Queens University Smith School of Business Study

Funded by

The Department of Health
## CPRPM Overview/Highlights

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Patients Enrolled (as of December 2017)</td>
<td>1109</td>
</tr>
<tr>
<td>Actual Reduction in ED Transport (Interdev)</td>
<td>31% (460 Transports)</td>
</tr>
<tr>
<td>Actual Reduction in ED Visits (ICES)</td>
<td>26% (467 ED Visits)</td>
</tr>
<tr>
<td>Time Reallocated to Paramedic Services</td>
<td>764 Hours</td>
</tr>
<tr>
<td>Total Savings to Paramedic Services</td>
<td>$331,576</td>
</tr>
<tr>
<td>Total # of Device Readings</td>
<td>368,510</td>
</tr>
<tr>
<td>Total Medical Alerts</td>
<td>28,703 (1 Alert / 12.8 Readings)</td>
</tr>
<tr>
<td># of Paramedic-Patient Coaching Interactions</td>
<td>3,281</td>
</tr>
<tr>
<td>911 Call Reduction (Interdev)</td>
<td>26% (453 Calls)</td>
</tr>
<tr>
<td>Actual Reduction in Hospital Admissions (ICES)</td>
<td>32% (170 Admissions)</td>
</tr>
<tr>
<td>Actual Reduction in Hospital Readmissions (ICES)</td>
<td>35% (18 7-day Readmits)</td>
</tr>
<tr>
<td></td>
<td>41% (59 30-day Readmits)</td>
</tr>
<tr>
<td>Estimated Savings to Overall Health System</td>
<td>$4,731,350</td>
</tr>
<tr>
<td></td>
<td>$7,279/patient</td>
</tr>
<tr>
<td>Estimated Cost to Implement CPRPM Program (assuming 6-month program duration)</td>
<td>$737,100</td>
</tr>
<tr>
<td></td>
<td>$1,134/patient</td>
</tr>
<tr>
<td>Estimated ROI to Overall Health System</td>
<td>542%</td>
</tr>
</tbody>
</table>

### HIGHLIGHTS

- 70% of the patient population lived in rural or suburban locations.
- Average age was 77.49.
- 90% retention rate.
- 96% users found equipment easy to use.
- 35% reduction in 7 day re-admits.
- 41% reduction in 30 days re-admits.
- As prepared by Queen School of Business, funded by the Department of Health.
- Home Care agencies in US fulfills function of paramedics in this model.
- Almost 80% of the patient population scored 10 or higher on the Johns Hopkins Aggregated Diagnosis Groups (measure of patient condition severity).
- The population had extremely severe conditions compared to the average population. (Based on the Johns Hopkins scale).
### Gender Summary

<table>
<thead>
<tr>
<th>Years</th>
<th>Total</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td></td>
</tr>
<tr>
<td>18-34</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>35-49</td>
<td>13</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>50-64</td>
<td>87</td>
<td>41</td>
<td>46</td>
</tr>
<tr>
<td>65-74</td>
<td>175</td>
<td>91</td>
<td>84</td>
</tr>
<tr>
<td>75-84</td>
<td>227</td>
<td>121</td>
<td>106</td>
</tr>
<tr>
<td>85-94</td>
<td>134</td>
<td>61</td>
<td>73</td>
</tr>
<tr>
<td>95+</td>
<td>13</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>650</td>
<td>322</td>
<td>328</td>
</tr>
</tbody>
</table>

### Diagnostic Summary

<table>
<thead>
<tr>
<th>Years</th>
<th>CHF</th>
<th>COPD</th>
<th>Diabetes</th>
<th># of Comorbidities</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-34</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>35-49</td>
<td>13</td>
<td>6</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>50-64</td>
<td>32</td>
<td>61</td>
<td>25</td>
<td>4</td>
</tr>
<tr>
<td>65-74</td>
<td>76</td>
<td>134</td>
<td>39</td>
<td>6</td>
</tr>
<tr>
<td>75-84</td>
<td>114</td>
<td>168</td>
<td>44</td>
<td>17</td>
</tr>
<tr>
<td>85-94</td>
<td>87</td>
<td>75</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>95+</td>
<td>7</td>
<td>7</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>322</td>
<td>452</td>
<td>121</td>
<td>28</td>
</tr>
</tbody>
</table>

### # of Comorbidities

<table>
<thead>
<tr>
<th>Years</th>
<th>Total</th>
<th>Male</th>
<th>Female</th>
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<tr>
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### Average

<table>
<thead>
<tr>
<th>Years</th>
<th>CHF</th>
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### Highlights of Patient Population:
- 650 patients were included in the evaluation
- Evenly split between male and female
- Average age 77 years old
- Most patients had COPD, followed by CHF and Diabetes
- Most patients had at least one comorbidity
- The program had a 90% retention rate
- Of the patients who did not remain on the program 3% were not able to use equipment, 4% were non compliant and 3% were deceased
### 911 Call Reduction

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Pre</th>
<th>Post</th>
<th>%</th>
<th>N</th>
<th>Pre</th>
<th>Post</th>
<th>%</th>
<th>N</th>
<th>Pre</th>
<th>Post</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>182</td>
<td>983</td>
<td>646</td>
<td>34%</td>
<td>832</td>
<td>535</td>
<td>36%</td>
<td>85%</td>
<td>83%</td>
<td>2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>164</td>
<td>761</td>
<td>643</td>
<td>15%</td>
<td>649</td>
<td>486</td>
<td>25%</td>
<td>85%</td>
<td>76%</td>
<td>10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total/Average</td>
<td>346</td>
<td>1,744</td>
<td>1,289</td>
<td>26%</td>
<td>1,481</td>
<td>1,021</td>
<td>31%</td>
<td>85%</td>
<td>79%</td>
<td>6%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### ED Transport Reduction

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Pre</th>
<th>Post</th>
<th>%</th>
<th>N</th>
<th>Pre</th>
<th>Post</th>
<th>%</th>
<th>N</th>
<th>Pre</th>
<th>Post</th>
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<td>6%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Transport Rate Reduction

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
<th>%</th>
<th>Pre</th>
<th>Post</th>
<th>%</th>
</tr>
</thead>
<tbody>
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<td>31%</td>
<td>85%</td>
</tr>
</tbody>
</table>

### Interesting observations with demographic information:

- Women seem to reduce 911 calls more than men, but men reduce their ER transports more than women.
- All groups had reduction in 911 calls with older patients having the highest, 50-64 group the lowest (although they had the highest reduction in ER visits).
- CHF and COPD had the highest 911 call reduction while diabetics had the highest ER visit reduction.
- Patients with 3 comorbidities had the highest 911 call reduction and ER visit reduction.
Pre-Post 911 Call Activity

Call Reduction by Patient Group

<table>
<thead>
<tr>
<th></th>
<th>Low Level 1</th>
<th>Moderate Level 2</th>
<th>High Level 3A</th>
<th>Very High Level 3B</th>
<th>Total / Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (N)</td>
<td>90</td>
<td>122</td>
<td>90</td>
<td>42</td>
<td>344</td>
</tr>
<tr>
<td>% of Total</td>
<td>26%</td>
<td>35%</td>
<td>26%</td>
<td>12%</td>
<td>100%</td>
</tr>
<tr>
<td>Pre 911 Calls</td>
<td>180</td>
<td>421</td>
<td>554</td>
<td>588</td>
<td>1,742</td>
</tr>
<tr>
<td>Post 911 Calls</td>
<td>155</td>
<td>324</td>
<td>438</td>
<td>372</td>
<td>1,289</td>
</tr>
<tr>
<td>911 Calls Reduced</td>
<td>25</td>
<td>97</td>
<td>116</td>
<td>216</td>
<td>453</td>
</tr>
<tr>
<td>911 Call Reduction</td>
<td>14%</td>
<td>23%</td>
<td>21%</td>
<td>37%</td>
<td>26%</td>
</tr>
<tr>
<td>Pre ED Transports</td>
<td>177</td>
<td>380</td>
<td>445</td>
<td>470</td>
<td>1,481</td>
</tr>
<tr>
<td>Post ED Transports</td>
<td>150</td>
<td>273</td>
<td>346</td>
<td>252</td>
<td>1,021</td>
</tr>
<tr>
<td>ED Transports Reduced</td>
<td>27</td>
<td>107</td>
<td>107</td>
<td>217</td>
<td>460</td>
</tr>
<tr>
<td>ED Transport Reduction</td>
<td>15%</td>
<td>28%</td>
<td>24%</td>
<td>46%</td>
<td>31%</td>
</tr>
<tr>
<td>Pre Transport Rate</td>
<td>98%</td>
<td>90%</td>
<td>82%</td>
<td>80%</td>
<td>89%</td>
</tr>
<tr>
<td>Post Transport Rate</td>
<td>97%</td>
<td>84%</td>
<td>79%</td>
<td>68%</td>
<td>84%</td>
</tr>
<tr>
<td>Transport Rate Reduction</td>
<td>2%</td>
<td>7%</td>
<td>3%</td>
<td>15%</td>
<td>6%</td>
</tr>
</tbody>
</table>

Patient Group Observations:
- Patients with only hospitalizations had the lowest 911 call reduction (14%), likely less use of emergency services.
- Patients with the highest pre program 911 call activity had the highest call reduction (37%) and reduction in ED visits (46%).

Patient Groups
Patients were divided into 4 groups
- Level 1: one hospitalization in previous year
- Level 2: 2 or more ER visits in previous year
- Level 3A: more than 3 911 calls in previous year
- Level 3B: more than 5 911 calls in previous year
Pre-On-Post Trends Observations:

- ICES data allowed analysis of enrolled patients healthcare usage pre-during-post program.
- Patients had a reduction in ED visits, Admissions and readmissions from pre program to during program.
- Patients seemed to slide back into pre program activity when discharged from the program.
Patient Status Observations:

- 60% of the patient population was low or very low socioeconomic status
- 70% of the patient population lived in rural or suburban locations
- Almost 80% of the patient population scored 10 or higher on the Johns Hopkins Aggregated Diagnosis Groups (measure of patient condition severity). The Ontario average is 2.3.
- The CPRPM patient population had extremely severe conditions compared to the average population
## Program Return on Investment Analysis

<table>
<thead>
<tr>
<th></th>
<th>Per Patient</th>
<th>#</th>
<th>Total Savings/Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMS Savings</td>
<td>$958</td>
<td>650</td>
<td>$622,700</td>
</tr>
<tr>
<td>Hospital Savings</td>
<td>$6,316</td>
<td>650</td>
<td>$4,105,400</td>
</tr>
<tr>
<td>Total Savings</td>
<td>$7,274</td>
<td>650</td>
<td>$4,728,100</td>
</tr>
<tr>
<td>Hospital ED Savings</td>
<td>$1,040</td>
<td>650</td>
<td>$676,000</td>
</tr>
<tr>
<td>Hospital Admission Savings</td>
<td>$3,917</td>
<td>650</td>
<td>$2,546,050</td>
</tr>
<tr>
<td>Hospital Readmission Savings</td>
<td>$1,359</td>
<td>650</td>
<td>$883,350</td>
</tr>
</tbody>
</table>

| Technology Costs: Devices, communication, Software ($75/month) | $450 | 650 | $292,500 |
| Monitoring Costs: Setup, Coaching, etc ($114/month) | $684 | 650 | $444,600 |
| Total Costs ($189/month) | $1,134 | 650 | $737,100 |

ROI 541%

<table>
<thead>
<tr>
<th>CPRPM Cost Savings / Patient</th>
<th>EMS</th>
<th>LHIN</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPRPM Cost Savings / Patient</td>
<td>$958</td>
<td>$6,316</td>
<td>$7,274</td>
</tr>
<tr>
<td>Overall Benefit Allocation</td>
<td>13%</td>
<td>87%</td>
<td>100%</td>
</tr>
<tr>
<td>6-month Cost Allocated ($189 Basic Service)</td>
<td>$147</td>
<td>$987</td>
<td>$1,134</td>
</tr>
<tr>
<td>Overall Cost Allocation</td>
<td>13%</td>
<td>87%</td>
<td>100%</td>
</tr>
<tr>
<td>Return on Investment (Basic Service)</td>
<td>552%</td>
<td>540%</td>
<td>541%</td>
</tr>
<tr>
<td>6-month Cost Allocated ($215 Extended Service)</td>
<td>$168</td>
<td>$1,122</td>
<td>$1,290</td>
</tr>
<tr>
<td>Return on Investment (Extended Services)</td>
<td>470%</td>
<td>463%</td>
<td>464%</td>
</tr>
</tbody>
</table>

### CPRPM Business Case Observations:

- The program had an overall high ROI of about 500% although the savings are not divided equally.
- **Extended Service:** The evaluation team projected the ROI for keeping patients on for a longer period of time. ROI dropped from above 500% to about 450%.
The degree that program improved quality of life.

- 90% of patients agreed that CPRPM improved their quality of life

The degree to which respondents agreed that their self-management skills improved because of the CPRPM program.

- 89% of patients agreed that CPRPM improved their ability to manage their condition

From patient survey data:
- Strongly Agree (53.79%)  Somewhat Agree (36.55%)
- Somewhat Disagree (6.21%)
- Strongly Disagree (3.45%)  Not Sure (0%)
- Does Not Apply (0%)

- Strongly Agree (62%)  Somewhat Agree (27.33%)
- Somewhat Disagree (4.67%)  Strongly Disagree (6%)
- Not Sure (0%)  Does Not Apply (0%)
Patient satisfaction with progress towards their health goals

- 84% of patients were satisfied they were moving closer to their health goals

Patient ease of use of equipment

- 95% of patients did not have any trouble using the RPM equipment
98% of patients were satisfied with the quality of care and coaching provided by the community paramedics.

86% of patients suggested their ED usage had declined while on the program which was verified with the data.
Responses to medical problems before and after the program

How did you respond to a medical problem related to your condition?

- A comparison of before and during survey showed that patients altered their behavior while on the program

Family/Caregiver Satisfaction

Being in this program means my family and/or those who help me with my care feel sure that I am getting the care I need

- Surveys also found that the CPRPM program provided assurance to family and other care providers the patient was receiving the care they needed
Crispy/John,

I wanted to share with you some positive feedback. Dr. Lewell received today from one of our patients’ primary care providers. The patient (L2R-1163) has presented with sustained tachycardia since enrolment on our program two weeks ago. We have since discovered that this has been an ongoing issue for the patient over several years without a diagnosis. Due to our level of concern, I consulted with Dr. Lewell who offered to reach out to the patient’s primary care provider, express our concern, and offer assistance in troubleshooting the possible differentials on CPRPM’s behalf.

The primary care provider was very receptive to this and expressed gratitude for our monitoring, alerts, and concerns. Further, the provider shared how impressed they are with the program and due to their alert notifications and trend reports, they have been able to titrate the patient’s medication to a more appropriate dose rather than solely relying on BP measurements over spread out primary care office visits. I believe this also validates the importance of providing not only trend reports when patients are alerting, but also at the minimum recommendation’s of one week follow up, 3 month follow up, and pre-discharge.

It is extremely rewarding to hear feedback like this from our community’s respected health care providers. Thank you for the great work and please keep it up!

Regards,
Thank You!

IDEAL LIFE
www.ideallife.com