

# Hospitalised-Patient One-Year Mortality Risk Score

## Change Package

## About HOMR

This change package describes strategies for integrating the Hospitalised-Patient One-Year Mortality Risk (HOMR) intervention into daily practice based on the implementation experience of hospitals in Ontario. We recommend using the change package in consultation with the research teams who can provide further guidance and networking opportunities. To access the research teams please email Dr. James Downar at [jdownar@toh.ca](mailto:jdownar@toh.ca) and Dr. Pete Wegier at [pwegier@hrh.ca](mailto:pwegier@hrh.ca) or contact Healthcare Excellence Canada at [info@hec-esc.ca](mailto:info@hec-esc.ca) who will be able to connect you.

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# About Healthcare Excellence Canada

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Launched in 2021, HEC brings together the Canadian Patient Safety Institute and Canadian Foundation for Healthcare Improvement. We are an independent, not-for-profit charity funded primarily by Health Canada.

The views expressed herein do not necessarily represent the views of Health Canada.

HEC provided financial and implementation support for the HOMR intervention, including in-person and virtual events, quality improvement coaching, and an online learning platform to access HOMR resources and quality improvement tools and share helpful documents with other participating sites.

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# Introduction

The World Health Organization (WHO) defines palliative care as “an approach that improves the quality of life of patients and their families facing the problem associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual”<sup>1</sup>.

Palliative care can help provide relief from distressing symptoms and support patients and families to achieve the best possible quality of life. Early identification of palliative needs increases patient satisfaction with care, leads to better symptom control, and can reduce hospitalizations and the overuse of potentially ineffective or aggressive treatments at the end of life<sup>2</sup>. Integrating palliative care means coordinating services centered on the needs and preferences of people and their families.

Ontario Health recognizes the early identification of palliative needs as a priority. The Ontario Palliative Care Network (OPCN) developed a framework and tools to support early identification of people who would benefit from a palliative approach to care<sup>3</sup>. The Hospital One-Year Mortality Risk (HOMR) score and its derivations [modified HOMR (mHOMR) and HOMR Now!] are reliable methods for identifying patients who are admitted to a hospital with shortened life expectancy and unmet palliative needs<sup>4</sup>. This is especially true for patients with conditions that have more ambiguous trajectories towards death, such as those dying from organ failure or frailty, who are less likely to receive palliative care compared to patients with a terminal illness such as cancer<sup>5</sup>.



# HOMR Overview

Patients at elevated risk of dying within one year after hospital admission are identified by their HOMR score. HOMR is based on 12 administrative data points routinely coded by hospitals at the time of discharge<sup>4</sup>. Nine of the 12 data points are available in the Electronic Health Record (EHR) at the time of admission in Ontario. Modified HOMR (mHOMR) is an application that was developed to retrieve these 9 data points and calculate each patient's mortality risk on admission<sup>6-8</sup>. Additionally, an updated version of mHOMR has recently been developed and validated, called HOMR Now!, which is calculated using 10 data fields available in many hospital admissions data, similar to mHOMR<sup>9</sup>.

Both the mHOMR and HOMR Now! applications are intended to be reliable and accurate triggers to improve the effectiveness of any palliative intervention by focusing attention on a small group of patients with a high risk of death and unmet palliative needs. However, HOMR Now! is slightly more accurate. If the additional variables required to calculate the HOMR Now! score are available in the electronic medical record in the clinical area, HOMR Now! would be the recommended application. Appendix 1 compares the different HOMR applications.

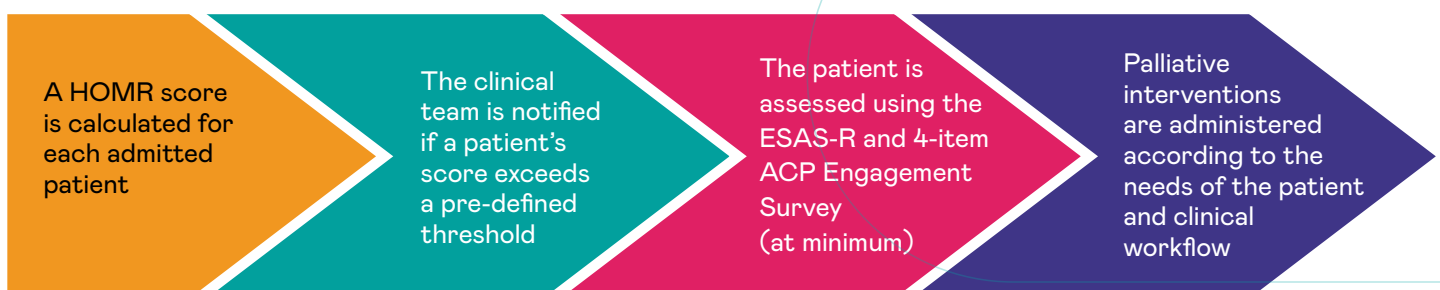
Figure 1 provides an overview of the HOMR intervention. Each hospital identifies its target population/units to start implementing HOMR and collecting baseline data for 9 months. It is recommended that hospitals start with their general medicine units. If a patient's mortality risk

score exceeds a pre-defined threshold (baseline recommendation is 0.21), the application sends a message to the clinical team to assess and address unmet palliative care needs. Ideally, assessments should be done within 72 hours of the message receipt using at minimum the [Edmonton Symptom Assessment System Revised \(ESAS-R\)](#), which looks at symptom management, and the [Advance Care Planning \(ACP\) Engagement Survey](#), which explores advance care planning and goals of care [10, 11]. If a patient meets the score threshold on either tool, their needs should be addressed, whether that is related to symptom management or a desire to engage in Advance Care Planning, or both:

- [ESAS-R](#): Scores of > 6 are flagged as "severe" and the clinical team decides to either address the symptoms as appropriate for the patient or consult with an expert in palliative care.
- 4-item [ACP Survey](#): Scores of 3-4 indicate that a patient is ready to discuss ACP with a member of the clinical team. The clinical team may choose to discuss ACP and goals of care themselves, consult with an expert in palliative care and/or distribute ACP documentation, as applicable.

Palliative care interventions are administered, either in hospital or via discharge planning, according to the needs of the patient and workflow at each hospital.

**Figure 1. Key Steps in the HOMR Intervention**



# HOMR Teams

As of November 2020, 13 hospitals in Ontario are implementing HOMR (modified or Now!) to improve the identification of patients with unmet palliative needs and the documentation of those needs, and the end of life care provided to these patients:

- Cambridge Memorial Hospital
- Headwaters Health Care Centre
- Humber River Hospital
- Kingston Health Sciences Centre
- London Health Sciences Centre
- Montfort Hospital
- North York General Hospital
- Pembroke Regional Hospital
- Queensway Carleton Hospital
- St. Michael's Hospital
- The Ottawa Hospital
- William Osler Health System
- Windsor Regional Hospital

The process of implementing HOMR in these hospitals has helped identify strategies and lessons learned across the quality improvement roadmap.

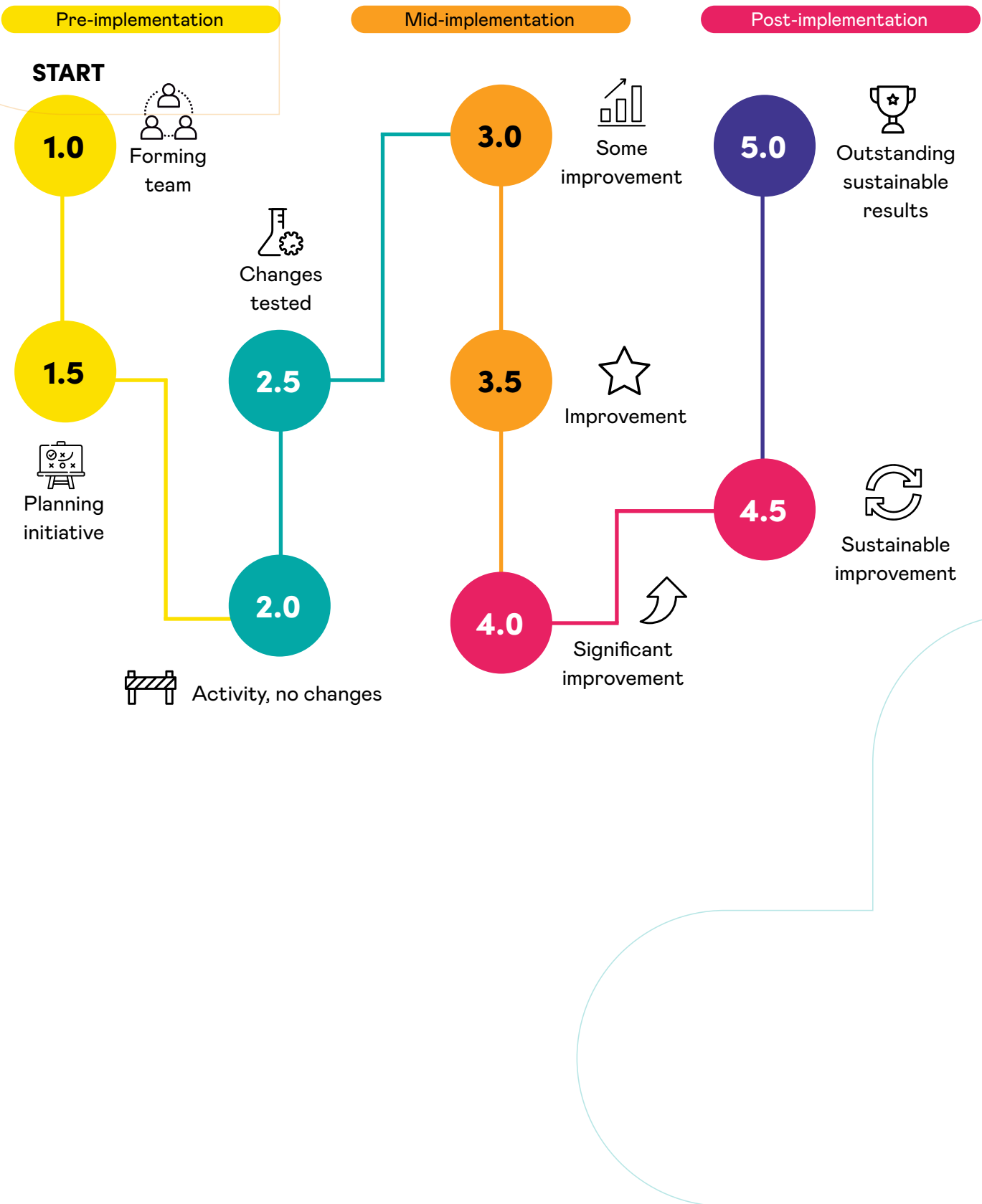
# Quality Improvement Roadmap

HEC's quality improvement roadmap helped guide the implementation of HOMR using three main phases as illustrated in *Figure 2*:

- 1. Pre-Implementation:** The first phase is forming the quality improvement team, identifying relevant stakeholders, and planning how HOMR is going to be integrated into daily practice. This includes developing an aim statement and driver diagram, mapping the current and desired clinical workflow for early identification of palliative needs, installing and testing the HOMR algorithm, and collecting baseline data.
- 2. Mid-Implementation:** The second phase is to evaluate components of the revised clinical workflow process to identify, assess and manage patients with palliative needs using HOMR. This is an iterative process where the quality improvement team is testing, learning, and adjusting the clinical workflow for HOMR based on feedback from clinicians and other stakeholders.
- 3. Post-Implementation:** The third phase is sustaining improvements. The end goal of the quality improvement initiative is to integrate HOMR in a sustainable way. The Long-Term Success Tool highlights the factors that contribute to embedding a quality improvement initiative into everyday practice (e.g., alignment with organizational priorities, leadership support, team involvement). This tool could be used as a checklist during the pre-implementation phase and re-administered throughout the initiative to track progress. A follow-up survey administered after 6 and 12 months can help evaluate the sustainability of the quality improvement initiative.



**Figure 2. HEC’s Quality Improvement Roadmap: Implementing HOMR**



## Forming a Team

It is recommended that a quality improvement team with a dedicated project manager lead the implementation of HOMR, including identifying common goals and timelines for the initiative. It is important for teams to clearly define the roles and responsibilities of each member. Teams should be multidisciplinary and representative of the people who will be setting up the infrastructure for HOMR in the EHR platform and receiving and following up on the HOMR notifications:

- Patient advisors
- Clinicians (e.g., nurses and physicians working in targeted units)
- Information Technology (IT), Systems (IS), and Decision Support specialists
- Quality improvement experts
- Hospital management and leadership members
- Regional leads for palliative care to support the coordination of care in the community

In addition to the quality improvement team, it is important to identify the stakeholders for the HOMR intervention, level of engagement and communication methods. A stakeholder is defined as an individual or a group “who can affect your quality improvement project at an early stage when these relationships can be managed, including supporters and resistors of change<sup>13</sup>.” Stakeholders were identified in Figure 3 for service users (patients/providers who might benefit from HOMR), partners (people who help deliver the HOMR intervention), contributors (people who influence the implementation team), champions (active supporters of the HOMR intervention and associated practice changes) and voices (opinions shared about the HOMR project and heard by others).

**Figure 3. Stakeholders for the HOMR Intervention**

Service Users	Partners	Contributors	Champions	Voices
<ul style="list-style-type: none"> <li>• Patients &amp; Families</li> <li>• Patient experience advisors</li> <li>• Patient advisory group</li> <li>• Patient care team</li> <li>• Transition care provider</li> <li>• Home care &amp; community care</li> </ul>	<ul style="list-style-type: none"> <li>• Patients &amp; Families</li> <li>• Patient care team (e.g. social work, RNs, hospitalist)</li> <li>• Primary care, home care &amp; community care providers</li> <li>• HEC</li> <li>• Researchers</li> <li>• Policymakers</li> <li>• IT/EHR</li> <li>• External Vendors</li> </ul>	<ul style="list-style-type: none"> <li>• Patient care team (e.g. RNs, physicians)</li> <li>• Administrators/management</li> <li>• Patient Advocacy group</li> <li>• Professional practice group</li> <li>• Primary care</li> <li>• Researchers</li> <li>• IT</li> <li>• Social media (e.g. Twitter)</li> </ul>	<ul style="list-style-type: none"> <li>• Patients &amp; families</li> <li>• Patient care team (e.g. physicians, RNs, social work, OT)</li> <li>• Educators (e.g. RNs, manager of implementation unit, physicians, hospitalists, internal medicine, ward chiefs)</li> <li>• Administrators (e.g. project manager, director of clinical services/operations)</li> <li>• IT</li> <li>• Researchers (relationship with hospital)</li> <li>• Primary care, home care &amp; community care providers</li> </ul>	<ul style="list-style-type: none"> <li>• Patients &amp; families (e.g. sharing experiences, feeling heard and involved)</li> <li>• Patient advocacy group</li> <li>• Patient care team including palliative care specialists (e.g. workload, best care practices)</li> <li>• Organization (e.g. risk, costs)</li> <li>• Professional practice group</li> <li>• Primary care (understanding what's currently being done, informed and up-to-date)</li> <li>• HEC</li> <li>• Social media</li> </ul>

## Planning Initiative

There are quality improvement tools available to support teams in their planning efforts. This includes templates for drafting an Aim Statement, Driver Diagram and PDSA (Plan-Do-Study-Act) cycle that were adapted for the HOMR intervention (*note: to access these files please contact the research teams*). The Driver Diagram summarizes the core and flexible features of the HOMR intervention. It is recommended that the following steps are completed during the planning phase:

- Develop a plan for spreading the change across the hospital to other units.
- Develop and regularly review the aim statement and driver diagram as a team (e.g., every three months).
- Provide education sessions on HOMR including assessment tools (e.g., [ESAS-R](#) and [ACP Engagement Survey](#)).
- Provide education sessions that are tailored to the various members of the clinical team based on their role.
- Explain how HOMR fits within the hospital's overall strategy for palliative care (e.g., Ontario Health's quality improvement plans for early identification of goals of care).

Determine how often the quality improvement team needs to meet to plan the initiative, communicate changes, and track progress. It's important to communicate the goals of the HOMR intervention beyond the quality improvement team, specifically to the clinicians involved in administering the assessment tools and following-up on the results.

## Key Takeaways

- Planning takes time especially given competing priorities in hospitals.
- Involving many stakeholders is key to getting buy-in and commitment, and it's important to take the time to do this early on.
- It's important to have diverse perspectives on the team including IT specialists, clinicians, quality improvement experts and regional palliative care leads if applicable.
- Understand the value of HOMR and share this message with others during training activities. This concept is explained in the book *Start With Why* by Simon Sinek.

## Key Resources

- HOMR Frequently Asked Questions (Appendix 1)
- [How to Improve | IHI - Institute for Healthcare Improvement \(PDSA Cycles\)](#)
- [How to Improve | IHI - Institute for Healthcare Improvement \(Setting Aims\)](#)
- [Tools | IHI – Institute for Healthcare Improvement \(Driver Diagram\)](#)

# Sustaining Gains

Translating evidence into practice in a sustainable way is not easy. Improvement projects are at risk of failing to maintain their success after the end of implementation and financial support. The Long-Term Success Tool has been developed based on 12 factors that have been identified in the literature as important to long-term success<sup>12</sup>. These factors are grouped into three broad themes which are People, Practice and Setting (Figure 4).

**Figure 4. Long-Term Success Factors**



The purpose of the tool is to give teams a simple way to evaluate how they are doing against the 12 factors for long-term success. The tool is meant to be simple and quick to complete. It is recommended to complete the tool during the planning phase to obtain a baseline score and identify strengths and areas for improvement. The survey can be readministered every three months during the quality improvement initiative to track progress. The review of the results can be integrated into any existing meetings planned by the quality improvement team that is implementing HOMR. At the end of the implementation phase, a follow-up survey can be completed after six and 12 months to evaluate the sustainability of the quality improvement initiative.

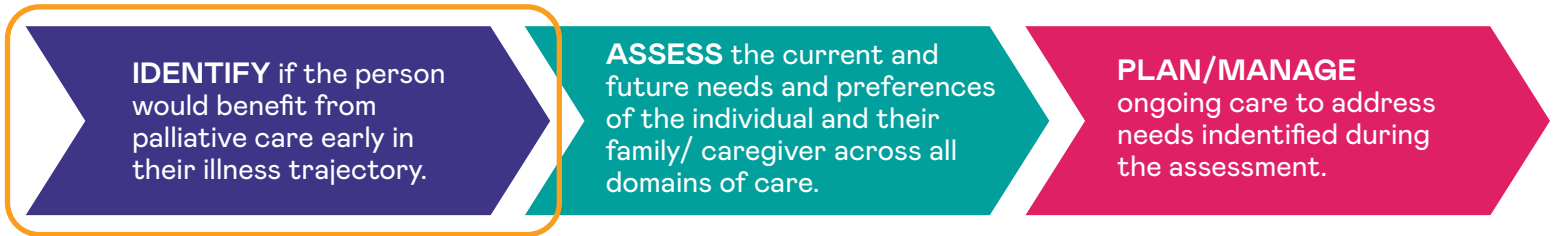
## Key Resources

- Long-Term Success Tool
- Six/Twelve-month follow-up survey (Appendix 2)

# Setting-Up the IT Infrastructure for HOMR

## Description

This step of the HOMR intervention is setting-up the IT infrastructure required to identify patients who are admitted to the hospital with shortened life expectancy using the HOMR algorithm. This is part of *Step 1: Identify* of [Ontario Palliative Care Network's \(OPCN\)](#) best practice model for early identification of people who would benefit from palliative care.



## Objectives

This is an example of an excerpt from the HOMR driver diagram specific to this step.

A HOMR score is calculated for all newly admitted patients to [enter unit name(s), e.g., general medicine].

## Team Discussion

It is recommended to discuss the following questions as a team to help with planning the IT infrastructure for HOMR:

- Should we implement HOMR Now! or mHOMR on our EHR platform? (See Appendix 1 for comparisons of the different versions of HOMR).
- As a clinical team how do we decide what the HOMR score threshold will be for our patients?
- How do individual clinicians get informed when patients go over the threshold, we have set using the HOMR tool?
- How will we incorporate the HOMR notification process into our EHR platform?

## Tips

- Use the most accurate, updated version of HOMR Now! if possible.
- Discuss logistics of the mHOMR or HOMR Now! application at your site, including which application would be a better fit based on your existing EHR platform.
- If possible, connect with the IT leads of other sites with similar EHR platforms who have implemented HOMR to exchange learnings.
- Identify and test a threshold for HOMR notifications referred to as “HOMR positive patients” (recommended baseline score of  $> 0.21$ ). Adjust the thresholds as needed based on volume of patients and staff capacity.
- Develop education materials on how the application works for staff.

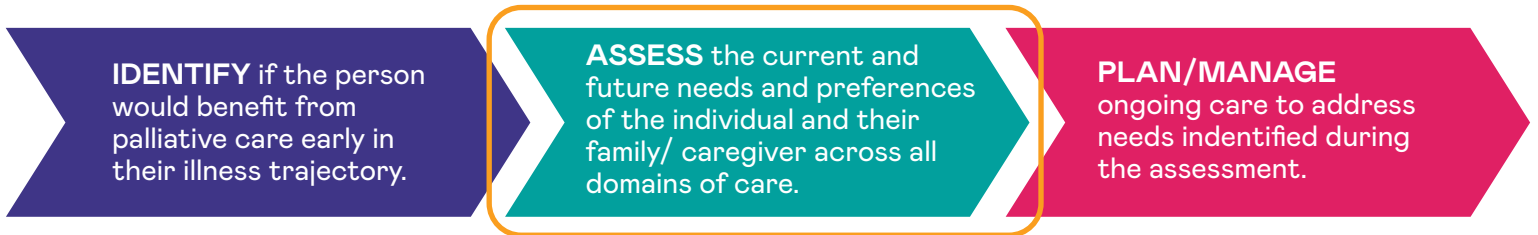
## Key Takeaways

- It's better to run HOMR on every hospital admission and limit alerts to the testing unit(s). This will make it easier to spread HOMR to other units later.
- Start with 0.21 for the threshold and adjust up/down based on volume of patients and staff capacity.
- Identify who will receive the notifications for triage every day, e.g., patient's nurse. It's not recommended to email physicians directly. Develop your notification process in consultation with clinicians including how to manage recurring flags for the same patient.

# Understanding Why and How to Administer the Assessment Tools

## Description

This step focuses on understanding the value of the HOMR intervention and supporting clinicians to administer at minimum the [ESAS-R](#) and the [ACP Engagement Survey](#), and also respond to the unmet needs identified with these tools to improve patient care. This is part of *Step 2: Assess* of the [Ontario Palliative Care Network's \(OPCN\)](#) best practice model.



## Objectives

This is an example of an excerpt from the HOMR driver diagram specific to this step.

Patients identified by HOMR are assessed using the [ESAS-R](#), 4-item [ACP Engagement Survey](#) and [add any other tools if applicable] within 72 hours of admission.

## Team Discussion

It is recommended to discuss the following questions as a team to help with understanding why and how to administer the assessment tools:

- What is the value of the HOMR intervention? What are some key messages to share with clinical team members based on their role (e.g., physicians and nurses/allied health)?
- How will we capture the patient/family perspective on our assessment process? Do we have patient/family advisor(s) on our quality improvement team?
- What happens once a patient is flagged by HOMR? Who needs to be notified and when?
- How will we assess HOMR positive patients?
- How will we communicate and use the results from the assessment tools?
- Who needs to be trained on this process? How will we provide this training?



## Tips

- Identify which unit(s) will receive HOMR notifications and roles/responsibilities of clinical team members.
- Develop a process for completing the assessment tools.
  - ESAS-R: score of > 6 flags severe cases.
  - ACP Engagement Survey: scores of 3-4 indicate that a patient is ready to discuss ACP and goals of care.
- Provide training to staff on how to assess HOMR positive patients and follow-up based on the results.
- Connect with the project/clinical leads from other sites who've implemented HOMR to exchange learnings, and with palliative care regional leads as applicable.

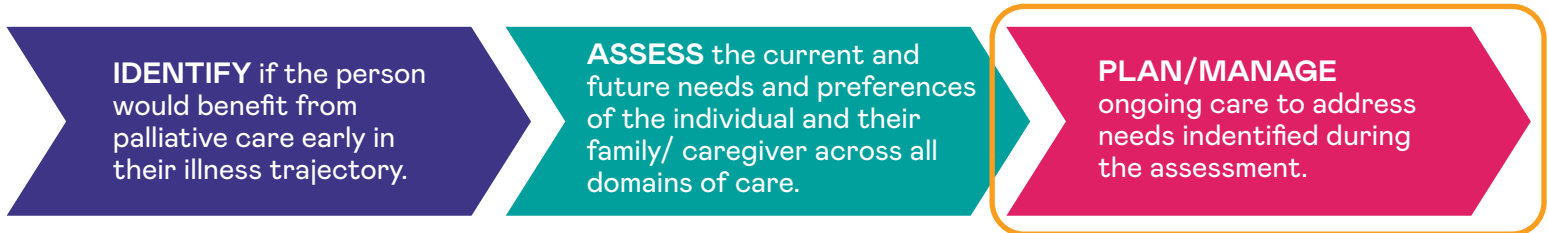
## Key Takeaways

- HOMR helps identify patients with conditions that have more ambiguous trajectories towards death (e.g., organ failure or frailty compared to terminal illnesses like cancer).
- ESAS-R and the 4-item ACP were selected because they are validated tools that are very short and easy to complete.
- The HOMR application is a reliable tool with low chance of false positives.
- Start implementing HOMR in medicine units before broader spread.
- Set-up a standard time to send notifications every day (e.g., morning at shift change).
- Patients may need support with completing the tools due to cognitive impairment.

# Following Up on the Patient Assessment Results

## Description

This step focuses on managing the patient's palliative care needs including following-up with their primary care provider to share clinical assessment results. This is part of *Step 3: Plan/Manage* of the [Ontario Palliative Care Network's \(OPCN\)](#) best practice model.



## Objectives

This is an example of an excerpt from the HOMR driver diagram specific to this step.

Palliative care interventions are administered during hospital admission according to the needs of the patient and this information is shared with the patient's primary care provider.

## Team Discussion

It is recommended to discuss the following questions as a team to help with managing the patient's palliative care needs in the hospital and coordinating care in the community:

- Why is this step important in palliative care?
- How will we use the results from the clinical assessment tools? How will we share this information with patients/families and the patient's primary care provider?
- Who needs to be trained on this process? How will we provide this training?

## Tips

- Develop a process for following-up on the results from the assessment tools while the patient is at the hospital and coordinating the patient's needs with their primary care provider in the community.
- Provide training to staff on how to follow up based on the results.
- Connect with the project/clinical leads from other sites to exchange learnings, and regional leads in palliative as applicable.

## Key Takeaways

- It's important to have an integrated model with the community sector and be aware of the services available before the patient is sent home.
- Share information with physicians/nurses quickly to support the palliative needs of patients.
- Follow up on the referral process and take an active role.
- Ensure role clarity on who is responsible for following up on a patient when they leave the hospital.

# Learning from the HOMR Intervention

## Description

Identifying how to implement the HOMR intervention in a sustainable way will be an iterative process. This phase focuses on how to monitor progress and use the results to make improvements. This will help evaluate the process used to implement all three steps of the [Ontario Palliative Care Network's \(OPCN\)](#) best practice model.

**IDENTIFY** if the person would benefit from palliative care early in their illness trajectory.

**ASSESS** the current and future needs and preferences of the individual and their family/ caregiver across all domains of care.

**PLAN/MANAGE** ongoing care to address needs identified during the assessment.

## Objectives

This is an example of an excerpt from the HOMR driver diagram specific to this step.

Process for identifying, assessing, and planning/ managing the palliative needs of patients is evaluated on an ongoing basis as a team using (for example) PDSA cycles.

## Examples of Measures

- Proportion of admissions at each site identified by the HOMR application.
- Proportion of admissions with a HOMR score >0.21 who have the [ESAS-R](#) and 4-Item [ACP Engagement Survey](#) tools completed within 72 hours.
- Proportion of admissions with a HOMR score >0.21 with ESAS symptom score >6 and/or documented desire to engage in ACP via the 4-item [ACP Engagement Survey](#).
- Proportion of HOMR positive patients with documented palliative needs shared with primary care providers.

## Team Discussion

It is recommended to discuss the following questions as a team to help with evaluating the implementation of HOMR:

- What data will we track to evaluate our implementation of the HOMR initiative? What are our targets?
- Who will be responsible for collecting data at our site? How will we collect this data and how often?
- How will we review our process to identify improvements (e.g., further training, meeting the 72-hour timeframe target for completing the assessment tools, etc.) and how often?

## Tips

- Identify who will be collecting the data used to evaluate HOMR.
- Define your pre-intervention and post-intervention periods. Use data collected for the pre-intervention period (i.e., baseline data) to inform implementation targets (e.g., goal may be a 50 per cent improvement from baseline in needs being assessed).
- Develop a schedule for testing different components of the clinical workflow process and establish a process for sharing the results.

## Key Takeaways

- Establish a baseline by collecting pre-implementation data (e.g., nine months). This will help with the development of the aim statement and driver diagram.
- Develop a schedule for tracking progress to make timely changes based on feedback and share these results with other units to help scale HOMR within the hospital.
- Review one-year follow-up results from HOMR positive patients to assess impact.

# Glossary

- **Palliative care** focuses on providing patients with relief from pain, other symptoms, and the stresses of serious illness. The goal is to improve quality of life for both the patient and the family. Palliative care is provided in a variety of locations, including people's homes, hospices, residential care settings and hospitals.
- **Goals of care** are choices made by patients or families for treatment and care based on diagnosis and prognosis, the potential benefits and risks associated with various therapies, and personal priorities and beliefs.
- **End of life care** is associated with advanced, life-limiting illnesses, and focuses on comfort, quality of life, respect for personal healthcare treatment decisions, support for the family, and psychological and spiritual concerns.
- **Life-limiting illness** is used to describe illnesses that can be reasonably expected to cause the death of the individual within the foreseeable future.
- **Advance care planning** is a process that supports people in understanding and sharing their personal values, life goals and preferences for future medical care. The goal of advance care planning is to help people receive care that is consistent with their values and preferences during serious illness.

# Appendices

## 1. HOMR Frequently Asked Questions

### What is HOMR?

Hospital One-Year Mortality Risk (HOMR) is an application that automatically, accurately, and reliably uses data routinely collected by hospitals upon admission to calculate a patient's risk of dying within the next 12 months. This helps clinicians identify patients who are admitted to hospital with potential unmet palliative needs. The HOMR application is intended to be a trigger to improve the effectiveness of any palliative intervention by focusing attention on a small group of patients with a high risk of death and unmet palliative needs, at a timely point in their illness trajectory.

### Why is HOMR needed? How will it improve patient care?

Clinicians need a reliable method to identify patients who are admitted to hospital with shortened life expectancy and unmet palliative needs. This is especially true for patients with conditions that have more ambiguous trajectories towards death such as those with organ failure or frailty, who are less likely to receive palliative care compared to patients with a terminal illness such as cancer. Furthermore, in practice, patient identification falls to clinicians who often have numerous other responsibilities competing for their attention, decreasing the number of patients identified and limiting the ability to accurately identify patients for whom palliative and end of life care supports and interventions would be appropriate.

HOMR automatically and reliably identifies patients with unmet palliative needs. The HOMR tool can act as a trigger for physicians to consider administering palliative and end of life care interventions that benefit patients such as symptom management, goals of care discussions, deprescribing, or deintensification of treatment.

### What is the advantage of using HOMR for patient identification over other tools like the surprise question?

An objective, automated approach like HOMR overcomes several barriers of existing provider-dependent approaches. In current practice, patients are often identified for a palliative approach based on poor prognosis or a surrogate of prognosis. However, literature shows clinicians frequently overestimate survival, thus delaying interventions. To correct for this tendency, some have suggested the use of the surprise question (SQ): A clinician asking themselves "Would I be surprised if this patient died in the next 12 months?". An answer of "no" (SQ+) would then act as a trigger for a more detailed assessment and appropriate palliative intervention. The SQ has been widely advocated and integrated into the Gold Standards Framework and the NECesidades PALliativas [Palliative Needs] (NECPAL) tool, both designed for the identification of patients in need of palliative care. However, a meta-analysis of the SQ indicated modest accuracy at best—missing more than a third of dying patients, and returning many false positives, particularly among patients with non-cancer illness. The SQ also has a poor inter-rater reliability, and it is dependent on a healthcare provider being willing and remembering to use it. Implementation studies of SQ-triggered interventions in the UK and Canada (Ontario) have shown low uptake. More complicated provider-dependent identification tools like the Gold Standards Framework and NECPAL identify roughly the same patients as the SQ, and their complexity is a considerable barrier to real-world implementation.

## What's the difference between HOMR, mHOMR, and HOMR Now!?

There are three different versions of the Hospital One-year Mortality Risk: 'HOMR', 'mHOMR', and 'HOMR Now!'. The three versions differ in their clinical usage due to the administrative data points that each version collects.

The original HOMR calculates a 12-month mortality risk for patients admitted to hospital using 12 administrative data points, some of which are only routinely coded at the time of discharge. This means HOMR cannot be used in real-time to help with clinical decision making during the patient's admission.

mHOMR is a modified version of HOMR that uses 9 administrative data points, all of which are available at the time of admission. mHOMR uses a computerized application (via the electronic medical record system) to automatically calculate mHOMR scores for all patients as they are admitted to hospitals. It then prompts the

admitting team to consider palliative and end of life care interventions for patients with an elevated mortality risk.

HOMR Now! is an updated version of mHOMR that has recently been developed and validated. It is calculated using 10 data fields and an interaction term available in many hospitals' admissions data. It includes slightly different variables than mHOMR, such as the patient's previous Charlson Comorbidity Index, whether they were seen in a cancer clinic in the past 12 months, and the patient's previous Laboratory-based Acuity Physiology Score (LAPS).

Both mHOMR and HOMR Now! are accurate and reliable (C-statistic of 0.89 and 0.92, respectively). The decision to implement one over the other is based on whether or not the additional variables required to calculate the HOMR Now! score are available in the electronic medical record; if yes, we recommend implementing HOMR Now!, since it is slightly more accurate.



## Variations of HOMR

HOMR (c=0.90-0.92)	MHOMR (c=0.89)	HOMR Now! (c=0.92)
Age	Age	Death risk (life tables)
Sex	Sex	Sex
Home O2		
Admitting diagnosis		
Charlson Comorbidity Index		Charlson (previous admission)
Admitting service	Admitting service	Admitting service
Urgent 30d readmission	Urgent 30d readmission	
# of emergency department visits in the past 12 months	# of emergency department visits in the past 12 months	# of emergency department visits in the past 12 months
Admissions by ambulance in the past 12 months	Admissions by ambulance in the past 12 months	
Living status (e.g., home, long-term care)	Living status (e.g., home, long-term care)	Living status (e.g., home, long-term care)
Admission urgency/via ambulance	Admission urgency/via ambulance	Admission urgency/via ambulance
Direct to Intensive Care Unit	Direct to Intensive Care Unit	
		Seen in cancer clinic in past 12 months
		Laboratory- based Acuity Physiology (LAPs) Score

### How does HOMR calculate mortality risk? Is it accurate?

HOMR calculates mortality risk by using simple demographic variables (e.g., age, sex) and administrative information (e.g., admitting service, living status, number of admissions in the past 12 months). It is not a perfect measure, but it is more accurate (C-statistic of 0.89-0.92) than any published prognostic tool that uses clinical information or clinician judgement. For more detailed information about HOMR score validation, you can reference articles provided on the last page of this document.

## **How is the HOMR score interpreted (e.g., what does a score of 0.34 mean)?**

A patient's HOMR score represents their probability of death within 12 months of hospital admission; therefore, a patient with a HOMR score of 0.34 has a 34 per cent risk of dying within 12 months of hospital admission.

## **Why aren't clinicians or patients and their families given the actual HOMR score?**

The goal of HOMR is to bring attention to patients who may benefit from a palliative approach to care. As the actual HOMR score itself is not prescriptive and can vary with the time window being assessed, it is not made available to clinicians, patients, or their families. The absolute score number is also a population-based metric and thus not easily interpretable for a given individual (e.g., the difference between a 25 per cent and 33 per cent risk of death in the next year is unlikely to be interpretable or meaningful for the patient, or significantly affect whether or not they can/should receive palliative supports).

## **Why is a score threshold recommended? How is the score threshold selected?**

The HOMR tool sends a notification to a patient's admitting team when that patient's HOMR score is over a certain threshold. The tool was developed to be used as a binary measure of whether a patient should be considered for palliative care, not as a prescriptive tool. The decision about whether to use palliative care interventions or not is left to the admitting team.

While we recommend a starting threshold of 0.21 (\*90 per cent specificity, 59 per cent sensitivity for mHOMR), HOMR is a versatile tool that can be adjusted depending on an organization's preference. As HOMR produces a continuous risk score between 0 and 1, the user can decide what threshold to use for identifying "high risk" patients.

Organizations concerned with the efficient use of limited resources can set a higher mortality threshold (score threshold), meaning that the application would be more specific than sensitive. Of the patients flagged by the HOMR tool, most of them would have unmet palliative needs or a desire to discuss goals of care with their physician. Organizations using more scalable interventions can lower the HOMR score threshold, meaning the instrument would be more sensitive than specific. More patients would be flagged by the tool, but not as many of them would necessarily have unmet palliative needs.

For most hospitals, a score threshold of 0.21 flags approximately 10 per cent of all hospital admissions, which is also reflective of the one-year hospital mortality actually observed in Ontario. Experience thus far suggests a HOMR positive rate of 10 per cent is a manageable workload for staff.

## **How is HOMR integrated into the EMR? What type and volume of information technology and information system supports are required?**

HOMR is integrated into the Electronic Medical Records (EMR). EMR integration and score generation can be thought of in a three-step process: Data Mapping, Data Validation, and Data Communication/Flow.

*Data Mapping:* The HOMR application is built with the help of the hospital's Information Technology/Systems (IT/IS) department using the programming language of the hospital's EMR. The application starts by pulling the required variables (i.e., mapping to determine where the required variables are stored and how they can be retrieved). The application then uses these variables to calculate a HOMR score for each patient.

*Data Validation:* IT/IS teams validate the HOMR score against previously admitted patients to ensure the score is being calculated and generated correctly. During validation teams also select a score threshold that will output a

manageable number of HOMR positive patient notifications.

*Data Communication/Flow:* After a HOMR score is calculated, the score is then compared against a preset score threshold, determining whether a notification will be created for a patient or not. If the patient's HOMR score is greater than the score threshold, a notification is sent from the HOMR application back into the patient's EMR to flag the clinical team. How the score is communicated to the care team through the EMR is different for each hospital depending on the EMR used and clinical workflows.

Based on experience from hospitals who have implemented to date, it is estimated that a total of two weeks of 1.0 FTE data analyst/IS/IT time is required for HOMR EMR integration. Note that this estimate is based on hospitals who have completed HOMR EMR integration from scratch – new hospitals onboarded will have the benefit of using solutions already developed for MEDITECH (5.6.7; Magic5.67; Expanse7.5.4), EPIC, Cerner, Anzer, Soarian, and Quadramed.

### **When a patient is identified as HOMR positive, how is this information delivered to the care team? How does the care team use this information?**

When a patient is identified as HOMR positive, the patient's care team is notified through the patient's electronic medical records (EMR). These notifications are not prescriptive in nature, and the decision about how to respond to them is left to the patient's care team. Generally, these notifications are actionable and prompt care teams to 1) assess for severe uncontrolled symptoms and the patient's desire to engage in advance care planning and 2) address any identified unmet palliative needs through existing hospital interventions as appropriate. The latter could include standardized goals of care discussions, medication review, treating pain and other symptoms, and/or a palliative care consultation.

### **Won't HOMR implementation add more to my workload as a clinician?**

We encourage each hospital to develop a site-specific, tailored implementation plan. One of the goals of this process is to ensure HOMR implementation is integrated into existing workflows to minimize burden on healthcare providers. Hospitals may have tools they are already using or familiar with to conduct symptom and advance care planning assessments with HOMR positive patients. Otherwise, our team recommends two simple, short, validated tools for these purposes: 1) the Edmonton Symptom Assessment Scale-revised (ESAS-r) (10 items rated on a Likert scale) and the 4-Item Advance Care Planning Engagement Survey (four multiple choice questions).

In most hospital patient populations, when the HOMR score threshold is set at 0.21, approximately 10 per cent of admissions are identified as HOMR positive, for which a notification is sent to the care team. However, this score threshold can be modified depending on the hospital- and unit-specific context to manage workloads; increasing the HOMR score threshold will make the tool more specific and reduce the number of alerts, and decreasing the threshold will make the tool more sensitive and increase the volume of alerts.

While integrating HOMR implementation into existing workflows and carefully selecting the score threshold can reduce the impact on clinician workload, there remains a modest time investment to conduct assessments, and to provide appropriate follow-up care and have goals of care discussions based on the assessments. While we have yet to study the long-term effects of HOMR implementation (this is planned as more hospitals implement HOMR), we anticipate that the upfront time investment in HOMR implementation will lead to downstream time savings in addition to improved patient outcomes (e.g., reduced hospital emergency department visits and re-admissions). Qualitative feedback from clinicians at hospitals who have implemented HOMR to date indicates that using

HOMR to drive improved symptom management and proactive advance care planning and goals of care discussions has helped prevent crisis situations for patients, their families, and clinicians at the end of life.

### **HOMR predicts mortality, but it's being used to screen for palliative needs. Does everyone in the last year of life have unmet palliative needs?**

Not everyone in the last year of life has unmet palliative needs; however, previous research has demonstrated that over 90 per cent of patients with HOMR scores of 0.21 or greater have unmet needs, operationalized as a severe symptom, a desire to discuss advanced care planning, or both.

### **HOMR identifies patients in acute care. Can it be used in other settings? How can it be linked to primary and community care?**

HOMR is only validated for use in adult, non-psychiatric inpatient acute care settings. However, identifying HOMR positive patients in acute care can have downstream benefits for follow-up primary and community care. For example, identifying patients in hospital with unmet palliative needs may trigger increased home care supports, or goals of care discussions may reduce unnecessary emergency department visits. Some participating hospitals have taken a more direct approach to primary care engagement – for instance, patients with a positive HOMR score have a discharge summary report sent to their primary care provider which includes a HOMR page communicating to the primary care provider what the tool is, that the patient is HOMR positive, assessments and interventions that were completed in hospital, and recommended follow-up items.

There are similar tools to HOMR that use health administrative data collected in community and home care settings, such as the Risk Evaluation for Support: Predictions for Elder-life in the Community Tool (RESPECT) and RESPECT-Long-Term Care, respectively.

### **What do patients and families think of HOMR?**

A HOMR mixed methods study asked patients and families for their thoughts on the acceptability of the HOMR tool in hospitals. This pilot study demonstrated patients and families are supportive of the HOMR approach. Many patients in particular reported they were supportive of any intervention that increased their facetime with the treating physician.

Additionally, participating hospitals have engaged their patient and family advisory councils throughout the HOMR implementation process – consistently, patients and families were surprised to find out that routine, standardized processes for assessing palliative care needs and conducting advance care planning were not already standard of care. The overwhelming sentiment among patients and families was “why are we not already doing this?”.

## **Why is consent not obtained from patients to calculate their HOMR score and notify their care team of the score outcome?**

Every patient admitted to the hospital units implementing HOMR will be automatically screened by the HOMR application that is integrated into the existing EHR system. If a patient is identified as HOMR positive with increased risk of mortality and likely unmet palliative needs, the patient's clinical care team will be prompted to complete a palliative needs assessment using tools accepted as standard of care and, based on these assessments, use their clinical judgment to provide the patient with any appropriate palliative care interventions according to usual best-practice care (de-prescribing intervention, palliative care consult, goals of care discussions, etc.). Thus, the HOMR tool itself is simply a screening tool to drive and optimize early identification of palliative needs and existing patientcare practices as part of a quality improvement initiative. The HOMR score itself is not communicated to the care team or the patient, and the information used to generate the HOMR score is collected as part of routine hospital admission assessments.

## 2. Hospitalised-Patient One-Year Mortality Risk Score Six/12-Month Sustainability Survey

Thank you for completing this survey – we appreciate your time and input. Survey responses will be reported only in aggregate to ensure confidentiality. If you have any questions, please contact [E-mail].

### 1. About You: Which hospital or site do you work at?

### 2. Sustained Implementation

The following questions ask about the extent to which the practices implemented as part of your quality improvement initiative have continued or remain a part of your organization. Please indicate the extent to which you agree or disagree with the following statements:

Since the conclusion of the quality improvement initiative, in my organization...	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree	Don't know / Not applicable
The innovative or better practices implemented as part of our quality improvement initiative are regarded as common practice.						
Staff continue to use the knowledge and skills gained during the quality improvement initiative.						
We continue to regularly measure our performance in our quality improvement initiative (e.g., once every 3 months).						

### 3. Sustained Improvement Gains

3.1 The following questions ask about the extent to which your organization continues to see or hold the improvement gains/benefits/results realized through the implementation of your quality improvement initiative. Please indicate the extent to which you agree or disagree with the following statements:

This quality improvement initiative continues to...	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree	Don't know/ Not applicable
Improve the patient experience of care (e.g., as measured by patient surveys).						
Improve the quality of life of patients (e.g., as measured by self-reports by patients/families, interviews/ observations by the team).						
Provide value for money (e.g., as measured by administrative data, cost data, economic evaluations, ROI analyses).						
Improve the work life of healthcare providers (e.g., as measured by healthcare provider surveys).						

3.2 What have been the major facilitators contributing to the sustainability of your quality improvement initiative?

3.3 In instances where your quality improvement initiative was not sustained, what have been the major barriers?

Please describe what has been done to support the sustainability of your quality improvement initiative:

#### **4. Other comments**

Do you have any further information or stories to share about your team's sustainability efforts?



### 3. Long Term Success Tool

The Long Term Success Tool (LTST) is a way to identify risks and strengths of 12 factors that are known to impact the long term success of an improvement initiative<sup>1</sup>. With your team, discuss, rate and identify comments and actions for the 12 LTST factors. Each rating should represent your team's overall impression of how the improvement is currently doing.

1

**Commitment to the improvement:** My team understands what the improvement initiative is trying to achieve and believe this work will lead to improved processes and outcomes.

Additional reflection questions to inform your responses:

- Do you feel committed to the initiative? Do you understand what the initiative is trying to achieve?
- Do you believe the initiative will improve processes and outcomes?
- Do you think there is commitment across the team as a whole?
- Has a shared aim been established for your initiative?

very good

good

fair

very poor

no opinion

don't know

Comments and actions:

2a

**Involvement:** I have the opportunity to input into the improvement initiative and I feel a sense of ownership towards the work. I am able to express my ideas freely which are openly considered by the team.

Additional reflection questions to inform your responses:

- Do you personally feel involved in the initiative?
- Are you given the opportunity to express your ideas and recommend changes to the initiative when necessary?

very good

good

fair

very poor

no opinion

don't know

Comments and actions:

2b

Involvement: There is wide breadth of involvement from people including patients and members of the public who regularly feed into the improvement initiative.

Additional reflection questions to inform your responses:

- Do you think the initiative has involved the right people? If not, how can this improve?
- Does your initiative involve patients affected by the improvement? Is there involvement from staff who will be delivering the improvement as part of their day-to day practice?
- Does the team have a good spread of views, skills and expertise?
- Are there groups of people you still need to involve?

very good

good

fair

very poor

no opinion

don't know

Comments and actions:

3

Skills and capabilities: Staff have the necessary skills to deliver the improvement. Training and development opportunities are available to all staff, volunteers and other people involved.

Additional reflection questions to inform your responses:

- Do you feel able to fulfil your role within the initiative?
- Do you or staff involved require further training or education to deliver the improvement effectively? What should be done to address these needs?
- Are new staff informed about the initiative and their role in it?

very good

good

fair

very poor

no opinion

don't know

Comments and actions:

4

Leadership: My improvement initiative has supportive and respected leaders and/or champions who advocate for the improvement, communicate the vision, and effectively manage the process.

Additional reflection questions to inform your responses:

- Are leaders actively involved in the initiative and able to garner support and enthusiasm for the work?
- Are leaders available to help solve problems?
- How do you think leadership could be strengthened?

very good

good

fair

very poor

no opinion

don't know

Comments and actions:

5

Team functioning: My team is working well together. There are clear responsibilities for individuals and the work is shared across the team and does not rely on particular individuals.

Additional reflection questions to inform your responses:

- How well do you feel your team is working together?
- Does the team meet and communicate on a regular basis?
- Have clear roles and responsibilities for team members been established?
- In your opinion, are team members fulfilling these roles and responsibilities?
- Are skills and expertise of team members considered and used?
- What do you think can be done to improve team functioning?

very good

good

fair

very poor

no opinion

don't know

Comments and actions:

6

Resources in place: The improvement initiative has financial support to achieve long term success. We have the necessary staff, material and equipment. I am given enough time to dedicate to the improvement.

Additional reflection questions to inform your responses:

- Have enough resources (e.g. staff and tools) been dedicated to support the initiative? What's lacking?
- Do you believe the financial support provided will allow the initiative goals to become part of normal working practice in the long term?
- Do staff have enough time to spend on the improvement?
- Are resources needed discussed by the team on a regular basis?

very good

good

fair

very poor

no opinion

don't know

Comments and actions:

7

Progress monitored for feedback and learning: There is a monitoring system in place that allows the team to collect, manage and regularly review data. Feedback from the improvement initiative is shared with me.

Additional reflection questions to inform your responses:

- Have measures to enable continuous monitoring for the initiative been defined by the team?
- Do you think the established measures are able to assess the impact of the improvement?
- Are these measures regularly assessed?
- If the measures show lack of progress are the causes for this investigated to inform adjustment?
- Are team members and staff regularly informed about what is working well and what could be better?

very good

good

fair

very poor

no opinion

don't know

Comments and actions:

8

Evidence of benefits: There is evidence of benefits emerging from the improvement initiative and this evidence is regularly communicated and visible to staff and patients.

Additional reflection questions to inform your responses:

- Does the evidence for your initiative include both the impact on physical and mental well-being of patients?
- Is there evidence that the initiative is producing the desired impact on patients?
- Is evidence of the initiative’s impact regularly shared with staff, patients and others?
- If evidence shows lack of progress, does the team explore reasons?

very good

good

fair

very poor

no opinion

don't know

Comments and actions:

9

Robust and adaptable processes: There is the opportunity to adapt the improvement initiative to reflect local needs, setting and emerging evidence. Adaptations are documented and the successes and failures of changes are reported.

Additional reflection questions to inform your responses:

- Is there regular review of how the initiative is working?
- How well does the initiative fit within current practices?
- Do staff and team members need to adapt how they implement the improvement in response to challenges or changing care needs?

very good

good

fair

very poor

no opinion

don't know

Comments and actions:

10

Alignment with organisational culture and priorities: The improvement my initiative is trying to achieve is aligned with the strategic aims and priorities of the organisation(s) we work within and our work contributes to these aims. Our work is supported by the policies and procedures within the organisation.

Additional reflection questions to inform your responses:

- Are your improvement goals aligned with organisational priorities? If not, what could improve alignment?
- How well is the work of the initiative being integrated into the everyday operations of the organisation?
- Does the initiative conflict with any other changes taking place within the organisation?

very good

good

fair

very poor

no opinion

don't know

Comments and actions:

11

Support for improvement: There are values and beliefs in my organisation(s) that emphasise the need to improve. Staff and management are supportive of improvement initiatives and continuous improvement is a priority for the organisation, staff and patients.

Additional reflection questions to inform your responses:

- Do you feel continuous improvement is a priority within your organisation?
- Are staff and senior management receptive to improvement initiatives?
- Are you supported by your leaders to participate in the improvement initiatives?
- Do senior leaders actively participate in improvement of the initiatives?

very good

good

fair

very poor

no opinion

don't know

Comments and actions:

12

Alignment with the political and financial environment: My improvement initiative exists in a supportive economic and political environment. My team is aware of external pressures and incentives that may influence the initiative.

Additional reflection questions to inform your responses:

- Has your team considered the impact of the external environment on the initiative? For example, are there economic pressures or political developments that may impact the initiative?
- Is there political support for the implementation of your initiative?
- Does your initiative help address external political or economic concerns or goals?
- Are there plans to mitigate risks due to the external environment?

very good

good

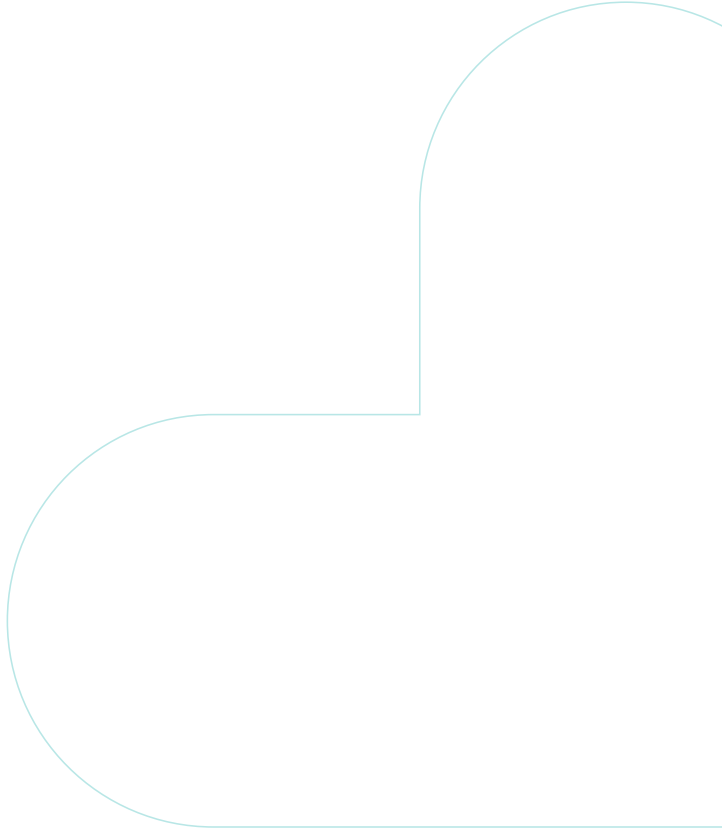
fair

very poor

no opinion

don't know

Comments and actions:



# Planning for long term success using the long term success tool

Using your completed Long Term Success Tool (LTST), use this tool with your improvement team to support planning for long term success.

1a

What two LTST factors are your greatest strengths, in that you and your team see these factors as most likely to contribute to the long term success of the improvement initiative?

Success factor 1:

Success factor 2:

1b

For each of the top two success factors identified in question 1 (a): what are your goal(s) to maximize these strengths, over the long term, so these factors continue to support the long term success of the improvement initiative?

Goal for success factor 1:

Goal for success factor 2:

1c

Create an action plan to achieve the goal(s) identified in 1 (b). We recommend that your action plan identify the elements listed in the table below – use extra paper or your computer to write detailed action plans.

Action	Who is responsible?	Due date	Completed



1d

Create a measurement plan to identify how your team will evaluate success of the goal(s) identified in 1 (b). we recommend that your measurement plan identify the elements listed in the table below – use extra paper or your computer to write detailed measurement plans.

What data will be collected?	How? (eg. checklist, chart audit)	Who?	When? (Be specific)	Where?

2a

What two LTST factors are your greatest risks, in that you and your team see these factors as most likely to threaten the long term success of the improvement initiative?

Risk factor 1:

Risk factor 2:

2b

What are your goal(s) to minimize these risks, over the long term, so these factors do not threaten the long term success of the improvement initiative?

Goal for risk factor 1:

Goal for risk factor 2:

2c

Create an action plan to achieve the goal(s) identified in 2 (b). We recommend that your action plan identify the elements listed in the table below – use extra paper or your computer to write detailed action plans.

Action	Who is responsible?	Due date	Completed

2d

Create a measurement plan to identify how your team will evaluate success of the goal(s) identified in 2 (b). We recommend that your measurement plan identify the elements listed in the table below – use extra paper or your computer to write detailed measurement plans.

What data will be collected?	How? (eg. checklist, chart audit)	Who?	When? (Be specific)	Where?

The content for this tool is reproduced and adapted from the Long Term Success Tool developed by Laura Lennox and the Imperial College for use in Healthcare Excellence Canada programming. Please refer to *What makes a sustainability tool valuable, practical, and useful in real world healthcare practice? A qualitative study on the development of the Long Term Success Tool in Northwest London<sup>1</sup>* for further background on its development and use.

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