


Is 911 The Answer? A Retrospective Review of Emergency Medical Services Use by Home Care Providers

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ABSTRACT: With the Ontario healthcare system under strain the use of resources—particularly emergency medical services (EMS) is an increasing focus. Recent work has identified long-term care facilities as high users of EMS despite access to health-related support outside of the hospital. However, such insights are not available for home care. A retrospective review of administrative records of EMS calls drawn from over 6 million visits by home care providers found relatively low call rates: 8.4 calls per 100 000 personal support visits, 4.1 calls per 100 000 for rehabilitation providers, and 0.9 calls per 100 000 for nurses. The majority (85%) of calls resulted in transport to the hospital; the notable exception was fall-related events, and of these falls, a third (32%) were treated at home. Classification of reported physical symptoms suggests opportunities for leveraging in-home clinical specialists to avoid hospital transport where possible and preserve EMS capacity to respond to the most urgent and severe events.

KEYWORDS: Home care, health services, patient flow, ambulance services, community care

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Introduction

It is well documented that the Ontario health system is under strain. Patients experience long waits in emergency departments and often receive care in unconventional spaces such as meeting rooms and hallways—this has come to be known as “hallway medicine.” Without question, hallway medicine is a complex challenge that can be attributed to a number of factors including lack of timely access to hospital and long-term care beds, insufficient availability of home care and community wellness and prevention programs and restricted access to home and primary care services.¹ The emergency department (ED) remains a common point of access for individuals wishing to seek medical care and many of those individuals are transported there using the clinically sophisticated paramedic services.

Existing studies of emergency medical services (EMS) usage provide insights into the extent and “appropriateness” of use. Much of the available work in this area is informed by the attending ED physician and is not sensitive to the available healthcare services received by individuals in the home or community.^{2–6} More recent work conducted in Ontario provided insights into the use of EMS by individuals and organizations such as schools and long-term care facilities where some health-related supports are available to these individuals.⁷ DeJean’s work highlights several factors that contribute to use of EMS despite the availability of health-related support

outside of the ED. However, the review does not contain information related to home care organizations’ use of EMS.

This work will address a current gap in the literature by providing insights into the type of situations that lead to decisions to call EMS and the outcome of the decision to call for help within a population of individuals receiving home care services. A review of community-based incidents involving clients requiring paramedic services can provide insights into the use of EMS by home care personal support, nursing and rehabilitation providers and their clients. This can be valuable for creating evidence-based recommendations and opportunities to provide home care clients, who have increasingly complex medical needs, with the timely access to the medical advice and support that they are seeking.

Methods

Client Incident Record Review

A retrospective record review was conducted using client incident reports from a large not-for-profit home care organization in Ontario. The review analyzed client incidents from an internal database that were reported between January 1, 2018, to December 31, 2019. Research ethics approval was provided by the University of Toronto Health Sciences Committee (Protocol #: 00038299).



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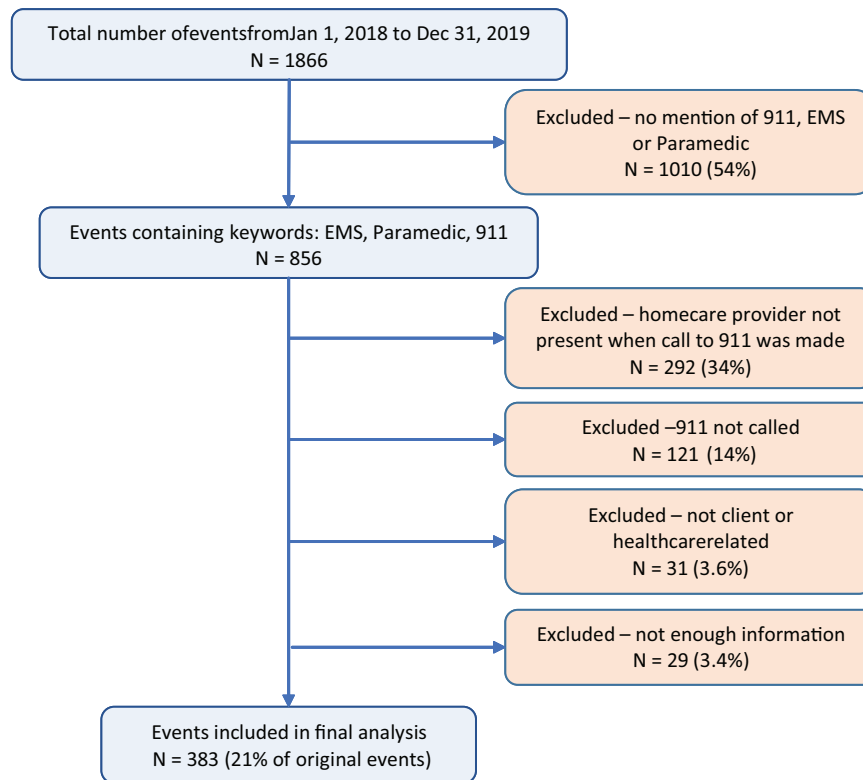


Figure 1. Flowchart of data inclusion and exclusion process for client records.

The initial search yielded a total of 1866 event records. To extract a comprehensive list of events in which healthcare-related emergency services (ie, paramedics) were involved, these records were filtered to identify only records containing the keywords “911,” “EMS,” or “paramedic.” The resulting 856 client records were manually reviewed by investigators to confirm their eligibility. A single investigator reviewed all records, and any uncertainty was resolved through consensus with 2 investigators.

Client records were included if a home care provider was present and participated in the decision to call 911 due to the client’s health condition. Records were excluded if a home care provider was not present when the decision to call 911 was made, there was not enough information about the event, if the 911 event was unrelated to healthcare, or if 911 was not called. Reasons for record exclusions are shown in Figure 1. A total of 383 records were included in the final analysis. Further analysis of the records stratified them into events that involved personal support workers, rehabilitation therapists (occupational therapy & physical therapy), or nurses.

Analysis

Analysis of the 383 events involved reviewing each record to extract key metrics: individual who called, why they called, EMS decision, and outcome of the call.

Who called? The incident report was reviewed to extract 2 pieces of information related to the decision to call EMS: the discipline of the healthcare provider (personal support worker,

rehabilitation therapist, or nurse) and whether there was any evidence that a family member, caregiver, or others contributed to the decision to call 911. If there was no evidence of shared decision-making, that is, mention of others in the event report, it was assumed that a home care provider alone made the decision and placed the call on behalf of the client.

Precipitating event and level of medical urgency. To categorize each call, it was important to identify and preserve the physical symptoms and consider the level of urgency indicated by each event report. To do so, the authors created a coding scheme that combined the American Medical Directors Association’s clinical process guidelines for the categorization of symptoms related to Acute Changes of Condition (ACOC)⁸ and the Canadian Triage and Acuity Scale (CTAS)⁹ level of urgency. The physical symptoms from each point-of-care event were then mapped to this coding scheme which contained 3 distinct levels of medical urgency:

- Level 1—urgent need for acute care intervention: threats to life or limb, or imminent risk of deterioration requiring immediate aggressive interventions; changes in level of consciousness, changes in vital signs, seizures/strokes, suicide
- Level 2—moderate need for intervention: wounds/injuries, falls, accidents, pain, edema, behavioral or cognitive decline, change in elimination patterns
- Level 3—clinical follow-up required: medical device troubleshooting, client is weak or unwell

Table 1. Individuals who made the decision to call 911.

DECISION TO CALL 911	UNIQUE EVENTS IN FINAL ANALYSIS (N=383)		
	PERSONAL SUPPORT WORKERS (93%, N=356)	REHABILITATION THERAPISTS (4.9%, N= 19)	NURSES (2.1%, N=8)
Home care provider alone	90% (320/356)	84% (16/19)	100% (8/8)
Shared decision-making: home care provider and family	10% (36/356)	16% (3/19)	0% (0/0)

If more than one symptom was reported for a single event, for example, pain and loss of consciousness, the more urgent of the symptoms (eg, loss of consciousness) was used for categorization. If both symptoms had the same level of urgency, for instance, pain and edema, the event was categorized under both symptoms (eg, both pain and edema) to ensure that the record reflected the frequency with which each symptom contributed to a decision to call 911.

EMS decision (outcome of call). The outcome of each call was extracted from the event record based on the EMS decision of whether to treat the client at home or transport to the hospital.

Statistical analyses. Data tables and graphs were constructed to summarize the events and descriptive metrics (frequencies & means). Additionally, a one-way ANOVA test was conducted to identify whether differences between the event outcomes were significant for each home care provider group. A Fishers Exact Tests were calculated to determine the association between call frequency and provider group (personal support, nurse, rehabilitation therapist). Odds ratios were calculated to determine how the likelihood of client transport to the hospital varied by urgency level. All tests of significance were set a $P < .05$.

Results

A total of 1866 client incident reports were identified from January 2018 to December 2019. Of these, 1476 (79%) were excluded per Figure 1. The remaining 383 (21%) event-related records formed the sample for analysis.

Call-related outcomes (decision to call EMS)

The call volume data for each home care provider group (nurse, rehabilitation therapist or personal support worker) indicated that nurses called EMS significantly less frequently with 0.9 calls per 100 000 visits compared to personal support workers ($P < .00001$) and rehabilitation therapists ($P = .0001$) with 8.3 and 4.1 calls per 100 000 visits, respectively. Personal support workers called EMS roughly 9 times more frequently than nurses ($P < .00001$) and 2 times more frequently than rehabilitation therapists ($P = .0006$) per 100 000 visits.

Information regarding the individuals who contributed to the decision to call 911 is reported in Table 1. Overall,

event-related documentation suggested that when home care providers (personal support workers, nurses & rehabilitation therapists) were involved in the decision to call 911, they made this decision alone 90% of the time, and collaboratively with family 10% of the time. Event-related records document that family members were more likely to contribute to shared decision-making with rehabilitation therapists (16% of calls) and personal support workers (10% of calls).

Analysis of the event records found that most clients represented in the dataset (93%) had one EMS call made throughout the 2 years of the study period. There were 26 clients (7.5% of all clients) for whom more than one call was made (range: 2-4 calls).

Event-related outcomes (urgency and transport decision)

The most common reasons for 911 calls were for level 1 events ($n = 223$, 56% of all observations; most commonly due to altered level of consciousness or abnormal vital signs), followed by fall-related events ($n = 142$, 36% of all observations). This finding was consistent across all provider types (personal support, nurse, rehabilitation therapist) (Figure 2). Most events were categorized under level 2 urgency ($n = 240$, 63%), followed by level 1 ($n = 119$, 31%) then level 3 ($n = 37$, 9.7%). Calls by nurses more often had a higher level of urgency (level 1: 63%); whereas calls by rehabilitation therapists and personal support workers were most often categorized as level 2 (68% and 61%, respectively).

Finally, looking at EMS decisions and the subsequent event outcomes, 85% ($n = 325$) of events led to transfers to hospital, while in the remaining 15% ($n = 58$) of events the client was treated at home (Figure 2). It is important to note that in 4.7% ($n = 18$) of “transferred to hospital” events, the client passed away. There were no significant differences between the outcome of events (transferred to hospital vs treat at home) among home care provider groups (personal support, nurse or rehabilitation therapist) ($P = .29$): All calls by nurses led to transport to hospital (100%, $n = 8$); the vast majority of calls by personal support workers (85%, $n = 302$), then rehabilitation therapists (79%, $n = 15$) were also transferred to hospital. Calls for level 1 urgency events were 10 times more likely to lead to transport to the ED than level 2 events (OR = 10.3, $P = .0001$), and 7 times more likely to lead to transport than level 3 events (OR = 7.48,

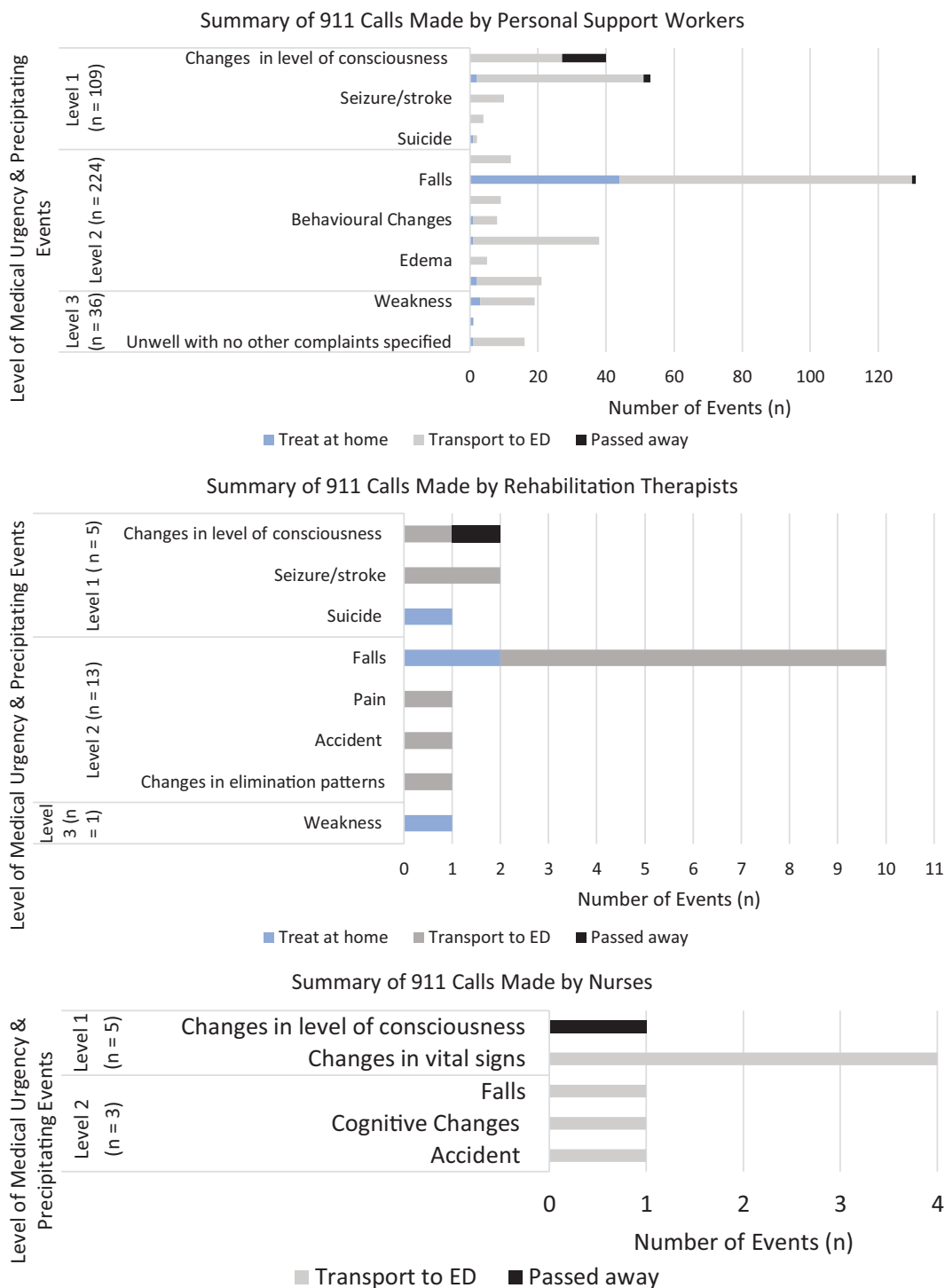


Figure 2. Summary of 911 calls made by each home care provider.

$P = .0062$). Of the level 2 events that did not lead to transport to hospital, the vast majority (92%) were falls.

Discussion

There is a lack of literature that provides insight into the use of EMS by individuals receiving home care services.⁷ This retrospective record review provides insight into the reasons for home care providers' decisions to call EMS, the urgency of the

conditions that led to these calls, and the frequency of transport to hospital following these calls.

There is increasing international interest in community-based urgent care models where treatment can be provided safely in the community without the need to transport patients to the hospital or require hospital level resources. The development of appropriate strategies for creating and using alternative care pathways requires insight into the conditions under

which home care providers and clients make use of EMS. This study provides visibility into calls placed by home care providers, precipitating events, and whether clients were treated at home or required transport to the hospital. We have implemented a categorization scheme that maintained the most significant clinical symptoms contributing to the decision to contact EMS. The face validity of this coding scheme is highlighted by a significant association which described that events in the highest urgency category (level 1) were most likely to be transported to the hospital compared to less urgent (level 2 or level 3) events.

Home care provision requires a significant degree of autonomous decision-making regarding how care will be provided and when additional support is required—including emergency situations. Home care providers alone made the decision to call EMS nearly 90% of the time, reaffirming the independent nature of home care delivery. Regardless of the discipline of the provider who made the EMS call (nurse, PSW or rehabilitation therapist), EMS was equally likely to transport the client to hospital: 85% of calls resulted in transport to the hospital, compared to a provincial rate of approximately 73% (as of 2014, the most recent date for which these data were available).¹⁰ The high rate of decisions to transport to hospital for calls made by home care providers (85%) and lack of significant differences by home care provider discipline indicate a high quality of decision-making from home care providers of all disciplines.

The present data were drawn from nearly 6 million home visits that contributed 383 calls for EMS over a 2-year period. The highest call rate in this sample was 8.3 calls per 100 000 visits for personal support workers. Given the large number of yearly client visits for personal support workers and the fact that many of these visits involve mobility and transfer activities, the relatively higher call rate (compared to rehabilitation and nursing services) could be a result of more frequent interactions and active visits with clients.

Opportunities

Internationally, there is increasing interest in community-based urgent care models that do not require transport to an ED when hospital resources are not necessary and treatment can be provided safely in the community.^{6,7,11-14} This need for urgent medical advice and in-person assessment of care needs (though not necessarily transport to a hospital) is growing as people with increasingly complex medical needs are living and receiving care in their own homes, rather than institutions.¹¹

Only a small percentage of community-based urgent care models focus on initiatives that occur in response to unscheduled emergency calls—the majority involve adding scheduled visits by paramedics to address social determinants of health that are common characteristics of frequent callers (eg, loneliness & poverty).^{12,13} Of these, pilot programs in the UK, New Zealand, and the United States have shown that paramedics

with advanced training are able to provide this support and initiate alternative care pathways that do not require hospital admission can have very high diversion rates with minimal need for subsequent ED admission.¹⁴⁻¹⁶ In Canada, British Columbia paramedics are increasingly being asked to perform such local triage.¹⁷ In Ontario, a specific COVID-19 directive was developed to allow paramedics to sign-off on low-risk COVID-19 patients without transport to ED.¹¹ In all of these programs, the ability of paramedics to provide rapid-community based support is leveraged, but in some situations over-resources the response given the expensive vehicles and medical equipment with which paramedics travel. Deployment of these expensive resources to support level 2 and 3 incidents may not always be necessary and could be reduced with the availability of alternative approaches to accessing urgent care in the community.

The present study highlights opportunities for alternative models that use community-based individuals like nurses and PSWs to provide additional clinical support (nurses) or physical assistance (nurses or PSWs) when situations arise during care that do not require the expensive and sophisticated medical equipment carried by paramedics. The goal of these alternatives would be to leverage clinicians already working and traveling in the community to preserve EMS and hospital capacity for those clients with the most urgent threats to life or limb who cannot safely be treated at home (eg, acute changes in vital signs or level of consciousness, stroke, etc.) while helping patients to avoid potentially traumatic¹⁸ ED visits.

While the majority (85%) of events were transported to the ED, fall-related events were the largest contributor to events that were treated at home. Increased mobility expectations during personal support and rehabilitation visits compared to nursing visits may explain the higher incidence of falls related to these visits. After a fall, it is often unsafe for a lone provider to assist a client to rise from the floor, as doing so could cause injury for both the client and the provider. Thus, home care providers are encouraged to call for help in these instances. While support must be provided, it does not necessarily need to come from EMS and in many instances (32% in the present dataset), transport to a hospital is not necessary. As an alternative, support could be provided by an on-call PSW or a fall response unit staffed by rehabilitation therapists to assist with challenging transfers.

Within the specific home care agency, there are also opportunities for clinical specialists (eg, nurses) to support point-of-care providers when dealing with level 2 and 3 medical emergencies to avoid the use of EMS and hospital EDs for medical issues that can be managed at home with appropriate clinical expertise. This may include both opportunities for urgent in-person nursing visits and/or opportunities that leverage virtual technologies (eg, video calling, remote patient monitoring technologies) to provide remote nurses with the clinical information required to support decision-making and care.

Limitations

As with any retrospective record review, the study relies on administrative documentation created for operational reasons, and some records did not contain sufficient detail to address the study questions—these records were excluded. The included records provided an indication of the nature of the medical concern, but not indications of clinical severity. The classification scheme used was designed with this limitation in mind but could be improved where greater precision and detail regarding clinical symptoms are available. A further limitation is that our documentation records only the call and paramedics' decision regarding hospital transport, it does not allow an understanding of what treatment was provided or whether hospital admission occurred. Record review provided an indication of family member participation but does not contain sufficient detail to determine the extent to which family members contributed to the decision.

Although the base dataset was very large (>6 million home care visits over 2 years), the low rate of medical emergency calls led to a relatively small dataset for analysis, particularly for calls from rehabilitation and nursing providers. Despite this, the sample was sufficient to find a statistical difference between Level 1 and less urgent events, providing some validation for the coding scheme and supporting the identification of evidence-based recommendations.

Conclusion

This retrospective review of medical emergency calls by home care providers found relatively low call frequencies for all provider groups: 8.4/100 000 personal support visits, 4.1/100 000 rehabilitation provider visits, and 0.9/100 000 nursing visits. Transport to the hospital was a common outcome (85%), regardless of whether the call was made by a PSW, nurse or rehabilitation provider. The notable exception was for calls related to client falls in the home: 32% of these events were treated at home and did not require transport to the hospital. In these events, it is unclear whether the specialized equipment that accompanies paramedics was necessary, suggesting a potential opportunity for alternative, less resource-intensive ways to provide community-based providers with timely in-home support. Similarly, there may be an opportunity for clinical specialists (eg, nurses) to provide timely (virtual or in-person) in-home support for level 2 and 3 medical events to reduce demands on EMS resources. Future work leveraging data with a greater level of clinical detail could be used to further assess the viability of these options and the scope required for these to be impactful and economically viable.

Author Contributions

SM conceived of the work, participated in acquisition, analysis, interpretation and prepared the manuscript, EM participated in analysis and interpretation, MR participated in analysis and interpretation, VH participated in acquisition and analysis, MW & BL participated in analysis and interpretation and EK participated in analysis, interpretation and manuscript preparation. All authors reviewed and approved the submitted manuscript.

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