



Canadian Consensus on Clinical Pharmacy Key Performance Indicators: Knowledge Mobilization Guide

MAKE IT COUNT!
Advancing practice to improve
patient outcomes

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Introduction

This guide contains key information about consensus clinical pharmacy key performance indicators¹ (cpKPIs) for pharmacy care provided to inpatients in Canada and provides details on how to measure them. The intent of this guide is to facilitate the understanding and implementation of the cpKPIs.

In addition to a detailed description of each cpKPI, this guide provides a summary of how the cpKPIs were selected and key points to consider when implementing cpKPIs.

A compilation of the terms defined throughout the guide is found in Appendix A: Glossary.

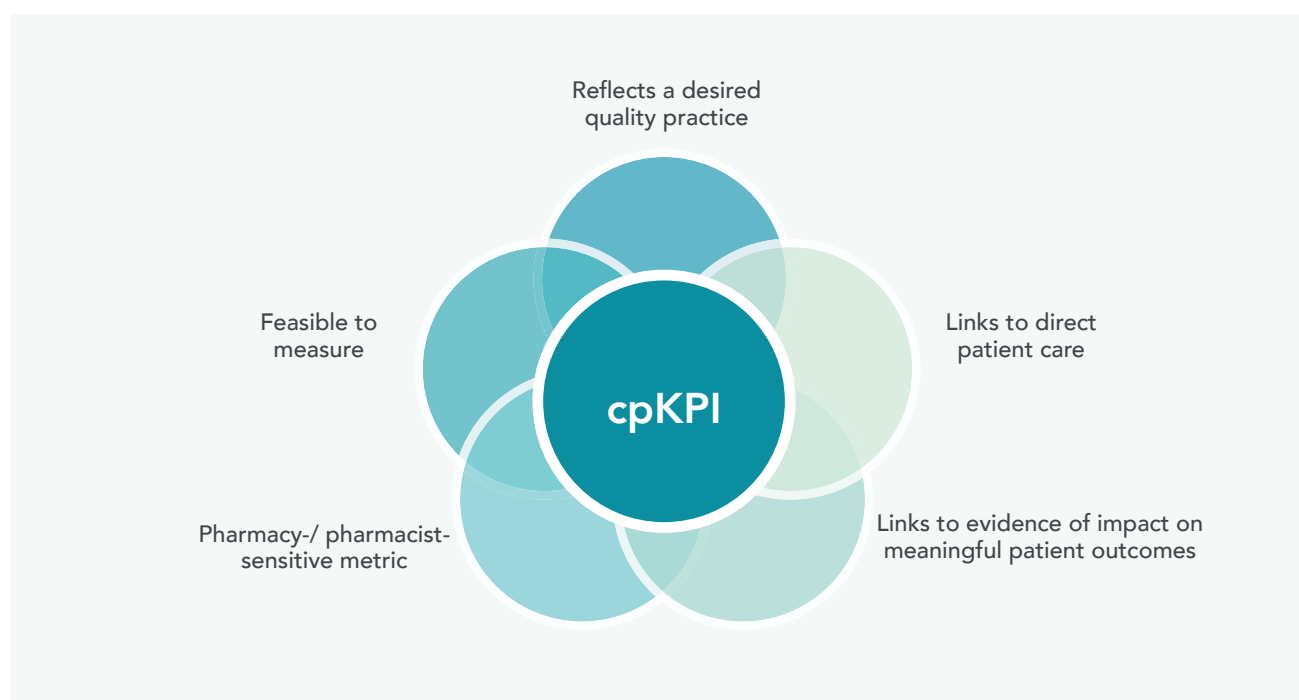
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What is a Clinical Pharmacy Key Performance Indicator?

A key performance indicator (KPI) is a quantitative measure that reflects an organization's identified priorities. Collecting KPI data over time allows for monitoring, decision-making, and quality improvement. A clinical pharmacy KPI (cpKPI) is a KPI that is designed to measure progress for a particular clinical pharmacy activity. Each of the cpKPIs meets the 5 characteristics illustrated in Figure 1.

FIGURE 1. CHARACTERISTICS OF A CLINICAL PHARMACY KEY PERFORMANCE INDICATOR (cpKPI)



Why undertake a project to define cpKPIs?

Until recently,¹ there was no national consensus on what constitutes a KPI for clinical pharmacy services. For decades, the performance indicators for pharmacy services focused on drug distribution activities, not on measuring the quality of direct patient care.

A group of hospital pharmacists from across the country, in cooperation with CSHP, formed the Canadian cpKPI Collaborative, to develop a core set of cpKPIs with the goal of advancing clinical pharmacy practice to improve patient outcomes.

In 2013, a final set of 8 national cpKPIs was established. The implementation of cpKPIs in hospital settings is intended to

- > improve quality of care and advance clinical pharmacy practice
- > advance practice toward desired evidence-informed patient outcomes
- > define minimum standards and permit benchmarking within and between organizations
- > elevate professional accountability and transparency

It is anticipated that these consensus cpKPIs will allow hospital pharmacists to focus their patient care efforts on clinical interventions that influence important outcomes such as mortality and hospital readmissions.

What are the cpKPIs?

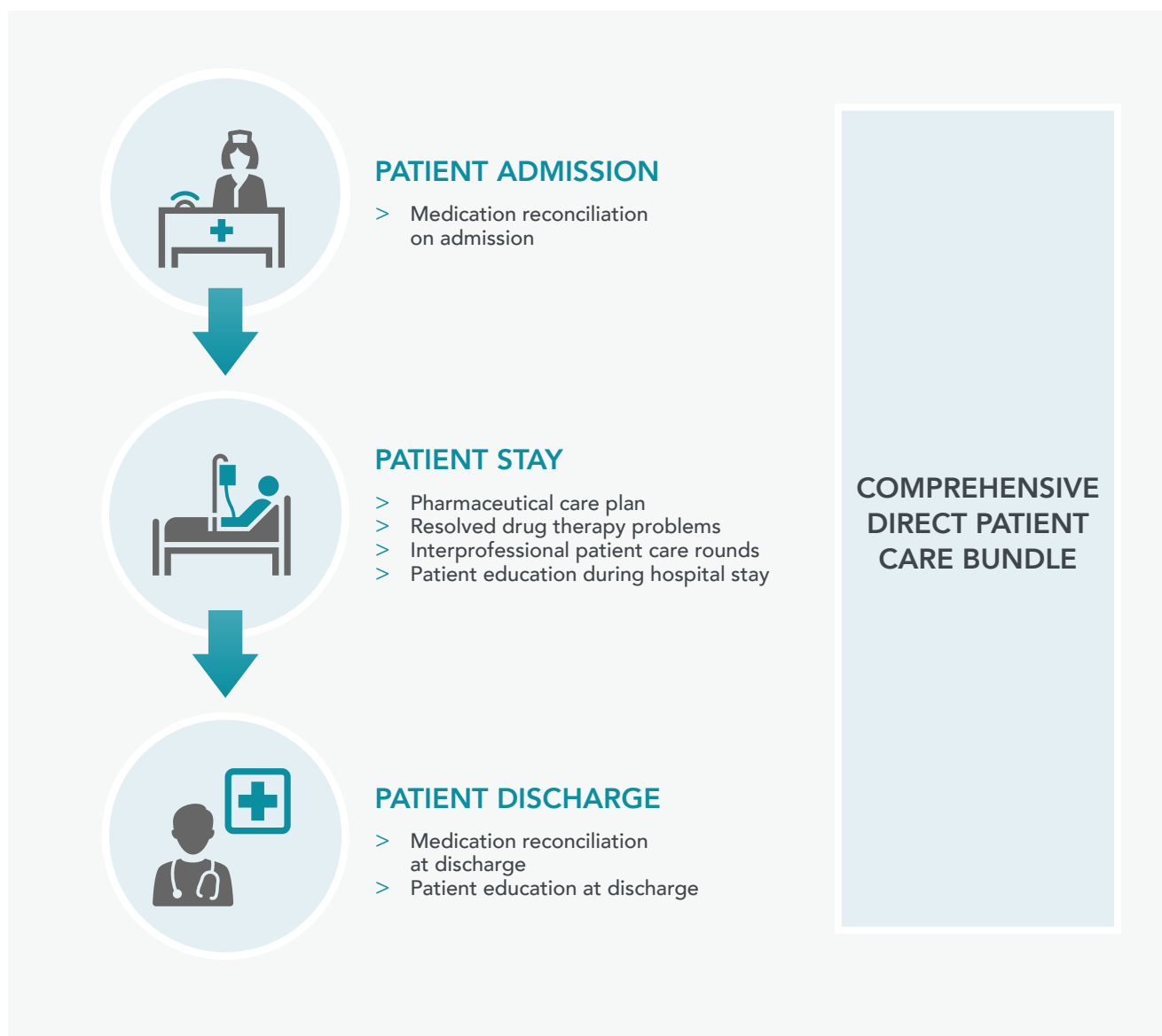
TABLE 1: CONSENSUS cpKPIs

cpKPI Topic	What are the 8 Canadian consensus cpKPIs?
Medication reconciliation on admission	Proportion of patients who received documented medication reconciliation on admission (as well as resolution of identified discrepancies), performed by a pharmacist.
Pharmaceutical care plan	Proportion of patients for whom a pharmacist has developed and initiated a pharmaceutical care plan.
Drug therapy problems	Number of drug therapy problems resolved by a pharmacist per admission.
Interprofessional patient care rounds	Proportion of patients for whom a pharmacist participated in interprofessional patient care rounds to improve medication management.
Patient education during hospital stay	Proportion of patients who received education from a pharmacist about their disease(s) and medication(s) during their hospital stay.
Patient education at discharge	Proportion of patients who received medication education from a pharmacist at discharge.
Medication reconciliation at discharge	Proportion of patients who received documented medication reconciliation at discharge (as well as resolution of identified discrepancies), performed by a pharmacist.
Bundled patient care interventions	Proportion of patients who received comprehensive direct patient care from a pharmacist working in collaboration with the healthcare team.

8 Canadian consensus cpKPIs as they relate to a patient's hospital course

Figure 2 illustrates the 8 Canadian consensus cpKPIs¹ according to the order in which a patient receives comprehensive direct patient care provided by a pharmacist.

FIGURE 2: EIGHT CONSENSUS cpKPIs IN THE PATIENT JOURNEY

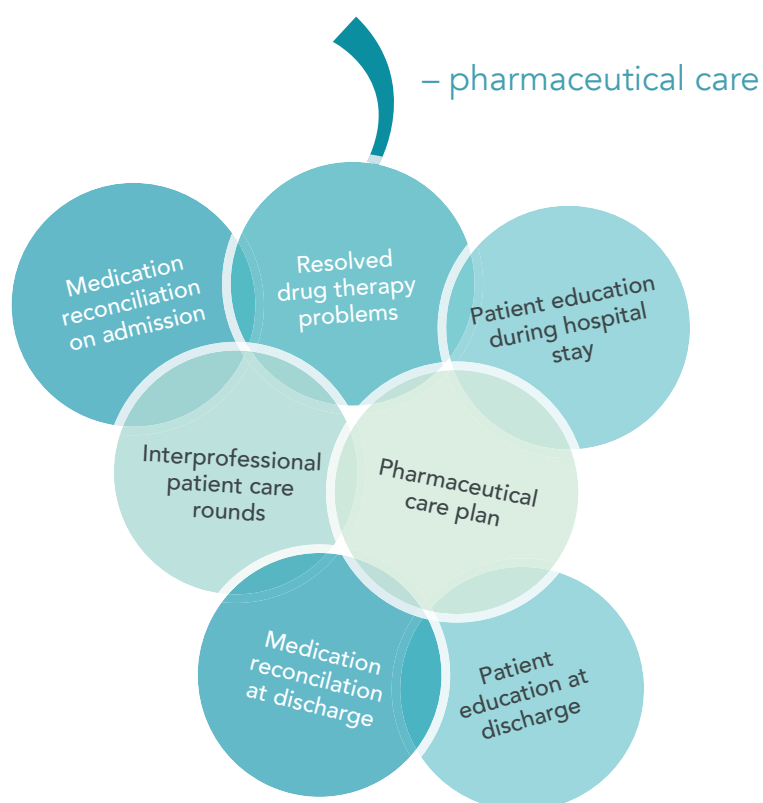


Comprehensive Direct Patient Care

Figure 3 is a graphic representation of the collection of individual cpKPIs as a bunch of grapes, interlinked and attached to the “vine” representing the pharmaceutical care process.

Individually, each cpKPI (“grape”) measures a certain set of patient care activities (critical elements), with the understanding that these activities are connected to the pharmaceutical care process and serve as a surrogate measure for desired patient outcomes. The “bunch of grapes”, characterizing a bundle of comprehensive direct patient care activities, corresponds to the evidence that a bundle of integrated patient care activities improves meaningful patient outcomes (e.g., readmission rates).

FIGURE 3: COMPREHENSIVE DIRECT PATIENT CARE



Background

How the cpKPIs were selected

The Canadian cpKPI Collaborative created an inventory of 137 candidate cpKPIs. To assess each of these cpKPIs, a list of ideal attributes of a cpKPI was developed. This list, (informally referred to as the “Slavik 11” and found in Table 2 on page 11) takes into account the 5 cpKPI characteristics (as described on page 5) and the 4 properties of a quality indicator, as developed by the Agency for Healthcare Research and Quality²)

- > importance of the measure
- > scientific soundness: clinical logic
- > scientific soundness: measureable properties
- > feasibility

The collaborative then applied the 5 cpKPI characteristics and the 11 ideal attributes of a cpKPI to the candidate cpKPIs. This process yielded a short list of 26 candidate cpKPIs to be rated through a national, systematic, evidence-informed consensus process (a modified Delphi process).

The 26 candidate cpKPIs were grouped into 8 evidence-informed critical activity areas in the patient care process (informally referred to as the “Doucette 8”), representing best practices for hospital pharmacy for which improvements in meaningful patient outcomes have been demonstrated. Table 3 represents the 8 evidence-informed critical activity areas and the 26 candidate cpKPIs represented within them. Note: the evidence-informed critical activity areas are not necessarily the same as the final 8 cpKPIs.

Twenty-six hospital pharmacists (referred to hereafter as “panellists”) representing all Canadian provinces participated in the modified Delphi process.¹ Using a 9-point Likert scale, the panellists rated the 26 candidate cpKPIs according to the cpKPI consensus definition and 11 ideal attributes. Appendix B: Relevant Notes from Key Papers summarizes the key studies of clinical pharmacy activities which were used by the panellists. And, Appendix C: Evidence Crosswalk identifies the key studies that addressed certain activities. Consensus was deemed to have been reached if 75% or more of the panellists assigned an overall rating of 7 or more on the third and final round of the modified Delphi process. The summary results for the 8 final cpKPIs are found in Appendix D: cpKPI Scorecard.

The list of candidate cpKPI grew from 26 to 29 based on feedback provided during the modified Delphi process.

This work led to identification of the final 8 national cpKPIs, presented in Tables 1 and 4.

A summary of the methodology is presented in Figure 4. Refer to the study paper¹ for a more detailed examination of the methodology.

FIGURE 4: STUDY METHODOLOGY

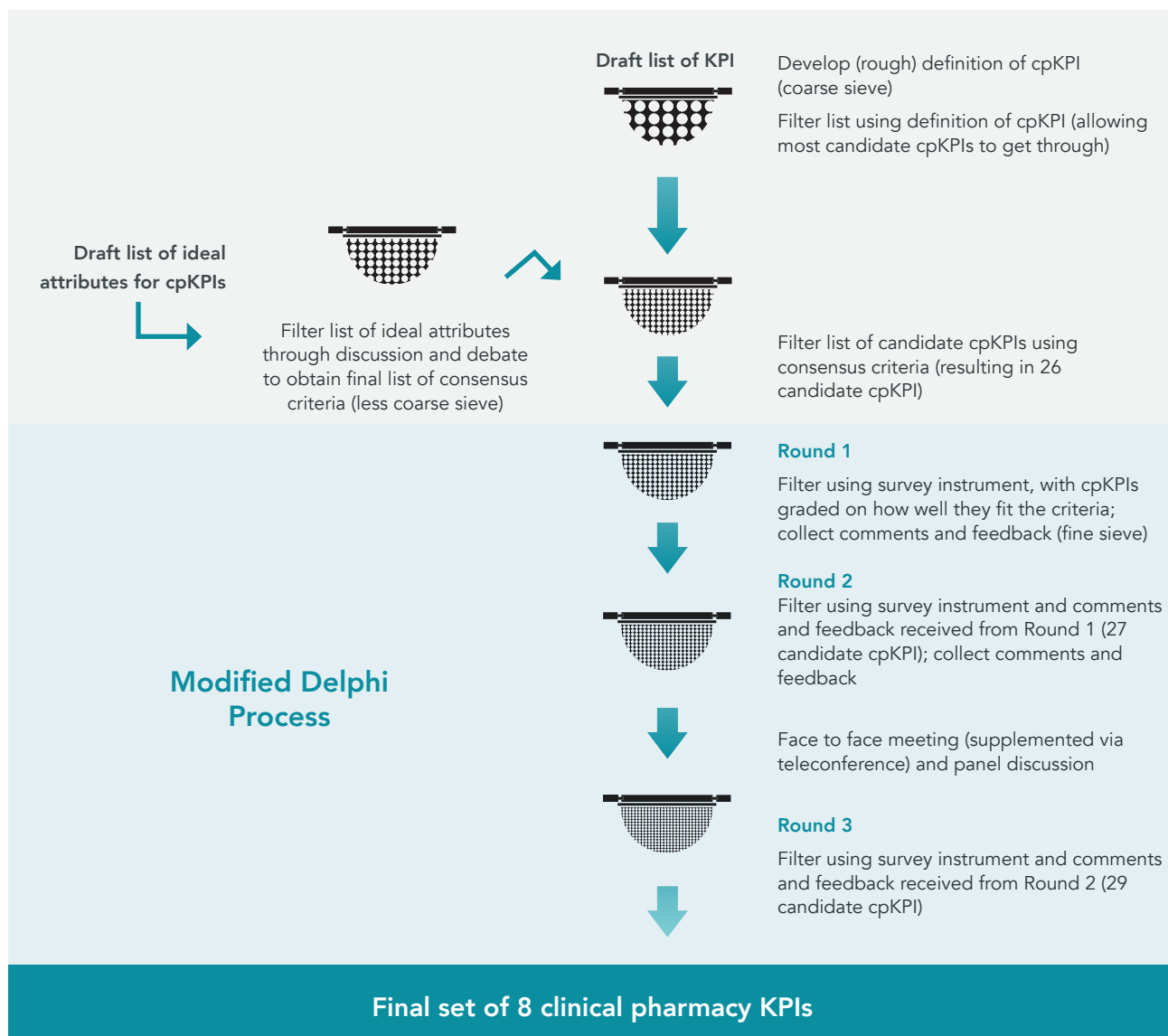


TABLE 2: LIST OF IDEAL ATTRIBUTES OF A CPKPI (“SLAVIK 11”)

1	Indicator is supported by high-quality evidence.
2	Indicator is associated with relevant impact on clinically important outcomes.
3	Indicator is a reflection of a role that is best suited for a clinical pharmacist.
4	Indicator is attributable to direct patient care.
5	Indicator is specific to pharmaceutical care process.
6	Indicator is aligned with professional goals, objectives, and practices of a clinical pharmacist.
7	Indicator is an accepted disease-based quality indicator.
8	Indicator is feasible to measure.
9	Indicator is efficient to measure.
10	Indicator is a valuable quality measure.
11	Indicator is generalizable to all hospital pharmacy departments.

TABLE 3: TWENTY-SIX CANDIDATE cpKPIs

26 Candidate cpKPIs (Semchuk 26)	Critical Activity Area (Doucette 8)
Number (or proportion) of patients who receive a formal documented best possible medication history (BPMH) by a pharmacist or pharmacy technician	Best possible medication history
Number (or proportion) of patients who receive formal documented admission medication reconciliation and the resolution of identified discrepancies by a pharmacist	Admission Medication Reconciliation
Number (or proportion) of pharmacists who actively participate in interprofessional patient care rounds to improve medication management	Interprofessional patient care rounds
Number (or proportion) of patients for whom clinical pharmacists have completed a pharmaceutical care plan	Pharmaceutical care
Number of total drug therapy problems (DTPs) resolved by pharmacists	Pharmaceutical care
Number of DTPs resolved for high-alert medications (as defined by the Institute for Safe Medication Practices [US]) by pharmacists	Pharmaceutical care
Number (or proportion) of patients with health record documentation by a pharmacist	Pharmaceutical care
Number (or proportion) of patients who have received in person education from a pharmacist about their disease(s) and medication(s) during their hospital stay	Patient education/discharge counselling
Number (or proportion) of hospital patients who receive medication counselling by a pharmacist at discharge	Patient education/discharge counselling
Number (or proportion) of hospital patients who receive formal documented seamless care activities by a pharmacist	Patient education/discharge counselling
Proportion of patients who receive formal documented discharge medication reconciliation and resolution of identified discrepancies by a pharmacist	Discharge medication reconciliation
Number (or proportion) of patients discharged with complex and high risk medication regimens who pharmacists have documented assessments of the patients' response to treatment plans by following up between 3 and 7 days post discharge	Post-discharge follow-up
Number (or proportion) of heart failure patients with an ACE-inhibitor or ARB initiated or titrated to target doses prior to discharge	Disease or drug-specific quality indicators
Number (or proportion) of heart failure patients with a beta blocker initiated or titrated to target doses prior to discharge	Disease or drug-specific quality indicators

cont'd



26 Candidate cpKPI (Semchuk 26)	Critical Activity Area (Doucette 8)
Number (or proportion) of ischemic heart disease patients with a beta blocker initiated or titrated to target doses prior to discharge	Disease or drug-specific quality indicators
Number (or proportion) of ischemic heart disease patients who receive ASA prior to discharge	Disease or drug-specific quality indicators
Number (or proportion) of ischemic heart disease patients who receive a statin prior to discharge	Disease or drug-specific quality indicators
Number (or proportion) of chronic obstructive pulmonary disease (COPD) patients who receive systemic corticosteroids for acute exacerbation of COPD (AECOPD)	Disease or drug-specific quality indicators
Number (or proportion) of COPD patients who receive empiric antibiotics for purulent acute exacerbation of COPD	Disease or drug-specific quality indicators
Number (or proportion) of COPD patients who receive documented pharmacist education on COPD, medications including inhaler technique, recognizing AECOPD, self-management plan, nicotine replacement/smoking cessation, vaccines, medication adherence, and exercise	Disease or drug-specific quality indicators
Number (or proportion) of atrial fibrillation patients who receive stroke prophylaxis before discharge	Disease or drug-specific quality indicators
Number (or proportion) of patients who receive influenzae/pneumococcal/tetanus vaccination before discharge	Disease or drug-specific quality indicators
Number (or proportion) of patients who receive nicotine replacement therapy (NRT) to prevent symptoms of nicotine withdrawal during hospital admission	Disease or drug-specific quality indicators
Number (or proportion) of patients who receive smoking cessation counselling/therapy before discharge	Disease or drug-specific quality indicators
Number (or proportion) of inpatients receiving venous thromboembolism (VTE) prophylaxis	Disease or drug-specific quality indicators
Number (or proportion) of cancer in-patients receiving cytotoxic chemotherapy as determined by hospital approved chemotherapy treatment protocol	Disease or drug-specific quality indicators

Note: "Best Possible Medication History" and "Admission Medication Reconciliation" were merged as one cpKPI.

The Canadian cpKPI Collaborative failed to reach the consensus threshold for "Drug-/Disease-Specific" quality indicators and "Postdischarge Follow-up".

TABLE 4: SUMMARY DESCRIPTION OF cpKPIs

Link to the Critical Activity Area	cpKPI Topic	cpKPI	Description
Medication reconciliation 	Medication reconciliation on admission	Proportion of patients who received documented medication reconciliation (as well as resolution of identified discrepancies) performed by a pharmacist	<ul style="list-style-type: none"> Medication reconciliation is a formal process to ensure that accurate and comprehensive medication information is communicated consistently across transitions of care. Specifically, medication reconciliation on admission involves gathering a complete and accurate list of the patient's home medications (Best Possible Medication History) and comparing that list with the prescriber's admission medication orders. Any differences or discrepancies are to be discussed with the prescriber, with changes being made to the orders if appropriate.
Pharmaceutical care  	Pharmaceutical care plan	Proportion of patients for whom a pharmacist has developed and initiated a pharmaceutical care plan	<ul style="list-style-type: none"> Pharmaceutical care involves a practitioner assuming responsibility for a patient's drug-related needs. It involves the completion of all steps in the patient care process, specifically (1) assessment of the patient (i.e., medical problems and drug therapies, which can lead to identification of drug therapy problems), (2) development of a care plan, and (3) follow-up evaluations. The pharmacotherapy work-up is a rational decision-making process used in pharmaceutical care practice to resolve and prevent drug therapy problems, establish goals of therapy, select interventions, and evaluate outcomes.
	Drug therapy problems	Number of drug therapy problems resolved by a pharmacist per admission	<ul style="list-style-type: none"> Pharmaceutical care involves identifying, resolving, and preventing drug therapy problems. Drug therapy problems are undesirable events or risks experienced by the patient that involve or are suspected to involve drug therapy, that inhibit or delay the patient from achieving the desired goals of therapy, and that require professional judgment to resolve. Such drug therapy problems are identified by evaluating whether the patient's drug therapy is appropriate, effective, and safe and whether the patient is adherent with his or her medications.
Interprofessional patient care rounds 	Interprofessional patient care rounds	Proportion of patients for whom a pharmacist participated in interprofessional patient care rounds to improve medication management	<ul style="list-style-type: none"> The pharmacist actively participates in interprofessional patient care rounds, to improve medication management and patient outcomes. Active participation (on interprofessional rounds): The pharmacist is present and is interacting by making an intervention, providing information, or otherwise influencing patient care.

Critical Activity Area in the Patient Care Process	cpKPI Topic	cpKPI	Description
Patient education 	Patient education during hospital stay	Proportion of patients who received education from a pharmacist about their disease(s) and medication(s) during their hospital stay	<ul style="list-style-type: none"> Education is specific to a disease or drug and is provided in an interactive manner (e.g., face-to-face, via telephone or video) to either the patient or the patient's agent (e.g., parent, guardian).
	Patient education at discharge 	Proportion of patients who received medication education from a pharmacist at discharge	<ul style="list-style-type: none"> Medication education at discharge involves providing comprehensive information to patients and their caregivers at discharge from hospital, with the goal of ensuring effective, safe use of medications, and to improve patient adherence to the treatment plan. May include a schedule for postdischarge medications, a summary of changes from the preadmission medication regimen, and education about new medications.
Medication reconciliation 	Medication reconciliation at discharge	Proportion of patients who received documented medication reconciliation at discharge (as well as resolution of identified discrepancies), performed by a pharmacist	<ul style="list-style-type: none"> Medication reconciliation is a formal process to ensure that accurate and comprehensive medication information is communicated consistently across transitions of care. Specifically, medication reconciliation at discharge involves comparing the patient's home medications (Best Possible Medication History) with the patient's current hospital medications and with the prescriber's discharge medication orders. Any differences or discrepancies are to be discussed with the prescriber, with changes being made to the orders if appropriate.
Comprehensive direct patient care bundle 	Bundled patient care interventions	Proportion of patients who received comprehensive direct patient care from a pharmacist working in collaboration with the healthcare team	<ul style="list-style-type: none"> A bundle of inter-related patient care services associated with improving meaningful patient outcomes, such as reducing hospital readmissions. This bundle of services includes (1) medication reconciliation on admission, (2) pharmaceutical care plan and/or resolution of drug therapy problems, (3) pharmacist's participation in interprofessional patient care rounds, (4) patient education (during hospital stay and/or at discharge), and (5) medication reconciliation at discharge.

Key Points

1 *The cpKPIs are collected and reported for care given to inpatients.*

The measures for any cpKPI do not include data for patients who have not been admitted to the hospital (e.g., ambulatory patients treated in the emergency department or outpatient clinics). For example, medication reconciliation that is completed in the emergency department for a patient who is not admitted to hospital would not be counted as a cpKPI. However, the medication reconciliation that is completed for a patient who was admitted via the emergency department would be counted as a cpKPI.

2 *The number of patient admissions is the chosen denominator for calculating cpKPIs.*

The number of patient admissions was chosen as the denominator for calculating cpKPIs because this value reflects the potential number of patients who could have received the clinical pharmacy interventions. It is believed that collecting these data will inform practice with the goal of advancing the quality of clinical pharmacy services provided in the course of direct patient care. Using the same denominator for all cpKPI metrics allows for consistency and ease of use.

3 *Complexity of a patient case does not affect what is measured.*

The decision to measure an activity as a cpKPI does not take into account the degree of complexity of a patient case.

4 *Continual measurement of the cpKPIs is suggested.*

It is recommended that these cpKPIs be measured on a continuous basis (e.g., daily) to optimize the improvement in quality of care and practice advancement. However, if continuous measurement is not feasible, the suggested minimum is a 2-week sample measurement per quarter. It should also be noted that each measure is a static indicator for the specified reporting period, reported as a percentage, not a directional value (e.g., 12% increase) nor a raw data value (e.g., 12).

5 *Documentation of cpKPI is highly recommended.*

Best practices imply that documentation is an essential part of any quality assurance system, as it provides evidence of what is planned, what has been done, and the outcome. Documentation of patient care activities should be determined at the local level, with the goal of maximizing the communication and implementation of these activities in collaboration with other healthcare providers. Usually, the ideal and recommended location for documentation would be in the patient's healthcare record, although other pharmacy records may also be acceptable; the choice should be decided at the local level.

6 *The pharmaceutical care plan cpKPI differs from the drug therapy problems cpKPI.*

These 2 cpKPIs are related to and overlap one another. The pharmaceutical care plan cpKPI measures the proportion of patients for whom a pharmacist has developed and initiated a pharmaceutical care plan, whereas the drug therapy problem cpKPI measures the proportion of patients whose drug therapy problems have been resolved by a pharmacist. In summary, the pharmaceutical care plan cpKPI metric measures completion of the care plan, whether or not a drug therapy problem has been resolved. To identify and resolve a drug therapy problem, a pharmacist may or may not have completed a comprehensive care plan.

7 *Different pharmacists may be involved in the care of a single patient during provision of the comprehensive direct patient care bundle.*

During the course of a patient's admission, one or more pharmacists may provide medication reconciliation on admission, complete a pharmaceutical care plan (with possible identification and resolution of drug therapy problems), participate in interprofessional patient care rounds, and provide education (or counselling) to the patient during hospital stay or at discharge and discharge medication reconciliation. Regardless of the number of people involved in providing the comprehensive direct patient care bundle, the bundle is counted only once.

8 *Consensus was not reached for the drug- and disease-specific quality indicators.*

Throughout the Delphi consensus process, the only candidate drug- and disease-specific indicator for which consensus was reached in any round was the number (or proportion) of patients receiving prophylaxis for venous thromboembolism. Specifically, consensus was reached for this candidate cpKPI in round 1, but the level of agreement for this cpKPI dropped progressively in subsequent rounds.¹

Medication Reconciliation on Admission

cpKPI

Proportion of patients who received documented medication reconciliation on admission, with resolution of identified discrepancies



Expectation

Pharmacists perform and document medication reconciliation on admission and resolve identified discrepancies. To qualify as an aspect of measurement for this cpKPI, a Best Possible Medication History completed by a non-pharmacist must be reviewed by a pharmacist as part of the reconciliation and discrepancy-resolution process.

Definitions

Please refer to the websites of Accreditation Canada (www.accreditation.ca) and the Institute for Safe Medication Practices Canada (ISMP Canada; www.ismp-canada.org) for the most up-to-date national and international definitions related to medication reconciliation.

Measure

Number of patients who received documented medication reconciliation on admission, with resolution of identified discrepancies

Number of patient admissions

This cpKPI does not require that a pharmacist complete the entire Best Possible Medication History (BPMH). A non-pharmacist (e.g., pharmacy technician, pharmacy student, or nurse) may collect the information for the BPMH, which must then be reviewed by a pharmacist, who also completes the medication reconciliation. The published evidence supporting these 2 options differs, as described below.

- > BPMH initiated and completed by pharmacist, supported by randomized control trials: A BPMH and medication reconciliation on admission performed by a pharmacist as part of an integrated care process is supported by randomized control trials, including those of Gillespie and colleagues³ and Makowsky and colleagues,⁴ as well as multiple systematic reviews and observational studies focused on improving patient outcomes.

- > BPMH initiated by a non-pharmacist and completed by pharmacist, supported by before-and-after studies and expert opinion: A review of a BPMH that is started by a non-pharmacist (e.g., pharmacy technician, nurse, and physician) who is trained in eliciting a BPMH, but is completed by a pharmacist as part of the reconciliation process is supported by limited evidence. Such evidence does not include effects on patient outcomes such as readmissions. The authors of this guide are not aware of any published evidence for an independent, pharmacy technician (or nurse or physician)–led BPMH and medication reconciliation process on admission that correlates with improvement in patient readmissions, mortality, or other outcomes, as would be necessary if such a process were to qualify as a cpKPI. To date, most of the evidence from non-randomized controlled trials or observational studies with controls has been correlated with medication discrepancies.

Rationale

The activity represented by this indicator has been shown to improve meaningful patient outcomes (e.g., readmissions), if performed as part of a comprehensive intervention for pharmacy patient care services, rather than as an individual critical element. See Figure 3 (on page 8).

Accreditation Canada has identified medication reconciliation as a required organizational practice.⁵

Medication reconciliation is covered by one of the objectives of the CSHP 2015 initiative.⁶

The Safer Healthcare Now! program recognizes medication reconciliation on admission as a core intervention that hospitals and other organizations can report to the program.⁷

The World Health Organization's High 5s international patient safety initiative recognizes medication reconciliation as 1 of 5 key areas of patient safety chosen to facilitate addressing specific patient safety problems.⁸

Background and Evidence

The studies highlighted here investigated patient outcomes following interventions that included BPMH and/or medication reconciliation performed by a pharmacist.

- > **Mueller SK, et al. Hospital-based medication reconciliation practices: a systematic review.**⁹

The authors highlighted that the “medication reconciliation literature is most robust for pharmacist-related interventions, which were evaluated in 15 of 26 included studies and in 4 of 6 good-quality studies.”

- > **Kaboli, P. J. and O. Fernandes (2012). Medication reconciliation: moving forward.**¹⁰

The authors highlighted the importance of involving a pharmacist as a critical element in best practices for interprofessional medication reconciliation with the potential to improve outcomes.¹⁰

- > **Kwan JL, et al. Medication reconciliation during transitions of care as a patient safety strategy: a systematic review.**¹¹

The authors conducted a systematic review of hospital-based medication reconciliation interventions, focusing on “nontrivial risks for patient harm or 30-day postdischarge emergency department visits and readmission.”

They included 18 studies evaluating a total of 20 interventions. Pharmacists performed medication reconciliation in 17 of the 20 interventions. The authors concluded that “pharmacists play a major role in most successful interventions” in medication reconciliation.

> **Kaboli PJ, et al. Clinical pharmacists and inpatient medical care: a systematic review.**¹²

The authors identified medication reconciliation as 1 of 5 process-of-care services performed by clinical pharmacists that “resulted in improved [patient] outcomes”.

> **Bond CA, Raehl CL. Clinical pharmacy services, pharmacy staffing, and hospital mortality rates.**¹³

The authors identified “admission drug histories” as 1 of 8 clinical pharmacy services (and 1 of 5 patient-specific variables) that were significantly correlated with a reduction in mortality rates.

> **Gillespie U, et al. A comprehensive pharmacist intervention to reduce morbidity in patients 80 years or older: a randomized controlled trial.**³

Study pharmacists compiled “a comprehensive list of current medications on admission to complement [information] obtained in the [emergency department], ensuring that the medication list received by the ward was correct.”

The authors found that including pharmacists on a decentralized, ward-based healthcare team led to a 16% decrease in postdischarge hospital visits, a 47% decrease in emergency department visits, and an 80% decrease in drug-related readmissions.

> **Makowsky MJ, et al. Capturing outcomes of clinical activities performed by a rounding pharmacist practicing in a team environment: the COLLABORATE study.**⁴

Pharmacists in the intervention arm “performed a thorough medication history and performed medication reconciliation” on admission.” Pharmacists in the usual care arm “generally did not perform medication histories/reconciliation”.

The authors found that the provision of “proactive clinical services”, including medication reconciliation, by team-based pharmacists led to improvements in the mean quality score relative to usual care (56.4% vs. 45.3%), as well as lower all-cause readmission at 3 months (80/221 patients [36.2%] vs. 105/231 patients] 45.5%).

Pharmaceutical Care Plan



cpKPI

Proportion of patients for whom a pharmacist has developed and initiated a pharmaceutical care plan

Expectation

Pharmacists develop and initiate a pharmaceutical care plan for each patient under their care.

Definitions

Pharmaceutical care:

Pharmaceutical care is a patient-centred “practice in which the practitioner takes responsibility for the patient’s drug-related needs, and is held accountable for this commitment.”¹⁴

Pharmaceutical care plan:

A treatment plan that is founded on pharmaceutical care and which is developed according to standards of care. The plan includes all of the following activities:

- > establishing goals of therapy,
- > determining interventions to prevent or resolve DTPs, and
- > scheduling follow-up monitoring.¹⁴

Measure

Number of patients for whom a pharmacist has developed and initiated a pharmaceutical care plan

Number of patient admissions

This cpKPI measures an isolated critical element that is part of a bundle of interventions required for continuous pharmaceutical care from admission to discharge. It covers both patients whose DTPs have been resolved and those who have received a comprehensive pharmaceutical care work-up. It is intended to capture the proportion of patients for whom a pharmaceutical care plan has been developed and initiated.

The patient care process includes patient assessment, a care plan, and follow-up evaluation.¹⁴

The pharmacist reviews, monitors, and modifies the plan as necessary and appropriate, in collaboration with the patient and other members of the healthcare team.

Pharmaceutical care plans are dynamic in nature, changing with the identified needs of the patient. For the purpose of cpKPI reporting, any pharmaceutical care plan that has been formulated, documented, and initiated would be included in calculating the indicator. It is recommended that any unresolved DTPs identified within the plan be communicated to community care providers through discharge planning and follow-up.

A pharmacist may determine and document, either at or before discharge, whether a pharmaceutical care plan was implemented during a patient's admission. If more than one such plan is documented before discharge, only one care plan should be counted for any given patient.

Rationale

The activity represented by this indicator has been shown to improve meaningful patient outcomes (e.g., readmissions), if performed as part of a comprehensive intervention for pharmacy patient care services, rather than as an individual critical element. See Figure 3 (on page 8).

Background and Evidence

This cpKPI focuses on the development and execution of a pharmaceutical care plan. In 2 studies, researchers have looked at patient outcomes achieved with interventions that included pharmaceutical care plans.

> Gillespie U, et al. A comprehensive pharmacist intervention to reduce morbidity in patients 80 years or older: a randomized controlled trial.³

Pharmacists in the intervention arm provided the following services as a pharmaceutical care bundle:

- 1 conducting medication reconciliation on admission;
- 2 collecting the BPMH;
- 3 providing advice for drug selection, dosages, and monitoring;
- 4 educating and monitoring patients during the admission;
- 5 providing medication counselling (i.e., education) at discharge; and
- 6 conducting a follow-up phone call at 2 months after discharge from hospital.

The authors found that including pharmacists on a decentralized, ward-based healthcare team led to a 16% decrease in postdischarge hospital visits, a 47% decrease in emergency department visits, and an 80% decrease in drug-related readmissions.

> Makowsky MJ, et al. Capturing outcomes of clinical activities performed by a rounding pharmacist practicing in a team environment: the COLLABORATE study.⁴

The following proactive clinical services were included in the intervention:

- 1 conducting medication reconciliation on admission and at discharge;
- 2 participating in patient care rounds;
- 3 resolving DTPs; and
- 4 providing discharge counselling.



The proactive clinical services provided by the pharmacists were “modeled on the philosophy of pharmaceutical care”.

The authors found that the provision, by team-based pharmacists, of proactive clinical services modelled on the philosophy of pharmaceutical care led to improvements in the mean quality score. As well, when resolution of DTPs was included as part of that bundled intervention, the secondary outcome of 3-month all-cause readmission frequency was significantly reduced (intervention, 80/221 patients [36.2%] vs. control, 105/231 patients [45.5%]; adjusted odds ratio [OR] 0.63, 95% confidence interval [CI] 0.42–0.94).

Drug Therapy Problems

cpKPI

Number of drug therapy problems resolved by a pharmacist per admission



Expectation

Pharmacists identify and resolve drug therapy problems.

Definitions

Drug therapy problem (DTP):

Any “undesirable event or risk of an event experienced by the patient” that involves, or is suspected to involve, drug therapy, and that interferes with achieving the desired goals of therapy and requires professional judgement to resolve.¹⁴

A patient who experiences a DTP falls into 1 of the following 7 categories:¹⁴

- > The patient does not have a clinical indication for the drug.
- > The patient requires additional drug therapy.
- > The patient is at risk for or experiencing a suboptimal response to drug therapy.
- > The patient needs a higher dose to benefit from the drug therapy.
- > The patient needs a lower dose to benefit from the drug therapy.
- > The patient is experiencing an adverse reaction to the drug.
- > The patient is not able or willing to take the drug as prescribed.

Measure

Number of DTPs resolved by a pharmacist

Number of patient admissions

A DTP is considered to be resolved if, as a result of a pharmacist’s action, the patient experiences a change in their drug therapy or receives strategies or information to improve medication adherence. The actions that a pharmacist can perform to resolve a DTP may include: stopping a drug in a patient that is not indicated; starting a drug for a patient that is indicated; changing a drug regimen for a patient at risk for or experiencing

a suboptimal response to drug therapy; increasing the drug dose; decreasing the drug dose; changing a drug regimen for a patient experiencing an adverse reaction to the drug; and providing the patient with information or strategies to improve their medication adherence.

Only drug therapy problems (DTPs) that are resolved should be included for this measure. This explicitly means that, as a result of a pharmacist action, the patient experienced a change in their drug therapy or received information or strategies to improve medication adherence.

Supplemental measures

Number of patients with DTPs resolved by a pharmacist

Number of patients

In calculating this supplemental measure, care must be taken to avoid double-counting patients. A patient who had more than one resolved DTP is counted only once.

A health authority may collect other quality measures to provide more detailed information about the number of resolved DTPs per patient-day. The decision to collect data at a more detailed level is a local decision. For example, consideration may be given to tracking the number of resolved DTPs per patient-day in relation to the following variables:¹⁵

- > drug or drug class
- > action (in relation to the 7 categories of DTP described above)
- > disease state
- > severity of disease, which relates to potential for harm if DTP is not resolved.

Rationale

Resolving a DTP as a critical element of a bundle of services has direct benefits for patient care (e.g., reduction in 30-day and 1-year drug-related readmissions).

Background and Evidence

This cpKPI focuses on resolving DTPs. In 2 studies, researchers have looked at patient outcomes achieved with resolution of DTPs.

- > **Gillespie U, et al. A comprehensive pharmacist intervention to reduce morbidity in patients 80 years or older: a randomized controlled trial.**³

Patients in the intervention arm received the critical elements of the intervention as a bundle, which included a drug review to identify and resolve DTPs (referred to as drug-related problems in the study). The healthcare team discussed relevant DTPs for each patient during ward rounds. DTPs that were not resolved during the patient's hospital stay were described in the discharge letter faxed to the patient's general practitioner and also given to the patient at discharge. All DTPs were communicated to the hospital physician in charge of the patient, along with suggested actions; these suggestions were carried out in 75% of cases (69% in the hospital, 6% after discharge).



The authors found that including pharmacists on a decentralized, ward-based healthcare team led to a 16% decrease in post-discharge hospital visits, a 47% decrease in emergency department visits, and an 80% decrease in drug-related readmissions.

> **Makowsky MJ, et al. Capturing outcomes of clinical activities performed by a rounding pharmacist practicing in a team environment: the COLLABORATE study.⁴**

Team-based pharmacists provided “proactive clinical services”, including participation in “bedside patient care rounds”. Pharmacists in the usual care group “reacted to drug-related problems identified in the dispensary or by pharmacy profile review”.

The authors found that resolution of DTPs as part of the “proactive clinical services” performed by team-based pharmacists led to improvements in the mean quality score relative to usual care (56.4% vs. 45.3%), as well as lower all-cause readmission at 3 months (80/221 patients [36.2%] vs. 105/231 patients) 45.5%.

Interprofessional Patient Care Rounds



cpKPI

Proportion of patients for whom a pharmacist participated in interprofessional patient care rounds to improve medication management

Expectation

Pharmacists actively participate in interprofessional patient care rounds to improve medication management and patient outcomes.

Definitions

Active participation (on interprofessional rounds):

The pharmacist is present and is interacting by making an intervention, providing information, or otherwise influencing patient care.

Interprofessional patient care rounds:

Patient care rounds that involve the responsible prescriber and that provide an opportunity for the rounding pharmacist to present relevant pharmacy information or perform interventions to influence patient care. The rounds may or may not include the patient or the patient's caregivers. This definition excludes brief rounds where the intent is only to share information, without making any decisions. An example of the latter would be "bullet rounds", in which a brief (e.g., 1- to 2-minute) summary is given for each patient about his or her current status or discharge plans.

Interprofessional team:

"[A] group of people from different provider backgrounds that works with clients and families to meet jointly established goals. Team members include regulated and unregulated health providers, clients, family members, other care givers and others within the circle of care necessary for the patient's/client's achievement of his or her goals."¹⁶

Medication management:

"...patient-centred care to optimize safe, effective and appropriate drug therapy. Care is provided through collaboration with patients and their health care teams."¹⁷

Measure

Number of patients for whom a pharmacist actively participated in interprofessional patient care rounds

Number of patient admissions

The frequency of rounding by a pharmacist depends on the frequency of patient care rounds within the organization and as appropriate for ongoing patient care.

Measuring active participation in interprofessional patient care rounds as a cpKPI does not depend on whether such participation results in specific outcomes.

Supplemental measure

Proportion of patient-days on which a pharmacist actively participates in interprofessional patient care rounds (For example if there are 15 patients in a ward on which a pharmacist actively participates in rounds for 10 patients for 5 days, the proportion is 66%: 50 patient-days out of the total 75 patient days on the ward in 5 days).

Number of patient days on which pharmacist actively participated in interprofessional patient care rounds to improve medication management

Patient days

Rationale

The activity represented by this indicator has been shown to improve meaningful patient outcomes (e.g., readmissions), if performed as part of a comprehensive intervention of pharmacy patient care services, rather than as an individual critical element.

In particular, pharmacists' participation on patient care rounds has been reported to have positive effects on various outcomes, including adverse drug event rates,¹² length of stay,¹² cost per patient,¹² 30-day and 1-year drug-related readmissions,^{3, 12} and mortality.¹³

Background and Evidence

This cpKPI focuses on the pharmacist's involvement in interprofessional patient care rounds. In 4 studies, researchers have looked at patient outcomes in relation to the intervention of patient care rounds.

> **Bond CA, Raehl CL. Clinical pharmacy services, pharmacy staffing, and hospital mortality rates.**¹³

The authors identified "medical rounds participation" as a clinical pharmacy service that was correlated with a reduction in mortality rates.

The authors summarized the results as follows: “It is logical that hospitals that had pharmacist participation on medical rounds had 11 093 fewer actual deaths, since decisions about care and drug therapy are primarily made while the medical team does rounds.”⁴

> **Gillespie U, et al. A comprehensive pharmacist intervention to reduce morbidity in patients 80 years or older: a randomized controlled trial.**³

Pharmacists in the intervention arm provided a bundle of pharmaceutical care services. The paper did not include a detailed description of pharmacists’ participation on rounds, but the authors stated that “Relevant DRPs [drug-related problems] for the patient were discussed among the health care team during ward rounds.”

The authors found that including pharmacists on a decentralized, ward-based healthcare team led to a 16% decrease in postdischarge hospital visits, a 47% decrease in emergency department visits; and an 80% decrease in drug-related readmissions.

> **Kaboli PJ, et al. Clinical pharmacists and inpatient medical care: a systematic review.**¹²

The authors identified pharmacists’ participation on patient care rounds as an intervention that improves “the quality, safety, and efficiency of care.”

> **Makowsky MJ, et al. Capturing outcomes of clinical activities performed by a rounding pharmacist practicing in a team environment: the COLLABORATE study.**⁴

The authors found that the provision of “proactive clinical services”, including participation in “bedside patient care rounds”, by team-based pharmacists led to improvements in the mean quality score relative to usual care (56.4% vs. 45.3%), as well as lower all-cause readmission at 3 months (80/221 patients [36.2%] vs. 105/231 patients] 45.5%).

Patient Education during Hospital Stay

cpKPI

Proportion of patients who received education from a pharmacist about their disease(s) and medication(s) during their hospital stay



Expectation

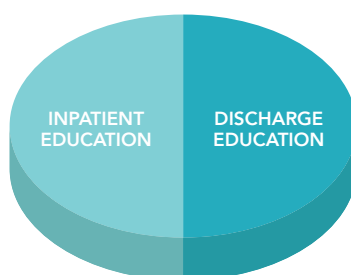
Pharmacists provide education to patients about their disease(s) and medication(s).

Definitions

Patient education during hospital stay:

Education that is specific to a disease or drug which is provided in an interactive manner (e.g., face-to-face, via telephone or video) given to either the patient or the patient's agent (e.g., parent, guardian). This term is not interchangeable with "patient education at discharge".

PATIENT EDUCATION



Measure

Number of patients who received education from a pharmacist

Number of patient admissions

Adjustment for the quality of the education delivered complicates the measure beyond the scope and purpose of tracking this cpKPI. It is expected that individual pharmacists will provide education that is appropriately customized for the needs of each patient.

In calculating this measure, care must be taken to avoid double-counting. For example, each patient who receives medication education from a pharmacist during the hospital stay is counted only once, even if there were multiple education sessions.

Rationale

Educating patients about their medications helps them to become active participants in their health care, which may lead to safer medication use, improved adherence and management of adverse effects, and overall better self-management of their health. Standards for pharmacy practice require that pharmacists help patients to become informed about their medications, so as to receive the intended benefits of the treatment plan.

Background and Evidence

Medication education involves a planned exchange of comprehensive information, with the primary objective being a collaborative learning experience and process regarding prescribed medication. The intent is to increase the patient's knowledge about proper and safe use of medication for a specific condition. In this context, the nature of the relationship between patient and healthcare professional is interactive learning about the implications of a medication, with learning being shared between patient and provider.

Medication education and medication counselling can often be provided during the same session.

> Gillespie U, et al. A comprehensive pharmacist intervention to reduce morbidity in patients 80 years or older: a randomized controlled trial.³

Among other services, pharmacists in the intervention arm provided medication education at various times during the patient's hospital stay (as well as education at discharge).

As part of the medication education providing during the admission, pharmacists provided counselling to individual patients regarding newly commenced or newly discontinued drugs. The counselling sessions were not standardized or recorded in the patient documentation sheets. The extent of counselling for each patient was at the pharmacist's discretion. As part of discharge counselling, patients received information about discharge medications from a pharmacist, as a complement to discharge information received from the physician.

The authors found that including pharmacists on a decentralized, ward-based healthcare team led to a 16% decrease in postdischarge hospital visits, a 47% decrease in emergency department visits, and an 80% decrease in drug-related readmissions.

Patient Education at Discharge

cpKPI

Proportion of patients who received education from a pharmacist at discharge



Expectation

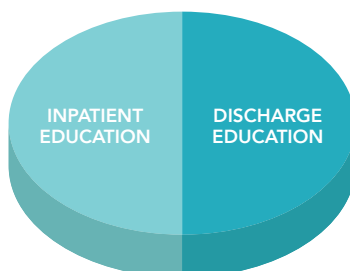
Pharmacists provide education at discharge for hospital patients. This activity is performed with the intent to facilitate the discharge process by providing patients with the tools and education necessary to ensure optimal postdischarge medication management.

Definitions

Patient education at discharge:

Comprehensive education to ensure patient's adherence to the treatment plan on transition out of the acute care setting. Such education may include a schedule for postdischarge medications, a summary of changes from the preadmission medication regimen, and education about new medications. This term is not interchangeable with "patient education during hospital stay".

PATIENT EDUCATION



Measure

Number of patients who received education from a pharmacist at discharge

Number of patient admissions

Adjustment for the quality of the education delivered complicates the measure beyond the scope and purpose of tracking this cpKPI. It is expected that individual pharmacists will provide education that is appropriately customized for the needs of each patient.

Supplemental measure

Number of patients who received education from a pharmacist at discharge

Number of patient discharges

Measures for education at discharge should not include data for patients who received only education during hospital stay (with no education provided at discharge).

Rationale

A number of organizations and practice standards consider medication education at discharge to be important:

- > CSHP 2015 – Objective 1.4: “75% of hospital inpatients discharged with complex and high-risk medication regimens will receive medication counselling [education] managed by a pharmacist”.⁶
- > ISMP Canada¹⁸ states that, at discharge, the patient and the next healthcare provider should be given an updated medication plan, with the generic name, dose, dosing frequency, route of administration, reason for use, and duration of therapy for each medication.

As part of a bundle of interventions, the provision of medication education at discharge is linked to clinically meaningful patient outcomes, as observed in the randomized trials conducted by Gillespie and colleagues³ and Makowsky and colleagues.⁴

More generally, pharmacists accept responsibility for providing patient education and counselling in the context of pharmaceutical care, to improve adherence and reduce DTPs¹⁹ (which the study refers to as medication-related problems).

Background and Evidence

Medication education at discharge is a critical element of interventions that have been linked to meaningful outcomes in the key trials described below.

- > **Gillespie U, et al. A comprehensive pharmacist intervention to reduce morbidity in patients 80 years or older: a randomized controlled trial.**³

Among other services, pharmacists in the intervention arm provided medication counselling at discharge, as a complement to the physician’s discharge information.

As part of routine practice on the study ward, a discharge letter summarizing the patient's hospital stay was faxed to the patient's general practitioner, and a copy of the letter was also given to the patient at discharge. For each patient in the intervention arm, a pharmacist wrote a discharge letter providing a comprehensive account of all changes in the patient's drug therapy during the admission (as well as the rationale for those decisions), the postdischarge monitoring required, and the expected goals of therapy. DTPs (referred to as drug-related problems in the study) identified but not yet resolved were also listed in the letter, along with suggested actions. These discharge letters were not provided to patients, but were sent to the patient's general practitioner.

The authors found that including pharmacists on a decentralized, ward-based healthcare team led to a 16% decrease in postdischarge hospital visits, a 47% decrease in emergency department visits, and an 80% decrease in drug-related readmissions.

> **Kaboli PJ, et al. Clinical pharmacists and inpatient medical care: a systematic review.**¹²

Providing discharge counselling and follow-up was 1 of 5 categories of patient care activities performed by pharmacists that had a positive impact on patient outcomes. The authors reported that "The addition of clinical pharmacist services in the care of inpatients generally resulted in improved care, with no evidence of harm."

> **Makowsky MJ, et al. Capturing outcomes of clinical activities performed by a rounding pharmacist practicing in a team environment: the COLLABORATE study.**⁴

As part of discharge counselling (education), pharmacists in the intervention arm reviewed changes to the medication regimen with the patient. In addition, when deemed appropriate, the pharmacist provided the patient with a written summary and contacted the patient's community pharmacy or general practitioner.

The authors found that the provision of "proactive clinical services", including discharge counselling, by team-based pharmacists led to improvements in the mean quality score relative to usual care (56.4% vs. 45.3%), as well as lower all-cause readmission at 3 months (80/221 patients [36.2%] vs. 105/231 patients) 45.5%).

Medication Reconciliation at Discharge



cpKPI

Proportion of patients who received documented medication reconciliation at discharge, with resolution of identified discrepancies

Expectation

Pharmacists perform and document medication reconciliation at discharge and resolve identified discrepancies.

Definitions

Please refer to the websites of Accreditation Canada (www.accreditation.ca) and ISMP Canada (www.ismp-canada.org) for the most up-to-date national and international definitions related to medication reconciliation.

Measure

Number of patients who received documented medication reconciliation at discharge, with resolution of identified discrepancies by a pharmacist

Number of patient admissions

Supplemental measure

Number of patients who received documented medication reconciliation at discharge

Number of patient discharges

Rationale

The activity represented by this indicator has been shown to improve meaningful patient outcomes (e.g., readmissions), if performed as part of a comprehensive intervention for pharmacy patient care services, rather than as an individual critical element.

Accreditation Canada has identified medication reconciliation as a required organizational practice.⁵

Medication reconciliation is covered by one of the objectives of the CSHP 2015 initiative.⁶

The Safer Healthcare Now! program recognizes medication reconciliation at discharge as a core intervention that hospitals and other organizations can report to the program.⁷

The World Health Organization's High 5s international patient safety initiative recognizes medication reconciliation as 1 of 5 key areas of patient safety chosen to facilitate addressing specific patient safety problems.⁸

Background and Evidence

This cpKPI focuses on completion of medication reconciliation at discharge by a pharmacist. Several studies highlighted here investigated patient outcomes following interventions that included an integrated, pharmacist-centred medication reconciliation process.

Medication reconciliation carries interprofessional accountability, but for this patient care service to qualify as a cpKPI, a pharmacist must be directly involved through oversight and accountability. Pharmacy technicians and pharmacy students may be involved, but pharmacists must provide review and oversight of any activities performed by these people.

The quality and impact of medication reconciliation at discharge is highly influenced by processes of care covered by other cpKPIs, including pharmaceutical care, patient education during hospital stay, patient education (and medication counselling) at discharge, and medication reconciliation on admission.

See also page 8 ("grape bunch" analogy).

> **Mueller S, et al. Hospital-based medication reconciliation practices: a systematic review.**⁹

Mueller and colleagues conducted a comprehensive systematic review with the objective of summarizing available evidence on medication reconciliation interventions in the hospital setting and identifying the most effective practices. Outcomes explored included medication discrepancies, adverse events (both potential and realized), and postdischarge healthcare utilization (e.g., hospital readmissions).

The authors highlighted that the "medication reconciliation literature is most robust for pharmacist-related interventions, which were evaluated in 15 of 26 included studies and in 4 of 6 good-quality studies."

> **Kaboli, P. J. and O. Fernandes (2012). Medication reconciliation: moving forward.**¹⁰

The authors highlighted the importance of involving a pharmacist as a critical element in best practices for interprofessional medication reconciliation with the potential to improve outcomes.¹⁰

> **Kaboli PJ, et al. Clinical pharmacists and inpatient medical care: a systematic review.**¹²

The authors of the systematic review identified medication reconciliation as 1 of 5 "process of care" services performed by clinical pharmacists that "result in improved [patient] outcomes".

> **Kwan JL, et al. Medication reconciliation during transitions of care as a patient safety strategy: a systematic review.**¹¹

The authors conducted a systematic review of hospital-based medication reconciliation interventions, focusing on "non-trivial" risks for patient harm or 30-day postdischarge hospital visits.

They included 18 studies evaluating a total of 20 interventions. Pharmacists performed medication reconciliation in 17 of the 20 interventions. The authors concluded that “pharmacists play a major role in most successful interventions” in medication reconciliation.

> **Makowsky MJ, et al. Capturing outcomes of clinical activities performed by a rounding pharmacist practicing in a team environment: the COLLABORATE study.**⁴

As part of a bundle of “proactive clinical services”, pharmacists in the intervention arm “ensured that patients were discharged on appropriate drug therapy”. “Information about discharge medications (i.e., rationale for changes, therapeutic goals, and monitoring needs for newly commenced drugs) was communicated to the primary care physicians by the [study] pharmacists”. Pharmacists in the usual care arm “generally did not perform medication histories/reconciliation”.

When deemed appropriate, the pharmacist provided a written summary to the patient and communicated with the patient’s general practitioner or community pharmacist.

When pharmacists conducted medication reconciliation at discharge as part of a team-based bundled intervention, the secondary outcome of 3-month all-cause readmission frequency was significantly reduced (intervention, 80/221 patients [36.2%] vs. control, 104/229 patients [45.5%]; adjusted OR 0.63, 95% CI 0.42–0.94).

> **Stowasser, DA, et al. A randomised controlled trial of medication liaison services, 1: patient outcomes**²⁰

This review involved implementation of a medication liaison service designed to improve communication between physicians and pharmacists in the community and the hospital’s inpatient team at admission and discharge. The study found that pharmacist-initiated changes to at least one medication during the hospital admission or other interventions by a pharmacist were more likely to occur in the intervention group. At 30 days post discharge, the group that received the intervention had fewer healthcare encounters and a nonsignificant decrease in readmission rate. In addition, the overall health status of the patients in that group did not change.

Comprehensive Direct Patient Care Bundle

cpKPI

Proportion of patients who received comprehensive direct patient care from a pharmacist working in collaboration with the healthcare team



Expectation

In collaboration with the healthcare team, pharmacists provide a bundle of critical, inter-related patient care services to patients.

Definitions

Comprehensive direct patient care bundle:

A collection of inter-related patient care activities associated with meaningful patient outcomes. It includes all of the following elements:

- 1 medication reconciliation on admission;
- 2 pharmaceutical care plan (with identification and resolution of DTPs when present);
- 3 pharmacist's active participation in interprofessional patient care rounds;
- 4 patient education during hospital stay and/or patient education at discharge; and
- 5 medication reconciliation at discharge.

Measure

Number of patients who received comprehensive, direct patient care by a pharmacist in collaboration with the health care team

Number of patient admissions

This cpKPI measures the bundle of patient care activities, whereas the other cpKPIs measure the isolated elements that make up the bundle. All of the 5 elements of the bundle must be present for the bundle to be counted as complete.

This cpKPI may be measured and recorded by the "discharging" pharmacist, on the basis of his or her knowledge of the patient's hospital course of stay, or may be generated from a cumulative record of each discrete component for the patient (i.e., as recorded in a patient-specific reporting system).

Rationale

This cpKPI addresses the important principle that in many of the key trials (specifically the randomized controlled trials of Makowsky and colleagues⁴ and Gillespie and colleagues³), a bundle of integrated or interlinked critical elements (patient care activities), rather than individual, isolated patient care activities (e.g., participation in interprofessional patient care round), was associated with improvements in meaningful patient outcomes (e.g., readmission to hospital).

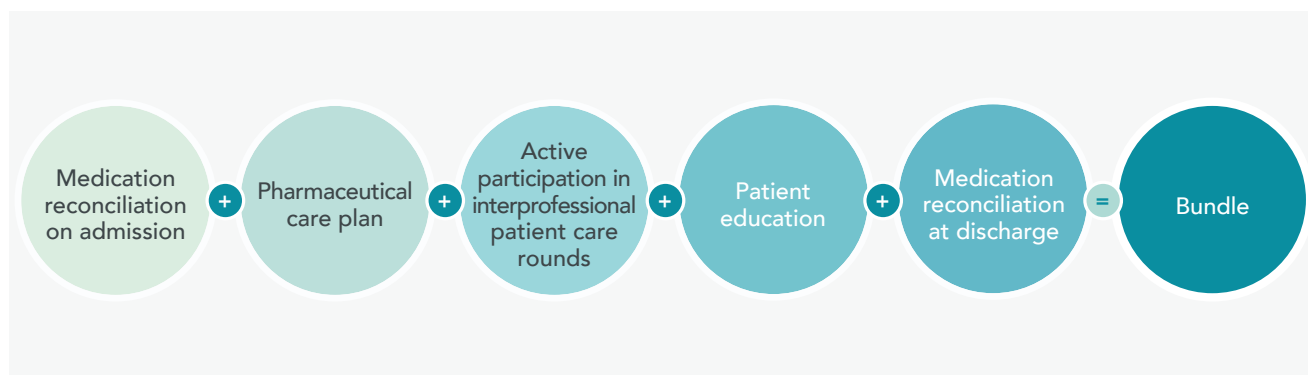
Background and Evidence

This cpKPI focuses on the bundle of interventions made up of the various critical elements described previously. In 2 studies, researchers have looked at patient outcomes with a bundled intervention.

> **Makowsky MJ, et al. Capturing outcomes of clinical activities performed by a rounding pharmacist practicing in a team environment: the COLLABORATE study.**⁴

Figure 5 illustrates the collection of clinical pharmacy services given to patients in the intervention arm of the study. The pharmacists in the intervention arm “clarified and documented pharmacotherapy history, participated in bedside patient care rounds, identified and resolved actual and potential drug related problems, communicated patient-specific therapeutic recommendations to the team, and ensured that patients were discharged on appropriate drug therapy. As part of the admission, the pharmacist performed a thorough medication history and performed medication reconciliation. Medication reconciliation occurred again before patient discharge and the pharmacist reviewed changes to the medication regimen with the patient, and when deemed appropriate provided the patient a written summary and contacted the patient’s community pharmacist or general practitioner. All drug therapy recommendations and monitoring plans were documented in the patient care record.”

FIGURE 5: BUNDLE OF CLINICAL PHARMACY SERVICES USED IN THE INTERVENTION ARM



The authors found that the provision, by team-based pharmacists, of “proactive clinical services, modeled on the philosophy of pharmaceutical care” led to improvements in the mean quality score relative to usual care (56.4% vs. 45.3%), as well as lower all-cause readmission at 3 months (80/221 patients [36.2%] vs. 105/231 patients] 45.5%).



> **Gillespie U, et al. A comprehensive pharmacist intervention to reduce morbidity in patients 80 years or older: a randomized controlled trial.**³

Pharmacists in the intervention arm provided the following services as a pharmaceutical care bundle:

- 1 conducting medication reconciliation on admission;
- 2 collecting the BPMH;
- 3 providing advice for drug selection, dosages, and monitoring;
- 4 educating and monitoring patients during the admission;
- 5 providing medication counselling (i.e., education) at discharge; and
- 6 conducting a follow-up phone call at 2 months after discharge from hospital.

The authors found that including pharmacists on a decentralized, ward-based healthcare team led to a 16% decrease in postdischarge hospital visits, a 47% decrease in emergency department visits, and an 80% decrease in drug-related readmissions.

When different elements of advanced pharmacy practice are combined, improvements in meaningful patient outcomes (such as decreases in postdischarge hospital visits, emergency department visits, and drug-related admissions or improvements in quality scores) can be achieved.^{9, 10, 21, 22}

From the 2 trials described above, pharmaceutical care appears to be the “vine” that links the critical elements together (as in the grape bunch analogy presented at the beginning of this report). This “bundled” intervention involves continuous pharmaceutical care from admission to discharge.

Literature Cited

1. Fernandes O, Gorman SK, Slavik RS, Semchuk WM, Shalansky S, Bussieres JF, et al. Development of clinical pharmacy key performance indicators for hospital pharmacists using a modified delphi approach. *Ann Pharmacother*. Prepublished March 16, 2015. DOI: 10.1177/1060028015577445
2. Desirable attributes of a quality measure. Rockville, MD: Agency for Healthcare Research and Quality, US Department of Health & Human Services; 2014 [cited 2014 Oct 15]. Available from: <http://www.qualitymeasures.ahrq.gov/tutorial/attributes.aspx>.
3. Gillespie U, Alassaad A, Henrohn D, Garmo H, Hammarlund-Udenaes M, Toss H, et al. A comprehensive pharmacist intervention to reduce morbidity in patients 80 years or older: A randomized controlled trial. *Arch Intern Med*. 2009;169(9):894-900.
4. Makowsky MJ, Koshman SL, Midodzi WK, Tsuyuki RT. Capturing outcomes of clinical activities performed by a rounding pharmacist practicing in a team environment: The collaborate study. *Med Care*. 2009;47(6):642-50.
5. Required organizational practices handbook 2015. Ottawa, ON: Accreditation Canada; 2013 [cited 2015 November 14]. Available from: <http://www.accreditation.ca/sites/default/files/rop-handbook-2015-en.pdf>.
6. Canadian Society of Hospital Pharmacy. Canadian Hospital Pharmacy (CSHP 2015). 2007 [updated 2008; cited 2014 Feb 25]. Available from: http://www.cshp.ca/dms/dmsView/2_CSHP-2015-Goals-and-Objectives-Feb-25%2707-w-Appdx-rev-May%2708.pdf.
7. Safer healthcare now! [website]. Toronto, ON: Canadian Patient Safety Institute; 2012 [cited 2014 June 9]. Available from: <http://www.saferhealthcarenow.ca/EN/Pages/default.aspx>.
8. Welcome to the high 5's project website. Geneva, CH: High 5s; 2009. Available from: www.high5s.org/bin/view/Main/WebHome.
9. Mueller SK, Sponsler KC, Kripalani S, Schnipper JL. Hospital-based medication reconciliation practices: A systematic review. *Arch Intern Med*. 2012;172(14):1057-69.
10. Kaboli PJ, Fernandes O. Medication reconciliation: Moving forward. *Arch Intern Med*. 2012;172(14):1069-70.
11. Kwan JL, Lo L, Sampson M, Shojania KG. Medication reconciliation during transitions of care as a patient safety strategy: A systematic review. *Ann Intern Med*. 2013;158(5 Pt 2):397-403.
12. Kaboli PJ, Hoth AB, McClimon BJ, Schnipper JL. Clinical pharmacists and inpatient medical care: A systematic review. *Arch Intern Med*. 2006;166(9):955-64.
13. Bond CA, Raehl CL. Clinical pharmacy services, pharmacy staffing, and hospital mortality rates. *Pharmacotherapy*. 2007;27(4):481-93.
14. Cipolle RJ, Strand LM, Morley PC. Pharmaceutical care practice: the patient-centred approach to medication management services. 3rd ed. New York, NY: McGraw-Hill; 2012.



15. Chase PA, Bainbridge J. Care plan for documenting pharmacist activities. *Am J Hosp Pharm.* 1993;50(9):1885-8.
16. Accreditation of Interprofessional Health Education (AIPHE). Principles and practices for integrating interprofessional education into the accreditation standards for six health professions in Canada [cited 2014 Mar 20]. Available from: <http://www.cihc.ca/files/aiphe/resources/AIPHE%20Principles%20and%20Practices%20Guide%20-%20v.2%20EN.pdf>.
17. Blueprint for Pharmacy. Medication management definition. Ottawa, ON: Canadian Pharmacists Association; 2013 [cited 2014 June 9]. Available from: <http://blueprintforpharmacy.ca/docs/resource-items/medication-management-definition-handout---july-30-2013.pdf>.
18. Institute for Safe Medication Practices Canada. Medication reconciliation (MedRec). Toronto: Institute for Safe Medication Practices Canada; 2014. [2014 Sep 29]; Available from: <http://www.ismp-canada.org/medrec/>.
19. ASHP guidelines on pharmacist-conducted patient education and counseling. *Am J Health Syst Pharm.* 1997;54(4):431-4.
20. Stowasser DA, Collins DM, Stowasser M. A randomised controlled trial of medication liaison services - patient outcomes. *J Pharm Pract Res.* 2002;32:133-40.
21. Hansen LO, Young RS, Hinami K, Leung A, Williams MV. Interventions to reduce 30-day rehospitalization: A systematic review. *Ann Intern Med.* 2011;155(8):520-8.
22. Fernandes O, Shojania KG. Medication reconciliation in the hospital: What, why, where, when, who and how? *Healthc Q.* 2012;15 Spec No:42-9.

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Appendix A: Glossary

Active participation (on patient care rounds): The pharmacist is present and is interacting by making an intervention, providing information, or otherwise influencing patient care.

Comprehensive direct patient care bundle: A collection of inter-related patient care services associated with meaningful patient outcomes. It includes all of the following elements:

- 1) medication reconciliation on admission;
- 2) pharmaceutical care plan (with identification and resolution of DTPs when present);
- 3) pharmacist's participation in interprofessional patient care rounds;
- 4) patient education during hospital stay and/or patient education at discharge; and
- 5) medication reconciliation at discharge.

Drug therapy problem (DTP): "Any undesirable event or risk experienced by the patient that involves, or is suspected to involve, drug therapy, and that interferes with achieving the desired goals of therapy and requires professional judgment to resolve."¹⁴

Patients who experience a drug therapy problem fall into one of the following 7 categories.¹⁴

- The patient does not have a clinical indication for the drug.
- The patient requires additional drug therapy.
- The patient is not experiencing the desired response to the drug therapy.
- The patient needs a higher dose to benefit from the drug therapy.
- The patient is experiencing an adverse reaction to the drug.
- The patient needs a lower dose to benefit from the drug therapy.
- The patient is not able or willing to take the drug as prescribed.

Interprofessional patient care rounds: Patient care rounds that involve the responsible prescriber and that provide an opportunity for the rounding pharmacist to present relevant pharmacy information or perform interventions to influence patient care. The rounds may or may not include the patient or the patient's caregivers. This definition excludes brief rounds where the intent is only to share information, without making any decisions. An example of the latter would be "bullet rounds", in which a brief (e.g., 1- to 2-minute) summary is given for each patient about his or her current status or discharge plans.

Interprofessional team: "[A] group of people from different provider backgrounds that works with clients and families to meet jointly established goals. Team members include regulated and unregulated health providers, clients, family members, other care givers and others within the circle of care necessary for the patient's/client's achievement of his or her goals."¹⁵

Medication management: "...patient-centred care to optimize safe, effective and appropriate drug therapy. Care is provided through collaboration with patients and their health care teams."¹⁷

Patient: Person admitted to hospital or his or her agent (e.g., parent, guardian).

cont'd



Patient education at discharge: Comprehensive education to ensure patient's adherence to the treatment plan on transition out of the acute care setting. Such education may include a schedule for postdischarge medications, a summary of changes from the preadmission medication regimen, and education about new medications.

Patient education during hospital stay: Education that is specific to a disease or drug which is provided in an interactive manner (e.g., face-to-face, via telephone or video) given to either the patient or the patient's agent (e.g., parent, guardian).

Pharmaceutical care: Pharmaceutical care is a patient-centred "practice in which the practitioner takes responsibility for the patient's drug-related needs, and is held accountable for this commitment."¹⁴

Pharmaceutical care plan: A treatment plan that is founded on pharmaceutical care and which is developed according to standards of care. The plan includes all of the following activities:

- > establishing goals of therapy,
- > determining interventions to prevent or resolve DTPs, and
- > scheduling follow-up monitoring.¹⁴

Appendix B: Relevant Notes from Key Papers

Bond and Raehl 2007: Clinical pharmacy services and mortality	
Citation	Design
<p>Bond CA, Raehl CL. Clinical pharmacy services, pharmacy staffing, and hospital mortality rates. <i>Pharmacotherapy.</i> 2007;27(4):481-93.</p>	<ul style="list-style-type: none"> • Observational • Retrospective (based on Medicare mortality data) • Location: United States • Timeframe: 1998
Study objective	Eligibility criteria
<p>Extrapolated practice question:</p> <ul style="list-style-type: none"> • What specific pharmacist-led activities are associated with reductions in patient mortality rates? <p>Study objective:</p> <ul style="list-style-type: none"> • “To determine if hospital-based clinical pharmacy services and pharmacy staffing continue to be associated with mortality rates” <ul style="list-style-type: none"> • A previous study of the same methodology (published in 1999) found that 4 clinical pharmacy services were associated with lower mortality rates: clinical research, drug information, admission drug histories, and participation on the cardiopulmonary resuscitation (CPR) team 	<p>Inclusion:</p> <ul style="list-style-type: none"> • General medical-surgical hospitals (n = 885) that had Medicare mortality data • All patients (n = 2,836,991) in the included hospitals <p>Exclusion:</p> <ul style="list-style-type: none"> • Pediatric, psychiatric, alcohol and drug rehabilitation, and rehabilitation hospitals <p>Baseline characteristics:</p> <ul style="list-style-type: none"> • Unit of comparison was the hospital or the pharmacy services provided at the hospital, but baseline characteristics of hospitals were not provided
Comparison	Targeted outcomes
<p>Comparator:</p> <ul style="list-style-type: none"> • Hospitals that had a particular clinical pharmacy service, out of the following 14 possible clinical pharmacy services: <ul style="list-style-type: none"> • Centrally delivered services: drug-use evaluation, in-service education, drug information, poison information, clinical research • Patient-specific services: monitoring of adverse drug reactions, pharmacokinetic consultations, drug therapy monitoring, drug protocol management, participation on total parenteral nutrition team, drug therapy counselling, participation on CPR team, participation on medical rounds, admission drug histories • Pharmacy staffing variables were also compared <ul style="list-style-type: none"> • Pharmacists, pharmacy administrators, distribution pharmacists, clinical pharmacists, pharmacy technicians <p>Control:</p> <ul style="list-style-type: none"> • Hospitals that did not have a particular clinical pharmacy service, out of the 14 possible clinical pharmacy services 	<p>Primary outcome:</p> <ul style="list-style-type: none"> • In-hospital mortality (inferred; not clearly stated that the reported measure refers to deaths occurring during the hospital admission) <p>Statistical analysis:</p> <ul style="list-style-type: none"> • Adjusted for severity of illness, using 2 validated variables that were available from national databases (annual number of emergency department visits/ average daily census and number of Medicaid admissions/total number of admissions) • Correlation and multiple regression methods • Weighted least squares regression used to estimate and test relationships between clinical pharmacy services and pharmacy staffing levels and observed mortality rates

Main results	Authors' conclusions
<ul style="list-style-type: none"> • 7 clinical pharmacy services were significantly correlated with reduced mortality rates: <ol style="list-style-type: none"> 1. Admission drug histories 2. Participation on CPR team 3. Participation on medical rounds 4. In-service education 5. Drug protocol management 6. Monitoring of adverse drug reactions 7. Drug-use evaluation • Increased staffing levels of 2 pharmacy staffing variables were significantly correlated with reduced mortality rates: <ol style="list-style-type: none"> 1. Staffing levels of administrative pharmacists 2. Staffing levels of clinical pharmacists • Breakdown by hospital showed that admission drug histories accounted for the largest proportion of reduction in deaths, followed by participation on the CPR team and on medical rounds 	<ul style="list-style-type: none"> • “The number of clinical pharmacy services and staffing variables associated with reduced mortality rates increased from 2 in 1989 to 9 in 1998” • “The impact of clinical pharmacy on mortality rates mandates consideration of a core set of clinical pharmacy services to be offered in US hospitals” • “These results have important implications for health care in general, as well as for our profession and discipline”
Strengths	Limitations
<ul style="list-style-type: none"> • Large sample size (885 hospitals, representing > 2 million patients) • Meaningful level 1 patient outcome, according to criteria of the Agency for Healthcare Research and Quality (AHRQ): primary outcome was mortality • Examined impact of variables related to pharmacy staffing • Adjusted for severity of illness • Transparency in reporting data (provided r ratios) • Examined impact of clinical pharmacy services over time (through update of an older study) 	<ul style="list-style-type: none"> • Exact details of mortality outcome not specified (may have been 1-year in-hospital mortality rate) • Adjusted only for severity of illness and not other possible confounders (e.g., patient acuity, reason for admission) • Risk of self-reporting bias <ul style="list-style-type: none"> • Information about clinical pharmacy services provided by each hospital was obtained by self-reported survey • Study used self-reported estimation rather than an independent measure of frequency and quality of services • Unclear what proportion of patients in each hospital actually received each clinical pharmacy service • Survey recorded only whether or not the hospital provided the service • Measure did not account for scope and volume of services provided • Did not examine impact of nonpharmacy variables on mortality rate • Unclear from this publication how the list of clinical pharmacy services under observation was obtained

cont'd

	<ul style="list-style-type: none"> • Represents data up to 1998; <ul style="list-style-type: none"> • In an era before full implementation of pharmaceutical care, this study looked at discrete clinical pharmacy services • Only a few of the 14 clinical pharmacy services were amenable to the pharmaceutical care approach • Limited generalizability <ul style="list-style-type: none"> • Included hospitals from US healthcare system only • Did not report hospital-level data <p>Points for consideration</p> <ul style="list-style-type: none"> • Large variation in number of hospitals with each designated pharmacy service • Observational design, so results could be affected by confounders <ul style="list-style-type: none"> • Different patient morbidities have different inherent risks for in-hospital death
<p>How does this study inform the cpKPI selection process?</p>	<p>What are the patterns (similarities and differences) compared with other key papers?</p>
<ul style="list-style-type: none"> • This study associated certain clinical pharmacy services with a reduction in mortality rates • Findings suggested that staffing variables may be linked to the particular clinical pharmacy services provided, as well as being associated with patient outcomes • This study focused on clinical pharmacy services, not distribution activities <ul style="list-style-type: none"> • In this context, staffing of distribution pharmacists was not significantly correlated with reduced mortality rates, whereas clinical pharmacist staffing was • Results support extrapolation of use of cpKPIs to measure quality • This study was hypothesis-generating; it provides a focus for future studies with different designs (e.g., randomized controlled trials) 	<ul style="list-style-type: none"> • This was the only study to look at the association between pharmacist staffing and patient outcomes • This was the only observational study among the 6 key papers <p>Chisholm-Burns et al.</p> <ul style="list-style-type: none"> • Both studies looked at US patients only • Bond and Raehl focused on a set of clinical pharmacy services, whereas Chisholm-Burns et al. focused on outcomes • Bond and Raehl looked at a level 1 AHRQ outcome, whereas Chisholm-Burns et al. considered all levels of outcomes <p>Bond and Raehl focused on inpatients, whereas Chisholm-Burns et al. had a broader focus that included outpatients (in 65% of included studies)</p> <p>Gillespie et al.</p> <ul style="list-style-type: none"> • 2 of the clinical pharmacy services identified by Bond and Raehl were incorporated into the intervention studied by Gillespie et al.: admission drug histories and participation on medical rounds • Gillespie et al. emphasized holistic, patient-centred pharmaceutical care, whereas Bond and Raehl focused on clinical pharmacists' activities
cont'd	



Kaboli

- Bond and Raehl identified 7 clinical pharmacy services that positively affected patient outcomes, whereas Kaboli et al. identified 5 services that had a positive effect
- 2 of the services identified in each study were the same: admission drug histories and participation on medical rounds

Makowsky et al.

- 2 of the clinical pharmacy services identified by Bond and Raehl were incorporated into the intervention studied by Makowsky et al.: admission drug histories and participation on medical rounds
- Makowsky et al. emphasized patient-centred pharmaceutical care, whereas Bond and Raehl made no mention of this approach

Bruchet et al. 2011: quality of clinical pharmacy services	
Citation	Design
Bruchet N, Loewen P, de Lemos J. Improving the quality of clinical pharmacy services: a process to identify and capture high-value “quality actions”. <i>Can J Hosp Pharm.</i> 2011;64(1):42-7.	Pharmacy practice quality improvement research paper
Study objectives	Proposed process intervention
<p>Background:</p> <ul style="list-style-type: none"> “Despite the widespread use of quality indicators to improve health services, the pharmacy profession has not widely adopted this concept for quality improvement in the clinical realm” “As pharmacists, we need to redefine what we need to be doing, find out whether we are doing it, and then use this information to find areas to improve” It is appropriate to focus on doing the right things (those actions that have been shown by randomized controlled trials to improve patient outcomes), doing them more often, and measuring how often they are done <p>Objective:</p> <ul style="list-style-type: none"> To define a new concept called “quality actions” and to describe a process to identify high-value quality actions for specific patient populations 	<ul style="list-style-type: none"> Quality action = an action that is needed to achieve a standard of care for specific conditions Pharmacists can develop a panel of quality actions which they have customised for the specific patient population they serve By anticipating the medical conditions that are prevalent in specific populations, pharmacists can develop quality actions 4 criteria for quality: evidence base, effectiveness, safety, and efficiency. The efficiency criterion has 2 subcriteria: modifiability – “processes or outcomes that pharmacists can reasonably be expected to alter” and reliance on pharmacists to perform – “activities that the pharmacist needs to do for the patient, as opposed to activities that could be done by others on the team.” Once a candidate panel of quality actions has been generated, each action can be evaluated according to its value index: <ul style="list-style-type: none"> Value index allows pharmacists to prioritize their efforts Value index = $\frac{(\text{prevalence of problem in patient population} \times \text{quality aggregate})}{(\text{effort required to manage})}$ Effort can be reduced by incorporating actions into protocols
Anticipated benefits of a panel of quality actions	Authors’ conclusions
<ul style="list-style-type: none"> Integrating a panel of high-value quality actions into daily care would allow new evidence to be immediately translated into practice Would support professional development and accountability 	<ul style="list-style-type: none"> “Using a quality improvement model based on “quality actions” may represent a significant improvement over [drug-related problem]- and workload-based methods to guide and improve the delivery of care by pharmacists”
<i>cont’d</i>	

<ul style="list-style-type: none"> • Might motivate pharmacists to increase effort in certain tasks • Pharmacists and pharmacy managers could make more informed decisions about resource allocation, because the patient's needs, in terms of pharmacists' actions, will have been defined 	<ul style="list-style-type: none"> • "Pharmacist teams can use the value index to design and prioritize their own panels of quality actions" • "Further work is needed to collaboratively develop population-specific panels and efficient documentation and reporting processes and to determine whether pharmacists and managers consider this an improved process"
Strengths of a panel of quality actions	Limitations of a panel of quality actions
<p>From author:</p> <ul style="list-style-type: none"> • Provides a practical approach for introducing quality actions in a hospital pharmacy practice setting • Links clinical pharmacist activities to quality and evidence, which can help when making decisions about resource allocation 	<p>From author:</p> <ul style="list-style-type: none"> • Quality actions target specific interventions for medical conditions or elements of practice; as a consequence, less anticipated and as-yet-undefined high-value quality actions may be missed • Focusing on defined quality actions could divert effort from other important but undefined activities • Quality actions are not "denominator-oriented"; they "do not support measurement of the proportion of times an intervention is appropriately performed within an eligible population" • Missed opportunities to perform quality actions are not visible
How does this study inform the cpKPI selection process?	What are the patterns (similarities and differences) compared with other key papers?
<ul style="list-style-type: none"> • The criteria recommended to measure the quality of pharmacist services (i.e., quality actions) bear similarities to the proposed cpKPI definition: <ul style="list-style-type: none"> • evidence base, desired quality practice, pharmacist-sensitive metric with a link to direct patient care • Introduces the concept of a value index, which can be used to prioritize pharmacists' efforts in performing quality actions • Despite authors' statement that "using a quality improvement model based on 'quality actions' may represent a significant improvement over [drug-related problem]- and workload-based methods", this model may actually serve to complete such measures, rather than replace them • Systematic process used in this study may help the working group to quickly identify specific clinical interventions for the disease-specific cpKPIs included in the final suite 	<p>Chisholm-Burns et al, Gillespie et al., and Makowsky et al.:</p> <ul style="list-style-type: none"> • These 3 studies generally support the conclusion that an evidence base is required when developing quality actions

Chisholm-Burns et al. 2010: Pharmacists as team members

Citation	Design
<p>Chisholm-Burns MA, Kim LJ, Spivey CA. US pharmacists' effect as team members on patient care: systematic review and meta-analyses. <i>Med Care.</i> 2010;48(10):923-33.</p>	<ul style="list-style-type: none"> • Systematic review • Meta-analyses • n = 298 studies • Location: United States • Language: English only • Timeframe: variable, according to start of literature database (from 1900–2000 to January 2009)
Study objective	Eligibility criteria
<p>Extrapolated practice question:</p> <ul style="list-style-type: none"> • What are the effects of pharmacist-provided direct patient care on therapeutic, safety, and humanistic outcomes? <p>Study objective:</p> <ul style="list-style-type: none"> • “To conduct a comprehensive systematic review with focused meta-analysis to examine the effects of pharmacist-provided direct patient care on therapeutic, safety, and humanistic outcomes” 	<p>Inclusion:</p> <ul style="list-style-type: none"> • Studies reporting evidence of pharmacist involvement in direct patient care (i.e., able to discern pharmacist contribution), with comparison group present and patient-related therapeutic, safety, or humanistic outcomes reported <p>Exclusion:</p> <ul style="list-style-type: none"> • Non-US studies, systematic reviews, meta-analyses, clinical drug trials, commentaries, editorials, case studies, guidelines, theses <p>Search process:</p> <ul style="list-style-type: none"> • Team of medical librarians assisted with search, using standardized search terms in multiple databases • Systematic search performed by 2 independent teams each consisting of a pharmacist and a social scientist
Data extraction	Data synthesis and analysis
<p>Possible outcomes for each study:</p> <ul style="list-style-type: none"> • Favourable: indicative of significant improvement following pharmacist-provided intervention ($p < 0.05$) • Not favourable indicative of significant improvement following invention provided by someone other than a pharmacist (conventional care) ($p < 0.05$) • Mixed: some study variables show favourable results, whereas others were not favourable or had no effect • No effect ($p > 0.05$) • Unclear result <p>Hierarchy of study outcomes (based on an adaptation of the hierarchy of outcomes developed by the Agency for Healthcare Research and Quality [AHRQ]):</p> <ul style="list-style-type: none"> • Level 1: clinical and quality-of-life (QOL) outcomes (e.g., mortality, morbidity, adverse events) 	<p>Data synthesis:</p> <ul style="list-style-type: none"> • Data extraction performed by 2 independent teams of interprofessional reviewers <p>Data analysis:</p> <ul style="list-style-type: none"> • Used random effects model, to address study heterogeneity • Heterogeneity was investigated using the Q statistic; if the results were statistically significant, the effects were examined after removal of the study that largely influenced the heterogeneity • Studies were weighted according to sample size • Funnel plot was constructed for each meta-analysis to determine publication bias • Quality of individual studies was assessed using Jadad scale

cont'd

<ul style="list-style-type: none"> • Level 2: surrogate outcomes (e.g., blood glucose, blood pressure, cholesterol) • Level 3: variables with indirect or unestablished connection to target outcome (e.g., information about medication or disease state) • Level 4: indirect variables (e.g., patient satisfaction, potential adverse events) 	
Main results	Authors' conclusions
<p>Studies:</p> <ul style="list-style-type: none"> • Therapeutic outcomes, n = 224 studies; safety outcomes, n = 73 studies; humanistic outcomes, n = 120 studies; multiple outcome areas, n = 105 studies • 48.3% of all studies reported AHRQ level 1 outcomes <p>Therapeutic outcomes:</p> <ul style="list-style-type: none"> • HbA1C (n = 6 studies): mean difference -1.8% (standard deviation [SD] 0.5%, 95% CI -2.7% to -0.9%) • Low-density-lipoprotein (LDL) cholesterol (n = 8 studies): mean difference -6.3 mg/dL (SD 0.12 mg/dL, 95% CI -6.5 to -6.0 mg/dL); equivalent to -0.163 mmol/L • Blood pressure (BP) (n = 14 studies): mean difference for systolic BP -7.8 mm Hg (SD 1.5 mm Hg, 95% CI -9.7 to -5.8 mm Hg); mean difference for diastolic BP -2.9 mm Hg (SD 0.7 mm Hg, 95% CI -3.8 to -2.0 mm Hg) <p>Safety outcomes:</p> <ul style="list-style-type: none"> • Signification reduction (by 47%) in odds of adverse drug events for intervention vs. comparison group ($p = 0.01$) <p>Humanistic outcomes:</p> <ul style="list-style-type: none"> • Significant results favouring pharmacists' interventions were found in 3 of 6 meta-analyses: medication adherence, patient knowledge, and QOL general health • No significant difference in patient satisfaction, QOL physical functioning, or QOL mental health 	<ul style="list-style-type: none"> • "Pharmacist-provided direct patient care has favourable effects across various patient outcomes, health care settings, and disease states" • "Incorporating pharmacists as health care team members in direct patient care is a viable solution to help improve US health care"

Strengths of study	Limitations of study
<ul style="list-style-type: none"> • Rigorous systematic review methodology <ul style="list-style-type: none"> • Systematic, comprehensive literature search • Independent study selection and data extraction by interprofessional team • Inclusion of controlled trials only • Reporting of study characteristics <p>Robust meta-analysis methodology</p> <ul style="list-style-type: none"> • Used random effects model • Assessed quality of included studies using Jadad score • Investigated effect of publication bias • Measured the effect size for each meta-analysis 	<ul style="list-style-type: none"> • Minimal clarity about specific interventions required to achieve outcomes <ul style="list-style-type: none"> • Detailed account of actual pharmacist intervention was not provided, only outcomes • Limited generalizability <ul style="list-style-type: none"> • Included US studies only • Outcomes reflected best practices in 2010, but best practices change with time • Differences among studies in terms of pharmacist activities • Number of patients for each study and in the meta-analysis was not stated • Non-randomized studies were included in the systematic review <p>Points for consideration</p> <ul style="list-style-type: none"> • Significant heterogeneity for some outcomes • Data were pooled and meta-analyses performed only for the most frequently reported outcomes • Majority of studies did not report power or sample size analysis
How does this study inform the cpKPI selection process?	What are the patterns (similarities and differences) compared with other key papers?
<ul style="list-style-type: none"> • Shows some of the outcomes that can be positively affected by pharmacists • Did not provide detailed account of what specific patient care activities performed by pharmacists were used to produce these outcomes • Findings may not support a specific pharmacist patient care activity, but rather highlight that pharmacist involvement in direct patient care in general improves certain patient outcomes (i.e., HbA1C, BP, LDL cholesterol) • Extrapolation of findings may highlight 3 specific areas of focus, with stronger evidence of pharmacist impact: diabetes mellitus, hyperlipidemia, and hypertension • Suggests that pharmacists can affect all AHRQ-defined levels of patient outcomes 	<ul style="list-style-type: none"> • Chisholm-Burns et al. was the only study to look at and report favourable effects on AHRQ-defined level 2 outcomes • Chisholm-Burns et al. was the only study to look at both inpatients and outpatients (65% of studies) <p>Bond and Raehl</p> <ul style="list-style-type: none"> • Both studies looked at US patients only • Bond and Raehl focused on a set of clinical pharmacy services, whereas Chisholm-Burns et al. focused on outcomes <p>Chisholm-Burns et al. considered all levels of outcomes, whereas Bond and Raehl looked only at a level 1 outcome</p> <p>Gillespie et al.</p> <ul style="list-style-type: none"> • Gillespie et al. considered only AHRQ-defined level 1 patient outcomes, whereas Chisholm-Burns et al. considered all AHRQ-defined levels of outcomes

cont'd



Kaboli et al.

- Chisholm-Burns et al. had similar inclusion criteria, but only required evidence of pharmacist involvement in direct patient care, whereas Kaboli et al. defined a list of specific clinical interventions that were required for a study to be included
- Chisholm-Burns et al. had a similar focus on direct patient outcomes, including therapeutic, safety, and humanistic outcomes, although scope of outcomes was broader than that of outcomes studied by Kaboli et al.

Makowsky et al.

- Quality score consisted of best practice interventions that could produce some of the level 1 and 2 outcomes highlighted by Chisholm-Burns et al.
 - Like Chisholm-Burns et al., Makowsky et al. found that pharmacists had a positive impact for patients with diabetes mellitus
 - Unlike Chisholm-Burns et al., Makowsky et al. found that pharmacists had a positive impact in patients with community-acquired pneumonia and chronic obstructive pulmonary disease

Gillespie et al. 2009: Pharmacist intervention to reduce morbidity

Citation	Design
<p>Gillespie U, Alassaad A, Henrohn D, Garmo H, Hammarlund-Udenaes M, Toss H, et al. A comprehensive pharmacist intervention to reduce morbidity in patients 80 years or older: a randomized controlled trial. <i>Arch Intern Med.</i> 2009;169(9):894-990.</p>	<ul style="list-style-type: none"> • Prospective • Randomized controlled trial (RCT) • Blinding of evaluators during data analysis, but no blinding of patients or clinicians • Single centre • n = 368 patients • Location: Sweden • Duration: October 2005 – June 2006 • Follow-up: 12 months
Study objective	Eligibility criteria
<p>Extrapolated practice question:</p> <ul style="list-style-type: none"> • Does pharmacist-led comprehensive pharmaceutical care reduce morbidity (and other meaningful patient outcomes) for elderly hospitalized patients? <p>Study objective:</p> <ul style="list-style-type: none"> • “To investigate the effectiveness of interventions performed by ward-based pharmacists in reducing morbidity and use of hospital care among older patients” 	<p>Inclusion:</p> <ul style="list-style-type: none"> • Patients 80 years or older from 2 acute internal medicine wards at University Hospital of Uppsala in Sweden <p>Exclusion:</p> <ul style="list-style-type: none"> • Patients previously admitted to the study wards during the study period and those with scheduled admissions <p>Baseline characteristics:</p> <ul style="list-style-type: none"> • Table 1 of the study report shows all important criteria <p>Control and intervention groups were similar, with 2 exceptions: intervention group had higher mean number of medications (8.7 vs. 7.3), and more patients in this group had a history of cerebrovascular lesions (20.9% vs. 10.2%)</p>
Intervention	Targeted Outcomes
<p>Intervention:</p> <ul style="list-style-type: none"> • Pharmacists were decentralized and part of ward-based healthcare team • 3 pharmacists received a 10-week training course on pharmaceutical care, and subsequently provided pharmaceutical care and enhanced services: <ul style="list-style-type: none"> • Compiling a comprehensive list of current medications on admission • Performing drug review and advising the patient’s physician on drug selection, dosages, and monitoring needs 	<p>Primary outcome:</p> <ul style="list-style-type: none"> • Frequency of hospital visits (including both emergency department visits and readmissions [total and drug-related]) during the 12-month follow-up period. <p>Secondary exploratory outcome:</p> <ul style="list-style-type: none"> • Cost of hospital care <p>Statistical analysis:</p> <ul style="list-style-type: none"> • Used per-protocol-analysis, whereby patients who dropped out or died after randomization were excluded from analysis

cont’d

<ul style="list-style-type: none"> • Educating and monitoring patients throughout the admission process • Providing discharge counselling to patients • Conducting a follow-up phone call to patients at 2 months postdischarge <p>Control:</p> <ul style="list-style-type: none"> • Standard of care provided, without pharmacist involvement in healthcare team at ward level 	<ul style="list-style-type: none"> • Did not perform intention-to-treat or sensitivity analysis to determine whether the type of analysis made a difference
Main results	Authors' conclusions
<ul style="list-style-type: none"> • 482 patients eligible, 400 consented to participate • 17 patients from intervention group and 15 from control group dropped out or died during index admission • Intervention, n = 182 patients; control, n = 186 patients • 16% reduction in postdischarge hospital visits in intervention group vs. control (intervention, 266 visits; control, 316 visits; quotient 1.88 vs. 2.24, 95% CI 0.72–0.99) • 47% decline in emergency department visits in intervention group vs. control (intervention, 49 visits; control, 93 visits; quotient 0.35 vs. 0.66, 95% CI 0.37–0.75) • 80% reduction in drug-related readmission in intervention group vs. control (intervention, 9 visits; control, 45 visits; quotient, 0.06 vs. 0.32, 95% CI 0.10–0.41) • No significant difference in readmissions between groups • No significant difference in the number of patients who died • Number needed to treat = 12 index visits with intervention applied to prevent 1 postdischarge hospital visit <p>Secondary:</p> <ul style="list-style-type: none"> • Total cost per patient was US\$230 lower in intervention group than in the control group (after inclusion of intervention costs) 	<p>“If implemented on a population basis, the addition of pharmacists to health care teams would lead to major reductions in morbidity (hospitalizations) and health care costs”</p>
Strengths	Limitations
<ul style="list-style-type: none"> • RCT linked to meaningful level 1 patient outcome, as defined by Agency for Healthcare Research and Quality (AHRQ) (primary outcome was hospital visits) • Large number of patients (n = 368) 	<ul style="list-style-type: none"> • Limited generalizability <ul style="list-style-type: none"> • Patients 80 years and older only • Single-centre study • Swedish healthcare system
<i>cont'd</i>	

<ul style="list-style-type: none"> • Unit of randomization was patient, not ward or team • Long follow-up (12 months) • Comprehensive intervention • Pharmacists in the intervention group used standard operating procedures which were developed and peer reviewed during the pilot study • Intervention was described in enough detail to replicate; time commitment was logged • Intervention was practical and authentic to the services that pharmacists desire to provide 	<ul style="list-style-type: none"> • Risk of contamination of control group <ul style="list-style-type: none"> • Physicians may have learned intervention over time and provided it to controls • Not powered to detect a difference in readmissions alone • Performed per-protocol analysis, but did not perform intention-to-treat as a sensitivity analysis, to see if type of analysis affected the results • Bundled intervention • Difficult to discern independent effect of each critical element within the bundle
<p>How does this study inform the cpKPI selection process?</p>	<p>What are the patterns (similarities and differences) compared with other key papers?</p>
<ul style="list-style-type: none"> • One of only a few RCTs (not quasi-RCT) examining impact of pharmaceutical care on hospitalized inpatients • Intervention was a bundle of critical elements, which represented comprehensive pharmacist services provided to patients from admission to discharge • Highlights the impact of pharmacists as part of the healthcare team, and their influence on patient outcomes • Within a healthcare team, potential cpKPIs vary in terms of their “pharmacist-centricity” and to what extent a pharmacist can affect that metric • Pharmacist-led pharmaceutical care may reduce postdischarge hospital visits even 12 months after discharge, but we must be cautious of the true influence of the intervention on outcomes over such a long period of time • Patients received the critical elements as a bundle, which included pharmaceutical care and services such as medication reconciliation, drug review to identify and resolve drug therapy problems, patient education and monitoring, discharge counselling, and a 2-month postdischarge follow-up phone call to patient • The independent critical elements used in this study may serve as surrogate markers for reduced hospital visits (e.g., patient discharge counselling) • Caution is required in extrapolating the results of this study to other age groups (i.e., patients < 80 years old) 	<ul style="list-style-type: none"> • 1 of 2 RCTs (the other is Makowsky et al.) out of the 6 key papers <p>Makowsky et al.</p> <ul style="list-style-type: none"> • Makowsky et al. used a similar intervention, consisting of best possible medication history (BPMH), medication reconciliation at admission and discharge, participation on patient care rounds, resolution of drug therapy problems, and discharge counselling <ul style="list-style-type: none"> • Appears to support the impact of these pharmacist services in the Canadian setting • Unlike the intervention described by Makowsky et al., the intervention used by Gillespie et al. included a follow-up phone call, which may have prolonged the effect of the intervention (there was no significant difference in 6-month readmissions in the Makowsky et al. trial) • Both studies followed the pharmaceutical care process; however, Gillespie et al. sent pharmacists for standardized pharmaceutical care training, which increased the likelihood of a consistent approach <p>Kaboli et al.</p> <ul style="list-style-type: none"> • Systematic review by Kaboli et al. suggested improved patient outcomes with pharmacist services (the “Kaboli 5”: participating on rounds with other healthcare professionals; interviewing patients; Reconciling medications; Providing discharge education; providing post-discharge following up) • Results appear to support the conclusions drawn by Kaboli et al. regarding patient outcomes

cont'd



- This study showed that inpatient pharmaceutical care resulted in overall cost savings to the healthcare system, but only a limited, crude pharmacoeconomic analysis was performed, so the results must be interpreted with caution

Bond and Raehl

- 2 of the 7 clinical pharmacy services identified by Bond and Raehl were incorporated into the intervention used by Gillespie et al. (admission drug histories and participation on medical rounds)
- Gillespie et al. emphasized patient-centred pharmaceutical care, whereas Bond and Raehl did not mention this approach

Chisholm-Burns et al.

- Chisholm-Burns systematic review and meta-analyses considered all levels of outcomes, while Gillespie only looked at AHRQ level 1 outcomes (hospital visits)

Kaboli et al. 2006: Inpatient medical care	
Citation	Design
Kaboli PJ, Hoth AB, McClimon BJ, Schnipper JL. Clinical pharmacists and inpatient medical care: a systematic review. <i>Arch Intern Med.</i> 2006;166(9):955-64.	<ul style="list-style-type: none"> • Qualitative systematic review of 346 publications • n = 36 studies (met inclusion criteria) • Location: worldwide • Language: English only • Timeframe: January 1985 – April 2005
Study objective	Eligibility criteria
<p>Extrapolated practice question:</p> <ul style="list-style-type: none"> • What specific patient care activities performed by clinical pharmacists in a hospital setting result in improved patient outcomes? <p>Study objective:</p> <ul style="list-style-type: none"> • “To evaluate the published literature on the effects of interventions by clinical pharmacists on processes and outcomes of care in hospitalized adults” <p>Inclusion:</p>	<ul style="list-style-type: none"> • Published English-language studies • Description of pharmacy service or intervention (i.e., cognitive service not routinely associated with dispensing or compounding) • Control group used, and objective patient-specific health outcomes reported <p>Exclusion:</p> <ul style="list-style-type: none"> • Studies presented only in abstracts, letters to the editor, editorials, surveys, reviews, pediatric studies, studies with primary intervention occurring in ambulatory setting, observational studies. and studies without a comparison or control group • Studies reporting only pharmacoeconomic outcomes, and services occurring as part of guideline or protocol implementation or provider education <p>Search process:</p> <ul style="list-style-type: none"> • Medical librarian assisted with the search, using standardized search terms in MEDLINE and International Pharmaceutical Abstracts (IPA) • Systematic search for study inclusion performed by 3 independent reviewers • No mention of methods for data extraction and analysis
Main results	Authors’ conclusions
<p>Studies:</p> <ul style="list-style-type: none"> • Of the 346 publications identified, 36 met the inclusion criteria. The 36 studies were grouped according to primary type of clinical pharmacist service • Participation of patient care unit pharmacist on medical rounds (n = 10 studies) • Admission or discharge medication reconciliation (n = 11 studies) 	<ul style="list-style-type: none"> • “The addition of clinical pharmacist services in the care of inpatients generally resulted in improved care, with no evidence of harm” • “Interacting with the health care team on patient rounds, interviewing patients, reconciling medications, and providing patient discharge counselling and follow-up all resulted in improved outcomes.”

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<ul style="list-style-type: none"> • Drug class-specific pharmacist services, including anticoagulation services, infectious disease consults, and therapeutic drug monitoring (n = 15 studies) <p>Results, presented in the form of select statements representing key generalizations from the qualitative review</p> <ul style="list-style-type: none"> • Adverse drug events (ADEs), adverse drug reactions (ADRs), or medication errors were reduced in 7 of 12 studies that examined these outcomes • Medication adherence, knowledge, and appropriateness improved in 7 of 11 studies that examined these outcomes • Decreased length of stay in 9 of 17 trials that examined this outcome • No intervention led to worse clinical outcomes, and only 1 study reported higher healthcare use among patients who received the intervention • Identified the “Kaboli 5”: <ol style="list-style-type: none"> 1. Participating on rounds with other healthcare professionals 2. Interviewing patients 3. Reconciling medications 4. Providing discharge education 5. Providing post-discharge following up • interacting with the healthcare team on patient care rounds, interviewing patients, reconciling medications, providing patient discharge counselling, and providing follow-up 	<ul style="list-style-type: none"> • “Future studies should include multiple sites, larger sample sizes, reproducible interventions, and identification of patient-specific factors that lead to improved outcomes”
<p>Strengths</p>	<p>Limitations</p>
<ul style="list-style-type: none"> • Focused methodology (given the challenge of heterogeneous studies included in this qualitative review) <ul style="list-style-type: none"> • Thorough, systematic search strategy • 3 independent literature reviewers (a mixed group of physicians and pharmacists) • Only controlled trials were included • Only studies involving inpatients were included • Written by a mixed group of physicians and pharmacists (i.e., was not an introspective pharmacist assessment) 	<p>Individual studies included in the review were heterogeneous:</p> <ul style="list-style-type: none"> • Range of sample sizes, many small studies • All included studies were single-centre studies (no multi-centre studies) • Various study designs and interventions • Various endpoints and measures <p>Methodology of systematic review:</p> <ul style="list-style-type: none"> • Included nonrandomized studies • Included retrospective assessments

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<ul style="list-style-type: none"> Balanced examination of risks and benefits <ul style="list-style-type: none"> Searched not only for studies that showed benefit with pharmacist services, but also for those that showed harm, increased resource usage, or no effect 	<ul style="list-style-type: none"> Did not describe method for data extraction and did not indicate whether the data extraction was independently reviewed Few of the included studies assessed level 1 and 2 clinical outcomes, as defined by the Agency for Healthcare Research and Quality <ul style="list-style-type: none"> Mortality (n = 8 out of 36 studies) Readmission Differing outcome measures and definitions (ADEs, ADRs, medication errors) Included only published trials Included only English-language study reports Included only studies published between 1985 and 2005, so many key studies done after 2005 were missing
<p>How does this study inform the cpKPI selection process?</p>	<p>What are the patterns (similarities and differences) compared with other key papers?</p>
<ul style="list-style-type: none"> Highlights general areas of pharmacy practice or clinical services that may affect patient outcomes, as extracted from a heterogeneous literature Hypothesis-generating study, showing which clinical pharmacy services can be linked to evidence Identifies 5 areas that could be the basis for developing candidate cpKPIs Identifies disease-specific services (not just drug-specific services) as being important 	<ul style="list-style-type: none"> Identified the “Kaboli 5”: <ul style="list-style-type: none"> Participating on rounds with other healthcare professionals Interviewing patients Reconciling medications Providing discharge education Providing post-discharge following up <p>Gillespie et al.</p> <ul style="list-style-type: none"> The intervention used by Gillespie et al. incorporated these elements of the Kaboli 5 within the framework of a pharmaceutical care model, from admission to discharge <ul style="list-style-type: none"> Providing discharge education (Providing discharge counselling to patients) Providing post-discharge following up (Conducting a follow-up phone call to patients at 2 months postdischarge) Showed a decrease in postdischarge hospital visits Appeared to support the conclusions drawn by Kaboli et al. regarding patient outcomes in a randomized controlled trial (RCT)
<p><i>cont'd</i></p>	



Makowsky et al.

- The intervention studied by Makowsky et al. incorporated these elements of the Kaboli 5:
 - participating on rounds with other healthcare professionals
 - reconciling medications (at admission and discharge)
 - providing discharge education
- Showed a decrease in 3-month hospital readmissions and improved quality scores (representing best practices) with intervention
- Appeared to support the conclusions drawn by Kaboli et al. regarding patient outcomes in an RCT in a Canadian healthcare setting

Bond and Raehl

- Bond and Raehl identified 7 clinical pharmacy services that positively affected patient outcomes, whereas Kaboli et al. identified 5 services
- 2 out of the 5 services identified by Kaboli et al. overlapped with those of Bond and Raehl:
 - admission drug histories
 - participation on medical rounds

Chisholm-Burns et al.

- Chisholm-Burns et al. used similar inclusion criteria, but Kaboli et al. defined a list of specific clinical interventions (listed in their Table 1) necessary for inclusion, whereas Chisholm-Burns et al. only required evidence of pharmacists' involvement in direct patient care
- The 2 studies had a similar focus on direct patient outcomes, including therapeutic, safety, and humanistic outcomes, although the Chisholm-Burns et al. study had a broader scope
- Unlike Chisholm-Burns et al., Kaboli et al. considered only inpatient pharmacist activities

Makowsky et al. 2009: Pharmacists on rounds (COLLABORATE study)	
Study	Design
<p>Makowsky MJ, Koshman SL, Midodzi WK, Tsuyuki RT. Capturing outcomes of clinical activities performed by a rounding pharmacist practicing in a team environment: the COLLABORATE study. <i>Med Care.</i> 2009;47(6):642-50.</p>	<ul style="list-style-type: none"> • Prospective • Controlled trial (quasi-randomized) • Randomized by team • Blinding of chart reviewer who assigned overall quality scores, but no blinding of patients or clinicians • Multicentre (3 hospitals) • n = 452 patients • Location: Alberta, Canada • Duration: January 2006 – February 2007 • Follow-up: 12 months
Study objective	Eligibility criteria
<p>Extrapolated practice question:</p> <ul style="list-style-type: none"> • Does collaborative care, including a team-based clinical pharmacist, improve the quality of prescribed drug therapy and reduce hospital readmission rates? <p>Study objective:</p> <ul style="list-style-type: none"> • “To examine and validate a number of ‘core’ clinical pharmacy services in a Canadian population by determining the impact of provision of evidence-based services by a team-based pharmacist on process of care and patient outcomes, including predefined quality indicators and hospital readmission” 	<p>Inclusion:</p> <ul style="list-style-type: none"> • Patients >18 years old admitted to 2 internal and 2 family medicine teams, with primary diagnosis of coronary artery disease (CAD), community-acquired pneumonia (CAP), chronic obstructive pulmonary disease (COPD), heart failure (HF), or type 2 diabetes mellitus (T2DM) <p>Exclusion:</p> <ul style="list-style-type: none"> • Patients admitted for ≤ 2 days, those with a diagnosis of palliative cancer [sic palliative care], those that were transferred to the care of another team/service, and those who resided outside the hospital catchment area <p>Baseline characteristics:</p> <ul style="list-style-type: none"> • Table 1 reports all important criteria • Control and intervention groups were similar; however, the usual care group had more internal medicine patients (34.2% vs. 27.6%) and fewer with primary diagnosis of HF (26.8% vs. 36.7%)
Intervention	Targeted outcomes
<p>Intervention:</p> <ul style="list-style-type: none"> • Team-based pharmacists with standardized training, providing proactive clinical services, modelled on pharmaceutical care 	<p>Primary outcome:</p> <ul style="list-style-type: none"> • Overall quality score using 20 best-practice indicators (4 for CAD, 4 for CAP, 6 for COPD, 4 for HF, 2 for T2DM)

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<ul style="list-style-type: none"> Pharmacists obtained best possible medication history (BPMH) and performed medication reconciliation at admission and discharge, participated in patient care rounds, resolved drug therapy problems (DTPs), and counselled patients at discharge <p>Control:</p> <ul style="list-style-type: none"> Usual care, which involved reactive clinical pharmacy services provided by either ward-based or dispensary-based pharmacists Pharmacists reacted to DTPs identified in the dispensary or by review of the pharmacy profile and occasionally participated in patient education 	<ul style="list-style-type: none"> Quality score was calculated for each patient, by dividing all instances in which participants received the recommended care by the total number of instances in which the care should have been received for the 5 specified conditions <p>Secondary outcomes:</p> <ul style="list-style-type: none"> Achievement of quality indicators at level of disease state and individual indicator 3-month and 6-month all-cause hospital readmission <p>Statistical analysis:</p> <ul style="list-style-type: none"> Intention-to-treat analysis Multivariate regression used to control for possible imbalances in patient-level characteristics
Main results	Authors' conclusions
<ul style="list-style-type: none"> 452 patients eligible, 451 participated (1 dropped out of intervention group) Intervention, n = 221; control, n = 231 56.4% of team-care patients vs. 45.3% of usual-care patients received care specified by the indicators (adjusted mean difference 10.4%, 95% CI 4.9%–15.7%) Difference in quality score was significant for all disease states, except HF 22.7% of team-care patients (50/221) achieved a quality score of 100% vs. 11.7% of usual care patients (27/231). <p>Secondary:</p> <ul style="list-style-type: none"> Significant drop in rate of 3-month hospital readmissions in team-care vs. usual-care patients (80/221 patients [36.2%] vs. 105/231 patients [45.5%], adjusted OR 0.63, 95% CI 0.42–0.94) Number needed to treat = 11 patients who must receive intervention to prevent 1 readmission at 3 months No significant difference in 6-month readmissions Significant increase in length of stay for team-care group vs. usual-care group (median 9.0 days vs. 8.0 days; difference 1 day) 	<ul style="list-style-type: none"> "In patients admitted to internal and family medicine teams, team-based care including a clinical pharmacist, improved the overall quality of medication use and reduced rates of readmission" "...integrating a pharmacist on the medical team to perform and document a medication history, attend patient care rounds, identify and resolve drug related issues, and provide discharge medication counseling, improved the quality of medication use, and reduced 3-month readmission rates for patients admitted to internal and family medicine teams with a diagnosis of coronary artery disease, CAP, chronic obstructive pulmonary disease, HF, and type 2 diabetes."
Strengths	Limitations
<ul style="list-style-type: none"> Meaningful level 1 patient outcome, as defined by the Agency for Healthcare Research and Quality; secondary outcome was 3-month hospital readmissions 	<ul style="list-style-type: none"> Quasi-randomized <ul style="list-style-type: none"> Unit of randomization was not the patient (on/off design)

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<ul style="list-style-type: none"> • Quality score was evidence-based and relevant to pharmacy practice • Blinded ascertainment of quality score by an independent observer • Good generalizability (multicentre study involving wide range of patient ages and disease conditions) • Standardized local therapeutic training for pharmacists delivering the intervention • Intervention was described in enough detail to replicate • Intervention was practical and authentic to the services that pharmacists desire to provide • Introduced concept of proactive vs. reactive pharmacy services • Adjusted for covariates 	<ul style="list-style-type: none"> • Risk of contamination of control <ul style="list-style-type: none"> • On/off design • Physicians may have learned intervention over time, and continued to implement it once “off” (which would have lessened between-group differences in primary and secondary outcomes) • Quality measure was not validated • Evidence for best practice, which was used to make up the quality score, changes over time • Did not reach a priori target sample size of 650 patients • Assessment of primary outcome was retrospective
<p>How does this study inform the cpKPI selection process?</p>	<p>What are the patterns (similarities and differences) compared with other key papers?</p>
<ul style="list-style-type: none"> • Intervention was a bundle of critical elements representing comprehensive pharmacist services provided to patients from admission to discharge • Implementing collaborative care may improve the quality of prescribed drug therapy and reduce hospital readmissions • Highlights the impact of pharmacists as part of the healthcare team and their influence on patient outcomes • The 20 quality indicators used in this study may not have been pharmacist-only-sensitive metrics; however, a pharmacist’s presence on the healthcare team still made a difference • Suggests that when a pharmacist is part of a healthcare team, the team is more likely to engage in best practices • Within a healthcare team, potential cpKPIs vary in terms of their “pharmacist-centricity” and to what extent a pharmacist can affect that metric • The independent critical elements used in this study may serve as surrogate markers for reduced hospital readmissions (e.g., patient discharge counselling) • Increased length of stay in the intervention group may have resulted from patients receiving needed care for additional issues identified by the pharmacist 	<ul style="list-style-type: none"> • 1 of 2 randomized controlled trials (the other is Gillespie et al.) out of the 6 key papers • Unlike other studies, is applicable to Canadian healthcare system • Used a unique evidence-based quality score as primary outcome <p>Gillespie et al.</p> <ul style="list-style-type: none"> • Gillespie et al. used a similar intervention: BPMH, drug review, participation in patient care rounds, discharge counselling, 2-month follow up <ul style="list-style-type: none"> • Similar to Makowsky et al., who found a decrease in 3-month hospital readmissions, Gillespie et al. found a decrease in hospital visits (emergency department visits and readmission), but over 12 months rather than 3 months • Gillespie et al. added a follow-up phone call; lack of follow-up in the study by Makowsky et al. may have contributed to decay of intervention (no significant difference in 6-month readmissions) • Both studies followed the pharmaceutical care process; however, Gillespie et al. sent pharmacists for standardized pharmaceutical care training, whereas Makowsky et al. provided local therapeutic training

cont'd



Kaboli et al.

- The intervention studied by Makowsky et al. incorporated these elements of the Kaboli 5:
 - participating on rounds with other healthcare professionals
 - reconciling medications (at admission and discharge)
 - providing discharge education
- The results of the Makowsky et al. study appear to support the conclusions drawn by Kaboli et al. regarding patient outcomes

Bond and Raehl

- 2 of the clinical pharmacy services identified by Bond and Raehl were incorporated into the intervention used by Makowsky et al. (admission drug histories and participation on medical rounds)
- Makowsky et al. emphasized patient-centred pharmaceutical care, whereas Bond and Raehl made no mention of this approach

Chisholm-Burns

- Quality score determined by Makowsky et al. consisted of best-practice interventions that could produce some of the AHRQ-defined level 1 and 2 outcomes highlighted by Chisholm-Burns et al.
- Like Chisholm-Burns et al., Makowsky et al. found that pharmacists had a positive impact for patients with CAD and T2DM
- Unlike Chisholm-Burns, Makowsky et al. found that pharmacists had a positive impact for patients with CAP and COPD

Appendix C: Evidence Crosswalk

Activity or Topic	Gillespie	Makowsky	Kaboli	CSHP 2015 Objectives	Bond	Ng	Chisholm-Burns
Pharmaceutical Care – Integrated (DTP assessment/ care plan/ monitoring)	✓	✓					
Pharmaceutical Care – Patient Assessment / DTP Workup	✓	✓					
Pharmaceutical Care – Pharmacy Care Plan / Intervention	✓	✓					
Pharmaceutical Care – Monitoring / Follow-Up	✓	✓					
“Patient Interviewing”			✓				
Medication Reconciliation – BPMH/Med History Taking	✓	✓	✓	✓	✓	✓	
Medication Reconciliation – Admission Reconciliation	✓	✓	✓	✓		✓	
Medication Reconciliation – Discharge Reconciliation	✓	✓	✓	✓		✓	
Team (or Patient) Rounds	✓	✓	✓		✓		
Discharge Patient Education / Counselling	✓	✓	✓				
Post Discharge Follow-Up	✓		✓				
Cardiopulmonary resuscitation (CPR) team participation					✓		
Disease or Drug Specific – Best Practice Quality Indicators		✓	✓	✓			✓
Drug Information / Drug Use Evaluation					✓		



Bibliography

Bond CA, Raehl CL. Clinical pharmacy services, pharmacy staffing, and hospital mortality rates. *Pharmacotherapy*. 2007;27(4):481-93.

Canadian hospital pharmacy 2015 (CSHP 2015) 2008 [cited 2014 Feb 25]. Available from: http://www.cshp.ca/dms/dmsView/2_CSHP-2015-Goals-and-Objectives-Feb-25%2707-w-Appdx-rev-May%2708.pdf.

Chisholm-Burns MA, Kim LJ, Spivey CA. US pharmacists' effect as team members on patient care: systematic review and meta-analyses. *Med Care*. 2010;48:923-933.

Gillespie U, Alassaad A, Henrohn D, Garmo H, Hammarlund-Udenaes M, Toss H, et al. A comprehensive pharmacist intervention to reduce morbidity in patients 80 years or older: A randomized controlled trial. *Arch Intern Med*. 2009;169(9):894-900.

Kaboli PJ, Hoth AB, McClimon BJ, Schnipper JL. Clinical pharmacists and inpatient medical care: A systematic review. *Arch Intern Med*. 2006;166(9):955-64.

Makowsky MJ, Koshman SL, Midodzi WK, Tsuyuki RT. Capturing outcomes of clinical activities performed by a rounding pharmacist practicing in a team environment: The collaborate study. *Med Care*. 2009;47(6):642-50.

Ng J, Harrison J. Key performance indicators for clinical pharmacy services in New Zealand public hospitals: stakeholder perspectives. *J Pharm Health Serv Res*. 2010;1:75-84.

Appendix D: cpKPI Scorecards

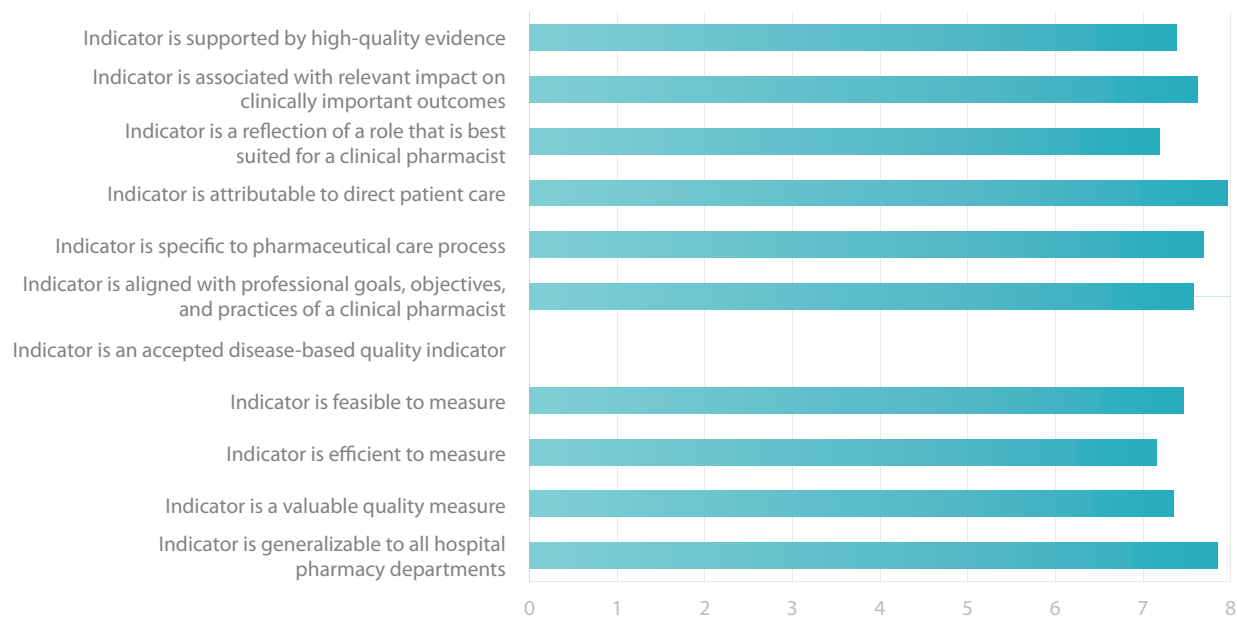
The scoring scale was designed to facilitate a balanced assessment of competing perspectives for individual cpKPIs

cpKPI Selection Attributes	Example
Indicator is supported by high quality evidence.	Observational data vs. randomized controlled trial vs. systematic review
Indicator is associated with a relevant impact on clinically important outcomes.	Surrogate vs. clinical endpoints Effect size of intervention
Indicator is a reflection of a role that is best-suited for a clinical pharmacist.	Identified pharmacist-specific role vs. general practitioner vs registered nurse
Indicator is attributable to direct patient care.	Marker of clinical intervention, not distribution activities
Indicator is specific to a pharmaceutical care process.	Related to a generally accepted component of patient care process
Indicator is aligned with professional goals, objectives and practices of a clinical pharmacist.	Accreditation Canada's Required Organizational Practices, standards, CSHP 2015 Goals and Objectives
Indicator is an accepted disease-based quality indicator.	ACEI or beta blocker for heart failure, VTE prophylaxis in hospitalized patients
Indicator is feasible to measure.	Reliable measurement system could be put in place
Indicator is efficient to measure.	Acceptable time commitment, usable
Indicator is a valuable quality measure.	Prevalent, impactful problem with practical, proven interventions
Indicator is generalizable to all hospital pharmacy departments.	Representative of a variety of practice settings and patient population (e.g., rural and urban/tertiary care settings, pediatrics and adults)

MEDICATION RECONCILIATION ON ADMISSION

Average Ratings of Agreement for each Attribute

1 (Strongly disagree) to 9 (Strongly agree)

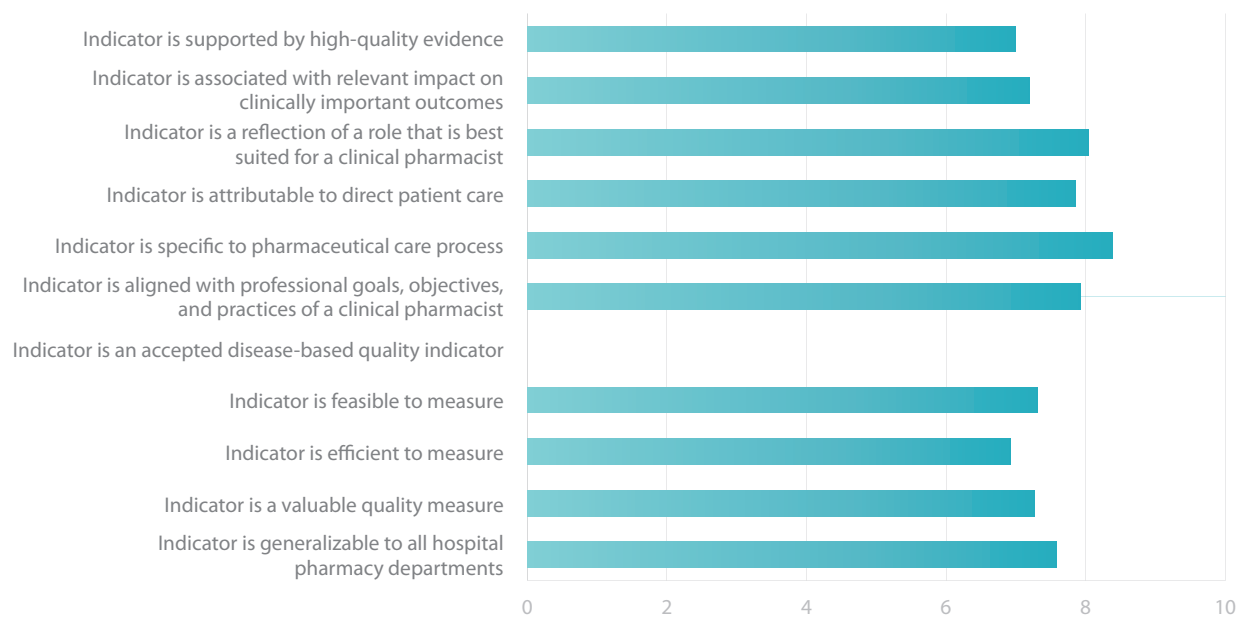


Composite mean Slavik 11 rating = 7.52, Overall rating mean = 7.65

PHARMACEUTICAL CARE PLAN

Average Ratings of Agreement for each Attribute

1 (Strongly disagree) to 9 (Strongly agree)

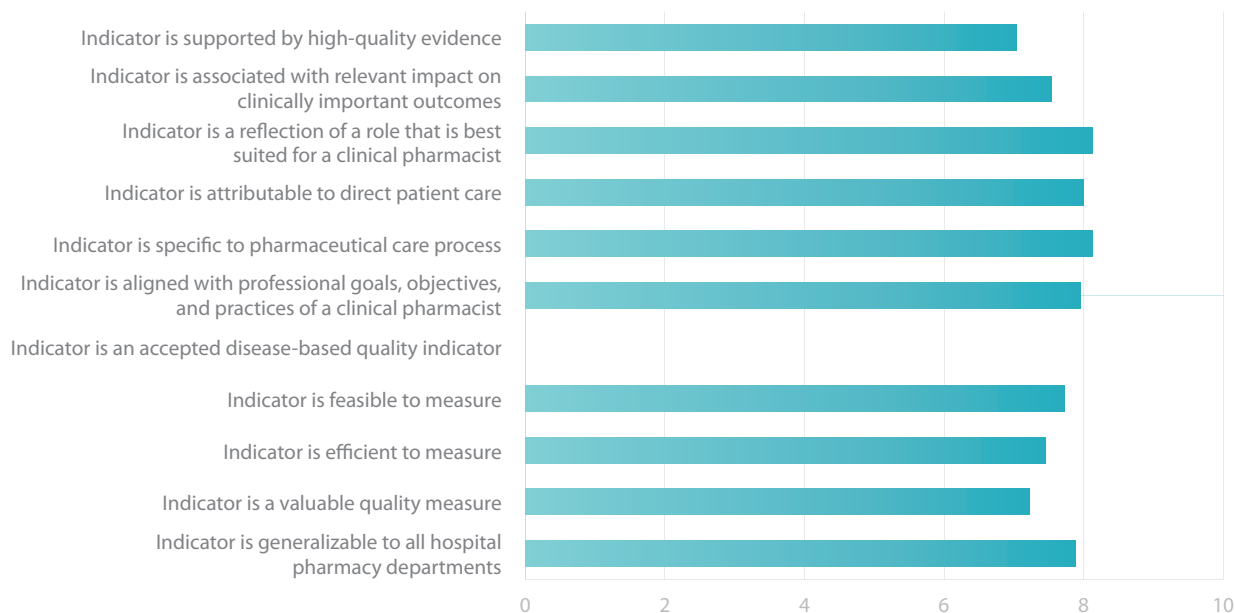


Composite mean Slavik 11 rating = 7.55; Overall rating mean = 7.62

RESOLUTION OF A DRUG THERAPY PROBLEM (DTP)

Average Ratings of Agreement for each Attribute

1 (Strongly disagree) to 9 (Strongly agree)

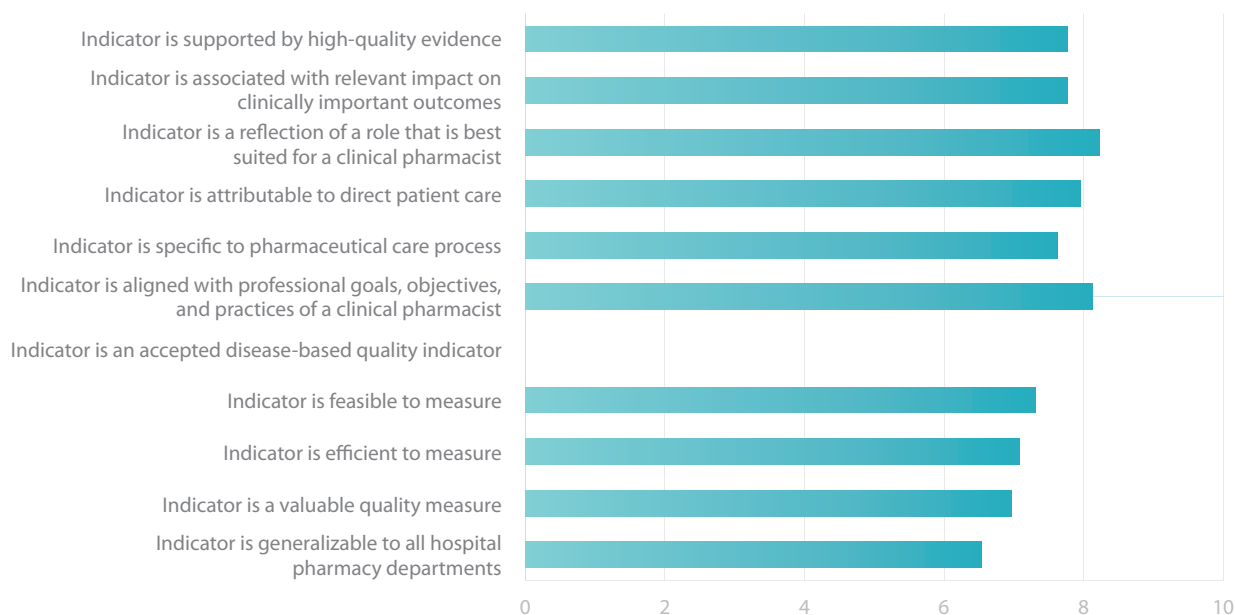


Composite mean Slavik 11 rating = 7.71; Overall rating mean = 7.62

ACTIVE PARTICIPATION IN INTERPROFESSIONAL PATIENT CARE ROUNDS

Average Ratings of Agreement for each Attribute

1 (Strongly disagree) to 9 (Strongly agree)

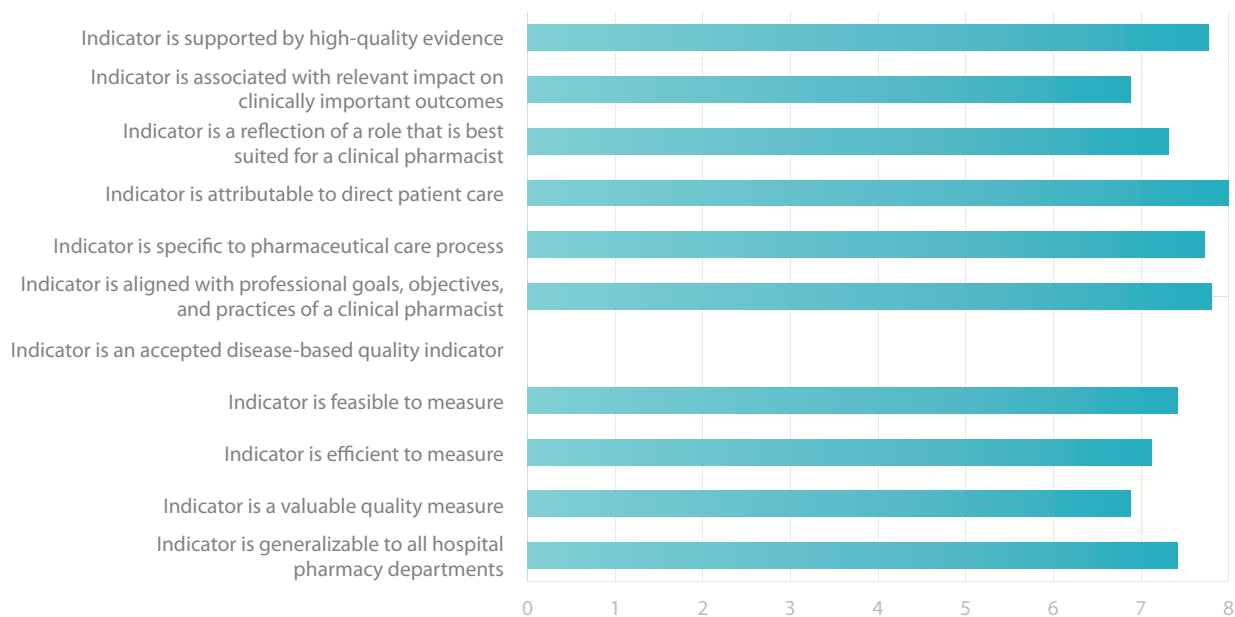


Composite mean Slavik 11 rating = 7.54; Overall rating mean = 7.50

IN-PERSON EDUCATION DURING HOSPITAL STAY

Average Ratings of Agreement for each Attribute

1 (Strongly disagree) to 9 (Strongly agree)

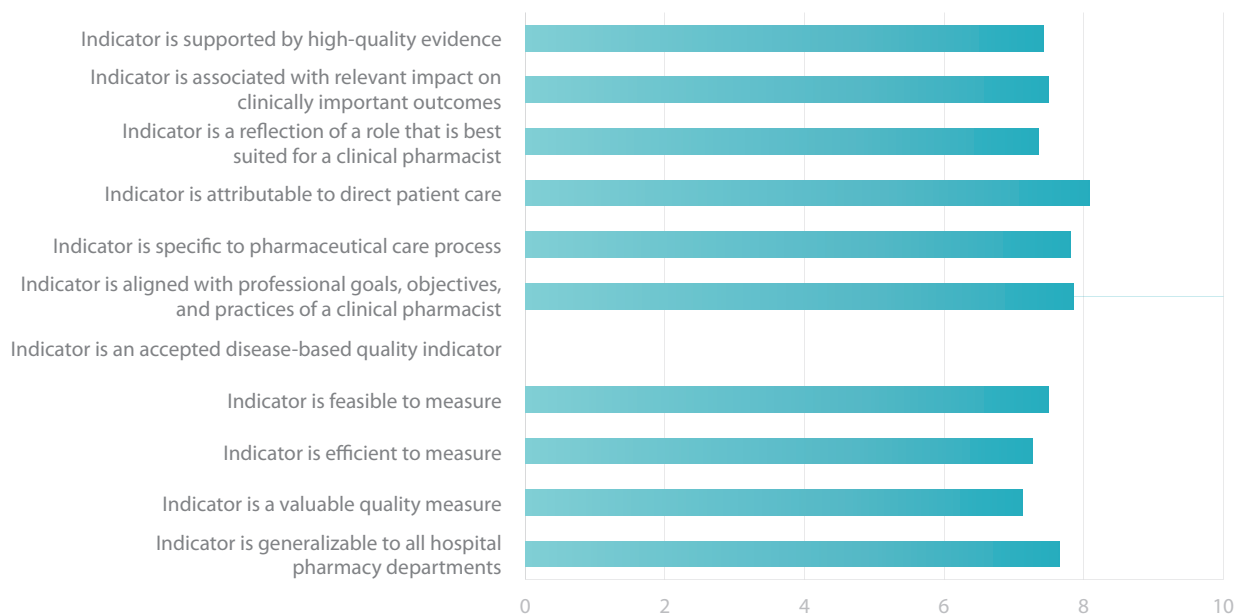


Composite mean Slavik 11 rating = 7.34; Overall rating mean = 7.08

MEDICATION EDUCATION AND COUNSELLING AT DISCHARGE

Average Ratings of Agreement for each Attribute

1 (Strongly disagree) to 9 (Strongly agree)

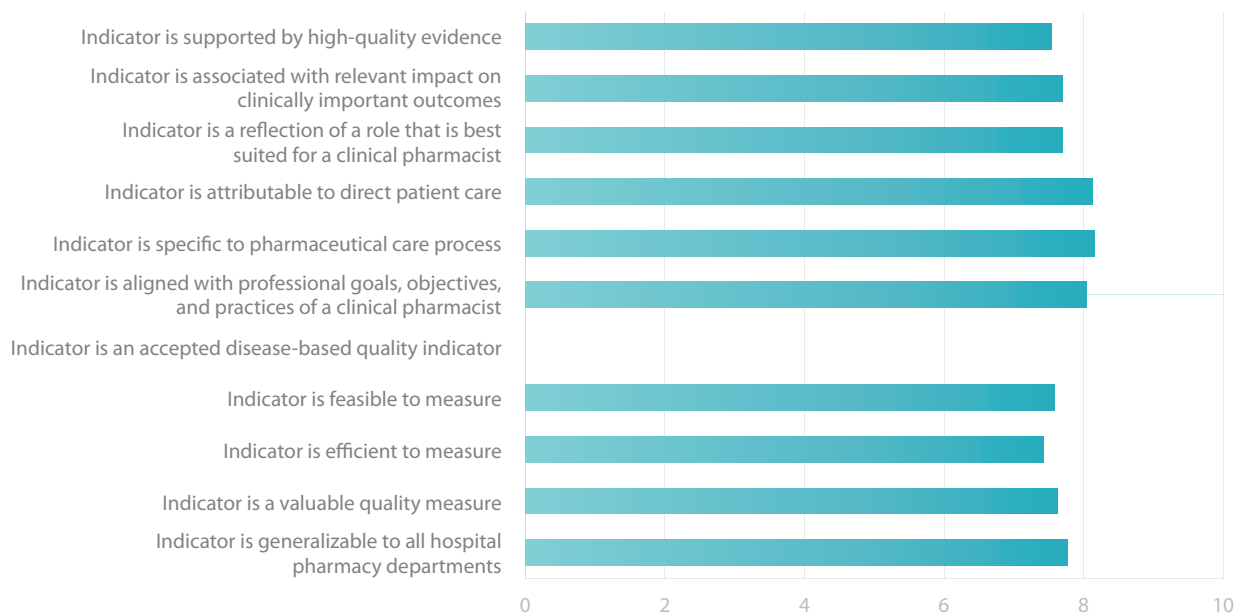


Composite mean Slavik 11 rating = 7.56; Overall rating mean = 7.35

MEDICATION RECONCILIATION ON DISCHARGE

Average Ratings of Agreement for each Attribute

1 (Strongly disagree) to 9 (Strongly agree)

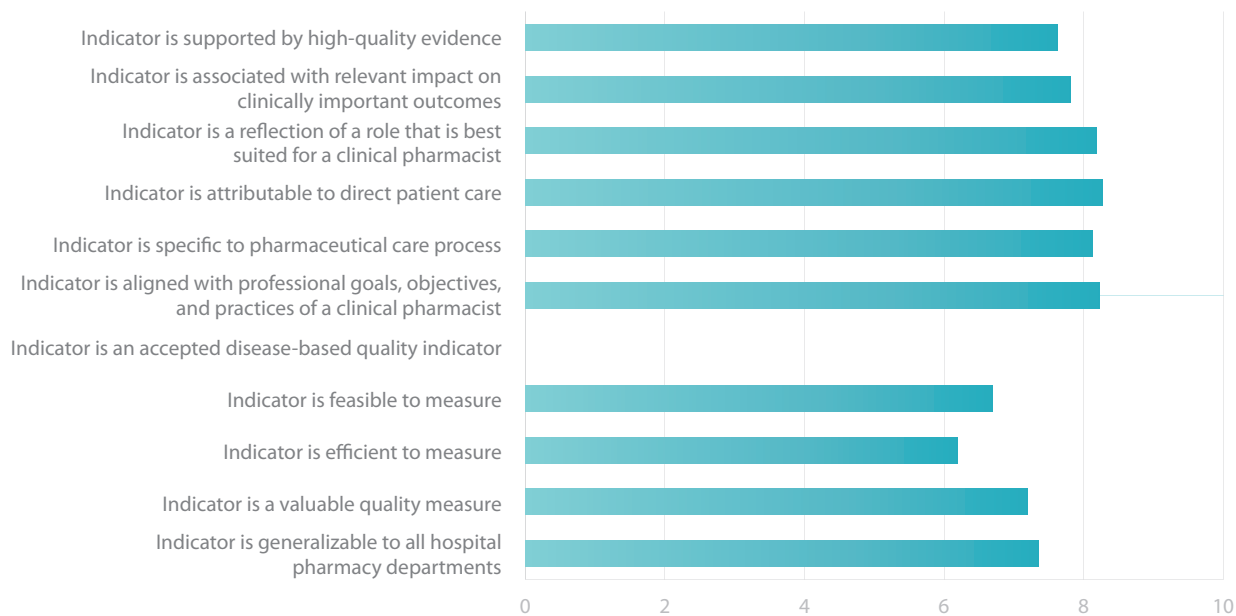


Composite mean Slavik 11 rating = 7.76; Overall rating mean = 7.81

SET BUNDLE OF ACTIVITIES

Average Ratings of Agreement for each Attribute

1 (Strongly disagree) to 9 (Strongly agree)



Composite mean Slavik 11 rating = 7.57; Overall rating mean = 7.62

