

CHAPTER 2: Ontario's Telehealth system: A novel syndromic surveillance system

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Background

The US Centers for Disease Control and Prevention define syndromic surveillance as “an investigational approach where health department staff, assisted by automated data acquisition and generation of statistical alerts, monitor disease indicators in real-time or near real-time to detect outbreaks of disease earlier than would otherwise be possible with traditional public health methods.”[1]

Syndromic surveillance initially came into prominence as a bioterrorist surveillance methodology primarily following the events of September 11th, where a rapidly evolving emergency situation required regular and timely access to epidemiologic information to foresee and plan for the allocation and use of limited and stressed resources. It has subsequently evolved into a sub-discipline of epidemiologic surveillance beyond the exclusive scope of bioterrorism preparedness[2-4] to include, among others, pandemic preparedness[5,6], West Nile surveillance[7,8], and as a potential tool to enhance routine surveillance systems commonly used within the field of public health[9].

A significant benefit of syndromic surveillance systems is that they characteristically rely on the use of pre-existing datasets, thereby foregoing the challenges associated with the development and implementation of a data-collection infrastructure (including buy-in, funding, and adoption), as well as increasing communication within the public health system and between acute care and public health.

Canada, and many other countries, have access to data streams that are electronically captured in a timely manner that could theoretically be used for the purpose of syndromic surveillance. These include, but are not limited to emergency/A&E data[10,11], absenteeism data[12], emergency calls[13], ambulance dispatches[14], patient transfers[15], over the counter drug sales[16], billing data[17] and telephone medical helplines[18,19].

In Ontario, Canada, it is evident from the post-SARS literature that the Ontario public health system was, and arguably remains, burdened by many of the shortcomings consistently seen with routine public health surveillance systems. Part of the failure of the public health system during SARS was attributed to a lack of timely communication between implicated stakeholders[20]. The problems encompassed within the definition of

“lack of timely communication” cannot be attributed exclusively to the lack of an infrastructure to share data in a timely fashion; however, this was one of the main problems confronting the individuals and institutions involved in the control of the SARS epidemic.

The Initial Report of the Ontario Expert Panel on SARS and Infectious Disease Control, published as a response to the SARS outbreak in Ontario, Canada, stated that the aforementioned failures in public health surge capacity could be potentially addressed by “hav[ing] a well-developed system for real-time data sharing and reporting, and for the rapid dissemination of surveillance information[21].” In particular, it mentioned the potential to “broaden the information collection capacity of Telehealth as a syndromic surveillance tool[22].”

Following the lead established by the UK’s NHS Direct Syndromic Surveillance system, we are retrospectively evaluating the value of Ontario’s Telehealth’s health helpline as a syndromic surveillance system. To date, there have been no published descriptions of Telehealth. This article endeavours to address this lacuna by providing an overview of Telehealth, Ontario’s nursing telephone helpline, including how data are collected, stored, and how the data may be evaluated to determine this data source’s usefulness as a in an enhanced awareness surveillance system.

Description of Telehealth

The Ontario Telehealth Telephone Helpline (henceforth referred to as “Telehealth”) was implemented in Ontario in 2001. It was initiated as a pilot study, which included the Greater Toronto area (416 and 905 calling areas), as well as the Northern area of Ontario (705 calling area). The Northern Pilot was subsequently evaluated, “suggest[ing] that teletriage may have decreased visits to emergency departments relative to patient intent[23],” one of the goals of Telehealth being to “lead to more appropriate use of emergency departments[24].”

The program was expanded province-wide at the end of 2001, and has been administered by Clinidata, a private contractor hired by the Ontario Ministry of Health and Long-Term Care. The helpline is available 24 hours a day, 7 days a week, including holidays, at no cost to the caller[25]. The calls are answered by registered nurses who

are required to have multiple years of clinical experience prior to their involvement with Telehealth. Although calls are primarily answered in both official languages (English and French), the system has the capability of responding to calls in 110 different languages within 60 seconds (with the help of translators in a three-way calling setup)[26].

Calls are handled by four calling centres that use identical decision rules (algorithms) and store all call information into one centralized data repository (unlike the UK system that relies on local call centres with proprietary databases). The calls are usually approximately 10-minutes, patient based, and are directed by trained nurses who use an electronic clinical support system that can be used to provide either clinical guidelines (approved by a panel of clinicians), health information, care information, and a health care referral system.

This Telehealth evaluation project was approved by a REB, as well as meeting Ontario Personal Health Information Protection Act (PHIPA) and Ontario Municipal Freedom of Information and Protection of Privacy Act (MFIPPA) requirements. The anonymised data were provided by the Ontario Ministry of Health and Long-Term Care as well as with Clinidata, the private company contracted out to administer Telehealth. The agreement resulted in a record of all calls spanning June 2004-June 2006 (25 months).

Who Calls Telehealth, When and Why?

Between June 2004 and June 2006, a total of over 2 million calls were made, averaging approximately 2700 calls daily, slightly lower than the numbers published elsewhere. Of calls where the caller's sex was recorded, 64.1% of calls were made by females, which can be explained in large part by the fact that mothers tend to be the primary caregiver for children and frequently call on their behalf. Calls were categorized into one of three categories: Health information (11.3% of all calls); Service referral (4.9% of all calls); Symptom (83.8% of all calls).

The volume of calls was not the same across all months. The highest call volume was recorded in January 2005 (97,896 calls), followed by March 2005 (95,097 calls). The highest call volume in the 2005-2006 year was in March 2006, with 92,527 calls. As a general rule, call volumes increased during influenza season (December-March), and

were lower in the non-influenza months (Figure 1), which is similar to Telehealth call patterns reported elsewhere[27], as well as call patterns for other systems[28].

The largest proportion of calls was made during weekends – 15.2% of calls were made on Sundays, and 15.9% of calls were made on Saturdays, when doctors' offices are routinely closed. The smallest proportion of calls were made on Thursdays (13.7%) (Table 1). Of the calls where time of day was recorded (97.8% of all calls), nearly half of calls (47.5%) were made in the late afternoon and evening (16:00-23:59), when physicians' offices are closed, followed by the daytime (08:00-15:59) (37.8%). The remaining calls were made between 24:00 and 07:59.

The dataset provided to the project did not include information about whether the caller called for him/herself or for someone else. However, the age recorded in each record is the age of the person the call was made for. For example, if a mother called for her son, the age of the son, not the age of the mother, was recorded. The majority of calls were made for/by individuals aged 18-64 years of age (52.3%). Nearly 18 percent of calls were made for children aged 0-4 years, followed by calls for/by children aged 5-17 years (10.5%). The smallest percentage of calls were made by/for individuals aged 65 years and above. Approximately 13 percent of calls did not have an age specified.

Syndromic Surveillance-Specific Data

For the purpose of the evaluation of Telehealth's usefulness as a syndromic surveillance system, the main interest is in symptom calls, which are triaged to a clinical guideline-driven nurse helpline. These calls represent a call volume of approximately 1.7 million calls, or approximately 84% of all calls made to Telehealth during the time period under study. These calls are of most interest to us as the other call types (health information and service referral) do not provide symptom information, the basic variable required for a syndromic surveillance system.

Description of Algorithms

When a symptom call is made, the call nurse follows through a decision tree, based on the algorithm that the nurses assesses as best describing the caller's initial complaint[29]. At the end of a symptom call, once the decision tree has been followed to its conclusion, a call is assigned one of 11 dispositions. These dispositions include:

- Information call (calls initially coded as symptom calls, but where no care is recommended).
- Community service
- 911 Ambulance/Dispatch
- ED (Guideline directed)
- ED (No alternative)
- Pharma
- Physician reference
- Poison control
- Self-care
- Other health care provider
- Other.

The frequency of disposition type is available in Table 2. The most commonly recorded disposition was “physician referral,” (41.9%). However, this category includes two types of physician referral – referral within 24 hours and referral within 72 hours if no improvement. The data as provided do not differentiate between the two. The next most commonly recorded disposition was “self care” (31.1%), whereby the caller/patient is to remain at home without seeking further medical condition, unless an important change in his/her condition occurs.

While there are 480 algorithms that a Telehealth nurse can choose from, there are some algorithms selected more frequently than others. Table 3 provides an overview of the ten most frequently assigned algorithms. Although the most common age group of callers was the 18-64 year age group, the top three most commonly assigned algorithms were pediatric after hours algorithms and, overall, 5 of the top 10 were pediatric. Therefore, although the majority of calls were not pediatric ones, the most commonly reported symptoms were pediatric vomiting, cough and fever – common childhood symptoms. This cannot be explained by a greater diversity of algorithms across adult age groups, relative to pediatric ones, as approximately 47% of all 440 algorithms were pediatric ones, with the remaining 53% being adult-specific or all age group algorithms.

For the purpose of using Telehealth as a syndromic surveillance tool, the different algorithms were categorized against prodrome categories by an emergency medicine

physician with experience in this area. The prodromal categories include respiratory upper, respiratory lower, influenza-like illness, dermatological infectious – vesicular, dermatological infectious – not vesicular, neurological infectious, asthma, gastroenteritis. These categories were developed by the RODS-based Ontario Syndromic Surveillance Pilot Project and were used and validated within an emergency-department (A&E) setting, with a primary focus on outbreak detection of public health significance.

Next Steps

The project's next steps will include classifying all algorithms to one of the aforementioned prodromal categories, quantitatively comparing Telehealth data with laboratory data and emergency department (A&E) visits, and, using the CDC Framework for evaluating public health surveillance systems for early detection of outbreaks, retrospectively determining whether the Telehealth system could be successful as an early-warning system. More details on these steps are described elsewhere[30].

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Table 2-1. Day of Week Calls Made (All Call Types)

Day	Health Information	Service Referral	Symptom	Total (%)
Sunday	27,091	11,218	271,343	309,652 (15.2)
Monday	35,266	16,271	245,730	297,267 (14.6)
Tuesday	36,089	16,039	233,574	285,702 (14.0)
Wednesday	36,420	15,730	238,503	290,653 (14.2)
Thursday	35,074	15,101	229,657	279,832 (13.7)
Friday	33,995	14,102	234,451	282,548 (13.8)
Saturday	27,518	11,192	285,086	323,796 (15.9)
Total	231,453	99,653	1,711,344	2,042,450

Table 2-2. Disposition of Symptom Calls

<i>Disposition</i>	<i>Frequency (%)</i>
Information Call	31,423 (1.8)
Community Service	457 (0.0)
911 Ambulance/Dispatch	49,023 (2.9)
Emergency Department (Guideline directed)	323,336 (18.9)
Emergency Department (No alternative)	17,492 (1.0)
Pharma	991 (0.1)
Physician Reference	717,016 (41.9)
Poison Control	12,713 (0.7)
Self-care	532,729 (31.1)
Other Health Care Provider	19,750 (1.2)
Other	64,14 (0.4)
Total	1,711,344 (100)

Table 2-3. Most Frequently Assigned Algorithms

<i>Symptom</i>	<i>Frequency (%)</i>
1. Vomiting (Pediatric after hours)	74,423 (4.3)
2. Cough (Pediatric after hours)	47,050 (2.7)
3. Fever (Pediatric after hours)	45,937 (2.7)
4. Chest pain (Adult after hours)	42,691 (2.5)
5. Diarrhea (Pediatric after hours)	39,604 (2.3)
6. Colds (Pediatric after hours)	38,975 (2.3)
7. Headaches (Adult after hours)	33,775 (2.0)
8. Diarrhea (Adult after hours)	33,490 (2.0)
9. Abdominal pain – female (Adult after hours)	31,324 (1.8)
10. Vomiting (Adult after hours)	30,240 (1.8)
Total	417,514 (24.4)

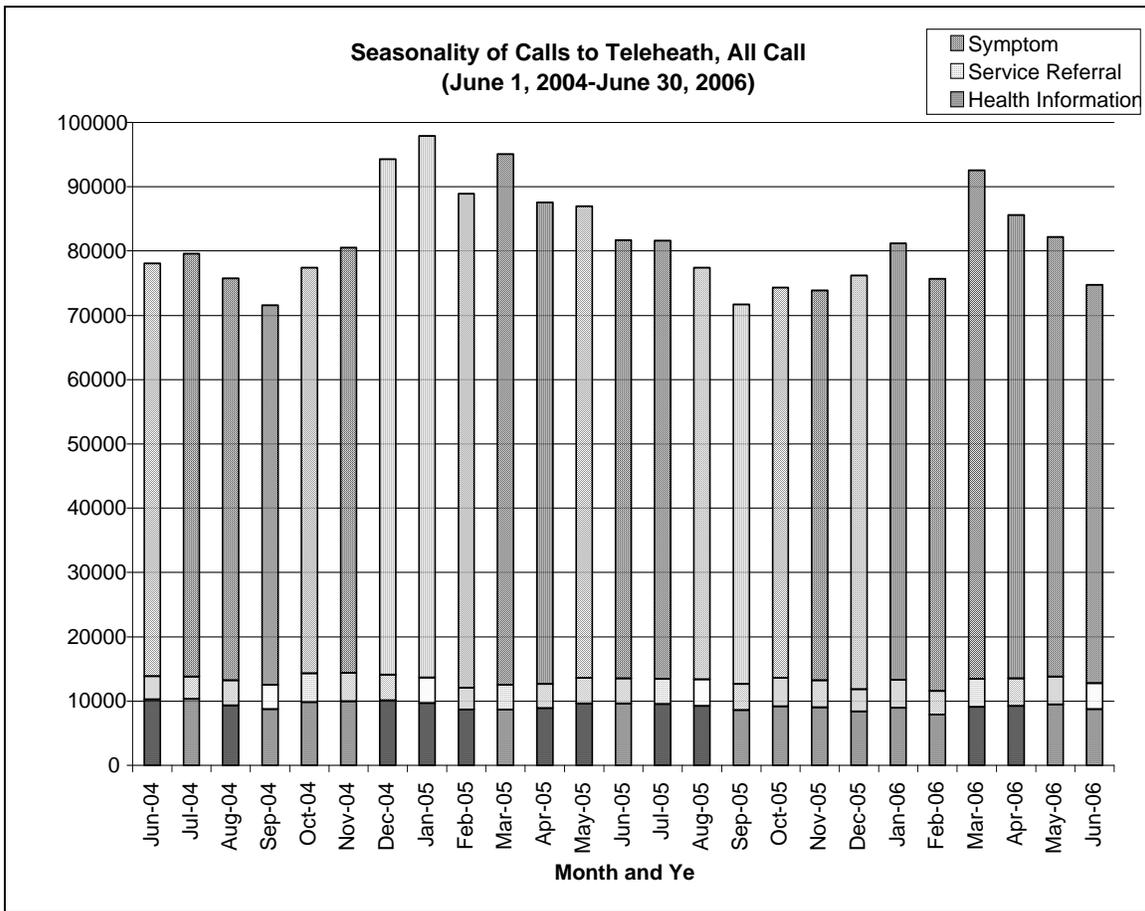


Figure 2-1. Seasonality of Telehealth Calls