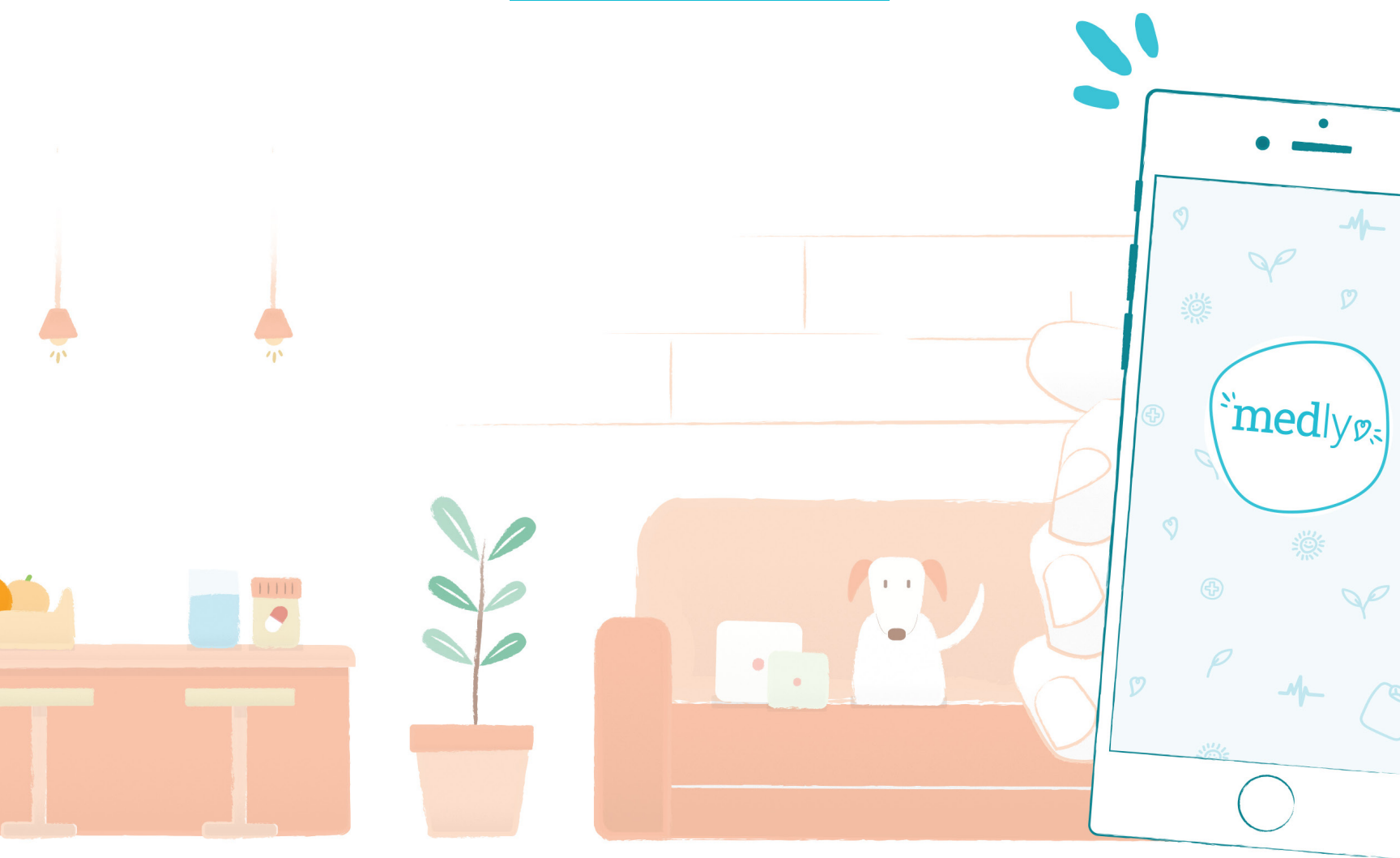


# medly

a companion for heart care.

## Program Overview



Designed and created by:



# Heart Failure Affects One Million Canadians

The growing burden of heart failure requires us to adapt to address this challenge.

Heart failure is a complex chronic condition that occurs when the heart is unable to pump enough blood to meet the body's needs. It is the most rapidly rising cardiovascular disease in Canada, with more than 50,000 new diagnoses each year, and affects over one million Canadians.<sup>1,2</sup> With recurring exacerbations, heart failure is the single most common reason for hospital admission and readmissions in Canada.<sup>3</sup> Thus, it is a major driver of rising health care utilization, costing the health system approximately \$482 million in 2013.<sup>4</sup> Due to advancements in the clinical management of heart failure, more Canadians are living with heart failure and other comorbid conditions, further adding to the burden of heart failure on the Canadian health system. With projected costs of heart failure-related hospitalization increasing to over \$722 million by 2030,<sup>4</sup> the need to curb the use of acute health services is more critical now than ever.

Patients with heart failure need greater support.

Patients with heart failure experience symptoms such as swelling in the lower extremities, fatigue, and shortness of breath, which can limit their ability to function and impacts their quality of life. Alongside guideline-directed medical care, heart failure management requires patients to take an active role in their care by maintaining a low-sodium diet, restricting fluids, and taking their medication as prescribed.<sup>1</sup> Heart failure self-management is often complicated by a lack of access to heart failure specialists and the actionable information needed to most effectively manage their condition.<sup>1,5</sup>

Clinics are challenged with high patient volumes and prioritizing the urgency of patient needs.

Numerous studies have demonstrated the efficacy of heart failure specialty clinics, in particular for patients recently hospitalized with heart failure or those at a high risk for exacerbations.<sup>6</sup> Given the chronic and deteriorating nature of heart failure, typical management occurs on an ongoing basis post-discharge. With the growing prevalence of the condition, heart failure clinics are facing a serious capacity challenge. A new framework for heart failure management is needed to deal with these large volumes and to ensure that the appropriate resources remain accessible and provide patients with continuity of care during times of high acuity as well as periods of stability.

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Health Systems are in need of a clinically validated scalable digital solution in order to address the burden of heart failure across Canada.

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# What is Medly?

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The Medly program is a model of care based on an expert system developed at the University Health Network (UHN) to assist patients and clinicians with the management of heart failure.

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The program consists of two key components:

- i) The Medly System: The core technology components that support the active monitoring of patients.
- ii) The Medly Service: The key people, processes and tools required to operationalize the Medly System.

## Medly System

The patient-facing technology includes the Medly app (available on iOS and Android smartphones and tablets) and peripheral devices (weight scale and blood pressure monitor) which enable patients to measure and record their weight, blood pressure, heart rate, and symptoms. Patients take these readings daily and receive automated phone calls as regular reminders. The recorded measurements are immediately analyzed by the Medly algorithm, a proprietary rules-based expert system within Medly which was developed, refined, and vetted by heart failure clinicians from the Ted Rogers Centre for Heart Research at the Peter Munk Cardiac Centre.<sup>11</sup> Patients can choose to enter their readings manually at any time, or automatically through wireless data transfer from Bluetooth-enabled devices.

The Medly algorithm automatically generates self-care feedback messages based on personalized thresholds and treatment plans (i.e. prescribed medications) set by a patient's clinician at the time of program enrollment. Examples of patient self-care feedback include advising when they are within or outside their personalised normal range thresholds, instructing them to take their prescribed medication, and suggesting when to con-

tact their heart failure clinic or go to the emergency department. Parameters that fall outside the personalized thresholds also simultaneously trigger an alert for the Medly clinicians on the patient's care team.

The clinician-facing technology is the web-based Medly Dashboard that enables clinicians to rapidly assess a patient's health status and respond to patients who have alerted through the Medly app. The patient summary feature is a compilation of relevant patient-level information for heart failure management, including a current medication list, heart failure-related laboratory data, and historical trends displayed graphically to support clinicians with timely clinical decision-making. Through the alerts centre feature, clinicians are provided a summary of the most recent patient alerts, including the patient parameters which triggered the alert and the specific self-care feedback message provided to the patient. Patient profiles are accessible, offering the ability to easily adjust or add to patient-specific thresholds, medications and laboratory data from any location. Finally, through Medly Messenger, patients and clinicians are able to chat asynchronously directly from within Medly.



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**Medly is a Class II Medical Device** as classified by Health Canada. Our engineers and designers work hand-in-hand in an agile development process to incorporate user feedback, realities of clinic workflow, and patient safety considerations in the development of the system. Medly product development follows the ISO 13485 Medical Device Quality Management System, ensuring that Medly consistently meets the evolving quality standards of the medical device industry.

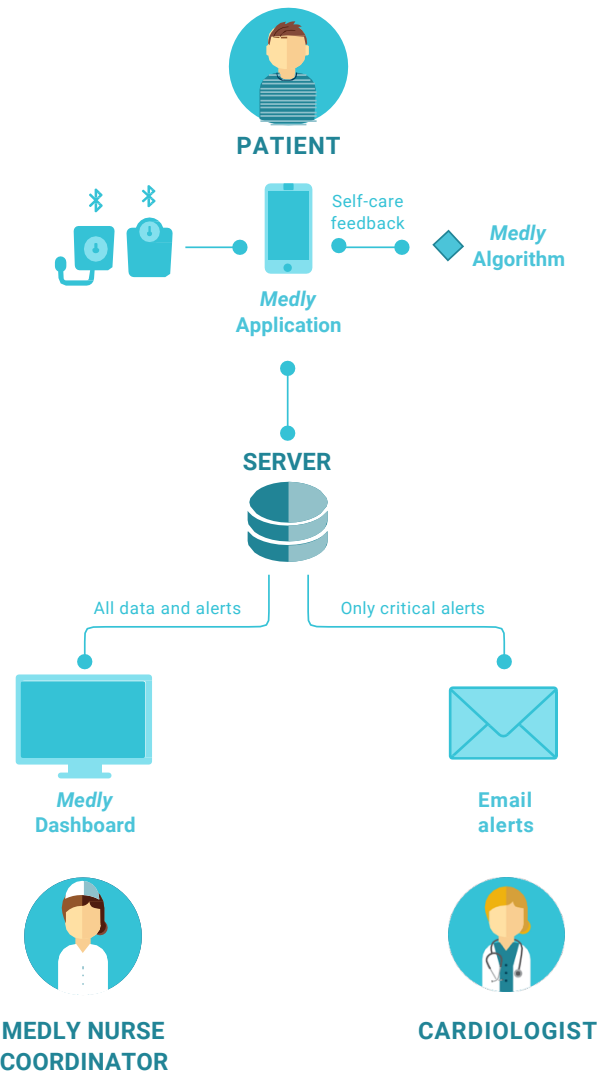
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## Medly Service

Through our innovative model of care delivery, one Medly nurse coordinator is able to provide comprehensive care for up to 300 complex chronic patients.

As a single point of contact for patients, the Medly Coordinator is able to build trust with patients and caregivers, understand patients' comprehensive needs and medical history, and support them with care navigation. A tight network of healthcare providers within the hospital enables the coordinator to collaborate with all providers in the patients' circle of care through a shared digital record and secure email. This allows for more cohesive care management, and smoother transitions between clinical services. Together, the Medly Application, Dashboard, and Messenger help foster communication between patients & providers, and create efficiencies in clinical workflows.

The Medly team has developed flexible options for patients to acquire the devices needed for the Medly program.<sup>12</sup> These range from a full-kit model (the program provides all required devices) to the bring-your-own (BYO) model (the patient uses their own devices). When a patient is onboarded, the Medly Coordinator reviews these options with the patient and their MRP to determine the best fit, enabling a better patient experience.



## Medly Program Development

The Medly program was developed by an integrated public sector team of heart failure specialists, researchers, engineers, designers and human factors experts. As such, the program is not only evidence-based, it is infused with the practical clinical knowledge and processes of Canada's leading cardiac care centre. In addition, the Medly program continues to be rigorously evaluated, enabling the continuous deployment of clinically-valid and user-tested enhancements to both the system and delivery models.

Recently, the team at UHN has sought to marry fundamental techniques of Service Design with the field of Implementation Science to ensure that all deployments of the Medly program achieve a high level of integration success in a range of cardiac care settings.<sup>12,13</sup>

Understanding that each site is unique - including the services rendered, clinical workflows, and patient populations - the Medly program roles and deployment models are reviewed and customized on a clinic-by-clinic basis to fit the needs and goals of each site.

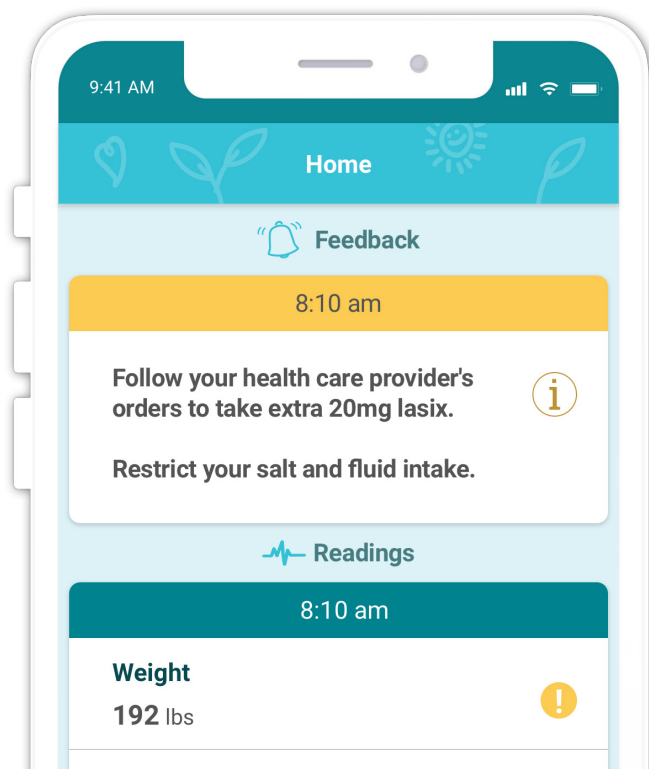
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**Patients, providers and clinics will all benefit from a solution designed by the Canadian health system.**

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# Why Medly?

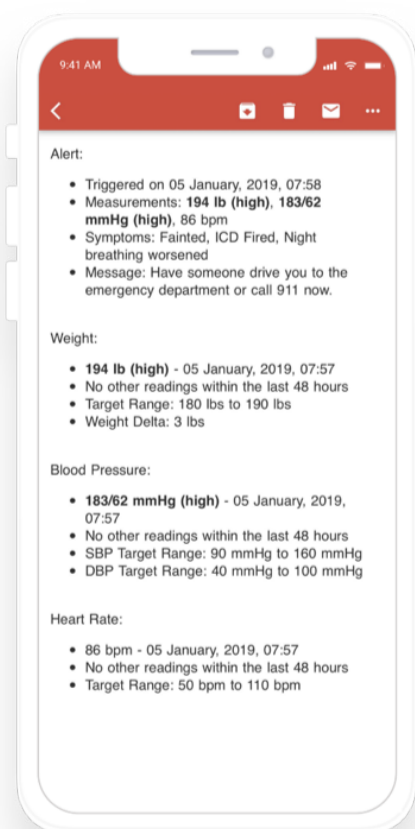
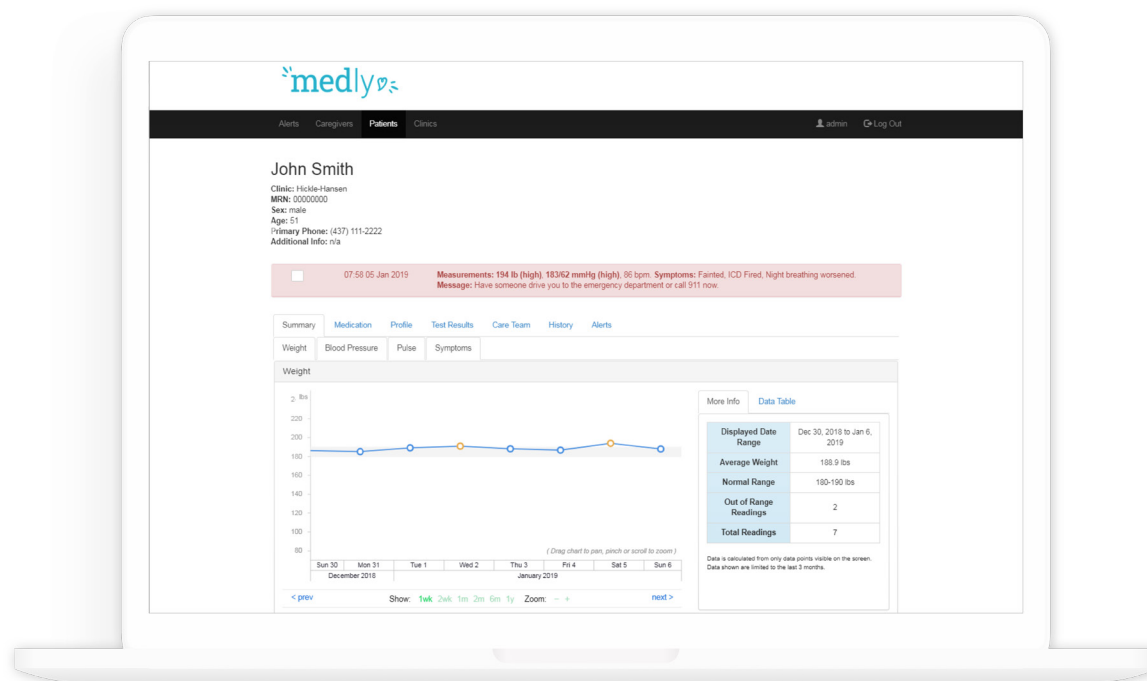
Patients gain peace of mind and improved quality of life from the Medly algorithm's real-time actionable feedback.



Medly empowers patients with the tools to self-manage their heart failure. Through the morning task cards and the automated phone call reminder system, patients develop the habit of taking their important readings on a daily basis. The instant actionable feedback and targeted educational content provided by the expert system enables patients to feel more confident in their self-management abilities. Patients have profound peace of mind knowing that all readings are sent to the Medly Coordinator and that a member of their care team can act immediately at the first sign of trouble.

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Clinicians can rapidly assess patients' health status through the Medly Dashboard and automated email alerts.

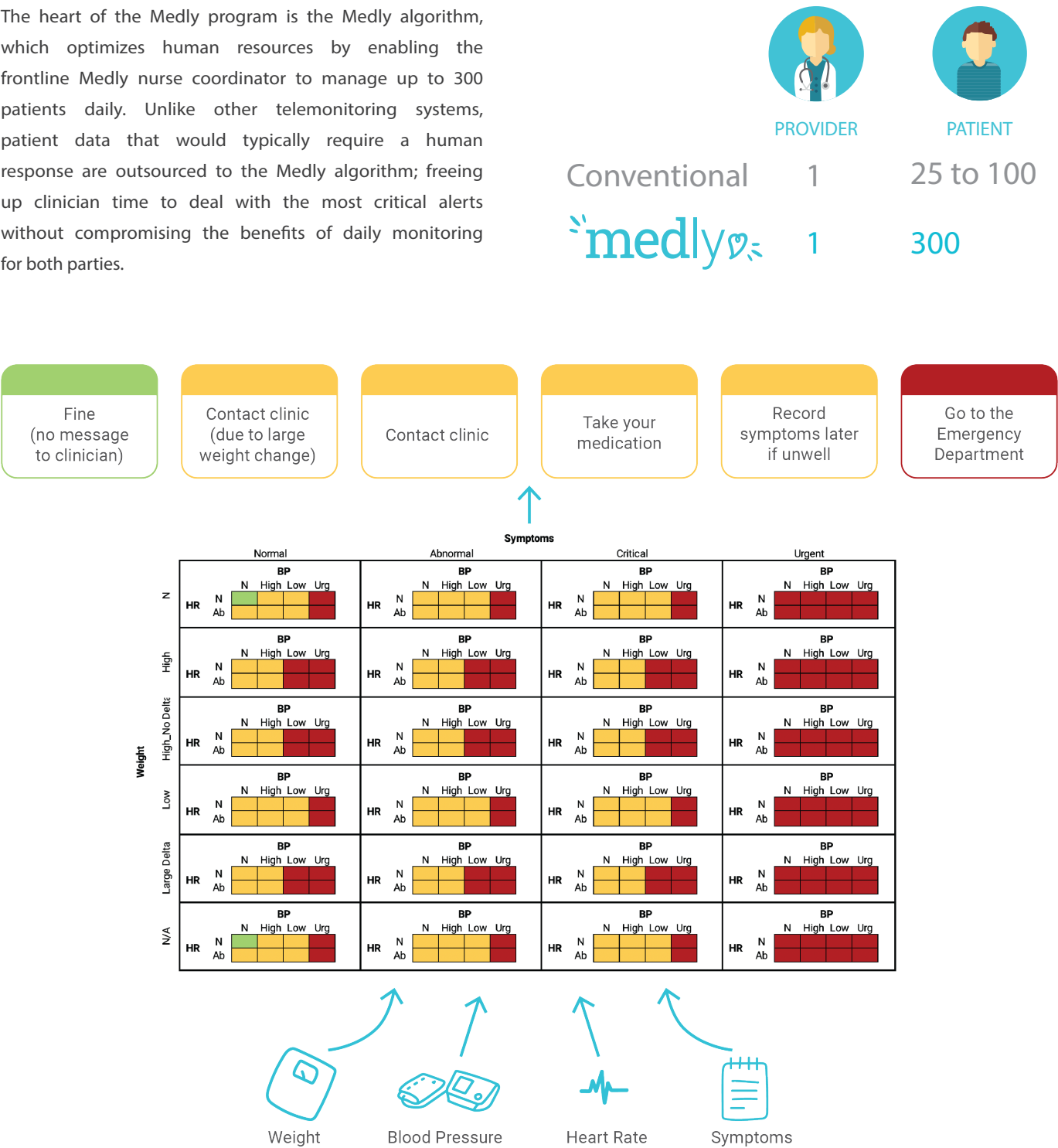


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The Medly Dashboard provides clinicians with a holistic picture of their patients' clinical status and recent symptoms consistent with acute exacerbations, by compiling patient readings and alert history, recent lab results, and current medication list. Importantly, this data is contextualized thanks to the Medly algorithm, to truly support clinical decision-making. Understanding that clinicians often need to respond to patients rapidly and on-the-go, the Medly Dashboard offers clinicians the ability to receive these alerts and relevant data via secure email. Thus, clinicians have the comfort of knowing they are offering the best care possible, wherever they are.

# Clinics benefit from the Medly program's optimized clinician-patient ratio.

The heart of the Medly program is the Medly algorithm, which optimizes human resources by enabling the frontline Medly nurse coordinator to manage up to 300 patients daily. Unlike other telemonitoring systems, patient data that would typically require a human response are outsourced to the Medly algorithm; freeing up clinician time to deal with the most critical alerts without compromising the benefits of daily monitoring for both parties.



Fine  
(no message to clinician)

Contact clinic  
(due to large weight change)

Contact clinic

Take your medication

Record symptoms later if unwell

Go to the Emergency Department

Symptoms

Normal

Abnormal

Critical

Urgent

Weight

N

High

Low

Urg

BP

N

High

Low

Urg

HR

N

Ab

High

High

Low

Urg

BP

N

High

Low

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BP

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High

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N

Ab

N/A

High

Low

Urg

BP

N

High

Low

Urg

HR

N

Ab

Weight

Blood Pressure

Heart Rate

Symptoms



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## Health Systems benefit from the Medly Program's impact on the Quadruple Aim of healthcare.

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### Improving patient experience, self-care and quality of life

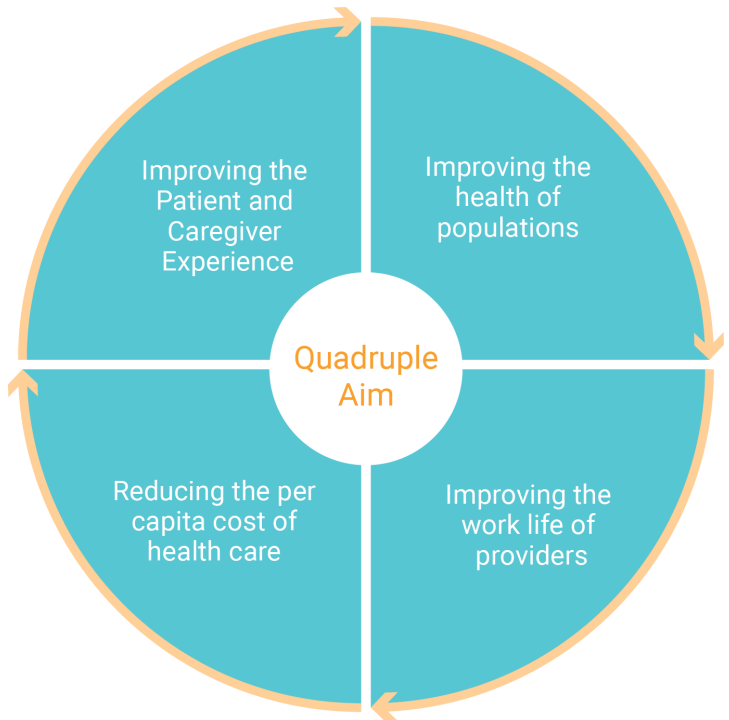
In a pragmatic pre-post evaluation of the UHN Medly Program, Medly was shown to have a [significant improvement on patients' ability to self-manage and their health failure-related quality of life](#) as measured by the Self-Care of Heart Failure Index and Minnesota Living with Heart Failure Questionnaire, respectively.<sup>14</sup> These outcomes were achieved thanks to high levels of patient adherence, particularly in older patients, which was attributed to Medly's ease of use, and perceived benefits.<sup>15</sup>

### Improving heart failure outcomes

The UHN Medly Program evaluation demonstrated a [50% reduction in heart failure-related hospitalizations](#) and a [24% reduction in all-cause hospitalizations](#)<sup>[14]</sup> attributed to a tighter management of patients between scheduled episodes of care. In addition, enrollment in the Medly Program was associated with a [59% decrease in B-Type Natriuretic Peptide \(BNP\)](#), which is a key clinical marker of heart failure severity - whereby higher levels of BNP are associated with an increased risk of mortality and hospitalization.<sup>14</sup> Finally, when comparing the use of Medly to enable safe remote GDMT titration to the standard of care (dosage adjustments during in-person visits), the use of Medly nearly [doubled the proportion of patients who achieved dose optimization within 6 months and reduced the time to dose optimization by 8 weeks](#).<sup>16</sup>

### Reducing the cost of heart failure management

In a microsimulation model using data from the UHN Medly program costs and outcomes, the Medly program was found to be [cost-effective compared to standard](#)



[ambulatory heart failure care](#).<sup>17</sup> Importantly, the model also suggested that the probability of [cost-effectiveness improves for patients with more advanced heart failure](#) and in deployment models whereby a higher proportion of patients use their own equipment.<sup>17</sup>

### Improving the work life of providers

Implementation of the Medly program at UHN was found to be successful, in part, because [clinicians found the Medly Dashboard and email alerts intuitive to use and easy to incorporate within existing workflows](#). Many clinicians perceived Medly to be superior to alternative telemonitoring programs due to its ability to provide timely and comprehensive data that enables better clinical decision making<sup>13</sup> and safe remote heart failure care.



# The future of chronic disease self-management:

## Medly for Multiple Chronic Conditions

### Challenges of caring for patients with multiple chronic conditions

Caring for patients with multiple chronic conditions (MCC) is one of the biggest challenges facing our healthcare system. Patients with MCC face poorer health outcomes and frequent readmissions due to:

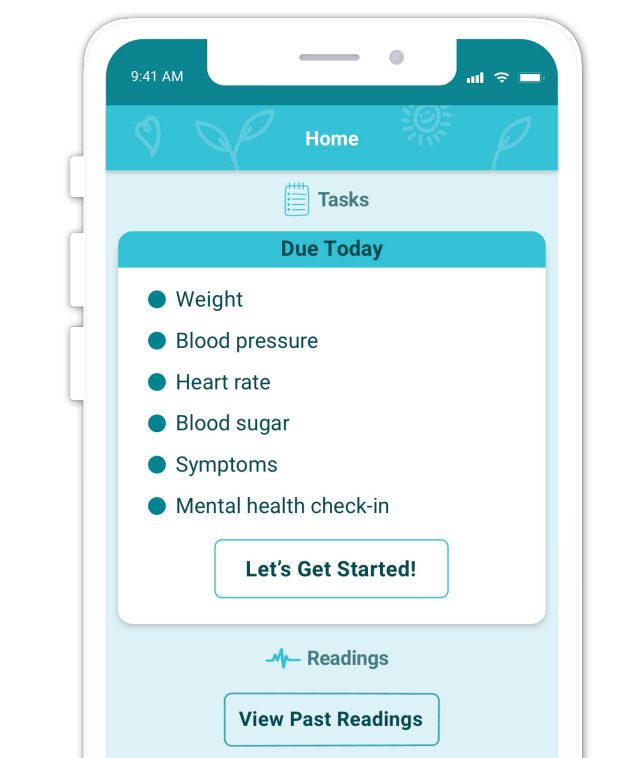
1. Lack of coordination and continuity of care.<sup>18,19</sup>
2. Inadequate communication between specialists.<sup>20</sup>
3. Inadequate support for self-management.
4. Lack of patient education to perform self-care with confidence.<sup>21,22</sup>
5. Inability to monitor patient's health between clinic visits.

These challenges lead to suboptimal and fragmented care plans, delays in preventative medical intervention, inadequate self-care, and confusion for patients on whom they should contact when they have questions. In particular, the lack of frequent and real-time patient information represents a missed opportunity to inform individualized and optimized care plans.

### Digitally-enabled care for multiple chronic conditions

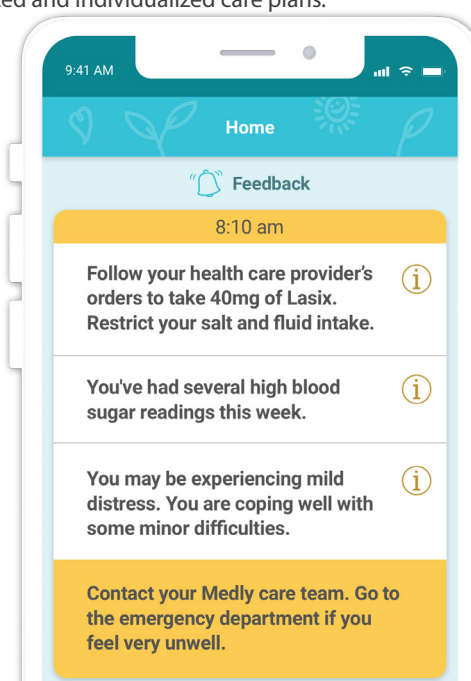
Medly for MCC takes the foundation of Medly for Heart Failure and expands it to offer patients a single platform to support their management of heart failure, diabetes, chronic obstructive pulmonary disease (COPD), hypertension, and mental health conditions.

Each day, users are presented with personalized tasks based on their individual chronic conditions as defined by their clinical care team. After inputting readings, Medly automatically generates a single, consolidated, and actionable set of self-care instructions. Clinicians receive alerts triggered by the overall severity of patients' health status to facilitate coordinated care management of MCCs.



### Supporting patients holistically through an integrated complex care model

As part of a large multi-centre implementation, a nurse-led integrated care model is envisioned to support patients with MCCs. A nurse or nurse practitioner is the central coordinator between the patient and their care team, to plan and execute a care plan that accounts for all the patient's monitored chronic health conditions. The Medly MCC technology acts as a single touch point to help clinicians assess real-time health status of the patient between clinic visits for early intervention, and it provides the care team with up-to-date data to create optimized and individualized care plans.



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