Issue: Reducing Acute Care Length of Stay
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Evidence *in* Context

Health research — synthesized and contextualized for use in Newfoundland & Labrador

Reducing Acute Care Length of Stay *in* Newfoundland & Labrador

Christine Soong, Susan Gillam, Stephen Bornstein, Pablo Navarro

Newfoundland & Labrador Centre for APPLIED HEALTH RESEARCH
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Table of Contents

About This Report

About NLCAHR

The Newfoundland & Labrador Centre for Applied Health Research, established in 1999, contributes to the effectiveness of the health and community services system of the province and the physical, social, and psychological well-being of the population. NLCAHR accomplishes this mandate by building capacity in applied health research, supporting high quality research, and fostering more effective use of research evidence by decision makers and policy makers in the province's health system.

About the Contextualized Health Research Synthesis Program

In 2007, NLCAHR launched the Contextualized Health Research Synthesis Program (CHRSP) to provide research evidence that would help guide decision makers in the provincial health system on issues of pressing interest to Newfoundland & Labrador. Instead of conducting original research, CHRSP analyzes findings from high-level research already conducted in the subject area, such as systematic reviews, meta-analyses and health technology assessments. Findings are then synthesized and subjected to a systematic process of contextualization: they are analyzed in terms of their applicability to the conditions and capacities of the unique context of Newfoundland & Labrador. Our contextual analysis includes assessing the specific forms an issue may take in this province as well as the applicability of any proposed solutions and methods to locally available resources, infrastructure, human resources, cultural conditions, and financial capacities. CHRSP uses a combination of external experts and local networks to carry out and contextualize the research synthesis and to facilitate the uptake of the results by research users. CHRSP focuses on three types of projects: health services/ health policy projects, health technology assessment (HTA) projects, and projects that combine the two to examine processes for the organization or delivery of care involving a health technology.

Who Should Read This Report?

This report provides a synthesis of the relevant research-based evidence on synthesis of the relevant research-based evidence on effective interventions for reducing acute care hospital length of stay. This report is intended to inform and assist decision makers in Newfoundland & Labrador's four Regional Health Authorities and the Departments of Health and Community Services and Children, Seniors, and Social Development. The findings of our synthesis are based on an international search of the literature and may also be applicable to other countries, but are specifically interpreted for the context of Newfoundland & Labrador.

Decision makers from other jurisdictions, especially those with similar potential clients, geography and resources, may also find the content helpful. The report includes explanations of research terms and technical language; as such, there is no need to have a specialized medical or health background in order to understand its content.

The Research Team

Reducing Acute Care Hospital Length of Stay *in* Newfoundland & Labrador

Report Authors:

Dr. Christine Soong, MD, MSc, CCFP
Assistant Professor, University of Toronto
Director, Hospital Medicine, Mount Sinai Hospital
(Subject Expert)

Dr. Susan Gillam
Chief Executive Officer
Western Health
(Health System Leader)

Dr. Stephen Bornstein
Director
NL Centre for Applied Health Research
(CHRSP Program Director)

Pablo Navarro
Senior Research Officer
NL Centre for Applied Health Research
(CHRSP Project Coordinator)

Project Team:

Dr. Brendan Barrett
Professor, Medicine (Nephrology)
Faculty of Medicine, Memorial University
Clinical Nephrologist, Eastern Health

Dr. John Campbell
Primary Care & Emergency Medicine Physician
Faculty of Medicine, Memorial University

Cynthia Davis
Vice President, Patient Services
Western Health

Sherry Freake
Vice President, Acute Care
Chief Operating Officer
Central Health

Beverly Griffiths
Director, Acute Health Services and Nursing Policy
Department of Health and Community Services
Government of Newfoundland & Labrador

Liz Kennedy
Director, Clinical Efficiency and Ambulatory Clinics
Eastern Health

Rufina Letto
Regional Director, Acute Care Services
Labrador-Grenfell Health

Dr. April Manuel, RN
Assistant Professor of Nursing
Memorial University

Karen Nolan
Health Care Consultant, Regional Services
Department of Health and Community Services
Government of Newfoundland & Labrador

Kimberley White
Regional Director of Health Services
Labrador-Grenfell Health

Charmaine Wight
Manager, Acute Care Social Workers
Central Health

Kathy Winsor
Director of Site Operations
James Paton Memorial Regional Health Centre
Central Health

External Reviewer:

Dr. Kristen McMartin
Clinical Epidemiologist
Health Quality Ontario

Acronyms

ALC	Alternate Level of Care
ALOS	Average Length of Stay
AMSTAR	A Measurement Tool to Assess Systematic Reviews
CBA	Controlled Before and After trials
CC	Case Control study
CCT	Clinical Controlled Trials
CHF	Chronic Heart Failure
CP	Care Pathways
CPM	Critical Paths Methods
COPD	Chronic Obstructive Pulmonary Disease
ELOS	Expected Length of Stay
ERAS	Enhanced Recovery After Surgery
FT	Fast-Track surgery
LOS	Length of Stay
MA	Meta-Analysis
MBP	Mechanical Bowel Preparation
MR	Meta-Review (a systematic review of the review literature)
NIHR	National Institute for Health Research (UK)
NGT	Naso-Gastric Tube
NLU	Nursing-Led Unit
PANG	Post-operative analgesia
PCA	Patient-controlled analgesia
PONV	Post-Operative Nausea and Vomiting
pRCT	pseudo Randomized Controlled Trials
RCS	Retrospective Case Series
RCT	Randomized Controlled Trials
REA	Rapid Evidence Assessment
RHA	Regional Health Authority
SR	Systematic Review

Glossary

Alternate Level of Care (ALC)	A clinical designation that identifies patients who no longer require the intensity of resources or services provided in their current settings and who are waiting for an alternate placement (1)
Care Pathways (CP)	A broad term that may encompass other more specific interventions, e.g., ERAS and ERP. Previous literature and liaison with the European Pathways Association resulted in five criteria being used to define a clinical pathway: • the intervention was a structured multidisciplinary plan of care; • the intervention was used to translate guidelines or evidence into local structures; • the intervention detailed the steps in a course of treatment or care in a plan, pathway, algorithm, guideline, protocol or other 'inventory of actions;' • the intervention had timeframes or criteria-based progression; and • the intervention aimed to standardize care for a specific clinical problem, procedure or episode of healthcare in a specific population (2)
Early Discharge (ED)	Interventions initiated during the acute phase of an illness or injury to facilitate transition of care back to the community as soon as the acute event is stabilized (3)
Early Supported Discharge (ESD) or **Early Home Supported Discharge (EHSD)**	Services [that] aim to accelerate the patient's discharge home and provide an equivalent level of rehabilitation input in the patient's own in comparison with conventional hospital care and discharge arrangements (4)
Enhanced Recovery Pathways (ERP)	Multidisciplinary care pathways that integrate multiple evidence-based interventions in all perioperative phases to decrease the surgical stress response, hasten recovery, and ultimately improve outcomes (5)
Fast Track Surgery (FT) *or* **Enhanced Recovery After Surgery (ERAS):**	The Fast Track Surgery (FTS) pathway, also known as enhanced recovery after surgery (ERAS), was initiated in 1995 by Bardram et al. FTS is a multidisciplinary approach aiming to accelerate recovery, reduce complications, minimize hospital stay and reduce healthcare costs, all without compromising patient safety. The FTS pathway has been used successfully in urological, orthopedic, gynaecological and, especially, colonic settings (6)

The Research Question

"What does the available research-based evidence tell us about what models/strategies/practices are best suited for the timely and effective discharge of patients admitted to hospitals in Newfoundland & Labrador?"

Key Messages from this Report

The following key messages summarize the most relevant evidence synthesis findings in this report and reflect the state of the available research:

1. The volume of evidence for the effectiveness of Care Pathways to reduce Length of Stay is exceptional. However, pooling evidence for multiple different types of patient population sub-groups masks important variations in that effectiveness. In other words, the validity of the measure of effectiveness is reduced by generalizing across sub-groups. A meaningful synthesis requires examination of the evidence at the level of individual types of patients, as well as an analysis of why differences exist between different patient sub-groups.

2. A strong body of evidence has demonstrated that Care Pathways are consistently effective at reducing average length of stay (ALOS) for acute care patients who have undergone colorectal surgery. Furthermore, Care Pathways are shown to have no effect on readmission rates and to decrease costs for the healthcare system. The implementation of Care Pathways for colorectal surgery indicates that several common elements appear to be critical for their effectiveness.

3. A moderate body of evidence indicates that Care Pathways are effective at reducing ALOS among patients undergoing gynaecological surgery and pancreatic surgery, without affecting readmission rates.

4. Care Pathways may be effective for liver and stomach surgery in particular, as they are for gastrointestinal surgery in general, but the current body of evidence is insufficient to draw any conclusive findings.

5. Care Pathways may also be effective for lung and thyroid surgery and for acute care patients with chronic heart failure (and some other chronic disease conditions), but the current body of evidence is insufficient to draw any conclusive findings.

6. A strong body of evidence indicates that Discharge Planning is effective at reducing ALOS and readmission rates for older acute care patients. The key elements of Discharge Planning are developing and enforcing an individualized plan for discharge from the point of admission or before.

7. A moderate body of evidence shows that Early Supported Discharge for stroke patients significantly reduces ALOS and suggests it may do so without changing readmission rates or increasing costs for the hospital/health care system.

8. A moderate body of evidence indicates that hospitalist models of care can be expected to reduce ALOS without increasing readmission rates or costs.

9. Nursing-Led Units are not effective for reducing hospital ALOS in the context of the parameters studied in this report.

How to Navigate this Report

- The section entitled **Synthesis Findings** (page 16) provides supporting detail about each of the foregoing key messages. This section of the report provides readers with a comprehensive overview of the scientific evidence that was examined for this study. For this study, the Synthesis Findings are divided into two sub-sections: *Care Pathways* and *Other Interventions*.

- Local contextual variables that may have an impact on how decision makers apply the evidence in Newfoundland & Labrador are detailed in this report under the section: **The Newfoundland & Labrador Context** (Page 46).

- The synthesis findings were then considered in light of our contextualization findings to come up with the list of **Implications for Decision Makers** (page 52). Please note that CHRSP prefers to use the term “implications” rather than “recommendations” because we recognize that evidence is one of several inputs health system decision makers need to consider. CHRSP reports present the issues decision makers should *consider* rather than asserting which options they should *choose*.

Background

This research topic originated from our health system partners at Central Health, but there was consensus on its importance among the other provincial Regional Health Authorities (RHAs) and the Department of Health and Community Services. The main concern expressed by our health system partners was that *the average Length of Stay (ALOS) of many types of acute care patients in Newfoundland & Labrador is longer than the Expected Length of Stay (ELOS) based on national estimates* (7).

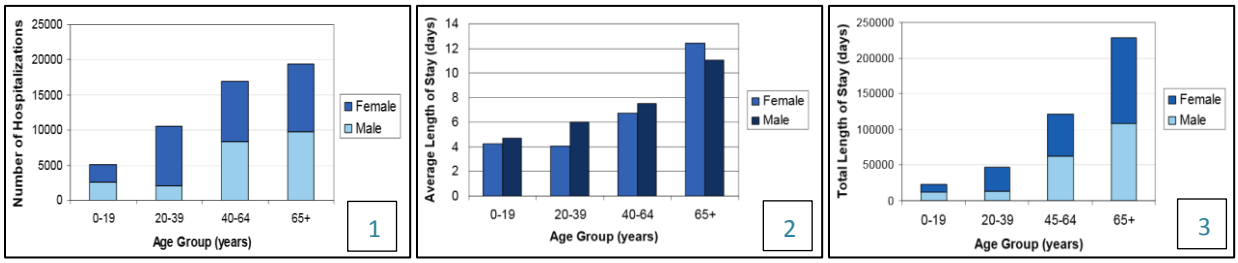

Figure 1: Total Acute Care Hospitalizations, Newfoundland & Labrador, by Sex and Age Group, 2007/08 (7)
Figure 2: Average Length of Stay, Newfoundland & Labrador, by Sex and Age (7)
Figure 3: Total Length of Stay, Newfoundland & Labrador, by Sex and Age (7)

These figures reflect the following realities, consistent with national trends:

- the number of acute care hospitalizations increases with age (Figure 1);
- the ALOS for individual cases also increases with the age of the patient (Figure 2);
- the combination of these trends results in an exponential increase in the total number of ALOS days among increasing age groups of acute care patients (Figure 3).

The ALOS profiles for different types of acute care patients tend to follow a similar pattern in which most patients have shorter stays and fewer patients have longer stays (see Figure 4 which shows data for all of Canada). Medical patients are the largest group in terms of numbers of acute care patients. Mental health patients have the longest ALOS and also have the largest amount of variability in individual LOS.

Nonetheless, a plurality of all types of acute care patient groups have an ALOS of three days or less (ranging from 85.2% for newborns to 30.0% for mental health patients). The majority of acute care patients have an ALOS of less than one week (79.5% for all patient types combined); the exception is mental health patients where just under half (49.8%) are admitted for one week or less. The tail-end of acute care in-patients with longer ALOS tend to be older and have complex co-morbidities. They often

have additional non-clinical challenges such as an absence of appropriate post-discharge placement and support options.[1] (8)

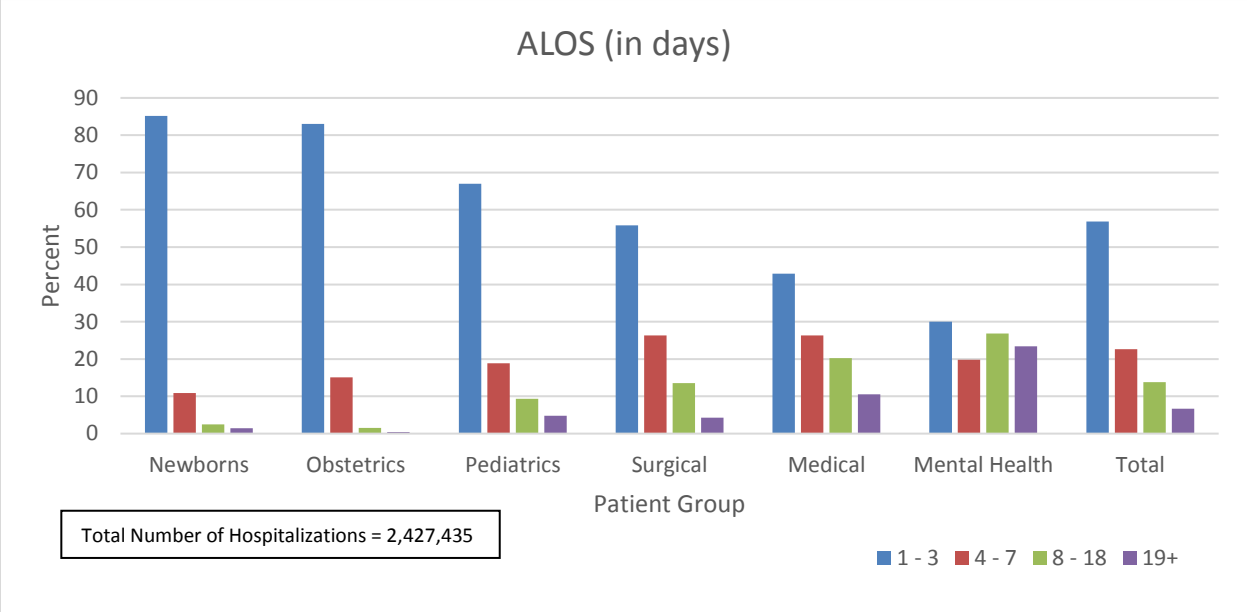

Figure 4: Frequency of average lengths of stay for different types of patients in Canada (excluding Quebec) 2004-2005 (8)

Acute care admissions in Newfoundland & Labrador are generally similar to those in the rest of the country, except for slightly longer ALOS. The overall ALOS for acute care in-patients in Newfoundland & Labrador is approximately one day longer than the national average (7). A longer than expected ALOS in this context suggests the possibility that services and resources are not optimally designed and/or implemented, resulting in inefficiencies such as bottlenecks, increased process times, increased wait times, excessive costs, etc.

Our Health System Partners asked the Contextualized Health Research Synthesis Program to find out what can be done to reduce acute care ALOS for the majority of patients with short-to-medium expected ALOS, in the range of 1-21 days. This study focuses on models, strategies, and practices that expedite both recovery and the discharge process in a timely and effective manner. In this context, an "effective" measure does not increase the risk of readmission for the same or related problems, while at the same time, it should reduce healthcare system costs. The scope of this project does not include the planning, coordination, and delivery of post-discharge services for patients.

[1] These patients, for whom there are an absence of placement options may be referred to as Alternate Level of Care (ALC) patients.

Methodology

A brief overview of the CHRSP *Evidence in Context* methodology is provided below.

Our methodology is described in greater detail in the Online Companion Document, which includes:

- data extraction methods and analysis results (Annex A);
- our critical appraisal methods and results (Annex B); and
- our search strategies and results (Annex C).

URL for the Online Companion Document: http://www.nlcahr.mun.ca/CHRSP/RACLOS_OCD_2017.pdf

What evidence did we look for?

We operationalized our research question and organized our evidence review using the PICOS analytic framework (9). This framework deconstructs the review question into five dimensions: Population, Intervention, Comparator, Outcome, and Setting (see Table 1 below). Our search for evidence is divided into three separate strategies:

1. We searched for eligible **systematic reviews** (systematic reviews including meta-analyses and health technology assessments) using three periodical indexes (PubMed, CINAHL and Embase). We included publications from the past 10 years. We checked reference lists and used Google Scholar to reverse-citation search for potentially relevant reviews.

2. We searched for relevant **primary research** that was conducted recently enough to have not been captured by the systematic review literature. We used the same periodical indices and modified versions of the search strings used in the systematic review search.

3. We searched for **grey literature**, i.e., non-commercially published research, by following the relevant sections of CADTH's "Grey Matters" guide (10).

PICOS Dimension	Description
Population(s)	All acute care patients admitted to hospital or seen in the emergency department.
Intervention(s)	INCLUDED INTERVENTIONS: This study examined models, strategies, and practices intended to reduce ALOS, including: • specialized units • programs of care • specific personnel or structured practices, unless otherwise excluded (see below) • Care Pathways,[2] which were identified as an area of specific interest. Included interventions could address patient care directly (e.g., those aimed at minimizing trauma or improving recuperation) or indirectly, by enhancing the organization of health services (e.g., altering the staffing mix, improving inter-professional collaboration, optimizing the scheduling of rounds, or implementing innovative documentation methods). EXCLUDED INTERVENTIONS: This study excluded any interventions: • based on the involvement of pharmacists;[3] • involving the planning, coordination, and delivery of outpatient services; or • requiring new infrastructure investments.
Comparator(s)	Standard or usual care.
Outcome(s)	**Average Length of Stay (ALOS)** is the primary outcome of interest for this project. ALOS is generally defined as the period of time that a patient remains in hospital for of a single episode of care, based on the number of nights the patient spent in hospital. A patient who is admitted and discharged on the same day is considered to have an ALOS of less than a day. **Readmission (RA)** is a secondary outcome of interest for this project. RA is defined as the risk for readmission to a hospital unit for a recurrence of, or a complication related to, the health problem that was the cause for the initial admission. **Cost** is the third outcome of interest for this project, defined as any measure or estimate of the difference in cost, from the perspective of the health system, between the intervention and a control group.
Setting(s)	Acute care units, including emergency medicine, intensive care, and psychiatry.

Table 1: PICOS parameters for this project

We refined our searches iteratively with our members of our Project Team and with the help of librarians at Memorial University. The portions of our search strategies for interventions were based,

[2] These are standardized multidisciplinary care plans for well-defined periods of time that detail essential steps and goals in specific patient cohorts with specific clinical problems based on evidence or recognized guidelines.

[3] At the time of this project, the RHAs had already identified the need for an enhanced role for pharmacists in improving medication reconciliation in acute care discharge as well as other and other potential roles. The RHAs are taking steps to address these issues.

when possible, on syntax previously used in Cochrane Reviews studying the same intervention or type of interventions (see Table 2 for a summary and the Online Companion Document Annex C for details).

Intervention search strategy focus	Cochrane Review
Care Pathways	Rotter et al., 2010 (11)
Operational Organization • Inter-professional Collaboration • Staffing • Organizing Rounds	 • Zwarenstein et al., 2009 (12) • White et al., 2011 (13) • No Cochrane Review found
Documentation Methods	No Cochrane Review found
Other Patient Discharge Interventions	Shepperd et al., 2013 (14)

Table 2: Intervention search strategies and corresponding Cochrane Reviews

Two researchers separately screened the search results for potentially eligible articles. The same two researchers separately filtered the screened results, using a pre-determined set of criteria for eligibility. In both cases, disagreements were resolved through discussion, and if needed, consultation with other Project Team members.

Evidence Synthesis Method

Two researchers separately appraised all included articles, using the AMSTAR instrument (15) for systematic reviews and the Downs and Black checklist (16) for primary research articles (see OCD Annex B for details). Two researchers divided the included articles for data extraction and reviewed each other's work. A template was used for the data extraction. The results of the data extraction formed the basis for the synthesis of this report (see Online Companion Document Annex A).

What is a finding? In the synthesis of evidence, we were careful to combine *comparable research results* to arrive at a *finding.* In practice, this meant that the synthesis was carried out at the level of combining the evidence that showed how a particular intervention affected a specific outcome for a given population, in a given setting, compared to a given comparison group. In other words, we compared findings that related to matching PICOS parameters. As an example, a finding could be the combined evidence for: the impact of Care Pathways (Intervention) on changing ALOS (Outcome) for colorectal surgery patients (Population) admitted to hospital (Setting) compared to "usual care" (Comparator).

How did we assess the body of evidence for a given finding? The synthesis of evidence in this study also assessed *the body of evidence* for any finding. A CHRSP Evidence Rating System (ERS) was designed, tested, and implemented for this purpose. The ERS measures the body of evidence using five ordinal categories: Very Strong, Strong, Moderate, Weak or Very Weak.

The body of evidence measure is a compound measure that indicates the degree to which the evidence for a finding can be trusted. The strength of the body of evidence takes into account:

- the number and methodological quality of the included systematic reviews;
- the consistency of results between articles; and
- the number of unique primary research studies that underpin the review results.

It is important to note that the strength of the body of evidence for a finding is *independent of the favourability of the finding* in question. That is to say, the strength (or weakness) of the body of evidence is independent of whether or not the evidence favours (or does not favour) an intervention over a control group. Table 3 below provides a legend to help readers of this report better understand the strength of the evidence and whether the evidence indicates an intervention is favoured, has no effect, or that the findings conflict with each other or indicate that there is evidence against the intervention.

Body of Evidence ↓	**Favourability of Finding**		
	Favouring (evidence that intervention is effective)	**No effect** (evidence that intervention has no effect)	**Conflicting or Against** (evidence not consistent or against using the intervention)
Very strong	✓✓✓	✓✓✓	✘
Strong	✓✓	✓✓	✘
Moderate	✓	✓	✘
Weak or Very Weak	~	~	✘

Table 3: Evidence Rating Legend

To return to the example used above, the body of evidence for Care Pathways to reduce ALOS for colorectal surgery patients is very strong because there is plenty of high-quality evidence that all points in the same direction. In this particular case, it favours the intervention. At the same time, and for the same reasons, an equally strong body of evidence exists for whether Care Pathways have an effect on rates of readmission. However, in this particular case, the evidence indicates that Care Pathways do not make a difference in the rates of readmission, i.e., the evidence does not favour the intervention.

The CHRSP ERS is implemented using a programmed Excel spreadsheet that integrates critical appraisal scores, data extraction, primary research analysis and an algorithmic scoring system. Detailed methods for the CHRSP ERS and algorithm thresholds are provided in the Annex B of the Online Companion Document.

Synthesis Findings

We found 55 individual systematic reviews (SRs) eligible for inclusion (relevant focus and a moderate or high AMSTAR score for methodological rigour). Of these, 25 focused exclusively on Care Pathways (CPs), with four systematic reviews studying CPs for multiple types of acute care patients (e.g., all types, abdominal surgeries, gastrointestinal surgeries) and the remaining 21 studying specific types of Care Pathways (e.g., for colorectal surgery or lung surgery patients). The remaining SRs addressed a broad range of interventions of varying focus, scale and multi-disciplinary involvement.

Given the number of interventions under study in this report, we have kept the information presented to a manageable length by describing each intervention briefly and by providing a summary table of the evidence. Detailed information regarding the evidence synthesis is provided in the Online Companion Document in Annex A (Data Extraction and Synthesis) and in Annex B (Critical Appraisal).

To further streamline our findings for this report, we list all synthesis results for Care Pathways in Part 1 and the evidence for Other Interventions in Part 2 of these Synthesis Findings. When reporting on the evidence, we have listed the interventions in order of the strength of the body of evidence, from strongest to weakest, as summarized in Tables 4 and 5 below.

PART 1: Evidence for Care Pathways	
Strength of Evidence	**Type of Acute Care Patients**
Very Strong Body of Evidence (Effective) ✓✓✓	• All types of patients • Abdominal surgery • Gastrointestinal surgery
Strong Body of Evidence Effective) ✓✓	• Colorectal surgery
Moderate Body of Evidence (Effective) ✓	• Gynaecological surgery • Pancreatic surgery
Weak Body of Evidence (Undetermined) ~	• Gastrectomy • Liver surgery • Lung surgery • Thyroidectomy • Chronic Heart Failure • Chronic Obstructive Pulmonary Disease • Heart failure • Pediatric asthma

Table 4: The Body of Evidence for Care Pathways (Part 1 of the synthesis findings)

PART 2: Evidence for Other Interventions	
Strength of Evidence	**Intervention (Acute Care Patient Sub-Group)**
Strong Body of Evidence (Effective) ✓✓	• Individualized Discharge Planning (Elderly)
Moderate Body of Evidence (Effective) ✓	• Early Supported Discharge (Stroke) • Hospitalist-based Interventions (Mixed)
Moderate Body of Evidence (Not Effective) ✓	• In-patient Geriatric Consultation Teams (Elderly) • Multi-Disciplinary Rehabilitation (Hip Fracture) • Nutritional Therapy (Mixed) • Stroke Unit Care (Stroke)
Moderate Body of Evidence (Against) ✘	• Nursing-Led Units (Mixed)
Weak Body of Evidence (Undetermined) ~	• Active Mobilization (Mechanically Ventilated) • Acute Care for Elders (Elderly) • Case Management (Heart Failure) • Emergency Department Short Stay Unit (Mixed) • Exercise (Mixed) • Interdisciplinary Rounds (Mixed) • Physiotherapy (ICU)

Table 5: The Body of Evidence for Other Interventions (Part 2 of the synthesis findings)

PART 1: Synthesis Findings *for* Care Pathways

What do we mean by "Care Pathways"?

Care Pathways (CP) is a term used in the research literature that, for the purposes of this report, describes Clinical Care Pathways, Clinical Pathways, Enhanced Recovery after Surgery (ERAS), and Fast-Track Surgery.[4]

The original goals of Care Pathways were to improve acute care patient outcomes in terms of quality of care, safety, adverse events and efficiency. In the first implementations of Care Pathways, length of stay (LOS) and hospital expenditures were always the primary outcomes of interest. As such, Care Pathways are considered an example of the operationalization of patient-focused care.

The original goals of Care Pathways were to improve acute care patient outcomes in terms of quality of care, safety, adverse events and efficiency. In the first implementations of Care Pathways, length of stay and hospital expenditures were always the primary outcomes of interest. As such, Care Pathways are considered an example of the operationalization of patient-focused care.

The definition of a CP adopted by the European Pathway Association, is:

A complex intervention for the mutual decision making and organization of predictable care for a well-defined group of patients during a well-defined period. Defining characteristics of pathways include: an explicit statement of the goals and key elements of care based on evidence, best practice and patient expectations; the facilitations of the communication and coordination of roles, and sequencing the activities of the multidisciplinary care team, patients and their relatives; the documentation, monitoring, and evaluation of variances and outcomes; and the identification of relevant resources. (18)

Our synthesis uncovered a considerable body of evidence about Care Pathways that can be used for a number of acute care patients. These are details in this section of the report in the order of the strength of the evidence, from strongest to weakest.

[4] Care Pathways emerged from Critical Path Methods (CPMs) developed in the field of industrial quality management for the control and monitoring of complex processes. The overall goals of CPMs are to: 1) use resources efficiently; and 2) finish work on time. Karen Zander and Kathleen Bower translated CPMs into case management approaches in 1985 while at the New England Medical Centre in Boston, Massachusetts. Early successes led to more than 80% of US hospitals adopting at least one Care Pathway by the 1990's, with European health care systems beginning to adopt them at this time as well (17,18).

CPs for Acute Care, Abdominal Surgery, and Gastrointestinal Surgery Patients: Very Strong Body of Evidence (Effective)

The systematic reviews) we found that study CPs by aggregating different acute care patient types indicate that there are very strong bodies of evidence favouring the use of Care Pathways over 'usual care' or 'standard care' when ALOS is the primary outcome of interest (see Table 6 below).

CARE PATHWAYS FOR ALL [STUDIED] TYPES OF ACUTE CARE PATIENTS

✓✓✓ **Length of Stay:** Very strong body of evidence **favouring** Care Pathways overall
✓✓✓ **Readmission:** Very strong body of evidence for **no effect**, positive or negative, overall
✗ **Cost: Conflicting evidence**

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
High	Rotter 2010 (11)	Favours CPs (qualitative synthesis)	No difference	Favours CPs (qualitative synthesis)
Moderate	Pucher 2014 (19)	Favours CPs (qualitative synthesis)	No difference	n/a
+ an additional 25 systematic reviews studying individual (6,18,20–40) or sub-groups (41,42) of care pathways, which are discussed below in their own categories				

CARE PATHWAYS FOR ABDOMINAL SURGERY PATIENTS

✓✓✓ **Length of Stay:** Very strong body of evidence **favouring** Care Pathways for this category

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
High	Rollins 2015 (41)	- 1.55 days 95% CI [-2.73, -0.36], p=0.019	n/a	n/a
+ an additional 19 systematic reviews studying specific care pathways (6,20–35,42,43), which are discussed below in their own categories				

CARE PATHWAYS FOR GASTROINTESTINAL SURGERY PATIENTS

✓✓✓ **Length of Stay:** Very strong body of evidence **favouring** Care Pathways for this category
✓✓✓ **Readmission:** Very strong body of evidence for **no effect** (positive or negative) for this category
✓✓ **Cost:** Strong evidence **favouring** Care Pathways for this category

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
High	Song 2014 (42)	- 4.0 days 95% CI [-5.2, -2.9], p<0.00001	No difference	Favours CPs (qualitative synthesis)
+ an additional 15 systematic reviews studying specific care pathways (6,20–29,33–35,43), which are discussed below in their own categories				

Table 6: Evidence for Care Pathways for aggregate groups of different types of acute care patients

When considering all groups of acute care patients together, the evidence indicates that CPs are effective at reducing ALOS without changing (either increasing or decreasing) rates of readmission for the same or related conditions. At this level of aggregation, the evidence is not consistent in terms of costs: moderate quality SRs report more favourable evidence than high quality SRs, raising concerns of risk of bias. At the very least, we can say that CPs, overall, are either *more* cost-effective or *as* cost-effective when considered from the perspective of the hospital/health care system (11,19).

For two acute care patient groups, abdominal surgeries and gastrointestinal surgeries (Table 6), the body of evidence is similarly strong in finding that CPs reduce ALOS without changing readmission rates. The evidence is more consistent than in the previous body of literature in terms of indicating increased cost effectiveness/lower costs from a health system/hospital perspective (41,42).

A 2014 UK National Institute for Health Research (NIHR) report that reviewed SRs of interventions to decrease hospital ALOS concluded: "the available evidence highlights that the implementation of clinical care pathways [in general] led to improvements in processes or teamwork, reduced delays in discharge and better collaboration within the care team." A 2009 Australian "review of new interventional procedures" agreed, finding that SRs and primary research studying CPs consistently found reduced ALOS among different groups of *surgery* patients, with gastrointestinal surgery patients having the best outcomes of any subgroup (44).

It should be noted that this volume and consistency of evidence for an intervention's effect on an outcome (i.e., CPs and LOS), is exceptional. However, pooling systematic review evidence from multiple different types of patient populations is bound to be characterized by large amounts of heterogeneity. The results of a class of interventions on a particular outcome vary significantly between subgroups of acute care patients. As a result, generalizing across subgroups greatly reduces validity. A meaningful synthesis requires examination of the evidence at the individual patient type, as well as an analysis of why differences exist between different patient groups. The following subsections examine CPs for acute care subgroups in order of strongest to weakest bodies of evidence.

Key Message #1

The volume of evidence for the effectiveness of Care Pathways to reduce Length of Stay is exceptional. However, pooling evidence for multiple different types of patient population sub-groups masks important variations in that effectiveness. In other words, the validity of the measure of effectiveness is reduced by generalizing across sub-groups. A meaningful synthesis requires examination of the evidence at the level of individual types of patients, as well as an analysis of why differences exist between different patient sub-groups.

CPs for Colorectal Surgeries: Strong Body of Evidence (Effective)

Colorectal surgeries are among the most frequently performed surgeries and among the most studied. Different procedures have become highly standardized and lend themselves to CPs for "a well-defined group of patients during a well-defined period" (18).

Our synthesis found a strong body of evidence demonstrating that CPs for colorectal surgeries are consistently effective at significantly reducing ALOS in the range of approximately 1 to 3 days (see Table 7). A similarly strong body of evidence indicates that this improvement in ALOS comes with no change in readmission rates. A moderate body of evidence favours CPs for colorectal surgeries in terms of cost from a hospital/healthcare system perspective based on qualitative syntheses.

There was no clear association between effect sizes and overall methodological quality or risk of bias of the included SRs. CP effectiveness at reducing ALOS and costs was demonstrated across a range of healthcare settings. As a result, the body of evidence favouring colorectal surgery CPs is as strong as can be reasonably expected from the research literature. One Cochrane Review concluded: "the results therefore seem to advocate the use of [a colorectal surgery CP] *as standard care.*" (emphasis added) (21).

CARE PATHWAYS FOR COLORECTAL SURGERY ACUTE CARE PATIENTS

✓✓ **Length of Stay**: Strong body of evidence **favouring** Care Pathways
✓✓ **Readmission**: Strong body of evidence for **no effect**, positive or negative
✓ **Cost:** Moderate evidence **favouring** Care Pathways

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
High	Lv 2012 (20)	-1.88 days 95% CI [−2.91, −0.86], *p*<0.0003	No difference	n/a
	Spanjersberg 2011 (21)	-2.94 days 95% CI [-3.6, -2.19], *p*<0.00001	No difference	n/a
	Eskicioglu 2009 (22)	Favours CPs (qualitative)	No difference	n/a
	Greco 2014 (23)	-2.28 days 95% CI [-3.09, -1.47], *p*<0.001	No difference	n/a
Moderate	Adamina 2011 (24)	-2.5 days 95% CI [3.92, -1.11]	No difference	Favors CPs (qualitative)
	Gouvas 2009 (25)	-2.35 days 95% CI [−3.24, −1.46], *p*<0.00001	No difference	n/a
	Lee 2014 (26)	n/a	No difference	Favors CPs (qualitative)
	Varadhan 2010 (27)	-2.51 days 95% CI [-3.54, -1.47], *p*<0.00001	No difference	Favors CPs (qualitative)
	Walter 2009 (43)	-3.64 days |95% CI [-4.98, -2.29], *p*<0.0001	No difference	n/a
	Wind 2006 (28)	-1.56 days 95% CI [−2.61, −0.50], *p*<0.0014	No difference	n/a
	Yin 2014 (29)	-0.91 days 95% CI [−1.26, −0.57], *p*<0.0001	No difference	n/a

Base of Primary Research Evidence

- Length of Stay: 20 unique primary research studies.
- Readmission: 20 unique primary research studies
- Cost: 27 unique primary research studies

Table 7: Evidence for Care Pathways for colorectal surgery

Key Message#2

A strong body of evidence has demonstrated that Care Pathways are consistently effective at reducing ALOS for colorectal surgery acute care patients without changing readmission rates and has indicated decreased costs for the healthcare system.

Elements of Colorectal Surgery Care Pathways

Colorectal surgery CPs are highly standardized in design but not necessarily uniform in their implementation. The approach of Care Pathways in general is to adapt evidence-based standards and benchmarks to locally available resources and capacities. CPs are made up of a series of what we are calling "elements." Each element requires or prohibits a particular action or procedure. The timing of CP elements is typically divided into preoperative, perioperative and postoperative categories.

	25 INCLUDED PRIMARY STUDIES → / Care Pathway Category | *Care Pathway Sub-Category* ↓	Anderson 2003	Basse 2004	Basse 2004 (A)	Bradshaw 1998	Delaney 2003	Garcia-Botello 2011	Gatt 2005	Ionescu 2009	Kariv 2007	Khoo 2007	Muller 2009	Polle 2007	Raue 2004	Ren 2012	Serclova 2007	Serclova 2009	Stephen 2003	Vlug 2011	Wang 2011	Wang 2012	Wichmann 2007	Yang 2012	Lee 2011 (not in SR)	Wang 2012 (not in SR)	Wang 2012(A) (not in SR)	TOTAL # STUDIES
PREOPERATIVE	**Preoperative Counselling (extensive preoperative counseling)**	•		•	•	•	•	•	•	•	•	•	•	•			•	•	•		•	•	•			19
	PF- Preoperative Feeding (avoidance of fasting) ALL VERSIONS	•		•			•	•	•		•	•	•	•	•		•		•	•		•		•	•	17
	FR - Fluid Restriction	•		•			•	•	•		•	•	•	•	•		•		•	•	•	•		•	•	17
	No Bowel Preparation (avoidance of mechanical bowel preparation, MBP)	•		•			•	•	•			•	•		•		•		•	•	•			•	•	13
	Preoperative Feeding- General	•						•	•		•	•			•		•		•	•	•		•		•	13
	Fluid Restriction- Fluid Restriction Only			•				•	•		•	•	•	•	•		•		•	•			•			13
	Preoperative Feeding- Preoperative carbohydrate loading until 2 h prior to surgery	•						•	•				•		•				•	•	•	•	•		•	12
	No Premedication (avoidance of premedication)			•									•				•		•	•						5
	Synbiotics (administration of pre- and postbiotics)	•						•																		2
	Pre-assessment by anesthesia/surgery	•						•																		2
	Preoperative Feeding- Preoperative fast 3 h prior to surgery	•																								1
	Fluid Restriction- Oral fluids until 3 h prior to surgery										•															1
	Fluid Restricton- No intravenous (IV) fluids overnight										•															1
	MBP—Fleet phospho-soda (2 bottles)										•															1
PERIOPERATIVE	**Epidural Analgesia**	•		•	•		•	•	•		•	•	•	•			•	•	•	•		•	•			16
	Minimal Invasive Incision (transverse incision, laparoscopy)	•		•				•					•	•			•	•	•	•		•	•			11
	Normothermia						•						•		•				•			•	•			6
	Hyperoxia	•						•														•				3
	Strict fluid management			•							•															2
	Specific avoidance of drains and lines	•												•												2
	NG tubes removed before extubation					•																				1
POST OPERATIVE	**Early Routine Mobilization**	•		•	•	•	•	•	•	•	•	•	•	•	•		•		•	•	•	•	•		•	•	21
	Early Feeding (early enteral nutrition)	•		•	•	•	•	•	•	•	•	•	•	•	•		•		•	•	•	•	•	•	•	•	22
	LAX Laxatives- ALL VERSIONS			•					•		•		•	•					•				•				7
	LAX Standard Laxatives			•					•				•	•					•				•				6
	LAX Regular domperidone, magnesium hydroxide 8% and liquid protein										•																1
	No Routine Use of NG tubes (avoidance of nasogastric tubes)	•			•	•	•	•	•	•	•	•	•	•	•		•		•	•	•		•	•	•	•	20
	No Use of Drains (avoidance of peritoneal drains)	•						•	•			•	•	•	•		•		•	•	•		•		•		13
	Early Removal of Urine Catheters			•			•		•		•	•	•	•	•		•		•	•	•	•	•	•	•	•	17
	PANG Postoperative Analgesia -- All Versions	•		•		•		•	•		•	•		•	•		•		•	•	•		•		•	•	16
	PANG No Systemic Morphine Use	•		•				•	•		•	•		•			•		•	•			•				11
	PANG Low systemic morphine use	•						•	•		•	•			•		•			•	•		•		•	•	12
	PANG PCA analgesia + ketorolac q6hr PRN					•																					1
	PANG Epidural anesthesia	•		•				•	•		•	•		•			•		•	•	•		•		•	•	14
	PANG Thoracic epidural										•																1
	PANGEpidurals discontinued at 48 h postoperatively										•																1
	PANG Standing paracetamol and ibuprofen starting immediately postoperatively										•																1
	PANG Oral analgesia started on POD#2					•																					1
	PPNV Prevention of Postoperative Nausea and Vomiting --All Versions			•		•	•		•		•			•									•	•			9
	PPNV Offer clear fluids on the evening of surgery					•																					1
	PPNV IV fluids discontinued once tolerating 200 cc of water over 30 min										•																1
	PPNV PONV prophylaxis						•								•									•			3
	PPNV Prokinetics			•					•					•	•								•				5
	PPNV Routine anti-emetic																										0

Table 8: Elements of colorectal surgery Care Pathways, based on included evidence

An analysis of the included Systematic Reviews indicates that colorectal surgery CP elements are more or less common (see Table 8) with variable implementation.

Elements that are more common and have a more standardized implementation method are assumed to play a more critical role in the effectiveness of the Care Pathway.

The most common **preoperative** elements shared by the majority of studies were:

- Counselling (76%),
- Restriction of foods and fluids (68%), and
- Avoiding mechanical bowel preparation (MBP; 52%).

Here, avoiding mechanical bowel preparation is a notable element since the technique has long been thought of as 'required' for better colorectal surgery outcomes; this finding suggests that the practice lacks merit (45).

Critical **perioperative** elements include:

- Minimizing invasiveness with epidural analgesia (64%), and
- Using minimal incision techniques (44%).

Postoperative elements in the majority of studies included a focus on:

- Returning the patient to normal activity levels as soon as possible, including mobilization (84%),
- Feeding (88%),
- Minimizing invasive procedures, such as
    - nasogastric tubes (80%),
    - catheters (68%) or drains (52%), and
- Managing postoperative pain (64%) with established protocols (e.g., epidural analgesic).

Key Message #3

The implementation of Care Pathways for colorectal surgery indicates several common elements at preoperative, perioperative, and postoperative stages that appear to be critical for their effectiveness.

CPs for Gynaecological and Pancreatic Surgeries: Moderate Body of Evidence

Two types of procedures have a moderate body of evidence that favours CPs to reduce ALOS for acute care patients: gynaecological surgery and pancreatic surgery.

Care Pathways for Gynaecological Surgery

In the context of this analysis, gynaecological surgery includes hysterectomy and myomectomy, and surgeries for vulvar, vaginal, cervical, uterine, fallopian and ovarian cancers. A moderate body of evidence indicated that CPs for this category of surgeries reduce ALOS on average between 1 and 2 days without changing readmission rates related to the original surgery. CPs may reduce costs, but the body of evidence is not clear in this regard (Table 9).

CARE PATHWAYS FOR GYNAECOLOGICAL SURGERY ACUTE CARE PATIENTS

✓ **Length of Stay:** Moderate body of evidence **favouring** Care Pathways
✓ **Readmission:** Moderate body of evidence for **no effect**, positive or negative
~ **Cost:** Weak evidence **favouring** Care Pathways

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
High	Lv 2010 (30)	n/a	n/a	n/a
	De Groot 2005 (31)	-1.57 days 95% CI [-2.94, -0.20], *p*=0.02	No difference	n/a
Moderate	Xuping 2014 (32)	-1.61 days 95% CI [−1.91, −1.31], *p*<0.0001	No difference	Favors CPs (qualitative synthesis)

Base of Primary Research Evidence
- Length of Stay: 16 unique primary research studies.
- Readmission: 11 unique primary research studies
- Cost: 2 unique primary research studies

Table 9: Evidence for Care Pathways for gynaecological surgery.

Gynaecological surgery CPs include a range of related but different conditions and procedures. However, the main source of heterogeneity in the research-based evidence appears to arise from the difference between malignant and benign indications for surgery, rather than affected organs (31). Larger effect sizes were found for malignant indications compared to benign, i.e., greater improvements were seen among malignant tumour patients. All of the included primary studies favoured CPs in the context of reducing ALOS, and all but two found statistically significant differences (31,32).

Key Message #4

A moderate body of evidence indicates that Care Pathways are effective at reducing ALOS among patients undergoing gynaecological surgery without affecting readmission rates.

Similar to colorectal surgery CPs, the implementation of gynaecological surgery CPs involves some elements assumed to be critical for effectiveness, as detailed in Table 10.

The most common **preoperative** elements shared by the majority of studies were:
- Counseling and education (100%)
- Avoiding long-acting sedatives (69%),
- No MBP (63%) and
- No overnight fasting (56%).

Counselling and education are apparently standard pre-operative elements. This is similar to colorectal surgery CPs and suggests evidence for the common-sense proposition that pre-operative knowledge exchange with patients is generally beneficial.

Elements of Gynaecological Surgery Care Pathways

	Primary Study: / Care Pathway element:	Borendal 201	Carter 2011	Cascales 2011	Chowdhury 2012	Dickson 2012	Eberhart 2008	Hansen 2007	Kalogera 2012	Kroon 2010	Marx 2006	Moller 2001	Oscarsson 2006	Pather 2011	Rardin 1999	Sidhu 2012	Wijk 2014	TOTAL # STUDIES
Pre-Operative	Counselling and education	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	16
	Avoidance of long-acting sedatives	x	x	x		x		x	x	x	x	x	x				x	11
	No mechanical bowel preparation		x	x	x			x	x		x	x		x		x	x	10
	No overnight fasting	x	x	x	x		x		x	x						x	x	9
	Oral carbohydrate loading			x	x		x		x								x	5
	Preoperative optimization		x		x												x	3
	Gabapentin		x						x									2
Peri-Operative	Antimicrobial prophylaxis	x	x	x			x	x			x	x	x	x	x		x	11
	IV fluid restriction	x	x	x	x		x		x	x		x					x	9
	Routine pharmaceutical anti-emetics						x	x	x	x	x	x			x		x	8
	Preventing hypothermia		x	x	x		x			x				x		x	x	8
	Wound infiltration with local anesthetic	x							x	x		x	x		x		x	7
	(Thoracic) epidural analgesia			x			x	x			x	x	x					6
	Avoidance of pelvic drains		x		x				x			x				x	x	6
	Mechanical thrombosis prophylaxis		x											x	x			3
	High oxygen concentrations						x											1
Post-Operative	Multimodal analgesia	x	x		x	x	x	x	x	x	x	x		x		x		12
	Avoidance of nasogastric tubes		x	x	x		x		x		x				x	x		8
	Prevention of PONV	x	x	x				x		x		x				x	x	8
	Avoidance of ileus		x						x		x	x		x		x		6

Table 10: Elements of gynaecological surgery Care Pathways, based on included evidence

The range of **perioperative** elements has more variability and fewer dominating elements. The most common elements include:

- Reducing the potential for infection (69%),
- IV fluid reduction (56%),
- Reducing vomiting (50%) and
- Reducing hypothermia (50%).

A limited number of elements figure in the **post-operative** phase, with only one implemented more than half the time:

- Multimodal analgesia (75%).

Avoidance of naso-gastric tubes (NGTs) and prevention of post-operative nausea and vomiting (PONV) were both implemented in less than half of the included studies.

Care Pathways for Pancreatic Surgery

A moderate body of evidence also favours Care Pathways for patient groups undergoing pancreatic surgery. The evidence indicates that CPs are more effective than usual care for reducing ALOS without changing readmission rates (see Table 11).

CARE PATHWAYS FOR PANCREATIC SURGERY ACUTE CARE PATIENTS

- ✓ **Length of Stay:** Moderate body of evidence **favouring** Care Pathways
- ✓ **Readmission:** Moderate body of evidence for **no effect**, positive or negative
- ~ **Cost:** Weak evidence **favouring** Care Pathways

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
High	Coolsen 2013 (33)	Favours CPs (qualitative synthesis)	No difference	Favours CPs (qualitative synthesis)

Base of Primary Research Evidence

- Length of Stay: 8 unique primary research studies.
- Readmission: 8 unique primary research studies
- Cost: 4 unique primary research studies

Table 11: Evidence for Care Pathways for pancreatic surgery.

The single SR identified did not carry out a meta-analysis to pool estimates for reductions in ALOS (only readmission) but did find that CPs "may reduce" ALOS (33). The authors noted that secular trends are also playing a role in reducing ALOS. However, using evidence from colorectal surgery CPs, the authors further conclude that the observed reduction in ALOS is not due solely to those trends. It is unclear if Care Pathways for pancreatic cancer reduce costs because only a small number of primary research studies were included in the synthesis.

Key Message #5

A moderate body of evidence indicates that Care Pathways are effective at reducing ALOS among patients undergoing pancreatic surgery without affecting readmission rates.

The analysis of pancreatic surgery CP elements shows the following **preoperative** elements (Table 12):

- Antithrombotic prophylaxis, which is standard pre-operative practice (100%) and
- Patient counseling and education, which was included/identified in some, but not all studies (63%).

The remaining elements were implemented in less than half the studies, suggesting ongoing development with regard to standard practices.

Elements of Pancreatic Surgery Care Pathways

	Primary Study: / Care Pathway element:	Balzano 2008	Porter 2000	Kennedy 2009	Vanounou 2007	Kennedy 2007	di Sebastiano 2011	Berberat 2007	Robertson 2012	TOTAL # STUDIES
Pre-Operative	Antithrombotic prophylaxis	x	x	x	x	x	x	x	x	8
	Preoperative counseling	x	x	x	x	x				5
	No oral bowel prep			x	x	x				3
	No pre-medications				x		x			2
	Preoperative feeding: CHO loading up to 2 h before surgery						x			1
Peri-Operative	Single-dose antibiotics	x	x	x	x	x	x	x		7
	Patient Controlled Analgesia (PCA)			x	x	x	x	x	x	6
	Fluid restriction	x		x	x	x	x		x	6
	Epidural analgesia	x	x		x			x	x	5
	Proton Pump Inhibitor (PPI)			x	x	x	x		x	5
	Avoiding hypothermia				x		x	x		3
	No preanesthetic medication									0
	Prevention of postoperative nausea and vomiting (PONV)									0
	Perioperative glycemic control (< x0 mmol/l)									0
	No postoperative nasogastric intubation									0
	Good fluid balance									0
Post-Operative	Early and scheduled mobilization	x	x	x	x	x	x	x	x	8
	Normal food at will after surgery from day x, increasing intake	x	x	x	x	x	x	x	x	8
	Removal of urinary catheter on day x or 2		x	x	x	x	x	x	x	7
	Removal of NG tube (from POD)		x	x	x	x	x	x	x	7
	Perianastomotic drain removal < 72 h		x	x	x	x		x	x	6
	Octreotide	x			x	x		x	x	5
	Antiemetics	x					x	x	x	4
	Stimulation of BM with laxatives according to tolerance over 3–4 days				x		x	x		3
	Somatostatin analogues									0
	Audit									0

Table 12: Pancreatic surgery care pathway elements from included evidence

Common **perioperative** elements included:

- Single-dose antibiotics (88%),
- Patient-controlled analgesia (PCA; 75%) and/or Epidural analgesia (63%),
- Fluid restriction (75%), and
- Use of proton pump inhibitor (63%).

Some elements were identified as potentially implemented, e.g., PONV, but without clear attribution to a primary study.

A block of elements were implemented universally or nearly so in the **post-operative stage**:

- Early and scheduled mobilization (100%),
- Normal food after surgery (100%),
- Removal of urinary catheter (88%), and
- Removal of NG tube (88%).
- Perianastomotic drain removal (75%) and

- Reduction of pancreatic secretions using octreotide (63%).

CPs for Other Surgeries, and for Patients with Chronic Disease: Weak Body of Evidence (Undetermined)

The research evidence base indicates that Care Pathways are effective at reducing ALOS for some subgroups of acute care patients. While the evidence is clearest for colorectal surgery patients, and to a lesser but still convincing extent, for gynaecological and pancreatic surgery patients, in contrast, the evidence for some other subgroups of surgical patients is not sufficiently strong to draw similarly unequivocal findings.

While the evidence is clearest for colorectal surgery patients…the evidence for some other subgroups of surgical patients is not sufficiently strong to draw similarly unequivocal findings.

This is not to say that there is evidence to indicate that CPs for other surgeries are not effective: the absence of evidence for an effect is not the same thing as evidence for no effect. Rather, the evidence for the following Care Pathways may be considered as preliminary in nature.

This is not to say that there is evidence to indicate that CPs for other surgeries are *not* effective: the absence of evidence for an effect is not the same thing as evidence for no effect. Rather, the evidence for the following Care Pathways may be considered as preliminary in nature.

Care Pathways for Other Gastrointestinal Surgeries

In the case of the two other gastrointestinal surgeries, gastrectomy (Table 13) (6,34) and liver surgery(Table 14) (35), the evidence so far is definitely promising, if not yet conclusive. In both cases, Systematic Review authors found evidence favouring CPs to reduce ALOS. Furthermore, SRs that aggregated gastrectomy and/or liver patient subgroups with other related patient groups, e.g., abdominal (41) or gastrointestinal (42) surgery patients, did not discount the finding that CPs were effective for these subgroups.

At issue, however, is not the reported direction of the findings but rather the limited volume of evidence in combination with the methodological quality of the Systematic Reviews. A few additional high quality research studies have the potential to confirm the effectiveness of CPs for these patient subgroups. The situation at present necessitates waiting for additional research-based evidence before concluding the reliability and degree of effectiveness of these CPs.

CARE PATHWAYS FOR GASTRECTOMY ACUTE CARE PATIENTS

- ~ **Length of Stay:** Weak body of evidence **favouring** Care Pathways
- ~ **Readmission**: Weak body of evidence for **no effect**, positive or negative
- ~ **Cost:** Weak evidence **favouring** Care Pathways

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
Moderate	Chen 2014b (34)	-1.19 days 95% CI [-1.79,-0.60], p=0.0001	n/a	-2,590 [5] 95% CI [-4,05, -1,13], *p*<0.001
	Chen 2015 (6)	-2.62 days 95% CI [-3.59, -1.65], p=0.009	No difference	-3,900 CNY 95% CI [-5,200, -2,600], *p*<0.00001
Base of Primary Research Evidence • Length of Stay: 7 unique primary research studies. • Readmission: 4 unique primary research studies • Cost: 7 unique primary research studies				

Table 13: Evidence for Care Pathways for gastrectomy

CARE PATHWAYS FOR LIVER SURGERY ACUTE CARE PATIENTS

- ~ **Length of Stay:** Weak body of evidence **favouring** Care Pathways
- ~ **Readmission:** Weak body of evidence for **no effect**, positive or negative
- o **Cost:** No evidence

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay** (days)	**Readmission** (odds)	**Cost**
Moderate	Coolsen 2012 (35)	Favours CPs (qualitative synthesis)	No difference	n/a
Base of Primary Research Evidence • Length of Stay: 6 unique primary research studies. • Readmission: 6 unique primary research studies • Cost: 0 unique primary research studies				

Table 14: Evidence for Care Pathways for liver surgery

Key Message #6

Care Pathways may be effective for liver and stomach surgery in particular, as they are for gastrointestinal surgery in general, but at present the body of evidence is insufficient to draw any conclusive findings.

Care Pathways for Lung and Thyroid Surgeries

A similar scenario emerges for the two remaining surgery patient groups, lung (Table 15) (36) and thyroid (Table 16) (37). In both cases, the available evidence suggests that CPs could reduce the ALOS of

[5] Currency not specified, but all primary research studies included in the synthesis were conducted in China (CNY or RMB) and South Korea (KRW).

acute care patients. However, the small number of SRs and primary research studies and limits the strength of the body of evidence from which to draw conclusions.

CARE PATHWAYS FOR LUNG SURGERY ACUTE CARE PATIENTS

- ~ **Length of Stay:** Weak body of evidence **favouring** Care Pathways
- ~ **Readmission:** Weak body of evidence for **no effect**, positive or negative
- ~ **Cost:** Weak body of evidence for **no effect**, positive or negative

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
High	Fiore 2016 (36)	Favours CPs (qualitative synthesis)	No difference	No difference

Base of Primary Research Evidence
- Length of Stay: 6 unique primary research studies.
- Readmission: 3 unique primary research studies
- Cost: 3 unique primary research studies

Table 15: Evidence for Care Pathways for lung surgery

CARE PATHWAYS FOR THYROIDECTOMY

- ~ **Length of Stay:** Weak body of evidence **favouring** Care Pathways
- o **Readmission**: No evidence
- ~ **Cost:** Weak body of evidence **favouring** Care Pathways

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
Moderate	Yang 2014 (37)	-1.56 days 95% CI [−2.08, −1.04], *p*<0.00001	n/a	-1,200 CNY 95% CI [−2,000, −500], *p*<0.00001

Base of Primary Research Evidence
- Length of Stay: 5 unique primary research studies.
- Readmission: 0 unique primary research studies
- Cost: 5 unique primary research studies

Table 16: Evidence for Care Pathways for thyroidectomy

Key Message #7

Care Pathways may be effective for lung and thyroid surgery but at present the body of evidence is insufficient to draw any conclusive findings.

Care Pathways and Chronic Disease

In addition to surgeries, CPs have been applied to chronic disease subgroups as well. In these cases, patients have been admitted to acute care units primarily because of a chronic health condition. We

found weak bodies of evidence studying Chronic Heart Failure (CHF; see Table 17) (38), Chronic Obstructive Pulmonary Disease (Table 18) (39), and pediatric asthma (see Table 19) (40).

In all cases, there is a weak body of evidence that favours using CPs instead of usual care in terms of reducing the ALOS of acute care patients. The Systematic Review on Chronic Heart Failure was the only one to carry out a meta-analysis and reported a reduction of ALOS of just under two days. The Systematic Reviews for COPD and pediatric asthma carried out qualitative syntheses. While these findings are promising, they are drawn from single Systematic Reviews based on a relatively small number of primary research studies.

CARE PATHWAYS FOR CHRONIC HEART FAILURE (CHF) ACUTE CARE PATIENTS

- ~ **Length of Stay:** Weak body of evidence **favouring** Care Pathways
- ~ **Readmission:** Weak body of evidence **favouring** Care Pathways
- ~ **Cost:** Weak body of evidence for **no effect**, positive or negative

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
Moderate	Kul 2012 (38)	-1.89 days 95% CI [-2.44, -1.33], p<0.0001	0.81 OR 95% CI [0.66, 0.99], p=0.04	No difference

Base of Primary Research Evidence
- Length of Stay: 7 unique primary research studies.
- Readmission: 5 unique primary research studies
- Cost: 3 unique primary research studies

Table 17: Evidence for Care Pathways for chronic heart failure

CARE PATHWAYS FOR CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD) ACUTE CARE PATIENTS

- ~ **Length of Stay:** Weak body of evidence **favouring** Care Pathways
- ~ **Readmission**: Weak body of evidence **favouring** Care Pathways
- ○ **Cost**: No evidence

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
Moderate	Lodewijckx 2011 (39)	Favours CPs(qualitative)	Favours CPs (qualitative)	n/a

Base of Primary Research Evidence
- Length of Stay: 4 unique primary research studies.
- Readmission: 4 unique primary research studies
- Cost: 0 unique primary research studies

Table 18: Evidence for Care Pathways for Chronic Obstructive Pulmonary Disease (COPD)

CARE PATHWAYS FOR PEDIATRIC ASTHMA ACUTE CARE PATIENTS				
~ **Length of Stay:** Weak body of evidence **favouring** Care Pathways o **Readmission:** No evidence ~ **Cost:** Weak body of evidence **favouring** Care Pathways				
Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
High	Sylvester 2013 (40)	Favours CPs (qualitative synthesis)	n/a	Favours CPs (qualitative synthesis)
Base of Primary Research Evidence • Length of Stay: 9 unique primary research studies. • Readmission: 0 unique primary research studies • Cost: 8 unique primary research studies				

Table 19: Evidence for Care Pathways for pediatric asthma

Key Message #8

Care Pathways may be effective for acute care patients with chronic heart failure (and some other chronic disease conditions) but at present the body of evidence is insufficient to draw any conclusive findings.

PART 2:
Synthesis Findings *for* Other Interventions

Discharge Planning: Strong Body of Evidence (Effective)

Discharge planning is, in essence, the development of a plan of care for a patient until they leave the hospital for the community or for care within another institution.[6] (14) The included research literature consists of studies with mixed groups of elderly acute care patients, usually aged 65 or older and in this particular case, the evidence was not entirely consistent (14,46–48).

While a conflicting body of evidence revealed mixed findings on whether discharge planning reduces acute care costs from the perspective of the hospital or health care system, two high quality Cochrane Reviews (14,46) found evidence favouring discharge planning for reducing ALOS and readmission rates, while two moderate-quality systematic reviews (47,48) had inconsistent findings. We chose to focus our

[6] Please note that the scope of this project limits the findings from this body of evidence to the activities related directly to **in-patient care and monitoring**, and does not include post-admission planning (e.g., setting up community-based supports).

analysis of discharge planning on the two Cochrane Reviews.[7] Based on these, a strong body of evidence indicates that discharge planning has modest effects in reducing ALOS and readmission (see Table 20).

INDIVIDUALIZED DISCHARGE PLANNING FOR MIXED ELDERLY ACUTE CARE PATIENTS

✓✓ **Length of Stay:** Strong body of evidence **favouring** Discharge Planning
✓✓ **Readmission:** Strong body of evidence **favouring** Discharge Planning
✗ **Cost:** Conflicting body of evidence for Discharge Planning

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
High	Gonçalves 2016 (46)	-0.73 days 95% CI [-1.33, -0.12], *p*=0.02	0.87 OR 95% CI [0.79, 0.97], *p*<0.01	Mixed findings
High	Shepperd 2013 (14)	-0.91 days 95% CI [-1.55, -0.27], *p*<0.01	0.82 OR 95% CI [0.73, 0.93], *p*<0.01	Mixed findings
Moderate	Zhu 2015 (47)	No difference	0.72 OR 95% CI [0.58, 0.89], *p*<0.01	Favours DP (qualitative synthesis)
Moderate	Preyde 2009 (48)	Mixed findings	Mixed findings	Mixed findings

Base of Primary Research Evidence
- Length of Stay: 29 unique primary research studies.
- Readmission: 37 unique primary research studies
- Cost: 20 unique primary research studies

Table 20: Evidence for Discharge Planning for Mixed Elderly Acute Care Patients

With Discharge Planning, the measured improvements in ALOS were small and at the borderline of statistical significance (14,46). On average, patients had an ALOS that was less than a day shorter. However, readmission rates were found to be 13%-18% lower. This is a notable difference compared to the other studied interventions which almost always find no difference in readmission.

These findings are consistent with other similar reviews of the literature. An Ontario Health Technology Assessment from 2013 (49) found that there was evidence that individualized discharge planning is effective for reducing ALOS as well as for reducing readmission rates. A UK National Institutes of Health Research report from 2014 concurred, finding that improved discharge planning led to a range of improvements, including modest reductions in ALOS (less than one day) (50).

[7] Our primary research analysis of the four Systematic Reviews cross-referenced included primary research studies, as well as the discharge planning elements that were included in those primary research studies (see Table 21). The results showed that the two pairs of Systematic Reviews were studying largely distinct discharge planning elements and, as such, different evidence bases. This difference appears to account for the discrepancies in findings. The two moderate-quality SRs (47,48) included an additional 28 primary research studies (all but one unshared between them) which were not included by the two Cochrane Reviews (14,46). Most of these 28 primary research studies focused on specific elements involved in discharge planning and not on discharge planning as an integrated program.

However, a dissenting 2007 review-of-reviews found mixed results in terms of reducing ALOS and concluded that there was "little evidence" to support discharge planning (51). This report drew on older research with what appear to be fewer reliably-defined discharge planning elements. As with our decision to focus on the two Cochrane Reviews, in our analysis of discharge planning elements (Table 21) we chose mainly to disregard the 2007 report.

Key Message #9

A strong body of evidence indicates that Discharge Planning is effective at reducing ALOS, as well as readmission rates, for older acute care patients.

Elements of Discharge Planning

The Cochrane Reviews that examined Discharge Planning synthesized a total of 30 primary research studies that included 15 Discharge Planning elements. These reviews focused on in-hospital, as opposed to post-discharge care (14,46). The most common elements are summarized in Table 21 below.

A core group of five elements underpin the included primary research studies and were used as eligibility criteria in the SR:

1. **Inpatient assessment and preparation of a discharge plan based on individual patient needs**
   This element allows for a fairly broad interpretation of assessment and preparation and is essentially a category of potential elements rather than a specific implementation.

2. **Implementation of the discharge plan**
   This second element is the requirement for enforcing the first.

3. **A monitoring phase**
   Monitoring refers to an audit to assess if the discharge plan had been implemented.

4. **Case finding on admission**
   Case finding refers to selecting patients that were not involved in other interventions that may have confounded the results.

5. **Home Visit by a Nurse**
   As noted previously, the scope of this project limits the findings from this body of evidence to the activities related directly to in-patient care and monitoring, and does not include post-admission planning, although this element was included in one review (Lin 2009).

Systematic Reviews				Primary Studies	Element of Discharge Planning				
Goncalves 2016	Shepperd 2013	Preyde 2009	Zhu 2015		Inpatient assessment and preparation of DP based on individual patient needs	Implementation of DP	Monitoring phase	Case finding on admission	Home visit by nurse (n/a)
				# of Primary Studies:→	33	31	16	11	9
x	x			Balaban 2008	x	x	x		
x	x			Bolas 2004	x	x	x		
x	x			Eggink 2010	x	x			
x	x			Evans 1993	x	x		x	
x				Farris 2014	x	x	x	x	
x				Gillespie 2009	x	x	x		
x				Goldman 2014	x	x	x	x	
x	x	x		Harrison 2002	x	x		x	
x	x			Hendriksen 1990	x	x			
x	x		x	Jack 2009	x	x	x	x	
x	x			Kennedy 1987	x	x			
x				Kripalani 2012	x	x	x		
x				Lainscak 2013	x	x	x		
x	x			Laramee 2003	x	x	x		
x	x			Legrain 2011	x	x	x	x	
x	x		x	Lin 2009	x	x	x		x
x				Lindpaintner 2013	x	x	x	x	
x	x			Moher 1992	x	x			
x	x			Naji 1999		x			
x	x			Naughton 1994	x	x			
x	x			Naylor 1994	x	x			
x	x	x		Nazareth 2001	x	x	x		
x	x			Pardessus 2002	x	x	x	x	
x	x			Parfrey 1994	x	x		x	
x	x	x		Preen 2005	x	x	x		
x	x			Rich 1993	x	x	x	x	
x	x	x		Rich 1995	x	x		x	
x	x			Shaw 2000	x	x			
x	x			Sulch 2000	x	x			
x	x			Weinberger 1996	x	x			

Table 21: Discharge planning elements from the included evidence

The key message from these elements is that having an ***individualized*** plan for discharge that is developed and enforced ***from the point of admission*** (or before), instead of "routine discharge care not tailored to the individual patient" (46) is critical in reducing ALOS.

Such a plan may be embedded in another intervention, e.g., stroke unit care, or used in conjunction with other proposed ALOS-reducing interventions, for example physiotherapy. The SRs indicate that the particular details of the discharge plan seem to be of secondary importance and may be highly contingent on the care setting and available resources (14,46).

Key Message #10

A key element of Discharge Planning involves developing and enforcing an individualized plan for discharge from the point of admission or before.

Early Supported Discharge: Moderate Body of Evidence (Effective)

Early Supported Discharge (ESD) programs see patients returning home earlier than usual but with enhanced community-based rehabilitation. The available research describes a broad range of elements to accelerate the discharge process. In other words, ESD is a term that describes a category of heterogeneous interventions that share a common objective of greatly expedited discharge (4,52–55).

ESD appears to have been primarily studied among stroke patients and to a lesser degree with older patients with mixed medical conditions (Table 22).

EARLY SUPPORTED DISCHARGE FOR STROKE PATIENTS

✓✓ **Length of Stay:** Moderate body of evidence **favouring** ESD for stroke patients
~ **Readmission:** Weak body of evidence for **no effect**, positive or negative
~ **Cost:** Weak body of evidence for **favouring** ESD for stroke patients

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
High	Fearon 2012 (52)	-7.10 days 95% CI [-10.03, -4.17], *p*<0.00001	No difference	Favours ESD (qualitative synthesis)
Moderate	Olson 2011 (55)	Favours ESD (qualitative synthesis)	No difference	n/a

Base of Primary Research Evidence
- Length of Stay: 19 unique primary research studies.
- Readmission: 7 unique primary research studies
- Cost: 9 unique primary research studies

Table 22: Evidence for Early Supported Discharge

For stroke patients, a moderate body of evidence indicates that ESD is effective at reducing ALOS by an average of a week or more. It should be noted that this result is highly skewed to stroke severity. The Cochrane Review (52) found that ESD was more effective for severe stroke victims (-28 days, 95% CI [-17, -40]) compared to moderate groups (-3 days, 95% CI [-1, -7]). This relatively dramatic decrease in ALOS is linked to the explicitly accelerated discharge nature of the approach (52,55). These findings are consistent with a 2014 UK NIHR Rapid Evidence Review (50).

A weak body of evidence suggests that ESD does not change readmission rates. A similarly weak body of evidence indicates that ESD is less costly than usual care from a hospital or health system perspective (52,55). These bodies of evidence are based on two SRs synthesizing the results of a small number of primary research studies (7 and 9, respectively). While the findings are promising, they are insufficient

to draw any firm conclusions. The available evidence does not indicate that ESD is effective at reducing ALOS for mixed groups of elderly patients (54).

Key Message #11

A moderate body of evidence shows that Early Supported Discharge for stroke patients significantly reduces ALOS and suggests it may do so without changing readmission rates or increasing costs for the hospital/health care system.

Elements of Early Supported Discharge

ESD teams were multi-disciplinary and usually consisted of a core set of health service providers: physician, nurse, physiotherapist, occupational therapist, speech language therapist and personal assistant. The contributions of the individual team members comprise the core elements of the in-hospital intervention. In addition, some level of social work and/or support with filling out forms or other paperwork may be available to admitted patients (52,55). Most ESD teams (85%) provided care both before and after discharge, while a minority (15%) provided service only during admission. A sensitivity analysis indicated there was no significant difference in ALOS of the minority ESD team that did not provide services after discharge (-7.0 days) compared with those that did (-7.10 days) (52).

Hospitalists' professional focus is the delivery of comprehensive medical care to acute care and other hospitalized patients, particularly for those that do not have a primary care physician who provides in-patient services.

A moderate body of evidence indicates that hospitalists are generally effective at reducing ALOS.

Hospitalists: Moderate Body of Evidence (Effective)

Hospitalists' professional focus is the delivery of comprehensive medical care to acute care and other hospitalized patients, particularly for those that do not have a primary care physician who provides in-patient services (56). The research literature describes their roles as: reviewing clinical data, coordinating and integrating acute and post-acute care for admitted patients, and making decisions regarding tests, treatments and procedures (13). Hospitalists assume care for inpatients upon admission and release the care of the patient to a community-based primary care physician (56).

A moderate body of evidence indicates that hospitalists are generally effective at reducing ALOS. The evidence is based on one moderate quality SR with a very large pool of primary studies (see Table 23) (13). The analysis was a qualitative synthesis without any meta-analytic estimates for difference in ALOS, readmission or costs. It found 69% of studies showed "improved performance" compared to "traditional modes of inpatient care", with 60% reporting significant differences. Shorter ALOS were found across all models of hospitalist practice, with academic hospitals outperforming non-

academic hospitals. However, 12% of studies did report a longer ALOS with hospitalists, where the majority of dissenting studies (57%) compared private hospitalists hired on contract (13).

HOSPITALIST-BASED INTERVENTIONS FOR MIXED POPULATIONS OF ACUTE CARE PATIENTS

- ✓ **Length of Stay:** Moderate body of evidence **favouring** hospitalists
- ✓ **Readmission:** Moderate body of evidence for **no effect**, positive or negative
- ✓ **Cost:** Moderate body of evidence **favouring** hospitalists

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
Moderate	White 2011 (13)	Favours Hospitalists (qualitative synthesis)	No difference	Favours Hospitalists (qualitative synthesis)

Base of Primary Research Evidence
- Length of Stay: 58 unique primary research studies.
- Readmission: 42 unique primary research studies
- Cost: 44 unique primary research studies

Table 23: Evidence for hospitalist-based interventions

The majority of primary studies (79%) found no difference in readmission rates, while 14% reported reduced rates and the remaining 7% increased rates. A smaller majority (63%) also reported decreased costs from a hospital/health care system perspective. The SR authors propose that shorter ALOS was the main driver for lower costs.

Key Message #12

A moderate body of evidence indicates that hospitalist models of care can be expected to reduce ALOS without increasing readmission rates or costs.

Interventions with Moderate Body of Evidence (Not Effective)

The following list of interventions had moderate bodies of evidence that indicated they were either ineffective at reducing ALOS or increased ALOS for specified patient groups.

This is not to say that the interventions were not effective at achieving other outcomes, e.g., reducing mortality or increasing functionality. They are described below in brief.

In-patient Geriatric Consultation Teams

The comprehensive geriatric assessment (CGA) is “a multidimensional interdisciplinary diagnostic process” used to assess frail older inpatients and to develop a plan for treatment and follow up (57).

CGA may be applied in hospitals through a ward model or via in-patient geriatric consultation teams (IGCTs). One high quality SR studied the effectiveness of IGCTs to reduce ALOS among mixed elderly

acute care patients (see Table 24) (58). A moderate body of evidence indicated that IGCTs did not shorten ALOS for patients, nor did it improve readmission rates.

IN-PATIENT GERIATRIC CONSULTATION TEAMS (IGCT) FOR MIXED ELDERLY PATIENTS

- ✓ Length of Stay: **Moderate** body of evidence for **no effect**, positive or negative
- ○ Readmission: **Moderate** body of evidence for **no effect**, positive or negative
- ○ Cost: **No** evidence

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay** (days)	**Readmission** (odds)	**Cost**
High	Deschodt 2013 (58)	No difference	No difference	n/a

Base of Primary Research Evidence
- Length of Stay: 12 unique primary research studies.
- Readmission: 10 unique primary research studies
- Cost: 0 unique primary research studies

Table 24: Evidence for Geriatric Consultation Teams

Multi-Disciplinary Rehabilitation (MDR)

Hip fractures are serious injuries for elderly people and most, if not all, go on to have hip surgery. Post-surgery recovery can be lengthy. Interventions to reduce ALOS (as well as improve functionality, reduce readmission rates and reduce costs) have recently focused on multi-disciplinary rehabilitation approaches (MDR) which encompass a wide range of strategies and approaches. In the context of the SR by Handoll et al., MDR was characterized as being overseen by a specialist (geriatrician or rehabilitation physician) (59). MDR was delivered in a range of settings including, but not limited to, rehabilitation units and orthopedic units.

MULTI-DISCIPLINARY REHABILITATION FOR HIP FRACTURE PATIENTS

- ✘ **Length of Stay:** Conflicting body of evidence for MDR
- ~ **Readmission:** Weak body of evidence for **no effect**, positive or negative
- ✘ **Cost**: Conflicting body of evidence for MDR

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
High	Handoll 2009 (59)	Mixed findings	No difference	Mixed findings

Base of Primary Research Evidence
- Length of Stay: 11 unique primary research studies.
- Readmission: 6 unique primary research studies
- Cost: 4 unique primary research studies

Table 25: Evidence for Multi-Disciplinary Rehabilitation

A moderate body of evidence indicated MDR was not consistent in terms of reducing ALOS (see Table 25). Seven of 11 studies showed reduced ALOS for MDR compared to usual care, three showed longer ALOS and one was the same. Furthermore, the studies demonstrated elevated levels of heterogeneity, with control group ALOS ranging from 56 to 10 days. The distribution of ALOS was long-tailed with

several studies recording patients LOS of over 100 days. A weak body of evidence showed a consistent lack of effect for readmission. Data for costs of MDR were few and conflicting. As a result, it is not possible to draw conclusions based on these findings.

Nursing-Led Units

As the name implies, Nursing-Led Units (NLU) are managed by nurses instead of physicians. NLUs are considered a form of "intermediate care" designed to facilitate discharge from acute care. The objectives of NLUs are to optimize the quality of care needed for recuperation and to free up acute care beds for more appropriate use (60).

Table 26 below outlines the evidence base for this intervention.

NURSING-LED UNITS (NLUS) FOR MIXED POPULATIONS OF ACUTE CARE PATIENTS

- ✘ **Length of Stay:** Moderate body of evidence **against** NLUs
- ~ **Readmission:** Weak body of evidence **favouring** NLUs
- ✘ **Cost:** Conflicting body of evidence **against** NLUs

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
Moderate	Griffiths 2007 (60)	+ 7.37 days 95% CI [+2.86, +11.88] *p*<0.01	0.52 OR 95% CI [0.34, 0.80]	Mixed Findings (qualitative synthesis)

Base of Primary Research Evidence

- Length of Stay: 9 unique primary research studies.
- Readmission: 4 unique primary research studies
- Cost: 7 unique primary research studies

Table 26: Evidence for Nursing-Led Units

A moderate body of evidence indicated that hospital ALOS in NLUs was longer than usual care by more than a week (60). This finding was replicated in other review-of-review research from the UK (50). While patients were moved out of specific acute care units, it is assumed that NLU beds would need to be taken from these units if the addition of infrastructure is precluded (a parameter for this study). In and of itself, this finding precludes NLUs as a feasible option.

Key Message #13

In the context of this report, Nursing Led Units are not effective for reducing hospital ALOS.

Nutritional Therapy

The study of the impacts of nutrition on acute care patients includes comparing normal daily caloric intake to a lower than normal one (i.e., hypocaloric) (61) and giving additional nutritional support to patients who are or are at risk of malnourishment (62).

In both instances, the interventions did not have any effect on ALOS among mixed groups of acute care patients. While nutritional therapy may improve readmission rates, the evidence is not sufficient to draw any conclusions.

NUTRITIONAL THERAPY (NT) FOR MIXED POPULATIONS OF ACUTE CARE PATIENTS

- ~ **Length of Stay:** Moderate body of evidence for **no effect**, positive or negative
- ~ **Readmission:** Weak body of evidence **favouring** Nutritional Therapy
- o **Cost:** No evidence

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
High	Bally 2016 (62)	No difference	Favours NT (multiple quantitative findings)	n/a
Moderate	Marik 2016 (61)	No difference	n/a	n/a

Base of Primary Research Evidence
- Length of Stay: 17 unique primary research studies.
- Readmission: 6 unique primary research studies
- Cost: 0 unique primary research studies

Table 27: Evidence for Nutritional Therapy

Stroke Unit Care (SUC)

A stroke unit is a specialized, geographically defined hospital unit dedicated to the management of stroke patients that typically uses a core interdisciplinary team of clinicians with appropriate levels of expertise in medicine, nursing, occupational therapy, physiotherapy, speech–language pathology, social work and clinical nutrition.

SUC FOR STROKE ACUTE CARE PATIENTS

- ✓ **Length of Stay:** Moderate body of evidence for **no effect**, positive or negative
- o **Readmission:** No evidence
- ~ **Cost**: No evidence

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
High	Langhorne 2013 (63)	No difference	n/a	n/a

Base of Primary Research Evidence
- Length of Stay: 32 unique primary research studies.
- Readmission: 0 unique primary research studies
- Cost: 0 unique primary research studies

Table 28: Evidence for Stroke Unit Care

One high-quality study reviewed in this report (63) found moderate evidence that Stroke Unit Care (SUC) had no effect on ALOS; the study found *no evidence* for the impact of SUC on either readmission or cost.

This is not to say that SUC is not effective at achieving other important outcomes.

Interventions with a Weak Body of Evidence (Undetermined)

The following sections summarize a range of interventions that, at present, do not have sufficient bodies of evidence to support or negate their implementation for the ***primary purpose of reducing acute care ALOS***. This is not to say that these interventions are not effective at achieving other outcomes. Detailed information on the individual interventions is available in our Online Companion Document, Annex A.

Active Mobilization

As defined in the literature: "…assisted training such as in-bed exercises (e.g., weights, cycling), sitting on the edge of the bed, standing beside the bed, transferring to a chair, and assisted or independent ambulation." (64)

ACTIVE MOBILIZATION (AM): MECHANICALLY VENTILATED PATIENTS (MVP)

- ~ **Length of Stay:** Weak body of evidence for **no effect**, positive or negative
- o **Readmission:** No evidence
- ~ **Cost:** Weak body of evidence for **no effect**, positive or negative

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
Moderate	Li 2013 (64)	No difference	n/a	No difference

Base of Primary Research Evidence

- Length of Stay: 7 unique primary research studies.
- Readmission: 0 unique primary research studies
- Cost: 1 unique primary research study

Table 29: Evidence for Active Mobilization

Acute Geriatric Unit Care

As defined in the literature: "Acute geriatric unit care included at least one of the five ACE model components or principles: patient-centered care, defined as care activities (assessments and protocols) to prevent declines in activities of daily living (ADLs), mobility, continence, nutrition, skin integrity, mood, sleep, and cognition; frequent medical review, defined as activities to minimize the adverse effects of treatments on older adults' functioning; early rehabilitation, defined as the participation of physical or occupational therapists in daily team meetings for the purposes of initiating rehabilitation or standard provision of physical or occupational therapy; early discharge planning, defined as activities to facilitate return to the community; and prepared environment, defined as environmental modifications to facilitate physical and cognitive functioning." (65)

ACUTE CARE FOR ELDERS (ACE) FOR MIXED ELDERLY ACUTE CARE PATIENTS

- ~ **Length of Stay:** Weak body of evidence **favouring** ACE
- ~ **Readmission:** Weak body of evidence for **no effect**, positive or negative
- ~ **Cost:** Weak body of evidence **favouring** ACE

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
Moderate	Fox 2012 (65)	–1.28 days 95% CI [–2.33, –0.22], *p*<0.02	No difference	-$431.37 USD 95% CI [-$933.15–$70.41], *p*<0.09

Base of Primary Research Evidence
- Length of Stay: 12 unique primary research studies.
- Readmission: 2 unique primary research studies
- Cost: 6 unique primary research studies

Table 30: Evidence for Acute Geriatric Unit Care

Case Management

As defined in the literature: Hospital-based case-management based on six core components: assessment, education, multi-disciplinary collaboration, discharge planning, linking patients to appropriate post-discharge resources, and monitoring (66).

CASE MANAGEMENT FOR HEART FAILURE ACUTE CARE PATIENTS

- ~ **Length of Stay:** Weak body of evidence **favouring** Case Management
- ~ **Readmission:** Weak body of evidence for **no effect**, positive or negative
- o **Cost:** No evidence

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay**	**Readmission**	**Cost**
Moderate	Kim 2005 (66)	- 0.241 days 95% CI [0.012, 0.470], *p*=0.02	No difference	n/a

Base of Primary Research Evidence
- Length of Stay: 4 unique primary research studies.
- Readmission: 4 unique primary research studies
- Cost: 0 unique primary research studies

Table 31: Evidence for Case Management

Emergency Department Short Stay Units

As defined in the literature: "…general-purpose units, beyond a simple extension of beds, designed to treat and/or observe any ED patients with expected lengths of stay (LOS) of 72 hours or less." (67)

(Continued on next page)

EMERGENCY DEPARTMENT (ED) SHORT STAY UNIT (SSU) FOR MIXED POPULATIONS OF ACUTE CARE PATIENTS

~ **Length of Stay:** Weak body of evidence **favouring** ED Short Stay Units
~ **Readmission:** Weak body of evidence for **no effect**, positive or negative
~ **Cost:** Weak body of evidence **favouring** ED Short Stay Units

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay** (days)	**Readmission** (odds)	**Cost**
High	Galipeau 2015 (67)	Favours ED SSUs (qualitative synthesis)	Favours ED SSUs (qualitative synthesis)	Favours ED SSUs (qualitative synthesis)

Base of Primary Research Evidence
- Length of Stay: 4 unique primary research studies.
- Readmission: 2 unique primary research studies
- Cost: 4 unique primary research studies

Table 32: Evidence for ED Short Stay Units.

Exercise

As defined in the literature: "Group circuit class therapy (CCT) describes a model of therapy delivery that utilises active exercises and activities which are task specific (practising the functional task itself or part thereof) and provided in an intensive manner. The key components of CCT are that therapy is provided in a group setting with more than two participants per therapist, and there is a focus on repetitive practise of functional tasks and continual progression of exercises." (68) Any physical exercise program for acute care patients, as either a distinct activity or as a part of a multi-disciplinary rehabilitation program. (69)

EXERCISE ALONE FOR MIXED ELDERLY

✘ **Length of Stay:** Conflicting body of evidence for exercise alone
○ **Readmission:** No evidence
~ **Cost:** Weak body of evidence for **no effect**, positive or negative

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay** (days)	**Readmission** (odds)	**Cost**
High	English 2010 (68)	Mixed findings	n/a	n/a
High	De Morton 2007 (69)	No difference	n/a	No difference

Base of Primary Research Evidence
- Length of Stay: 8 unique primary research studies
- Readmission: 0 unique primary research studies
- Cost: 4 unique primary research studies

Table 33: Evidence for exercise alone for mixed elderly populations

Interdisciplinary Rounds

As defined in the literature: "…an intervention that involves members of more than one health and/or social care profession interacting together with the explicit purpose of improving interprofessional collaboration. In a current scoping review of the interprofessional field, three types of interprofessional interventions have been delineated: interprofessional education, interprofessional practice, and interprofessional organisation interventions." (12)

Interdisciplinary Rounds (IDR)-based interventions for Mixed Populations of Acute Care Patients

- ~ **Length of Stay:** Weak body of evidence for **no effect**, positive or negative
- ○ **Readmission:** No evidence
- ~ **Cost:** Weak body of evidence for **no effect**, positive or negative

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay** (days)	**Readmission** (odds)	**Cost**
High	Zwarenstein 2009 (12)	No difference	No difference	No difference

Base of Primary Research Evidence
- Length of Stay: 5 unique primary research studies.
- Readmission: 0 unique primary research studies
- Cost: 2 unique primary research studies

Table 34: Evidence for interdisciplinary rounds-based interventions

Physiotherapy

As defined in the literature: Physiotherapy (PT) services provided in addition to regular PT and delivered out of regular business hours (70). Physiotherapy delivered in intensive care units (71).

PHYSIOTHERAPY FOR MIXED POPULATIONS OF ICU ACUTE CARE PATIENTS

- ✓ **Length of Stay:** Moderate body of evidence for **positive** effect
- ○ **Readmission:** No evidence
- ~ **Cost:** Weak body of evidence for **no effect**, positive or negative

Evidence		**Outcomes** (compared to usual care)		
Quality	**Reference**	**Length of Stay** (days)	**Readmission** (odds)	**Cost**
Moderate	Brusco 2006 (70)	-1.38 95% CI [-2.55, -0.22]	n/a	Favours PT (qualitative synthesis)
Moderate	Kayambu 2013 (71)	Favours PT	n/a	n/a

Base of Primary Research Evidence
- Length of Stay: 10 unique primary research studies.
- Readmission: 0 unique primary research studies
- Cost: 3 unique primary research studies

Table 35: Evidence for physiotherapy for mixed populations of ICU Acute Care Patients

The Newfoundland & Labrador Context

Throughout the course of this project, we have tried to identify contextual factors unique to Newfoundland & Labrador that may influence the relevance and applicability of the research-based evidence to our province and its population. This section of the report addresses those contextual factors and is based primarily on consultations with local decision makers, administrators, clinicians and stakeholder group representatives in the province.

Contextualization Approach

By 'contextual factors' we mean the local conditions, capacities and qualities that can have an impact on the reported effects of our included research evidence—such factors have the potential to enhance or to reduce the likely effectiveness, feasibility or acceptability of an intervention in Newfoundland & Labrador. Our Research Team helped us recruit key contextual advisors from across the province and the factors that we considered are outlined in this section, categorically.

Our synthesis of the evidence indicates that, for reducing acute care length of stay (LOS),[8] two broad approaches had a sufficient body of evidence to merit consideration as potential interventions:

- The approach designed around structured acute care plans that are evidence-based but tailored to the institution where implemented. This approach is shared by different categories of interventions including Care Pathways (CPs), Early Supported Discharge (ESD), and Discharge Planning (DP, as defined in this report). These have all been demonstrated to be effective across multiple jurisdictions and appear to be more effective for patient groups for which there is diagnostic clarity.

- The approach of providing integrated and continual comprehensive medical care to acute care patients during their admission. This is the "Hospitalist" approach, which has been shown to be generally effective across publicly funded acute care settings.

The contextualization section considers both of these approaches and their various intervention categories. In this project, the setting of inpatient acute care units has a significant equalizing effect when interpreting the research-based evidence in the context of Newfoundland & Labrador:

- Acute care patients tend to be similarly older and sicker, regardless of provincial demographics.
- The resources used in studied interventions are relatively equitable between research settings and acute care settings in the province.

[8] While at the same time not increasing readmission rates nor decreasing cost-effectiveness.

- Most of the findings from this project addressed how to best organize these acute care resources; this is in contrast to specialized technologies, practices or trainings that may differ considerably between health services research settings and our province.

Nonetheless, our CHRSP consultants identified several contextual factors that may influence the effectiveness of any implementation of either approach. The CHRSP methodology has developed categories for these factors and this structure will form the basis for the contextualization below.

Patient-Level Factors

Our consultants did not identify any contextualization factors at the patient level that would affect health equity, feasibility or acceptability. Our consultants estimated that acute care patients in the province are comparable to those in other research settings. Patient-level factors play a role post-discharge but not during the lead-up to discharge per se.

Health Human Resources Factors

The role of hospitalists in the research-based literature is not standardized, nor is it standardized across Canada or even within Newfoundland & Labrador. This is a key contextual factor that is expected to influence the effectiveness of hospitalists in reducing reduce acute care LOS.

Unclear Definitions/ Roles for Hospitalists

The role of hospitalists in the research-based literature is not standardized, nor is it standardized across Canada or even within Newfoundland & Labrador. This is a key contextual factor that is expected to influence the effectiveness of hospitalists in reducing reduce acute care LOS. Our consultants explained that the term hospitalist refers more to practice and local context than to training. In the literature, hospitalists are typically general physicians (internal medicine or family medicine) physicians with some additional hospital training, who work primarily in hospitals (not private practice), and who are dedicated to one unit or a limited number of units.

There are hospitalist positions in most, if not all, hospitals in the province. In one RHA, the majority of hospitalists are foreign-trained graduates with conditional licenses and not necessarily trained for the role. In teaching hospitals, the role of hospitalist may be carried out by senior medical residents, supervised by attending internal medicine physicians or sub-specialists. We learned that some general internists may take on the hospitalist role, but to expect fewer and fewer general internists in acute care units in the province.

Compatibility with existing plans

Our consultants did not see any potential conflicts between either structured care plans (CPs, ESD or DP) or hospitalists with the Province's Strategic Health Workforce Plan (72).

Care Pathways in Facilities without Specialists

Our consultants suggested that hospitals and health centres that have shortages of specialists may benefit from the decision support aspects of Care Pathways and Early Supported Discharge. They felt that these types of structured care plans could expedite decision making, standardize the level of care, and reduce average acute care LOS.

Design of Service Factors

Implementation of Care Pathways

Our CHRSP consultants were in broad agreement that the most pressing contextual factor for the implementation of structured care plan approaches was physician compliance, particularly for Care Pathways (CPs) in acute care settings. The primary concern is that the rate of successful uptake for approaches like CPs will be variable among physicians and possibly across facilities, and consequently will be less effective overall than reported in the scientific literature where uptake is close to 100%. As a contextualization factor, this issue is at the intersection of Health Human Resources, Health System Organization and Politics.

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The Government of Newfoundland & Labrador currently licenses a product from Think Research (73) that provides physicians with Patient Order Sets (74). The license provides the province's RHAs with access to up-to-date, evidence-based datasets that physicians can access to develop electronic checklists used in acute care that are tailored to types of patients. The service is intended to reduce the variability in acute care LOS and reduce the average acute care LOS to the national expected LOS rates. Think Research's Patient Order Sets were licensed in NL starting in 2014, though it is unclear if the program has been fully implemented across the four Regional Health Authorities. This service provides several insights about the contextual factors that may affect the implementation of CPs and other structured acute care planning approaches like ESD and DP.

Our contextual consultants indicated that there were and are challenges in implementing Patient Order Sets, and that these challenges are expected to arise with any potential implementation of CPs, ESD or DP as highlighted in this report. Consultants agreed that the root of the challenge is change management for interventions that reduce the agency of physicians by constraining choices and/or decisions. Consultants reported that the uptake of Patient Order Sets was variable from site to site, independent of size of facility or physician traits, and that the same may be expected to occur with CPs.

Several strategies have been developed in an attempt to address this challenge, including: organizational information campaigns; educational sessions; assessments of barriers; physician

engagement by peer champions. It is not clear to what degree these strategies have been applied systematically or in a targeted manner across the province. The Newfoundland & Labrador Centre for Health Information has four change management experts who work for the RHAs, one for each authority. Our consultants indicated that this was most likely not enough capacity to manage all program and policy changes within the province's RHAs.

The efforts of the RHAs to increase uptake of Patient Order Sets have had variable results. Some facilities/units are reported to have high adherence rates, upward of 80% with 100% in some smaller hospitals. However, others are characterized by persistent non-adherence by at least some individual physicians. This can contribute to a general lack of consistent uptake at the unit/organization level.

The efforts of the RHAs to increase uptake of Patient Order Sets have had variable results. Some facilities/units are reported to have high adherence rates, upward of 80% with 100% in some smaller hospitals. However, others are characterized by persistent non-adherence by at least some individual physicians. This can contribute to a general lack of consistent uptake at the unit/organization level. In 2015, the province's Auditor General reported indirectly that neither Patient Order Sets nor other structured care plan approaches were being sufficiently implemented in the province (75).

Some of our consultants suggested that a potential solution would be to make Patient Order Sets (and similar initiatives like CPs) mandatory with consequences for non-compliance (instituting mandatory vitamin D testing on the lab formulary was cited as a successful precedent). Our consultants also cited experience and/or previous research that indicated that system-wide attempts to change policy, programs or practice in acute care in Newfoundland & Labrador are often not as effective as targeted interventions and that workplace climate is a critical factor in successfully reorganizing services (more discussion below) (76).

Our consultants pointed out that the attempts to improve change management at the RHA level have been partially successful. They made several suggestions on how to further enhance uptake of structured care planning strategies:

- Develop surveys and similar communication tools to better capture opinions and attitudes toward potential change and to identify potential barriers.

- Integrate system-wide stakeholder mapping on relevant issues, e.g., Care Pathways, before, during, and after implementation. Stakeholder mapping involves: identifying and classifying key stakeholders needed to support an intervention for its implementation to be successful; understanding their perspectives, needs and concerns; and assessing their relationships to each other and the objectives of the intervention.

- Use audit and feedback methods for groups of physicians. This process compares individual health service providers (most often physicians) to professional standards and/or targets. It may be carried out through educational meetings that already take place in the RHAs. When delivered by peers, audit and feedback has the potential to improve physician adherence (77).

- Several consultants explained that fear of increased workload is often an impediment to changing practice. Conversely, physicians are more likely to adopt new practices if the new practices are perceived as not making physician workloads more burdensome.

- We also heard that physicians are more likely to accept new practices if they are engaged and involved early on in the change management process, including, if applicable, through the development and implementation of accountability agreements.

…the RHAs may want to consider adding new or additional resources for change management, including to address workplace climate and culture.

In summary, any attempts to implement Care Pathways, Early Supported Discharge or Discharge Planning (as defined in this report) should anticipate uptake challenges among some physicians, which will lower the effectiveness of the intervention here, as compared to the effectiveness reported where uptake levels are high. The RHAs already have a range of targeted and systematic mechanisms to address these change management challenges, but these mechanisms are not as effective as may be needed. For these and other programmatic changes, the RHAs may want to consider adding new or additional resources for change management, including to address workplace climate and culture. Mandatory requirements may be administratively simpler but may not address workplace-level factors that are expected to critically influence the effectiveness of CPs or other structured care plan approaches.

Logistics & Scheduling

Our consultants informed us that, in St. John's, the design of acute care admission can result in a physician having patients admitted to different hospitals in multiple wards/units. Consequently, physicians can spend significant amounts of time in transit at the expense of time spent seeing patients, in rounds, or otherwise communicating with the discharge team. This feature may reduce the effectiveness and feasibility of care pathways and discharge planning models that were studied in settings where physicians had less resource intensive access to patients.

Our consultants also told us that discharges are happening too late in the day (which may cause bottlenecks and delays) and that work on the weekend is inconsistent. The research evidence is unequivocal that the most effective discharge programs release patients throughout the day and over the full week (14,18). Care Pathways, in particular, may provide a scheduling structure that would facilitate the spreading out of patient discharges and further improve acute care average LOS.

Health System Organization Factors

Multi-stakeholder, coordinated initiatives such as the Choosing Wisely Program are attempting to get health systems to more readily adopt key evidence-based standards and practices. Our consultants told us that trends such as these, alongside the growing use of decision support tools like Care Pathways in some fields/units like colorectal surgery, are expected to influence the larger physician and health care culture to be more accepting of those approaches and strategies.

Broader Trends

Several of our consultants mentioned that a broader trend is underway in healthcare settings wherein patient orders are documented in electronic, rather than paper, formats. Electronic formats are conducive to facilitating documentation. For example, certain fields may be required in order to process an order and electronic formats can also contribute to compliance, consistency and eligibility by potentially limiting choices with drop down menus or check boxes. Our consultants told us that as electronic patient ordering is implemented across the health system, it will facilitate transitions to Care Pathways, Early Supported Discharge and Discharge Planning strategies.

Trends in health system change are also taking place at the national and international levels. Multi-stakeholder, coordinated initiatives such as the Choosing Wisely Program are attempting to get health systems to more readily adopt key evidence-based standards and practices. Our consultants told us that trends such as these, alongside the growing use of decision support tools like Care Pathways in some fields/units like colorectal surgery, are expected to influence the larger physician and health care culture to be more accepting of those approaches and strategies.

Workplace Climate & Culture

Our consultations indicated that workplace climate and culture are important factors for being able to manage change in general and programmatic change in particular. Furthermore, the adoption of interventions that require multi-disciplinary team-work like CPs, ESD and DP depends on good working relations between and within the different professions. Mapping out stakeholder positions and units could be a useful tool in assessing the readiness for change for something like Care Pathways to be rolled out. It could also indicate additional preparation that would be needed for the uptake to be successful.

Compatibility with Existing Strategic Planning

Our consultants did not see any potential conflicts between the current Government of Newfoundland & Labrador strategy as outlined in its strategic planning document *The Way Forward* and either structured care plans (CPs, ESD or DP) or hospitalists (78). The implementation of structured care plans tends to involve electronic documentation, and this would be consistent with the provincial data analytics strategy.

Economic & Political Factors

Our consultants indicated that there is a palpable pressure to do more with less because of the province's current fiscal climate. The Auditor General for Newfoundland & Labrador included reducing acute care costs as a significant potential cost-saving measure (75). As such, the economic contextual factors for adopting structured acute care planning strategies such as Care Pathways and Discharge Planning, are favourable. These interventions have relatively low implementation costs that are centered on coordination and documentation.

Implications for Decision Makers

In Newfoundland & Labrador, patients have slightly longer average lengths of stay (ALOS) in acute care units than those in other Canadian provinces. This indicates that some efficiencies could be realized within acute care settings in this province. An extensive body of research has investigated a range of interventions that have impacts on length of stay, rates of readmission, and cost-effectiveness. When considering the findings from this research evidence in the context of Newfoundland & Labrador, the following "Implications for Decision Makers" should be borne in mind:

- Care Pathways (CP) for colorectal surgery patients have a uniquely strong body of research evidence demonstrating their ability to reduce acute care length of stay by several days without increasing rates of readmission or decreasing cost-effectiveness. Gynecological surgery and pancreatic surgeries have moderate bodies of evidence supporting them. It is reasonable to expect future research to further support Care Pathways, especially for conditions with higher diagnostic accuracy and standardized treatments.

- Discharge Planning (DP) practices have a strong body of evidence indicating modest reductions in average acute care length of stay. These approaches are based on evidence-based, structured plans of care.

- The principal contextual factor for CP and DP approaches is *change management.* The ability of health system administrators in Newfoundland & Labrador to manage change among physicians is expected to be critical to the effectiveness of any proposed interventions.

- Moderate bodies of evidence show that the use of Hospitalists can be effective at reducing acute care ALOS. Hospitalists offer an alternative approach to structured care plans, and take advantage of positions that already exist throughout the province. However, the roles and responsibilities of hospitalists may need to be redefined to capitalize on improvements in ALOS.

- Early Supported Discharge for stroke patients may significantly reduce acute care LOS by several days. However, this intervention also requires significant community supports and represents more of a transfer of recovery setting rather than an expedited discharge process. The primary objective of the healthcare system, in the context of this project, was to improve acute care efficiency; Early Supported Discharge may not achieve this objective in a more global context.

- A range of other interventions currently lack the evidence for assessment of their effectiveness at decreasing average acute care length of stay and will require more research. These include: Care Pathways for other surgeries and chronic diseases, active mobilization, acute geriatric care, case management, emergency department short stay units, exercise, interdisciplinary rounds and additional physiotherapy. This is not to say that they will not be shown to be effective, but rather that forthcoming evidence is needed to make the distinction.

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