Malnutrition Strategy

2024–2029

Nutrition Services

Essential partners in health

Malnutrition Strategy Overview

Vision: Creating a healthier Alberta and supporting efficiencies in healthcare through improved awareness, prevention, detection, and treatment of malnutrition.

Mission: Improving the management and quality of nutrition care for all Albertans by increasing knowledge and awareness, developing partnerships, and implementing best practices and system level changes.

Nutrition and Food Services Practice, Skills, and Processes	Providers and Partners Knowledge and Practice	Systems and Environment	Awareness and Connections
Educate and train dietitians and Nutrition and Food Services staff so they feel supported to strengthen malnutrition care. Staff champion and implement best practices.	Educate and train healthcare providers and partners to implement best nutrition care practices and provide appropriate and timely nutrition interventions in all settings.	Advocate for and implement patient, provider, and system level changes to improve malnutrition care. Foster a food and nutrition culture that prevents and treats malnutrition.	Create awareness that malnutrition is an issue that affects the health of Albertans. Connect individuals to the support they need. Establish internal and external partnerships to explore how to prevent, detect and treat malnutrition.
Priorities			
Support dietitian practice through education, training, and support tools related to malnutrition. Create knowledge, capacity, and confidence for patient food service staff to be involved in malnutrition care.	Provide targeted education to healthcare providers to increase awareness and understanding of malnutrition. Create and communicate practice support tools for healthcare providers.	Utilize technology to support best practice through quality improvement initiatives. Embed nutrition care pathways into current systems to promote use by all healthcare providers. Enhance patient mealtime experience in acute care and continuing care homes.	Raise public awareness of malnutrition prevalence, risk, outcomes, and available supports. Partner with others in AHS and healthcare to align with existing initiatives. Partner with community groups to support the prevention, detection, and treatment of malnutrition across Alberta. Collaborate with other organizations to create an environment in Alberta supporting malnutrition best practice.

Guiding Principles

Person-centred; Partnerships and Collaborations; Evidence-informed and Data-driven approach; Adaptable and Flexible; Equitable and Sustainable.

We are committed to reconciliation and working towards achieving health equity with and for Indigenous peoples in Alberta

Strategy 2024–2029

Nutrition Services

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Contact and Acknowledgements

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This strategy document has been prepared by Nutrition Services, Nutrition, Food, Linen & Environmental Services

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Introduction

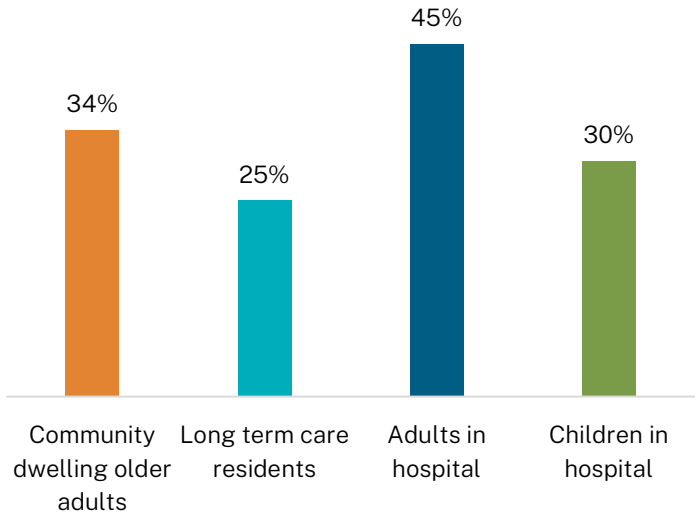
Malnutrition is a prevalent, often under-recognized disease that can result from widespread health, economic, and systemic disparities. Historically, malnutrition has been associated with food scarcity and poor socioeconomic status, common in developing nations. More recently, the issue of malnutrition in developed nations is recognized as a significant health issue. This is particularly true in healthcare settings, where associated adverse health effects can contribute to poor clinical and health outcomes for patients as well as place a significant economic burden on the healthcare system.[1–12]

What is Malnutrition?[13,14]

Malnutrition, or undernutrition, is a lack of intake or body uptake of nutrition leading to altered body composition resulting in decreased physical function, mental function, ability to heal from disease, and, in children, altered growth and development.

Malnutrition is commonly seen in combination with other disease states, as a result of decreased intake, increased losses, increased needs, and altered nutrient utilization. In the absence of disease or injury, malnutrition can be present in situations where nutrient intake is limited due to socioeconomic, psychological, or environmental factors.[13,14] Due to the complex and varied causes of malnutrition, it can be present in any setting including in hospitals, care centres and in the community.

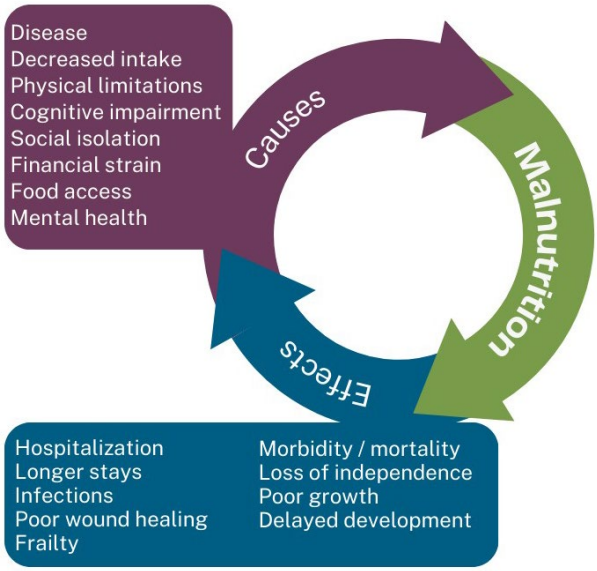
Canadian data suggests malnutrition is present in:[12,15–18]



Impact of Malnutrition

Albertans

Malnutrition is multifactorial and affects all ages. The varied causes of malnutrition make it challenging to detect and prevent, especially in community settings with limited screening for nutrition risk. The impact malnutrition can have on individuals' physical health, mental health and quality of life is great, and likely underappreciated.



Causes and effects of malnutrition on individuals of all ages. The effects of malnutrition can exacerbate the causes, leading to a cyclical worsening of the condition.[1–12,38–55]

Healthcare System

Malnutrition puts stress on the healthcare system by delaying discharge, occupying healthcare professional time, and increasing resource utilization. It is estimated that malnutrition costs Canada over **$2 billion** per year.[9]

This number may be underestimating the impact of malnutrition as it does not consider the added strain on community resources for those who are malnourished outside of the healthcare system.

Impact of Treatment

Nutrition interventions have been shown to improve individuals' health and nutritional status both in hospital and the community.[19–23]

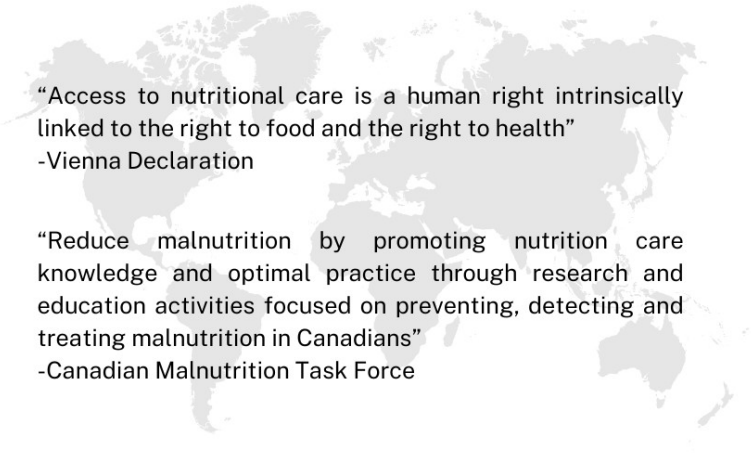
Research suggests for every $1 spent on nutrition interventions in the community, the health care system could save up to $99.[24]

In hospital, studies have shown nutrition interventions for malnourished patients can result in cost savings of over $2000 per patient when compared to those who are malnourished and receive no nutrition intervention.[25]

Call to Action

Global

Tackling malnutrition is a local, national, and international priority. Multiple international agencies have made declarations affirming "nutrition care as a human right",[26] and dedicating efforts to "eliminate malnutrition in all its forms".[27]



"Access to nutritional care is a human right intrinsically linked to the right to food and the right to health"
-Vienna Declaration

"Reduce malnutrition by promoting nutrition care knowledge and optimal practice through research and education activities focused on preventing, detecting and treating malnutrition in Canadians"
-Canadian Malnutrition Task Force

National

Within Canada, the Canadian Malnutrition Task Force partnered with the Health Standard Organization (HSO) to release the "Malnutrition Detection, Prevention, and Treatment Health Standard" in 2021.[28] The standard outlines best practice for the prevention, detection, and treatment of malnutrition in both adult and pediatric acute care settings with the intention of improving the quality of nutrition care.

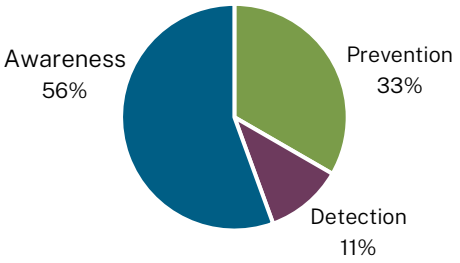
Local

In Alberta, the Four Foundational Strategies of Alberta Health Services (AHS) state all members of the organization must consider "new ways of doing things and to innovate, evaluate, and implement solutions that make our health system more nimble, sustainable, and responsive to the needs of Albertans."[29] Knowing the prevalence and negative impact of malnutrition in Alberta, prioritizing the prevention, identification, and treatment of malnutrition aligns well with the identified needs of AHS.

Nutrition Services (NS) aims to continue advancing malnutrition practice, using this strategy as the backbone for widespread implementation across the province.

Background

Malnutrition activities have been ongoing within AHS for over a decade, with a focus on building awareness of malnutrition across Alberta. The catalyst for this work in acute care was the 2010 "Nutrition Care in Canadian Hospitals" which highlighted the prevalence and negative outcomes of malnutrition in hospital.[12] In 2020, The Diabetes, Obesity, and Nutrition Strategic Clinical Network (DON SCN) Malnutrition Symposium initiated efforts to address the underrecognized prevalence of malnutrition in the community.

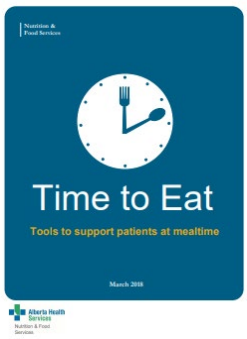


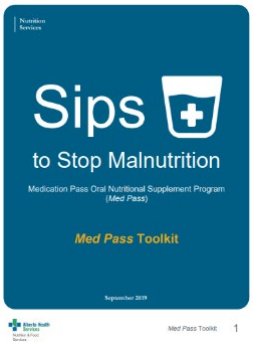
Focus of malnutrition activities in NS from 2015-2021. This information was collated from a scan of the provincial NS strategy drives to review activities completed. It did not include the daily clinical activities of dietitians.

A list of activities undertaken in the past by NS to address malnutrition can be found in Appendix 1. Examples of activities are highlighted below.

Hospital

- Implementation of validated screening and assessment tools in some sites, to align with the HSO Malnutrition standard.
- Tracking of nutrition indicators using technology from Connect Care.
- Prevention and treatment of malnutrition using available resources such as the Sips to Stop Malnutrition or Time to Eat Toolkit.





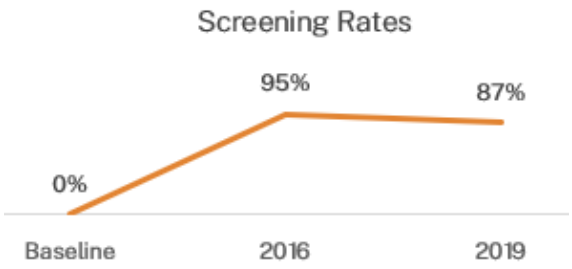
Community

- Piloted implementation of nutrition screening using SCREEN-8 for older adults in the community, and developed a Community Guide to Success to support spread and scale.
- Training of Health Link nurses to screen for nutrition risk and refer to Health Link dietitians when appropriate.
- Development of Nutrition Screening Pathways for Home and Community Care and Supportive Living Accommodations to support malnutrition identification and treatment.

Why Do We Need a Strategy?

Nutrition Services continues to work toward widespread implementation, sustainability, and scaling of initiatives needed to achieve system-level benefits. There have been pockets of success with positive outcomes, including research studies, pilot projects, and community initiatives:

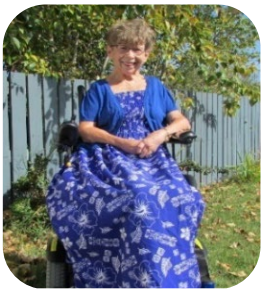
- The unit involved in both phases of the More-to-Eat study at the Royal Alexandra Hospital in Edmonton saw an increase in nutrition screening, SGA use, food intake monitoring and weight measurements.[30,31]



- The Alberta Children's Hospital in Calgary had successful implementation of nutrition screening on one unit, surpassing the goal of **75%** completion by the end of the study. There is support from the multidisciplinary team and hospital to spread implementation.

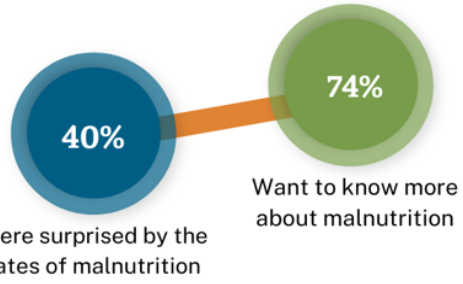
- In the Central Zone, nutrition risk screening is available for older adults in the community.

"[Having a nutrition screen] made me feel good because I found out that I was at high risk and that I could do something about it. My main thing is I want to stay healthy and strong so I can continue living in my own home...."
– Linda, Patient Advisor



To move beyond small, isolated successes, we need healthcare providers outside of NS to recognize the importance of malnutrition care and understand the role they can play in the nutritional health of their patients.[32,33] Engagement with AHS staff on malnutrition has been ongoing:

- **Your Voice Matters Survey** (2022): 413 staff responded to an online survey, showing a good understanding of what malnutrition means and highlighting opportunities for further awareness.



Results of the Your Voice Matters Survey

- **AHS Clinicians Council** (2024): NS met with a group of multidisciplinary clinicians to consult on the creation of this strategy. The clinicians saw a role for themselves in nutrition care but identified needing more support tools and resources in the nutrition care process.

A full breakdown of engagement activities can be found in Appendix 2.

Nutrition is not only a human right, but a necessary component of comprehensive, quality medical care. Research has shown addressing malnutrition has the potential to improve patient outcomes, decrease length of hospital stay, reduce hospital readmissions, and provide a positive return on investment through cost savings and cost avoidance. Using this Malnutrition Strategy to guide actions in the next five years will position us to achieve both positive clinical and fiscal outcomes.

Vision, Mission, and Guiding Principles

Vision

Creating a healthier Alberta and supporting efficiencies in healthcare through improved awareness, prevention, detection, and treatment of malnutrition.

Mission

Improving the management and quality of nutrition care for all Albertans by increasing knowledge and awareness, developing partnerships, and implementing best practice and system-level changes.

Guiding Principles

Person Centred

Putting people first ensures patients and their families are at the centre of all healthcare activities while also fostering a safe, healthy, and inclusive workplace that reflects the voice of our people.

Partnership and Collaboration

Unity of effort and integration relies on strong relationships with our patients and their families, operations (including programs and sites), internal and external partners and communities.

Evidence-informed and Data-driven Approach

High-quality care comes from combining front-line expertise with data, research, and evaluation to guide planning, decision-making, and actioning. These actions support the overall Nutrition Services' purpose of "enriching lives through knowledge and science".

Adaptable and Flexible

A shared service focus with appropriate provincial-level support and local decision-making provides access and quality care while recognizing the unique needs of different zones, geographies, and populations.

Equitable and Sustainable

Fostering innovation, redesign of services, new models of care, and continuous improvement connects meaningful change, fiscal responsibility, and equitable distribution of services and practice support resources.

This Malnutrition Strategy aligns with the Nutrition Services Reconciliation Action Statement. We are committed to reconciliation and working towards achieving health equity with and for Indigenous peoples in Alberta.

Pillars and Priorities

Pillar 1: Nutrition and Food Services Practice, Skills, and Processes

Educate and train dietitians and Nutrition and Food Services staff so they feel supported to strengthen malnutrition care. Staff champion and implement best practice.

Staff within Nutrition and Food Services (NFS) including dietitians, food service workers, supervisors, team leads, managers, and support staff, are the crux of nutrition care in all settings. Pillar 1 focuses on enabling NFS staff through education and clinical support tools, so they are equipped to carry out, and champion this work within their area.

Priority: Support dietitian practice through education, training, and support tools related to malnutrition.

Dietitians play a significant role in most malnutrition initiatives and supporting them to champion and implement best practice in all settings is a priority. The focus will be on the following activities:

Screen	Diagnose	Treat
• Canadian Nutrition Screening Tool (CNST) • Pediatric Nutrition Screening Tool (PNST) • Mini Nutrition Assessment Short Form (MNA-SF) • Seniors in the Community: Risk Evaluation for Eating and Nutrition (SCREEN)	• Subjective Global Nutrition Assessment (SGA) • Subjective Global Nutritional Assessment (SGNA) • Nutrition Focused Physical Exam (NFPE) • Malnutrition diagnosis statements	• How to talk about malnutrition • Optimize food intake • Oral nutrition supplements (MedPass) • Nutrition support (enteral and parenteral nutrition) • Discharge planning • Referrals to community organizations and supports

Priority: Create knowledge, capacity and confidence for Patient and Food Services staff to be involved in malnutrition care

Patient Food Services (PFS) workers are well positioned to play a role in the nutritional health of patients and residents. They may have close contact with individuals during meal service and can have a strong understanding of food and diet preferences. Leadership within PFS can also support malnutrition initiatives with their staff, patients and residents. Examples include:

- Encourage collaborative work between PFS staff and dietitians.
- Develop resources and education on food intake monitoring and providing mealtime supports.

Pillar 2: Providers and Partners Knowledge and Practice

Educate and train healthcare providers and partners to implement best nutrition care practices and provide appropriate and timely nutrition interventions in all settings.

A multidisciplinary approach to malnutrition care has been shown to be effective.[34,35] Involvement of the healthcare team, family members and caregivers, and community supports are needed to ensure malnutrition care is available in all settings. Understanding the important role individuals outside of NFS play, pillar 2 focuses on education and training for healthcare providers and partners on the importance of malnutrition care and equipping them with the tools needed to provide care.

Priority: Provide targeted education to healthcare providers to increase awareness and understanding of malnutrition.

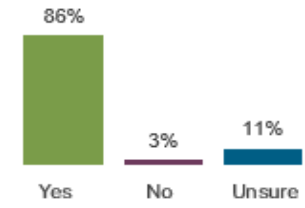
Through engagement activities, it was clear that healthcare providers all believe nutrition is important. However, many clinicians identified a lack knowledge on malnutrition and how it relates to their profession as a barrier to integrating malnutrition care into their practice. To address this barrier, we will aim to:

- Integrate malnutrition information into orientation and training for new staff.
- Embed malnutrition content into university and continuing education courses.

Priority: Create and communicate practice support tools for healthcare providers.

Another important finding during the engagement was the need for practice supports related to nutrition care. Most healthcare professionals want to be involved in the nutritional health of their patients but require support to ensure they are providing the best care possible. Examples of practice supports this strategy will focus on include:

- Support for nutrition screening on admission to hospital.
- Implement care pathways to outline the next steps and resources for those screened as at risk.
- Provide guidance on food intake monitoring, mealtime support, and bringing food from home in care settings.



Poll results from engagement with the AHS clinician's council.

Pillar 3: Systems and Environment

Advocate for and implement patient, provider, and system level changes to improve malnutrition care.
Foster a food and nutrition culture that prevents and treats malnutrition.

Changing systems and environments in healthcare will ensure initiatives are not only implemented but sustained and spread across all settings. This level of change is vital to see the system-level benefits malnutrition care can provide. NS has positioned itself to have influence at many levels, including provincial committees and leadership forums, and within pillar 3 we aim to promote changes to systems and environments to support malnutrition initiatives.

Priority: Utilize technology to support best practice through quality improvement.

Technology plays an important role in healthcare, for both healthcare professionals and individuals interacting with the healthcare system. This strategy aims to use existing and emerging technologies to improve the nutrition care of all Albertans. Examples of how we will use technology to support malnutrition initiatives include:

- Analyze large data sets through Connect Care to understand the true prevalence of malnutrition and the impact of initiatives.
- Access to data for frontline staff to support change management through real-time feedback.

- Improve ordering practices by integrating MedPass on the Medication Administration Record (MAR).
- Increase access to nutrition screening in the community by building nutrition screening tools on the AHS Nutrition Screening webpage.

Priority: Embed nutrition care pathways into current systems to promote use by all healthcare providers.

Malnutrition care includes use of evidence-based nutrition pathways to ensure all individuals, regardless of location, age, or care setting receive the best care possible. Nutrition pathways have already been embedded into clinical care, but more work is needed to:

- Optimize the existing care pathways in Connect Care, including the adult and pediatric Integrated Nutrition Pathway for Acute Care (INPAC, P-INPAC)
- Integrate nutrition screening pathways into assessments used in Home and Community Care and Supportive Living Accommodations.
- Collaborate with the Acute Care Bundle Implementation (ACBI) Hive to embed nutrition content into areas of focus, including frailty, mobility, Enhanced Recovery After Surgery (ERAS), and Pressure Injury Prevention.

Priority: Enhance patient experience and mealtime intake in acute care and continuing care homes.

In acute and continuing care settings, mealtime experience is a major contributor to nutritional intake. Although barriers to eating are well understood,[16,36] they remain challenging to overcome. As part of this strategy, members of NFS including NS, PFS, and the provincial menu committee will work collaboratively to address the system and site-level barriers to patient and resident mealtime satisfaction, including:

- Support diet liberalization work to promote ordering of the least restrictive diet possible.
- Review the patient menu to ensure they are meeting the nutritional needs of individuals while still promoting variety, taste, and preference.
- Look for opportunities to adapt food service models to best meet the needs of patients and residents.

Pillar 4: Awareness and Connections

Create awareness that malnutrition is an issue that affects the health of Albertans.
Connect individuals to the support they need.
Establish internal and external partnerships to explore how to prevent, detect, and treat malnutrition.

Raising public awareness of malnutrition and working with partners across the province is necessary to ensure the activities of this strategy are supported and implemented widely. Pillar four focuses on raising public awareness of malnutrition to support healthcare professionals' ability to provide the best care, and individuals' ability to make informed decisions about their health.

Priority: Raise public awareness of malnutrition prevalence, risk, outcomes, and available supports.

To ensure information is readily available in all settings, this strategy will focus on existing and new awareness campaigns using a variety of communication methods to ensure information is widespread and accessible. Examples include:

- Utilize AHS social media platforms to highlight events and sessions such as Alberta Seniors' Week and Canadian Malnutrition Awareness Week.
- Share information on the AHS website for both individuals and healthcare professionals.
- Provide resources and support to local nutrition champions to share information within their own area of work.

Priority: Partner with others in AHS and healthcare to align with existing initiatives.

NS will continue to work with existing and new healthcare partners to further malnutrition initiatives by identifying common goals and collaborating on work in a multidisciplinary fashion. Groups NS will engage with include:

- Program Improvement and Integration Networks (PINS)
- Health Profession Strategy & Practice
- Pharmacy Services
- Pediatric Eating and Swallowing (PEAS)
- Recovery Alberta, Continuing Care, and Primary Health Care

Priority: Partner with community groups to support the prevention, detection, and treatment of malnutrition across Alberta.

To ensure all Albertans have access to the nutrition care they require, we aim to partner with community groups across the province to support initiatives, such as:

- Implement nutrition risk screening in community centres, libraries, pharmacies, faith centres, cultural groups etc.
- Partner with organizations such as Family and Community Support Services and First Nations health organizations to support the priorities of equity-denied groups.
- Provide resources and promote appropriate dietitian referrals by Primary Care clinicians.
- Conduct research and evaluation with universities and research bodies to ensure malnutrition initiatives are evidence-based.

Priority: Collaborate with other organizations to create an environment in Alberta supporting malnutrition best practice.

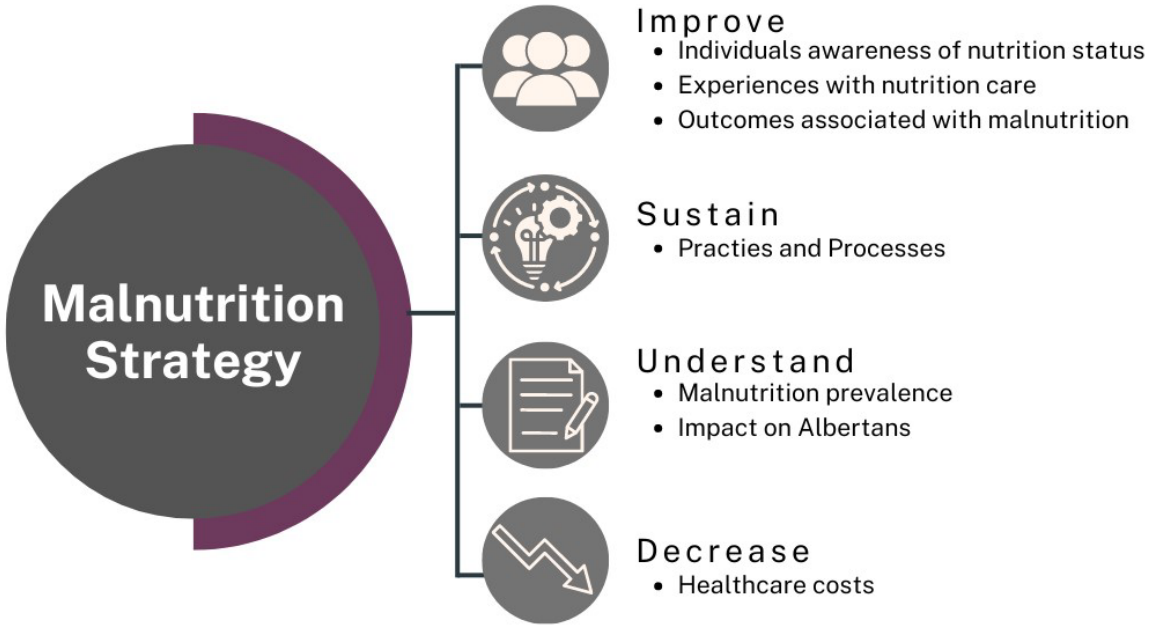
Malnutrition has a known association with mental health, financial strain, and household food insecurity. Tackling the issue of malnutrition cannot occur without addressing these underlying factors in collaboration with other organizations, such as:

- Local, provincial, and federal governments
- Indigenous Services Canada
- Family Support for Children with Disabilities (FSCD)
- Assured Income for the Severely Handicapped (AISH)
- Insurance agencies (e.g. Alberta Blue Cross)
- Social prescribing programs

Measuring Success

Anticipated Outcomes

The Malnutrition Strategy is a large undertaking, spanning many demographics, settings, and geographic locations. Success needs to be measured at all levels, culminating in the overall anticipated outcomes outlined below.



Anticipated long term outcomes of the malnutrition strategy

A comprehensive overview of short and long-term outcomes expected from the malnutrition strategy can be found in the Logic Model in Appendix 3. The logic model will provide a framework for initiatives related to the malnutrition strategy which can be used to support implementation, monitoring and evaluation.

Performance Measures

We will leverage technologies and resources available to measure and document the performance of key initiatives within the malnutrition strategy. Connect Care provides the opportunity to continually monitor successes in acute and other care settings. Within the community, we aim to work with community groups, universities and researchers to define and collect performance metrics, based on setting specific needs and resources.

Conclusion

The Malnutrition Strategy is evidence-based and aligns with AHS's four foundational strategies, CMTF initiatives, and the Vienna Declaration. The Strategy's four pillars outline the priorities and actions that we will take over the next 5 years to raise awareness, prevent, detect and treat malnutrition, thereby creating a healthier Alberta and supporting efficiencies in healthcare.

Appendix 1: Summary of Activities to Address Malnutrition (2010–2024)

Nutrition Services (NS) has been addressing malnutrition in all settings for over a decade. This appendix outlines some activities and successes we have seen. This is not a complete list, zones have had their own successful initiatives in all settings.

Activity	Date	Setting	Description
Enhanced Recovery After Surgery (ERAS) Alberta	2013	Acute Care	NS supported implementation of ERAS in the initial pilot sites and continues to work with ERAS Alberta to support the nutrition components of ERAS pathways.
Meals Matter (Enhancing Patient Meal Experience)	2014	Acute Care	Initiative aimed at "enhancing the patient meal experience and champion a cultural shift around mealtime in hospitals and continuing care centres."
Canadian Malnutrition Awareness Week (CMAW) campaigns	2015	All	Each year during CMAW NS creates awareness campaigns for healthcare professionals and the public to highlight malnutrition information and initiatives.
Childhood Growth Monitoring	2015	All	Resources for acute and community settings to enhance monitoring growth of infants, children, and adolescents.
More-2-Eat phase I and II	2015, 2018	Acute Care	At the Royal Alexandra Hospital in Edmonton, one unit participated in Phase I and three units participated in Phase II of the study, which aimed to test the feasibility of the Integrated Nutrition Pathway for Acute Care (INPAC).
Provincial SGA training	2016	Acute Care	Provincial training of frontline dietitians on the SGA with in-person training at 7 sites.
Calgary Malnutrition Initiative	2016	Acute Care	Nutrition screening and care pathway developed and piloted at the Peter Lougheed Centre.
Time to Eat Toolkit	2018	Acute Care	Toolkit with resources and supports for healthcare providers to reduce mealtime barriers.
Sips to Stop Malnutrition	2019	Acute Care	Toolkit providing healthcare providers guidance on how to implement the MedPass program on their unit.
Pediatric Nutrition Focused Physical Exam (NFPE) training	2019	Acute Care	Pediatric dietitians across the province received a one-day NFPE hands-on training workshop by the Academy of Nutrition and Dietetics.[37]

Activity	Date	Setting	Description
Connect Care build	2019	Acute Care	Malnutrition best practices were embedded into Connect Care during the initial build, including screening (PNST, CNST) and diagnosis (SGA, SGNA, NFPE, nutrition diagnosis statements).
Nutrition Screening Pathway for Supportive Living Clients	2019	Supportive Living	Pathway was developed to identify residents of supporting living and clients in-home care at risk of malnutrition.
DON SCN Malnutrition in Seniors Symposium	2020	Community	Symposium and Workshop in 2020 focused on hospital and community malnutrition in older adults.
AHS Menu Planning Policy	2022	Acute Care	Policy to guide best practice for menu planning and development, with a patient-first focus.
Your Voice Matters	2022	Acute Care	Survey developed with support from the Our Peoples Strategy Team was sent to AHS employees and physicians with questions about malnutrition in hospital.
Advancing Malnutrition Care	2022	Acute Care	Mentoring program by the CMTF to support implementation and sustainability of best practices in malnutrition care through INPAC. 8 units at the Royal Alexandra Hospital and 7 units at the University of Alberta Hospital in Edmonton are involved.
Room service food delivery model pilot	2023	Acute Care	Pilot at the Arthur J.E. Child Comprehensive Cancer Centre in Calgary of a room service style of food delivery.
Home to Hospital to Home (H2H2H)	2023	Acute and Community	Calgary Zone NS working with Primary Care and the Foothills Primary Care Networks (PCN) to improve transitions of care for at-risk patients.
Nutrition Screening for Older Adults: Community Guide to Success	2023	Community	Guide to setting up nutrition screening for older adults in the community using SCREEN-8©.
Alberta Health Services Malnutrition Webpage	2023	All	Webpage for professionals and the public to raise awareness and provide supports on malnutrition care.
Nutrition Screening Webpage	2023	All	Webpage for professionals and the public around nutrition risk screening.
Household Food Insecurity webpage	2023	Community	Webpage with guidelines and supports to understand and support individuals with household food insecurity.

Activity	Date	Setting	Description
SCREEN-3 extended built into Connect Care	2024	Community	Nutrition screening tool built into Connect Care Ambulatory environment for use by health providers working with older adults (e.g. Family Care Clinics, specialty clinics).
SCREEN-14 build online	2024	Community	SCREEN-14 was built on the external website, allowing community members to complete the screen and learn about their nutrition risk.
Bringing Food from Home handout	2024	Acute	Resource created for patients, visitors, and families on how to bring food from home to support nutritional intake while in hospital.

Publications

Carter LE, Klatchuk N, Sherman K, Thomsen P, Mazurak VC, Brunetwood MK. Barriers to oral food intake for children admitted to hospital. Can J Diet Pract Res. 2019;80(4).

Carter LE, Shoyele G, Southon S, Farmer A, Persad R, Mazurak VC, et al. Screening for Pediatric Malnutrition at Hospital Admission: Which Screening Tool Is Best? Nutr Clin Pract. 2020;35(5):951–8.

Chan CB, Popeski N, Gramlich L, Atkins M, Basualdo-Hammond C, Stadnyk J, Keller H. Harnessing Stakeholder Perspectives and Experience to Address Nutrition Risk in Community-Dwelling Older Adults. Healthcare. 2021; 9(4):477. https://doi.org/10.3390/healthcare9040477

Fedoruk R, Olstad H, Watts L, Morrison M, Ward J, Popeski N, Atkins M, Chan CB. Community-Based Nutrition Risk Screening in Older Adults (COMRISK): An Exploration of the Experience of Being Screened and Prevalence of Nutrition Risk in Alberta, Canada. Can J Aging. 2023; 17:1-11. doi: 10.1017/S0714980823000703.

Geary R, Mantik J, Moore V, Schuller J, Fedoruk R, Atkins M, Chan CB. COMmunity-Based Nutrition RISK Screening in Older Adults Living Independently (COMRISK): Feasibility, Acceptability, and Appropriateness of Community Partnership Models in Alberta, Canada. Can J Aging. 2024; 43(2):287-296. doi: 10.1017/S0714980823000582.

Keller H, Allard J, Vesnaver E, Laporte M, Gramlich L, Bernier P, Davidson B, Duerksen D, Jeejeebhoy K, Payette H. Barriers to food intake in acute care hospitals: a report of the Canadian Malnutrition Task Force. J Hum Nutr Diet. 2015;28(6):546-57. doi: 10.1111/jhn.12314.

Keller HH, Valaitis R, Laur CV, McNicholl T, Xu Y, Dubin JA, Curtis L, Obiorah S, Ray S, Bernier P, Gramlich L, Stickles-White M, Laporte M, Bell J. Multi-site implementation of nutrition screening and diagnosis in medical care units: Success of the More-2-Eat project. Clin Nutr. 2019 Apr;38(2):897-905. doi: 10.1016/j.clnu.2018.02.009.

Keller H, Koechl JM, Laur C, Chen H, Curtis L, Dubin JA, Gramlich L, Ray S, Valaitis R, Yang Y, Bell J. More-2-Eat implementation demonstrates that screening, assessment and treatment of malnourished patients can be spread and sustained in acute care; a multi-site, pretest post-test time series study. Clin Nutr. 2021;40(4):2100-2108. doi: 10.1016/j.clnu.2020.09.034.

Keller, H., Laur, C., Atkins, M. et al. Update on the Integrated Nutrition Pathway for Acute Care (INPAC): post implementation tailoring and toolkit to support practice improvements. Nutr J. 17, 2 (2018). https://doi.org/10.1186/s12937-017-0310-1

Kocel S, Carter LE, Atkins M. Families' perception of proposed nutrition screening on admission to pediatric hospitals: a qualitative analysis. Appl Physiol Nutr and Metab. 2024; 1(49): 15-21. doi: 10.1139/apnm-2023-0132.

Martin, L., Gillis, C., Atkins, M., Gillam, M., Sheppard, C., Buhler, S., Hammond, C.B., Nelson, G. and Gramlich, L. (2019), Implementation of an Enhanced Recovery After Surgery Program Can Change Nutrition Care Practice: A Multicenter Experience in Elective Colorectal Surgery. J Parenter and Enter Nutr, 43: 206-219. https://doi.org/10.1002/jpen.1417

Nutrition Care in Canadian Hospitals Study.

Standards Council of Canada. CAN/HSA 5066:2021 (E) Malnutrition prevention, detection, and treatment [Internet]. 2021. Available from: https://nutritioncareincanada.ca/prevention-and-awareness/malnutrition-prevention-detection-and-treatment-standard

Tom, M., Atkins M., Basulado-Hammond, C. Improving Nutrition Care in Hospitalized Patients. PowerPoint Presentation (nutritioncareincanada.ca)

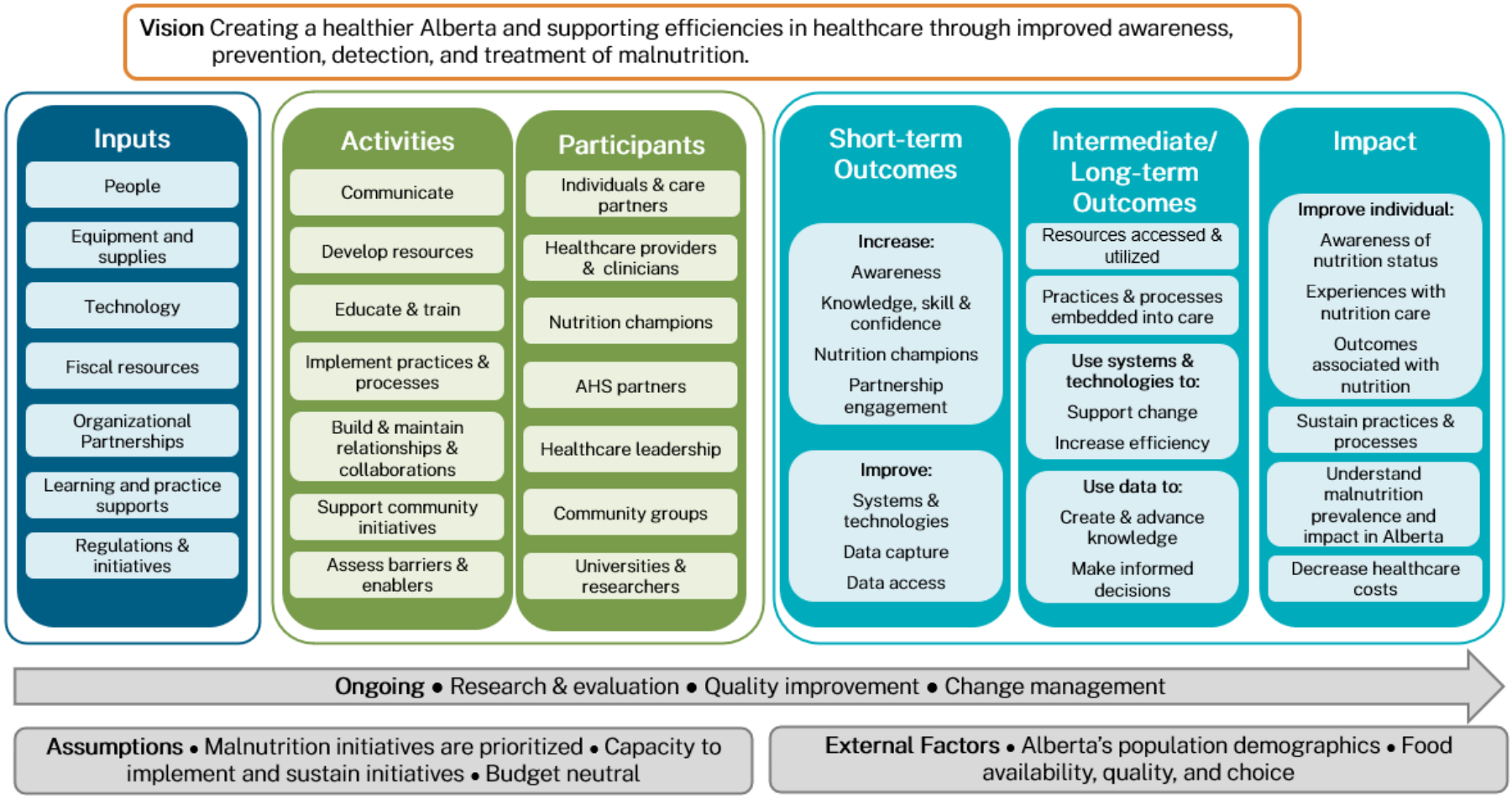
Appendix 2: Engagement

The creation of this strategy involved engagement with many groups. Through these engagement sessions, we established a clear direction that clinicians recognize the importance of nutrition and the impact it has on our healthcare system.

Engagement Group	Discussion	Outcomes
Your Voice Matters Survey – all employees of Alberta Health Services	• How do other staff members view malnutrition? What strategies are others already using in their daily work to prevent or treat malnutrition?	• A total of 413 respondents (physicians, health professionals, managers, support staff, and students) participated. While 40% of respondents were unaware of the prevalence of malnutrition, 75% were interested and wanted to learn more about it.
Nutrition, Food, Linen, and Environmental (NFLES) Services Senior Leadership	• Overview of Malnutrition Strategy	• Support for the strategy by Senior Leadership. • Guidance on how to proceed with internal engagement
Nutrition Services (NS) zone operations managers	• Short and long-term priorities for each zone. • Feasibility of implementing proposed malnutrition initiatives.	• **Short-term priorities:** Education and Training; Screening and Diagnosis • **Barriers:** Workload; staffing; time constraints • **Enablers:** Partnering with Patient Food Services; Provincial Support
Patient Food Service (PFS) operations managers	• Which malnutrition initiatives can PFS workers be involved in? How can we continue to improve the mealtime experience?	• PFS staff may be involved in monitoring food intake, mealtime support, and collaborating with RDs to optimize food intake.
Nutrition and Food Services (NFS) Education and Training	• How can we embed malnutrition information into education and training for PFS staff?	• Malnutrition information is important and can be integrated into existing education as it is updated.

Engagement Group	Discussion	Outcomes
Alberta Clinicians Council	• What role can the multidisciplinary team play in malnutrition care? How can we empower other disciplines to support the malnutrition strategy? How can we engage with staff to increase knowledge?	• Everyone sees the importance of malnutrition care and understands the role they could play. • They want to be involved but need more guidance and resources to support those at risk of, or with malnutrition. • Need targeted education for each discipline on the risks and impact of malnutrition.

Appendix 3: Logic Model



Logic Model Glossary of Terms

Inputs

People: Nutrition and Food Services staff, allied health professionals, physicians, leadership, patients and family members, community members, community leaders.

Equipment and supplies: Food, food service equipment (e.g. snack carts, Suzy-Q), scales, length boards, measuring tapes, calipers, enteral nutrition (EN) and parenteral nutrition (PN) pumps, home nutrition support supplies, formulary products.

Technology: Connect Care, other EMRs, data analysis software, webpages (internal and external), food service technologies (e.g. CBORD, Timeless), apps.

Fiscal resources: Salaries, education funds, research grants, awards, healthcare budget.

Organizational partnerships: Any group or organization that will contribute to the work of the malnutrition strategy, for example, hospitals, clinics, Primary Care Networks, long term care facilities, pharmacies, senior centres, Family Community and Support Services, doctors' offices, and so forth.

Learning and practice supports: Nutrition Services Practice Support Tools, Dietitians of Canada Practice-based Evidence in Nutrition (PEN), Lippincott, peer-reviewed journals, patient handouts, promotional videos, webpages, professional education resources and supports.

Regulations and initiatives: Local, provincial, national, and international initiatives such as the Health Standards Organization (HSO), Canadian Malnutrition Task Force (CMTF) guidelines (e.g. Advancing Malnutrition Care), Vienna Declaration of Nutrition Care is a Human Right.

Activities

Communicate: Raise awareness of malnutrition initiatives and practices through communication with healthcare providers, partners, and community members.

Develop resources: Develop the resources needed to support best practices and education of health care providers and community members. This includes physical resources such as handouts, webinars, webpages, practice guidelines, research articles, and opportunities such as in-person and virtual classes.

Educate and train: Provide opportunities and resources for continued education of healthcare professionals on malnutrition. Provide education materials and opportunities for community members to increase their knowledge and understanding of their personal nutrition, and understanding of what resources are available to them.

Implement practices and processes: Embed practices and processes related to malnutrition into the organization (e.g. nutrition care algorithms, transitions of care) and implement best practice as a frontline care worker (e.g. screening, SGA/SGNA, diagnosis statements).

Build and maintain relationships and collaborations: Work with internal and external partners to support best practices in all settings. Continue to look for opportunities for new partnerships and collaborations.

Support community initiatives: Provide support to community members and groups to improve access and delivery of best (e.g. capacity building, screening, access, referral processes, communication).

Assess barriers and enablers: Continued assessment of barriers faced in all care settings and the community related to best practices; identify and utilize enablers to promote successful implementation and sustainment of best practices.

Participants

Individuals and care partners: All Albertans and their families or caregivers.

Healthcare providers and clinicians: Any persons providing care to Albertans in all care settings or the community.

Nutrition champions: Any individual (health care provider or community member) championing nutrition initiatives in their care setting or community (e.g. dietitian, physician, nurse, patient, family member, community leader).

AHS partners: Departments or groups within AHS working with NFS to achieve the goals of the Malnutrition Strategy. (e.g. Pharmacy Services, PINS, Health Professions Strategy & Practice, Provincial Seniors Health and Continuing Care, Population and Public Health, Indigenous Wellness Core, Patient and Family Centred Care, Volunteer Resources).

Healthcare leadership: Leadership at all levels (e.g. unit managers, medical leaders, operational zone leadership, provincial strategy leadership, executive leadership, government leadership).

Community groups: Any groups in the community supporting or implementing practices to prevent, detect or treat malnutrition (e.g. libraries, fitness centres, pharmacies, senior centres, primary care networks, community agencies).

Universities and researchers: University staff, researchers, and students within all health science faculties (e.g. nutrition, nursing, medicine, public health) as well as other research groups.

Short Term Outcomes: Learning

Increase awareness: Increase the awareness of malnutrition practices and initiatives in all healthcare professionals, partners, groups, and community members through engagement and education opportunities.

Increase knowledge, skill, and confidence: Increase the knowledge, skill, and confidence through the integration of malnutrition information into multidisciplinary education, training and orientation materials, and increased resources to support dietitians and other healthcare professionals in providing care.

Increase nutrition champions: Increase the number of healthcare professionals and community members who support and promote malnutrition practices in their area.

Increase partnership engagement: Increase the number of new internal and external partnerships actively collaborating in malnutrition care.

Improve systems and technologies: Improve the infrastructure of care settings and the community to support best practices (e.g. Connect Care optimization, Timeless implementation, increased access to screening in the community, assessing patient food service delivery models).

Improve data capture: Educate and train healthcare professionals on the importance of consistent and accurate documentation to help improve the monitoring and analysis of malnutrition-related data.

Improve data access: Utilize existing data collection methods such as Connect Care and other EMRs to efficiently collect and assess accurate data in all care settings. Create data in environments previously unavailable.

Intermediate/Long-Term Outcomes: Behaviour Change

Resources accessed and utilized: Increase the use of resources by healthcare professionals and community members to support best practices (e.g. education resources used to support practice change, community members using self-screening).

Practices and processes embedded into care: Practices and processes related to malnutrition are implemented and part of routine care in all care settings and the community. Includes both organizational and individual level practices and processes (e.g. policies and procedures and individual healthcare provider practices).

Use systems and technologies to facilitate implementation: Utilize technology and system-level supports to implement best practices (e.g. MedPass on MAR, Connect Care Tableau dashboards, SCREEN-14 built on the website).

Use systems and technologies to increase efficiencies: Utilize technology and system-level supports to promote efficiencies in the health system (e.g. improved transitions of care, decreased food and formula wastage), human resources (e.g. dietitians focus on patients most at risk) and individuals (e.g. access to supports to address nutrition risk).

Use data to create and advance knowledge: Conduct research using the available data, and knowledge translation activities such as educational opportunities, conference presentations, and publications.

Use data to make informed decisions: Use local data to support changes in practice (e.g. updating nutrition practice guidelines and pathways).

Impact

Improve individual awareness of nutrition status: Improve each Albertans ability to determine their own nutritional status, and how it is impacting their overall health and well-being. Provide Albertans with the knowledge and skills needed to access nutrition care.

Improve individual experiences with nutrition care: Improve a person's reported experience with receiving nutrition care (e.g. patient food services in hospitals and LTC, dietitian care in all settings, and community classes). Improve dietitians' experience and ability to provide nutrition care and other healthcare providers' experiences working with NFS and supporting or providing nutrition care.

Improve individual outcomes associated with nutrition: Impact the health outcomes related to nutrition in all care settings such as growth and development, functional capacity, activities of daily living, infection risk, hospital admission/length of stay, and patient-reported outcome measures (PROMs).

Sustain practices and processes: Best practices have been embedded into routine care and are sustained in all care settings and the community.

Understand malnutrition prevalence and impact in Alberta: Gain a better understanding of the causes, impact, treatment options, and rates of malnutrition in Alberta, across all ages and settings.

Decrease healthcare costs: Decrease the financial burden of malnutrition on the Alberta healthcare system by providing optimal nutrition care in all settings. This includes identifying and treating malnutrition in the community to reduce acute care admissions due to malnutrition, and improving nutrition care in hospitals and other care settings to reduce the length of stay and overall burden related to malnutrition in hospital.

References

1. Tuokkola J, Heikkilä A, Junttila K, Orell H. Prevalence of malnutrition risk and acute malnutrition in pediatric population in a tertiary hospital and their burden on healthcare. Nutr Clin Pract. 2021;36(6):1270–5.
2. Thomas MMC, Miller DP, Morrissey TW. Food insecurity and child health. Pediatrics. 2019;144(4).
3. Jeejeebhoy KN, Keller H, Gramlich L, Allard JP, Laporte M, Duerksen DR, et al. Nutritional assessment: Comparison of clinical assessment and objective variables for the prediction of length of hospital stay and readmission. Am J Clin Nutr. 2015;101(5):956–65.
4. Kang MC, Kim JH, Ryu SW, Moon JY, Park JH, Park JK, et al. Prevalence of malnutrition in hospitalized patients: A multicenter cross-sectional study. J Korean Med Sci. 2018;33(2):1–10.
5. O'Shea E, Trawley S, Manning E, Barrett A, Browne V, Timmons S. Malnutrition in hospitalised older adults: a multicentre observational study of prevalence, associations and outcomes. J Nutr Health Aging. 2017;21(7):830–6.
6. Lim SL, Ong KCB, Chan YH, Loke WC, Ferguson M, Daniels L. Malnutrition and its impact on cost of hospitalization, length of stay, readmission and 3-year mortality. Clin Nutr [Internet]. 2012;31(3):345–50. Available from: http://dx.doi.org/10.1016/j.clnu.2011.11.001
7. Hecht C, Weber M, Grote V, Daskalou E, Dell'Era L, Flynn D, et al. Disease associated malnutrition correlates with length of hospital stay in children. Clin Nutr. 2015;34(1):53–9.
8. Guenter P, Abdelhadi R, Anthony P, Blackmer A, Malone A, Mirtallo JM, et al. Malnutrition diagnoses and associated outcomes in hospitalized patients: United States 2018. Nutr Clin Pract. 2021;36(5):957–69.
9. Curtis LJ, Bernier P, Jeejeebhoy K, Allard J, Duerksen D, Gramlich L, et al. Costs of hospital malnutrition. Clin Nutr [Internet]. 2017;36(5):1391–6. Available from: http://dx.doi.org/10.1016/j.clnu.2016.09.009
10. Cuong TQ, Banks M, Hannan-Jones M, Diep DTN, Gallegos D. Prevalence and associated risk factors of malnutrition among hospitalized adults in a multisite study in Ho Chi Minh city Viet Nam. Asia Pac J Clin Nutr. 2018;27(5):986–95.
11. Barker LA, Gout BS, Crowe TC. Hospital malnutrition: Prevalence, identification and impact on patients and the healthcare system. Int J Environ Res Public Health. 2011;8(2):514–27.
12. Allard JP, Keller H, Jeejeebhoy KN, Laporte M, Duerksen DR, Gramlich L, et al. Decline in nutritional status is associated with prolonged length of stay in hospitalized patients admitted for 7 days or more: A prospective cohort study. Clin Nutr [Internet]. 2016;35(1):144–52. Available from: http://dx.doi.org/10.1016/j.clnu.2015.01.009
13. Mehta NM, Corkins MR, Lyman B, Malone A, Goday PS, Carney L, et al. Defining pediatric malnutrition: A paradigm shift toward etiology-related definitions. J Parenter Enter Nutr. 2013;37(4):460–81.

14. Cederholm T, Barazzoni R, Austin P, Ballmer P, Biolo G, Bischoff SC, et al. ESPEN guidelines on definitions and terminology of clinical nutrition. Clin Nutr. 2017;36(1):49–64.

15. Ramage-Morin PL, Garriguet D. Nutritional risk among older Canadians [Internet]. Health Reports (Statistics Canada, Catalogue 82-003). 2013 [cited 2023 May 8]. p. 3–13. Available from: https://pubmed.ncbi.nlm.nih.gov/24257971/

16. Carter LE, Klatchuk N, Sherman K, Thomsen P, Mazurak VC, Brunetwood MK. Barriers to oral food intake for children admitted to hospital. Can J Diet Pract Res. 2019;80(4).

17. Bélanger V, McCarthy A, Marcil V, Marchand V, Boctor DL, Rashid M, et al. Assessment of Malnutrition Risk in Canadian Pediatric Hospitals: A Multicenter Prospective Cohort Study. J Pediatr [Internet]. 2019;205:160-167.e6. Available from: https://doi.org/10.1016/j.jpeds.2018.09.045

18. Alberta Health Services, Diabetes O and N (DON) SCN (SCN). Malnutrition in AHS Fact Sheet [Internet]. 2016 [cited 2023 May 8]. Available from: https://www.albertahealthservices.ca/assets/about/scn/ahs-scn-don-malnutrition-fact-sheet.pdf

19. Uhl S, Mehmood Siddique S, McKeever L, Bloschichak A, D'Anci K, Leas B, et al. Malnutrition in Hospitalized Adults: A Systematic Review. Agency Healthc Res Qual [Internet]. 2021;(249):1–146. Available from: https://effectivehealthcare.ahrq.gov/products/malnutrition-hospitalized-adults/research

20. Sulo S, Feldstein J, Partridge J, Schwander B, Sriram K, Summerfelt WT. Budget impact of a comprehensive nutrition-focused quality improvement program for malnourished hospitalized patients. Am Heal Drug Benefits. 2017;10(5):262–9.

21. Sriram K, Sulo S, VanDerBosch G, Partridge J, Feldstein J, Hegazi RA, et al. A Comprehensive Nutrition-Focused Quality Improvement Program Reduces 30-Day Readmissions and Length of Stay in Hospitalized Patients. JPEN J Parenter Enteral Nutr. 2017 Mar;41(3):384–91.

22. Kim SH, Bu SY. Effect of the Timing of Nutritional Support Team Intervention on Nutritional Status on Patients Receiving Enteral Nutrition. Clin Nutr Res. 2021;10(1):1.

23. Ansuya B, Baby SN, B U, N R, N SY, Mundkur SC. Impact of a home-based nutritional intervention program on nutritional status of preschool children: a cluster randomized controlled trial. BMC Public Health [Internet]. 2023;23(1):1–10. Available from: https://doi.org/10.1186/s12889-022-14900-4

24. Howatson A, Wall CR, Turner-Benny P. The contribution of dietitians to the primary health care workforce. J Prim Health Care. 2015;7(4):324–32.

25. Schuetz P, Sulo S, Walzer S, Vollmer L, Brunton C, Kaegi-Braun N, et al. Cost savings associated with nutritional support in medical inpatients: An economic model based on data from a systematic review of randomised trials. BMJ Open. 2021;11(7):1–6.

26. ESPEN, ASPEN, FELANPE, PENSA. The International Declaration on the Human Right to Nutritional Care [Internet]. 2022. p. 1–5. Available from: https://www.espen.org/files/Vienna-

Declaration-2022.pdf

27. United Nations Decade of Action on Nutrition Secretariat, Food and Agriculture Organization of the United Nations, World Health Organization. United Nations Decade of Action on Nutrition 2016-2025 Work Programme [Internet]. 2023. Available from: https://apps.who.int/gb/ebwha/pdf_files/EB152/B152_24-en.pdf

28. Standards Council of Canada. CAN/HSA 5066:2021 (E) Malnutrition prevention, detection, and treatment [Internet]. 2021. Available from: https://www.scc.ca/en/standardsdb/standards/31336

29. Alberta Health Services. Vision, Mission, Values & Strategies [Internet]. 2017 [cited 2022 Jul 20]. Available from: https://insite.albertahealthservices.ca/about/vmv/Page890.aspx

30. Keller HH, Valaitis R, Laur C V., McNicholl T, Xu Y, Dubin JA, et al. Multi-site implementation of nutrition screening and diagnosis in medical care units: Success of the More-2-Eat project. Clin Nutr [Internet]. 2019;38(2):897–905. Available from: https://doi.org/10.1016/j.clnu.2018.02.009

31. Keller H, Koechl JM, Laur C, Chen H, Curtis L, Dubin JA, et al. More-2-Eat implementation demonstrates that screening, assessment and treatment of malnourished patients can be spread and sustained in acute care; a multi-site, pretest post-test time series study. Clin Nutr [Internet]. 2021;40(4):2100–8. Available from: https://doi.org/10.1016/j.clnu.2020.09.034

32. Duerksen DR, Keller HH, Vesnaver E, Laporte MANON, Jeejeebhoy K, Payette H, et al. Nurses' Perceptions Regarding the Prevalence, Detection, and Causes of Malnutrition in Canadian Hospitals: Results of a Canadian Malnutrition Task Force Survey. J Parenter Enter Nutr. 2016;40(1):100–6.

33. Huysentruyt K, Brunet-Wood K, Bandsma R, Gramlich L, Fleming-Carroll B, Hotson B, et al. Canadian nationwide survey on pediatric malnutrition management in tertiary hospitals. Nutrients. 2021;13(8):1–11.

34. Bell JJ, Bauer JD, Capra S, Pulle RC. Multidisciplinary, multi-modal nutritional care in acute hip fracture inpatients - Results of a pragmatic intervention. Clin Nutr [Internet]. 2014;33(6):1101–7. Available from: http://dx.doi.org/10.1016/j.clnu.2013.12.003

35. Bell JJ, Young AM, Hill JM, Banks MD, Comans TA, Barnes R, et al. Systematised, Interdisciplinary Malnutrition Program for impLementation and Evaluation delivers improved hospital nutrition care processes and patient reported experiences – An implementation study. Nutr Diet. 2021;78(5):466–75.

36. Keller H, Allard J, Vesnaver E, Laporte M, Gramlich L, Bernier P, et al. Barriers to food intake in acute care hospitals: A report of the Canadian Malnutrition Task Force. J Hum Nutr Diet. 2015;28(6):546–57.

37. Academy of Nutrition and Dietetics. Nutrition-Focused Physical Exam Hands-on Training Workshop [Internet]. eatrightPRO. 2024. Available from: https://www.eatrightpro.org/nfpe

38. Siddiqui F, Salam RA, Lassi ZS, Das JK. The Intertwined Relationship Between Malnutrition and

Poverty. Front Public Heal. 2020;8(August):1–5.

39. Ramage-Morin PL, Gilmour H, Rotermann M. Nutritional risk, hospitalization and mortality among community-dwelling Canadians aged 65 or older. Heal Reports. 2017;28(9):17–27.

40. Munoz N, Posthauer ME. Nutrition Essentials: Pressure Injury Prevention and Healing for Adults. Adv Skin Wound Care [Internet]. 2021 Mar 1 [cited 2023 May 8];34(3):166–7. Available from: https://pubmed.ncbi.nlm.nih.gov/33587478/

41. Miettinen M, Tiihonen M, Hartikainen S, Nykänen I. Prevalence and risk factors of frailty among home care clients. BMC Geriatr. 2017;17(1):4–9.

42. Meulemans A, Matthys C, Vangoitsenhoven R, Sabino J, Van Der Schueren B, Maertens P, et al. A multicenter propensity score matched analysis in 73,843 patients of an association of nutritional risk with mortality, length of stay and readmission rates. Am J Clin Nutr. 2021;114(3):1123–30.

43. Marshall KA, Burson R, Gall K, Saunders MM. Hospital Admissions for Malnutrition and Dehydration in Patients With Dementia. Home Healthc Now. 2016;34(1):32–7.

44. Liu J, Raine A, Venables PH, Mednick SA. Malnutrition at age 3 years and externalizing behavior problems at ages 8, 11, and 17 years. Am J Psychiatry [Internet]. 2005 Nov [cited 2023 May 9];161(11):2005–13. Available from: https://pubmed.ncbi.nlm.nih.gov/15514400/

45. Liu J, Raine A, Venables PH, Dalais C, Mednick SA. Malnutrition at Age 3 Years and Lower Cognitive Ability at Age 11 Years: Independence From Psychosocial Adversity. Arch Pediatr Adolesc Med [Internet]. 2003 Jun 1 [cited 2023 May 9];157(6):593. Available from: /pmc/articles/PMC3975917/

46. Laur C V, McNicholl T, Valaitis R, Keller HH. Malnutrition or frailty? overlap and evidence gaps in the diagnosis and treatment of frailty and malnutrition. Appl Physiol Nutr Metab. 2017;42(5):449–58.

47. Larson-Nath C, Goday P. Malnutrition in Children With Chronic Disease. Nutr Clin Pract. 2019;34(3):349–58.

48. Lahmann NA, Tannen A, Suhr R. Underweight and malnutrition in home care: A multicenter study. Clin Nutr [Internet]. 2016;35(5):1140–6. Available from: http://dx.doi.org/10.1016/j.clnu.2015.09.008

49. Kiesswetter E, Colombo MG, Meisinger C, Peters A, Thorand B, Holle R, et al. Malnutrition and related risk factors in older adults from different health-care settings: An enable study. Public Health Nutr. 2020;23(3):446–56.

50. Keller HH, Carrier N, Slaughter SE, Lengyel C, Steele CM, Duizer L, et al. Prevalence and Determinants of Poor Food Intake of Residents Living in Long-Term Care. J Am Med Dir Assoc [Internet]. 2017;18(11):941–7. Available from: https://doi.org/10.1016/j.jamda.2017.05.003

51. Evans C. Malnutrition in the Elderly: A Multifactorial Failure to Thrive. Perm J [Internet]. 2005 [cited 2023 May 8];9(3):38. Available from: /pmc/articles/PMC3396084/

52. Eckert C, Gell NM, Wingood M, Schollmeyer J, Tarleton EK. Malnutrition Risk, Rurality, and

Falls among Community-Dwelling Older Adults. J Nutr Heal Aging. 2021;25(5):624–7.

53. DeBoer MD, Lima AA, Oria RB, Scharf RJ, Moore SR, Luna MA, et al. Early childhood growth failure and the developmental origins of adult disease: Do enteric infections and malnutrition increase risk for the metabolic syndrome? Nutr Rev. 2012;70(11):642–53.

54. Boulos C, Salameh P, Barberger-Gateau P. Social isolation and risk for malnutrition among older people. Geriatr Gerontol Int. 2017;17(2):286–94.

55. Artaza-Artabe I, Sáez-López P, Sánchez-Hernández N, Fernández-Gutierrez N, Malafarina V. The relationship between nutrition and frailty: Effects of protein intake, nutritional supplementation, vitamin D and exercise on muscle metabolism in the elderly. A systematic review. Maturitas. 2016;93(2016):89–99.