callers via Zoom phone calls (Zoom Video Communications, Inc., San Jose, USA); if the clinical
22 situation was deemed by either the callers or the VP to warrant visual assessments, and with mutual
23 agreement, a Zoom video call was initiated. VPs directly provided health advice to callers and retained
24 or modified RN disposition decisions based on the same classification as above. To ensure safety, VPs
25 could trigger follow-up calls by another VP the next day or later to check callers' health status, ensure
26 improvement, or exclude deterioration. In addition, for quality assurance purposes, all new VPs during
27 their first 3 clinical shifts had all callers contacted by the follow-up VP the next-day.
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32 **Data Sources**

33 Four different data sources were utilized: (1) 811's telephony system, which recorded the volume of
34 calls received each day by service level; (2) 811's caller encounter electronic health record, a database
35 with detailed record of each caller, including demographics, health problem category, nurse triage
36 decision, and, specific to HEiDi, the VP triage decision and clinical notes; (3) from mid-May onwards,
37 MOIS data extracts which contained information related to VP consultation characteristics (e.g.,
38 duration); and (4) as of June 8, 2020, an anonymous online caller survey, offered to all HEiDi callers via a
39 URL (<https://survey.health.gov.bc.ca/hlbcVPS#>). This 18-item survey included questions ~~asked~~
40 callers to rate aspects of the service, their experience, and planned actions on a five-point Likert-type
41 scale, along with several demographic ~~questions,~~ and open-ended questions. ~~to provide feedback.~~ The
42 survey was co-developed by members of the 811 service leadership and staff (including members of
43 clinical, operational, communications, and analytics teams, plus the university clinical and evaluation
44 leads). The survey was intended to provide an accessible and practical means of capturing patient
45 feedback for quality improvement purposes. Items were developed based on service goals and others
46 adapted from previously published surveys related to patient perspectives on virtual health
47 encounters.^{9,10}
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52 **Outcomes**

53 This process evaluation focused on both program and caller outcomes relevant to HEiDi, including: call
54 volumes, particularly the busiest days, characteristics of callers accessing HEiDi (e.g., age group, gender,
55 health concern, if concern is COVID-19 related, health authority), characteristics of the virtual
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consultations (e.g., duration), the proportion of callers diverted from seeking care within 24 hours (as defined by the percentage of callers triaged “yellow” by VPs compared to 811 RNs), caller-reported experience and satisfaction with HEiDi. We additionally standardized calls by each geographic health authority’s population to compare the number of calls per 100,000 residents.¹¹¹⁰

Analysis

R (version 4.0.2, R Core Team, Vienna, Austria) was used for the analysis, with results descriptively expressed as means (standard deviations, SD) if normally distributed, or medians (interquartile ranges, IQR) if non-normally distributed. X²-tests were used to compare distributions between categorical variables and t-tests to compare normally distributed variables (no comparisons of non-normally distributed variables were done).

Ethics Statement

[As this evaluation was for quality assurance and improvement purposes and used routinely collected anonymized data, no ethical approval was sought, in keeping with the Tri-Council Policy Statement¹²⁵ and guidance provided by the University of British Columbia’s Research Ethics Board.](#)

RESULTS

Call Volumes

During the 17-week study period, 811 RNs triaged 21,441 callers as “yellow,” of whom 7,845 (36.6%) were referred to HEiDi and 7,687 (98.0%) of those received a virtual consultation. Figure 1 shows the flow of callers through 811 and HEiDi. Figure 2 shows the daily and cumulative call volumes of HEiDi for the reporting period. The single day peak was 106 calls on July 12, while HEiDi managed a mean of 74.84 (SD=12.62) calls per day since the service expanded to 36 hours of coverage. On average, Saturday and Sunday were the busiest days of the week, while Monday and Tuesday were the slowest (see Supplementary Material); weekends (mean=73.32 calls per day [SD=21.91]) were busier than weekdays (mean=62.42 calls per day [SD=20.21]; $p=0.015$).

Caller Characteristics

Table 1 summarizes demographic characteristics of callers. Callers were more likely to be female and 57.8% were adults in the 20-64 years old age range. Health concerns encompassed a range of 23 standard problem categories used by 811 RNs (see Supplementary Material), with approximately half being one of four categories and 39.3% being COVID-19-related. The distribution of age groups significantly differed by gender ($p<0.001$), with female callers more likely to be in the 20-39 year old age group (38.2% v. 26.2%) and males were more likely to be in the 0-4 year old age groups (23.4% v. 12.5%) (see Supplementary Material).

While 35.9% of absolute calls came from one regional health authority (Fraser), calls standardized by population revealed that the number of calls per 100,000 residents was: 180.37 for Vancouver Island; 152.99 for Northern; 141.66 for Interior; 140.96 for Fraser; and 138.03 for Vancouver Coastal (Figure 3). The distribution of age groups significantly differed by health authority ($p<0.001$), but gender was similar across health authorities ($p=0.42$) (see Supplementary Material).

Based on 5659 consultations with available data in MOIS since its mid-May implementation, 5538 unique callers accessed HEiDi, with 112 callers having multiple consultations (excluding follow-ups) within the reporting period. Of those, 107 (95.5%) had two consultations and five (4.5%) had three or more.

VP Consultation Characteristics

After speaking with the 811 RN, most callers (88.9%) waited one minute or less before their call was answered by the HEiDi VMOA (median=0.05 minutes [IQR=0.03–0.32]). After speaking with the VMOA, callers waited a median time of 28 minutes (IQR=19–44) before the VP contacted them to begin the consultation. Consultations with VPs lasted a median time of 18 minutes (IQR=13–24). Based on 5659 consultations with available MOIS data, 996 (17.6%) consultations used Zoom video. VPs completed a mean of 12.29 (SD=3.79) consultations per six-hour shift.

VP Triage Decision

Of the 7687 callers assessed by a VP, 7531 (98.0%) had available data for the VP's triage decision. Of those, 2548 (33.8%, 95%CI=32.8%–34.9%) were advised to attempt home treatment and 2885 (38.3%, 95%CI=37.2%–39.4%) were advised to contact a primary care physician within one week, resulting in a “downgrade” of triage level for 72.1% (95%CI=71.1%–73.1%) of callers (Figure 1). A further 1331 (15.0%, 95%CI=14.2%–15.8%) were advised to attend an ED or UPCC immediately and 538 (7.1%, 95%CI=6.6%–7.8%) were advised to attend their primary care provider now. The distribution of VP triage decisions significantly differed by health authority ($p=0.004$), with Northern having the lowest “green” triage proportion and Interior having the highest “red” triage proportion (see Supplementary Material).

Caller-Reported Experience

Responses were received from 331 callers (an 18.2% response rate of 1819 survey links sent), of which 317 (95.8%) were at least partially completed. [Callers who responded to the survey](#) almost uniformly rated their experience with the HEiDi service very favorably (97.2% satisfied with overall experience), 80.8% reported that they felt better after speaking with the VP, and 97.6% stated that they planned to follow the physician's advice (Figure 4, [and see Supplementary Material Table 2](#)).

INTERPRETATION

Telephone-based 811 services offered by public health systems that respond to citizens' urgent health inquiries exist in BC, many provinces in Canada, and globally.^{2,3} While callers accessing these services use phones and are connected with nurses, HEiDi is the first such service (that we are aware of) to integrate virtual physicians in partnership with nurses to provide advice to callers, using video in appropriate cases. Two studies from other jurisdictions during the COVID-19 pandemic reported that telemedicine options that replace in-person appointments were rated favourably by callers.^{13,14,11,12}

Our early process evaluation results indicate that, [by](#) partnering VPs with 811 RNs, a substantial percentage of callers can be diverted from urgent referrals to in-person EDs or UPCC visits, compared to RN-triage alone. During the peak of the COVID-19 pandemic, this undoubtedly helped preserve ED and UPCC capacity to treat those who need acute care services, decreased congestion and overcrowding of EDs or walk-in-clinics, and improved appropriate use of acute care services. Moreover, a virtual approach protected individuals from unnecessary potential exposure to COVID-19 and other infections in ED or UPCC waiting rooms.

Appropriate triaging of 811 callers also led to an acceleration of those callers who required acute care to present to ED immediately, while simultaneously reassuring those that could be managed at home or by their community-based healthcare services. In this respect, the HEiDi service was designed to preserve the primary care system to serve callers' needs longitudinally by health professionals familiar to them.

This is the only report that we are aware of that describes the experience by physicians to define who can be served virtually and who needs a face-to-face visit for assessment and/or treatment.

~~While the response rate to survey was relatively low,~~ callers felt that HEiDi VPs provided timely and trustworthy information ~~and assurance.~~ ~~This allowed a majority of~~ A majority of HEiDi callers ~~to were~~ able to manage at home or without needing to go to the ED. ~~Those callers who did respond to the survey reported resulting in~~ high satisfaction and reassurance for both callers and their families. Callers ~~They~~ reported reduction in anxiety in dealing with their conditions or problems for which they called 811. Further, this on-demand phone and videoconferencing service was easily accessible and convenient for all BC residents, available seven days per week anywhere in the province, including remote communities.

From the health system's perspective, this preliminary process evaluation suggested that HEiDi is a consistent, reliable, and provincially accessible approach for timely access of health advice to all callers. The VP workforce can contract or expand based on caller volumes, providing staffing flexibility for pandemic-related volume increases and decreases. HEiDi supported the appropriate triaging of callers through interprofessional collaboration with 811 RNs and VMOAs, such that only calls requiring physician intervention were answered by HEiDi. Conceivably, this could result in cost-effectiveness by deploying physicians only when deemed necessary.

Limitations

This is a preliminary report of a novel physician-assisted nurse-managed telephone service in a single province during a pandemic, ~~thus and~~ results may differ in other settings or times. ~~Patients-Callers~~ outside of BC, or those who did not speak English, were not served by this program and results may be different. We have not yet collected long-term or linked ~~administrative data,~~ and therefore ~~patients callers~~ may have attended the ED, been hospitalized, or died as a result of their condition, irrespective of physician advice, without our knowledge. Many primary care physicians were unavailable, or only available by telephone, and this increased our ED and UPCC referral rates, compared to time periods when more comprehensive primary care was available. ~~Patient-The caller~~ survey ~~findings and low~~ ~~low~~ ~~response rate~~ likely reflect both selection and social desirability biases and these may spuriously increase favorable results. At this stage, we cannot estimate the direct and indirect costs and benefits of the program beyond the outlined results.

Conclusion

Our early program evaluation of HEiDi during its first 17 weeks of service demonstrates that VPs can add significant and flexible capacity to an 811 service. It results in a substantial proportion of callers diverted from seeking immediate in-person medical attention, has accelerated urgent care when appropriate, and has been well received by ~~callers~~. Our innovative use of information technology enabling virtual physician consultations supports citizens' equitable access to needed healthcare advice and information and merits consideration in other similar public telephone access systems, during and beyond pandemics. In future research, we intend to link our 811 data with ED and practitioner data to assess patient safety, system utilization, and cost-effectiveness.

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3 **DATA SHARING STATEMENT**

4 Data reported here are available from the corresponding author upon reasonable request with requisite
5 permissions.
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8 **CONTRIBUTOR'S STATEMENT**

9 All authors meet the four ICMJE's criteria for authorship, namely all authors: (1) contributed
10 substantially to conception and design, or acquisition of data, or analysis and interpretation of data, (2)
11 drafted the article or revised it critically for important intellectual content, (3) gave final approval of the
12 version to be published, and (4) agreed to act as guarantor of the work (ensuring that questions related
13 to any part of the work are appropriately investigated and resolved).
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Confidential

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FIGURES

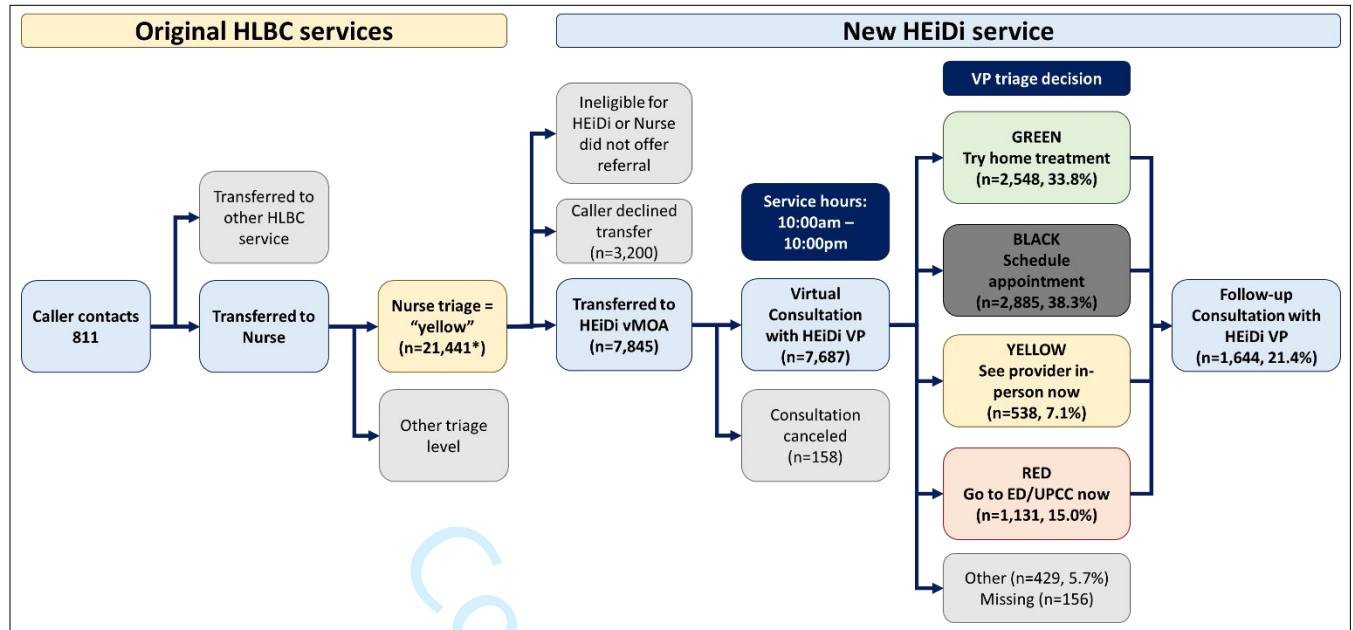


Figure 1. Flow of callers through 811 and HEiDi service. *Nurse call numbers reported here are only for the 12-hour period of the HEiDi service.

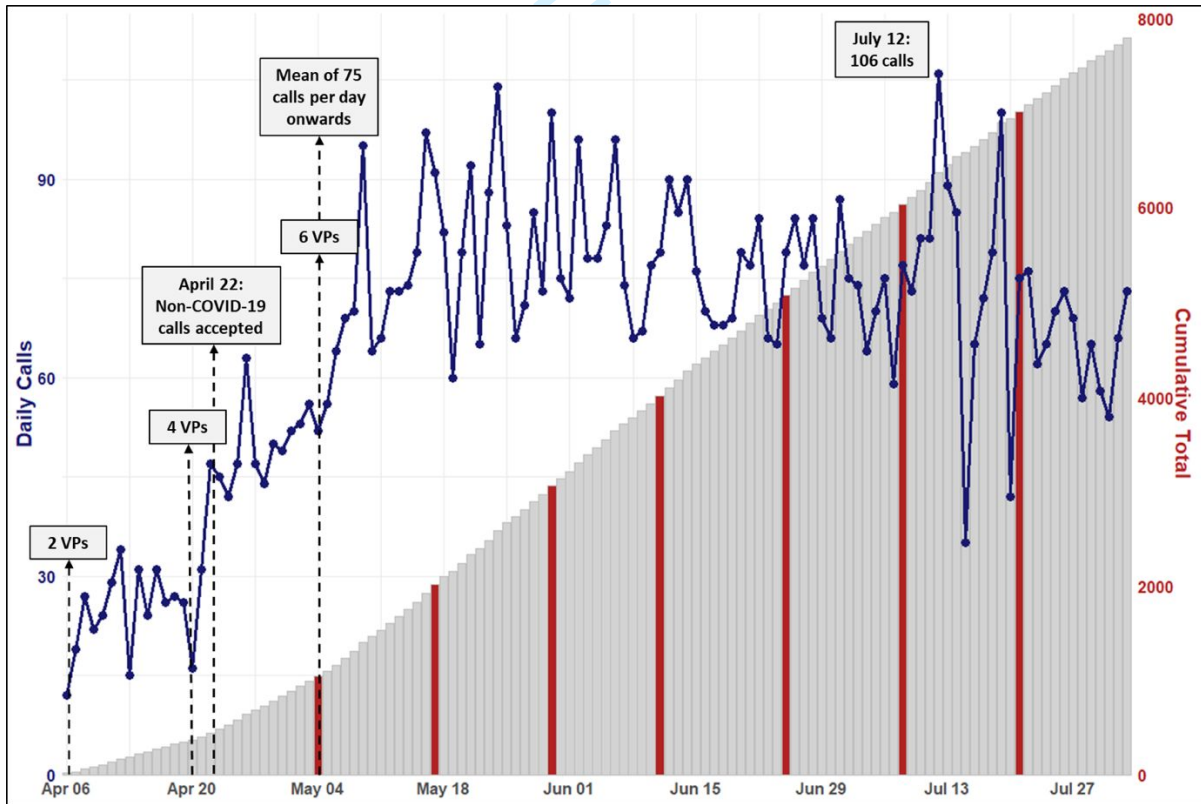


Figure 2. Daily and cumulative call volumes to HEiDi. Red bars indicate when 1,000, 2,000, etc. calls were received.

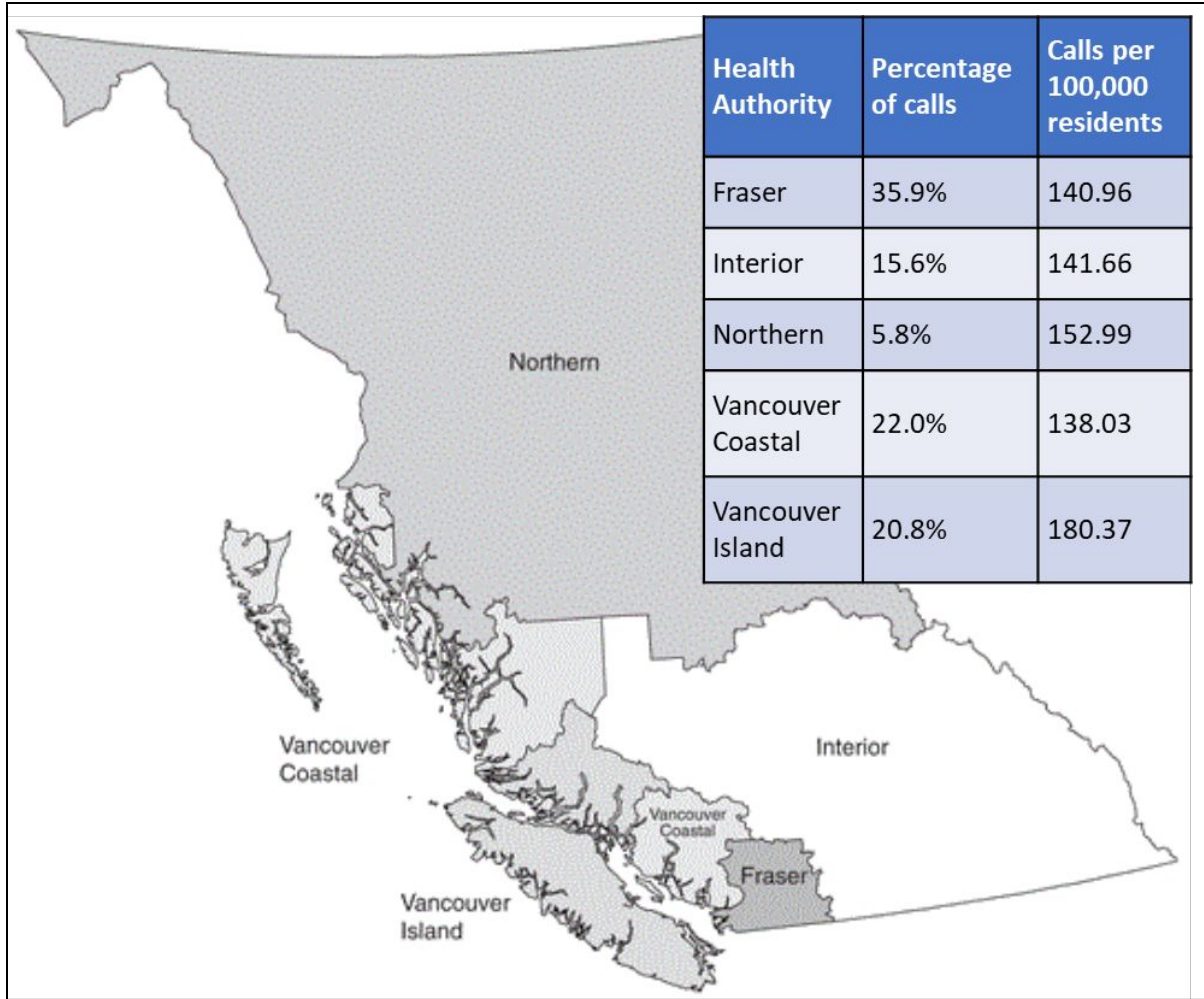


Figure 3. Summary of percentage of calls and population-standardized number of calls by BC Health Authority.

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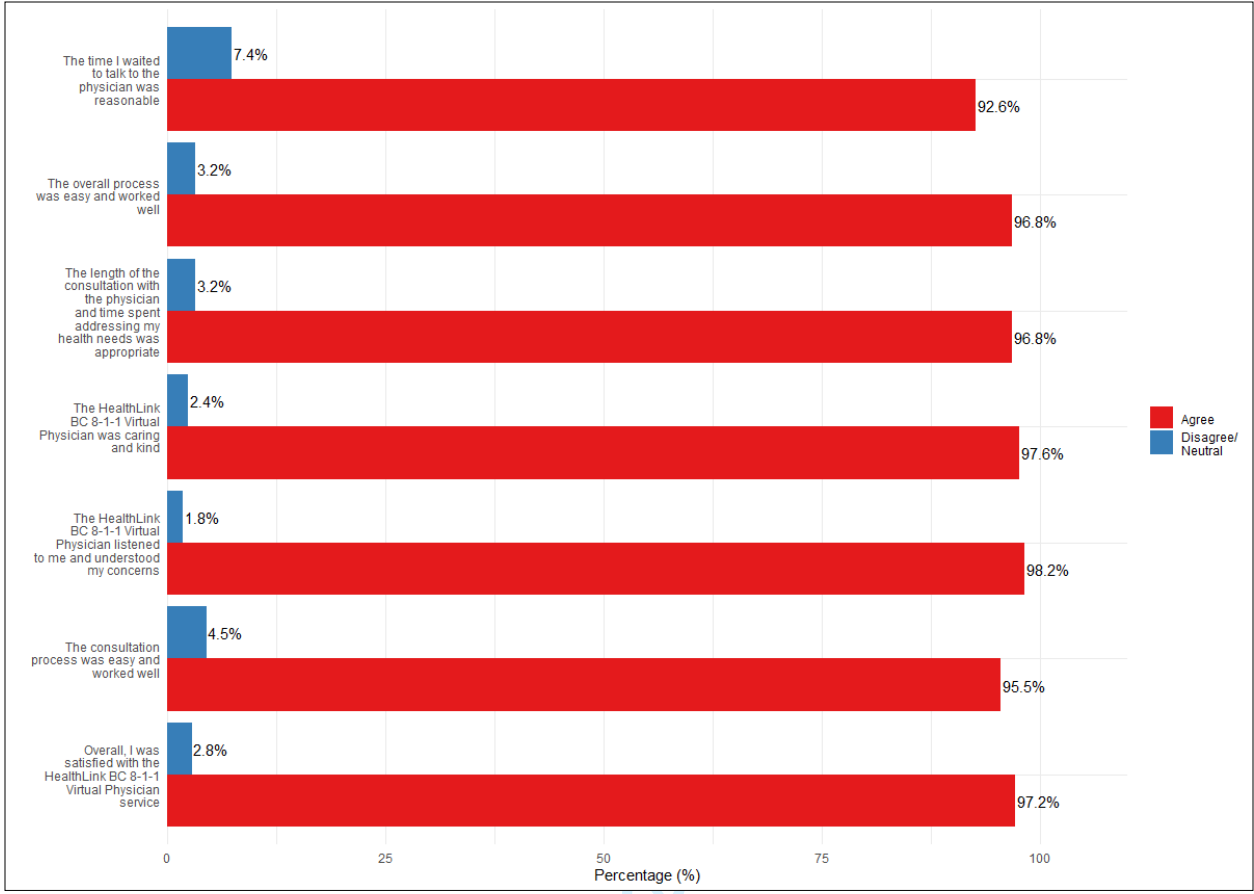


Figure 4. Caller-reported satisfaction ratings from the post-call online survey (n=317). Ratings were dichotomized into “Agree” (caller rating = 4 or 5) and “Disagree/Neutral” (caller rating = 1, 2, or 3). The items presented here correspond to the first seven items in Table 2.

TABLES

Table 1. Caller characteristics of HEiDi referrals (n=7687).	
Gender (female)	4814 (62.9%)
<i>Missing or Unknown</i>	37
Age group	
< 1 year	544 (7.0%)
1 – 4 years	721 (9.4%)
5 – 19 years	887 (11.6%)
20 – 39 years	2603 (33.9%)
40 – 64 years	1836 (23.9%)
> 64 years	1090 (14.2%)
<i>Missing or Unknown</i>	2
Health Authority	
<i>Fraser</i>	2688 (35.9%)
<i>Interior</i>	1172 (15.6%)
<i>Northern</i>	435 (5.8%)
<i>Vancouver Coastal</i>	1648 (22.0%)
<i>Vancouver Island</i>	1549 (20.7%)
<i>Missing or Unknown</i>	195
Health concern category	
<i>Gastroenterology (digestive)</i>	1275 (16.6%)
<i>Respiratory</i>	877 (11.4%)
<i>Dermatology (skin, hair, nails)</i>	874 (11.4%)
<i>Musculoskeletal (bone, muscle, joint)</i>	813 (10.5%)
Caller's health concern related to COVID-19	1169 (39.3%) ¹
<i>Missing or Unknown</i>	4749
Caller has a usual care provider	1228 (81.3%) ²
<i>Missing</i>	133
<i>No follow-up</i>	6043
<p><i>Note: cell values represent counts (percentages). Percentages were calculated after removing missing/unknown/not applicable data from the denominator.</i></p> <p>¹<i>Only a subset of 2977 HEiDi calls were recorded if they were COVID-19-related or not.</i></p> <p>²<i>Only callers receiving a subsequent follow-up call from a VP are asked if they have a usual care provider; 1511 callers received a follow-up call and answered this question.</i></p>	

SUPPLEMENTARY MATERIAL***Call volumes by day of week***

Summary of HEiDi call volumes by day.	
Day of week	Mean (SD) number of daily calls (n=17 each)
Mon	59.71 (25.14)
Tue	60.06 (19.71)
Wed	62.53 (19.1)
Thu	64.94 (18.84)
Fri	64.88 (19.39)
Sat	72.53 (22.5)
Sun	74.12 (21.97)

811 health problem categories

Total n=7687; 23 problem categories used.

Nursing problem category	n	%
Gastroenterology (Digestive)	1275	16.6
Respiratory	877	11.4
Dermatology (Skin, Hair, Nails)	874	11.4
Musculoskeletal (Bone, Muscle, Joint)	811	10.6
Otolaryngology (Ear, Nose, Throat)	602	7.8
Neurology	597	7.8
First Aid	414	5.4
Gynecology (Women's Reproductive)	407	5.3
Urology (Urinary Tract & Male Genitalia)	335	4.4
Ophthalmology (Eyes)	308	4.0
Pediatrics	275	3.6
Obstetrics & Postpartum	230	3.0
Immunology	181	2.4
Cardiovascular (Heart/Circulation)	171	2.2
Dental/Mouth	123	1.6
Psychology (Mental Health)	73	0.9
Diabetes	42	0.5

Wellness	23	0.3
Pharmaceutical (Medication)	22	0.3
Endocrinology (Glands)	21	0.3
Infectious/Communicable Diseases	19	0.2
Oncology (Site-Specific Cancers)	5	0.1
Hematology (Blood)	2	0.0

Distributions of age group, gender, and health authority

Total n=7687.

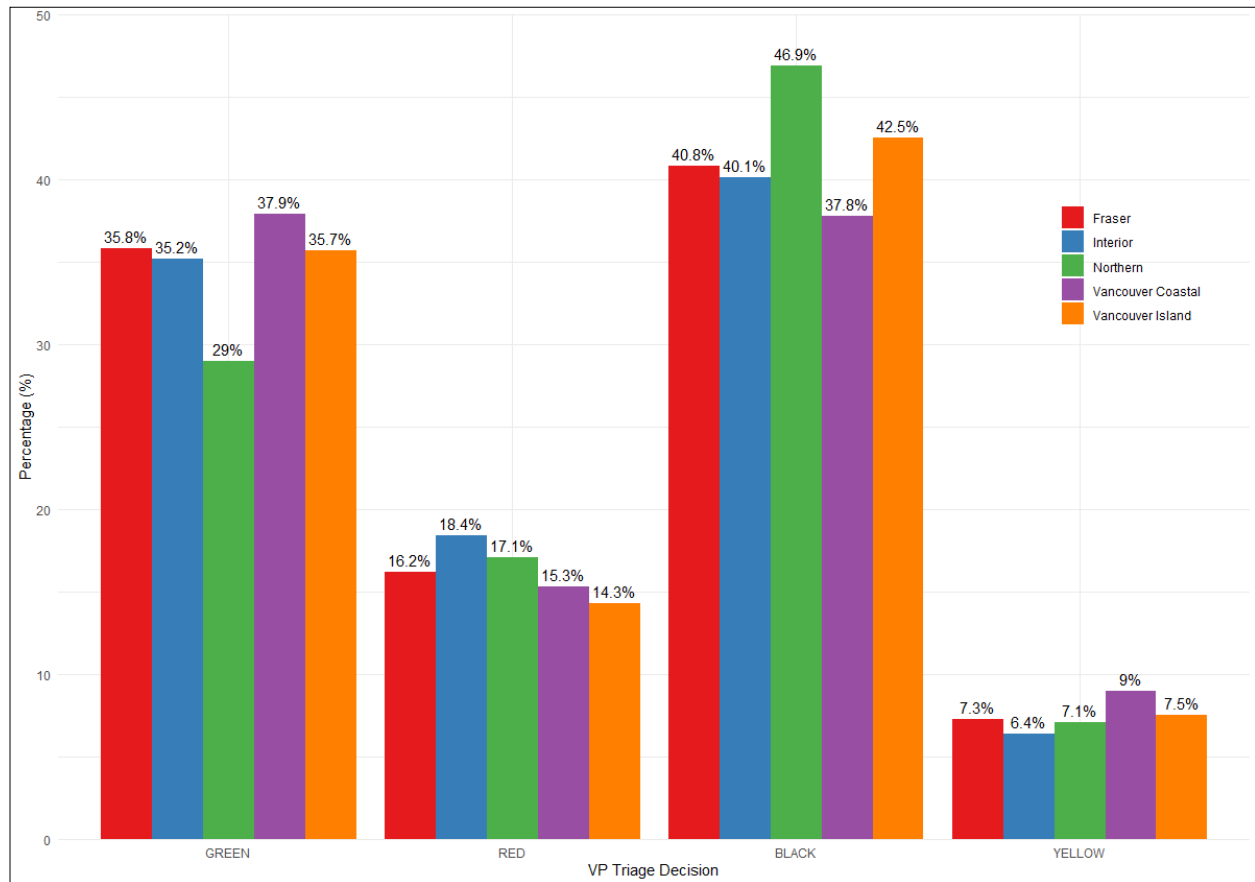
Age Group	Female (n=4814)	Male (n=2836)	Gender missing (n=37)
< 1 year	269 (5.6%)	277 (9.8%)	2
1 – 4 years	331 (6.9%)	386 (13.6%)	4
5 – 19 years	526 (10.9%)	354 (12.5%)	7
20 – 39 years	1841 (38.2%)	743 (26.2%)	19
40 – 64 years	1168 (24.3%)	666 (23.5%)	2
> 64 years	679 (14.1%)	410 (14.5%)	1
Age group missing (n=2)	0	0	2

Health Authority	Female (n=4701)	Male (n=2777)	Gender missing (n=37)
Fraser	1673 (35.6%)	1010 (36.4%)	5
Interior	717 (15.3%)	455 (16.4%)	0
Northern	281 (6%)	152 (5.5%)	2
Vancouver Coastal	1036 (22%)	609 (21.9%)	3
Vancouver Island	994 (21.1%)	551 (19.8%)	4
Health authority missing (n=195)	113	59	23

Age Group	Fraser (n=2688)	Interior (n=1172)	Northern (n=435)	Vancouver Coastal (n=1648)	Vancouver Island (n=1549)	Health authority missing (n=195)
< 1 year	247 (9.2%)	81 (6.9%)	26 (6%)	126 (7.6%)	58 (3.7%)	10
1 – 4 years	296 (11%)	99 (8.4%)	47 (10.8%)	156 (9.5%)	104 (6.7%)	19
5 – 19 years	332 (12.4%)	130 (11.1%)	66 (15.2%)	170 (10.3%)	171 (11%)	17
20 – 39 years	849 (31.6%)	388 (33.1%)	159 (36.6%)	620 (37.6%)	508 (32.8%)	79
40 – 64 years	607 (22.6%)	263 (22.4%)	115 (26.4%)	377 (22.9%)	422 (27.2%)	52
> 64 years	357 (13.3%)	211 (18%)	22 (5.1%)	199 (12.1%)	286 (18.5%)	15
Age group missing (n=3)	0	0	0	0	0	3

Distribution of VP triage decision by health authority

Note: These numbers exclude the category of “other” for VP triage decision. The distribution of VP triage decisions significantly differed by health authority ($\chi^2(12)=28.95, p=0.004$).



Health Authority	VP Triage Decision			
	Green	Red	Black	Yellow
Fraser	893 (35.8%)	403 (16.2%)	1016 (40.8%)	181 (7.3%)
Interior	385 (35.2%)	201 (18.4%)	439 (40.1%)	70 (6.4%)
Northern	115 (29%)	68 (17.1%)	186 (46.9%)	28 (7.1%)
Vancouver Coastal	578 (37.9%)	233 (15.3%)	576 (37.8%)	137 (9%)
Vancouver Island	506 (35.7%)	203 (14.3%)	602 (42.5%)	107 (7.5%)

Green: caller advised to try treatment at home.

Red: caller advised to go to ED immediately.

Black: caller advised to schedule an in-person appointment with their primary care provider within the next 7 days.

Yellow: caller advised to see primary care provider within 24 hours.

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Summary of caller responses to online survey

Summary of caller responses to online post-consultation survey (n=317).						
Question	Response options					Missing
	1 = Strongly disagree	2	3	4	5 = Strongly agree	
The consultation process was easy and worked well.	6 (2.1%)	0	7 (2.4%)	42 (14.6%)	232 (80.8%)	30
The HealthLink BC 8-1-1 Virtual Physician was caring and kind.	4 (1.4%)	1 (0.3%)	2 (0.7%)	17 (5.9%)	262 (91.6%)	31
The HealthLink BC 8-1-1 Virtual Physician listened to me and understood my concerns.	4 (1.4%)	0	1 (0.4%)	21 (7.4%)	259 (90.9%)	32
The time I waited to talk to the physician was reasonable.	2 (0.7%)	5 (1.8%)	14 (5%)	46 (16.3%)	215 (76.2%)	35
The length of the consultation with the physician and time spent addressing my health needs was appropriate.	3 (1.1%)	2 (0.7%)	4 (1.4%)	27 (9.6%)	245 (87.2%)	36
The overall process was easy and worked well.	4 (1.4%)	0	5 (1.8%)	45 (16%)	227 (80.8%)	36
Overall, I was satisfied with the HealthLink BC 8-1-1 Virtual Physician service.	5 (1.8%)	1 (0.4%)	2 (0.7%)	28 (9.9%)	247 (87.3%)	34
	1 = More anxious	2	3	4	5 = Much better	Missing
Compare how you felt before you spoke to the HealthLink BC 8-1-1 Virtual Physician to how you feel now that you have spoken to the Virtual Physician	8 (2.7%)	9 (3.1%)	39 (13.4%)	71 (24.4%)	164 (56.4%)	26
	Yes	No	Missing			
Do you plan to take the action recommended by the HealthLink BC 8-1-1 Virtual Physician?	283 (97.6%)	7 (2.4%)	27			

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3 **TITLE PAGE**
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7 Development and early evaluation of HealthLink Emergency iDoctors in-assistance (HEiDi): An
8 integration of virtual physicians into a provincial 811 health information telephone line
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10
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ABSTRACT

Background: British Columbia, like many jurisdictions, has a health information telephone service (811) to provide callers information by nurses and help them decide whether to attend an emergency department (ED), primary care clinic, or manage their concern at home. We developed and evaluated a novel service (HEiDi) that partnered virtual physicians (VP) with 811 nurses to support callers.

Methods: All callers categorized as “seek care within 24 hours” by nurses were eligible for referral to HEiDi. VPs connected directly with callers via desktop videoconferencing software, assessed their health complaint, provided advice, and suggested care disposition. We prospectively collected demographics, health concern, VP-determined disposition, caller feedback, and caller outcomes.

Results: From April 6 to August 2, 2020, HEiDi VPs provided 7687 consultations. Most callers (57.8%) were in the 20-64 age range and 62.9% were female. Common health concerns were related to gastroenterology (16.6%), respiratory (11.4%), and dermatology (11.4%). Of the 7531 calls with available data: 2548 (33.8%) were advised to attempt home treatment, 2885 (38.3%) to contact a primary care physician within one week, 1331 (15.0%) to attend an ED immediately, and 538 (7.1%) to attend their primary provider now. Three hundred seventeen callers responded to the post-call survey, showing a 97.2% satisfaction rate with their experience.

Interpretation: Virtual physicians can provide an effective complement to a provincial health telephone system that results in 72.1% of callers diverted from urgent in-person care assessment and accelerates 15.0% of callers to seek immediate ED care, while providing high satisfaction.

Keywords: Virtual care; Interprofessional collaboration; Healthcare utilization; Telemedicine; Public health

INTRODUCTION

The novel coronavirus 2019 (COVID-19) pandemic exposed challenges throughout Canada for citizens to access health professionals and health system resources. Unfamiliarity with this disease and its severity prompted many to seek educational information on symptoms to determine whether or not an urgent need existed to access acute care facilities, such as Emergency Departments (ED) or Urgent and Primary Care Centres (UPCC). Visits to EDs during the pandemic decreased,¹ most likely due to fear of disease contraction and concern over appropriateness of ED visits, underscoring a need for patients to have alternative ways to seek care and access health information. In addition, the rules for testing and self-isolation were complex and often changing, thus the public was seeking a consistent source for specific, professional advice.

In 2008, British Columbia (BC) established a province-wide telephone service (811) as an alternative to in-person assessment. Other jurisdictions (e.g., Alberta,² United Kingdom's 111 service³) also have similar services where registered nurses (RN) provide advice to callers regarding their health concerns. The RNs can advise callers to call 911, go to an ED immediately, seek medical care within 24 hours, schedule an in-person appointment with their usual care provider, or continue with home-based management. In 2016, our team conducted a pilot project and found that incorporating emergency physicians to further assess and advise ED-directed callers led to a 15% decrease in ED visits compared with RN advice alone during the same time period one year previously.⁴

In March 2020, the COVID-19 pandemic led to an immediate seven-fold increase in calls to BC's 811 service, overwhelming personnel and telephone lines. In response and in part based on our pilot project experience, 811 rapidly initiated a novel virtual physician (VP) service – *HealthLink BC Emergency iDoctors in-assistance* (HEiDi) – to assist 811 RNs in providing support to callers and triaging. This paper describes the development and four-month early program evaluation of the HEiDi service.

METHODS

Design

This is a prospective cohort study of HEiDi, which commenced on April 6, 2020 to manage COVID-19-related calls and expanded to include all calls starting April 22. We used routinely collected, anonymized data from 811.

Setting and Sample

BC is a province with over five million residents across five regional health authorities.⁵ The 811 telephone service, managed by HealthLink BC (HLBC) in BC Ministry of Health, is available to any BC resident and manages approximately 450,000 calls annually. Callers can discuss their personal health issues, those of a family member, or other individual under their care. Trained RNs determine callers' dispositions using the *healthwise*[®] algorithm (Healthwise, Inc., Boise, USA) and their clinical judgement, triaging callers to one of the following categories: "red" to seek ED care immediately; "yellow" to seek care within 24 hours; "black" to seek primary care within seven days; or "green" to try home treatment.

The HEiDi Service

In mid-March 2020, HLBC established the HEiDi service in partnership with the BC Emergency Medicine Network,^{6,7} Rural Coordination Centre of BC,⁸ and UBC Department of Emergency Medicine. HEiDi recruited 40 family and emergency physicians to work as VPs. Virtual medical office assistants (VMOA), situated on-site at 811 offices, received referrals from 811 RNs and transferred callers to connect with

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3 VPs, who were located off-site throughout BC. VPs provided initially 12 hours of services per day from
4 10:00-22:00, seven days per week, and rapidly increased to 36 hours of daily service per day within four
5 weeks.
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7 As the VP coverage could not accommodate all callers that connected with RNs, HLBC and VP leadership
8 jointly decided on the following callers' eligibility criteria for referral from 811 RNs to HEiDi: (1) basic
9 English-language proficiency as there was no consistent translation services available to VPs; (2)
10 currently residing in BC; and (3) triaged "yellow" by RN, as we felt this group of callers can potentially be
11 given sufficient advice that may render ED or UPCC visits within 24 hours unnecessary.
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14 The HEiDi VPs are either emergency physicians or full-service family physicians licensed in BC, as these
15 physicians have domain expertise in the assessment of whether callers need to be treated in an ED
16 versus being managed in the community. With callers' explicit consent, VMOAs securely sent callers'
17 synopses of the chief complaints and related health information captured by 811 RNs to VPs via an
18 electronic medical record system (MOIS, Bright Health, Prince George, BC). VPs initiated the consults
19 with callers via Zoom phone calls (Zoom Video Communications, Inc., San Jose, USA); if the clinical
20 situation was deemed by either the callers or the VP to warrant visual assessments, and with mutual
21 agreement, a Zoom video call was initiated. VPs directly provided health advice to callers and retained
22 or modified RN disposition decisions based on the same classification as above. To ensure safety, VPs
23 could trigger follow-up calls by another VP the next day or later to check callers' health status, ensure
24 improvement, or exclude deterioration. In addition, for quality assurance purposes, all new VPs during
25 their first 3 clinical shifts had all callers contacted by the follow-up VP the next-day.
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29 **Data Sources**

30 Four different data sources were utilized: (1) 811's telephony system, which recorded the volume of
31 calls received each day by service level; (2) 811's caller encounter electronic health record, a database
32 with detailed record of each caller, including demographics, health problem category, nurse triage
33 decision, and, specific to HEiDi, the VP triage decision and clinical notes; (3) from mid-May onwards,
34 MOIS data extracts which contained information related to VP consultation characteristics (e.g.,
35 duration); and (4) as of June 8, 2020, an anonymous online caller survey, offered to all HEiDi callers via a
36 URL (<https://survey.health.gov.bc.ca/hlbcVPS#>). This 18-item survey included questions asked callers to
37 rate aspects of the service, their experience, and planned actions on a five-point Likert-type scale, along
38 with several demographic and open-ended questions. The survey was co-developed by members of the
39 811 service leadership and staff (including members of clinical, operational, communications, and
40 analytics teams, plus the university clinical and evaluation leads). The survey was intended to provide an
41 accessible and practical means of capturing patient feedback for quality improvement purposes. Items
42 were developed based on service goals and others adapted from previously published surveys related to
43 patient perspectives on virtual health encounters.^{9,10}
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48 **Outcomes**

49 This process evaluation focused on both program and caller outcomes relevant to HEiDi, including: call
50 volumes, particularly the busiest days, characteristics of callers accessing HEiDi (e.g., age group, gender,
51 health concern, if concern is COVID-19 related, health authority), characteristics of the virtual
52 consultations (e.g., duration), the proportion of callers diverted from seeking care within 24 hours (as
53 defined by the percentage of callers triaged "yellow" by VPs compared to 811 RNs), caller-reported
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3 experience and satisfaction with HEiDi. We additionally standardized calls by each geographic health
4 authority's population to compare the number of calls per 100,000 residents.¹¹
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6 **Analysis**

7 R (version 4.0.2, R Core Team, Vienna, Austria) was used for the analysis, with results descriptively
8 expressed as means (standard deviations, SD) if normally distributed, or medians (interquartile ranges,
9 IQR) if non-normally distributed. X²-tests were used to compare distributions between categorical
10 variables and *t*-tests to compare normally distributed variables (no comparisons of non-normally
11 distributed variables were done).
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14 **Ethics Statement**

15 As this evaluation was for quality assurance and improvement purposes and used routinely collected
16 anonymized data, no ethical approval was sought, in keeping with the Tri-Council Policy Statement¹²⁵
17 and guidance provided by the University of British Columbia's Research Ethics Board.
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20 **RESULTS**

21 **Call Volumes**

22 During the 17-week study period, 811 RNs triaged 21,441 callers as "yellow," of whom 7,845 (36.6%)
23 were referred to HEiDi and 7,687 (98.0%) of those received a virtual consultation. Figure 1 shows the
24 flow of callers through 811 and HEiDi. Figure 2 shows the daily and cumulative call volumes of HEiDi for
25 the reporting period. The single day peak was 106 calls on July 12, while HEiDi managed a mean of 74.84
26 (SD=12.62) calls per day since the service expanded to 36 hours of coverage. On average, Saturday and
27 Sunday were the busiest days of the week, while Monday and Tuesday were the slowest (see
28 Supplementary Material); weekends (mean=73.32 calls per day [SD=21.91]) were busier than weekdays
29 (mean=62.42 calls per day [SD=20.21]; *p*=0.015).
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33 **Caller Characteristics**

34 Table 1 summarizes demographic characteristics of callers. Callers were more likely to be female and
35 57.8% were adults in the 20-64 years old age range. Health concerns encompassed a range of 23
36 standard problem categories used by 811 RNs (see Supplementary Material), with approximately half
37 being one of four categories and 39.3% being COVID-19-related. The distribution of age groups
38 significantly differed by gender (*p*<0.001), with female callers more likely to be in the 20-39 year old age
39 group (38.2% v. 26.2%) and males were more likely to be in the 0-4 year old age groups (23.4% v. 12.5%)
40 (see Supplementary Material).
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43 While 35.9% of absolute calls came from one regional health authority (Fraser), calls standardized by
44 population revealed that the number of calls per 100,000 residents was: 180.37 for Vancouver Island;
45 152.99 for Northern; 141.66 for Interior; 140.96 for Fraser; and 138.03 for Vancouver Coastal (Figure 3).
46 The distribution of age groups significantly differed by health authority (*p*<0.001), but gender was
47 similar across health authorities (*p*=0.42) (see Supplementary Material).
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50 Based on 5659 consultations with available data in MOIS since its mid-May implementation, 5538
51 unique callers accessed HEiDi, with 112 callers having multiple consultations (excluding follow-ups)
52 within the reporting period. Of those, 107 (95.5%) had two consultations and five (4.5%) had three or
53 more.
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VP Consultation Characteristics

After speaking with the 811 RN, most callers (88.9%) waited one minute or less before their call was answered by the HEiDi VMOA (median=0.05 minutes [IQR=0.03–0.32]). After speaking with the VMOA, callers waited a median time of 28 minutes (IQR=19–44) before the VP contacted them to begin the consultation. Consultations with VPs lasted a median time of 18 minutes (IQR=13–24). Based on 5659 consultations with available MOIS data, 996 (17.6%) consultations used Zoom video. VPs completed a mean of 12.29 (SD=3.79) consultations per six-hour shift.

VP Triage Decision

Of the 7687 callers assessed by a VP, 7531 (98.0%) had available data for the VP's triage decision. Of those, 2548 (33.8%) were advised to attempt home treatment and 2885 (38.3%) were advised to contact a primary care physician within one week, resulting in a "downgrade" of triage level for 72.1% of callers (Figure 1). A further 1331 (15.0%) were advised to attend an ED or UPCC immediately and 538 (7.1%) were advised to attend their primary care provider now. The distribution of VP triage decisions significantly differed by health authority ($p=0.004$), with Northern having the lowest "green" triage proportion and Interior having the highest "red" triage proportion (see Supplementary Material).

Caller-Reported Experience

Responses were received from 331 callers (an 18.2% response rate of 1819 survey links sent), of which 317 (95.8%) were at least partially completed. Callers who responded to the survey almost uniformly rated their experience with the HEiDi service very favorably (97.2% satisfied with overall experience), 80.8% reported that they felt better after speaking with the VP, and 97.6% stated that they planned to follow the physician's advice (Figure 4, and see Supplementary Material).

INTERPRETATION

Telephone-based 811 services offered by public health systems that respond to citizens' urgent health inquiries exist in BC, many provinces in Canada, and globally.^{2,3} While callers accessing these services use phones and are connected with nurses, HEiDi is the first such service (that we are aware of) to integrate virtual physicians in partnership with nurses to provide advice to callers, using video in appropriate cases. Two studies from other jurisdictions during the COVID-19 pandemic reported that telemedicine options that replace in-person appointments were rated favourably by callers.^{13,14}

Our early process evaluation results indicate that, by partnering VPs with 811 RNs, a substantial percentage of callers can be diverted from urgent referrals to in-person EDs or UPCC visits, compared to RN-triage alone. During the peak of the COVID-19 pandemic, this undoubtedly helped preserve ED and UPCC capacity to treat those who need acute care services, decreased congestion and overcrowding of EDs or walk-in-clinics, and improved appropriate use of acute care services. Moreover, a virtual approach protected individuals from unnecessary potential exposure to COVID-19 and other infections in ED or UPCC waiting rooms.

Appropriate triaging of 811 callers also led to an acceleration of those callers who required acute care to present to ED immediately, while simultaneously reassuring those that could be managed at home or by their community-based healthcare services. In this respect, the HEiDi service was designed to preserve the primary care system to serve callers' needs longitudinally by health professionals familiar to them. This is the only report that we are aware of that describes the experience by physicians to define who can be served virtually and who needs a face-to-face visit for assessment and/or treatment.

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3 While the response rate to survey was relatively low, callers felt that HEiDi VPs provided timely and
4 trustworthy information and assurance. A majority of HEiDi callers were able to manage at home or
5 without needing to go to the ED. Those callers who did respond to the survey reported high satisfaction
6 and reassurance for both callers and their families. They reported reduction in anxiety in dealing with
7 their conditions or problems for which they called 811. Further, this on-demand phone and
8 videoconferencing service was easily accessible and convenient for all BC residents, available seven days
9 per week anywhere in the province, including remote communities.
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12 From the health system's perspective, this preliminary process evaluation suggested that HEiDi is a
13 consistent, reliable, and provincially accessible approach for timely access of health advice to all callers.
14 The VP workforce can contract or expand based on caller volumes, providing staffing flexibility for
15 pandemic-related volume increases and decreases. HEiDi supported the appropriate triaging of callers
16 through interprofessional collaboration with 811 RNs and VMOAs, such that only calls requiring
17 physician intervention were answered by HEiDi. Conceivably, this could result in cost-effectiveness by
18 deploying physicians only when deemed necessary.
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21 **Limitations**

22 This is a preliminary report of a novel physician-assisted nurse-managed telephone service in a single
23 province during a pandemic, thus results may differ in other settings or times. Callers outside of BC, or
24 those who did not speak English, were not served by this program and results may be different. We have
25 not yet collected long-term or linked administrative data, therefore callers may have attended the ED,
26 been hospitalized, or died as a result of their condition, irrespective of physician advice, without our
27 knowledge. Many primary care physicians were unavailable, or only available by telephone, and this
28 increased our ED and UPCC referral rates, compared to time periods when more comprehensive primary
29 care was available. The caller survey findings and low response rate likely reflect both selection and
30 social desirability biases and these may spuriously increase favorable results. At this stage, we cannot
31 estimate the direct and indirect costs and benefits of the program beyond the outlined results.
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35 **Conclusion**

36 Our early program evaluation of HEiDi during its first 17 weeks of service demonstrates that VPs can add
37 significant and flexible capacity to an 811 service. It results in a substantial proportion of callers diverted
38 from seeking immediate in-person medical attention, has accelerated urgent care when appropriate,
39 and has been well received by callers. Our innovative use of information technology enabling virtual
40 physician consultations supports citizens' equitable access to needed healthcare advice and information
41 and merits consideration in other similar public telephone access systems, during and beyond
42 pandemics. In future research, we intend to link our 811 data with ED and practitioner data to assess
43 patient safety, system utilization, and cost-effectiveness.
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DATA SHARING STATEMENT

Data reported here are available from the corresponding author upon reasonable request with requisite permissions.

CONTRIBUTOR'S STATEMENT

All authors meet the four ICMJE's criteria for authorship, namely all authors: (1) contributed substantially to conception and design, or acquisition of data, or analysis and interpretation of data, (2) drafted the article or revised it critically for important intellectual content, (3) gave final approval of the version to be published, and (4) agreed to act as guarantor of the work (ensuring that questions related to any part of the work are appropriately investigated and resolved).

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Confidential

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FIGURES

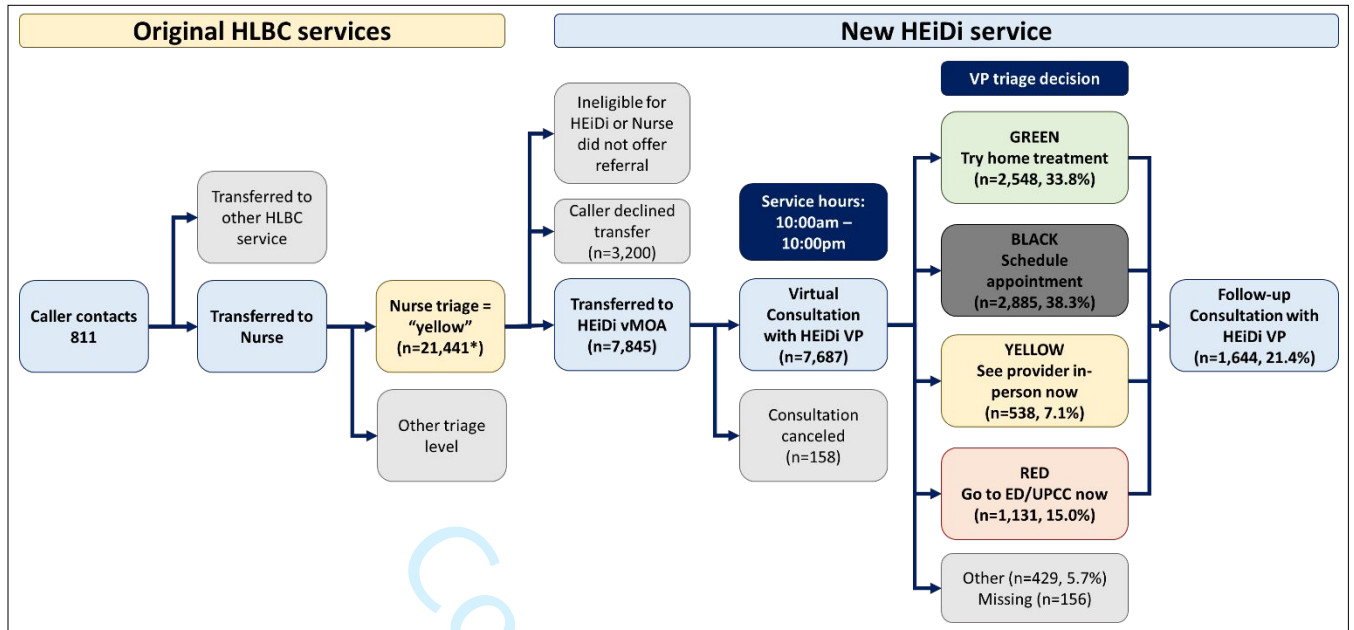


Figure 1. Flow of callers through 811 and HEiDi service. *Nurse call numbers reported here are only for the 12-hour period of the HEiDi service.

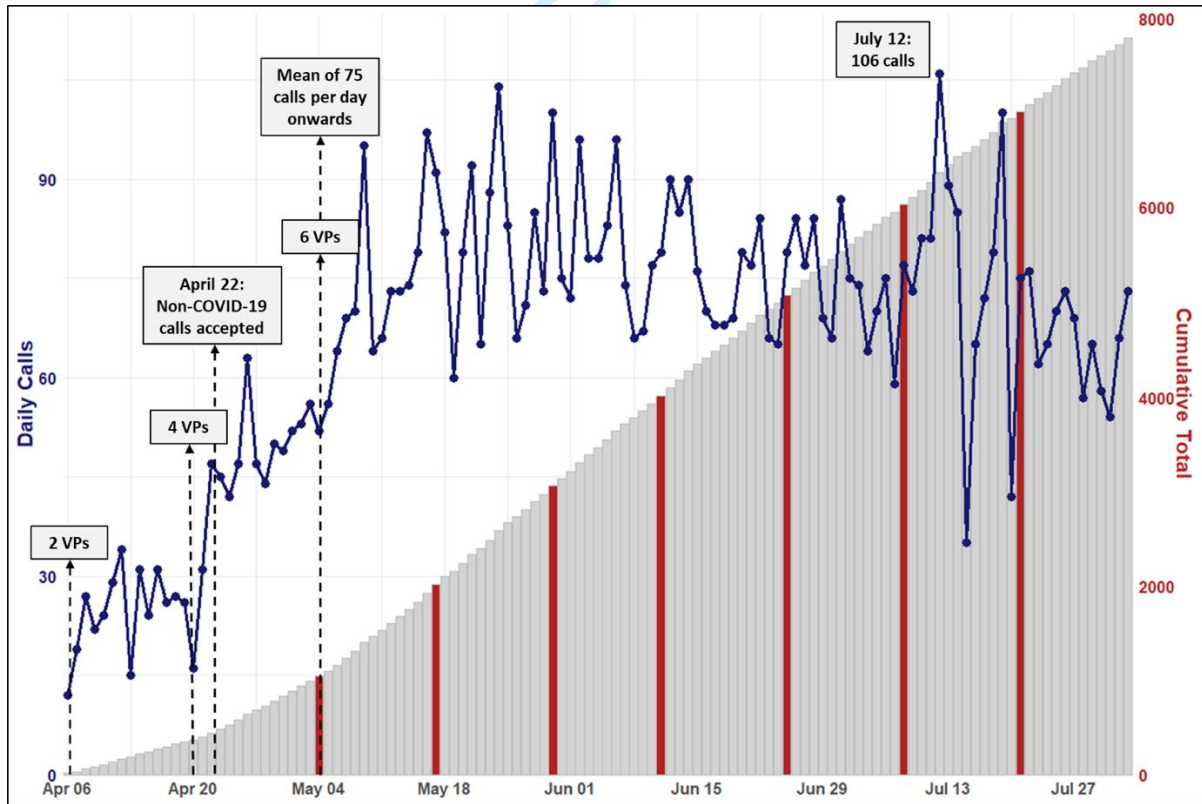


Figure 2. Daily and cumulative call volumes to HEiDi. Red bars indicate when 1,000, 2,000, etc. calls were received.

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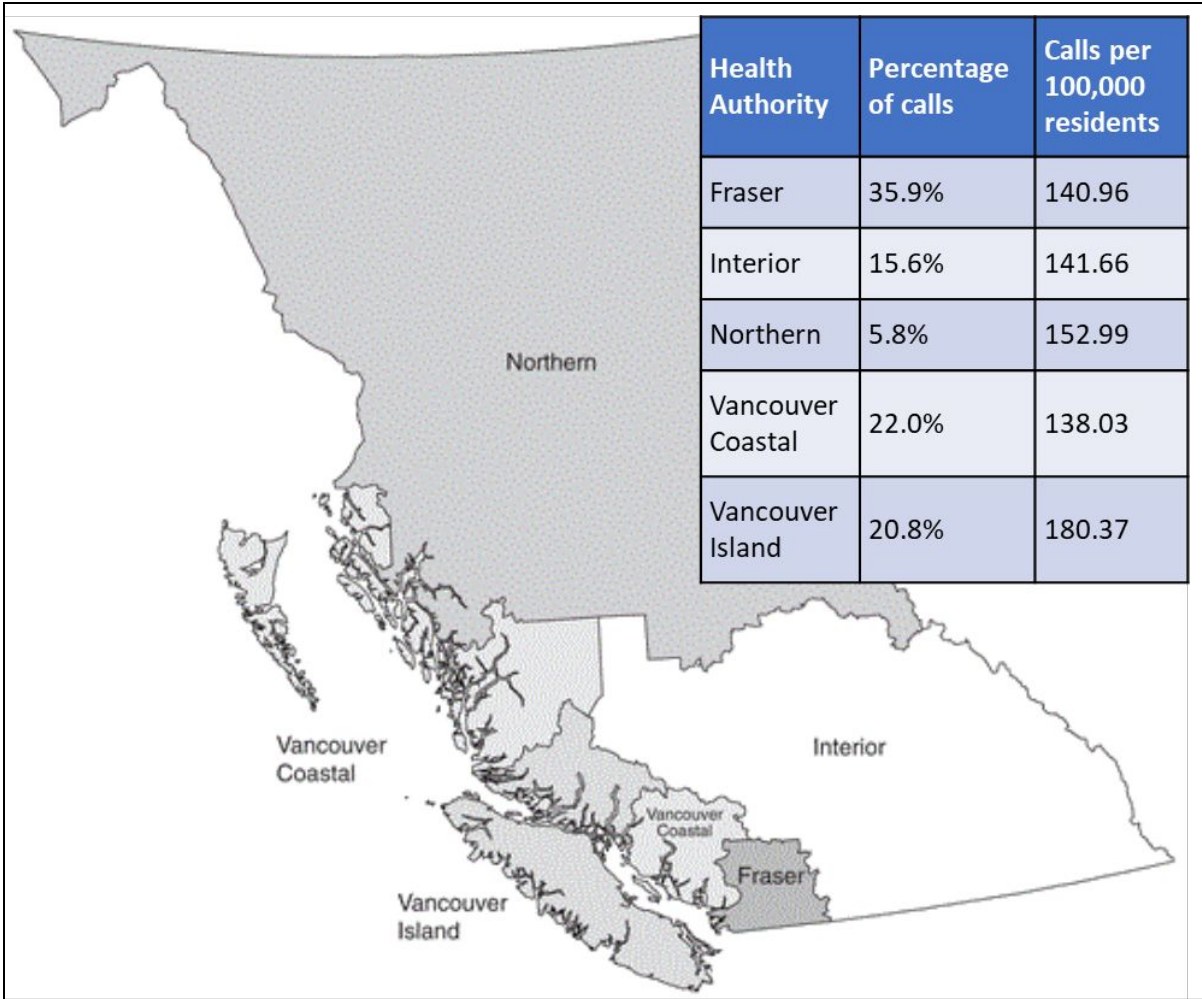


Figure 3. Summary of percentage of calls and population-standardized number of calls by BC Health Authority.

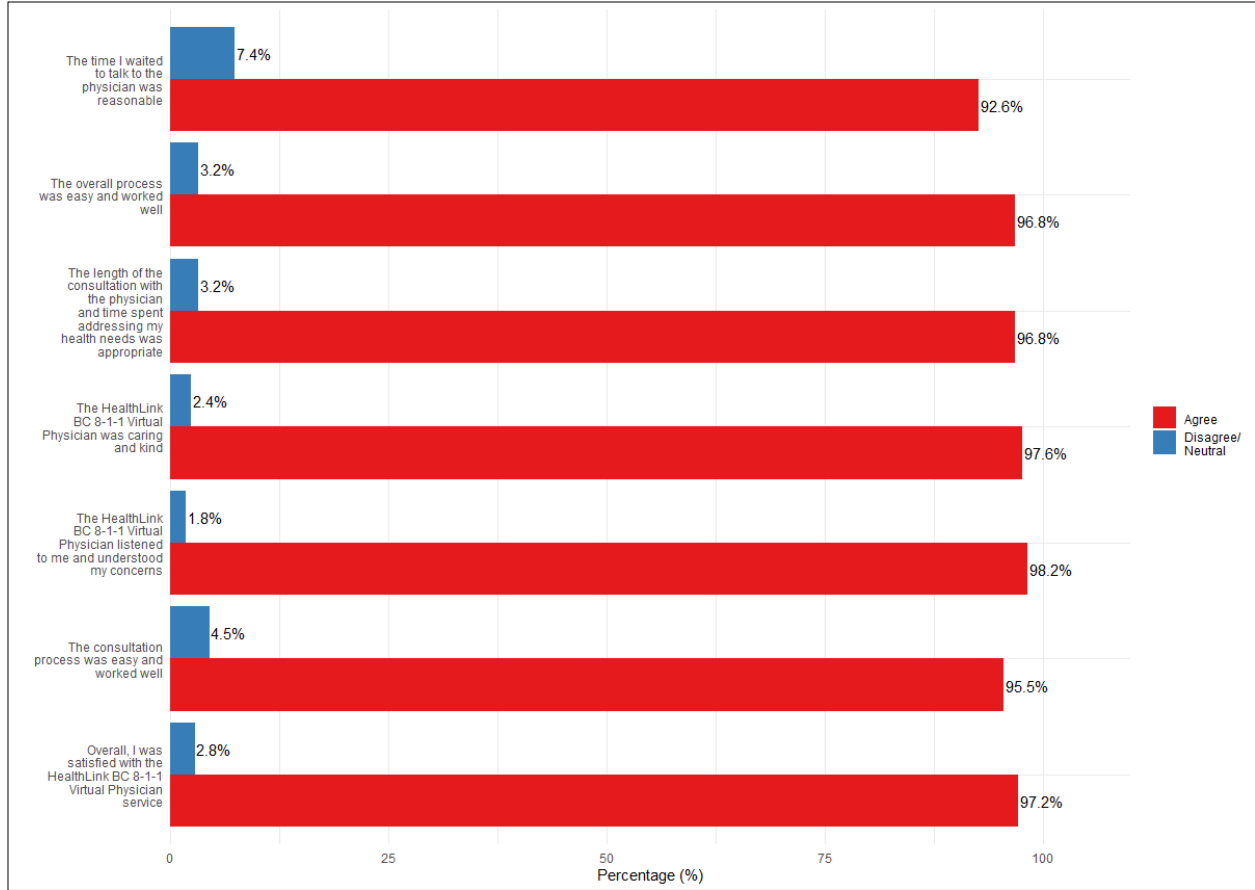


Figure 4. Caller-reported satisfaction ratings from the post-call online survey (n=317). Ratings were dichotomized into “Agree” (caller rating = 4 or 5) and “Disagree/Neutral” (caller rating = 1, 2, or 3). The items presented here correspond to the first seven items in Table 2.

TABLES

Table 1. Caller characteristics of HEiDi referrals (n=7687).	
Gender (female)	4814 (62.9%)
<i>Missing or Unknown</i>	37
Age group	
< 1 year	544 (7.0%)
1 – 4 years	721 (9.4%)
5 – 19 years	887 (11.6%)
20 – 39 years	2603 (33.9%)
40 – 64 years	1836 (23.9%)
> 64 years	1090 (14.2%)
<i>Missing or Unknown</i>	2
Health Authority	
<i>Fraser</i>	2688 (35.9%)
<i>Interior</i>	1172 (15.6%)
<i>Northern</i>	435 (5.8%)
<i>Vancouver Coastal</i>	1648 (22.0%)
<i>Vancouver Island</i>	1549 (20.7%)
<i>Missing or Unknown</i>	195
Health concern category	
<i>Gastroenterology (digestive)</i>	1275 (16.6%)
<i>Respiratory</i>	877 (11.4%)
<i>Dermatology (skin, hair, nails)</i>	874 (11.4%)
<i>Musculoskeletal (bone, muscle, joint)</i>	813 (10.5%)
Caller's health concern related to COVID-19	1169 (39.3%) ¹
<i>Missing or Unknown</i>	4749
Caller has a usual care provider	1228 (81.3%) ²
<i>Missing</i>	133
<i>No follow-up</i>	6043
<p><i>Note: cell values represent counts (percentages). Percentages were calculated after removing missing/unknown/not applicable data from the denominator.</i></p> <p>¹<i>Only a subset of 2977 HEiDi calls were recorded if they were COVID-19-related or not.</i></p> <p>²<i>Only callers receiving a subsequent follow-up call from a VP are asked if they have a usual care provider; 1511 callers received a follow-up call and answered this question.</i></p>	

SUPPLEMENTARY MATERIAL

Call volumes by day of week

Summary of HEiDi call volumes by day.	
Day of week	Mean (SD) number of daily calls (n=17 each)
Mon	59.71 (25.14)
Tue	60.06 (19.71)
Wed	62.53 (19.1)
Thu	64.94 (18.84)
Fri	64.88 (19.39)
Sat	72.53 (22.5)
Sun	74.12 (21.97)

811 health problem categories

Total n=7687; 23 problem categories used.

Nursing problem category	n	%
Gastroenterology (Digestive)	1275	16.6
Respiratory	877	11.4
Dermatology (Skin, Hair, Nails)	874	11.4
Musculoskeletal (Bone, Muscle, Joint)	811	10.6
Otolaryngology (Ear, Nose, Throat)	602	7.8
Neurology	597	7.8
First Aid	414	5.4
Gynecology (Women's Reproductive)	407	5.3
Urology (Urinary Tract & Male Genitalia)	335	4.4
Ophthalmology (Eyes)	308	4.0
Pediatrics	275	3.6
Obstetrics & Postpartum	230	3.0
Immunology	181	2.4
Cardiovascular (Heart/Circulation)	171	2.2
Dental/Mouth	123	1.6
Psychology (Mental Health)	73	0.9
Diabetes	42	0.5

Wellness	23	0.3
Pharmaceutical (Medication)	22	0.3
Endocrinology (Glands)	21	0.3
Infectious/Communicable Diseases	19	0.2
Oncology (Site-Specific Cancers)	5	0.1
Hematology (Blood)	2	0.0

Distributions of age group, gender, and health authority

Total n=7687.

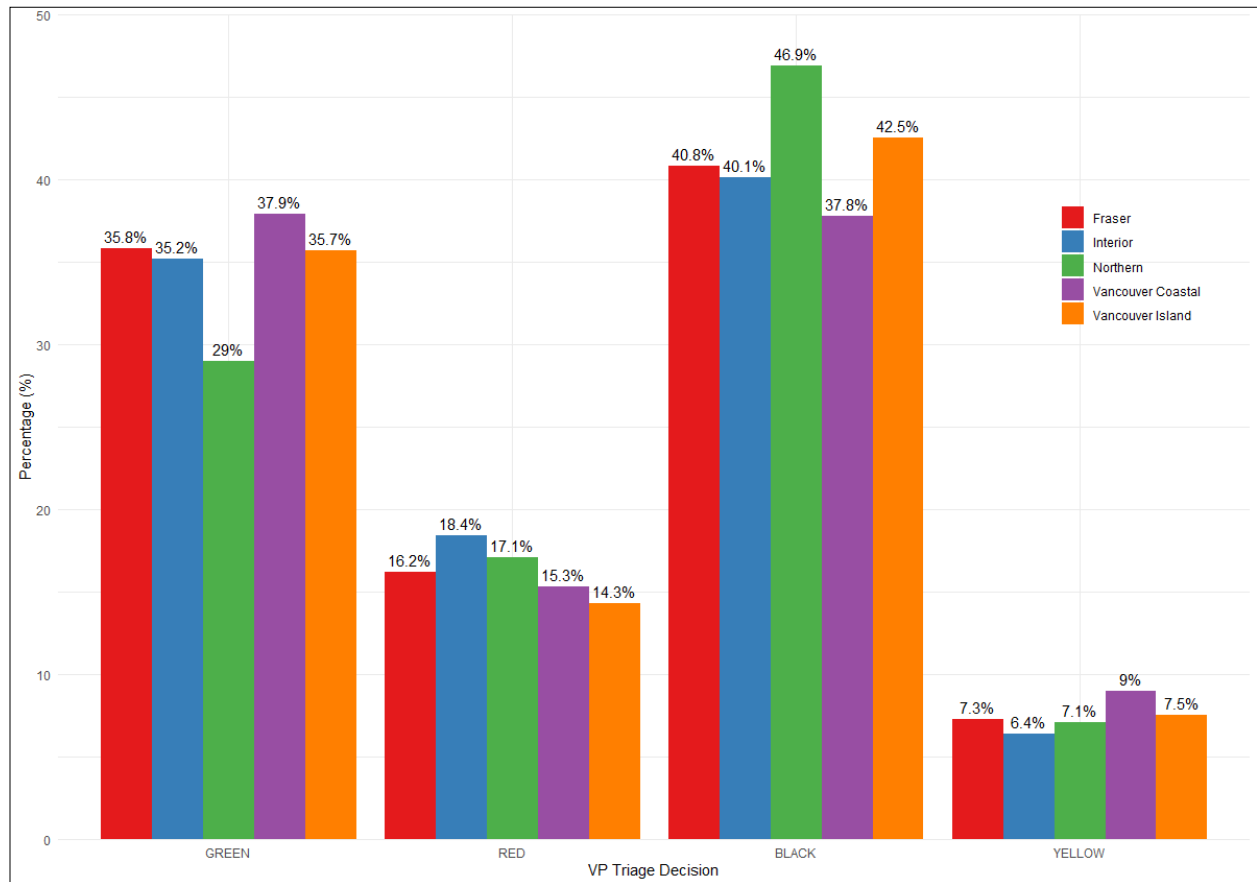
Age Group	Female (n=4814)	Male (n=2836)	Gender missing (n=37)
< 1 year	269 (5.6%)	277 (9.8%)	2
1 – 4 years	331 (6.9%)	386 (13.6%)	4
5 – 19 years	526 (10.9%)	354 (12.5%)	7
20 – 39 years	1841 (38.2%)	743 (26.2%)	19
40 – 64 years	1168 (24.3%)	666 (23.5%)	2
> 64 years	679 (14.1%)	410 (14.5%)	1
Age group missing (n=2)	0	0	2

Health Authority	Female (n=4701)	Male (n=2777)	Gender missing (n=37)
Fraser	1673 (35.6%)	1010 (36.4%)	5
Interior	717 (15.3%)	455 (16.4%)	0
Northern	281 (6%)	152 (5.5%)	2
Vancouver Coastal	1036 (22%)	609 (21.9%)	3
Vancouver Island	994 (21.1%)	551 (19.8%)	4
Health authority missing (n=195)	113	59	23

Age Group	Fraser (n=2688)	Interior (n=1172)	Northern (n=435)	Vancouver Coastal (n=1648)	Vancouver Island (n=1549)	Health authority missing (n=195)
< 1 year	247 (9.2%)	81 (6.9%)	26 (6%)	126 (7.6%)	58 (3.7%)	10
1 – 4 years	296 (11%)	99 (8.4%)	47 (10.8%)	156 (9.5%)	104 (6.7%)	19
5 – 19 years	332 (12.4%)	130 (11.1%)	66 (15.2%)	170 (10.3%)	171 (11%)	17
20 – 39 years	849 (31.6%)	388 (33.1%)	159 (36.6%)	620 (37.6%)	508 (32.8%)	79
40 – 64 years	607 (22.6%)	263 (22.4%)	115 (26.4%)	377 (22.9%)	422 (27.2%)	52
> 64 years	357 (13.3%)	211 (18%)	22 (5.1%)	199 (12.1%)	286 (18.5%)	15
Age group missing (n=3)	0	0	0	0	0	3

Distribution of VP triage decision by health authority

Note: These numbers exclude the category of “other” for VP triage decision. The distribution of VP triage decisions significantly differed by health authority ($\chi^2(12)=28.95, p=0.004$).



Health Authority	VP Triage Decision			
	Green	Red	Black	Yellow
Fraser	893 (35.8%)	403 (16.2%)	1016 (40.8%)	181 (7.3%)
Interior	385 (35.2%)	201 (18.4%)	439 (40.1%)	70 (6.4%)
Northern	115 (29%)	68 (17.1%)	186 (46.9%)	28 (7.1%)
Vancouver Coastal	578 (37.9%)	233 (15.3%)	576 (37.8%)	137 (9%)
Vancouver Island	506 (35.7%)	203 (14.3%)	602 (42.5%)	107 (7.5%)

Green: caller advised to try treatment at home.

Red: caller advised to go to ED immediately.

Black: caller advised to schedule an in-person appointment with their primary care provider within the next 7 days.

Yellow: caller advised to see primary care provider within 24 hours.

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Summary of caller responses to online survey

Summary of caller responses to online post-consultation survey (n=317).						
Question	Response options					Missing
	1 = Strongly disagree	2	3	4	5 = Strongly agree	
The consultation process was easy and worked well.	6 (2.1%)	0	7 (2.4%)	42 (14.6%)	232 (80.8%)	30
The HealthLink BC 8-1-1 Virtual Physician was caring and kind.	4 (1.4%)	1 (0.3%)	2 (0.7%)	17 (5.9%)	262 (91.6%)	31
The HealthLink BC 8-1-1 Virtual Physician listened to me and understood my concerns.	4 (1.4%)	0	1 (0.4%)	21 (7.4%)	259 (90.9%)	32
The time I waited to talk to the physician was reasonable.	2 (0.7%)	5 (1.8%)	14 (5%)	46 (16.3%)	215 (76.2%)	35
The length of the consultation with the physician and time spent addressing my health needs was appropriate.	3 (1.1%)	2 (0.7%)	4 (1.4%)	27 (9.6%)	245 (87.2%)	36
The overall process was easy and worked well.	4 (1.4%)	0	5 (1.8%)	45 (16%)	227 (80.8%)	36
Overall, I was satisfied with the HealthLink BC 8-1-1 Virtual Physician service.	5 (1.8%)	1 (0.4%)	2 (0.7%)	28 (9.9%)	247 (87.3%)	34
	1 = More anxious	2	3	4	5 = Much better	Missing
Compare how you felt before you spoke to the HealthLink BC 8-1-1 Virtual Physician to how you feel now that you have spoken to the Virtual Physician	8 (2.7%)	9 (3.1%)	39 (13.4%)	71 (24.4%)	164 (56.4%)	26
	Yes	No	Missing			
Do you plan to take the action recommended by the HealthLink BC 8-1-1 Virtual Physician?	283 (97.6%)	7 (2.4%)	27			