

# Telehomecare Reduces ER Use and Hospitalizations at William Osler Health System

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**Abstract.** Background: The Ontario Telemedicine Network's Telehomecare initiative brings together specially trained clinicians and technology to coach patients with COPD and/or heart failure to monitor vital signs and manage their health at home.

Objectives: To evaluate pre- and post-enrollment and post discharge data captured by Telehomecare host William Osler Health System (WOHS).

Outcomes: Results demonstrate a 46% reduction in emergency department use and a 53% reduction in hospitalizations post-enrollment compared to pre-enrollment. Average length of stay (LOS) dropped by 25% of a day compared to pre-enrollment. In addition, six months after Telehomecare discharge, inpatient admissions and emergency department visits continued to decline, by 65% and 57% respectively, compared to pre-enrollment. While average LOS increased between pre-enrollment and post-discharge, the reduction in acute inpatient episodes created a net reduction in accumulated inpatient days of 563.16 days (63% reduction).

Conclusions: The WOHS Telehomecare results strongly support the positive influence of the program on health system utilization and the development of effective long-term self-management skills. Next steps could include reviewing, more closely, the reasons for hospital utilization and undertaking a cost-benefit analysis to support further expansion of the program to address other chronic illness and care needs.

**Keywords.** Telehomecare, self-management, health system utilization, technology, chronic disease, telehealth

## Introduction

It is estimated that the major categories of chronic disease, diabetes, heart disease, chronic respiratory illness, cancer, were responsible for more than 65% of healthcare expenditures in Ontario in 2010/11 [1]. These patients require ongoing care and monitoring and are, therefore, not well served by the existing episodic model of care. An innovative new Telehomecare initiative brings together specially trained clinicians and technology to help patients with chronic disease monitor vital signs and learn to

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manage their health at home through self-management coaching. The program, which is overseen by the Ontario Telemedicine Network and funded provincially and federally, is targeted to patients with Chronic Obstructive Pulmonary Disease (COPD) and/or Congestive Heart Failure (CHF).

Following a successful pilot, the initiative began provincial implementation in 2012. To date, more than 4,500 patients have enrolled in Telehomecare through seven Ontario Local Health Integration Networks (LHINs) that deliver it through hospitals or Community Care Access Centres. William Osler Health System (WOHS) is the host organization for Telehomecare for the Central West LHIN.

Oxygen saturation, weight, blood pressure and heart rate are measured weekdays and transmitted by tablet to a designated clinician who can monitor patterns, thereby helping to prevent exacerbations and hospital re-admissions or avoidable ER visits. Coaching addresses topics like generating an action plan, healthy lifestyle, being active and exercising, managing breathing and saving energy, preventing symptoms and taking medications, learning about self-management and practising for the weekend. Monitoring results are shared with the patient's most responsible provider to complement the existing circle of care. To enroll in Telehomecare, patients can self-refer or be referred by a care provider.

The initiative is based on Best Practice Guidelines including those of the Canadian Thoracic Society and the Canadian Cardiovascular Society. Through constant evaluation, Telehomecare is designed to respond to changing needs and emerging technology, ensuring cost-effective sustainability. Telehomecare helps patients manage their own health and enjoy the best possible quality of life while, at the same time, helping to ensure the appropriate use of healthcare resources.

## **1. Study Aims**

To evaluate program impact, WOHS tracked health system utilization data for patients participating in Telehomecare pre- and post-enrollment as well as post-discharge.

Results of changes in emergency department (ED), acute inpatient (IP) admissions and average lengths of stay (LOS) were analyzed.

## **2. Study Methods**

WOHS, in partnership with Headwaters Health Care Centre (HHCC), a community hospital and only other acute care organization within the Central West LHIN, initiated a review of hospital utilization by patients enrolled in Telehomecare to assess program impact. Considering the structure of the program (a six-month intervention), the review was constructed to focus on three six-month periods of time: immediately prior to enrollment in the program, during the enrolled period and immediately following discharge from the program.

All patients enrolled and registered with a virtual visit in Telehomecare, from initiation (April 2012) to September 2014, were retrieved from WOHS' electronic medical

record system (Meditech). Visits were grouped to unique patients by health card number. The chronologically first visit date reported for each patient was determined to be the patient-specific enrollment date. Enrolled patient discharge date or September 30, 2014 was used alongside the enrollment date to determine the duration of participation for each patient with a visit within the study period.

Patients enrolled for at least five months were included in the pre- and post-enrollment review. For inclusion in the post-discharge review, patients must have been discharged from Telehomecare for at least five months by September 30, 2014, and not have expired in hospital or at any Central West LHIN acute care facility within that five-month period.

Patient-specific acute inpatient episodes and ED visits were retrieved for all selected cases. WOHS & HHCC utilized both an encrypted email server, hosted by Osler, and encrypted files to enable a review of acute inpatient and emergency department activity at both facilities for all selected cases. The retrieval period spanned to include activity with acute discharge dates and ED registration dates up to six months prior to the earliest recorded enrollment date, and acute inpatient admission dates and ED registration dates up to September 30, 2014. LOS details were calculated for acute inpatient cases using the period between admission and discharge date. No diagnostic criteria were established to determine inclusion of the acute inpatient or ED activity in the review, therefore all acute inpatient and ED interactions a patient had with either WOHS or HHCC were included in the review.

Counts of acute inpatient and ED episodes within monthly periods pre- and post-enrollment and discharge were derived. The activity was grouped to a patient by their reason for enrollment ('Reason for Visit' as collected in medical record) in Telehomecare (i.e. CHF, COPD or both diagnoses). Six-month activity rates were calculated as the sum of all activity (acute inpatient or ED) within the six-month period, divided by the number of patients included in the review. Average LOS was calculated for all acute inpatient episodes within the three periods of interest.

### **3. Results**

Reported results reflect activity from initiation to September 30, 2014.

#### *3.1. Pre- and Post-Enrollment Group (12-Month Review)*

The average age of the 466 identified pre- and post-enrollment Telehomecare participants was 73.2 years (47% 75–79 years, 29% 80–89 years, 4% >90), with a 50–50 split between male and female participants. The six-month ED activity rate was 42% lower compared to the pre-enrollment rate. The six-month inpatient activity rate post-enrollment was 53% lower than the pre-enrollment rate. Average LOS was a quarter day shorter when compared to the pre-enrollment period.

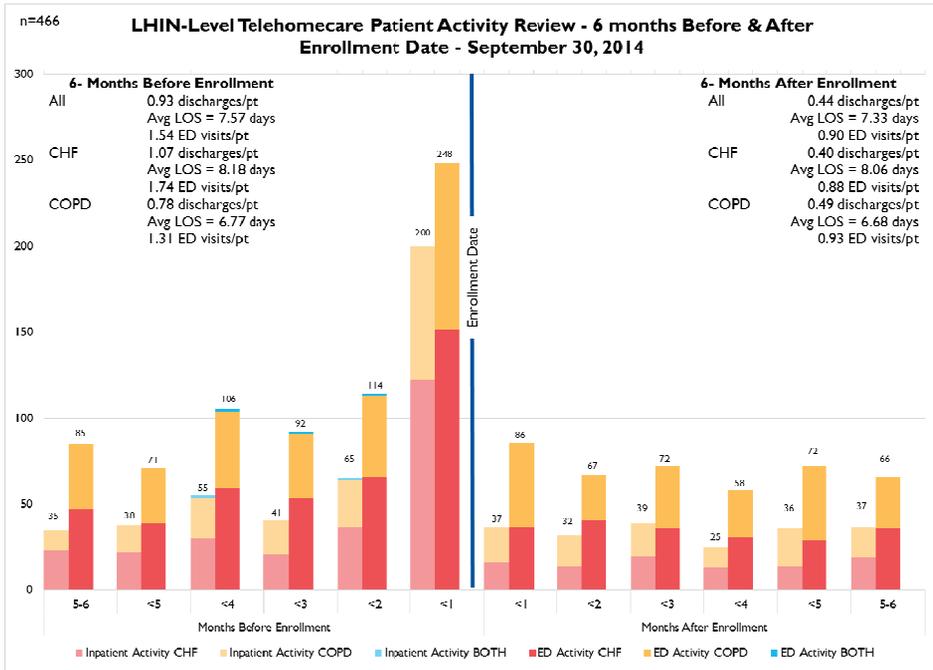


Figure 1. 12-Month Review (Pre/Post Enrollment).

Table 1. Patients enrolled in Telehomecare showed dramatic reductions in both the number of hospitalizations and ED visits after enrollment, as well as in the average length of stay in hospital, when compared to the period before enrollment.

Patients enrolled at least 5 months...	Activity/Patient/6-month period (n=466)					
	Inpatient Episodes				ED Visits	
	Episodes		Avg Length of Stay (days)			
	Pre-Enrollment	Post-Enrollment	Pre-Enrollment	Post-Enrollment	Pre-Enrollment	Post-Enrollment
Rate or LOS	0.93	0.44	7.57	7.33	1.54	0.9
%Δ		-53%		-3% (~-1.775 days)		-42%

3.2. Pre- and Post-Enrollment/Post-Discharge (18-Month Review)

A total of 125 patients were included in this review period. In the post-discharge group, average age was 72.9 years (45% 75–79 years, 26% 80–89 years), 55% male and 45% female. Six-month ED activity rates declined across the three periods, from 1.68 visits per patient pre-enrollment to 0.72 visits per patient post-discharge (57% reduction). Six-month inpatient activity rates also declined across the three periods, from 1.01 discharges per patient pre-enrollment to 0.37 discharges per patient post-discharge (64% reduction).

The highest average LOS occurred during the enrollment period, 7.80 days, dropping after discharge to 7.15 days, but remaining slightly higher (1%) than the pre-enrollment period (7.08 days). The average LOS for the COPD cohort showed more significant improvement post-discharge than did the CHF cohort when compared to the pre-enrollment period (8.73% reduction vs. 15.25% increase). While the average LOS for the total cohort increased between the pre-enrollment and post-discharge periods, the reduction in acute inpatient episodes created a net reduction in accumulated inpatient days of approximately 570 days (63% reduction).

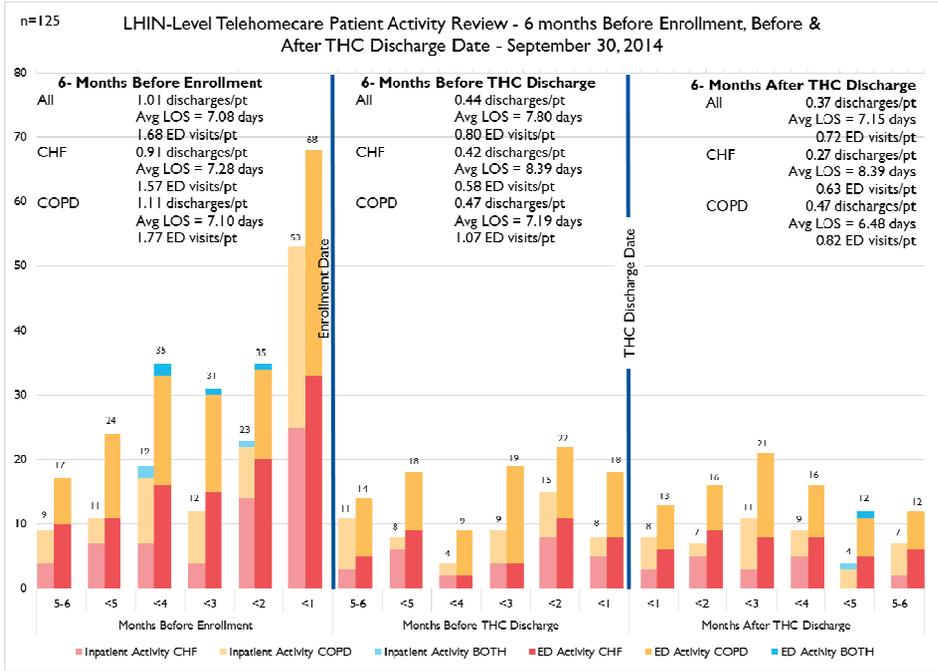


Figure 2. 18-Month Review (Pre/Post Enrollment and Post-Discharge).

Table 2. The 18-month Review results demonstrate that the reduction evident from the pre/post enrollment analysis was both maintained and improved. This post-discharge review shows decreasing hospitalizations and ED visits across the period alongside a net reduction in inpatient days.

Patients enrolled at least 5 months, discharged at least 5 months...	Activity/Patient/6-month period (n=125)								
	Inpatient Episodes			Avg Length of Stay (days)			ED Visits		
	Pre-Enrollment	Post-Enrollment	Post-Discharge	Pre-Enrollment	Post-Enrollment	Post-Discharge	Pre-Enrollment	Post-Enrollment	Post-Discharge
Rate or LOS	1.02	0.44	0.37	7.08	7.80	7.15	1.68	0.80	0.72
%Δ		-57%	-16%		10% (-470 days)	-8% (-100 days)		-52%	-10%
		-64%			1.0% (-570 days)			-57%	

### 4. Conclusions

Results for William Osler Health System demonstrate a significant reduction in emergency department use and reduced hospitalizations both post-enrollment and post-discharge when compared to pre-enrollment data. In addition, six months after discharge from Telehomecare, inpatient admissions and emergency department visits continued to decline. These results are consistent with evidence from recent studies using rigorous research methods that associate home-based telehealth interventions (e.g. telemonitoring, telephone support, videoconferencing) with beneficial results that include reductions in use of healthcare services, which include hospital admissions/readmissions, length of hospital stay and emergency department visits [2,3].

The increase in average LOS at six months post-discharge for enrolled patients with CHF may suggest that when patients did utilize the acute care system, their need and/or medical complexity was greater than in the pre-enrollment period. The result may indicate a more appropriate use of acute care resources, and that patients required

hospital admission to stabilize their condition. The Telehomecare results from William Osler Health System are strong evidence for the benefit of the program in positively influencing health system utilization through a model of care that empowers patients to develop effective and long-term self-management skills well past program discharge.

As a program designed to coach and strengthen patient disease self-management, Telehomecare appears to be meeting aims related to the reduction of dependence on the acute care system. CHF and COPD patients in the Central West LHIN, and provincially as greater deployment of the program rolls out, are benefiting from an innovative combination of specially trained clinicians and technology, right in their own homes. Patients are gaining greater awareness of their condition, as well as the important measures of their well-being, and are supported to gain confidence in their ability to self-manage.

Currently, Telehomecare programs are available in seven LHINs in Ontario, with the goal to have all LHINs across the province offer the program to eligible patients. Work is underway to apply the same methodology to evaluate program impact on health system utilization across all current and future Telehomecare programs. Consistent data collection and analysis allow for the evaluation of program impact/outcomes across the province.

While the program evaluation outlined herein offers a foundational performance measure, there exists great opportunity for further review. Another key indicator of Telehomecare success would be perceived benefit on the part of the patient, which might offer insight into whether the changes in patient health system utilization (acute inpatient and ED episodes) are aligned with a better grasp of tools, measures and community resources available to self-manage their disease.

Building from the existing evaluation, there is also opportunity to review, more closely, the reasons for hospital utilization, with respect to diagnosis and condition complexity. While improved patient experience, access to care and better well-being are the primary objectives of the program, a cost-benefit analysis could potentially strengthen support for further expansion of Telehomecare to a wider range of patients with other chronic illness and care needs.

A recent systematic review conducted by Bashur et al, with participation by Dr. Edward M. Brown, Chief Executive Officer, Ontario Telemedicine Network, looked at the impact of telemonitoring on key chronic diseases such as heart failure, stroke and COPD [2]. The study found that the capacity for early intervention and rapid response associated with telemedicine and the resulting empowered, educated and engaged patients, can have significant effects on outputs, one of which is cost of service. The study found that costs are frequently reduced by avoiding unnecessary services. Moreover, the study suggests that the costly complications of chronic illness may be reduced, yielding improved health outcomes among better informed patients, who are more likely to engage in positive health behaviours and adhere more closely to prescribed medical regimens and self-care guidelines.

When considering the large burden chronic disease places on the healthcare system, healthcare transformation can be supported by a shift to a chronic care model, with a greater emphasis on creative, innovative solutions that potentially reconfigure the traditional service delivery model to offer sustainable options for delivering high-quality care at the right cost [4,5]. The aim is to support those with chronic diseases to maintain their independence and remain in their own community and in their own homes, receiving the right care, at the right time, in the right way and by the right providers.

An integrated model of care that connects patients to their healthcare teams in real time can shift the health system from expensive hospital-based acute and ED care to a more proactive community-based model in which care options are delivered in patients' own homes.

Expansion of Telehomecare across Ontario can offer the community supports to manage and prevent exacerbation of chronic disease, promoting improved access to care for enrolled patients, while also offering cascading benefits for the entire health system.

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