Appendix 1: Focus group questions.

1) In your practice, which patients do you feel are at high risk of opioid adverse effects or future addiction? Which specific risk factors do you feel that this population has?
2) Can you think of any factors that we would be able to screen for in these patients through the electronic system?
3) In your day-to-day practice, do you find that the opioid medications that are prescribed are appropriate for the patient's needs in terms of the total amount prescribed, frequency, potency?
4) What sort of interventions do you already perform in day-to-day practice that could be described as opioid stewardship?
5) What do you view as barriers to being more involved in opioid stewardship as a clinical pharmacist? Is there anything preventing you from doing everything you want to do?
6) Some would propose an opioid stewardship model that replicates the approach we currently use for an antimicrobial stewardship model. Do you think that there would be a need for a program like that?
7) If this kind of stewardship program existed, what kind of interventions do you think would be appropriate to be performed by the pharmacist once this high-risk patient has been identified?

Supplementary material for Woods B, Legal M, Shalansky S, Mihic T, Ma W. Designing a pharmacist opioid safety and intervention tool. *Can J Hosp Pharm*. 2020;73(1):7-12.

Appendix 2: Survey results.

The number of respondents is indicated in the column below each possible response.

1) Please indicate how commonly you encounter the following risk factors for opioid adverse effects or misuse in your practice:

Survey Item	Almost never	Rarely	Occasionally	Often	Daily
Suboptimal Dose/Route/Frequency	-	1	4	4	-
Suboptimal Combinations (Benzodiazapine or Multiple Opioids)	-	3	5	1	-
Lack of Adjunctive Non-Opioid Pain Medications	-	1	3	4	-
Prior Opioid Use Disorder	1	-	3	4	2
Non-Modifiable Patient Risk Factors	-	-	4	5	-

2) Do you believe that the MORE tool was helpful in identifying risk factors for opioid adverse effects or misuse?

Survey Item	Definitely not	Probably not	Might or might not	Probably yes	Definitely yes
Risk Factor Identification	-	-	4	4	1

3) Please rate how feasible each of the following interventions would be in your practice:

Survey Item	Not feasible	Difficult but feasible	Feasible	Very feasible	Extremely feasible
Optimizing a Patient's Opioid Orders	-	1	4	4	-
Recommending Adjunctive Non-Opioid Pain Medications	-	-	3	6	-
Recommending Medications to Control Opioid Side Effects	-	-	2	6	1
Recommending that a Speciality Service (Addictions, Pain Services) be Consulted	-	2	2	4	-
Counselling a Patient on the Use of Naloxone and Safe Disposal of Opioids	-	1	5	2	1

4) Do you believe the MORE tool was helpful in providing suggestions of possible interventions?

Survey Item	Definitely not	Probably not	Might or might not	Probably yes	Definitely yes
Intervention Identification	-	-	4	5	-

5) Overall how would you rate the preliminary MORE tool in terms of ease of use?

Survey Item	Very difficult to use	Slightly difficult to use	Moderately easy to use	Very easy to use	Extremely easy to use
Ease of Use	-	4	3	-	1

6) Overall how useful was the MORE tool in helping you improve the management of patients receiving opioids?

Survey Item	Not at all useful	Slightly useful	Moderately useful	Very useful	Extremely useful
Usefulness	-	3	4	1	-

7) Overall how would you rate the MORE Tool in terms of feasibility of incorporating into your practice?

Survey Item	Very unfeasible	Unfeasible	Feasible	Very feasible	Extremely feasible
Feasibility	-	-	6	2	-

Supplementary material for Woods B, Legal M, Shalansky S, Mihic T, Ma W. Designing a pharmacist opioid safety and intervention tool. *Can J Hosp Pharm*. 2020;73(1):7-12.

Appendix 3: Literature review tables.

Key Studies Describing Risk Factors*

Study	Risk Factor Identified	Key Components
Deyo et al. (2017)[1]	Long acting opioids	Those prescribed long acting opioids were at an increased risk of remaining on opioids vs short acting opioids
	High dose opioids	Additionally, those on higher doses (over 400 MME total) had an increased risk of being long term users vs those prescribed lower doses (less than 120 MME total)
Dunn (2010)[2]	High dose opioids	Patients taking over 100 MME of opioids per day are at 8.9x risk of overdose vs those taking 20 MME or less
Logan et al. (2013)[3]	Opioid / benzodiazepine combination	Those patients taking a combination of opioids and benzodiazepines were at an increased risk of opioid adverse events
	Multiple opioid combination	Those patients taking a combination of long acting and short acting opioids were at an increased risk of opioid adverse effects
Shah et al (2017)[4]	Length of discharge prescription	Those prescribed 31 days or more had an increased likelihood of remaining on opioids at one year than those prescribed 8 days or less
Calcaterra et al. (2016)[5]	Discharge opioid prescriptions	Patients with discharge opioid prescriptions are at increased risk of use one-year post discharge
Bradford Rice et al. (2012)[6]	Comorbid conditions	Mental health diagnoses were a significant predictor of opioid abuse

*This is not a comprehensive summary of all studies located in the literature search.

Key Studies Describing Opioid Stewardship Interventions

Study	Interventions Identified	Results
Genord et al. (2017)[7]	Counselling patients taking over 60 MME per day Daily pharmacist rounds on patients taking > 60 MME/day Post-operative pain management counselling by pharmacist for each patient	Not reported in this study. A subsequent outcome evaluation of ED visits, readmission rates, frequency of prescriptions written and average quantities of opioid per prescription in underway.
Andrews et al. (2013)[8]	Dedicated clinical pharmacists to pain relief Use of adjunct agents for pain Patient education Service triggered by patients on high MME/day or using all prn dosing	Reduction of 25% in intermittent morphine use at 3 months Reduction of 42% in intermittent hydromorphone use at 3 months 40.7% of physicians felt that they would be "very likely" to utilize the service
Ghafoor et al. (2013)[9]	Creation of evidence-based order sets Reviewing safety and policy guidelines with staff Established a pain-medication specialist pharmacist	Of patients admitted to hospital with opioid orders, 44% required an intervention related to pain medication reconciliation

MME = morphine milligram equivalents.

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Supplementary material for Woods B, Legal M, Shalansky S, Mihic T, Ma W. Designing a pharmacist opioid safety and intervention tool. *Can J Hosp Pharm*. 2020;73(1):7-12.

Appendix 4: Focus group themes by Theoretical Domain Framework.[1]

Review of Focus Group Transcripts via Theoretical Domain Framework (TDF)

TDF Domain	Description of Domain	Examples	No. of Comments in this Domain
Goals	Importance and prioritization of a course of action to implement opioid stewardship	Optimizing pain management Education of healthcare professionals Foster connections between existing departments	34
Environmental Context and Resources	Factors related to the setting/ environment that influence a pharmacist's ability to perform opioid stewardship	Pharmacists are challenged by a lack of time and resources Often in hospital prescribers are uncomfortable changing opioid regimens Patients are not in hospital long enough to make changes Lack of organized outpatient follow-up	24
Skills	Competence and ability to manage patients who are prescribed opioids	Ability to correctly dose analgesics Ability to adjust dose on specific patient parameters Ability to educate patients	24
Memory, Attention and Decision Processes	Processes and factors taken into account before a pharmacist decides to perform opioid stewardship	Ward pharmacists can work to identify proper candidate patients	20
Knowledge	Existing knowledge of procedures, guidelines and evidence for opioid prescribing	Pharmacists have the ability to identify risk factors Intricate knowledge of the pharmacotherapeutics involved in pain	12
Professional Identity	Professional identity, the boundaries involved and role with other professionals	Ensure an opioid stewardship program would have a defined role within the hospital Act as a bridge between primary care team and other specialists	12
Social Influences	External pressure from other people and professions that may influence the pharmacist's ability to perform opioid stewardship	Lack of communication between existing teams may become a barrier to implementing an opioid stewardship program Prescribers have differing amount of comfort with opioids	9

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Supplementary material for Woods B, Legal M, Shalansky S, Mihic T, Ma W. Designing a pharmacist opioid safety and intervention tool. *Can J Hosp Pharm*. 2020;73(1):7-12.

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Intended for use in patients with non-cancer pain

M — Medication and Safety Review

Review Opioid Orders

Suboptimal Dose, Route & Frequency

- ☐ IV or SC route ordered when PO route is viable
- ☐ Excessively frequent regular dosing (< Q4H)
- ☐ Multiple PRN opioid orders
- ☐ PRN opioid order being used regularly
- ☐ Long acting opioids started for acute pain within first 5 days of hospital stay
- ☐ Order >10 MME/dose for opioid naïve patient

Suboptimal Drug Combinations

- ☐ Combinations of different opioids for acute pain are ordered*
- ☐ Benzodiazepines & opioids ordered together
- ☐ No adjunctive acetaminophen or NSAID ordered
- ☐ No other adjunctive pain medications ordered (i.e. for neuropathic pain)

*except methadone or fentanyl

Assess for Increased Risk of ADR & Overdose

- ☐ Opioid naive
- ☐ Advanced age (>75 years old)
- ☐ Low BMI
- ☐ Kidney or liver impairment
- ☐ Dose of opioid rapidly increased in recent days-weeks

Assess Pain Severity and Type

Is opioid therapy truly necessary for this patient?

If No -Stop opioid and use alternative; If Yes- Optimize

O — Optimize

Optimize Opioid Regimen

- If patient has any risk factors for ADRs or Overdose (as noted above) start with lower initial doses
- Use oral route instead of parenteral whenever possible
- If PRN opioid alone ineffective, switch to regularly scheduled opioid Q4H or Q6H and Q1H or Q2H PRN (PRN = 10% daily dose). Use the same opioid for regular and PRN doses.
- Aim to limit duration of regular Rx for acute pain to 5 days
- If patient NOT opioid naïve assess for symptoms of withdrawal

Use Adjunctive Rx

- Acetaminophen 650-975 mg po qid
- NSAID (e.g. naproxen 500 mg PO BID)
- Other agents depending on etiology of pain (e.g. TCA or gabapentin for neuropathic pain)

Avoid Benzodiazepines

- Use non-benzodiazepine medications for HS sedation (consider trazodone, TCA., etc.)
- Use alternatives for other indications if appropriate
- Switch or stop short-term use BDZ (< 7 days)
- If appropriate taper off benzodiazepine if patient has been on long term

Monitor and Treat Adverse Effects

Sedation:
- Reassess opioid regimen and lower dose

Constipation:
- Senna 17.2 mg po hs regular
- Bowel protocol

Nausea
- Usually transient, but can order dimenhydrinate 25-50 mg PO/IV/IM q4-6h PRN (max 400 mg/d)

Pruritus
- Switch to opioid with less peripheral activity
- Diphenhydramine 25-50 mg PO/IV/IM q6h PRN (max 400mg/d)

R — Reassess and Refer for Risk

Reassess Pain Management

- Reassess pain management within 24 hours after regimen change
- Monitor for side effects (sedation, dizziness, nausea, vomiting, constipation, respiratory depression)
- Adjust dose or switch to another opioid if necessary (due to side effects)

Refer to Specialty Pain or Addiction Service*

- **If patient has ≥ 3 or risk factors* and opioid therapy likely to continue for more than 5 days OR any of the issues below, consider consulting Pain or Addictions Services** (if not already involved)
- If patient has ongoing pain >8/10 despite Rx and/or ongoing need for opioid after 5-7 days of Rx → **Consult Acute Pain Service**
- If patient has ongoing pain **AND** risk factors for SUD (see back page for risk factor checklist) → **Consult Addiction Medicine Consult Team**
- If patient requires >50* MME ongoing → **Consult Chronic Pain Service**

E — Educate, Plan & Communicate

Plan

- Set target stop date for opioid with plan to reassess pain & provide alternative non-opioid options as needed
- Continue opioid post discharge only if absolutely necessary
- Prescribe the minimum appropriate duration of discharge Rx

Educate

- Review pain control plan with patient
- Counsel on pain management, side effects of opioids, appropriate use of non-opioid adjunctive agents, appropriate storage and disposal of any leftover supply of opioids
- Provide naloxone kit and teaching if discharged on >50 MME/day or if patient has a history of opioid use disorder

Communicate

- Document plan and counseling in health care record
- Communicate medication changes made in hospital and plan to primary care provider/community pharmacy for ongoing pain management

Supplementary material for Woods B, Legal M, Shalansky S, Mihic T, Ma W. Designing a pharmacist opioid safety and intervention tool. *Can J Hosp Pharm*. 2020;73(1):7-12.

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Risk for Substance Use Disorder

- ☐ History of any SUD
- ☐ Psychiatric diagnosis
- ☐ Family history of SUD
- ☐ PNET restriction or other indication of opioid misuse

Risk Factors for Both SUD and Overdose

- ☐ Multiple overlapping fills of opioids on PNET
- ☐ Multiple prescribers for opioids on PNET
- ☐ Receiving > 50 MME of opioid/day (but less than 100 MME)
- ☐ Receiving over 100 MME of opioid/day (give 2 points)

Morphine Milligram Equivalency Chart

Opioid	Conversion Factor
Morphine	1
Codeine	0.15
Fentanyl transdermal (ug/h)	2.4
Hydromorphone	4
Oxycodone	1.5

Conversion factor assumes the medication is given as the same dosage form (iv/po) with the exception of the Fentanyl transdermal patch.
Please note this is not a potency equivalency chart, rather a chart to easily convert current dosages of other opioids into Morphine Milligram Equivalents.

Approach to Opioid Adverse Effects

Sedation:
Can be expected when first starting opioids in naïve patient, and will generally self-resolve within a short time
Assess patient for DIMS criteria if there is a significant change in LoC after being stabilized on an opioid dose
May require decrease in dose or switch to a different opioid
Monitor for signs of respiratory depression in patients that are heavily sedated

Constipation:
Bowel protocol should be used in all patients on a regular opioid medication
Non-pharmacological management is important including ensuring proper hydration and movement if possible

Nausea
PRN dosing of ant-emetics will be necessary when starting opioid medications in select patients
Generally subsides within days of starting opioid treatment
If persistent it would be reasonable to switching to a different opioid

Pruritus
Generally subsides with time
Switch to opioid with less peripheral activity
Diphenhydramine 25-50 mg PO/IV/IM q6h PRN (max 400mg/d)

Medications for Opioid Adverse Effects

Constipation	1) Sennosides 12mg 2 tabs po qhs, increasing up to 3 tabs tid 2) Bisacodyl 5mg 2 tabs po daily 3) Glycerin suppository
Nausea	1) Dimenhydrinate 25-50mg po/iv/im q4-6h prn (max 400mg/d) 2) Metoclopramide 5-10mg sc/iv/po q6h 3) Ondansetron 4-8mg po/iv q8h
Pruritus	1) Diphenhydramine 25-50mg po/iv/im q6h PRN (max 400mg/d)
Severe Respiratory Depression	1) Naloxone 0.1-0.2mg iv q 2-3 min until RR > 10 or Naloxone 0.1-0.2mg sc q5-10min until RR > 10

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