The Economic Value of Community Paramedicine Programs

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IMPORTANT INFORMATIVE STATEMENTS

This project was sponsored by the Hastings-Quinte Paramedic Service in conjunction with the County of Renfrew Paramedic Service as well as 11 health service provider and policy organizations in the Quinte and County of Renfrew areas. Information-gathering and service provision took place following research ethics board reviews and approvals by the Research Ethics Boards of Quinte Health Care and Renfrew Victoria Hospital.

Abstract

The Economic Value of Community Paramedicine Programs Study was a randomized controlled trial (RCT) in two Eastern Ontario communities – one urban and one rural, to determine whether Community Paramedicine services (the intervention) could reduce hospital service utilization for high-frequency chronic condition clients. The Study also sought to establish whether Community Paramedicine could influence self-perceived quality of life.

A total of 200 eligible clients, recruited in early 2015, were randomly assigned to either the intervention group (receiving Community Paramedicine services for 12 months) or the control group (receiving conventional treatment).

The Study found that Community Paramedicine can achieve improved quality of life as measured with the (self-administered) EuroQol 5D-3L questionnaire and Quality Adjusted Life Years (QALY) calculations. Further, Community Paramedicine was found to reduce total visits to the Emergency Room, although not necessarily hospital admissions or length of stay in in-patient care. The Study did not find economic value for the healthcare system from deployment of Community Paramedicine for high-frequency chronic condition clients. However, study results suggest that the effectiveness of Community Paramedicine is highly sensitive to target group selection, the degree to which the target group is experiencing disease progression, and to the degree of integration of Community Paramedicine into a local healthcare system.

Executive summary

The Economic Value of Community Paramedicine Programs

Kathryn Wood, Dr. Chris Ashton, Denise Duffie-Ashton; DRDC-RDDC-2017-C086; Defence Research and Development Canada.

Introduction or background: High-frequency use of hospital Emergency Room (ER) services and in-patient hospital services are known to correlate with certain chronic diseases particularly Ambulatory Care Sensitive Conditions (ACSCs)[i] Health care organizations from paramedic services to hospitals and in-home/community support services are seeking cost-effective ways to manage progressive illnesses in order to reduce healthcare system resources and support client quality of life.

Community Paramedicine (CP) refers to a broad and developing field of paramedic practice focused on proactive and non-emergent activities (within the scope of a paramedic) that better influences health outcomes. CP allows paramedics to apply their training and skills in "non-traditional" roles, largely outside the usual emergency response and transportation to the emergency room. The Economic Value of Community Paramedicine Programs (EV-CP) Study was envisaged as a way to assess whether Community Paramedicine could be deployed to support high-service utilization, chronic disease clients at home.

The EV-CP Study was a randomized controlled trial (RCT) in two Eastern Ontario communities, to determine the economic value of Community Paramedicine services (the intervention) in reducing visits to hospital Emergency Rooms as well as associated in-patient hospital admissions. The Study also sought to establish whether Community Paramedicine could influence client perceptions of their own state of health, thereby improving quality of life as measured in Quality Adjusted Life Years (QALYs). This approach would support an assessment of the cost-efficiency and cost-effectiveness of Community Paramedicine as an intervention for the specific target population.

For this study, the specific interventions carried out using community paramedicine included assessments made at the patient's home, regular visits to provide supportive care, monitoring specific aspects of the patient's status, provision of in-scope healthcare services at the patient's home, provision of recommendations for on-site changes to prevent falls, and ensuring that information related to these services was provided to other healthcare professionals with a role in that patient's care. For the control group, the conventional approach was one in which clients used Paramedic and ER services along with family physicians and other community-based agencies or institutions as they have been doing.

Results: The Study team successfully executed key tasks associated with an RCT (ethics board approval, selection and recruitment of the target number of Study participants, securing informed consent, liaison with healthcare providers to obtain retrospective service utilization and service-focused financial data, delivery of the intervention (Community Paramedicine) for the prescribed 12 months (180 home visits per month), and obtaining pre and post quality of life assessments from clients. A Partners' Steering Committee functioned for the entire Study period to engage healthcare providers in the project and its results.

Analysis of the Study data shows that, for the target represented in the four sub-samples, the following results were generated:

- Flat or virtually no change in total and average-per-client Paramedic Service calls and transports to the ER in the (urban) Quinte Intervention group with the Control group showing declining numbers on both measures. These results are counter-intuitive.
- Declining total and average per-client Paramedic Service calls in the (rural) County of Renfrew Intervention group with the Control group showing slight increases on both measures, consistent with the hypothesized impact of the Community Paramedicine intervention.
- Quinte Intervention and Control groups saw reductions in the total number of ER visits (with arrivals by any means) and the average-per-client from 2014-2015 to the Field Phase (2015-2016). Based on limited hospital data, County of Renfrew results showed an increase in total ER visits for the Intervention and a decrease in the Control group.
- On both an aggregate and average-per-client basis, hospital admissions increased for the (urban) Quinte Intervention group with total days of stay remaining virtually unchanged. Hospital admissions and total days stay declined for the Control group, a counterintuitive finding,
- There is some evidence that the mortality rates of the Intervention Groups within the Study period were slightly lower than for the Control Groups and that Intervention Group participants were more likely to move to long term care than Control groups.

The preceding results did not test as statistically significant (using mean-focused confidence interval testing at the 0.95 level and Student t testing for small samples), due to the large variance within observations for each measure, and to some extent, small sample sizes. As a result, the Study was unable to confirm the hypothesis that the Community Paramedicine intervention would reduce service utilization for the selected target population. Similarly, regression analysis performed to identify correlations between factors that may influence service utilization did not identify strong correlations that might be helpful in shaping future service planning for chronic condition clients.

- Results in both the urban and rural areas confirm the hypothesis that the use of Community Paramedicine as an intervention for clients with the specific chronic conditions identified as eligibility criteria can bring about a clinically significant change in client perceptions of their quality of life, and that this change is one of slowing down rather than reversing disease

progression. Quality of life was measured with the (self-administered) EuroQol 5D-3L methodology and Quality Adjusted Life Years (QALY). However, achieving this impact through the Community Paramedicine intervention was not demonstrated to be cost-effective based on the service delivery costs as defined in this study. As a research study, the unit cost for each in-home visit may have been higher than would be the case in an ongoing operational program model.

The Study also provided information on the magnitude of service utilization by Study participants over an extended period (up to four years) and changing patterns of reliance on those services. Analysis of the extent of service utilization over the three retrospective years (2012-2013 to 2014-2015) showed a pronounced escalation of the specific target population's health care service utilization, suggesting that significant chronic disease progression was taking place in the period leading up to the Study's field phase. For instance, the (urban) Hasting-Quinte Intervention Group had 533 visits to either the Belleville or Trenton hospital Emergency Room *over the four-year period*, of which 400 (75%) were by ambulance. They were admitted to hospital 104 times (roughly once in every four visits) with a total of 720 days of in-patient stay. The Control Group had 613 ER visits, of which 410 (67%) were by ambulance. Control Group participants were admitted to hospital 69 times (roughly 17% of the time) with 406 days of in-patient stay. Over time, chronic condition clients showed increasing reliance on paramedic services to get to the hospital. Over the four-year period under study, service utilization (all services) for both Intervention and Control groups more than doubled with particularly sharp escalation from 2012-2013 to 2013-2014.

Analysis of the *direct* costs associated with service utilization by Study participants suggested that the impact of Community Paramedicine on the identified Intervention groups was insufficient to generate *net system-wide savings*. This conclusion was drawn from a statistical model (Activity-Based Costing) that captured record-level utilization of services (paramedic service transports, total ER visits by any means of arrival, admissions and days of in-patient stay in hospital, and in-home visits for services provided by the Community Care Access Centres) from 2012 to 2016 inclusive. The model multiplied these 'units' of service by the direct cost (overhead excluded) of providing a unit of service to estimate the *total cost* of serving each client. The direct cost of each unit of service was provided by each healthcare provider organization from their financial records based on a shared definition of direct cost.

These calculations underscore the *system-wide costs* of serving a group of chronic condition clients. Total four-year direct costs of serving the clients who remained in the Hastings-Quinte Intervention Group for the entire Study period (excluding Community Paramedicine) were $2.3 million, with the Control Group incurring $1.4 million in direct costs. Total direct costs of serving the clients who remained in the County of Renfrew Intervention Group for the entire Study period were $1.7 million, with the Control Group also incurring $1.7 million in costs. Total costs for the combined sample were $7.1 million for the 123 clients (out of an initial 200) that remained in the Study through to its conclusion. This is an average of $57,723 per client in direct costs alone, over the four-year period.

To determine the cost-effectiveness of the Community Paramedicine intervention, the Intervention Groups, with costs of Community Paramedicine included, were compared to the Control Groups on both an aggregate and cost-per-participant basis. These comparisons indicate that total direct costs for health care services provided to the Intervention Groups did not decline sufficiently in the 12-month field phase to offset the costs of the Community Paramedicine intervention.

These results suggest that there may be opportunity to moderate overall service utilization and associated direct costs for the Study target group by providing service earlier in the disease progression trajectory. The results also suggest that exploration of ways to reduce the unit cost of Community Paramedicine would be helpful in improving the cost-effectiveness of the intervention. In particular, the constraints of a research study (as opposed to an ongoing program) combined with the relatively small sample sizes suggest that unit costs of Community Paramedicine could be reduced in ongoing operating mode. More work could be done on service delivery design to increase the number of clients that can be supported per hour of Community Paramedicine time.

The Study also found that the effectiveness of Community Paramedicine is highly sensitive to target group selection, the degree to which the target group is experiencing disease progression, and to the degree of integration of Community Paramedicine into a local healthcare system.

Note that because the effective sample sizes were not identical for Intervention and Control Groups in either Hastings-Quinte or the County of Renfrew, comparison of aggregated data for intervention and control groups is not as accurate as comparison of average-per-client measures. Aggregate data is however the appropriate measure for deriving the economic value of Community Paramedicine for both of the Activity-Based Costing approach and the Quality Adjusted Life Years approach.

The Study confirmed the challenges of influencing the health status of a high service utilization sub-population, particularly one in which chronic disease is well-established and progressive. The Study deliberately targeted the client population exhibiting the highest frequent utilization of Paramedic Services (for transport to hospital Emergency Rooms) combined with the presence of one or more of five chronic conditions: Chronic Obstructive Pulmonary Disease COPD, Congestive Heart Failure (CHF), diabetes, hypertension, or stroke.

The original objective of comparing urban and rural settings for Community Paramedicine was not achieved due to small sample sizes, local differences in the way CPs were deployed, and differences in each community's degree of familiarity with a Community Paramedicine service.

For Intervention group clients, the Study found that Community Paramedics are viewed as high-credibility healthcare professionals, are able to support caregivers and reduce the sense of burden that clients feel when being cared for at home. These clients also provided qualitative corroboration for the quantitative results, indicating that the Community Paramedicine service did reduce their need to visit the ER.

Significance: Study results raise a question about whether Community Paramedicine could better reduce Emergency Room visits through visits to the client's home using a service delivery model that integrates both Paramedics and Community Paramedics into the circle of care (the model deployed in the County of Renfrew). Both groups of health care professionals gather useful knowledge about clients' home situations, extent of other supports (including from family members and friends) that could influence preventative strategies as well as follow-up care after receiving service in a physician's office or hospital. A model that has Paramedics who also are CP-qualified may permit more diversions from the ER than a stand-alone CP program by ensuring timely at-home interventions. This could not be demonstrated conclusively in this Study (due to small sample sizes). In addition to deployment of the integrated model in the County of Renfrew, that community already had a Community Paramedicine program with established relationships with other healthcare service providers – both of which could have influenced the results.

The research team notes that at the time of the Study, the health care system in Ontario was – and remains – in the midst of significant overall change with budgetary reallocations across the system, and announcements about specific priorities in the system (e.g. the Patients First discussion paper). Despite the implications of these changes for health service provider organizations, they remained active participants in the EV-CP study, contributing data to the research team and insights to the Partners' Steering Committee. A list of stakeholder organizations participating directly in the Study is included as Appendix B and the membership of the Partners' Steering Committee are listed in Appendix C.

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Acknowledgements

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The following organizations all participated directly or indirectly in the execution of this Study – through service on the Partners' Steering Committee, by facilitating research ethics board reviews, provision of data within the parameters of legislation and policy on privacy and confidentiality, providing significant in-kind staff support to assist with Study tasks, and offering expertise and related insights on the Study.

Brighton-Quinte West Family Health Team

Champlain Community Care Access Centre

Champlain Local Health Integration Network

Hastings-Quinte Paramedic Service

Pembroke Regional Hospital

Quinte Health Care Corporation

Quinte Health Links

Queen's University – Belleville Family Health Team

County of Renfrew Paramedic Service

Renfrew Victoria Hospital

St. Francis Memorial Hospital

South East Community Care Access Centre

Southeast Local Health Integration Network.

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1 Introduction

1.1 Background

With older adults accessing the healthcare system with greater frequency, and service utilization profiles demonstrating escalating utilization of healthcare services by specific populations, healthcare providers are seeking better ways to coordinate service delivery, manage precious healthcare resources and improve health outcomes. Hospitals seek to reduce wait times in Emergency Rooms and to make sure that in-patient services are utilized for those clients who need those services. The ability to avoid unnecessary ER visits and admissions as well as discharging client back into the community with appropriate community supports is considered to be part of the solution. Increasingly, community-based service providers are expected to deliver a range of social and healthcare services to clients in their homes [1].

Chronic Conditions Now Dominate Healthcare Service Utilization and Associated Costs: Across Canada, age-related chronic conditions are a key driver of healthcare service utilization and associated costs. For instance, nation-wide 5.8% of the population has diabetes; 2.5% has chronic obstructive pulmonary disorder (COPD), and another 1% has congestive heart failure (CHF). [2]

In Ontario, people with Chronic Obstructive Pulmonary Disease (COPD) make up 12.6% of the adult population, with 51% being between the aged of 35 and 64. People with COPD used half of all the lung cancer health services in Ontario, a third of all pneumonia and the same proportion of cardiovascular disease health services in Ontario [3]. The study's lead author Dr. Andrea Gershon notes that "a great amount of the health services used by individuals with COPD were not directly for COPD but for co-morbidities related to COPD – suggesting that they account for a large and previously unappreciated COPD disease burden."

> "There is growing evidence that when a patient with a chronic disease, such as diabetes, heart failure or emphysema sees their family doctor or specialist within 30 days of their ER discharge, the risk of death or hospitalization is significantly reduced. Such patients are often safe to discharge after an ER assessment, but prompt follow-up is virtually always recommended because they often need more tests and ongoing management of the chronic illness to avoid getting sicker, even with good care in the ER."
>
> Dr. Michael J. Schull, President and CEO, Institute for Clinical Evaluative Studies; emergency medicine specialist, Sunnybrook Health Sciences Centre, Toronto, Ontario [5]

Demographic and age-associated chronic condition trends drive increased demand for, and place particular strain on, paramedic services to meet response time standards. Similarly, the trends increase demand for service at emergency rooms of hospitals and increase wait times for service. The Ontario Action Plan for Health Care (MOHLTC, 2012) reported that 'In 2010/11, over 271,000 emergency room visits were made to Ontario hospitals that could have been treated in alternative primary care settings… We're taking avoidable trips to the emergency room (ER) instead of receiving care closer to home… these patients could have received optimal care at a lower cost outside of the hospital.' [4]

The 2012 Health Quality Ontario report noted that "over the past seven years, there has been a steady decrease in the rate of hospital admissions for (ambulatory-care sensitive conditions) and Ontario's rate is now lower than that of most other provinces." Nonetheless the report suggests that "there is still huge room for improvement" in the management of chronic diseases, especially avoidance of unnecessary hospitalizations and readmissions. For instance, the HQO report notes that one in five people with congestive heart failure

(CHF) or chronic obstructive pulmonary disease (COPD) is readmitted to hospital within 30 days of discharge [6]. This would suggest that 20% readmission of a sample group would be typical and 10% would be considered very good.

The value of hospital post-discharge care has been found to be especially important for heart failure patients visiting ERs of smaller hospitals. A study of more than 89,000 patients who visited an emergency department in Ontario between 2004 and 2010 found that heart failure patients who were treated at smaller hospitals with the lowest rates of admission for these types of patients, were more likely to return to the emergency department for care, be hospitalized for heart failure within 30 days, be hospitalized for cardiovascular disease within 30 days, and have inadequate post-discharge follow-up from cardiac specialists, with or without family doctors. [7] The study focused on the need for better tools for doctors to better identify low and high-risk patients, which senior author Dr. Douglas Lee noted would allow physicians to "determine if they need to be in hospital or can recover at home."

Community-based organizations whose service provision in Ontario is coordinated by the CCAC find themselves challenged to meet the demand for care of patients that can be maintained at home, as well as those who are discharged from hospital and require follow-up care. The Ontario Action Plan for Health Care notes that one of the province's greatest health care challenges is serving Alternative Level of Care (ALC), patients who are in hospital beds although '*could be better cared for at home or in the community if the right supports were in place. Better serving these patients benefits the entire system, because it frees up hospital beds for those who need them, reduces pressure on emergency rooms and saves money. Our plan will aggressively move to make progress on this issue by building capacity in the community*.' [Italics added] [8]

A preliminary report for Health Innovations (2013), *Paramedics Assessing Elders at Risk for Independence Loss (PERIL)* cites several sources indicating that "despite the popular perceptions that paramedics' main focus is cardio-pulmonary resuscitation, 85% of 911 calls are for non-life threatening problems". [9] [10]

The PERIL report also cites several papers from the City of Toronto indicating that data from Toronto EMS confirm that older persons are five times more likely to call 911 than younger people [11], [12], [13]. Repeat EMS use is also common and accounts for 18-40% of 911 calls among people 65 years of age or older". [14]

In the face of these reports and analyses, many jurisdictions – both in Canada and abroad – are exploring different models for addressing service utilization challenges, particularly for the highest-intensity and/or highest-cost sub-populations. [15] Community Paramedicine is one of the approaches being utilized to provide additional support to specific sub-populations to extend the time that clients can remain in their homes rather than being admitted to hospital or to long-term care. Community Paramedicine (CP) refers to a broad and developing field of paramedic practice focused on proactive and non-emergent activities (within the scope of a paramedic) that better influence health outcomes. CP allows paramedics to apply their training and skills in "non-traditional" roles, largely outside the usual emergency response and transportation to the emergency room focus.[1]

The Economic Value of Community Paramedicine Program (EV-CP) Study was designed to:

- Measure the economic value of community paramedicine (CP) to specific services such as Paramedic Services (PS) and hospital Emergency Rooms (ERs). For example, can CP programs reduce the number of unnecessary trips to ERs – particularly for ACSCs – and the associated costs incurred by both services?

- Measure the impact of CP programs on other community-based health-related services. For example, can CP programs play a useful role in serving a particular group of patients with complex healthcare needs through regular home visits, either on a short-term or long-term basis?
- Infer the projected economic value of CP programs on global (provincial) healthcare costs. For example, what do the conclusions of this study in two Ontario communities tells us about CP Programs' role(s) and contributions to health care across the province?

The CP study was also expected to comment on prospects for CP program sustainability. [16]

1.2 Local Evidence of Conditions Suggesting High Service Utilization

Quinte: The most recent Strategic Plan (2012) from the Quinte Healthcare Corporation, an integrated system of four hospitals working with community partners [17], points out that the average age in the QHC region is higher than the provincial average, between five and 10 years ahead of the baby boom for the province. The same report predicts that the population over age 65 will increase significantly in the next 20 years, with citizens over 85 almost doubling in that time.

Quinte Healthcare noted that local patterns of health status and service utilization are consistent with provincial trends:

- Patients over 65 use a higher rate of hospital resources, with patients age 65 to 76 accounting for almost one quarter of all ambulatory surgery cases, despite representing only about 2% of the population. Patients age 85 and over account for almost 10% of all inpatient visits.
- Health indicators reveal significant health issues in the community (e.g. high blood pressure, chronic pain, obesity)

Rates of chronic diseases are higher in this region than the provincial average (e.g. arthritis, diabetes, asthma, mood disorder). For instance, according to data from the South East Local Health Integration Network (SE LHIN), prevalence of Chronic Obstructive Pulmonary Disease (COPD) is 4.9% for Belleville and 5.4% for Quinte West compared to 3.6% for the province, and for diabetes, it is 10.9% in Quinte West and 11.9% in Belleville compared to 10.2% for Ontario as a whole.

In the Study period (2015-2016), the Hastings-Quinte Paramedic Service received 30,448 calls, routed via 911 – roughly 80 calls a day. In 2013, Hastings-Quinte Paramedic Service undertook a CREMS program (Community Referral by EMS) through which it reviewed and referred 112 clients to the Southeast Community Care Access Centre, to test the potential for home-based care rather than transport to a hospital emergency room. The profile of this group was as follows:

- Gender neutral: 50 % male/50% female
- Heavily oriented towards older citizens: 86% of referrals were above 60 years of age
- Included repeat users of 911: Patient group generated 401 calls to 911 (average 3.6/year)
- Included heavy users of 911: six repeat referrals generated 82 calls to 911 services (average 13.6/year)
- Health issues could be addressed without transport to hospital: 33% of calls did not result in transport
- More referrals from urban than rural areas: further analysis is required to determine if a higher percentage of the total patient population in urban areas emerged as high-potential referrals.

According to the most recent Census (see Table 1), the Study area for the Hastings-Quinte had a population of 92,540 with 18 per cent of the population over the age of 65. This proportion was slightly lower than the surrounding rural area which was not part of the Hastings-Quinte Study area but higher than the provincial average (15%).

Urban Areas served by Hastings-Quinte PS	# Age 65-74	# Age 75-84	# Age 85+	Total Aged 65 and Over	Total Population	Percentage 65 and Over
City of Belleville	**4,545**	**3,345**	**1,615**	**9,505**	**49,454**	**0.19**
City of Quinte West	**4,130**	**2,355**	**805**	**7,290**	**43,086**	**0.17**
Sub-total - Urban Areas	**8,675**	**5,700**	**2,420**	**16,795**	**92,540**	**0.18**
Rural Areas served by Hastings-Quinte PS	**4,770**	**2,495**	**865**	**8,130**	**42,394**	**0.19**
Deseronto	160	90	20	270	1,835	0.15
Bancroft	445	340	160	945	3,880	0.24
Faraday	240	90	20	350	1,468	0.24
Limerick	45	25	0	70	350	0.20
Madoc	240	110	25	375	2,197	0.17
Tudor and Cashel	85	35	5	125	586	0.21
Tyendinaga	255	150	35	440	4,150	0.11
Wollaston	100	50	15	165	708	0.23
Centre Hastings	495	250	60	805	4,543	0.18
Stirling-Rawdon	475	270	130	875	4,978	0.18
Tweed	705	360	160	1,225	6,057	0.20
Hastings Highlands	630	270	60	960	4,168	0.23
Carlow-Mayo	115	65	5	185	892	0.21
Marmora and Lake	560	310	140	1,010	4,074	0.25
Sub-Total - Rural Areas (Hastings County)	**4,550**	**2,415**	**835**	**7,800**	**39,886**	**0.20**
Total - Urban and Rural Areas Served by HQPS	**13,225**	**8,115**	**3,255**	**24,595**	**132,426**	**0.19**
Note: HQPS also serves Prince Edward County through a shared services agreement.						

Areas of the County of Renfrew	# Age 65-74	# Age 75-84	# Age 85+	Total Aged 65 and Over	Total Population	Percentage 65 and Over
Pembroke (Town of)	**1,415**	**1,230**	**730**	**3,375**	**14,360**	**0.24**
Arnprior	790	715	340	1,845	8,114	0.23
Deep River	480	340	145	965	4,193	0.23
Renfrew	875	695	430	2,000	8,218	0.24
Petawawa	710	385	80	1,175	15,988	0.07
Laurentian Hills	240	120	25	385	2,811	0.14
Head Clara and Maria	40	10	0	50	235	0.21
Horton	260	120	30	410	2,719	0.15
McNab-Braeside	690	315	90	1,095	7,371	0.15
Brudenell, Lyndoch and Raglan	220	125	20	365	1,658	0.22
North Algona-Wilberforce	360	145	35	540	2,873	0.19
Admaston-Bromley	250	115	25	390	2,844	0.14
Laurentian Valley	905	470	85	1,460	9,657	0.15
Killaloe, Hagarty and Richards	300	175	50	525	2,402	0.22
Madawaska Valley	570	345	170	1,085	4,282	0.25
Bonnechere Valley	480	280	75	835	3,763	0.22
Whitewater Region	665	375	185	1,225	6,921	0.18
Greater Madawaska	425	185	30	640	2,485	0.26
Total - Areas served by County of Renfrew PS	**9,675**	**6,145**	**2,545**	**18,365**	**100,894**	**0.18**
ONTARIO	**1,004,265**	**627,660**	**246,400**	**1,878,325**	**12,851,820**	**0.15**

Table 1 - Numbers and Percentages of Seniors in the Hastings-Quinte and Renfrew areas, Source: Statistics Canada 2011 Census

Note 1: The County of Renfrew population data does not include seasonal residents and visitors to the area, which increases the population in the county to roughly 150,000. The data analysis in this report is based on the permanent resident numbers shown in the above chart. Note 2: The cities of Belleville and Quinte West are independent municipalities, separate from the County of Hastings. However, in many areas of public service, the three local governments work collaboratively and deliver service across all three communities. The same relationship exists in County of Renfrew, which operates the Paramedic Service on behalf of Pembroke, even though it is a separate local government.

County of Renfrew: In 2015, the County of Renfrew Paramedic Service (Ontario) received 26,127 calls. Analysis of data from 2011 indicated that 66% of calls were code 4 life threatening calls. Sixty (60) per cent of all calls were for patients over the age of 60 and 27% of the calls were for patients over the age of 80 [18]. The 2011 Census shows that the County of Renfrew Paramedic Service serves a region characterized by towns, rural and remote areas with a total population of 100,894. The proportion of seniors in that service area is 18% – the same as for the urban area and higher than the province as a whole (15%).

1.3 Urban-Rural Considerations

Cost-effective, quality healthcare service provision is challenging in both urban and rural parts of Ontario. Acute care services are typically located in high-density areas; in lower-density areas, service delivery is expected to be more expensive (on a per client or per trip basis) for paramedic services to help clients access acute care or for clients to reach acute care themselves. This same phenomenon affects the relative costs of community-based care, particularly services delivered to clients at their own homes.

The population density of the City of Belleville is roughly 200 people per square kilometre and for the City of Quinte West: 86 people per square kilometre. By contrast, the rural areas of Hastings County have an average population density of 7 people per square kilometre (2011 Census). The County of Renfrew, a mix of rural, remote and small town areas, has an average population density of 10 people per square kilometre. Because community paramedicine delivers services to clients in their homes, lower population densities might be expected to increase the community paramedics' travel time between client visits and reduce the total number of clients they can serve each day.

By undertaking the Study in two areas – one primarily urban (Hastings-Quinte) and the other a mix of rural, remote and small towns (Renfrew), there was an additional research opportunity to see if the economic value of Community Paramedicine differed between urban and more rural areas.

1.4 Description of the Study

The *Economic Value of Community Paramedicine Programs* project was led by Hastings County's Department of Emergency Services. In partnership with the County of Renfrew, a successful application was approved by the Canadian Safety and Security Program in 2014 to "determine the economic value of community paramedicine programs and their effectiveness relative to global healthcare costs." [19]

This report describes study planning and execution processes as well as reporting results and offers observations, insights and potential next steps to explore the potential for Community Paramedicine specifically as well as the potential for cost-effective and cost-efficient system-wide responses to the needs of high-frequency users of healthcare services.

The study had three phases (timeframes in brackets):

1. Planning Phase: Research Design and Methodology, Ethics Board submission, Identification and Recruitment of Target Study Participants into Study sample, including assignment into intervention and control groups; and Retrospective Data gathering (originally anticipated to last seven months: July 1, 2014 to January 31, 2015, but actual elapsed time was 12 months.)

2. Field Phase: Deployment of Community Paramedicine in a 12-month Field Phase, including Training of Paramedics and deployment of in-home technology; also includes execution of pre- and post-EuroQol quality of life self-assessments, semi-structured interviews, and client satisfaction questionnaires (twelve months: February 1, 2015 to January 31, 2016)
3. Analysis and Results Phase: Consolidation and analysis of all service utilization and related cost data; includes delivering a final report and development of outreach communications (five months: February 1 to June 30, 2016).

2 Planning Phase

2.1 Research Design and Methodology

2.1.1 PICOT Statement

For the Economic Value of Community Paramedicine Programs Study, a PICOT Statement [20], set out in detail in Appendix D, was developed and used as the basis for research design and methodology choices. The key elements of the Statement were:

- A focus on a population of high-frequency users of both Paramedic Services and hospital emergency rooms (with the possibility of high-frequency admissions and length of stays in hospital) in the preceding year.
- Defining the intervention as the provision of Community Paramedicine as an incremental service to any other in-home services that clients might be receiving.
- Defining the control group as those clients receiving conventional service.
- Establishing expectations that the Study would measure the economic value of Community Paramedicine to specific services, and infer the value to global healthcare costs. The CP study was also expected to comment on prospects for CP program sustainability.
- Completing the Study in 18 months, with 12 months dedicated to the field phase (period of time the intervention would be offered.)

2.1.2 Mixed Methods Approach

The EV-CP Study was a mixed methods study, combining quantitative and qualitative methods to strengthen the validity of the results and the contribution of the project to the healthcare research literature. The main advantages of a 'mixed methods' approach are in its ability to:

- *Generate information complementarities*. Gathering standardised quantitative information provides the basis for statistical and financial calculations, enables generalisation to larger (similar) populations, and supports the analysis of social patterns. Collecting qualitative information highlights cultural and contextual dimensions and reveals meanings that people attribute to situations, actions and processes. The combination of these different types of information provides a deeper understanding and interpretation of population health needs and responses to various types of services intended to address them.
- *Provide meaningful information to guide future planning*, thereby helping decision-makers at the local and global (provincial) levels understand the nature of opportunities to shape the cost-effectiveness of the health care system while optimizing citizens' health status and quality of life.
- *Provide a mechanism for input by community stakeholders, including clients and service providers* (when conducted in a multi-stakeholder and participatory fashion). This shifts the nature of the discussion (and related decisions) about health services and health improvement from singular client-provider interactions to those which integrate multiple service providers as well as clients, in design and delivery of services for both individual clients and particular high-risk groups in any particular community.

Quantitative Methods: This Study used two quantitative methods:

1. Activity Based Costing (ABC) of healthcare utilization: A retrospective analysis was performed for all study participants to estimate utilization and associated costs of using paramedic services, local hospital ERs, in-patient hospital care, and community-based services accessed through the Community Care Access Centres. Initially, it was hoped that information on primary care service utilization could be obtained to supplement this data; several Family Health Teams did provide service utilization data for a small number of Study participants but the numbers of FHT patients in the Study were too small to justify inclusion in the ABC calculation. The ABC analysis provided the baseline data against which the interventions were compared. Initially expected to cover a twelve-month period preceding participants' enrolment in the Study, the Retrospective Data Collection was able to collect up to three years of retrospective data for many participants, providing a four-year timeframe over which to assess service utilization and associated costs.

   The focus of the analysis was on estimating utilization and costs of PS calls, ER visits, allied health visits or services, primary care visits, and any hospital stays in the retrospective and Field Phase periods. This analysis provided both a) an average global healthcare resource utilization profile with associated costs for the study participant group as a whole (with variances and standard deviations noted), and b) an anonymous individual participant profile that was carried forward into the sub-sample of which the participant was part (e.g. Intervention group or Control group).

   Service utilization (and associated costs) were tracked throughout the study period, enabling the tabulation of the same two analyses at the end of the trial period or when the participant exited the trial, whichever came first. The two sets of data and distributions across services, and over time, were compared and reported.

2. Client-Reported Outcome Measure: The EQ-5D-3L (EuroQol five dimensions, three levels) is a client reported outcome measure that captures five dimensions of health-related quality of life: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. It was appealing as a standardized health measure for this RCT because as a generic measure, it was considered applicable to a wide range of health conditions likely to be encountered in this study. As a population and program research tool, it also has the capacity for monitoring of results and changes over the course of a trial. It is designed for completion by the client, is easy to use and can be performed independently or with the help of a research assistant either face to face or by telephone.

   The EQ-5D-3L is commonly used around the world [21], and increasingly so in Canada in clinical, population health, health economics and research applications. Much research has been completed on the EQ-5D-3L which supports its face value, internal and test-retest validity, and reliability in clients with multiple medical conditions [22]. EQ-5D-3L data was collected at two stages, on entering the Study and at the end of the twelve-month field phase (or exit from the Study, under specific circumstances).

   Outputs from this scale are converted into a utility function representing quality of life. This value can then be converted to a monetary value through using Canadian benchmarks for calculation of economic value through Quality Adjusted Life Years (QALYs) [23]. Change in individual and collective QALYs for the RCT at the end of the field phase was then reported, to provide an additional measure (beyond the activity-based costing measure) of the economic impact of community paramedicine.

Note that the EQ-5D-3L results can be compared to healthcare providers' assessments for the same dimensions, providing additional insight into any apparent change in health status. It was expected that the Community Paramedics might be able to make an assessment of any change in health status (for the Intervention group only). However, this was not possible so EuroQol analysis was based on client perceptions alone.

Qualitative Methods: Additional qualitative information was obtained in two ways:

1. The Study used semi-structured interviews with a representative sample of clients (both Intervention and Control groups) on entry into and exit from the RCT. Interview questions were focused on gaining a more holistic understanding of high-need client experiences and included references to the impact on friends and families in meeting their needs. The questions utilized in the pre-Field Phase interviews are presented in Appendix G.
2. As the Study unfolded, the research team recommended that the semi-structured interviews to be completed on exit from the Study be replaced with a client satisfaction survey, to be administered to all Intervention Group participants in both communities who had completed the entire 12 months of the Field Phase. This change, which was discussed by the Study's Partners Steering Committee, was expected to provide a larger number of responses and allow a broader range of questions. The questionnaire utilized in both communities is presented an integral part of the results in Appendix J.

Bringing Quantitative and Qualitative Data Together: By using a unique identifier (not the client's Personal Health Information) in the Study database, the trial was expected to be able to consolidate quantitative data at the record level, which would support more granular analysis of the sample blocks and enable the production of economic value calculations at both the record level and local population level. It was also expected to support the analysis of results to determine the study's value for use in generalizing results to the provincial level. By bringing results from qualitative interviews into the discussion at the local level, the Study was thought to be able to go beyond calculations of economic and health care value of community paramedicine, to provide additional understanding of the patterns of services – including family, friends and neighbours' support – that best support the target client population.

2.2 Ethics Board Submission

Due to the nature of the Study (randomized controlled trial) as well as hospital policies and the need to ensure appropriate management of informed consent processes, the EV-CP Study prepared documentation for ethics board consideration in fall of 2015. In November of 2015, Quinte Health Care's Research Ethics Board received a full submission for consideration. The submission to QHC, included in its entirety as Appendix E to this report, contained:

- A summary of proposed research (abstract, rationale and hypothesis, anticipated results)
- Study design (description, target population, methods)
- Processes for obtaining Informed Consent
- Criteria for premature withdrawal
- Description of Study Interventions or Procedures
- Information-sharing among service providers
- Risk/benefit estimates to participants,
- Training plan
- Plan for handling adverse events
- Approach to use of placebo (none used)
- Use of deception or non-disclosure (none used)

- Withholding standard therapy (not deployed)
- Description of subjects/participants
- Research personnel credentials
- Informing healthcare colleagues
- Confidentiality and privacy
- Study monitoring and associated professional credentials
- Conflict of interest considerations
- Data/information collection and storage
- Use of record ID (for anonymity/privacy & confidentiality).
- Activity-Based Cost Information
- Protection of data,
- Data retention policy
- Payment to study participants (none)
- Funding
- Contract administration
- Publication/dissemination of results
- Liability
- Investigational drugs or devices (none)
- Handling and disposition of Study drugs
- Exclusion of clients from participation in simultaneous research studies
- Protection of research staff
- Study governance, and
- Specific Request to Ethics Board.

The sample selection and assignment protocol, and documents supporting obtaining of informed consent were provided to QHC separately and is included in this report as Appendix F. A Letter of Approval was provided to the Study team on January 12, 2015. A Letter of Approval was received by the County of Renfrew Paramedic Service from Renfrew Victoria Hospital Board's Ethics Board on January 28, 2015. These documents are included in Appendix F

2.3 Identification and Recruitment of Target Study Participants

2.3.1 Eligibility Criteria

Based on Study eligibility criteria, the two Paramedic Services used their own databases [24] to generate a comprehensive list of all potentially eligible persons in their respective areas. To be eligible a person would have had to meet all of the following criteria:

1. Three or more ambulance transports to a hospital ER in the preceding twelve months
2. Presence of one or more of five chronic conditions (COPD, CHF, Diabetes Hypertension, Stroke)
3. Lived in the Study area (for Quinte: City of Belleville or urban area of Quinte West/Trenton; for Renfrew: anywhere in the designated rural area of the County of Renfrew)
4. Still residing in own home/not admitted to long-term care (individuals living in a retirement residence in either independent living or assisted living accommodations were eligible for participation).
5. Permanent resident of the Study area (not a visitor)
6. Not be part of another research study in the same timeframe.
7. Had local retrospective health care data for the 12 months preceding enrolment in the Study
8. Had no significant physical, cognitive or other mental disability that would make full participation in the Study difficult or impossible (e.g. unable to complete the EuroQol questionnaire with assistance.
9. Be living at the start of the Study period. (Note however that persons who are deceased during the Study period would be excluded from the analysis).

10. Has not withdrawn consent or notified the Study (or any of the partner organizations) that they do not wish to be considered for research studies.

2.3.2 Sample Disposition for Identified Group of Potential Participants

The process for sample selection began with the identification of 718 potential participants, 485 in the urban areas of Quinte and 233 in the rural/small town areas of the County of Renfrew. In the Quinte area, the ability to contact potential participants was especially challenging: only 30% of the sample could be contacted; 70% were unreachable. This issue was not quite as pronounced in the County of Renfrew where just 18% could not be reached. In the County of Renfrew, it was easier to determine if a potential participant was deceased (11.1%) or had moved – either to long term care or out of the area: 23.6%. By contrast, in Quinte, just 3.7% could be confirmed as deceased and very few potential participants could be confirmed as having moved.

Sample Disposition Category	Hastings-Quinte (#) Target = 120	Renfrew (#) Target = 80	Total (#) Target = 200
Total Number of Eligible Clients (met criteria)	485	233	718
Deceased (at time of recruitment)	18	26	44
Moved to LTC or outside Study area	2	55	57
Declined to participate at initial contact	5	30	35
Unable to contact	340	42	382
Recruited into Study	120	80	200

Table 2 – Summary of Disposition of Potential Study Participants, by community and disposition category. Source: Study documentation

2.4 Sample Recruitment

The initial 200-person sample was recruited according to the approved protocol with Hastings-Quinte Paramedic Service recruiting 120 (60 each in intervention and control groups) and the County of Renfrew Paramedic Service recruiting 80 (40 each in intervention and control groups). Hastings-Quinte area was the designated urban area so all recruiting was executed in the cities of Belleville and Quinte West. The County of Renfrew was the designated rural area and all recruiting was executed across the entire county. Table 3 below summarizes the challenges of recruiting sufficient participants from a target population characterized by chronic illness – significant numbers of potential participants were deceased by the time the Study begins or could not be reached to determine their participation interest. This latter challenge was particularly acute in Hastings-Quinte whereas County of Renfrew also experienced recruitment challenges from potential participants moving to long term care (LTC) or outside the study area.

Both communities used a pre-screening telephone call to allow the client to consider interest without someone on their doorstep. However, both communities found that inability to contact sufficient numbers of potential participants by phone necessitated door-to-door calls to locate clients, then if they could be found or were interested, engaging them in conversations about the Study. It is not clear why County of Renfrew would have had so many potential participants moving to LTC or outside the Study area except that in rural areas, there is a pattern of older, less-well individuals moving from rural to urban areas as they age, to be closer to hospitals and other health care services. In urban areas, this phenomenon may be less pronounced. However, the large number of unreachable potential participants in Hastings-Quinte may be masking the same phenomenon. It is possible that in rural areas, Paramedic Services and other healthcare services find it easier to track these clients.

2.4.1 Informed Consent and EuroQol Questionnaire Completed Together

To expedite initial data collection and allow randomization into Intervention and Control groups, visits to discuss and allow a potential participant to reach a decision on participation in the study – including provision of informed consent – were also used to administer the "pre" EuroQol instrument on the client's assessment of quality of life. In all cases, informed consent was obtained before the EuroQol questionnaire was administered. Randomization into intervention and control groups took place after these two documents were completed.

Sample randomization was completed using an online randomizer. Both communities use random number generation as the method of anonymous assignment of clients to a group. Randomization and assignment to intervention and control groups took place on a batch basis to allow the Community Paramedics to begin service provision starting in late January. They were therefore able to take on clients at a manageable pace rather than having 60 or 40 clients all coming into the intervention group at the same time. As a result, the "wait time" for an intervention group client was less than two weeks. Once an individual had given consent for participation and was randomized into the Intervention group, the CPs sought to begin service as quickly as possible to prevent health status degradation.

2.4.2 Sample Management and Disposition

As demonstrated in Table 3, both Study areas suffered significant losses in their sample groups during the Field Phase period (February 1, 2015 to January 31, 2016). To some extent, this is not surprising given the health status of Study participants. For instance, each community lost at least 10 per cent of the starting sample to death (Quinte: 14.3%; Renfrew: 11.3%) and Hastings-Quinte lost 8.7 per cent of their Study sample to transfer to long term care. The County of Renfrew experienced significant sample losses to withdrawals (13.7 per cent of the total sample and 27.5% of the Intervention group). The reasons for such a high level of withdrawals from the Intervention group – especially early in the Study – are unclear although anecdotal evidence suggests that participants believed they had all the support they needed (either from their primary care provider or other services in the community) and could manage without the CPs' assistance. There may have also been some challenges for the CPs in staying in touch with clients since a different service delivery model was used in the County of Renfrew (*see Results section for discussion of the models used in each of the two communities*); some Intervention group participants may have not seen the value in continuing to be part of the Study. The County of Renfrew Paramedic Service was unable to ascertain the status of 18.7 per cent of the sample (mostly in the Control group) due to inability to reach them at the Study's conclusion. It is possible that a significant number of these participants are either deceased or in long-term care.

The result of these sample losses is much smaller final sample sets (participants who remained in the Study for the entire 12 month field phase): just 35 of 80 for the County of Renfrew (intervention and control groups combined) and 88 of 120 for the Quinte area (intervention and control groups combined). The total final or net sample is therefore 123 of the original 200 that started the Study (38% sample loss during the Study phase).

The small sample size in the County of Renfrew requires the use of different statistical techniques that apply to small samples (n = 30 or less). However, the small size of the Intervention group (15 participants) suggests that it would be quite difficult to ascertain statistically significant results since confidence intervals are quite large for small samples. Further, lack of information about any individual makes it unclear whether unreachable participants should remain in the sample for the purposes of data analysis or be removed as having effectively withdrawn consent. (Those who have explicitly withdrawn, have moved to long-term care, or are deceased would be deemed to have withdrawn consent for use of retrospective data. The exception to this rule would be for EuroQol results for deceased individuals (see a subsequent section of this report for a discussion on this point).

	Hastings-Quinte				Renfrew		
Status	Intervention	Control	Total		Intervention	Control	Total
Deceased	8	10	18		4	5	9
Moved	1	2	3		4	3	7
Hospitalized	4	1	5		2	0	2
Long Term Care	6	5	11		0	0	0
Unreachable	0	0	0		3	12	15
Withdrew	1	0	1		11	0	11
Discharged	0	0	0		1	0	1
Complete	46	42	88		15	20	35
TOTAL:	66*	60	126		40	40	80

Table 3 – Sample Disposition, by community and disposition status. Source: Study documentation.

*Includes 6 participants recruited to replace participants who left the study for one of the reasons noted above. Although they received Intervention Service for at least six months, their data was not used in calculating study results. The effective/net sample in Hastings-Quinte was therefore 88 people (46+42).

Opportunity to Replace Early Sample Losses Set Aside: Anticipating sample losses due to moves to long term care or death (due to health status of Study participants), the Research Team considered replacing any Intervention group participants exiting the Study with others who met the eligibility criteria, provided they would be able to be in the Intervention group for at least six months. Note that because Community Paramedics would not be visiting Control group participants, attrition from that group would not be monitored on an ongoing basis.

Quinte: With Intervention group attrition at 21%, Hastings-Quinte Paramedic Service returned to the original database and advanced the query date by six months (from July 2014 to December 2014) [25]. This process generated additional potential study participants that met Study criteria. As a result, Hastings-Quinte would have been able to maintain their intervention group size at nearly 60 persons. However, realizing the statistical challenges of co-mingling participants who are in month seven or later of service with those just entering the Study, Hastings-Quinte decided to complete the Field Phase with only those participants who could potentially complete a full 12 months as a Study participant.

Note that the mortality rate in both urban and rural areas was lower for the Intervention Group than for the Control Group. In the Quinte area, the mortality rate was 12.1% for the Intervention group compared to16.7% for the Control group. In the County of Renfrew, the mortality rate was 11.1% for the Intervention Group compared to at least 25% for the Control Group. However, the rate of admission to long term care is slightly higher in the Intervention group (10.6%) compared to 8.3% for the Control group. Neither of these differences test as statistically significant using confidence interval (0.95) or Student t tests.

Renfrew: Although County of Renfrew's Intervention group attrition was greater (50% of the starting sample were lost to death, moves, withdrawals and discharge), Renfrew was not able to replace these participants. Given the area's rural nature, the total pool of eligible candidates was smaller, the pre-existence of a CP program in the area meant that some otherwise eligible clients were already receiving service, and some otherwise eligible persons had already been recruited into other research initiatives. As a result, the Renfrew Intervention group is much smaller than originally anticipated (n = 15 rather than 40).

Because the Community Paramedics were not providing service to the Control Group, it was not known whether there has been a similar pattern of attrition in those groups (e.g. moves to nursing homes, death) during the Field Phase. However, data gathering at the conclusion of the Field Phase (Table 18) suggests that with the exception of Intervention group withdrawals in Renfrew, the patterns of deaths and moves appear similar.

2.5 Training and Professional Development

2.5.1 Staffing Requirements

While County of Renfrew Paramedic Service had operated a Community Paramedicine program for several years prior to the Study's inception, Hastings-Quinte Paramedic Service had not. As a result, HQPS recruited and trained four (4) Advanced Care Paramedics for service as Community Paramedics. Two of the CPs were designated as full-time and two as alternates [26]; the two full-time CPs provided continuous dedicated service to Intervention group clients for the full twelve months of the Field Phase.

The service delivery model used in the County of Renfrew was an integrated approach. County of Renfrew Paramedic Service designated one of their existing CPs as the service delivery lead for the Study (and for training); multiple CPs were used for home visits and other CP functions. Service delivery for the EV-CP Study required roughly 0.5 full-time equivalent (FTE) of staff time. Participation in research Study activities were considered separately.

2.5.2 Community Paramedic Recruitment, Training and Professional Development

In both Hastings-Quinte and the County of Renfrew, significant recruitment, training and professional development took place both before and during the Field Phase (actual delivery of Community Paramedicine services). A comprehensive training program was developed for Advanced Care Paramedics (ACPs) who would be delivering the Community Paramedicine program in the Quinte area. This program was developed by Premergency Inc. and offered in the fall of 2014. The program is described in detail in Appendix I.

In the Quinte area, both full-time Community Paramedics continue to provide service throughout the twelve months of the Field Phase. Over the summer of 2015, Renfrew Paramedic Services trained an additional 10 alternate Community Paramedics to deliver service on a variety of Community Paramedicine projects in which the County of Renfrew is involved, including the Economic Value of Community Paramedicine Study.

Hastings-Quinte Paramedic Service facilitated some supplementary training (beyond that provided by Premergency Inc. at the start of the project) through Hotel Dieu Hospital (Kingston). This training included

case studies and roundtable discussions surrounding Congestive Heart Failure (CHF), Chronic Obstructive Pulmonary Disease (COPD), Congestive Heart Failure (CHF), Diabetes and Hypertension (HTN). Specific client issues were brought to the table to gain ideas as to how better serve their needs. HQPS' intention was to continue to access HDH training/resources/clinics as they are offered in Belleville. The County of Renfrew has participated in the HDH training and is also using the content of the Premergency training developed specifically for the EV-CP Study.

2.6 Clinical Guidelines

Through this Study, Clinical Guidelines (also referred to as Standing Order Guidelines) were developed by the two Paramedic Services under the medical direction of Dr. Kristian Davis (Renfrew) and Dr. Christopher Hayman (Quinte). Drs. Davis and Hayman served as Medical Directors throughout the entire Field Phase.

Following the development and approval of these Clinical Guidelines for the Community Paramedics, Hastings-Quinte Community Paramedics identified several areas where additional guidelines would be very helpful. Examples included constipation and nausea, both of which may be more easily and cost-effectively addressed [27] with over-the-counter medications. However, given the chronic conditions present for these patients, a standing order on how to address these situations from a physician was considered advisable. The Community Paramedics did test strips and blood draws on a daily basis, which accelerated the diagnostic process and any resulting treatment. While use of the Clinical Guidelines was common in the Quinte area, County of Renfrew had limited opportunity to use the Guidelines.

2.6.1 Use of Technology for Intervention Group Participants

The Study tested the use of Code4Armour technology (a secure cloud-based medical records system that enables a Community Paramedic or a Paramedic to obtain up-to-date medical information via a smartphone or other internet-linked computer). The client is also able to access the information if they wish to do so.

Code4Armour is a chip-embedded bracelet that the client wore, to which a paramedic could wirelessly connect based on a bracelet code that is entered into a downloadable software application. All clients in the Quinte Intervention group were outfitted with Code4Armour bracelets and Community Paramedics were trained on and did upload medical records information to this technology. Although this could be done "on the fly" via smartphones and tablets, most often the Community Paramedic carried out this work upon return to the base.

Because the Code4Armour database permitted uploading of images and documents, it provided immediate access to available medical information. For the purposes of this Study, Code4Armour could also be used to verify that the client had given a Community Paramedic informed consent to access medical information from other healthcare services providers. In the future, more extensive deployment of this type of technology could facilitate real-time collaboration among healthcare services providers delivering service to a specific client.

2.7 Retrospective Data Collection

2.7.1 Types of Retrospective Data Collected and Associated Timeframes

To support 'pre' and 'post' comparisons on service utilization, to examine changing utilization patterns over time, and to consider relationships between service utilization and self-assessed health status, retrospective data was sought for three years before the start of the Field Phase. The definition of the retrospective 'years' were:

- February 1, 2012 to January 31, 2013
- February 1, 2013 to January 31, 2014
- February 1, 2014 to January 31, 2015

The Field Phase, the year in which the Intervention (Community Paramedicine) was introduced, was defined as February 1, 2015 to January 31, 2016.

To the extent that data could be obtained for all three retrospective years and the Field Phase, this provided the Research Team with four years of data with which to undertake longitudinal analysis as well as a comparison between the Field Phase and the year immediately preceding it. Note that the original Study plan suggested one year's retrospective data; this was extended to three years in the Study's planning phase to support more robust analytics.

Based on these defined timeframes, retrospective data was sought from the specific service providers as described in the following table. As is described in more detail in a subsequent section on Activity-Based Costing, retrospective data was used to tabulate the extent of direct health care resources dedicated to the sub-samples in each of the four years included in the Study. For this reason, it was important to specify the unit of measure for each "activity" (e.g. an ambulance transport to a hospital, a visit to an ER). To make data extraction as expeditious as possible and to keep data definitions consistent across organizations of the same type, the unit of measure was defined in the same way as it is defined on a day to day basis within each of the organizations.

Health Service Provider	Data Sought for Each Year for Each Participant in Each Sample Sub-Group
Paramedic Service	Number of PS calls Number of Transports
Community Paramedicine Programs	Number of Visits (for Intervention groups only)
Hospitals	Number of Visits to the Emergency Room (ER) by any means Number of Admissions to In-Patient Care Number of Days of Stay in In-Patient Care
Community Care Access Centres	Number of Hours of Personal Support Worker support Number of Visits by Nurses Number of Visits by Physiotherapists Number of Visits by Occupational Therapists Number of Visits by 'Other' Health Care Professionals

Table 4 – Description of Retrospective Data Collected from Health Service Providers. Source: Study documentation.

Retrospective data collection was scheduled to take place very early in the Study, with the expectation that this data could inform Study design and sample selection. However, as discussed in an earlier section of this report, this was not possible. Instead, retrospective data collection was undertaken concurrently with the Field Phase and took more than twelve months to complete. The reasons for this extended activity were:

- Health service providers handle research-related data requests differently than those that come from their regular partners in ongoing program delivery, for which data-sharing agreements may be in place. As a result, organizations often needed to verify what the appropriate procedure was and how data files would be exchanged with full protection for privacy and confidentiality.
- Health service providers were often quite willing to provide the data once informed consents were secured. However, the staff designated to perform these functions often had regular data submission obligations to other parties to attend to, or were being asked to undertake special/ad hoc analyses to support organizational strategies. As a result, designated staff were often unable to provide speedy turnaround for research-related requests.
- In some cases, service utilization information is not entered into organizational electronic databases for a considerable period of time after the service has been rendered. This meant that health service providers could not provide Field Phase data until several months after January 31, 2016.

Even if a particular health service provider was willing and able to extract the desired data, they may not have had data on all participants in the Study. For instance, not all participants were CCAC clients and not all participants were registered in hospital databases (especially in areas where a participant may have had the option to go to different hospitals or different hospital sites). This had the effect of reducing the effective sample size on which most analysis would be based. As a result, "n" (the number of observations used to generate a particular statistic) varies across health service providers.

In summary, data was obtained from both Paramedic Services as well as from both Community Care Access Centres (Champlain and Southeast CCACs) and four of six hospitals.

2.7.2 Profile of Starting Sample Based on Retrospective Data Collection

As summarized in Table 5, the sample profiles for each community show that, given the relatively small samples, the two sample groups are reasonably similar, at least on the basic demographics available, health status data provided through the Paramedic Services, and 'pre' intervention EuroQol data.

	Hastings-Quinte			Renfrew			Total
	Interv.	Control	Total	Interv.	Control	Total	Wtd. Average
Total # in sample	60	60	120	40	40	80	200
Number of males	25	21	45 (38%)	14	15	29 (37%)	37.4%
Number of females	35	39	75 (62%)	26	23	49 (63%)	62.6%
Average age (all)	76.76	75.56	76.17	75.03	73.46	74.25	75.40
Age range (youngest to oldest)	37-96	46-97	37 to 97	44-98	26-93	26-98	26-98
54 or under	4 (6.7%)	1 (1.67%)	**5 (4.2%)**	2 (5%)	4 (10%)	**6 (7.5%)**	11 (5.5%)
55-64	7 (11.67%)	12 (20%)	**19 (15.8%)**	7 (17.5%)	5 (12.5%)	**12 (15%)**	31 (15.5%)
65-74	14 (23.33%)	9 (15%)	**23 (19.2%)**	7 (17.5%)	8 (20%)	**15 (18.75%)**	38 (19%)
75-84	10 (16.67%)	20 (33.3%)	**30 (25%)**	11 (27.5%)	12 (30%)	**23 (28.75%)**	53 (26.5%)
85+	24 (40%)	15 (25%)	**39 (32.5%)**	9 (22.5%)	8 (20%)	**17 (21.25%)**	56 (28%)
Unknown	1 (1.67%)	3 (5%)	**4 (3.33%)**	4 (10%)	3 (7.5%)	**7 (8.5%)**	11 (5.5%)
Average # of transports to ER*	2.3	3.2	2.7	3.1	2.8	3.0	2.8
Range of transports to hospital*	0 to 10	0 to 22	0 to 22	0 to 12	0 to 8	0 to 12	0 to 22
Average number of chronic conditions	1.33	1.53	1.43	0.88	0.65	0.76	1.12
Range of number of chronic conditions (1 to…)	1 to 4	1 to 5	1 to 5	0 to 4	0 to 4	0 to 4	0 to 5
'Pre'-EuroQol – Presence of Health Issues							
Mobility Issues			106 (88%)			65 (81%)	85%
Self-Care Issues			72 (60%)			45 (56%)	58%
Usual Activities Issues			90 (75%)			64 (80%)	77%
Pain/Discomfort Issues			89 (74%)			61 (76%)	75%
Anxiety/ Depression			71 (59%)			48 (60%)	59%

Table 5 – Description of Retrospective Data Collected from Health Service Providers. Source: Study documentation.

*Note that for Quinte, the sample was drawn based on eligibility condition data from July 2014-July 2015, rather than the subsequently selected 'year' of February 1 to January 31. As a result, the starting sample data is not necessarily aligned to the 'year' as defined for data analysis purposes, which is what is presented in this chart. For the County of Renfrew, the incomplete participation by hospitals means that 'Most Responsible Diagnosis' information, which might have provided additional evidence of the presence of chronic conditions, was not always available.

Breakout of Chronic Conditions: Table 6 shows the prevalence of one or more of the chronic conditions specified as an eligibility criterion for participation in the Study. Note that this information was not verified by primary care physicians prior to inclusion in the Study. However, 'Most Responsible Diagnosis' information provided by hospitals was incorporated into Chronic Condition analysis if there was a specific reference to one or more of the eligibility criteria. While the sample numbers in each sub-sample are generally small (n = 60 or n = 40), there appears to be general similarity between the two sample groups in Quinte with the possible exception of the presence of hypertension. In this case, almost all of the Control group seem to have hypertension (89%), roughly double the prevalence of that condition in the Intervention group. The latter group seems more likely to have COPD or CHF, two conditions cited as typically leading to higher levels of service utilization [28].

Chronic Condition	Quinte Intervention	Quinte Control	Renfrew Intervention	Renfrew Control
COPD	37	24	18	13
CHF	22	14	10	0
Diabetes	39	35	15	20
Hypertension	41	89	35	25
Stroke	28	35	10	7

Table 6 – Percentage of Sub-Samples with One or More Chronic Conditions

Note: for the County of Renfrew, not all hospitals in the County provided retrospective or field phase data. As a result, the percentages of Study clients with specific chronic conditions is incomplete and comparisons between the two sub-samples would be inappropriate.

3 Field Phase Activity

3.1 Delivery of Intervention Service (Community Paramedicine)

Taken together, the two Paramedic Services delivered an average of 183 Community Paramedicine visits per month to their respective communities.

- In Hastings-Quinte, the Community Paramedicine Intervention provided between 160 and 190 visits *per month* to the intervention group (60 clients). This service level exceeded the anticipated Study target of 60 visits per month.
- County of Renfrew Community Paramedics provided roughly 23 visits per month to the Intervention group. On a day-to-day basis, Hastings-Quinte was able to serve more clients per day (an average of 7 to 9 visits per day from dedicated CPs) than Renfrew because of the more highly-concentrated populations in the two urban areas (Belleville and Trenton). Renfrew's CPs were also part of the County's regular emergency response team so may from time to time, have been called away from Community Paramedicine to provide that response service. In addition, the sample in Renfrew was distributed across a larger geographic area with clusters of clients in multiple small communities and rural areas, which added to the challenge of efficient scheduling.

The following table (Table 7) summarizes the main features of the service delivery model used in each of the two Study areas: urban (Hastings-Quinte) and rural (County of Renfrew).

Feature of Delivery Model	Hastings-Quinte	County of Renfrew
Geographic Area	Urban/city	Mix of rural/remote and small town
Number of independent hospitals in Study area	1	5
Previous CP Experience of Assigned Staff	Newly-trained	Mix of experienced CPs and newly-trained
Degree of integration of Paramedic and Community Paramedic Services	Community Paramedicine was a stand-alone service (due to its role as a research project in an area without prior CP as an ongoing service)	Community Paramedicine operated as an integral part of regular Paramedic Service (due to CP service already being an established service in the community).
Degree of CP working relationships with hospitals and primary care	Newly-developing (due to CP's role as a research project in an area without prior CP as an ongoing service)	Well-developed (due to CP service already being an established service in the community)

Table 7 – Description of Two Different Service Delivery Models for Community Paramedicine

4 Study Results

4.1 Retrospective and Field Phase Service Utilization

4.1.1 Defining Units of Service

To understand the overall intensity of health care service utilization, to be able to compare patterns of service utilization between communities as well as between intervention and control groups, and ultimately, to be able estimate the cost of health care services for the target population, the Study collected both retrospective and field phase data on the actual "units" of service received by the four sample groups. For this portion of the Study, a "unit" of service was defined by each health service provider for their services, as follows:

Hospitals: (data provided by Quinte Health Care, Renfrew Victoria Hospital, St. Francis Memorial Hospital and Pembroke Regional Hospital):

- A visit to the Emergency Room, arriving by any means (ambulance transport, walk-in or other self-transport)
- An admission to the hospital, to in-patient care for one or more days of stay.
- A day's stay in in-patient care (utilization of an overnight bed).

Paramedic Services (data provided by the Hastings-Quinte and Renfrew Paramedic Services):

- A call to the Paramedic Service for possible transport purposes.
- A client transport by ambulance to an Emergency Room. A client transport could be from one hospital to another at which admission might take place. In this case, each transport would be considered as a separate "unit" of service.
- A community paramedicine visit. A visit is defined as the presence of the Community Paramedic at the client's home, regardless of duration. Note that in addition to a physical presence at the clients' home, Community Paramedics might also be in touch with other health care providers while away from the client's home. This collaborative work is considered part of the "visit".

Community Care Access Centres (data provided by the Champlain and South East CCACs):

- A visit by a nurse to the client's home
- An hour's service by a Personal Support Worker (PSW)
- A visit by a Physiotherapist
- A visit by an Occupational Therapist
- A visit by another health care professional working on behalf of the CCAC ("Other").

Note that it was not possible to determine the extent of primary care services (e.g. physician visits) for the sample groups in this Study.

For the purposes of units of service calculations, each health care service was considered equally – an hour's service from a PSW and a visit to an ER were each considered as a "unit" of service. In a subsequent stage of the analysis, the unit of each service was assigned a unit cost (direct costs only). The direct cost of a unit of service was calculated by each health care organization based on a shared definition. This facilitated a tabulation of the global direct health care costs for each group.

Defining a CP Visit: Note that a Community Paramedic "visit" was defined as a CP having visited a client at his/her home for any duration, PLUS the associated out-of-home monitoring or follow-up that leads to future visits or flows from a visit. The definition of a "visit" also included time that a CP spent in collaborative work with healthcare practitioners who were also serving a particular client, liaison with primary care providers to keep them up to date and offer information from the most recent visit, and advocacy on the client's behalf when it was clear that some additional service would be warranted. The definition of a visit recognized the time a Community Paramedic must spend completing and filing reports and uploading medical data to the client's Code4Armour file. In this sense, a "visit" was a combination of services delivered at and away from the client's home. Anecdotal information suggested that for a new CP client, the amount of time required for away-from-the-home services was roughly equal to the amount of time taken up by visits.

4.1.2 Sample Sizes for Each Type of Service

To adhere to the Study protocols regarding informed consent, only Study participants that were able to complete the entire twelve- month Field Phase are included in the analysis. The data for those participants that were known to be deceased, moved into Long Term Care, moved away from the community, or advised the Study team of their decision to withdraw were not considered in this analysis. All other participants were retained as part of the sample even if they could not be reached at the end of the Study. The exception to this rule was the inclusion of deceased persons' data in the calculation of EuroQol/QALY results; the post-EuroQol score would be zero for someone who is deceased. Excluding those who were deceased would have understated the change in self-reported quality of life and overstated the impact of Community Paramedicine on the Intervention Group. For service utilization and Activity-Based Cost calculations, means (averages) have been calculated on the smaller number (the number of participants completing the full 12-month field phase) rather than the starting sample numbers.

Sample sizes and the associated statistical calculations (confidence interval and Student t testing) also vary by the specific service being considered. For instance, not all sub-sample participants were CCAC clients so means (averages) have been calculated based on the number of clients in each sub-sample that were CCAC clients in a given year. When consolidating hospital data, the analysis is based only on those clients for whom the hospital had data or at least could find the Study participant in their database. As a result, tables in this report may show different "n" values, reflecting whether the results are for the *initial* sample --- the full sample going into the field phase (e.g. n=60 or 40; total =200), for the (smaller) *net* sample completing the full 12 months of study (n=46, 42, 15 or 20; total = 123), or for the (smaller) *effective* sample by which provider-specific calculations were calculated (n< net sample sizes).

The total numbers of participants for each of the four sub-samples (two Intervention and two Control) are shown in the tables that follow as n=x, where x is the *net* sample size for each group.

The small sample sizes have significant implications for the Research Team's ability to draw substantive conclusions about differences between Intervention and Control groups, particularly for County of Renfrew. Confidence intervals for normal-distribution small samples tend to be relatively large and become even larger if the sample is not normal (with associated large standard deviations). Readers are therefore cautioned to avoid assumptions about statistical significance unless the results include a statement to that effect.

4.2 Summary of Service Utilization

4.2.1 Total Units of Service Provided Over Four-Year Period

Table 8 provides a summary of the total number of units of all services provided to each of the sub-sample groups as well as to Hastings-Quinte sample, the Renfrew sample, and the total Study sample.

The table is instructive in that it demonstrates the escalation of the specific target population's health care service needs over the course of three retrospective years. This pattern is quite pronounced in both communities and suggests that significant chronic disease progression was taking place in the period leading up to the Study's Field Phase. Table 9, describing average units of service per participant over the same timeframe, shows the same pattern. Provincial research suggests that "40% of high users remain high users over a period of two years, and that of the initial high-use population, 20% die within the first year." [29]

Total Service Utilization, in "Units" (n= refers to net number of participants in final sample or sub-sample)	**2012-2013 (Retrospective)** (# of units)	**2013-2014 (Retrospective)** (# of units)	**2014-2015 (Retrospective)** (# of units)	**2015-2016 (Field Phase)** (# of units)
Hastings-Quinte Intervention (n=46)	1,834	4,344	7,975	8,911
Hastings-Quinte Control (n=42)	774	2,489	4,960	4,879
Hastings-Quinte Total (n=88)	2,608	6,833	12,935	13,790
Renfrew Intervention (n=15)	2,805	4,274	7,810	7,079
Renfrew Control (n=20)	2,774	4,643	6,638	6,050
Renfrew Total[II] (n=35)	5,579	8,916	14,447	13,129
STUDY TOTAL (Hastings-Quinte and Renfrew) (n=123)	8,187	15,749	27,382	26,919

Table 8 – Total Units of Service for each sub-sample group, for each of three retrospective years and the field phase year. Note that this analysis tracks service utilization for the 123 Study participants who remained in the Study for the full 12 months.

Average Service Utilization, in "Units" (n= refers to net number of participants in sample or sub-sample)	**2012-2013 (Retrospective)** (average # of units/pp)	**2013-2014 (Retrospective)** (average # of units/pp)	**2014-2015 (Retrospective)** (average # of units/pp)	**2015-2016 (Field Phase)** (average # of units/pp)
Hastings-Quinte Intervention (n=46)	40	94	173	194
Hastings-Quinte Control (n=42)	17	54	108	106
Hastings-Quinte Total (n=88)	29	76	144	153
Renfrew Intervention (n=15)	100	153	279	253
Renfrew Control (n=20)	96	160	229	209
Renfrew Total (n=35)	98	99	161	146
STUDY TOTAL (Hastings-Quinte and Renfrew) (n=123)	48	97	171	172

Table 9 – Average Units of Service Per Participant for each sub-sample group, for each of three retrospective years and the field phase year. Note that this analysis tracks service utilization for the 123 Study participants who remained in the Study for the full 12 months.

4.3 Service Utilization by Type of Health Care Service

Hastings-Quinte: Table10 provides a breakout of the types of services used by each Hastings-Quinte sub-sample group over each of the four years included in the Study. The figure makes it clear that 70 per cent of the units of service being delivered to this sub-sample group are being provided by Personal Support Worker care from the Community Care Access Centres.

Economic Value of Community Paramedicine Study	Hastings-Quinte				
	Number (#) of Units of Service	Number (#) of Units of Service	Number (#) of Units of Service	Number (#) of Units of Service FIELD	Total Units of Service (4 Years) (#)
Service Utilized (Activity)	2012-2013	2013-2014	2014-2015	2015-2016	2012-2016
Intervention Group					
Paramedic Service Call	53	150	118	119	440
Transport to ER by Ambulance	51	139	104	106	400
ER Visit	102	166	141	124	533
Admissions to Hospital*	10	46	20	28	104
Day Stay in Hospital	67	315	118	220	720
CCAC - PSW -Hour	1,347.25	3,061.50	6,400.75	6,130.75	16,940.25
CCAC - Nursing Visit	181	221	847	778	2027
CCAC- PT	3	145.25	105	32	285.25
CCAC - OT	18	81	93	39	231
CCAC - Other	2	19	28	20	69
Community Paramedicine Visits	N/A	N/A	N/A	1,314	1,314
Total Activities (Units of Service) -All Types	1,834	4,344	7,975	8,911	23,064
Average Units of Service Per Year (for Intervention Group)	40	94	173	194	501
Control Group					
Paramedic Service Call	47	119	150	119	435
Transport to ER by Ambulance	44	112	140	114	410
ER Visit	83	171	200	159	613
Admissions to Hospital*	5	21	28	15	69
Day Stay in Hospital	17	128	182	79	406
CCAC - PSW -Hour	370.00	1,346.25	3,764.50	4,077.00	9,557.75
CCAC - Nursing Visit	199	466	306	256	1227
CCAC- PT	0	49	85	27	161
CCAC - OT	9	63	82	29	183
CCAC - Other	0	14	22	4	40
Total Activities (Units of Service) -All Types	774	2,489	4,960	4,879	13,102
Average Units of Service Per Year (for Control Group)	17	54	108	106	285
Total Units of Service Provided for Total Sample (for Each Community)	2,608	6,833	12,934	13,790	36,165
Average Units of Service Per Year (for Each Community)	29	76	144	153	402

Table 10 - Summary of Service Utilization - Hastings-Quinte Intervention and Control Groups 2012-2-13 to 2015-2016 Source: data provided by all service providers based on a February 1-January 31 year

County of Renfrew: Table 11 provides a breakout of the types of services used by each County of Renfrew sub-sample group over each of the four years included in the Study. The figure makes it clear that 80 per cent of the units of service being delivered to this sub-sample group are being provided by Personal Support Worker care from the Community Care Access Centres. (Service provided by primary care physicians is not included in this analysis). The next most frequent service, as measured by 'units' of service, is CCAC nursing visits, including in the Field Phase year when Community Paramedics provided service to the Intervention Group only.

This figure shows that the Renfrew Intervention Group had at least 154 visits to one or more of five hospital Emergency Rooms over the four-year period. However, because hospital data is incomplete, the total number of transports to ER by ambulance (249) is a better predictor of the *minimum* number of ER visits. The Intervention group accounted for at least 20 hospital admissions and 162 days of in-patient stay in hospital. The Renfrew Control group had at least 299 visits to an ER within the County of Renfrew (using transports rather than hospital-reported ER visits), with at least 37 admissions, and 334 days in in-patient stay in hospital. The actual number of visits to the five hospitals for either group, by any means, is not known due to less than 100 per cent participation in the Study by County of Renfrew hospitals.

Economic Value of Community Paramedicine Study	Renfrew County				
Service Utilized (Activity)	Number (#) of Units of Service 2012-2013	Number (#) of Units of Service 2013-2014	Number (#) of Units of Service 2014-2015	Number (#) of Units of Service FIELD PHASE 2015-2016	Total Units of Service (4 Years) (#) 2012-2016
Intervention Group					
Paramedic Service Call	45	78	109	72	304
Transport to ER by Ambulance	39	64	90	56	249
ER Visit	7	11	13	23	54
Admissions to Hospital*	1	1	5	13	20
Day Stay in Hospital	2	4	39	117	162
CCAC - PSW -Hour	2,306.25	3,475.75	6,693.50	5,971.25	18,446.75
CCAC - Nursing Visit	330	513	621	699	2163
CCAC- PT	36	69	174	65	344
CCAC - OT	36	38	51	37	162
CCAC - Other	3	20	14	26	63
Community Paramedicine Visits	N/A	N/A	N/A	272	272
Total Activities (Units of Service) -All Types	2,805	4,274	7,810	7,079	22,240
Average Units of Service Per Year (for Intervention Group)	100	153	279	253	794
Control Group					
Paramedic Service Call	54	87	97	103	341
Transport to ER by Ambulance	46	74	83	96	299
ER Visit	49	79	73	51	203
Admissions to Hospital*	9	14	9	14	37
Day Stay in Hospital	85	137	78	119	334
CCAC - PSW -Hour	2,183.75	3,778.58	5,523.75	4,665.75	16,151.83
CCAC - Nursing Visit	287	360	651	871	2169
CCAC- PT	28	80	93	36	237
CCAC - OT	17	29	13	30	89
CCAC - Other	15	4	17	64	100
Total Activities (Units of Service) -All Types	2,774	4,643	6,638	6,050	19,961
Average Units of Service Per Year (for Control Group)	96	160	229	209	688
Total Units of Service Provided for Total Sample (for Each Community)	5,579	8,916	14,447	13,129	42,071
Average Units of Service Per Year (for Each Community)	98	99	161	146	467

Table 11 - Summary of Service Utilization – County of Renfrew Intervention and Control Groups 2012-2-13 to 2015-2016 Source: data provided by all service providers based on a February 1-January 31 year

4.3.1 Visits to Emergency Rooms, Paramedic Services Transports by Ambulance

Quinte: Over the four-year period included in the Study (2012-13 to 2015-2016), the total number of visits to the Emergency Rooms (ERs) for Quinte Health Care's urban sites (Belleville and Trenton) showed different patterns of utilization for the Quinte Intervention and Control groups, with both groups showing increases over the retrospective years and registering a decline in visits in the field phase year (2015-2016) as compared to the year immediately preceding (2014-2015). The total ER visits (arriving by any means including by

ambulance) declined by 12.1% for the Intervention group compared to a 20.5% reduction for the Control group.

By contrast, the total number of Paramedic Service transports in Quinte remained almost unchanged (up 1.9%) for the Intervention group in 2015-2016 (Field Phase) compared to the preceding year (2014-2015) but was down 24% from the 2013-2014 period. The Control group showed a different pattern, dropping 18.6% in the Field Phase compared to the 2014-2015 period but up 1.8% from 2013-2014. This result is counter-intuitive; ER visits might be expected to rise for a group that was not receiving an additional intervention (Community Paramedicine), specifically designed to help people remain in their homes.

Both groups saw dramatic increases in service utilization in the field phase compared to the 2012-2013 year: 207% increase for the Intervention group and 259% for the Control group suggestive of a general increase in service utilization for clients with progressive disease conditions.

The Hastings-Quinte samples demonstrated increased reliance on ambulance transport as the years unfolded. In 2012-2013, 50% of the Intervention group visits to the ER were *by ambulance* rising to 85% by 2015-2016 – even though *total visits* declined. The Control group used ambulance transport to get to the ER 53% of the time in 2012-2013 rising to 72% of the time by 2015-2016. This trend, exhibited in an urban area where the ER is relatively close to home, suggests that disease progression may be making it more difficult for chronic condition patients to get to the ER other than by ambulance. As a result, use of ambulance transport increases.

Measure	2012-2013	2013-2014	2014-2015	Field Phase: 2015-2016
Quinte Intervention – ER Visits (by any means) n=42	102	166	141	124
Quinte Control – ER Visits (by any means) n=39	83	171	200	159
Quinte Intervention – PS Transports to ER (n=46)	51	139	104	106
Quinte Control – PS Transports to ER (n=42)	44	112	140	114
Renfrew Intervention – PS Transports to ER (n=10)	39	64	90	56
Renfrew Control – PS Transports to ER (n=24)	46	74	83	96

Table 12 - Visits to Emergency Rooms, Paramedic Services Transports by Ambulance - Quinte area. Sources: Hastings Quinte Paramedic Services and County of Renfrew Paramedic Services (transports); Quinte Health Care, Renfrew Victoria Hospital, St. Francis Memorial Hospital, Pembroke Regional Hospital (total ER visits)

County of Renfrew: Due to lack of hospital data, the focus of ER visit investigation was derived from the analysis of Paramedic Service visits which shows a reduction in the total number of transports for the Intervention group in the Field Phase as compared to the 2014-2015 period (60.7%). Note however that the total effective sample size for this measure is 10 (out of the original 40 participants). In contrast the Control group shows an increase in PS transports (15.7%) for a somewhat larger sample size (24); this is consistent with what would be expected.

4.4 Paramedic Service Transports to Emergency Rooms

4.4.1 Changes in ER Visits, Paramedic Services Transports Over Time

Hastings-Quinte: Figure 1 portrays both total visits to a hospital Emergency Room (Belleville or Trenton sites only) as well as the total number of transports via the Hastings-Quinte Paramedic Service over the four

years considered in this Study. These data represent ER visits and transports for the 123 Study participants who remained in the Study for the entire twelve-month Field Phase:

- **Hospital ER Visits:** From 2012-2013 to 2013-2014, the number of ER visits (by any means of arrival) rose sharply for both Intervention and Control groups; this pattern would be expected of clients with progressive illnesses. ER visits by the Intervention Group declined in 2014-2015 and declined further in 2015-2016 (the Field Phase) (141 to 124). ER visits by the Control Group continued to climb in 2014-2015 before declining in 2015-2016 (200 to 159). The drop in ER visits for the Intervention Group might be expected due to the additional service rendered (Community Paramedicine) but the decline in Control Group visits is counter-intuitive since this group did not receive CP services.

- **Paramedic Service Transports:** Transports to a hospital ER rose sharply from 2012-2013 for both the Intervention and Control Groups. PS transports declined in 2014-2015 (139 to 104) then remained flat through the Field Phase (104 to 106). By contrast, PS transports for the Control Group rose in 2014-2015, then declined somewhat in 2015-2016 (140 to 114). This latter result is counter-intuitive since this group did not receive CP services.

- **Average Visits and Paramedic Services Transports Per Client:** As shown in Table 27 below, average visits to an ER per client rose for Intervention and Control groups from the 2012-2013 to 2014-2015 period, then fell for both groups in the Study's field phase (2015-2016). The decline in ER visits from 2014-2015 to the field phase (2015-2016) was steeper for the Control group (20.5% compared to 12.1% for the Intervention group).

  Average paramedic service transports per client rose significantly for Intervention and Control groups from the 2012-2013 to 2014-2015 period. During the field phase (2015-2016), the Intervention group average remained flat (up by 1.7%) while the Control group use of PS transports declined markedly (down by 23%).

Measure	2012-2013	2013-2014	2014-2015	2015-2016
Average ER Visits/Client				
Quinte Intervention	2.4	4.0	3.4	3.0
Quinte Control	2.1	4.4	5.1	4.1
Renfrew Intervention (minimum)	N/A	3.9	4.7	2.7
Renfrew Control (minimum)	N/A	5.6	5.2	3.6
Average PS Transports/Client				
Quinte Intervention	1.10	3.02	2.26	2.30
Quinte Control	1.04	2.67	3.33	2.71
Renfrew Intervention	2.60	4.27	6.00	3.73
Renfrew Control	2.30	3.70	4.15	4.80

Table 13 – Average ER Visits and Paramedic Service Transports Per Client: Hastings Quinte Paramedic Services and County of Renfrew Paramedic Services (transports); Quinte Health Care, Renfrew Victoria Hospital, St. Francis Memorial Hospital, Pembroke Regional Hospital (total ER visits)

Both the absolute and average per-client differences in total ER visits between the two groups (Intervention and Control) and the changes in utilization in the 2013-2014 to 2014-2015 period suggest that other factors may have influenced the Field Phase results. At this time, the hypothesis that provision of Community Paramedicine services would reduce both hospital ER visits and PS transports cannot be confirmed from the Quinte samples.

Despite what might appear to be changes in year-over-year trend lines or differences between intervention and control groups, the changes and differences between two means (e.g. Intervention and Control) do not test as significant at the 95% confidence level (for samples of greater than 30) or when using the Student t test for small samples (samples smaller than 30). All four sub-groups (two Intervention and two Control) demonstrated extremely large internal variances, resulting in correspondingly large standard errors (standard error being the main determinant of margin of error calculations, along with sample size). In effect, the samples are quite heterogeneous and do not display a normal distribution profile. Similarly, when using regression analysis to test possible correlations between factors (e.g. does having family or caregiver support correlate with fewer ER visits), the relationships were weak and cannot be used to prove or disprove any of the hypotheses.

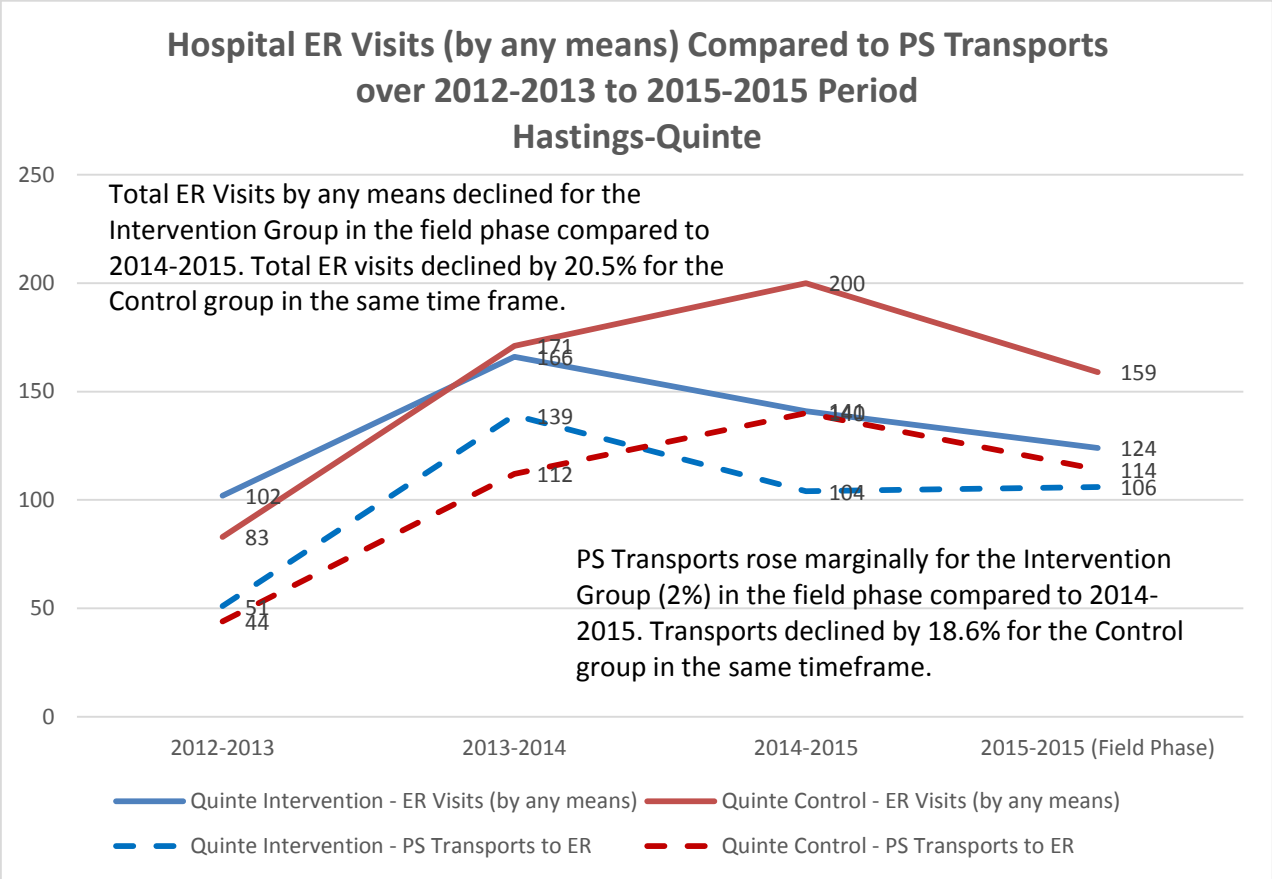

Figure 1 – Total Emergency Room visits and Paramedic Service Transports - Hastings-Quinte: 2012-2013 to 2015-2016 Period

County of Renfrew: Due to less than 100% participation in this Study by Renfrew hospitals, this portion of the analysis is based on Paramedic Service Transports only (which are comprehensive for all Study participants and all hospitals in the County).

- **Paramedic Service Transports:** Transports to a hospital ER rose sharply from 2012-2013 through to 2014-2015 then declined for the Intervention Group in 2015-2016 (from 90 to 56 transports). Transports for the Control Group showed the same upward trend in earlier retrospective years, then continued the upward trajectory in 2015-2016 (from 83 to 96 transports). These results are what would be expected for

one group receiving the Community Paramedicine intervention (Intervention Group) and the other receiving standard service (Control Group).

Average Paramedic Services Transports Per Client: As shown in Table 27, average paramedic service transports per client rose significantly for Intervention and Control groups from the 2012-2013 to 2014-2015 period. During the field phase (2015-2016), the Intervention group average declined by 39% while the Control group use of PS transports rose by 16%. These results supported the hypothesis that the Community Paramedicine intervention would reduce PS transports to the ER. However, incomplete hospital data means that no conclusion can be drawn with respect to Community Paramedicine's impact on total or average per-client visits to the hospital ER.

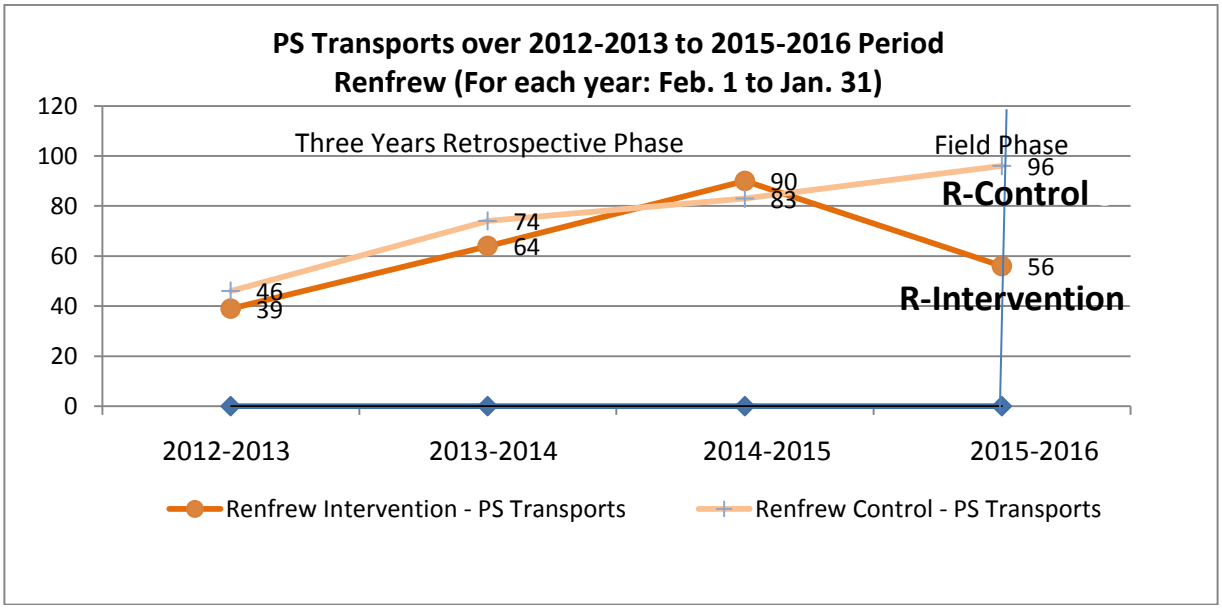

Figure 2- - Total Paramedic Service (PS) Transports to Renfrew Hospital Sites 2012-2013 to 2015-2016 Period (Four Years)

Provision of CCAC Services: It is not clear what role, if any, support from a CCAC or access to a primary care physician may have had on these results. For all four sub-samples, CCAC data shows a relatively modest proportion of the participant groups (23 to 58%) being CCAC clients three years before the Study began (2012-2013) then rising rapidly in in 2013-2014 --- nearly doubling in three of the four groups. In 2013-2014, between 72 and 81 per cent of the four sub-samples were CCAC clients. The proportions of each sub-sample that were CCAC clients continued to grow in 2014-2015 with Hastings-Quinte groups continuing to rise and the County of Renfrew groups showing a more significant rise for the Intervention group than the Control group. In the Field Phase (2015-2016), the proportion of the sub-samples that were CCAC clients fell in three of four sub-samples – in all three cases by at least 10 per cent. Only the County of Renfrew Control Group showed a slight increase in the proportion of CCAC clients (75 to 77 per cent).

Overall, the increasing proportion of CCAC support services is suggestive of progressive disease, particularly through the retrospective years. The reduction in the proportion of clients that received CCAC services in the Field Phase is counter-intuitive.

Sub-Sample	2012-2013 (%)	2013-2014 (%)	2014-2015 (%)	2015-2016 (%) Field Phase
Hastings-Quinte Intervention Group • CCAC Client this year?	36	72	87	74
Hastings-Quinte Control Group • CCAC Client this year?	23	73	80	70
County of Renfrew Intervention Group • CCAC Client this year?	58	81	100	86
County of Renfrew Control Group • CCAC Client this year?	46	74	75	77

Table 14 – Proportions of Sub-Samples Groups That Were CCAC Clients in Each of Four Years (Three Retrospective and Field Phase)

4.5 Community Paramedicine Visits

4.5.1 Monthly Visits to Intervention Groups

The following table summarizes the monthly Community Paramedic visits to the Intervention Group for each Paramedic Service.:

- In Hastings-Quinte, the Community Paramedics provided an average of 160 visits *per month* to the entire Intervention group (60 clients). This service level exceeded the anticipated Study target of 60 visits per month. In total, the HQPS provides 1,920 visits to the initial sample of 60 Intervention Group clients. For the 46 clients who remained in the Study through the entire Field Phase period, the Community Paramedics provided 1,314 visits.
- The County of Renfrew's Community Paramedics provided roughly an average of 23 visits *per month* to the Intervention Group. Of the total 279 visits, 272 were associated with the 15 of 40 Intervention Group clients who stayed in the Study to the end of the field phase. As noted earlier, the Renfrew Intervention Group suffered significant early losses with no opportunity to replace them due to the limited number of eligible candidates in a rural area. As a result, there were 26 Intervention Group participants in the initial stages of the Study.

Visits by Month	Hastings-Quinte Intervention Group = 60 of original 60	County of Renfrew Intervention Group = 26 of original 40; no replacements
January 2015	Recruitment still under way	Recruitment still under way
February 2015	141	5
March 2015	166	6
April 2015	165	23
May 2015	177	37
June 2015	190	27
July 2015	176	28
August 2015	183	24
September 2015	188	25
October 2015	162	27
November 2015	178	28
December 2015	113	25

January 2016	81	24
Total – Intervention Group	1,920	279
Average/Month – Intervention	160	23.3

Table 15 – Description of Retrospective Data Collected from Health Service Providers. Source: Study documentation.

Note: This chart shows the total number of Community Paramedicine visits per month for the entire sample – including those for clients who may not have completed the entire 12-month field phase of the Study; this is the data that was used for calculating 'cost per visit' (a unit of CP service) for these CP programs. However, only those clients completing the full 12 months of the study were considered for analysis of service utilization and economic value calculations.

5 Quality of Life Impact from Community Paramedicine

5.1 Use of EuroQol Questionnaire for Self-Reported Quality of Life

The EQ-5D-3L (EuroQol five dimensions, three levels) is a (client) self-reported outcome measure that captures five dimensions of health-related quality of life: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. It was chosen to serve as a standardized health measure for this Study because as a generic measure, it is applicable to a wide range of health conditions likely to be encountered in this study. As a population and program research tool, it also has the capacity for monitoring of results and changes over the course of a trial. It is designed for completion by the patient, is easy to use and can be performed independently or with the help of a research assistant either face to face or by telephone.

The EQ-5D-3L is commonly used around the world, and increasingly so in Canada in clinical, population health, health economics and research applications. Much research has been completed on the EQ-5D-3L which supports its face value, internal and test-retest validity, and reliability in clients with multiple medical conditions [30].

The EuroQol algorithm uses an incremental cost-effectiveness ratio (ICER), an equation commonly used in health economics (typically in cost-effectiveness analysis) to make decisions regarding health interventions. [31] ICER is the ratio of the change in costs to incremental benefits of a therapeutic intervention or treatment. The generic formula for calculating ICER is:

ICER = (C1 – C2)/(E1-E2)

where C1 and E1 are the cost and effect in the intervention or treatment group, and
C2 and E2 are the costs and effect in the control care group.

Costs are usually described in monetary units while benefits/effects on health status are measured in quality-adjusted life years (QALYS) gained or lost. By definition, costs are specific to the intervention/services rendered as they vary from one jurisdiction to another. As a result, they are specific to each study and its interventions. For this Study, the costs utilized were those developed for the Activity-Based Costing component of the Study.

QALY is a measure of disease burden, incorporating both the quality and quantity of the life lived. It is used to assess the value-for-money of a medical intervention. QALY is based on the number of years of life that would be added by the intervention. Each year in perfect health is assigned a value of 1.0 down to value of 0.0 for being dead. If the extra years of life from an intervention would not be lived in full health, then the extra life-years are given a value between 0 and 1. One QALY = 1 Year of Life x 1 year of perfect health. QALYs can be used in conjunction with health care costs to arrive at a common denominator of cost per QALY.

The EQ-5D-3L incorporates two ways of weighting a particular health state:

1. According to five dimensions of health state (mobility, self-care, usual activities, pain/discomfort, and anxiety depression. The client's choice on each dimension is translated into a numeric scale and summed to provide a total. This total can then be used proportionately to determine a quality of life "weight". Study

participants were asked to rate their state on each of the five dimensions at the time of their enrolment into the Study ('pre'-intervention) and at the end of the Field Phase ('post'-intervention).

2. Using a Visual Analogue Scale (VAS) for which participants were asked at the beginning and end of the Study to rate their state of health on a "temperature" scale of 0 to 100 with 0 representing being dead and 100 representing perfect health. This method has the advantage of being the easiest to remember – and may be easiest to use with a client group with significant loss of acuity – but it may also be the most subjective.

The 'Pre' EuroQol questionnaire was administered to all 200 clients and the data so gathered was incorporated into the Study database. In the spreadsheet, clients are identified only by a Study ID number and their OHIP number (to ensure that clients can be accurately identified for retrospective data gathering). The hard copy EuroQol questionnaires were stored with the original signed Informed Consent documents at each of the Paramedic Services. The 'Post' EuroQol was administered in late January/early February 2016 for as many of the participants who remained in the Study through the entire twelve-month field phase; their questionnaires were scored, and used to compare the intervention and control groups. In addition, the 'post' results for those participants that were deceased in the Study period were scored as zeros, to ensure that as much relevant data on participants' quality of life was included in the analysis.

5.2 EuroQol Results Comparing Intervention and Control Groups

Typically, the expectation for a medical intervention would be for improved quality of life and positive QALY scores. For this Study's target group however, positive scores are less likely. While there could be individuals who demonstrate significant improvement in quality of life, overall scores that signaled a slowing down of disease progression might be considered an appropriate expectation of the Community Paramedicine intervention. In particular, the analysis would expect to see a smaller degree of declining quality of life in Intervention groups than in Control groups.

Given the length of time that participants were in the Study (12 months/one year), one QALY (or fraction thereof) was calculated for each participant, and the change over time was also calculated at both a record level and for the Intervention and Control groups as a whole. The summary results are shown in Table 16 below. Study results do show clinically significant differences [32] between Intervention and Control groups in both communities, with both Intervention groups showing milder degrees of declining quality of life than their corresponding Control groups.

Community	Group	Change in EuroQols				Number of Responses
		ValSet	Average	Total %		
Hastings-Quinte	Intervention	-0.9480	-0.020	-3.87		47
Hastings-Quinte	Control	-4.7380	-0.095	-15.67		50
County of Renfrew	Intervention	-1.6954	-0.075	-13.31		22
County of Renfrew	Control	-4.1480	-0.160	-29.28		26

Table 16 – Quality Adjusted Life Year (QALY) Scores by Sub-Sample

The calculations suggest that the Hastings-Quinte Intervention group achieved a 0.075 QALY result compared to the Control group. The County of Renfrew Intervention group achieved a 0.085 QALY result in the Field Phase compared to the Control group. This is the equivalent to 27-31 more days of higher quality life for the average Intervention Group participant compared to the Control Group.

5.3 EuroQol Results Comparing Intervention and Control Groups

Given a one-year intervention, the cost to achieve a QALY (Quality Adjusted Life Year) is roughly $74,787 in the Hastings-Quinte area and $84,971 in the County of Renfrew area. The formula used to derive these estimates is:

Average Cost per QALY = (Aggregate annual cost of service intervention) / (number of clients) x (change in EQ x 1 year)

The average annual cost of service intervention was based on the actual cost per unit of Community Paramedicine service as derived in the Activity-Based Cost model (described in chapter 6), multiplied by the total number of units (visits) of service provided in the specified period (one year). For the Hastings-Quinte Intervention Group, the aggregate annual cost of service intervention was $263,627. In the County of Renfrew, the corresponding cost was $158,896. Please see the Global Health Care Costs section of this report for additional detail on derivation of these costs.

	Hastings-Quinte	County of Renfrew
Cost per Unit of Community Paramedicine Service	$200.63	$584.18
X Total number of CP 'visits' to Intervention Group in one year*	1,314	272
= Aggregate annual cost of CP intervention	$263,627	$158,896
/ Number of Clients Served in one year (intervention group)	47*	22*
/ Change in EuroQol in one year	0.075	0.085
= Average Cost Per Quality Adjusted Life Year QALY	$74,787	$84,971

Table 17 – Average Cost Per Quality Adjusted Life Year (QALY) for each of Hastings-Quinte and County of Renfrew

*Number of clients served in one year refers to the total number of clients who remained in the Study for 12 months plus those who were deceased within the Study period but for whom there was a pre-field phase EuroQol. The EuroQol index score for the latter individuals was considered to be zero. As a result, the change in the index scores could be calculated and included in the average cost per QALY calculation. Omitting these individuals would have had the effect of overstating the impact of the intervention on quality of life (for this group, slowing down disease progression).

Calculation result:

Quinte Intervention vs. Control showed a 0.083 better EQ result in the Intervention vs. Control group

Quinte Cost per QALY is then = ($ 263,627 / 47) / 0.075 = $74,787

Renfrew Intervention vs. Control showed a 0.075 better EQ result in the Intervention vs. Control group

Renfrew Cost per QALY is then = ($ 158,896 / 22) / 0.085 = $84,971

Comment on Results: These numbers are sub-optimal in terms of cost effectiveness. That being said, one would expect that the cost of achieving a full QALY for this aggregate group of clients who suffer from multiple chronic conditions to be very high, regardless of the intervention.

On the basis of the EQ analysis, the intervention (CP service) *for this population group* does not appear cost effective enough to be attractive. While a positive EQ outcome was shown and is clinically significant, it comes at high cost based on total health care costs.

An attractive cost per QALY would lie in the $25,000 range [34]. This is lower than the cost-effectiveness threshold per QALY gained as tabulated in the U.S., which has been suggested to be under $50,000 U.S [35]. Given the simple formula above, it would be possible to speculate on strategies might be deployed to see if doing so would make Community Paramedicine more attractive from a cost-effectiveness perspective.

Two examples of factors that could influence the denominator of the formula are: learning curve for introduction of a new program and the potential to see more people for the same overall cost. Hastings-Quinte and Renfrew had approximately the same effect on reducing the EQ drop over the course of the study. Note that Community Paramedics in Hastings-Quinte were completely new, and although Community Paramedicine in County of Renfrew has a longer history than Hastings-Quinte, the service delivery model in Renfrew for this Study was to rotate Community Paramedics through service to the Study group. As a result, some of those CPs seeing clients would have been relatively new to the field. It is therefore possible that over time, the number of clients followed over the course of a month might increase. The opportunity to test this hypothesis was not possible in this Study given the relatively small sample sizes, which were constrained by the total number of eligible participants in both communities.

Client Satisfaction Survey

At the conclusion of the Field Phase (February 2016), the two Paramedic Services administered a 16-question, per-based client satisfaction questionnaire to as many Intervention Group clients as could be contacted in a post-Intervention in-home setting. Of the original 60 Intervention Group sample in Hastings-Quinte, 46 remained in the Study for the entire 12 month period, constituting a retention rate of 76.7%. Of the 46, the Hastings-Quinte Paramedic Service was able to contact secure completed questionnaires from 45 clients and caregivers. Of the original 40 Intervention Group sample in the County of Renfrew, 15 remained in the Study for the full 12 months for a retention rate of 38%. The Renfrew Paramedic Service was able to secure completed questionnaires for 18 clients and caregivers. Different versions of the questionnaire were developed for the client/Study participant to complete directly and for a caregiver to use if the Study participant was unable to complete the questionnaire him/herself.

The detailed results for this questionnaire are provided in Appendix J to this report. However, the following chart provides highlights for eight key questions included in the questionnaire, and demonstrate that the Community Paramedicine intervention was very well-received by Intervention group participants in both communities. A letter received from a CP client in Hastings-Quinte is included (with permission) in this report as Appendix K.

Question Type – Posed to Intervention Group clients only	Renfrew (%) n=18	Hastings-Quinte (%) (n=45)
CP understood healthcare needs 'extremely well'	77.8	88.9
CP advice and information 'extremely' or 'very' useful useful in maintaining/improving health & well-being	72.2	80.0
CP services helped manage health & well-being 'a lot'	61.0	84.0
Indications that CP worked with other healthcare professionals to address your healthcare needs (Yes)	61.0	71.1
CPs helped manage a health issue at home (otherwise called 911) 'once or twice' or 'quite often'	5.6 11.0	24.4 26.7
Very Satisfied with ability to contact CP promptly	66.7	95.6
Very Satisfied not a burden on family, friends etc	38.5	78.5
Very Satisfied with services & care provided by CPs	77.8	95.6

Table 18 –Customer Satisfaction Survey Results

6 Global Health Care Costs

6.1 Estimated Costs of Health Care Services for Target Population

The approach taken to estimating the impact of Community Paramedicine as an intervention for the particular target population (high frequency users of Paramedic Service transports plus the presence of one or more of five designated chronic conditions) is to compare the total extent of specific health care services provided to the sample groups and the associated costs, then to compare the Intervention and Control groups in each of the two communities (Hastings-Quinte and County of Renfrew). The global costs for providing health care to the sample can be viewed retrospectively in the absolute (total dollar value) because the sample sizes for each sub-sample are identical. If in the Field Phase, the sub-sample sizes had remained identical in number (e.g. the same number of participants in each of the Intervention and Control groups), comparison of absolute costs would have been appropriate in the Field Phase as well. However, if the sub-sample sizes are quite different between communities and between the sub-samples in each of the two communities, it is important to compare *average costs per participant* in each of the sub-samples rather than absolute costs. Regardless, the only way to obtain an average cost is to calculate the total cost then divide it by the number of Study participants in that sub-sample.

As is described in detail on the following pages, the total cost of health care services received by each of the Study samples has been derived by in four stages:

- Obtaining and consolidating Retrospective and Field Phase record-level data for all study participants, then identifying those participants who remained in the Study throughout the full twelve-month Field Phase.
- Obtaining and validating with health service providers (Paramedic Services, hospitals, Community Care Access Centres) the *direct* cost of a 'unit' of service
- Totalling the units of each service for each participant in each of the sub-samples
- Multiplying the total units of each service by the direct cost of a 'unit' of service as validated by the health care organization.
- Adding up all the costs of each type of service by sub-sample.

It is also possible to total the costs of health care services for each community and for the Study as a whole.

6.2 Calculating Direct Costs for a Unit of Service

All healthcare providers providing financial data (direct cost of a unit of service) were asked to exclude general and administrative costs as well as overhead – those costs that would not change if one more unit or one less unit of service was provided. In other words, the focus was on variable not fixed costs. The rationale for this choice was based on the notion that if Community Paramedicine were able to reduce utilization of other services, any net savings would be found in variable or incremental costs rather than fixed costs. Because the specific budget lines differ from service to service, healthcare providers were asked to follow the principle of assessing direct costs rather than trying to allocate fixed costs to an ever-changing number of units of service or calculate direct costs based on one common budget template. The following text describes how each healthcare service provider calculated their direct costs for a unit of service.

Hospitals:

- Quinte Healthcare Corporation provided direct costs (excluding administration and overhead) of a day's stay in hospital for 13 Health-Based Inpatient Grouping (HIG) codes and descriptions for both 2013-2014 and 2014-2015. The HIG codes included COPD, chronic bronchitis, heart failure without angiogram, diabetes, hypertensive disease, hypertension and stroke. QHC also provided direct costs for an ER visit for 15 CACS including CHF, disease or disorders of the respiratory system, cardiovascular condition with acute admission/transfer, respiratory conditions with acute admission/transfer, diabetes/glucose intolerance and stroke. In both cases (day's stay and ER visit) the cost per unit of service was derived by taking the total number of days stay or visits and dividing by the total direct cost. For QHC, "direct cost" includes nursing, allied health and diagnostics but excludes administrative and decision support, building, maintenance, and cleaning costs. A weighted average direct cost was calculated based on the specific chronic conditions closest to those identified as eligibility criteria for the Study.
- Renfrew Victoria Hospital provided their direct cost of a day's stay in hospital and an ER visit based on the same methodology used by QHC with the exception that it was not possible to get a breakout of costs by condition for use in generating a weighted average. Nonetheless, the direct costs provided were actuals for a rural hospital in the Study area. The estimates provided by RVH were used as the estimate for all three participating Renfrew hospitals based on the assumption that the other (rural) hospitals would have similar cost structures.

Paramedic Services:

- Hastings-Quinte Paramedic Service and the County of Renfrew Paramedic Service developed their direct cost of a paramedic service transport to the ER by referring to their annual budgets and isolating the variable costs associated with direct service to clients. These budget lines included salaries and benefits, mileage and travel, telephone/communications, computer software, medical supplies and medications, linen/laundry, staff training and development, legal services, advertising and promotion, building maintenance, small equipment and supplies. The total costs were divided by the total number of transports to get a direct cost per transport.

Community Paramedicine:

- Because the direct cost of Community Paramedicine was incurred through a research project, the two Paramedic Services calculated the unit cost 'from the ground up', based on the number of full-time equivalent CPs working with Study clients, the annual salary and benefits associated with those CPs, the cost of backfilling positions for relief, vacations etc., an allocation for vehicles used by the CPs (mileage and depreciation), and a percentage allocation for administration for the CP program specifically as well as for management of the CPs. No fixed costs were included in this calculation. For this Study, the administration and management were in-kind contributions. However, in a regular operating program, these costs would exist and have to be paid.

Community Care Access Centres:

- Both the Southeast CCAC and the Champlain CCAC provided direct cost data for a 'unit' of service for nursing, personal support workers, occupational and physiotherapy services delivered to clients at

home. For all but PSWs, the unit of service used by CCACs is a visit. PSW costs are calculated on a per-hour basis. Since CCACs purchase these services from external/third party organizations, the direct cost is relatively easy to identify and is separate from the administrative and overhead costs of operating the CCAC itself. The CCAC did not include CCAC case coordination services or other elements of administration or overhead, although the third party billing rate would obviously include that organization's overhead and administration.

6.3 Activity-Based Costing Model

6.3.1 Overview of Model

6.3.2 Total Direct Costs for Provision of All Services

Hastings-Quinte: Based on the methodology described in section 7.1, the total DIRECT cost of all services provided to the Quinte sample over the four-year period (2012-2013 to 2015-2016) was $2.57 million for the Intervention group and $1.44 million for the Control group, for a total sample cost of $4.01 million (including the cost of Community Paramedicine). Without Community Paramedicine, the cost was $3.74 million. The total cost of services was higher for the Intervention group than for the Control group, a phenomenon that carried through all four years of the Study, with or without the additional intervention of Community Paramedicine.

The average cost of services per Study participant for all four Study years (three retrospective and one Field Phase) was $50,064 for the Intervention group and $32,716 for the Control group. Again, the Intervention group average cost was higher than the Control group.

In the 2014-2015 retrospective year, the average per client cost for services utilized by the Intervention group was $14,599 as compared to $14, 082 for the Control group. In the following year (Field Phase: 2015-2016), the average per client cost for services utilized by the Intervention group rose to $16,238 (an 11% increase) even without inclusion of the costs of Community Paramedicine. For this group, the reduction in costs associated with ER visits and CCAC services was overridden by increased utilization of increased days of in-patient hospital. By contrast, the average cost for the Control group dropped to $10,946 – a drop of 23%; this was due to fewer units of service being required for all services except Personal Support Worker hours. These data suggest that the health status of the Intervention group may have been different than the Control group.

County of Renfrew: The total DIRECT cost of all services provided to the Renfrew sample over the four-year period (2012-2013 to 2015-2016) was $1.83 million for the Intervention group and $1.68 million for the Control group, for a total sample cost of $3.50 million (including the cost of Community Paramedicine). Without Community Paramedicine, the cost was $3.36 million. The total cost of services was lower for the Intervention group than for the Control group in 2012-2013 and 2013-2014. Total costs for the Intervention group exceeded the Control group for 2014-2015 and 2015-2016, with or without the additional intervention of Community Paramedicine.

In the 2014-2015 retrospective year, the average per client cost for services utilized by the Intervention group was $21,034 as compared to $18,372 for the Control group. In the following year (Field Phase: 2015-2016), the average per client cost for services utilized by the Intervention group fell slightly to $20,911 (a 0.002%

drop) without inclusion of the costs of Community Paramedicine. For this group, the reduction in costs associated with fewer transports to the ER, CCAC services (other than nursing visits) was counterbalanced by increased days of in-patient hospital care. The average per client cost for the Control group fell to $18,214 – a 0.002% drop. This was due to more transports to the ER and higher levels of most CCAC services (particularly nursing) being counterbalanced by increased days in hospital. Note that hospital service utilization is almost certainly under-represented in the cost calculations due to the incomplete participation of County of Renfrew hospitals. As a result, no conclusions should be drawn from this data, particularly in a comparative sense (Intervention vs. Control).

Activity-Based Cost Measure	Quinte Intervention (n=46)	Quinte Control (n=42)	Renfrew Intervention (n=28)	Renfrew Control (n=29)
Total Cost of all Health Care Services (4 yrs.)	$2.57 million	$1.44 million	$1.83 million	$1.68 million
Average/Study Participant over 4 years (not including Community Paramedicine)	$50,064	$32,716	$42,706	$58,920
Average – 2014-2015	$14,599	$16,238	$21,034	$18,372
Average – 2015-2016 (not including Community Paramedicine)	$13,516	$10,946	$20,911	$18,214
Average – 2015-2016 (including Community Paramedicine)	$21,969	Not applicable	$26,585	Not applicable

Table 19 – Total and Average Direct Costs of Service Utilization

	Hastings-Quinte				
	Dollar Value ($)	Dollar Value ($)	Dollar Value ($)	Dollar Value ($)	Total
Service Utilized (Activity)	2012-2013	2013-2014	2014-2015	2015-2016	2012-2016
Intervention Group					
Transport to ER by Ambulance	$ 24,241	$ 67,389	$ 51,429	$ 53,466	$ 201,759
ER Visit	$ 20,686	$ 34,339	$ 29,751	$ 26,687	$ 114,712
Day Stay in Hospital	$ 62,249	$ 298,515	$ 114,061	$ 216,910	$ 709,886
CCAC - PSW -Hour	$ 85,466	$ 198,097	$ 422,450	$ 412,722	$ 1,140,418
CCAC - Nursing Visit	$ 5,741	$ 7,150	$ 27,951	$ 26,187	$ 68,229
CCAC- PT	$ 277	$ 13,671	$ 10,080	$ 3,133	$ 27,932
CCAC - OT	$ 2,266	$ 10,403	$ 12,183	$ 5,211	$ 30,866
CCAC - Other	$ 249	$ 2,414	$ 3,629	$ 2,644	$ 9,122
Total Activities (Units of Service) -All Types	$ 201,175	$ 631,978	$ 671,533	$ 746,961	$ 2,302,923
Community Paramedicine Visits				$ 263,627	$ 2,566,550
Sample Size based on PS Data	N=46				
Average Per Participant (without Community Paramedicine)	$ 4,373	$ 13,739	$ 14,599	$ 16,238	$ 50,064
With Community Paramedince				$ 21,969	
Control Group	2012-2013	2013-2014	2014-2015	2015-2016	2012-2016
Transport to ER by Ambulance	$ 20,913.41	$ 54,298.83	$ 69,231.01	$ 57,501.30	$ 201,945
ER Visit	$ 16,832.95	$ 35,373.53	$ 42,200.00	$ 34,219.98	$ 128,626
Day Stay in Hospital	$ 15,794.44	$ 121,301.33	$ 175,924.84	$ 77,890.24	$ 390,911
CCAC - PSW -Hour	$ 23,471.74	$ 87,110.29	$ 248,457.00	$ 274,463.64	$ 633,503
CCAC - Nursing Visit	$ 6,312.00	$ 15,076.47	$ 10,098.00	$ 8,616.96	$ 40,103
CCAC- PT	$ -	$ 4,611.76	$ 8,160.00	$ 2,643.84	$ 15,416
CCAC - OT	$ 1,133.22	$ 8,091.18	$ 10,742.00	$ 3,874.98	$ 23,841
CCAC - Other	$ -	$ 1,778.89	$ 2,851.30	$ 528.79	$ 5,159
Total Activities	$ 84,458.60	$ 327,642.28	$ 567,664.15	$ 459,739.72	$ 1,439,505
Sample Size based on PS Data	N=42				
Average Per Participant	$ 2,011	$ 7,801	$ 13,516	$ 10,946	$ 34,274
Total Sample (Both Intervention and Control)	$ 285,633	$ 959,620	$ 1,239,197	$ 1,206,701	$ 3,742,428
Total Sample in Community	90		Percentage of Total Starting Sample:		75
Average Per Participant - All Services, All Participants	$ 3,246	$ 10,905	$ 14,082	$ 13,713	$ 42,528
Additional Global Cost or Savings Per Participant for CP Service (Positive Number = Cost; Negative Number Implies Saving)				**$ 2,526**	

Table 20 - Total Direct Costs of Services to Study Participants 2012-2013 to 2015-2016 for Hastings-Quinte. Data presented by type of service based on units of service and associated direct costs as calculated by each agency/institution. Average costs per client are also presented.

	Renfrew County				
	Dollar V Dollar Value ($)	Dollar Value ($)	Dollar Value ($)	Dollar Value ($)	Total
Service Utilized (Activity)	**2012-2013**	**2013-2014**	**2014-2015**	**2015-2016**	**2012-2016**
Intervention Group					
Transport to ER by Ambulance	$ 19,511	$ 32,658	$ 46,844	$ 29,730	$ 128,743
ER Visit	$ 1,173	$ 1,963	$ 2,366	$ 4,270	$ 8,598
Day Stay in Hospital	$ 1,886	$ 3,157	$ 31,395	$ 96,069	$ 130,621
CCAC - PSW -Hour	$ 151,235	$ 232,485	$ 456,667	$ 415,539	$ 1,255,927
CCAC - Nursing Visit	$ 9,820	$ 15,571	$ 19,227	$ 22,074	$ 66,693
CCAC- PT	$ 4,600	$ 8,992	$ 23,130	$ 8,813	$ 45,536
CCAC - OT	$ 5,099	$ 5,490	$ 7,516	$ 5,561	$ 23,666
CCAC - Other	$ 374	$ 2,541	$ 1,814	$ 3,437	$ 8,167
Total Activities (Units of Service) -All Types	193,697	$ 302,858	$ 588,959	$ 585,494	$ 1,667,950
Community Paramedicine Visits				$ 158,896	$ 1,826,846
Sample Size based on PS Data	N=28				
Average Per Participant (without Community Paramedicine)	$ 6,918	$ 10,816	$ 21,034	$ 20,911	$ 59,570
With Community Paramedince				$ 26,585	
Control Group	**2012-2013**	**2013-2014**	**2014-2015**	**2015-2016**	**2012-2016**
Transport to ER by Ambulance	$ 23,013	$ 37,761	$ 43,201	$ 50,966	$ 154,941
ER Visit	$ 8,591	$ 14,096	$ 13,286	$ 9,468	$ 36,850
Day Stay in Hospital	$ 65,893	$ 108,123	$ 62,790	$ 97,711	$ 268,623
CCAC - PSW -Hour	$ 143,202	$ 252,741	$ 376,861	$ 324,690	$ 1,097,493
CCAC - Nursing Visit	$ 8,541	$ 10,927	$ 20,155	$ 27,506	$ 67,130
CCAC- PT	$ 3,578	$ 10,426	$ 12,363	$ 4,881	$ 31,247
CCAC - OT	$ 2,408	$ 4,190	$ 1,916	$ 4,509	$ 13,023
CCAC - Other	$ 1,869	$ 508	$ 2,203	$ 8,461	$ 13,041
Total Activities	$ 257,094	$ 438,772	$ 532,774	$ 528,192	$ 1,682,347
Sample Size based on PS Data	N=29				
Average Per Participant	$ 8,865	$ 15,130	$ 18,372	$ 18,214	$ 58,012
Total Sample (Both Intervention and Control)	$ 450,791	$ 741,629	$ 1,121,733	$ 1,113,686	$ 3,350,297
Total Sample in Community	57		Percentage of Total Staring Sample		71
Average Per Participant - All Services, All Participants	$ 5,009	$ 8,240	$ 12,464	$ 12,374	$ 37,226
Additional Global Cost or Savings Per Participant for CP Service (Positive Number = Cost; Negative Number Implies Saving)				**$ 8,536**	

Table 21 - Total Direct Costs of Services to Study Participants 2012-2013 to 2015-2016 for the County of Renfrew. Data presented by type of service based on units of service and associated direct costs as calculated by each agency/institution. Average costs per client are also presented

County of Renfrew – Economic Benefit of Community Paramedicine on Paramedic Service Transport Costs: Total direct costs associated with Paramedic Service transports to a hospital ER fell for the Intervention Group but continued to climb for the Control Group suggesting that the Community Paramedicine intervention delivered economic value to the County's Paramedic Service. On a per-client basis, the average annual direct cost of transports for the Intervention Group declined from $3,122 in 2014-2015 to $1,982 in 2015-2016. For the Control Group, the average annual direct cost of transports rose from $2,160 per client in 2014-2015 to $2,548 in 2015-2016. If the Community Paramedicine intervention avoided a progressive increase in PS transport utilization of $388.30 ($2,548 less $2,160) plus reduced transports valued at $1,140 ($3,211 less $1,982), the total economic benefit of Community Paramedicine could be said to be $1,528 per client per year ($388 plus $1,140).

7 Sustainability of Community Paramedicine Programs

Given the preceding research results which suggest that Community Paramedicine can reduce Paramedic Service transports to the ER in both urban and rural areas, reduce overall ER visits in urban areas and reduce ER visits via Paramedic Services in rural areas, and slow declining quality of life associated with chronic disease progression, there are several strategies for improving the sustainability of Community Paramedicine Programs:

- Fund these programs separately through the Ministry of Health and Long Term Care (MOHLTC), to achieve the quality of life benefits identified in this Study. This funding would enable Community Paramedicine to work on improvement of the cost-effectiveness of this service and explore more fully the potential for delaying admission to long-term care.

- Fund specific projects (through MOHLTC or the LHINs) to improve the completeness and consistency of Paramedic Service databases so that Community Paramedicine can be optimized and directed toward clients who fit the profile of those who would most benefit from this type of intervention.

- Fund file analysis projects (through MOHLTC or the LHINs) to determine how frequently Community Paramedics need to be in touch with clients and caregivers to achieve the identified benefits (or others not validated in this study, and by what means (e.g. remote patient monitoring, by telephone, in-person)

- Redirect funding from conventional Paramedic Services to Community Paramedicine at a scale that recognizes the economic benefits to those services from reduced transports to the ER.

- Explore opportunities to fund Community Paramedicine for services that may be rendered by CPs that benefit the primary care sector, particularly when CPs can act as the physician's agent in the home and provide clinical data, arrange for physician-approved tests, or contact other healthcare services to access additional supports in the community. These services would be especially valuable if a client has no primary care physician.

- Explore opportunities for Community Paramedicine to work with hospitals to identify strategies that could further enhance the benefit of Community Paramedicine to hospitals (beyond reduced ER visits) and provide a validated, calibrated basis for the institutional sector to support Community Paramedicine.

8 Conclusions, Observations and Recommendations

8.1 Conclusions

8.1.1 Community Paramedicine's Impact on Quality of Life

The results of this Study confirm the hypothesis that the use of Community Paramedicine as an intervention with the specific chronic conditions identified as eligibility criteria can bring about a clinically significant change in client perceptions of their quality of life, and that this change is one of slowing down rather than reversing disease progression.

Further, the results of this Study suggest that, as implemented in this trial, Community Paramedicine was not cost-effective as it related to these high-risk patient interventions. More work needs to be done on service delivery design to increase the number of clients that can be supported per hour of Community Paramedic time.

8.1.2 Community Paramedicine's Impact on Utilization of Other Healthcare Services

The results of this Study are unable to confirm the hypothesis that use of Community Paramedicine as an intervention with the specific chronic conditions identified as eligibility criteria will reduce hospital admissions or length of stay in hospital. There is evidence however, that Community Paramedicine can reduce visits to the Emergency Room.

8.2 Study Limitations

8.2.1 Qualitative Challenges Associated with Initial Data Set

As recruitment proceeded and later when the Community Paramedics were engaged in providing service to the Intervention Groups in each community, several qualitative challenges were noted in the initial data set:

- Due to limitations imposed by provincial privacy legislation, the Study was unable to obtain retrospective data from other health service providers on specific eligibility criteria *before* obtaining informed consent for participation. Specifically, the Study would have benefitted from pre-recruitment confirmation of the presence of chronic conditions by primary care providers, and frequency of use of ER/hospital services from all hospitals in the two study areas. As was revealed when retrospective data was secured from hospitals, reaching an ER by paramedic service transport in Hastings-Quinte represented 57 per cent of the Intervention Group's ER use and 64 per cent by the Control Group. As a result, some potential participants may have been excluded from the Study (threshold condition of 3 or more transports in a year) because the full extent of their ER use was not known at the outset of the Study. Secondly, the inability to confirm the presence of chronic conditions limited the depth of analysis based on clinical considerations (e.g. disease-specific utilization and multi-morbidity).

- The electronic (online) Patient Care Reporting system used by extensively by Paramedic Services in Ontario, iMedic, permits free text entry of vital information such as spelling of names and medical conditions. As a result, the search process to generate the original sample (as well as the service utilization patterns in the Field phase) created uncertainly over the degree to which all relevant information was captured for use in establishing eligibility. To normalize the data as much as possible and to permit cross-community comparisons, the two Paramedic Services utilized the same search terms and conditions used for all searches and follow-on recruitment processes.
- Ambulance Call Report (ACR) data available from the initial client complaint upon admission did not always match the data obtained by Community Paramedics when they began working with a particular client. This is an important research issue because sample selection was necessarily carried out based on ACR information. As a result, the total number of health conditions present for an individual may not be as accurate as originally anticipated. Accuracy of chronic condition diagnoses would be important to analysis undertaken to determine whether the impact of Community Paramedicine varies by the number and/or types of chronic conditions present. The absence of diagnoses confirmation, combined with attrition in the Study groups, imposed significant limitations on the granularity of results derived from the Study.

Learnings from Efforts to Validate Eligibility Conditions: The Research Team had hoped to validate chronic condition data used for recruitment against data from hospitals or Community Care Access Centres; this was only possible to a limited extent by comparing ACR data to most responsible diagnosis data from hospital ERs or in-patient admissions. However, the Team noted that these hospital departments may not have a complete medical history either. The best way to validate ACR data as a method of determining Study eligibility would have been through the primary care sector. The Study did not have the time or financial resources to reach out to all family health teams and especially the independent physicians in the region. Two family health teams and the Health Links initiative in Quinte did review the informed consents and compare the sample lists to their files and found that very few participants were either family health team clients or had received comprehensive care planning (CCPs). This suggests that most of the sample, in Quinte at least, are clients of independent family physicians or may not have a physician at all.

Other Exogenous Factors: Analysis of data collected in this Study suggests that a number of exogenous factors (beyond the actual delivery of Community Paramedicine services) may have influenced the Study outcomes. Examples of these factors are:

- Sample sizes that were constrained by either available trained Community Paramedics or eligibility criteria for which there turned out to be an inadequate number of potential candidates for recruitment into the Study. The resulting small sample sizes significantly increased prospects for undue influence of outliers, and difficulty in maintaining a viable sample in the face of sample losses, especially to death, nursing homes or client withdrawal.
- Inability (due to privacy legislation) to access comprehensive data from other health care services so that a complete list of all potentially eligible participants could have been available before recruitment commenced. In particular, the availability of hospital data on total ER visits, admissions and days of in-patient stay would have allowed Community Paramedics to target the most intense users of hospital services. Instead, sample selection and recruitment was executed based on the proxy variable of high frequency use of Paramedic Services for transport to hospital.

- The absence of a mechanism for engaging primary care physicians in effective utilization of the 'on the ground' resource they would have in Community Paramedicine. This was a particular challenge in Hastings-Quinte because the CP program has not operated there previously. Over time, CPs could develop a rapport with the physicians so that they could collaborate on support and treatment at home, reducing the need for visits to the physicians' offices or to the Emergency Room.
- The influence of social factors such as household structure (degree to which a client has caregiver support from family or friends) or income levels, through which social determinants of health may have exerted some influence on clients' ability to self-manage their health.
- The clients' proximity to hospitals and the cost/ease of getting to the Emergency Room. In urban areas, it may be easier to get someone to transport a client to the ER or cab service may be more easily available or less expensive. In rural areas, going to the ER other than by ambulance (for which there is a fee) may be a deterrent.
- The difference in service delivery models in the two communities. In the County of Renfrew, Community Paramedicine has been operating for a number of years now and is integrated into the regular Paramedic Service. Rather than dedicating specific individuals to deliver the Community Paramedicine intervention (as was done in Hastings-Quinte), the County of Renfrew paramedics may have more opportunity to address client needs at home and remove the need for a transport to hospital.

8.2.2 Recruitment Challenges

The Study's original work plan called for recruitment to conclude by December 31, 2014. This process was extended slightly due to the time-consuming nature of the recruitment process.

- Paramedic Services databases often do not have the most up to date telephone or address information. They may have moved, and as noted earlier, significant numbers of potential participants may have been either deceased or have moved with the past 12-18 months. This information is typically not available to the Paramedic Service and was therefore obtained, as much as possible, either by talking to other family members or making door to door visits. Although this is an extremely time-consuming process, it did enable both Hastings-Quinte and Renfrew Paramedic Services to get in touch with potential participants and avoid biasing the sample toward those easiest to reach. Door-to-door enquiries also enabled the Paramedic Services to update their databases, whether or not the PS client wished to take part in the study.
- Paramedic Services are unlikely to have the full suite of information from the various service providers from whom an individual client might receive service. As a result, it was not clear whether all relevant diagnostic information was available to ascertain eligibility. Careful – and time-consuming– record-level review, including reference to paper-based systems was therefore required.

Retrospective Data Challenges:

The Study noted three limitations related specifically to retrospective data:

- Total days of stay associated with a hospital admission were only available for the hospital to which the client was admitted. If a participant was transferred to another hospital, the days of stay associated with that transfer were not captured. As a result, utilization of hospital services may be understated in this analysis.

- Due to lag times associated with hospital data entry, ER visits for QHC were available for the full twelve months of the field phase but admissions and days of in-patient stay were for eleven months only. Actual 'annual' values could be higher.
- The decision by two County of Renfrew hospitals not to participate in the Study posed a major limitation on analysis of hospital service utilization in that community and the effect of Community Paramedicine on utilization patterns.
- In the Quinte area, two Family Health Teams and the local Health Link initiative agreed to provide data on any of the Study participants for whom these organizations were providing service. Reviews of the Study participant lists showed that the number of 'overlapping' clients was extremely small and therefore the data these organizations could provide on primary care service utilization would be insufficient to make any impact of Community Paramedicine on utilization patterns impossible to discern.

8.3 Discussion of Results

The Study has confirmed some hypotheses (for example, the effectiveness of Community Paramedicine intervention in reducing total visits to the hospital ER and its effectiveness in moderating loss of quality of life, but has not confirmed others (for example, the effectiveness of this intervention in reducing admissions to hospital and length of stay). There may be at least three factors that influenced the results:

High Utilization or High Cost Users? Bearing in mind that the Study focused on high utilization clients with specific chronic conditions, it is possible that the Study's recruitment approach did not distinguish between episodic high users and high users over time (the former exhibit intensive utilization for short periods of time whereas the latter group continues intensive utilization over extended periods of time.) Clients with progressive chronic disease would be expected to fall into the latter category. The Pan-Canadian Forum on High Users of Health Care – Summary Report (cited earlier) noted that "Without longitudinal data on service utilization available at the sample selection stage, it may not be possible to distinguish between the two." The same report suggested that "what constitutes high use?" and "what characteristics are associated with high use?" are still unanswered questions, and observed that "the high use category does not consist exclusively of chronic high users but also includes people experiencing high-cost events." [15]

Given that the EV-CP Study, by necessity due to privacy restrictions, focused on high service utilization of one service (Paramedic Services) in the year preceding the Study, it may have inadvertently recruited significant numbers of clients who had experienced high-cost events in that year but then returned to a moderated pattern of service utilization. The data indicates that within the Quinte Intervention group for example, 30 of 46 clients (65%) had fewer or the same number of field phase transports in 2015-2016 as compared to the 2014-2015 retrospective year while the other 35% (16 clients) had increases. The same phenomenon was exhibited in the Quinte Control group: 36 of 42 (86%) had fewer or the same number of field phase transports as compared to the 2014-2015 retrospective year while the other 14% (8 clients) had increases.

Research Study or Ongoing Program? Beyond the challenges posed in access to data (described in the Limitations section of this report), delivering Community Paramedicine as a research project limited the number of clients who could have benefitted from the intervention (by precluding the enrolment of clients who met the eligibility criteria while the field phase was taking place or clients who were on the cusp of meeting

the eligibility criteria and would have by the time the field phase started) and by excluding the service utilization and EuroQol impact of those Study participants who did not remain in the Study for a full year. This accentuated the challenges of data acquisition that were inherent is small initial samples (120 in Quinte and 80 in Renfrew), especially when sample losses are relatively high (to be expected for a group of clients who have progressive diseases). A review of paramedic service transports in the 2014-2015 retrospective year indicates that those Hastings-Quinte clients who were deceased or moved into long term care in the field phase (and were therefore removed from the Study) had significantly higher numbers of transports to the ER in the retrospective year than those who remained in the Study to its conclusion.

Another subtle difference between a time-limited research study and an ongoing program is the degree to which Community Paramedicine can develop relationships with other healthcare and social services and thereby maximize their contribution to the clients' circle of care. The Pan-Canadian Forum report noted that "Participants generally agreed that data availability and analytical capacity constituted challenges to carrying out this type of work. In particular, it was agreed that data linkage across care services and social services would be beneficial to analyses of this sort…" [15]

Finally, the limitations of a research study were also a factor in a relatively high cost per Quality Adjusted Life Year for Community Paramedicine. The Community Paramedics were likely not 'at capacity' in terms of the number of clients they could have served in an ongoing program, in part because they could not take on new clients as the Study progressed. For those they could serve though, the intervention achieved a clinically important result (slowing the impact of disease progression on quality of life).

Future plans: In addition to sharing Study results and engaging stakeholder groups in discussions about the findings and possible determining factors, research could be undertaken to probe several questions that have emerged from the results:

- **Influence of Data Quality and Recruitment Methodologies on Sample Structure**: A review of the initial sample frame (master list of eligible participants), in conjunction with recruitment methods (initial telephone contact followed by a personal/home visit) appears to have been an effective strategy for enrolling the required numbers of participants in the Study. However, both communities experienced difficulty identifying–and retaining–sufficient numbers of eligible candidates and validating eligibility (due to the absence of confirmed diagnoses). With literature citing the variability of intervention impact by specific chronic conditions and multi-morbidity [22], there is merit in understanding the best ways to identify, recruit and retain candidates for samples that support the specific hypotheses being tested.
- **More Effective Deployment of Community Paramedics**: Could Community Paramedicine be more effective with chronic condition clients before their service utilization escalates into high utilization? If so, what would be the predictive signals that would trigger CP intervention? Is it essential to have confirmed diagnoses of a chronic condition or does increasing service utilization – particularly of hospital services – serve as a reliable proxy? Are there other sub-populations for which Community Paramedicine would be a particularly effective intervention?

  For example, the Pan-Canadian Forum on High Users of Health Care noted that "The literature has generally shown that high-use populations have greater morbidity and comorbidity burdens. High users of care are more likely to have poorer self-assessed health, high prevalence of chronic conditions, including coronary artery disease, coronary heart failure and diabetes, and a greater number of psychosocial conditions, most commonly anxiety disorders, alcoholism, schizophrenia, drug dependence and

depression. Psychosocial distress, which may or may not exist alongside other mental illness, may also increase the likelihood of utilization. Patients with poorer social support structure (e.g. relatives attending to their care) tend to use more primary, outpatient and in-patient care." [15]

- **Strategies for Improving Cost-Effectiveness of Intervention**: What is the cost threshold that Community Paramedicine must reach to be cost-effective (achieving a result at a lower cost than the current approach)? And is this cost threshold also cost-efficient (achieving a result in the most economical way)? Cost-effectiveness suggests an incremental improvement whereas cost-efficiency suggests an optimal approach to resource allocation.

  One strategy that might improve the cost-effectiveness of the intervention would be the combination of CP service with remote patient monitoring (RPM). With RPM, the CP services suggest they can see many more clients with the same results. Given the relatively low cost of RPM, that would result (at least numerically) in a more attractive cost per QALY.

  Another alternative is to have paramedics provide CP service in their downtime. This is referred to as 'ad hoc' visitations in the paramedic sector and shows benefit at minimal increased marginal cost without affecting normal response times. This strategy assumes that paramedics are also trained as Community Paramedics and that work schedules could be negotiated to provide for this ad hoc role.

- **Opportunities to Deploy Technologies to Improve Cost-Effectiveness and Outcomes:** What role could technology such as in-home monitoring equipment play, in combination with provision of Community Paramedicine services, to help clients and caregivers self-manage their health conditions? Would remote monitoring impart a comfort factor that when combined with CPs' on-site support, that help clients stay at home with a feeling of safety?
- **Investigation of Influence of Social Determinants of Health**: To what extent are high service utilization patterns the result of progressive chronic disease or related social or emotional conditions? Is a more comprehensive approach necessary to address individuals' particular needs?
- **Investigation of Exogenous Variables Influencing Outcomes**: What impact, if any, does household structure (whether a client lives alone or has in-home caregiver support) have on propensity to call 911 or go to a hospital ER? And does proximity to a hospital influence propensity to call 911 or go to a hospital ER? In this Study, sample sizes were too small to test the significance (if any) for these factors.
- **Temporal Considerations in Assessing Intervention Impact:** Is there a latency effect for Community Paramedicine in that it takes time for a local network of healthcare professionals to understand how CP services can benefit a client as well as health service providers? A key difference between Quinte and Renfrew is that the latter has had a CP program for several years now whereas the Study period represented Quinte's first deployment. The higher diversion rate of Renfrew's regular Paramedic Service may suggest a multi-layered approach to changing service utilization patterns.

8.4 Recommendations

8.4.1 Data availability for research studies

It is recommended that Local Health Integration Networks work with the Province of Ontario to establish secure methods to allow REB-approved *research studies* to secure contact coordinates (name, address, phone number) from health care services that could provide access to that limited data so that clients who might benefit from participation in the research study would have the opportunity to indicate their interest.

8.4.2 Achieving Lower Intervention Costs

It is recommended that Paramedic Services explore ways to reduce the effective 'per visit' cost of Community Paramedicine (the Intervention) through any or all of the following means:

- Operationalization of Community Paramedicine as an ongoing service (removing the constraints of a research project)
- Modifying the target clientele for the service to optimize the probability of impact on quality of life and service utilization
- Integrating Community Paramedicine into the regular Paramedic Service
- Working with local healthcare providers to ensure that both the Paramedic Service and Community Paramedicine are part of the circle of care
- Increasing the use of technology including remote patient monitoring and particularly for collaboration with other healthcare providers including primary care physicians.

8.4.3 Enhanced Interventions

It is recommended that Paramedic Services and Community Paramedicine work with local social agencies to address social isolation and mental health issues that may lie behind some patterns of service high-utilization.

It is recommended that Community Paramedicine continue to explore how clinical guidelines and associated medical directorships might evolve to maximize the opportunities for proactive treatment at home, under the direction of the primary care physician.

It is recommended that Community Paramedicine continue to support provincial and local efforts to ensure that all clients have access to and an active relationship with primary care.

9 Appendices

Appendices

Appendix A - References:

[i] Ambulatory Care Sensitive Conditions; Ambulatory Care Sensitive Conditions Hospitalization Rate, Canadian Institute for Health Information (2013); Available at: http://www.cihi.ca/CIHI-ext-portal/pdf/internet/PHC_POLICY_ACSC_EN

[1] Ontario Ministry of Health and Long Term Care (2012). *Ontario Action Plan for Health Care.* Available at: http://www.health.gov.on.ca

[2] CANSIM Table 105-0501, 2013, Canadian Cardiovascular Society 2006

[3] As reported by the Institute for Clinical Evaluative Sciences (ICES): Quantifying co-morbidity in individuals with Chronic Obstructive Pulmonary Disease: a Population Study, *Gershon AS, Mecredy GC, Guan J, Victor JC, Goldstein R, To T* published in European Respiratory Journal, August 2014

[4] Ontario Ministry of Health and Long Term Care (2012). *Ontario Action Plan for Health Care.* Available at: http://www.health.gov.on.ca

[5] http://www.nationalnewswatch.com/2014/09/24/the-importance-of-follow-up-care-after-an-emergency-room-visit/#.VCq1CFeDySr

[6] Quality Monitor 2012 Health Care Ontario http://www.hqontario.ca/portals/0/documents/pr/qmonitor-full-report-2012-en.pdf

[7] The study was published in the July 2014 issue of the British Medical Journal Quality and Safety, and was conducted by researchers at Women's College Hospital, the Peter Munk Cardiac centre and the Institute for Clinical Evaluative Sciences (CES).

[8] Ontario Ministry of Health and Long Term Care (2012). *Ontario Action Plan for Health Care.* Available at: http://www.health.gov.on.ca

[9] Creating a Practical Paramedic Response Unit Program Evaluation; M. Ruest, June-July 2012

[10] Burt, McCaig & Valverede, 2006, Department of Health, 2005

[11] Vermeulen et al 2000

[12] McConnel & Wilson, 1998

[13] Singal et al, 1992

[14] Weiss et al, 2002

[15] Pan-Canadian Forum on High Users of Health Care – Summary Report : Health-related quality of life and healthcare utilization in multi-morbidity: results of a cross-sectional survey, for Health Research and Innovation, University of Alberta (2012)

[16] Canadian Safety and Security Program, Project Charter: Hastings-Quinte EMS-Economic Value of Community Paramedicine Programs, Department of National Defence, Government of Canada

[17] Quinte Healthcare Corporation Strategic Plan (2012) http://www.qhc.on.ca/our-strategic-plan-c211.php

[18] Ruest, M. (2012). Creating a practical Paramedic Response Unit Program Evaluation. *Canadian Paramedicine Magazine,* 0-12.

[19] Canadian Safety and Security Program, Project Charter: Hastings-Quinte EMS-Economic Value of Community Paramedicine Programs, Department of National Defence, Government of Canada

[20] A PICOT statement is a technique used by medical researchers to develop a clinical research question; it is an acronym for the five different areas upon which research design is based (patient population, intervention or approach to be employed, comparison of the study population with a reference (control) group, outcomes or results to be measured, to measure effectiveness of the intervention, and timeframe for data collection.

[21] National-level population norms for EuroQol 5D have been created for 19 countries and 7 regions on five continents (Asia, Australia, Europe, North and South America, as well as Scandinavia). The complete list of countries is found at http://www.euroqol.org/about-eq-5d/population-norms.html.

[22] Health-related quality of life and healthcare utilization in multi-morbidity: results of a cross-sectional survey, Agborsangaya, Lau, Lahtinen, Cooke and Johnson, in Quality of Life Research (2013), notes that EuroQol 5D-3L "has been used to compare Health-Related Quality of Life (HRQL) between populations or among patients with different conditions that might be vital for healthcare planning and resource allocation." The researchers used EuroQol 5D-3L for a general population study of with 4,946 respondents, then focused on those with any of 16 chronic conditions (1,675), including but not restricted to the five conditions on which the EV-CP study focused.

[23] The Quality Adjusted Life Year (QALY) is defined as "a year of life adjusted for its quality or its value. A year in perfect health is considered equal to 1.0 QALY. The value of a year in ill health would be discounted." http://www.medicinenet.com/script/main/art.asp?articlekey=5167

[24] Both Hastings-Quinte Paramedic Services and the County of Renfrew used iMedic to develop a list of eligible candidates for the Study. iMedic, a product of InterDev Technologies, is an electronic (online) Patient Care Reporting system used extensively by Paramedic Services in Ontario.
http://wp01.interdev.ca/WP01/index.php/en/home-2/

[25] The original query of the iMedic database to generate the master list of potential study candidates used a July 2014 to July 2015 timeframe to enable recruitment to begin before the end of 2014.

[26] Hastings-Quinte Paramedic Service was responsible for service delivery to 60 Study Intervention group participants. County of Renfrew PS had a slightly smaller intervention group: 40 persons.

[27] Early reviews of some retrospective data indicated references to constipation in Most Responsible Diagnosis (MRD) information recorded by healthcare providers. Constipation may not be the only MRD noted for that particular patient on that particular day.

[28] The Pan-Canadian Forum report describes analysis from New Brunswick that describes high use clients as including those with 'diabetes, mental health, COPD, ALC and congestive heart failure. » It does not mention hypertension. The study, Health-related quality of life and healthcare utilization in multi-morbidity: results of a cross-sectional survey, for Health Research and Innovation, University of Alberta (2012), notes a much stronger inverse relationship between certain chronic conditions such as COPD, CHF, and stroke than for diabetes or high blood pressure. The same study also notes that individuals with mult-morbidity were twice as likely to be hospitalized or to visit an emergency department when compared to those without multimorbidity.

[29] The Pan-Canadian Forum report notes that U.K. research indicates that "there is a difference between episodic high users and high users over time". Without longitudinal data on service utilization available at the sample selection stage, it may not be possible to distinguish between the two. The U.K. work also suggests that "it can take a relatively long time to demonstrate the effectiveness of interventions". The Pan-Canadian report also noted that "what constitutes high use?" and "what characteristics are associated with high use?" are still unanswered questions, and observed that "the high use category does not consist exclusively of chronic high users but also includes people experiencing high-cost events.".

[30] According to its creators, EuroQol 5D is a standardized instrument for use as a measure of health outcome. It provides a simple descriptive profile and a single index value for health status. It is primarily designed for self-completion by respondents and is ideally suited for use in postal surveys in clinics and face-to-face interviews. It is cognitively simple, taking only a few minutes to complete. Instructions to respondents are included in the questionnaire. http://www.euroqol.org/

[31] See https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1497852/ for a discussion of cost-effectiveness ratios.

[32] The EV-CP Study relied upon the finding in Kaplan, R.M., (2005) that established the minimally clinically important difference for COPD in generic utility-based measures (of which EuroQol 5D is one). This work established -0.03 or -3% as the smallest amount of change that would be considered clinically important. This approach was used in the Pan-Canadian Forum Report cited earlier. As in the EV-CP Study, the Pan-Canadian Forum work used the EuroQol 5D index scores and US national scoring algorithms. In that study, the index scores ranged from -0.11 to 1.00.

[33] Pan-Canadian Forum on High Users of Health Care – Summary Report : Health-related quality of life and healthcare utilization in multi-morbidity: results of a cross-sectional survey, for Health Research and Innovation, University of Alberta (2012)

[34] A Health Quality Ontario report entitled 'Cost-Effectivness of Interventions for Chronic Obstructive Pulmonary Disease (COPD) Using an Ontario Policy Model' (March 2012), put the average cost for treating a moderate exacerbation of COPD at $641 and a major exacerbation at $10,086 (hospital stay). The same report notes that smoking cessation programs had a base cost of $1,041 to $1,537 per patient for MDC and PR respectively. ″When the costs of MDC and PR were varied in a 1-way sensitivity analysis to reflect variation in resource utilization reported in the literature, the ICER increased to $55,322 per QALY and $56,270 per QALY, respectively. Assuming a base case cost of $2,261 per year per patient for LTOT as reported by data from the Ontario provincial program, the ICER was calculated to be $38,993 per QALY. Ventilation strategies were dominant (i.e., cheaper and more effective), as reflected by the clinical evidence of significant in-hospital days avoided in the study group…. Currently, costs for most of these interventions are being absorbed by provider services, the Ontario Drug Benefit Program, the Assistive Devices Program, and the hospital global budget. The most cost-effective intervention for COPD will depend on decision-makers' willingness to pay. Lack of provincial data sets capturing resource utilization for the various interventions poses a challenge for

estimating current burden and future expenditures." This report also includes cost-per-visit data for healthcare professionals engaged in work with COPD clients (see Table 8 of the report).
http://www.hqontario.ca/Portals/0/Documents/evidence/reports/rev_COPD_Economic_March.pdf

[35] Presentation by Usa Chaikledkaew, Ph.D, to the Health Intervention and Technology Assessment Program, citing Devlin and Parkin, Health Economics, 2004; 13 : 437-452; Towse, Devlin and Pritchard (eds), 2002 Cost effectiveness tresholds : economic and ethical issues, London, Office for Health Economics/King's Fund arch.apec.org/sites/default/files/Incremental%20analysis-10APR14%20(1).pptx

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AT THE TIPPING POINT: Health leaders share ideas to speed primary health care reform. Available at: http://healthcouncilcanada.ca/rpt_det.php?id=163
[1]Dixon, Mason, Knowles, Colwell, Wardrope & Snooks (2009). Is it cost effective to introduce paramedic practitioners for older people to the ambulance service? Results of a cluster randomized controlled trial. *Emergency Medicine Journal, 26*, 446-451.
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U.S. Flex Monitoring Team report: "The Evidence for Community Paramedicine in Rural Areas: State and Local Findings and the Role of the State Flex Program" February 2014.

Appendix B - Participating Stakeholder Organizations

Brighton-Quinte West Family Health Team
Champlain Community Care Access Centre
Champlain Local Health Integration Network
Hastings-Quinte Paramedic Service
Pembroke Regional Hospital
Quinte Health Care
Quinte HealthLinks
Queen's University – Belleville Family Health Team
County of Renfrew Paramedic Service
Renfrew Victoria Hospital
St. Francis Memorial Hospital
South East Community Care Access Centre
Southeast Local Health Integration Network.

Appendix C - Membership of Study Partners' Steering Committee

Dr. Christopher Hayman, Chief of Emergency, Quinte Health Care
Jeff Hohenkerk, Vice President, Quinte Health Care
John O'Donnell, (A) Chief, Hastings-Quinte Paramedic Services
Carl Bowker, Deputy Chief of Operations, Hastings-Quinte Paramedic Services
Mike Slatter, (A) Deputy Chief of Quality & Development, Hastings-Quinte Paramedic Services
Kathryn Wood, President & CEO, Natural Capital Resources Inc.
Dr. Christopher Ashton, Harbourfront Health Group
Denise Duffie-Ashton, Harbourfront Health Group
Dean DiMonte, President, Premergency Inc.
Kim Fletcher, Manager of BGH Emergency Department, Quinte Health Care
Heather Campbell, Emergency-Primary Care Program Director for Quinte Health Care
Jackie Redmond, Chief Executive Officer, South East Community Care Access Centre
Michel Ruest, Deputy Chief of Clinical Programs, County of Renfrew
Michael Nolan, Chief, County of Renfrew Paramedic Services
Dr. Kristian Davis, Medical Director, County of Renfrew Community Paramedicine
Jennifer Broek, Executive Assistant to Quinte Health Care Board of Directors
Beth Ann Dick, Executive Assistant, Quinte Health Care
Marsha Stephen, Executive Director, Belleville & Quinte West Community Health Centre
Doug Socha, Canadian Safety and Security Program, Government of Canada

Appendix D

PICOT Statement

Patient Population: The Study focused on high-frequency users of both PS (via 911) and hospital emergency rooms; for study purposes, high-frequency users are defined as patients who use either a Paramedic Service or a local hospital Emergency Room three (3) or more times in the preceding twelve-month period.

Because of the target patient populations and the pivotal role that paramedic services play in transporting clients to hospital, the study was led by the Paramedic Services of Hastings-Quinte and Renfrew Counties.

Intervention: The intervention was the provision of Community Paramedicine service. Originally, the expectation was that an in-home, in-home/remote patient monitoring technology[iii] might be deployed. However, this was not possible within the timelines and budget associated with this Study so remote patient monitoring technology was not deployed.[iv]

For this study, the specific interventions carried out using community paramedicine included assessments made at the patient's home, regular visits to provide supportive care, monitoring specific aspects of the patient's status, provision of in-scope healthcare services at the patient's home, provision of recommendations for on-site changes to prevent falls, and ensuring that information related to these services is provided to other healthcare professionals with a role in that patient's care.

Comparison with another intervention: This Study compared the economic and healthcare value of the Community Paramedicine approach with the existing approach (patients used Paramedic Services and the hospital Emergency Room along with family physicians and other community-based agencies or institutions, as they had been doing). The conventional approach was therefore the reference to which community paramedicine was compared.

While community paramedicine is an internationally recognized concept, the idea remains new and the evidence base proving its efficiency, effectiveness and compatibility with both clients and the overall health system is in early stages of maturation. Early work has been published both in the gray and peer-reviewed literature. However, as pointed out by Dixon and colleagues 'given these economic results (of CP) in tandem with the clinical, operational and patient-related benefits, the wider implementation and evaluation of similar schemes should be considered.'

Study Expectations: Overall, this study was expected to provide information and analysis to:

- Measure the economic value of Community Paramedicine (CP) to specific services such as Paramedic Services (PS) and hospital Emergency Rooms (ERs). For example, can CP programs reduce the number of unnecessary trips to ERs – particularly for ACSCs – and the associated costs incurred by both services?
- Measure the impact of CP programs on other community-based health-related services. For example, can CP programs play a useful role in serving a particular group of patients with complex healthcare needs through regular home visits, either on a short-term or long-term basis?
- Infer the projected economic value of CP programs on global (provincial) healthcare costs. For example, what do the conclusions of this study in two Ontario communities tells us about CP Programs' role(s) and contributions to health care across the province?

The CP study was also expected to comment on prospects for CP program sustainability. The premise of the study was that regular care provision by community paramedics (CPs), integrated with other providers, can effectively reduce aggregate demand on the local healthcare system. It was also believed that clients who receive regular care by CPs would experience an overall improvement in health status, allowing greater participation in life activities, and reducing demand on supports other than the healthcare system (e.g. family and neighbours).

Anticipated Results: The Study, which was a Randomized Controlled Trial (RCT), was expected to demonstrate record-level and aggregate differences between the Intervention group (CP) and the Control group (conventional PS). (Record-level retrospective data was used to support a 'before and after' comparison between the conventional service, PS, and the alternative approach, CP.) Compared to the Control group, the Intervention group results were expected to show:

- Reduced number and frequency of calls to 911, and therefore reduced utilization of PS for acute care and transport purposes.
- Reduced number and frequency of visits to local Emergency Room(s).
- Reduced PS costs for serving the identified patient population.
- Reduced net costs of direct CP service to the identified patient population, even after inclusion of any residual PS utilization.
- Reduced costs of ER service to the identified patient population.
- Reduced total health care costs for the identified patient population (with all service providers included).
- Improved health status as assessed by health care professionals. (*Note: This result could not be derived from Study data due to data access challenges described in the Retrospective Data collection section of this report*)
- Improved health and quality of life status as assessed by clients.

Note that this Study makes no assumptions about differences in economic value or health care value, between urban and rural areas.

Time Frame: This entire Study period was anticipated to last 18 months, with the first three months dedicated to program and evaluation preparation, followed by 12 months of service delivery and data collection. The final three months were to be dedicated to the final evaluation.

APPENDIX E

Ethics Board Submission – QHC

Health Sciences Research Ethics Board Submission:
The Economic Value of Community Paramedicine Study

November 19, 2014 - Final

1. Summary of Proposed Research:

A. ***Abstract***: Municipal Paramedic Services (PS) and hospital Emergency Rooms (ER) in Ontario are known to be transporting and serving patients who could be supported and maintained at home if appropriate services were available. Community-based organizations whose service provision in Ontario is coordinated by the community care access centres (CCAC) find themselves challenged to meet the demand for care of these patients, as well as those who are discharged from hospital and require follow-up care.

A novel use of current and evolving paramedic services known as Community Paramedicine (CP) is being proposed to meet the needs of both high intensity users of PS and ERs, that cannot currently be met by existing community services.

The *Economic Value of Community Paramedicine Programs (EV-CP) study* is a project sponsored by Hastings-Quinte Paramedic Services (PS) and funded by the Canadian Safety and Security Program (Government of Canada) in 2014. According to the Project Charter (2014), the objectives of this study are to determine the economic value of community paramedicine programs and their effectiveness relative to global healthcare costs.

The Study will compare the economic and healthcare value of CP in an urban area (Quinte) and a rural area (Renfrew County.

This study has three intended outcomes:

- To measure the economic value of community paramedicine (CP) on specific services such as Paramedic Services (PS) and hospital Emergency Rooms (ERs) utilization.
- To measure the impact of CP programs on other community-based health-related services.
- To infer the projected economic value of CP programs on global (provincial) healthcare costs.

  The CP study is also expected to comment on prospects for CP program sustainability.

B. ***Rationale and Hypothesis***: Across Canada, chronic conditions now dominate healthcare service utilization and associated costs. Nation-wide 5.8% of the population has diabetes; 2.5% has chronic obstructive pulmonary disorder (COPD), and another 1% has congestive heart failure (CHF) (CANSIM[1] and Canadian Cardiovascular Society, 2013).In Ontario, people with Chronic Obstructive Pulmonary Disease (COPD) make up 12.6% of the adult population, with 51% of that group being between the ages of 35 and 64. People with COPD use half of all the lung cancer health services in Ontario, a third of all pneumonia services and the same proportion of cardiovascular disease health services in Ontario[2].

Demographic and age-associated chronic condition disease trends drive increased demand for, and place particular strain on, paramedic services to meet response time standards. Similarly, the trends increase demand for service at emergency rooms of hospitals and increase wait times for service. The Ontario Action Plan for Health Care (MOHLTC, 2012) reported that '*In 2010/11, over 271,000 emergency room visits were made to Ontario hospitals that could have been treated in alternative primary care settings… We're taking avoidable trips to the emergency room (ER) instead of receiving care closer to home… these patients could have received optimal care at a lower cost outside of the hospital*.'

Community-based organizations whose service provision in Ontario is coordinated by the Community Care Access Centres (CCACs) find themselves challenged to meet the demand for care of patients that can be maintained at home, as well as those who are discharged from hospital and require follow-up care. The Ontario Action Plan for Health Care (MOHLTC, 2012) notes that one of the province's greatest health care challenges is serving Alternative Level of Care (ALC), patients who are in hospital beds although '*could be better cared for at home or in the community if the right supports were in place. Better serving these patients benefits the entire system, because it frees up hospital beds for those who need them, reduces pressure on emergency rooms and saves money. Our plan will aggressively move to make progress on this issue by building capacity in the community*.'

A preliminary report for Health Innovations (2013), *Paramedics Assessing Elders at Risk for Independence Loss (PERIL)*[3] cites several sources indicating that "despite the popular perceptions that paramedics' main focus is cardio-pulmonary resuscitation, 85% of 911 calls are for non-life threatening problems". (Burt, McCaig & Valverde, 2006, Department of Health, 2005).

The PERIL report also cites several papers from the City of Toronto indicating that "while no national Canadian EMS database exists (Vaillancourt & Stiell, 2004) data from Toronto EMS (Vermeulen et al, 2000) confirm that older persons are five times more likely to call 911 than younger people (McConnel & Wilson), 1998; Singal et al, 1992). Repeat EMS (paramedic

[1] CANSIM Table 105-0501, 2013, Canadian Cardiovascular Society 2006

[2] As reported by the Institute for Clinical Evaluative Sciences (ICES): Quantifying co-morbidity in individuals with Chronic Obstructive Pulmonary Disease: a Population Study, *Gershon AS, Mecredy GC, Guan J, Victor JC, Goldstein R, To T* published in European Respiratory Journal, August 2014

[3] Dr. Jacques Lee, Principal Investigator

service) use is also common and accounts for 18-40% of 911 calls among people 65 years of age or older" (Weiss et al, 2002).

The premise of this study (hypothesis) is that regular care provision by community paramedics (CPs), integrated with other providers, can effectively reduce aggregate demand on the local healthcare system. Also, it is believed that clients who receive regular care by CPs will experience an overall improvement in health status, allowing greater participation in life activities, and reducing demand on supports other than the healthcare system (e.g. family and neighbours).

Anticipated Results: The Study will generate data to permit comparison of record-level and aggregate health service and cost profiles between the Study group (CP) and the Control group (conventional PS). Record-level retrospective data will be used to support aspects of 'before and after' comparison between the conventional service, PS, and the alternative approach, CP.

Compared to the Control group, the Study results will be analyzed to determine whether or not they show:

- Reduced number and frequency of calls to 911, and therefore reduced utilization of Paramedic Services (PS) for acute care and transport purposes.
- Reduced number and frequency of visits to local Emergency Room(s).
- Reduced costs of PS service to the identified patient population.
- Reduced costs of ER service to the identified patient population.
- Reduced net costs of direct service to the identified patient population, even after inclusion of any residual PS or ER utilization.
- Reduced total health care costs for the identified patient population when CP is utilized, and costs of hospital and community-based service providers are included.
- Improved overall health status as assessed by health care professionals.
- Improved health and quality of life status as reported by clients using quality of life scales.

2. Study Design:

The EV-CP Study will be an experimental[4] Randomized Control Trial (RCT) to examine the economic and related health care value of Community Paramedicine, both longitudinally (over time/"before and after" intervention), and between two Study Areas (Hastings-Quinte and Renfrew County). This calls for at least four (4) study groups or sample blocks (two experimental/study groups and two control groups):

Hastings-Quinte	Renfrew County	Timeframe in Study
Urban – CP Service (Study/Experimental Group) N = 60	Rural – CP Service (Study/Experimental Group) N = 40	Up to 1 year depending on timing of enrolment
Urban –PS Only (Control Group) N = 60	Rural – PS Only (Control Group) N = 40	Up to 1 year depending on timing of enrolment

Acronyms: CP Service = Community Paramedicine Service; PS = Paramedic Service; N = sub-sample size

The EV-CP Study will be a mixed methods study, combining quantitative and qualitative methods to strengthen the validity of the results and the contribution of the project to the healthcare research literature.

Two quantitative methods will be utilized:

- Activity-based Costing (ABC) of Healthcare Utilization (retrospective and field phase)
- Patient-reported Outcome Measure, based on EQ-5D-3L (EuroQol five dimensions, three levels); pre- and post- field phase

On the qualitative front, the Study will also use semi-structured interviews with a representative sample of clients on entry into and exit from the RCT. These interviews will be conducted by a third party (member of the research team).

Target Population: The target population for this Study is the group of 911-Paramedic Service clients who a) actually used that service for transport purposes three (3) times or more in the 12 months preceding potential entry into the trial, and b) used the Paramedic Services to access the services of an Emergency Room three (3) times or more in the same period.

The target population will be identified by the Paramedic Service (Hastings-Quinte and Renfrew) from their data (drawn from iMedic or paper files), then validated by comparison with the records of the appropriate hospital in Hastings-Quinte or Renfrew County.

[4] The principal investigators determine the study participants by specifying eligibility conditions/criteria and through utilization of a randomized selection and allocation process. These are described in a subsequent section of this submission.

A further eligibility criterion is the presence of one or more of any of the following five conditions: CHF, COPD, diabetes, hypertension, or stroke.

Any potential study participants with the following characteristics will be deemed ineligible for participation in the Study:

a) Is living in a long-term care home (individuals living in a retirement residence in either independent living or assisted living accommodations are eligible for participation)
b) Was visiting in the area at the time of previous service use but does not live there permanently.
c) Was living in the area at the time of previous service use but have since moved to another municipality outside of the study areas.
d) Has no available local retrospective health care data for the 12 months preceding their enrolment in the study.
e) Has significant physical, cognitive or other mental disability so as to make full participation in the study difficult or impossible (e.g. unable to complete the EuroQol questionnaire with assistance).
f) Is deceased.
g) Has a notation on file indicating a desire for exclusion from any healthcare-related research study
h) Is part of another research study in the same timeframe.

Note that high-frequency PS service clients are eligible to participate in the study whether or not they:

- Have a family doctor/physician or are served by a Family Health Team
- Are already receiving services in the home from community-based services via CCAC (e.g. Meals on Wheels, Personal Support Worker, Nursing support etc.)
- Have caregiver support (family, friends, neighbours)
- Already have in-home technology supports such as Lifeline or OTN/Telus RPM.

Although not used as filters for participation, these characteristics will be noted on the client record for later use in data analysis. They will also form part of the qualitative description of the aggregated sub-samples. [A draft Subject/Client Information Form is included as an appendix].

Because the Study will be gathering data on the full range of health services (and associated costs) used by any Study participant, the refined list of potential participants will later be crosschecked against both CCAC and HealthLinks databases. However, this crosscheck process is solely for the purposes of obtaining retrospective data on service utilization. Use/lack of use of CCAC or primary care services is not an exclusionary criterion for participation in the study.

3. **Obtaining Informed Consent**: Informed consent will be obtained by a two-step process involving designated staff from each Paramedic Service (in Hastings-Quinte and Renfrew County) and the principal investigators of the study.

   With oversight by the Principal Investigators, Paramedics will make personal/direct contact with the individuals proposed for the CP (intervention) groups and the Control groups against which each of the intervention groups will be compared. Paramedic staff will review the client file prior to contact to determine if there is a need or requirement for an alternative caregiver or designate to be involved in any discussions about Study participation. Subjects who may not be competent to consent include young children, individuals with a cognitive disability or mental illness, and critically ill patients.

Paramedic staff contacting potential participants will ensure that the client and/or caregiver receives a simple description of the Study (Letter of Information), its purposes, sponsors and timeframe, to enable them in decision-making about participation (Letter of Information). The description will also summarize what types of information will be collected, the uses for which the information is being collected, and the provisions being taken to protect the clients' privacy.

The designated paramedics will be expected to make contact with the identified individuals and explain the nature of the Study and the opportunity for the client to participate as a Study subject. The Principal Investigators will follow up with the identified individuals to answer any outstanding questions, recruit them into the sample group into which their names have been placed, or record any refusals or inability to contact the client.

Prospective clients for either the CP group (intervention) or the Control group are permitted to refuse and clients will be advised that refusal is permitted and that ongoing services are not jeopardized by a decision to participate in the Study or not. If a client declines participation, the Paramedic or member of the research team must note the refusal and report same back to the coordinator of data collection (Principal Investigator).

A proxy for signing consent is acceptable if the proxy is a duly-designated individual such as a family member, a legal guardian or, perhaps in rare circumstances, a person who has power of attorney for personal care. If there is any notation on file that a client has indicated a desire for exclusion from any healthcare-related research study, this will be noted and the client will be removed from the list of potential participants.

Under no circumstances will a potential participant in an Intervention group be transferred or recruited to the Control group. Similarly, potential participants in a Control group may not be transferred to an Intervention group. Each sample group will be developed from the specific list provided.

4. **Engagement from Participant Perspective**: From the perspective of the Study participant, their engagement will be based on the following steps:
    1. Telephone or in-person contact by a member of the Paramedic Service serving that geographic area.
    2. Receipt of a simple description of the Study (paper copy of Letter of Information) as described above, along with provision of an opportunity to discuss the Study and ask questions prior to being asked to provide consent. (Appendix E)
    3. Receipt of a paper copy of the consent form, along with provision of an opportunity to review the form with a member of the research team, and request to sign the form to authorize participation in the Study, or indicate refusal/preference for exclusion from the Study. (Appendix B)
    4. Receipt of a copy of the (signed and dated) consent form to be posted in a prominent location in the client's home so that any and all healthcare professionals providing service to that client will be aware of the Study and the client's participation in it.
    5. In-person contact by a Principal Investigator to administer the EuroQol quality of life assessment tool prior to Study commencement. (Appendix F)
    6. (For a representative sample), in-person contact by a Principal Investigator to carry out a semi-structured interview, through which additional qualitative data will be obtained to provide context for the quantitative results. (Appendix G)
    7. In-person contact by a Principal Investigator to administer the EuroQol quality of life assessment tool at the conclusion of the field phase of the Study.
    8. (If client wishes to receive it) Upon completion of the Study, receipt of an executive summary of the Study findings.

5. **Criteria for Premature Withdrawal**: There are four criteria for a client's premature withdrawal from the Study (prior to the completion of the 12 month study period):
    1. Client moves out of the region
    2. Client is deceased.
    3. Client is in hospital with designation for long term care (will not be returning home)
    4. Client makes and notifies the Study of a decision to withdraw for a personal reason. The client is under no obligation to reveal the reason for withdrawal but will be given an opportunity to provide the reason if he/she wishes to do so.

6. **Study Interventions or Procedures:** The control group will receive the <u>usual standard of care/usual practice</u> associated with provision of services by paramedics, hospitals, primary care and other community-based service providers**.** The intervention (CP) group will receive regular home visits from a community paramedic along with services from other community-based service providers as may be warranted or are already in place. Participation in the Study does not affect services delivered by other community-based providers unless the service provider deems a change to be appropriate.

Community Paramedicine (CP) refers to a broad and developing field of paramedic practice focused on proactive and non-emergent activities (within the scope of an Advanced Care Paramedic (ACP) practice) that better influences health outcomes. CP allows these paramedics to apply their training and skills in "non-traditional" roles, largely outside the usual emergency response and transportation to the emergency department. For this study, home visits will typically include initial assessments, ongoing monitoring of key predictors of frequent use of 911 and presentation at hospital Emergency Rooms. Specific services included in home visits would include: wellness checks, vital signs, medication compliance, fall risk factors assessment, timed up and go (TUG) monitoring, blood draws, ECG, postural blood pressure checks (BP) and mini-mental state evaluation.

7. **Information-Sharing Among Service Providers**: Information gathering during a home visit would be shared with others in the subject client's circle of care (e.g. other service providers including the ER) so that it can be part of the client's medical record after the CP program field phase is complete (maximum of one year).

   Other service providers may or may not change their patterns of service provision when the CP program is in place; such changes would presumably only be made as part of the overall care plan for a specific client. Regular paramedic service and Emergency Department, day clinic or in-patient hospital services would still be available to the client if needed.

8. **Risk/Benefit Estimates to Participants:** To date, studies have shown significant decreases in PS, ER and hospitalization usage based on interventions in the home, including but not limited to community paramedicine programs. These studies imply an improved level of overall health and well-being for subject clients but these outcomes need to be studied specifically for community paramedicine. There are no known adverse effects on clients from participation in community paramedicine programs but this possibility will be studied as part of the Economic Value of Community Paramedicine Study. There is generally at least an inconvenience of time for subject client participation (to participate in the home visits); the Study will consider whether this inconvenience is outweighed by healthcare benefits to the subject client.

There is no guarantee of specific healthcare benefits to a client due to participation in the Study. However, a Study client MAY experience a change in medical stability as measured by vital signs or interaction with health care professionals. Medical management may be improved due to more frequent contact by health care professionals, earlier detection of emerging health issues, regular social contact, less stress due to fewer trips to an ER or admissions to hospital, or greater client engagement in self-management of their own care. Community paramedics will share this information with clients and caregivers as well as with other service providers who are part of the individual's care team. Unique and aggregate benefits to clients in this study will be captured through the mixed methods approach, and shared with clients and service providers in the study's final report.

9. **Training Plan:** Premergency Inc. has been retained to develop and implement a "blended training program" for urban and rural community paramedics who will provide this service in both Hastings-Quinte and Renfrew County. (Training for regular paramedics is already well-defined and deployed in both communities). Training participants will be paramedics from Hastings-Quinte Paramedic Service (urban) and the County of Renfrew (rural). The two Medical Directors (Drs. Hayman and Davis) will provide medical directives and management of patients within the five modules.

The outcome of the training program includes five main competencies delivered over approximately 200 hours, and includes both didactic and clinical training. These competencies are organized by module:

i) Module 1 - Community Referral and Home Wellness/Prevention[40 hours]
ii) Module 2 - Geriatric Emergency Management (GEM)
iii) Module 3 - Chronic Disease (CHF, COPD, Diabetes) [40 hours]
iv) Module 4 - Mental Health (Depression, Dementia, Delirium) [40 hours]
v) Module 5 - Palliative Care [40 hours]

Principles and Techniques: The primary principles and techniques utilized for this training will be facilitated through the development of competencies, methods, and systems for community paramedicine in both urban and rural environments. These principles and techniques have proven to be very successful in building collaborative relationships and generating new ideas to identify the competencies of community paramedicine. These competencies provide a meaningful tool to establish learning objectives and outcomes for community paramedic programs.

Blended Learning Approach: This training will develop the education required for community paramedics to respond to older adult patients in both urban and rural environments. This project will utilize the methodology of a blended learning approach, including:

Training Method	Rationale
• Bloom's Taxonomy approach in developing the learning objectives in both classroom and eLearning environments	• Bloom's Taxonomy is helpful to identify how well users comprehend a concept.
• Instructor led/classroom training and eLearning methodology	• Incorporation of face-to-face training and eLearning delivery to enhance learning of the core competencies.
• Patient mentorship within homes, clinics and hospitals.	• Knowledge transfer of competencies to enhance patient care.
• Provide online and practical evaluation techniques	• Validate knowledge transfer and retention.

10. **Adverse Events**: The plan for defining, identifying and managing risks/adverse events, and for reporting of these adverse events is three-fold:

- Definition of adverse events and communication of same to CPs through the training associated with the study; this communication will be part of a broader overview of the study. The key adverse events are expected to be:
  a) 911 call for whatever purpose/ reason;
  b) transport to a hospital ER by any means – paramedic service, by private transport, or by walking or taxi;
  c) admission to hospital;
  d) unexpected/unplanned visit to primary care provider (regular scheduled check-ups are not considered adverse events;
  e) deceased;
  f) events or information which must be reported by healthcare professionals by law; and g) breach of confidentiality.

  For the most part, these adverse events would be detected through the normal data management processes of service providers. However, in the case of CP, adverse events would also be recorded on the subject client visit report. An adverse event check-box and text explanation space will be provided on the visit form.

- For aggregate results only, the Principal Investigators' review of service utilization data will provide an opportunity to report on the overall incidence of adverse events/effects. The EuroQol tool and semi-structured interviews will also provide an opportunity for reporting any such events/effects. If there is any adverse event/effect that by law, must be reported, the Principal Investigators will confirm that this is done.
- If there is a breach of confidentiality provisions or mishandling of confidential subject/client information, any member of the Study team – including but not limited to Principal Investigators – is expected to report the adverse event, in writing, to the Project Manager immediately, who will then inform the appropriate Ethics Board so that corrective action can be taken.

11. Use of Placebo: There is no placebo in this study. Subjects that are not in the intervention group will continue to receive the existing/conventional 911-Paramedic Service.

12. Use of Deception or Nondisclosure: There is no use of deception in this Study. However, it is proposed to seek consent from clients for one specific sample block but not to disclose the existence of the other sample block. The rationale for this lack of disclosure is reduce the possible desire that some prospective Control group clients may have to be in the Intervention group (community paramedicine) and thereby reduce any associated bias that participants may have, based on the group for which they are recruited.

13.Withholding Standard Therapy: The control group (CP) will receive the standard therapy/ medical care (example: transport via standard paramedic vehicle to the Emergency Room of the hospital). There will be no withholding of standard therapy in this study.

14. **Subjects/Participants:** The study is expected to enroll a total of 200 participants, 120 in Hastings-Quinte and 80 in Renfrew. The Hastings-Quinte participants will be recruited evenly into the control group (60) and the intervention group (60). The Renfrew participants will be recruited evenly into the control group (40) and the intervention group (40). The sample sizes have been determined based on the total number of eligible participants in each geographic area, the availability of community paramedics in each area, and the number of clients that a community paramedic is likely to be able to serve each day. These sample sizes have been determined to be feasible in each geographic area through medical record search by the Paramedic Service in each community.

15. **Research Personnel Credentials:** All Paramedic or Community Paramedic personnel involved in the Study must have hospital credentials specifically to allow involvement in clinical research activity. Clinicians with hospital patient care credentials need nothing further. But other hospital or university staff, such as nurses or research assistants do need to apply for hospital credentials for their research activities. Members of the research team must sign confidentiality/non-disclosure agreements, use secure forms of electronic technology (e.g. password protected devices and files), and be willing to have any portable devices screened for any form of biological or electronic contamination.

16. **Informing Healthcare Colleagues**: On behalf of the Study, the principal investigators will inform healthcare colleagues of the details of the study that may involve their patients as participants (e.g. primary care, CCAC or other service providers, hospital staff and paramedics providing service to clients outside of the intervention group). Principal investigators will correspond with healthcare colleagues, particularly providers of primary care, in writing (either electronic or hard copy) subject to any limitations imposed by the consent provided by the subject client. This communication will provide the basis for engagement of healthcare colleagues in the study, the provision of retrospective healthcare utilization data related to that specific client (as deemed appropriate), and establish a mechanism by which healthcare colleagues can receive healthcare service utilization information from the Study.] This healthcare service utilization information is expected to be provided from both the control group and the intervention group.

    There will be a statement in the subject information sheet and consent form addressing a) whether or not the client consents to having his/her primary care physician notified of his/her participation in the study, and b) the other healthcare organizations that will be notified of the client's consent to participate in the study.

17. **Confidentiality and Privacy:** Given the purposes of the study, personal health information (defined as identifying or potentially identifying information about a subject) will be required. The sources of information may be from the client or a proxy (on behalf of the client), from hospital or clinic medical records held by community-based care providers, or from primary care providers. The source of the data will be identified in the master database.

In accordance with Ontario's privacy legislation, subjects will be identified on Principal Investigators' data collection forms or files by non-identifying record ID and Study number only. Therefore research staff will create and maintain a table linking the study number to subjects with subject identifiers on a password protected computer within their research setting.

The Principal Investigators will need to assess all the medical charts to ensure that clients included in the data analysis have not had withheld/withdrawn their consent to participate in research activities. If consent has been withheld, then the chart will not be further assessed and any collected data on that subject will be destroyed permanently. Where there is a requirement for direct contact with clients to collect any additional research data, the Principal Investigators will gain consent to additionally access their medical record. Note that it is the service provider controlling access to the data who must obtain prior consent for clients to be contacted directly. When subjects are actively participating in the research Study, it is important to obtain consent to extract personal health information through various sources (e.g. medical charts, client's primary physician, etc.) through the client information and consent form.

Personal health information will be used as variables integral to the analysis (example: age, gender, approximate geographic location/urban or rural, presence of chronic conditions). This information will also be linked to other databases held by other service providers (beyond the Paramedic Service). When the data is held in electronic form, it will be transferred into the master database electronically by the principal investigators. When the data is held in paper/hard copy format, it will be transferred directly into electronic form by the principal investigators.

18. **Study Monitoring and Associated Professional Credentials**: The Study, including the research design and methodology, has been approved by the sponsor, the Canadian Safety and Security Program (CSSP - Government of Canada). The Study charter has also been approved by both CSSP and the local sponsor (County of Hastings) and stakeholders directly involved in the execution of the study. A Partners Group, functioning as a Steering Committee, has been active from the study's inception and continues to review and provide feedback on study documentation. The Partners Group includes representatives from paramedic and community paramedic services, hospitals, Community Care Access Centres, and the primary care sector. There are also two MDs providing medical direction to the CP component of the study – one each in Hastings-Quinte and Renfrew. These medical professionals are also members of the Partners Group and already have the required credentials from their respective hospitals. Finally, the Principal Investigators, one of whom is an MD, are retained as third parties and are not employees of any of the partner organizations. Nor are they employees of any level of government (municipal, provincial or federal) The Principal Investigators will not provide any medical service but will be accessing records of medical services rendered; they will therefore carry out their research responsibilities under the authority of the informed consent obtained from clients, and a non-disclosure agreement (NDA) signed with the Study sponsor.

    The Study charter calls for a series of (interim) technical reports on the study but these are anticipated to be reports on the progress of executing the study and related 'early learnings' rather than interim reports on outcomes. The latter reports would be inappropriate for a study

that anticipates up to a year in field. Secondly, the sample sizes are relatively small (120 and 80 subject clients in Hastings-Quinte and Renfrew counties). As a result, interim results could be misleading and would be incomplete since they would not include the 'post' EuroQol results. Only after completion of the field stage would any data analysis and assessment of economic or healthcare outcomes be undertaken. Interim reports (technical reports) will be provided according to the milestone schedule set out in the project charter and reviewed by the CSSP project manager. All project reports will be submitted by Kathryn Wood on behalf of the research team (Wood, Ashton, Duffie). See Signature Page for additional details on personnel providing oversight on this study.

The role of a data safety monitoring board, an expectation for RCTs, will be filled by the Partner Steering Committee, all of whom are independent of the Principal Investigators. Partner Committee members have been selected to ensure representation of service provider organizations that are active in the specified areas. However, they will not have any direct role in conducting data analysis or preparing reports. None of the Committee members have collaborated on research projects/publications with research team members in the previous five years.

19. **Conflict of Interest Considerations**: There are no known conflict of interest considerations associated with this Study. Through separation of service delivery and research analysis, potential conflicts with or affect on healthcare-related responsibilities to the subject clients will be mitigated.

20. **Data/Information Collection and Storage:** Record-level Study information related to service provision will be collected manually by Principal Investigators based on a review of client files on a quarterly basis (retrospective data/study commencement plus four three-month periods, the last of which after a maximum of 12 months of participation in the Study). The purpose of interim data collection is for data quality assurance purposes only (e.g. to ensure that all required data is being collected and reported) and for tracking of overall progress against the research design and methodology; interim data collection will not be used to generate interim reports/results.

    Depending on the source of the information (e.g. PS, ER, HealthLinks, CCAC), some of these files are currently in electronic form while others are available in hard copy form. At all times, information transfer will be executed in a single step (to reduce probability of errors) and a randomly selected subset will be verified by a second member of the research team to ensure that information has been transferred correctly. All information will be gathered and/or transformed and stored as secure electronic files. At no time will copies of client records be made and taken from the source repository.

21. Use of Record (Study) ID: Record-level retrospective and field data will be stored in a separate (from ongoing health care services/case management) database maintained by the Principal Investigators. Each client record will be given a record (study) ID that is different from any identifying information and a concordance will be held separately from the aggregated Study database. The same identifier will be used to link the aggregated Study database to EuroQol data and semi-structured interview information. Use of an anonymous record ID will allow the principal investigators to provide the project sponsors with a copy of the database upon the completion of the Study; the principal investigators will also retain a copy of the database so as to be able to answer follow-up questions to the original Study. The concordance file will be provided to the project sponsors and destroyed by the principal investigators.

22. Activity-Based Cost Information will be obtained based on consultation with financial authorities with each of Hastings and Renfrew Counties (that handle finances for their PS services), the hospitals in each county, the CCACs, and primary care/HealthLinks. These data will not be derived from patterns of record-level service data but would be used to generate average costs for a specific service. Bringing together these averages with record-level retrospective and field data will provide the basis for estimating the economic value of community paramedicine in each of the two counties. The data will be used to calculate annual per-client costs of service under the each of the baseline scenario (control group) and the experimental (intervention) group. Activity-based cost information will be incorporated into the same database as record-level health service utilization data to permit economic value modeling. They will also be deployed in inferring the economic value of community paramedicine across the province.

23. Protection of Data: Individual subject client data (healthcare information and/or adverse event data only) will be shared with other healthcare providers within that client's circle of care. However, none of the individual subject health care, annual cost-of-service-utilization data, or adverse event data will be shared beyond the appropriate healthcare providers. Other members of the Study team will only receive aggregate results or typical client profiles with any/all identifying data removed (e.g. name or initials, age, birth date/month/year, address or geographic location). Such profiles will be a composite of multiple individual clients and will be used only to explain key findings or underpin Study findings.

24. **Data Retention Policy**: Data will be retained consistent with Canadian Institutes of Health Research (CIHR) requirements (although this is not a CIHR-funded study). CIHR requires grant recipients to retain original data sets for a minimum of five years after the end of the study. This applies to all data, whether published or not. Source: CIHR Policy on Access to Research Outputs, September, 2007; http://www.cihr-irsc.gc.ca/e/34846.html#5. The data for this Study will be stored in a secure form for the five year period and then destroyed.

25. Payment to Study Participants: There are no payments to be made to Study participants.

26. Funding: Funding for the study, in the amount of $660,000 cash and $342,250 in-kind, has been obtained from the Canadian Safety and Security Program – Government of Canada.

27. Contract: The County of Hastings is the contract administrator. The primary contact for financial matters is: Susan Bell, County of Hastings Treasury Department. Through the Hastings-Quinte Paramedic Service, two contracts have been formalized to implement the study:

- Premergency Inc. (for training)
- Natural Capital Resources Inc. (for technical writing/research)

Implementation of the portion of the fieldwork slated to take place in Renfrew County is accomplished by transfer of budgeted funds to the Renfrew County Paramedic Service based on agreed upon costs for such service.

The County of Hastings receives funding from the Government of Canada following the completion of specific milestones and the associated deliverables (described below):

- Technical Report – Needs Analysis (September 30, 2014); milestone met.
- Technical Report – Retrospective Data Analysis and Selection and Education of Paramedics (December 31, 2014)
- Technical Report – Initial Start Pilot Data Collection (March 31, 2015)
- Technical Report – Mid-way Pilot Collection (August 31, 2015)
- Technical Report – Final Pilot Data Collection (December 31, 2015)
- Technical Report – Data Analyses and Final Report (March 31, 2016)

All contracts specify the compensation for engaged services.

28. Publications/Dissemination of Results: The project charter describes the intended publications and dissemination of results:

Goals	Audiences	Strategies
• Increase knowledge/awareness of the economic value of community paramedicine • Inform future research aimed at developing evidence-based community paramedicine programs	• Operators of paramedic services • The Paramedic Chiefs of Canada • Paramedic unions • Paramedic professional associations • Paramedic preparation/training providers • Health care professionals developing programs for paramedics • Researchers • Hospitals • Other healthcare partners • Regulators	Dissemination: • Plain language summary report (Target: All) • Face-to-face briefings (Target: Chiefs, union representatives; professional association representatives) • Journal article(s) (Target: Researchers Diffusion: • Conference presentations (Target: Chiefs, union representatives, professional association representatives, researchers) • Website posting of economic value of community paramedicine (via professional associations and paramedic chiefs --- with permission) (Target: paramedic preparation programs, healthcare providers)

Note that the study will not recommend or set service levels for each municipality or any of the study partners. Rather the study will inform policy and identify the economic values of community paramedicine for each organization to consider when deciding on patient care delivery models. Findings on healthcare cost savings or otherwise will be part of the final report.

29. Liability: All parties with roles in service delivery, the management or execution of the Study carry appropriate levels of liability insurance. In all cases, the coverage included both Errors and Omissions and corporate liability insurance, and is a minimum of $2 million per claim. Without limiting the foregoing, liability coverage is in place for:

a. Both Hastings-Quinte and Renfrew Paramedic Services

b. Principal Investigator Kathryn Wood, President and CEO of Natural Capital Resources Inc. carries $2 million in coverage and is a voluntary registrant of the Workers Safety and Insurance Board (Ontario).

c. Premergency Inc.

d. County of Hastings.

30. Investigational Drugs or Devices: This Study does not include any investigational drugs or devices. It is solely a study of service provision by a relatively new type of healthcare professional (community paramedic), at a known site (client's home). Because of the setting, there will be an opportunity to address behavioural issues such as medication compliance and organization, nutritional and eating habits, physical activity, and in-home safety in combination with monitoring of chronic conditions and associated health services. Many of these different approaches to care, especially in combination with the setting, may lead to an improvement of the client's quality of life.

31. Handling and Disposition of Study Drugs: This Study is not a clinical drug research study; it uses standard care protocols, diagnostics, medications and other interventions.

32. Exclusion of Clients from Participation in Simultaneous Research Studies: Enrolment in multiple studies might compromise scientific validity of the studies or affect client care. It may also be overly burdensome for some clients. Any individual client may be enrolled in only the Economic Value of Community Paramedicine study; he/she may not be enrolled in any other research study under way at the same time.

33. Protection of Research Staff: Standard safety protocols are expected to be utilized for Paramedic or Community Paramedics providing service to participants of the Study. Any research staff that will be visiting clients in their homes (anticipated only for administration of EuroQol tool and semi-structured interviews) will consult in advance with the appropriate Paramedic or Community Paramedic to make an assessment of any risks to the physical or reputational safety of staff. If necessary, a second member of the research team will accompany the designated researcher on visits to the home for research purposes. If in the opinion of the Paramedic or Community Paramedic, there is sufficient risk of harm to the researcher(s), the Principal Investigators will determine an alternative strategy such as accompanying a Community Paramedic or substituting another participant (e.g. in the selection of the representative sample for semi-structured interviews.)

34. Study Governance: There are six levels of governance and oversight for this Study.

- Operational-level Project Management is provided through the Paramedic Services in each of Hastings-Quinte and Renfrew counties.
- Medical direction is provided by the heads of the Emergency Departments for Quinte Health Care and Renfrew-St. Francis Hospitals. These individuals Dr. Chris Hayman (QHC) and Dr. Kristian Davis (Renfrew)
- Research Study Oversight is provided by a Partners Committee composed of representatives from all major healthcare service providers (Paramedic Services, hospitals, CCACs, HealthLinks/Primary Care etc.)
- Financial oversight is provided by the County of Hastings for the entire Study and by each of the counties (Hastings and Renfrew counties) for the utilization of Study resources in those communities.
- Research Ethics Management will be the responsibility of the Principal Investigators
- Principal Investigators, who are independent of the sponsor, Kathryn Wood, Chris Ashton, and Denise Duffie.

35. Specific Request to Ethics Boards: The Economic Value of Community Paramedicine study hereby requests approval to proceed from the Ethics Boards of Quinte Health Care and Renfrew-St. Francis hospitals This approval would be taken to mean that Principal Investigators can work with hospital staffs for sample selection purposes and to access data on subject clients (once informed consent has been obtained). Approval will also allow Principal Investigators to proceed to obtaining Informed Consent from clients; the Principal Investigators can then work with other service providers (CCACs, primary care, Health Links) to gather data on their provision of services to subject clients.

36. Signature Page

Contracting Authority: _____
Jim Pine, Corporation of the County of Hastings

Project Champion: _____
John O'Donnell, Hasting-Quinte Paramedic Service

Project Manager: _____
Mike Slatter, Hastings-Quinte Paramedic Service

Medical Directors: _____
Chris Hayman, MD – Quinte Health Care

_____
Kristian Davis, MD – Renfrew-St. Francis Hospitals

Principal Investigator(s):_____
Kathryn Wood, BA (Hons), BSc (Hons)

_____
Chris Ashton, B. Eng, MD, MBA (Finance), MACP (c)

_____
Denise Duffie, BBA, MBA

Partner Steering Committee Member: _____
Doug Socha, Canadian Safety and Security Program

37. Appendices:

A. **General Description of Project (available for sharing with other stakeholders)**

B. **Informed Consent Form, including Letter of Information (LOI)**

C. **Subject Client Information Sheet (used for both intervention and control group subjects)**

D. **Recruiting script (to be used by Paramedics and Community Paramedics and Research Team in contacting clients to introduce Study and advise of informed consent process)**

E. **Description of Study to Be Provided to Potential Participants**

F. **Description of EuroQol Tool as well any supplementary data to be obtained at the same time**

G. **Questions for Semi-structured Interviews**

A Request for Your Consent
To Participate in a Health Care Research Study

December 2014

Dear Client:

A research study is about to begin in our community. You may have received a phone call or a visit from a member of your Paramedic Service telling you about it. This Letter is to provide more details and to make sure you have answers to any question you might have about the Study.

The Study is about the way that people use our local healthcare services. We want to know if there is a better way to serve people with chronic health conditions who make frequent use of 911 and ambulance transfer to hospital Emergency Rooms.

We are asking if you would be willing to participate in the Study. Your name was randomly selected by our Paramedic Service to take part in the Study. We encourage you to read through the attached Letter and share it with family members, your family doctor and other caregivers. That will help you come to a decision about participating that is the right one for you.

If you do decide to be part of the Study, you will need to sign a document called Informed Consent. There is a copy of this Consent document included in this package. There is a place on that document where you can tell us if you do or do not want to be part of the Study.

In a few days, you will receive a phone call from a member of the research team to see if you want to take part in the Study or if you need more information before you decide. The researcher will provide that information, ask if you are ready to make a decision, and whatever decision you make, make arrangements for us to get your signed Consent form. You will receive a copy of the form to keep in your home.

Here are just a few points you should keep in mind in considering whether to participate in the Study:

1. There are no experimental drugs or treatments in this Study.
2. You don't have to pay for anything.
3. You don't have to go anywhere to take part in the Study.
4. Any information you provide or authorize someone else to provide will be treated as private and confidential.

5. Whether or not you take part in the Study, you will continue to be eligible for the same healthcare services as you are eligible for now…. 911, hospital, in-home support services, your family doctor, and so on...
6. If you do decide to take part in the Study and later on decide that you don't want to continue, you can withdraw at any time.

For this Study, we are asking for permission to:

1. Obtain information about all the healthcare services you have used over the past 12 months. We would be asking organizations --- like the hospital, Community Care Access Centre, or primary care providers like your family doctor ---- to tell us what services you've been receiving. We would also want to continue to obtain this kind of information over the next year (up to December 31, 2015). Again, all of this information will be kept confidential. It's just so we know what kinds of health services someone with your health conditions needs.

2. We would send a member of the research team to talk to you at home about how you feel about your quality of life and your state of health. We'd talk to you at the beginning of the Study and at the end so we can understand what if anything has changed in your ability to maintain your health.

For half of the people who decide to enroll in the Study (selected at random), a specially trained healthcare professional, called a Community Paramedic, would visit you at your home to help you maintain your health. You may or may not be selected to receive this added service. The Community Paramedic would visit you regularly for up to a year. This is so we can understand if having more home visits would reduce the need to call 911 and go to the Emergency Room at the hospital.

Thank you for taking the time to read this Letter and consider taking part in the Study.

Yours truly

John O'Donnell
Acting Chief, Hastings-Quinte Paramedic Services

INFORMATION ABOUT THE STUDY

Name of the Research Study: The Economic Value of Community Paramedicine

Where the Study Will Take Place: The Study will take place in the urban areas of Quinte (the Cities of Belleville and Quinte West) and in the rural areas of Renfrew County. Both areas are in Eastern Ontario, Canada.

What is the Study About? The Study will look at how people that have chronic health conditions use healthcare services – from 911/ambulance and hospital services to family doctors, clinics and home services provided by local agencies. Some clients who participate in the Study will also receive home visits from a healthcare professional known as a Community Paramedic. The costs and impact on clients' health care of this added service will be compared to the way services are provided to clients today.

The results of the Study will be used to help municipalities, paramedic services, hospitals and other healthcare providers decide if it would be beneficial to deliver home-focused healthcare using Community Paramedics. ***The Study results will <u>not</u> be used to reduce overall levels of service for any individual client or community.***

Who Is Sponsoring the Study? The Study is being sponsored by the County of Hastings, on behalf of both Hastings and Renfrew Counties.

Who is paying for this study? This study is being paid for by the Canadian Safety and Security Program (Government of Canada). The CSSP is supporting the Study as a contribution to the Community of Practice for Emergency Medical Services (Paramedic Services) in Canada. The CSSP strives to connect and protect practitioners, build strong communities, and support evidence-based policy.

Under no circumstances will you or your family be asked to pay for any healthcare services provided as a result of participating in the Study.

When is the Study Taking Place: If you decide to participate in the Study and sign the enclosed Informed Consent form, the research team will begin gathering background information right away. However, the part of the research involving service delivery to clients will not begin until January of 2015 and will end in December of 2015.

Why is This Research Study Being Done? As Canada's population ages and more and more people have chronic conditions, people are using the healthcare system more often and more intensively. As a result, paramedic services, hospitals, family doctors, and community-based health care agencies are finding it harder to meet the growing need for care.

The age profile of the two communities involved in this Study (Hastings-Quinte and Renfrew County) have higher proportions of older citizens than the provincial or the national average and are already seeing the increased need for care. There are also patients in hospital beds who may be better cared for at home or in the community if the needed supports were in place.

This Study is to find out whether a type of home-based service known as Community Paramedicine could be used to provide care at home and if doing so would be a better use of healthcare dollars for at least some people.

Who is Doing the Research? The people conducting this research study are called Principal Investigators. They have been hired by the County of Hastings to make sure the research is conducted fairly, accurately, and with full respect and assurance for client safety and confidentially of any information collected in the study. There are also Co-Investigators who make sure that healthcare services are being delivered to clients as needed and according to Study rules.

For this Study, the **Principal investigators** are:

- Kathryn Wood, B.A. (Hons), B.Sc. (Hons), President and CEO, Natural Capital Resources Inc. Kathryn is an experienced researcher and has been hired to direct this research study and report on its findings. She has no financial or proprietary interests related to the specific results.
- Christopher Ashton, B. Eng, MD, MBA (Finance), HarbourFront Health Group, MACP (c) and Denise Ashton-Duffie, BBA, MBA, HarbourFront Health Group, are working with Kathryn on the study. They are private consultants with experience in primary care research and evaluation. They have no financial or propriety interests related to the specific results.

The **Co-investigators** are:

- John O'Donnell, Acting Chief, Hastings-Quinte Paramedic Services
- Mike Slatter, Acting Deputy Chief, Hastings-Quinte Paramedic Services
- Carl Bowker, Deputy Chief, Hastings-Quinte Paramedic Services
- Mike Nolan, Chief, Renfrew County Paramedic Service
- Michel Ruest, Deputy Chief, Renfrew County Paramedic Service
- Doug Socha, Canadian Security and Safety Program (on secondment from Hastings-Quinte Paramedic Services)

All co-investigators are members of your local Paramedic Service and are contributing their time at no extra charge to the Study sponsors.

How Many People Will Take Part in This Study? There will be 200 people taking part in this Study: 120 in the Hastings-Quinte area and 80 in Renfrew County.

How Do The Researchers Decide Who Should Be In the Study? To determine who should be part of the study, the Paramedic Service in your area put together a list of all the people who had used the Paramedic Service to go to the hospital Emergency Room at least three times in the past 12 months and have at least one chronic condition such as a heart problem, stroke, high blood pressure or diabetes. From this list, they randomly selected 200 people to participate in the study (120 in Hastings County and 80 in Renfrew County).

Your name was on the list of people who had made use of 911 and a hospital Emergency Room multiple times in the past 12 months and we understand that you have at least one --- maybe more than one --- chronic condition. When doing the random selection, we went down the list, choosing every 4th name on the list for possibly being part of the Study. Your name was one of those selected. In other words, you had a one in four chance of being selected… and you were.

Do I Have To Take Part in the Study? No. Your participation in this study is <u>voluntary</u>. You are not required to take part. Be assured that whether or not you decide to participate, you will <u>continue to have the right to receive service</u> from the Paramedic Service and/or your local hospital Emergency Room as your health condition requires it…. Just like you do now.

What Will Happen if I Take Part in This Research Study?

If you decide to take part in this study, there will be no change to the way you currently receive healthcare. You will continue to receive service from your family doctor as you do now. You will continue to receive the same service from 911, your local paramedic service, and your local hospital as you do now. You will continue to receive services from community-based agencies in the same way you would if the Study were not going on.

Here's what we will be asking Study participants to do:

1. You will be asked to provide permission for the Study research team to obtain information on the healthcare services you received over the past 12 months. You do not have to provide any of this information yourself. If you agree, the information would be provided to us, by the Paramedic Service, your local hospital, your family doctor or health team, HealthLinks, and any community agencies that provided service to you in the past year. The Community Care Access Centre and the services that provide home-based care for you are examples. If you agree, we will also ask for information from those organizations over the next 12 months so we will know what healthcare services you are using within the Study period, and how, if at all, your health is changing.

2. You will be asked to participate in a brief interview at the beginning and end of the study. A member of the research team will conduct the interview with you at your home at the beginning and end of the Study. You do not have to go anywhere. You can have a family member, friend or caregiver with you for the interview. The purpose of this interview is to give you an opportunity to tell us how you feel about your quality of life at the start and the end of the Study. This interview uses a very short questionnaire (six questions) to which you can just check a box to give us your answer. You will not be asked to write out any answers. A research team member will go over the questionnaire with you and answer any questions you might have about the questionnaire. We think you will be able to do this interview in 15 minutes or less.

3. Some clients will also be given a chance to talk to a member of the research team about who helps you with being able to stay in your home, and maintaining your health and your home. This interview is a conversation in which we ask you a few questions and you just tell us your answers. All you need to do is talk with us. The

research team member that visits you will write down your answers and treat this information as confidential. Only the overall conclusions from all of these discussions will be reported in the final analysis. You will not be identified personally and your name or other identifying information will not be written on the interviewer's notes. That discussion is likely to take 20 to 30 minutes at the most.

4. Some clients – selected at random from those who agree to be part of the Study – will receive home visits from a paramedic with special training to provide you with some additional healthcare services at home. You may or may not receive this added service. This person is called a Community Paramedic. If you are selected to receive this added service, the Community Paramedic would come to your home regularly to check on your health and help you decide how best to maintain your health. The number of times they visit will be determined when the Community Paramedic visits you for the first time. The frequency of the visits may change as the Study progresses, based on your state of health.

   During a home visit, the Community Paramedic will check your blood pressure, weight, blood sugar (glucose) levels (if you are diabetic) and other similar 'vital signs'.

   The Community Paramedic can help you with regular needs such as changing bandages and keeping medications organized.

   The Community Paramedic can also talk with you about the kinds of things you can do to help maintain or improve your own health and they can answer a lot of questions about what you should do about any health concerns you might have at the time of the visit.

   If you should ever need to talk to another health care professional (your family doctor, a personal support worker or anyone else who is part of your care team), or to be taken to the hospital, the Community Paramedic can help you with that too.

   Each visit may last for 20 to 30 minutes but the Community Paramedic will take as long as needed to make sure your health concerns are addressed. Some visits may be quite short and others may be longer.

   To make sure your healthcare is well-coordinated, the Community Paramedic visiting you at home would have access to your medical records from other local

healthcare organizations. Examples are previous calls to 911, trips to or stays in your local hospital, the CCAC and primary care providers. The Community Paramedic will provide a report on each visit to other health care professionals who are part of your care team (such as your family doctor or the Community Care Access Centre). That way, everyone who helps you maintain your health will know how you are doing.

There are no new or experimental drugs being used in this Study. Any drugs, medications or medical devices used by Paramedics or Community Paramedics are approved and in use in the Canadian health care system. Your consent will be sought for any of these drugs that are needed in the study. Any change in your current medication(s) would only take place at the direction of your family doctor or a hospital physician (for instance if you were seen in the Emergency Room). A Paramedic or a Community Paramedic may give you a medication to keep you stable until you can be seen by a medical doctor but any medication of this type is already approved for use in Canada and the Paramedics are trained and approved to administer it. There are no new or experimental drugs associated with this Study.

How Long Will I Be In This Study? If you agree to participate, you will be in the Study for a maximum of 12 months. Several weeks before the client participation phase begins, the research team will gather information about your use of healthcare services over the past 12 months. Data analysis will be conducted after the 12 month period has ended.

What Happens if I Don't Take Part in the Study? If for any reason, you can't or don't want to be part of the study, that is alright. You are not required to do so and you will continue to receive health care services as you are now. If you do not want to be part of the Study, all you need to do is tell us that and we'll make a note of that decision so you won't be asked again. An easy way to tell us is to sign the part of the Informed Consent document marked decision not to participate.

Can I Stop Being In the Study? Yes. If you decide to participate in the study, you have the right to withdraw from the study at any time for any reason. You are not required to tell anyone why you are withdrawing but you may tell the research team if you wish to do so. If you should withdraw, your family doctor or other service providers would be notified.

What Side Effects or Risks Can I Expect from Being in the Study? Because you will continue to receive the same healthcare services you do now, there is very low likelihood of any side effects from participating in this Study. If you are selected for having Community Paramedics monitor and assist you with your health needs (an added service in your home), there is very low likelihood of any side effects from participating in this Study.

The risks of participating in the Study are limited as well and are considered to be inconveniences rather than risk or harm:

- You will be asked to devote a limited amount of time (less than an hour at the beginning and end of the Study) to filling out a questionnaire and talking to a member of the research team. The research team member will come to your home at a time that is convenient to you.
- If you are selected to have a Community Paramedic visit, you will be asked to have this person come into your home on a regular basis to assess your state of health. This will take a few minutes of your time each visit – probably half an hour each time. There is a risk of receiving inappropriate care from the Community Paramedic but this risk is considered to be quite low. There are no reports of Community Paramedics creating harmful or unfavourable (adverse) health effects. The Community Paramedic is trained to provide specific types of health care in the home, and is also trained as a conventional paramedic. The Community Paramedics are therefore qualified to handle emergencies as well as make these regular home visits.

Whether you are in the Study or not, you will have the same access to emergency services (911/ambulance or hospital services) that you access now.

Are There Benefits to Taking Part in the Study? For you, there may be no direct personal healthcare benefit. There may be a direct personal health care benefit to many participants in the Study as a result of having a better understanding and management of their health condition and all health care professionals involved in your care may have more complete and timely information on your health status. However, this cannot be guaranteed.

You will be contributing to a better understanding of how different healthcare providers can work together to meet the needs of people like you that have needed to call 911 and go to the hospital frequently. A major part of the results of the research will be a better understanding of how to provide these services in the most cost-effective way and make the best use of our healthcare expenditures. This could result in changes in the way healthcare services are provided not just in your community but in other parts of the province too.

If you would like it, we will provide you with a summary of what we've learned from the research. Bear in mind that none of the results will mention you specifically or change your ability to access services as you do now. Just let us know if you would like to receive the summary report. It will not be available before the summer of 2016 because the Study will run through to the end of 2015 and results will be analyzed and reported after that.

What Other Choices Do I Have If I Do Not Take Part in This Study? If you decide not to take part in the Study, you will still be able to access all the same services you use now. Whether you participate or not, you will still have access to your family doctor, the local paramedic service (by calling 911) or the hospital Emergency Room. If you need to be admitted to hospital, you will still be admitted. Whether you participate in the Study or not, you still have access to healthcare services in the same way as you to today.

Will My Information Be Kept Private? Any information about you, your medical condition(s), status of health, services provided by a healthcare professional participating in the Study, or information you provide to a member of the research team in interviews will be kept private and confidential. The only exceptions to this rule are:

- If the research team was required by law to turn over medical records. There is no legal privilege between a research Investigator and a research client as there is between a physician and patient or a counselor and client. Although it is a rare occurrence, research records could be subpoenaed for a court case. If that happened, we would be obligated to turn over requested records.
- If the research team or healthcare professionals providing service discovers illegal activity associated with your care or taking place within your home.

- If the research team or healthcare professionals providing service are required by law to report specific information that comes into their profession. An example would be physical abuse or intent to hurt yourself or others.
- If a regulatory agency is legally entitled to view the records of the Study and asked to do so.
- If the funder of the Study (the Canadian Safety and Security Program - Government of Canada) was doing an audit of or evaluating the project (the Study) and we were required to show them the records to substantiate that the funding was spent as approved.

We take very seriously the responsibility to protect your privacy and the confidentiality of your information. For this study, we will:

- Have all members of the research team sign confidentially agreements.
- Gather and store all information in secure electronic files. At no time will copies of client records be made and taken from the files of the healthcare provider that normally maintains these client files. Similarly no client records will be transferred to or from the research team using email.
- Use an anonymous code on documentation and any information that is provided to the research team. That way, your name or any other identifying information will not be part of research data file. In addition, no identifying information will be used in any reports, presentations or articles about the Study. Please note that your name will be recorded on records associated with healthcare services you receive. The professionals delivering care will use the same procedure as if you were receiving services but were not part of the study).

This agreement to confidentiality on the part of the research team does not limit you in any way in speaking about the Study or your participation in it. If an insurer, employer, or other person obtains your written consent to receive your personal information from the Study, then the research team will provide it.

What Are the Costs of Taking Part in This Study (Costs/Financial Considerations): There are no costs to you for participating in this Study.

Will I Be Paid for Taking Part in This Study? (Payment/Reimbursement) No. You will not be paid for taking part in this Study.

What Happens If I am Injured Because I Took Part in This Study? Because the healthcare professionals who will be providing care to you are qualified and trained to provide the services they will deliver in the Study, there is no more risk of injury than would be the case when receiving standard service (for instance, being transported to hospital in an ambulance, being seen by an Emergency Room physician, receiving care from hospital nurses or doctors if you were admitted to hospital). Any injury would therefore be handled just as it would be if the Study were not going on.

Community Paramedics will not transport patients to hospital or to any other form of care (such as a visit to your family doctor). If an ambulance is needed, this service will be provided by your regular paramedic service.

What Are My Rights If I Take Part in This Study? You have the freedom to choose to participate in the Study or not. Either way, you retain the same right to healthcare services as others who have similar chronic medical conditions. You also have the right to be informed on any new information or changes in the Study that could affect your health or your willingness to continue in the Study.

Who Can Answer Further Questions About the Study? If you have any questions about the Study, either now or while the Study is under way, please get in touch with:

Anyone in the Belleville-Trenton area may call:
Mike Slatter, Acting Deputy Chief, Hastings-Quinte Paramedic Services:
613-771-9366 ext 226
Email: slatterm@hastingscounty.com

Carl Bowker, Deputy Chief, Hastings-Quinte Paramedic Services:
613-771-9366 ext 225
Email: bowkerc@hastingscounty.com

OR:
Kathryn Wood, Principal Investigator:
613-376-6006
Email: kwood@ncronline.ca

Ethics Board Letter of Approval – Quinte Health Care

Quinte Health Care
Belleville General
265 Dundas Street E.
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T: (613) 969-7400
F: (613) 968-8234

Quinte Health Care
North Hastings
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P.O. Box 157
Bancroft, ON K0L 1C0
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F: (613) 332-3647

Quinte Health Care
Prince Edward
County Memorial
403 Main Street E.
Picton, ON K0K 2T0
T: (613) 476-1008
F: (613) 476-0600

Quinte Health Care
Trenton Memorial
242 King Street
Trenton, ON K8V 5S6
T: (613) 392-2546
F: (613) 392-3749

Our Vision: "Exceptional Care, Inspired by You"

January 13, 2015

Mr. John O'Donnell, (A) Chief
Hastings Quinte Paramedic Services
111 Millennium Parkway
Belleville, ON
K8N 4Z5

Re: Economic Value of Community Para-medicine Study

Study Approval Date: December 30, 2014
Study Expiry Date: December 29, 2015

QHC REB Approval # 2014-08

Dear Mr. O'Donnell

Your application for a research ethics board review for the above noted study was conducted by members of Quinte Health Care's Research Ethics Board. The members provided an expedited review of the application and are satisfied with the responses received from you regarding consent.

I am therefore pleased to advise you that the study was approved by Quinte Health Care's Research Ethics Board as of December 30, 2014.

Upon the anniversary of the above study's approval, Annual Renewal is required. We will contact you a few months prior to the renewal date and provide the necessary forms to fill.

Please advise the REB of all adverse events that occur during the course of the study, and or any deviations from the approved protocol.

Quinte Health Care Research Ethics Board is in compliance with the ICH Guidelines and the Tri Council Policy Statement for Ethical Conduct for Research Involving Humans.

Sincerely

Karen Smith, Co-Chair
Research Ethics Board
Quinte Health Care

Ethics Board Letter of Approval – Renfrew Victoria Hospital

RENFREW VICTORIA HOSPITAL

January 28, 2015

Mike Nolan, Chief
Emergency Services Department
9 International Drive
Pembroke, Ontario
K8A 6W5

Dear Mike:

RE: Economic Value of Community Paramedicine

Thank you for sending the information on the research study "Economic Value of Community Paramedicine" to the Board Ethics Committee at RVH. The committee is only required to approve studies within our hospital setting.

However, the Ethics Committee did review the study for information and discussion. We understand that this study does not affect hospital care but was merely brought forward for awareness of studies taking place in the community.

We see no areas of the study that create concern for the hospital and appreciate you sharing this information with our Committee.

Thank you and we look forward to reviewing the findings from this study.

Sincerely,

Chris Ferguson

Chris Ferguson
VP, Patient Care Services on behalf of
RVH Board Ethics Committee

Appendix F – Sample Selection and Assignment Protocol

The RCT sample were selected and assigned to one of the four sub-groups through application of the following protocol:

1. Generate list of all PS clients: For each of the two Areas (Hastings-Quinte and Renfrew), generate a list of all clients of 911-PS services who actually used that service for transport purposes three (3) times or more in the 12 months preceding potential entry into the trial. This will most likely suggest a July 2013 to July 2014 timeframe (to allow enough time for sample selection and recruitment of participants into the Study, the fieldwork for which is expected to begin in early January 2014. Note that in Hastings-Quinte, the list will be focused on the urban areas (the cities of Belleville and Quinte West) Frequent clients of Paramedic Services in the rural areas of North Hastings or in Prince Edward County are not included because they are not part of any of the Area's sample blocks. County of Renfrew's list will be drawn from the rural areas of the County.

2. Sort the list by frequency of use of 911-PS service for transport purposes (e.g. highest frequency clients first, declining to lowest frequent clients; 3 PS calls in 12 months).

3. Filter or remove from the list any clients who:
   i) Live in a long-term care facility (individuals living in a retirement residence in either independent living or assisted living accommodations are eligible for participation)
   j) Were visiting in the area at the time but do not live there permanently.
   k) Were living in the area at the time but have since moved to another municipality.
   l) Have no available local retrospective health care data for the 12 months preceding their enrolment in the study
   m) Do NOT have any of the following five chronic conditions (CHF, COPD, diabetes, hypertension, stroke)
   n) Have significant physical or mental disability
   o) Are deceased.

   Note that high-frequency PS service clients are eligible to participate in the study whether or not they:
   - Have a family doctor/physician or are served by a Family Health Team
   - Are already receiving services in the home from community-based services via CCAC (e.g. Meals on Wheels, Personal Support Worker, Nursing support etc.)
   - Have caregiver support (family, friends, neighbours)
   - Have in-home technology supports such as Lifeline or OTN/Telus RPM.

   Although not used as filters for participation, these characteristics will be noted on the client record for later use in data analysis. They will also form part of the description of the aggregated sub-samples.

4. Provide the filtered lists to relevant hospital authorities and work with them to cross-check the list of potential study participants against high-frequency users of the hospital's Emergency Room(s). It is expected that all of the high frequency PS users will also be high frequency users of Emergency Rooms. This study is focused on the client group that uses both services with high frequency (3 or more visits in a twelve-month period).

5. Draw the full sample: For each master list (there should be two – one for each of Hastings-Quinte and one for Renfrew), divide the total number of potential participants on the list by the desired sample size for

each block. Cut the resulting numbers in half and if necessary round up to the nearest single digit. This increases the total size of the sample drawn to account for refusals or other reasons why a client may not be able to participate in the study. Designate this number as your sample sequencing number ("S"). For instance, if the sequencing number is 2, every 2nd person on a list would be selected for participation in one of the experimental/study groups (intervention) or the control group (no intervention).

6. Pick a random starting point between 0 and your sequencing number (2), say 2, and go to the second name on the list. Select that client and assign them to the CP experimental/study group. Then count down to the 4th client to identify the next candidate to be selected for contact to participate in the Study. Assign this person to the Control Group. Then count down to the 6th client and assign them to the CP experimental/study group. Continue this process, adding names to each of the lists in sequence until the complete list has been covered. This should generate two lists for each community that are random (random starting point and every "Sth person") and are larger than the sample size (to allow for refusals and exclusions from the study for other reasons not apparent at the time of sample selection). If the list has been generated with declining frequency of use in mind, this random selection process should also yield sample lists of prospective participants that are similar in composition to the total population of high frequency clients and to each other.
7. These lists must now be turned over to staff designated by each Paramedic Service (in Hastings-Quinte and County of Renfrew) to make contact with the individuals proposed for the CP (intervention) study and the Control group against which each of the intervention groups will be compared. The designated paramedics will be expected to make contact with the identified individuals and either recruit the identified individuals into the sample group into which their names have been place or record any refusals or inability to contact the client.
8. Prospective clients for either the CP group (intervention) or the Control Group are permitted to refuse and clients must be advised that ongoing services are not jeopardized by a decision to participate in the study or not. If a client declines participation, the paramedic must note the refusal and report same back to the coordinator of data collection. Under no circumstances will a potential participant in an intervention group be transferred or recruited to the control group. Similarly, potential participants in a control group may not be transferred to an intervention group. Each sample group will be developed from the specific list provided.
9. It is expected – and encouraged – that each list of clients will number more than the target sample size (e.g. 60 or 40). In fact, each of Hastings-Quinte and Renfrew counties are expected to "over-sample" by 5% to allow for the possibility that some clients may leave the study after the 12 month trial period has commenced or may be excluded later on if there has been a misunderstanding about their retrospective service utilization or insufficient retrospective data to permit meaningful record-level 'before and after' comparisons.
10. For those clients agreeing to be part of any of the sample groups, the designated paramedics must obtain a signed, witnessed consent form. The consent form must authorize the study team to obtain retrospective data from the Paramedic Service, hospital and other health care providers and to use data collected as services are provided through the study period. The consent form should also authorize contact with the client to carry out self-administered surveys and a face-to-face interview. Ethics clearance must be obtained for both intervention and control groups.

11. Once a client has signed the consent form to participate in the study, the form should be channelled to the coordinator for retrospective data collection, for use in securing information for the EuroQuol 5D-3L survey, for selecting a subset of each sub-sample group for a semi-structured interview, and for use in entering the client's ongoing healthcare service utilization information into the RCT database.

12. If after obtaining consent, the coordinator finds that there are significant gaps in the retrospective medical data over the preceding 12 months, the coordinator will make an assessment to determine the nature of the gaps and whether they will make rigorous economic value comparisons impossible. If so, additional participants will be recruited if necessary to meet the sample targets.

13. If after a participant is enrolled in the Study in any group, the individual withdraws for whatever reason (including moving away, moving into long term care, or is deceased), the data collected for that participant will be retained provided that the individual was part of the study for at least six months. If not, that record will be removed from the sample. If the participant revokes consent for any reason, that record will be removed from the sample. The incidence of withdrawals and revocation will be reported in the final analysis as part of the summary of disposition/ reconciliation of each study group sample.

Validation of Sample Selection Protocol:
Before final signoff on the sample selection protocol, both Hastings-Quinte and Renfrew Paramedic Services are reviewing their call data to ensure that the prospects for reaching the sample target are very high. A review of 911 calls to the Hastings-Quinte Paramedic Service in the July 2013 to July 2014 period has demonstrated that:

- There are 8,510 patient care records with an address in the Trenton/Quinte West and Belleville communities. From those patients' charts, 4,603 indicated a history of one or more of stroke, CHF, COPD, diabetes or hypertension.
- There are 481 qualifying candidates for the Study in the Paramedic Service area. Qualification is based on a minimum of three ambulance calls in the specified twelve-month period and exhibiting one of the five pre-existing medical conditions. Note that the number of qualifying candidates does not take into account those patients living in nursing homes, palliative care or possibly deceased. –(Needs Analysis, Sept. 2015)

Appendix G: Questions Utilized in Semi-Structured Interviews

(Background Information) Interview questions focused on gaining a more holistic understanding of high-need client experiences as well as their patterns of service utilization (regardless of which group they were in), and included the impact on friends and families in meeting their needs. The interview used a paper format with the research team member recording responses. The client was notified of the use of these forms of documentation. Documentation was identified only by the anonymous record ID. There was no personal information recorded on the form that would permit identification of the client. Once the Study is complete, documentation will be destroyed.

Following an introductory reminder of the objectives of the Study and a further assurance about the confidentially of participant responses, the proposed questions for these interviews were:

- What community supports do you use to be able to remain in your home? Community supports are things that an organization or individual in the community might do to help you – whether you pay for these services or not.

- Do family members regularly assist you with maintaining your health and your home? Who and how often do they visit and how much time do they spend with you? What kinds of things do they usually do to help you?

- Do friends and neighbours regularly assist you with maintaining your health and your home? Who and how often do they visit and how much time do they spend with you? What kinds of things do they usually do to help you?

- When you find yourself in great need, who do you generally turn to?

- (in post interview only) If you could change one thing about the support you receive that would help you maintain your health and your home, what would that be?[v]

- (In post interview only) Over the past few months – while you've been a participant in this Study, has there been any change in the kinds of support you get from family members, or friends and neighbours? If so, what kinds of changes have taken place?

While these are the core questions proposed for inclusion in the interview, the research team will employ probe questions to elicit additional information from the participant on any of these questions. (This is what makes the interview semi-structured rather than structured). The benefits of this approach is that a) it allows the research team to identify any issues associated with either standard service or community paramedicine that might influence either the economic value analysis or EuroQol quality of life results; and b) any perceptions of the CP program that may be useful to other communities considering implementation. Examples of probe questions are:

- Is there anyone else that plays a role in your ability to maintain your health and your home? (To ensure a complete answer/response, confirm who is viewed by the client as being in their circle of care)
- How does/would that help you? (to better understand the client's 'top value')
- What is it that makes you turn to (person/organization) first? (to understand the client's 'top value').

Appendix H: Unit Costs of Direct Services

Economic Value of Community Paramedicine Study		Retrospective Years		EV-CP Field Phase (2015-2016)	
		Hastings-Quinte	Renfrew	Hastings-Quinte	Renfrew
Activity	Unit	DIRECT Unit Cost ($CDN)	DIRECT Unit Cost ($CDN)	DIRECT Unit Cost ($CDN)	DIRECT Unit Cost ($CDN)
PS Call	Call				
PS Transport	Trip	$ 494.51	$ 520.49	$ 504.40	$ 530.90
ER Visit (by any mode of arrival)	Visit	$ 211.00	$ 182.00	$ 215.22	$ 185.64
Hospital In-patient Care	Day	$ 966.62	$ 805.00	$ 985.95	$ 821.10
CCAC - Nursing	Visit	$ 66.00	$ 68.23	$ 67.32	$ 69.59
CCAC - Personal Support Worker	Hour	$ 33.00	$ 30.96	$ 33.66	$ 31.58
CCAC - Physiotherapy	Visit	$ 96.00	$ 132.93	$ 97.92	$ 135.59
CCAC - Occupational Therapy	Visit	$ 131.00	$ 147.36	$ 133.62	$ 150.31
CCAC - Other	Visit	$ 129.60	$ 129.60	$ 132.20	$ 132.20
Community Paramedic Visit	Visit	N/A	N/A	$ 200.63	$ 584.18

Quinte ER cost based on weighted average for specific chronic conditions; Field Phase costs increased by 2% from 2014-2015; direct costs only

Quinte Hospital In-Patient Care Day of Stay based on weighted average of data provided by QHC; direct costs only

Renfrew ER cost is general direct cost provided by Renfrew Victoria Hospital; utilized for all Renfrew hospitals

Renfrew In-Patient Day of Stay cost is general direct cost provided by Renfrew Victoria Hospital; utilized for all Renfrew hospitals

Renfrew CCAC 'Other' Cost assumed to be the same as South East CCAC; data unavailable from Champlain CCAC

Depending on the fiscal year associated with unit cost data provided, unit costs were either backcast by 2% for earlier years or escalated 2% for subsequent years

All shaded cells can be modified for the purposes of increased accuracy of the model, to test service utilization scenarios if Community Paramedicine were to be extended across the research Study jurisdictions, to deduce impacts on or to compare the Study jurisdictions to other jurisidictions.

Data Sources:	
911 Calls	Through Paramedic Services
PS Transports	Directly by Paramedic Services
ER Visits - By Any Mode of Arrival	Directly by Hospitals
Hospital Admissions	Directly by Hospitals
Hospital In-Patient Days of Stay	Directly by Hospitals
CCAC Nursing Visit	Directly by Champlain and South East CCACs
CCAC - PSW Hour	Directly by Champlain and South East CCACs
CCAC -Physiotherapy Visit	Directly by Champlain and South East CCACs
CCAC - Occupational Therapy Visit	Directly by Champlain and South East CCACs
CCAC - Other Visit	Directly by Champlain and South East CCACs
Primary Health Care Visit	Limited Overlap; Review by QBFHT and BQWFHT
Community Paramedic Visit	Directly by Paramedic Services

Appendix I: Community Paramedicine Training Program

Hastings-Quinte EMS-Economic Value of Community Paramedicine Programs Research Project

COMMUNITY PARAMEDIC TRAINING PROGRAM REFERENCE GUIDE

by:

PREMERGENCY
Training Anytime, Anywhere

Suite 100A-40 Hugh St. N
Arnprior, Ontario
K7S 2V3
(613) 667-3101
www.premergency.com

This training program was written by:
Dean DiMonte AEMCA, ACP (F)
Ed Ouston, AEMCA, ACP
Dr. Kristian Davis, MD, CCF/EM

Contributors

- Renfrew County Paramedic Service - Community Paramedics
- Hastings Quinte EMS

For more information, please contact us:

- by e-mail, at info@premergency.com
- by phone, at (613) 667-3101
- by visiting our web site at www.premergency.com

Preface

This Community Paramedic Training Reference Guide is for the sole purpose of assisting the selected community paramedics employed by Hastings-Quinte EMS and Renfrew County Paramedic Service during the research project. Premergency Inc. will be the sole education provider of the training program and will govern all learning activities and final grading of all community paramedics within this research project. Premergency has made every attempt to consult subject matter experts in producing this Community Paramedic Training Reference Guide. However, we are not providing absolute direction or policy in the management or treatment of community paramedic patients. New knowledge and new patient management modalities and/or techniques will be continuously studied and considered by the paramedic services community.

Premergency Inc., are not attempting to encompass all evolving community paramedic response practices in this reference guide. Premergency Inc., will not be held responsible for any losses that may occur from either an error or omission in the information provided herein. Consult your local paramedic service(s) for updated information regarding guidelines changes that may occur over the period of this research project.

Table of Contents

Introduction

Community Paramedic Training Program

The purpose of this training program is to provide community paramedic education for both urban (Hastings EMS) and rural (County of Renfrew) paramedics to support the research project " the economic value of community paramedicine programs and their effectiveness relative to global healthcare costs"..

The concept and purpose of community paramedicine is to provide an affordable solution to those older adults whose health care needs are not being met by existing community health services. Due to this gap in community health care services it is hypothesized that older individuals with chronic medical conditions are frequent users of 911, Paramedic Services and Emergency room services for conditions that could be managed in the community.

Initial evaluation of a pilot program out of Renfrew county suggests that significant financial savings and improved health care management of patients can be achieved by the implementation of a paramedicine program. This intent of this research project is to test and quantify this hypothesis.

Baseline costs will be determined by looking at data from target communities, the Ministry of Health, local hospitals, family health teams, local health integrated networks, and long term care homes.

After the implementation of a 12-month pilot program in both urban and rural areas, the costs will be compared to the baseline data to determine the economic value of community paramedicine.

Premergency Inc.

Premergency Inc. is a Canadian-owned multi-disciplinary corporation located in Eastern Ontario. We specialize in the provision of paramedic training and online Learning Management Systems (LMS) for the health care sector. We provide value-added, web-based operational support tools and eLearning systems for paramedic personnel across a wide range of care and service environments. In collaboration with our clients, we design long-term strategies to achieve the best system performance by providing professional service and support to clients. Premergency Inc.'s expertise will facilitate the training of the Hastings-Quinte EMS and Renfrew County Paramedic Service. As such, this training program within the research project scope will provide an blended learning training solution that will include:

- Development of 5 main competencies for Community Paramedics via online web portal.
- Blended learning methodology utilizing cognitive, affective, and psychomotor taxonomies.
- Improvement of training capabilities.
- Enhancement of patient care within the community.

This virtual learning solution will offer self paced and engaging learner experiences, improve continuing education efficiencies, and provide grading capabilities. The virtual learning website is www.premergency.com/hemslearn.

Faculty/Facilitators

Name	Contact Phone	Contact Email
Dean DiMonte	(613) 327-1333	ddimonte@premergency.com
Ed Ouston	(819) 903-0665	eouston@premergency.com
*Additional Faculty may be added during the project as needed		

Roles and Responsibilities of the Community Paramedic

The responsibility for learning and competency attainment rests with the learner. Attributes of a strong learner include but are not limited to) the following skill sets:

1. Be punctual with learning assignments and activities.
2. Function as a team member within groups
3. Actively participate in all learning activities (i.e. discussion forums, group assignments, clinical experience)
4. Accept a series of graded responsibilities, progressing towards independent practice.
5. Maintain and improve skill and knowledge previously acquired.
6. Seek out and accept constructive criticism.
7. Collaborate with the facilitator and peers on all evaluation summaries.
8. Collaborate on strategies for improvement and remedial requirements.

Roles and Responsibilities of the Facilitator

1. Be punctual with assigning learning activities
2. Provide feedback for all learning activities (i.e. discussion forums, group assignments, clinical experience)
3. Grade each community paramedic in a confidential manner and assist the community paramedic in progressing towards **independent functioning within the community**.
4. Provide a positive learning environment by providing constructive feedback
5. Provide responsive answers to questions by paramedics.
6. Maintain strategies for improvement and remedial requirements.
7. Provide the opportunity to attain clinical competency.

Prerequisites

1. The community paramedic must be a advanced care community paramedic in good standing
2. The community paramedic must have access to a computer with high speed internet at home or at work.
3. The community paramedic must be willing to travel for clinical assignment

Schedule and Commitment

1. This learning program has strict timelines in order to fulfill the requirements of the research project.
2. Each community paramedic must be available to complete the training modules in the mandatory timelines set by the facilitator.
3. Each didactic module is based on an 8 hour time commitment and may be more or less depending on the learning activities assigned.
4. Each clinical/home visit module (practical component) is approximately 16 hours in length until "safe to perform unsupervised" standing is achieved as set out by the facilitator or his/her designate.
5. The total training program is approximately 200 hours.

Curriculum Agenda

NOVEMBER 2014 (login to: www.premergency.com/hemslearn)							
Module 1 of 5	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Online Learning Activities	• Online/Web Confirmation • Group assignment forum • Pre Reading • Training Presentation (referral) • Evaluation		• Quiz • Discussion Forum Q/A • Case Study 1,2		• Remedial (if required)		
DECEMBER 2014							
Module 2 of 5	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Online Learning Activities	• Training Presentation (GEM) • Problem Based Learning • Evaluation		• Quiz • Discussion Forum Q/A • Case Study 3,4		• Remedial (if required)		Clinical/ Ride-Out (travel day)
Module 3 of 5	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Online Learning Activities	• Clinical Ride-Out with Renfrew CPRU (Community Paramedic Response Unit)			• Training Presentation (Chronic Disease) • Problem Based Learning		• Evaluation Quiz • Discussion Forum Q/A • Case Study 5,6,7 • Remedial (if required)	
Module 4 of 5	**15**	**16**	**17**	**18**	**19**	**20**	**21**
Online Learning Activities	• Training Presentation (Mental Health) • Problem Based Learning • Evaluation		• Quiz • Discussion Forum Q/A • Case Study 8,9,10		• Remedial (if required)		
Module 5 of 5	**22**	**23**	**24**	**25**	**26**	**27**	**28**
Online Learning Activities	• Training Presentation (Palliative Care) • Problem Based Learning • Evaluation		HOLIDAY				
	29	**30**	**31**	**Jan 1**	**Jan 2**	**Jan 3**	**Jan 4**
	• Quiz • Discussion Forum Q/A • Case Study 11,12		• Remedial (if required)	HOLIDAY	Preparation for Community Data Collection		

Module 1	Community Paramedic Referral - Patient/Home Assessment
Didactic Duration	8 hours
Purpose	For the community paramedic to assess, treat and monitor the Community Referral patient.
Learning Objectives	By the end of each objective the community paramedic will be able to: • Describe the Community Referral patient • Identify acute and chronic conditions of the Community Referral patient • Define the Community Referral patient issues related to common community paramedic presentations. • Outline the monitoring and management of the Community Referral patient
Learning Outcomes	By the end of each outcome the community paramedic will be able to: • Recognize the Community Referral patient • Recognize acute and chronic conditions of the Community Referral patient. • Explain the Community Referral patient issues related to common community paramedic presentations. • Perform the monitoring and management of the Community Referral patient • Demonstrate the treatment regimes of the Community Referral patient
E-Learning Activities	By completion of each outcome the community paramedic will: • Perform Interactive Lessons and Problem Based Learning • Analyse and Evaluate Case Studies • Support Discussion forums • Perform evaluation exercises
Practical (clinicals/rideouts)	Perform and Demonstrate for the Community Referral patient: • Patient assessments • Acquisition and interpretation of vital signs • Acquisition and interpretation of diagnostic testing • Treatment interventions
Evaluation	The community paramedic will be evaluated by: • E-Learning assessments • Oral assessments during clinical activities • Peer review during practical(s)

Module 2	Geriatric Emergency Management (GEM)
Didactic Duration	8 hours
Purpose	For the community paramedic to assess, treat and monitor the GEM patient.
Learning Objectives	By the end of each objective the community paramedic will be able to: • Describe the physiology and pathophysiology of GEM • Identify acute and chronic conditions of GEM • Define the pathophysiology of GEM issues related to common community paramedic presentations. • Outline the monitoring and management of the GEM patient • Select the treatment of the GEM patient using current medical directives.
Learning Outcomes	By the end of each outcome the community paramedic will be able to: • Recognize the pathophysiology of GEM • Recognize acute and chronic conditions of GEM • Explain the pathophysiology of GEM issues related to common community paramedic presentations. • Perform the monitoring and management of the GEM patient • Demonstrate the treatment of the GEM patient using current medical directives
E-Learning Activities	By completion of each outcome the community paramedic will: • Perform Interactive Lessons and Problem Based Learning • Analyse and Evaluate Case Studies • Support Discussion forums • Perform evaluation exercises
Practical (clinicals/rideouts)	Perform and Demonstrate for the GEM patient: • Patient assessments • Acquisition and interpretation of vital signs • Acquisition and interpretation of diagnostic testing • Treatment interventions
Evaluation	The community paramedic will be evaluated by: • E-Learning assessments • Oral assessments during clinical activities • Peer review during practical(s)

Module 3-1	Chronic Disease - Diabetes
Didactic Duration	3 hours
Purpose	For the community paramedic to assess, treat and monitor the Diabetic patient.
Learning Objectives	By the end of each objective the community paramedic will be able to: • Describe the physiology and pathophysiology of Diabetes • Identify acute and chronic conditions of Diabetes • Define the pathophysiology of Diabetic issues related to common community paramedic presentations. • Outline the monitoring and management of the Diabetic patient • Select the treatment of the Diabetic patient using current medical directives.
Learning Outcomes	By the end of each outcome the community paramedic will be able to: • Recognize the pathophysiology of Diabetes • Recognize acute and chronic conditions of Diabetes • Explain the pathophysiology of Diabetic issues related to common community paramedic presentations. • Perform the monitoring and management of the Diabetic patient • Demonstrate the treatment of the Diabetic patient using current medical directives
E-Learning Activities	By completion of each outcome the community paramedic will: • Perform Interactive Lessons and Problem Based Learning • Analyse and Evaluate Case Studies • Support Discussion forums • Perform evaluation exercises
Practical (clinicals/rideouts)	Perform and Demonstrate for the Diabetic patient: • Patient assessments • Acquisition and interpretation of vital signs • Acquisition and interpretation of diagnostic testing • Treatment interventions
Evaluation	The community paramedic will be evaluated by: • E-Learning assessments • Oral assessments during clinical activities • Peer review during practical(s)

Module 3-2	Chronic Disease - Chronic Obstructive Pulmonary Disease (COPD)
Didactic Duration	3 hours
Purpose	For the community paramedic to assess, treat and monitor the COPD patient.
Learning Objectives	By the end of each objective the community paramedic will be able to: • Describe the physiology and pathophysiology of COPD • Identify acute and chronic conditions of COPD • Define the pathophysiology of COPD issues related to common community paramedic presentations. • Outline the monitoring and management of the COPD patient • Select the treatment of the COPD patient using current medical directives.
Learning Outcomes	By the end of each outcome the community paramedic will be able to: • Recognize the pathophysiology of COPD • Recognize acute and chronic conditions of COPD • Explain the pathophysiology of COPD issues related to common community paramedic presentations. • Perform the monitoring and management of the COPD patient • Demonstrate the treatment of the COPD patient using current medical directives
E-Learning Activities	By completion of each outcome the community paramedic will: • Perform Interactive Lessons and Problem Based Learning • Analyse and Evaluate Case Studies • Support Discussion forums • Perform evaluation exercises
Practical (clinicals/rideouts)	Perform and Demonstrate for the COPD patient: • Patient assessments • Acquisition and interpretation of vital signs • Acquisition and interpretation of diagnostic testing • Treatment interventions
Evaluation	The community paramedic will be evaluated by: • E-Learning assessments • Oral assessments during clinical activities • Peer review during practical(s)

Module 3-3	Chronic Disease - Congestive Heart Failure (CHF)
Didactic Duration	3 hours
Purpose	For the community paramedic to assess, treat and monitor the CHF patient.
Learning Objectives	By the end of each objective the community paramedic will be able to: • Describe the physiology and pathophysiology of CHF • Identify acute and chronic conditions of CHF • Define the pathophysiology of CHF issues related to common community paramedic presentations. • Outline the monitoring and management of the CHF patient • Select the treatment of the CHF patient using current medical directives.
Learning Outcomes	By the end of each outcome the community paramedic will be able to: • Recognize the pathophysiology of CHF • Recognize acute and chronic conditions of CHF • Explain the pathophysiology of CHF issues related to common community paramedic presentations. • Perform the monitoring and management of the CHF patient • Demonstrate the treatment of the CHF patient using current medical directives
E-Learning Activities	By completion of each outcome the community paramedic will: • Perform Interactive Lessons and Problem Based Learning • Analyse and Evaluate Case Studies • Support Discussion forums • Perform evaluation exercises
Practical (clinicals/rideouts)	Perform and Demonstrate for the CHF patient: • Patient assessments • Acquisition and interpretation of vital signs • Acquisition and interpretation of diagnostic testing • Treatment interventions
Evaluation	The community paramedic will be evaluated by: • E-Learning assessments • Oral assessments during clinical activities • Peer review during practical(s)

Module 4	Mental Health (Depression, Dementia, Delirium)
Didactic Duration	8 hours
Purpose	For the community paramedic to assess, treat and monitor the Mental Health patient.
Learning Objectives	By the end of each objective the community paramedic will be able to: • Describe the physiology and pathophysiology of Depression, Dementia, Delirium • Identify acute and chronic conditions of Depression, Dementia, Delirium • Define the pathophysiology of Depression, Dementia and Delirium issues related to common community paramedic presentations. • Outline the monitoring and management of the Depression, Dementia, Delirium patient • Select the treatment of the Depression, Dementia, Delirium patient using current medical directives.
Learning Outcomes	By the end of each outcome the community paramedic will be able to: • Recognize the pathophysiology of Depression, Dementia, Delirium • Recognize acute and chronic conditions of Depression, Dementia, Delirium • Explain the pathophysiology of Depression, Dementia, Delirium issues related to common community paramedic presentations. • Perform the monitoring and management of the Depression, Dementia, Delirium patient • Demonstrate the treatment of the Depression, Dementia, Delirium patient using current medical directives
E-Learning Activities	By completion of each outcome the community paramedic will: • Perform Interactive Lessons and Problem Based Learning • Analyse and Evaluate Case Studies • Support Discussion forums • Perform evaluation exercises
Practical (clinicals/rideouts)	Perform and Demonstrate for the Depression, Dementia, Delirium patient: • Patient assessments • Acquisition and interpretation of vital signs • Acquisition and interpretation of diagnostic testing • Treatment interventions
Evaluation	The community paramedic will be evaluated by: • E-Learning assessments • Oral assessments during clinical activities • Peer review during practical(s) •

Module 5	Palliative Care
Didactic Duration	8 hours
Purpose	For the community paramedic to assess, treat and monitor the Palliative Care patient.
Learning Objectives	By the end of each objective the community paramedic will be able to: • Describe the physiology and pathophysiology of Palliative Care Management • Identify acute and chronic conditions of Palliative Care • Define the pathophysiology of the Palliative Care patient issues related to common community paramedic presentations. • Outline the monitoring and management of the Palliative Care patient • Select the treatment of the Palliative Care patient using current medical directives.
Learning Outcomes	By the end of each outcome the community paramedic will be able to: • Recognize the pathophysiology of the Palliative Care patient • Recognize acute and chronic conditions of the Palliative Care patient • Explain the pathophysiology of the Palliative Care patient issues related to common community paramedic presentations. • Perform the monitoring and management of the Palliative Care patient • Demonstrate the treatment of the the Palliative Care patient using current medical directives
E-Learning Activities	By completion of each outcome the community paramedic will: • Perform Interactive Lessons and Problem Based Learning • Analyse and Evaluate Case Studies • Support Discussion forums • Perform evaluation exercises
Practical (clinicals/rideouts)	Perform and Demonstrate for the Depression, Dementia, Delirium patient: • Patient assessments • Acquisition and interpretation of vital signs • Acquisition and interpretation of diagnostic testing • Treatment interventions
Evaluation	The community paramedic will be evaluated by: • E-Learning assessments • Oral assessments during clinical activities • Peer review during practical(s)

Clinical Component

The clinical component will begin with attending the patient residence with a senior Community Paramedic. (schedule to be determined by operations). These patients will be based on the research study selected by the research team. These patients will fit the scope based on the modules learned in the didactic component. During these patient visits the community paramedic will be expected to perform (but not limited to):

1. Positively reflect their profession in their appearance, behaviours and deportment.
2. Provide services based on human and community need, with respect for dignity, unrestricted by consideration of nationality, race, creed, colour or status.
3. Provide assessment, monitoring and management within the scope of their practice
4. Perform patient assessments
5. Perform acquisition and interpretation of vital signs
6. Perform acquisition and interpretation of diagnostic testing
7. Perform treatment interventions based on the scope of practice determined by the community paramedic service and associated medical director
8. Accurately document findings and report research data sets.

Medical Directives

Medical Directives are being created for the purposes of this program and will be available by clinicals. Dr. Chris Hayman (Quinte) and Dr. Kristian Davis (Renfrew) will be providing medical direction.

Clinical Evaluation/Skill Competencies

Competency	Evaluation		
	YES	NO	*N/A
1. Contacted patient/client to confirm appointment? next of kin?			
2. Greeted patient in a friendly and professional manner?			
3. Reviewed client charts from previous visit? (if applicable)			
4. Performed an environmental scan of the patient's residence?			
5. Performed a patient assessment?			
6. Performed a wellness assessment?			
7. Acquired vital signs and documented findings? (P, R, BP, Temp, Sat, Glucose, LOC, Skin Color, Tugor, Cap Refill/Distal Perfusion, INR)			
8. Performed a 12 lead ECG?			
9. Performed a CAM? (Confusion Assessment Method)			
10. Performed a T.U.G. assessment? ("Timed, Up & Go")			
11. Provided "trip and fall" prevention monitoring and management?			
12. Performed blood draw/INR?			
13. Dialogued with patient about current health history and/or changes?			
14. Performed and dialogued with patient about medication compliance?			
15. Assessed for allergies?			
16. Performed a CAM assessment?			
17. Performed a mental health assessment of Depression, Dementia, Delirium? (screening)			
18. Evaluated, monitored and treated for chronic disease (Heart Failure/COPD/Diabetes)			
19. Performed palliative care monitoring, treatment and/or management?			
20. Documented findings for the research study?			

*N/A is not applicable. In the context of the clinical evaluation N/A may be used by the community paramedic as a skill that may not be necessary to perform based on the patient assessment.

Appendix J: Results of Client Satisfaction Survey (Intervention Group only)

Survey Respondents (#)	Renfrew County	Hastings-Quinte	Total
Client	13	42	55
Caregiver	5	3	8
TOTAL	18	45	63

Note: where question wording is identical, results following are client and caregiver combined. When the question wording was different, the groups are reported separately.

Survey Respondents (%)	Renfrew County	Hastings-Quinte
Q2. How well, if at all, did the Community Paramedic(s) understand your healthcare needs? (For caregivers: "...the person you care for")		
Extremely well	77.8	88.9
Fairly well	22.2	8.9
Not very well	0.0	2.2
Not at all	0.0	0.0
TOTAL	100.0	100.0
n=	18	45

Survey Respondents (%)	Renfrew County	Hastings-Quinte
Q3. How easy or difficult was it for you to understand the explanations the Community Paramedic(s) gave you about your health concerns? (For caregivers: "the health concerns of the person you care for")		
Very Easy To Understand	88.9	82.2
Somewhat Easy To Understand	11.0	13.3
Somewhat Difficult to understand	0.0	0.0
Very Difficult to Understand	0.0	0.0
No Explanations Needed or Given	0.0	4.4
TOTAL	99.9	99.9
n=	18	45

Survey Respondents (%)	Renfrew County	Hastings-Quinte
Q4. How useful was any advice and information that the Community Paramedic(s may have given you on maintaining or improving your health and well-being? (For caregivers: "the health and well-being of the person you care for")		
Extremely Useful	44.4	40.0
Very Useful	27.8	40.0
Somewhat Useful	11.0	13.3
Not Useful at All	0.0	0.0
No Advice Given	16.7	6.7
TOTAL	99.9	100.0
n=	18	45

Survey Respondents (%)	Renfrew County	Hastings-Quinte
Q5. How much, if at all, have the Community Paramedicine services provided to you helped you manage your overall health and well-being? (For caregivers: "overall health and well-being of the person you care for")		
Hasn't Helped at All	0.0	2.3
Helped a Little	16.7	4.6
Helped Somewhat	22.2	9.0
Helped a Lot	61.0	84.0
TOTAL	99.9	99.9
n=	18	44

Survey Respondents (%)	Renfrew County	Hastings-Quinte
Q6. During the time when you were receiving Community Paramedic visits, did you have any indication that the Community Paramedic(s) was working with other healthcare professionals to address your healthcare needs? (For caregiver: "when the person you care for was receiving..." and "of that person")		
Yes	61.0	71.1
No	38.9	17.8
Not sure	0.0	2.2
Not applicable/No one else (required)	0.0	8.9
TOTAL	99.9	100.0
n=	18	45

Survey Respondents (%)	Renfrew County	Hastings-Quinte
Q7. How often, if at all, did the Community Paramedic(s) help you manage a health issue at home that you would have otherwise called 911 for? (For caregiver: "help you or the person you care for manage his/her health issue...")		
Never	83.3	46.7
Once or Twice	11.0	26.7
Quite Often	5.6	24.4
All the Time	0.0	2.2
TOTAL	99.9	100.0
n=	18	45

Survey Respondents (%)	Renfrew County	Hastings-Quinte
Q8. How satisfied, if at all, were you that you could contact the Community Paramedic(s) promptly if you had questions or concerns about your health? (For caregiver: "...about the health of the person you care for").		
Very Satisfied	66.7	95.6
Somewhat Satisfied	5.6	4.4
Somewhat Dissatisfied	11.1	0.0
Very Dissatified	16.7	0.0
TOTAL	100.1	100.0
n=	18	45

Survey Respondents (%)	Renfrew County	Hastings-Quinte
Q9. How well-prepared do you feel to deal with health questions and concerns you might have in the future? (For caregiver: "that the person you care for might have in the future")		
Not Prepared at All	0.0	0.0
A Little Prepared	0.0	17.8
Fairly Well Prepared	16.7	31.1
Very Prepared	55.6	28.9
Not Applicable	27.8	22.2
TOTAL	100.0	100.0
n=	18	45

Survey Respondents (%)	Renfrew County	Hastings-Quinte
Q10. How much, if at all, did the Community Paramedics improve your knowledge about other healthcare programs and social services that are available to you? (For caregiver: "... available to the person you care for")		
Yes - Improved Knowledge a Lot	22.2	15.9
Yes - Improved Knowledge Somewhat	16.7	27.3
No - Very Little Improvement	11.1	0.0
No - Nothing New	50.0	56.8
TOTAL	100.0	100.0
n=	18	44

Survey Respondents (%)	Renfrew County	Hastings-Quinte
Q11. At any time over the past year, did Community Paramedic(s) put you in touch with other healthcare programs or social services that would help you maintain your health at home? (For caregiver: "... maintain the health of the person you care for at home")		
Yes	16.7	22.2
No	72.2	66.7
Not Sure/Can't recall	5.6	8.9
No Response	5.6	2.2
TOTAL	100.0	100.0
n=	18	45

Survey Respondents (%)	Renfrew County	Hastings-Quinte
Q12. At any time over the past year, did you start receiving new or more healthcare or social services (other than Community Paramedicine)? (For caregiver: "... did the person you care for...")		
Yes	55.6	13.3
No	27.8	2.2
Not sure/can't recall	0.0	4.4
No Response	16.7	80.0
Total	100.0	100.0
n=	15	45

Survey Respondents (%)	Renfrew County	Hastings-Quinte
If yes, did your services increase or decrease?		
Big increase in services	30.0	16.7
Moderate increase in services	10.0	16.7
Small increase in services	30.0	50.0
No increase in services	30.0	16.7
Not Applicable/No services needed	0.0	0.0
TOTAL	100.0	100.1
n=	10	6

If no, did your services increase or decrease?		
Big Increase	0.0	0.0
Moderate Increase	20.0	0.0
Small Increase	0.0	0.0
No Increase at All	60.0	2.6
Not Applicable/No Services Needed	20.0	0.0
No Response		97.4
TOTAL	100.0	100.0
n=	5	39

Survey Respondents (%)	Renfrew County	Hastings-Quinte
Q13. What financial impact, if any, did the Community Paramedic(s) have on the costs you have been paying personally for healthcare at your home? (For caregiver: " ... the costs you or the person you care for...")		
No Impact on Cost	83.3	68.9
Reduced Cost Slightly	16.7	17.8
Reduced Cost a Lot	0.0	13.3
Cost Increased	0.0	0.0
TOTAL	100.0	100.0
n=	18	45

Survey Respondents (%) CLIENTS/PATIENTS ONLY	Renfrew County	Hastings-Quinte
Q14. How satisfied, if at all, are you that during the time you were in the Community Paramedicine Study, you were not a burden on family, friends or others you care about?		
Very Satisfied	38.5	78.5
Somewhat Satisfied	15.4	16.7
Somewhat Dissatisfied	7.7	4.8
Very Dissatisfied	38.5	0.0
TOTAL	100.1	100.0
n=	13	42

Survey Respondents (%) CAREGIVERS ONLY	Renfrew County	Hastings-Quinte
Q14. What impact, if any, did the Community Paramedic(s) have on your confidence that you could help the person you care for?		
Very Satisfied	75.0	66.7
Somewhat Satisfied	0.0	33.3
Somewhat Dissatisfied	0.0	0.0
Very Dissatisfied	25.0	0.0
TOTAL	100.0	100.0
n=	5	3

Survey Respondents (%)	Renfrew County	Hastings-Quinte
Q15. Overall, how satisfied were you with the services and care provided by the Community Paramedic(s) that visited you personally? (For caregiver: "... that visited the person you care for"?)		
Very Satisfied	77.8	95.6
Satisfied	22.2	2.2
Dissatisfied	0.0	2.2
Very Dissatisfied	0.0	0.0
TOTAL	100.0	100.0
n=	18	45

Survey Respondents (%) CAREGIVERS ONLY	Renfrew County	Hastings-Quinte
Q15. What impact, if any, has the assistance of Community Paramedic(s) had on your stress level as a Caregiver?		
Much lower	60.0	66.7
Somewhat lower	40.0	33.3
Somewhat higher	0.0	0.0
Much higher	0.0	0.0
No change	0.0	0.0
TOTAL	100.0	100.0
n=	5	3

Survey Respondents (%) CAREGIVERS ONLY	Renfrew County	Hastings-Quinte
Q16. How much, if at all, have the Community Paramedic(s) helped you as a Caregiver, in teaching the person you care for to self-manage his/her conditions?		
Helped a Lot	0.0	33.3
Helped a Fair Bit	20.0	0.0
Helped a Little	0.0	0.0
Did Not Help at All	0.0	0.0
No Response	80.0	66.7
TOTAL	100.0	100.0
n=	5	3

Survey Respondents (#)	Renfrew County	Hastings-Quinte
Q16. Who do you trust the most when you have questions or concerns about your health? (Exclude emergency situations for which you would call 911)?		
Doctor/physician/specialist - First mentioned	10	16
Doctor/physician - Second mentioned	3	9
Paramedics - First mentioned	0	1
Paramedics - Second mentioned	3	0
Community Paramedics - First mentioned	1	16
Community Paramedics - Second mentioned	2	3
CCAC - First Mentioned	2	0
Nurse - First Mentioned	0	3
Nurse - Second Mentioned (one was "Home care nurse"	0	2
Staff at Retirement Home	2	0
Drug Store - First mentioned	1	0
Family member or friend (incl. POA)	0	8
Family member or friend - Second mentioned	0	3
Myself - First mentioned	0	1
Internet - First mentioned	0	1
"Anyone" - First mentioned	1	0
"Nobody" - First mentioned	0	1
TOTAL	25	64
n=	18	45
Reminder: each respondent could mention two person(s)/service(s) they "trust the most".		

Appendix K: Correspondence from Community Paramedicine Client

(Reprinted with Permission)

Florence E. Lennox
Bayview Retirement Residence
435 Dundas Street West, Suite 104
Belleville, Ontario, K8P 1B6

Bonnie. A. Coldham
19 Oriole Park Avenue
Belleville, Ontario, K8N 4C6

Mr. Graham Bent, Paramedic
Community Paramedic Study
Belleville, Ontario

January 16, 2016

Dear Graham;

As the current community paramedic study draws to a close, my Mum and I would like to thank you for the wonderful care you have given her. We truly believe that it has not only made a very positive difference in her life and has given us both peace of mind, but also has, on at least three occasions, averted the need for a trip to the hospital. On those occasions, you were able to identify a possibly concerning change and treat it immediately, thus preventing the change from becoming critical. In each case, she recovered quickly and did not require further treatment; and your regular monitoring ensured that her situation remained stable.

We were both thrilled that Mum was selected as a participant in the study. Although she receives good care at her retirement residence, it is not their role, nor are they equipped, to monitor vital signs on a regular basis or to treat changes. Rather, when they do see a concerning negative change, they have no choice but to recommend the resident go to hospital.

By having your regular visits, Mum was aware of her state of health, and could discuss changes and their significance with you. This, along with your follow up calls to me at her request, helped us both to understand more about her health, and gave us both peace of mind.

Thinking back to when Mum was still in her own home (until age 96!) there were many occasions when such visits would have made a real difference. Like most families caring for seniors in their own homes, I do not have any formal health training, and yet had to support my Mum in making the decision as to whether a hospital visit was necessary. Seniors without families nearby must feel even more uncertain and vulnerable.

We see the community paramedic program as a very critical element in home care for seniors, and sincerely hope this study will support the development of a continuing program for Belleville. While we understand that reducing costs by preventing unnecessary hospital visits is the key factor, we hope that other factors – such as reducing the isolation of seniors, promoting better health understanding and corresponding behaviours, supporting families by providing preventative care, and reducing worry – will be taken into consideration. These factors can also reduce costs, including by slowing the progression of disease and preventing otherwise manageable situations from getting out of control.

1

Either way, we would like to thank you, Graham, for your thoughtful, responsive and professional care throughout the study. You have given us more than you could ever know.

Sincerely and with gratitude,

Florence Lennox

Bonnie A Coldham

Florence Lennox and daughter Bonnie Coldham