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Identifying Intensive Care Unit Discharge Planning Tools: Protocol for a Scoping Review

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ABSTRACT

Background: Transitions of care between providers are vulnerable periods in health care delivery that expose patients to preventable errors and adverse events. Patient discharge from the intensive care unit (ICU) to a medical or surgical hospital ward is one of the most challenging and high risk transitions of care. Approximately one in twelve patients discharged will be readmitted to ICU or die before leaving hospital. Many more patients are exposed to unnecessary health care, adverse events and/or are disappointed with the quality of their care. Our objective is to conduct a scoping review by systematically searching the literature to identify ICU discharge planning tools and their supporting evidence-base including barriers and facilitators to their use.

Methods and analysis: Systematic searching of the published health literature will be conducted to identify existing ICU discharge planning tools and supporting evidence. Literature (research and non-research) reporting on tools used to facilitate decision making and/or communication at ICU discharge, with patients of any age will be included. Outcomes will include adverse events and provider and patient/family reported outcomes. Two investigators will independently review the abstracts (Screen 1) to identify those meeting inclusion criteria and then independently assess the full text articles (Screen 2) to determine if they meet inclusion criteria. Data collection will include information on citations and identified tools. A quality assessment will be performed on original research studies. A descriptive summary will be developed for each tool.

Ethics and dissemination: Our scoping review will synthesize the literature for ICU discharge planning tools and identify opportunities for knowledge to action and gaps in evidence where primary evidence is necessary. This will serve as the foundational element in a multi-step

research program to standardize and improve the quality of care provided to patients during ICU discharge. Ethics approval is not required for this study.

BACKGROUND

The transfer of responsibility for patient care (synonyms include transition of care, handoff, sign over etc.) is a common practice in acute-care hospitals.[1] During transfers of patient care, crucial information on patient conditions, tests undertaken, and treatments received is transferred between providers, so that care plans can be effectively continued by receiving providers. A handoff between health care providers is not only a process to provide accurate and vital information regarding a patients' care, but is also a transfer of accountability and responsibility for the patient.[2-7] Healthcare organizations recognize the importance of transitions of care and have proposed organizational practices to improve the effectiveness and coordination of communication among providers and recipients of care across the care continuum.[8-10]

Unfortunately, the practice of provider handoff is often suboptimal due to communication barriers[6, 11-13] and is a major contributor to medical errors and adverse events.[2, 7, 14-20] In 2006, the Joint Commission for Accreditation of Health Care Organization (JCAHO) reported that 63% of deaths related to medical error in its sentinel events database involved a breakdown in communication.[21] Most research on handoffs for in-hospital patient transfers has focused on patient transfers from the perspective of a single discipline, such as physician end-of-shift[1, 6, 12, 19, 22] or end-of-service[2, 17, 18, 23] handoffs. In contrast, relatively little is known about handoffs between non-physician providers.[11, 24] Multidisciplinary handoffs though are required to optimally transition care and likely face relatively greater communication hurdles due to cultural differences, work load challenges, and differences in clinical focus between specialties and disciplines, and thus may lead to greater potential for medical errors and adverse events.[11, 13, 24]

Numerous types of patient transfers and provider handoffs occur every day.[4, 6] A transition of care occurs each time a patient is referred to a specialist by their family doctor, assigned a new nurse during hospital shift change or discharged from hospital. Among these, patient transfers from the Intensive Care Unit (ICU) to a medical or surgical hospital ward are likely of particularly high risk due to the number, complexity and acuity of the medical conditions that characterize this patient group;[25-28] the large "voltage" drop in available resources when patients move from the ICU, where medical care is intensive and resources are rich, to ward environments, where patients typically receive much less intensive monitoring and patient care;[25] the multitude of communication barriers that providers often face during inter-specialty and multidisciplinary handoffs;[29] the lack of standardization in patient transfer processes overall; and in particular the lack of standardized written and/or electronic tools to facilitate an optimal transfer process.[27]

Patients admitted to the ICU are of the highest acuity requiring management with life support technologies and aggressive interventions to sustain life and progress towards a clinically stabilized condition.[27] Approximately one in ten patients admitted to an acute care facility are admitted to an ICU.[30] Transition of care is extremely common with 90% of ICU patients being eventually discharged to medical or surgical hospital wards.[31] With millions of hospitalizations in acute care facilities in most countries each year,[30] hundreds of thousands of patients will be admitted to ICU and experience challenging and high risk transfers to hospital wards.

ICU discharge represents a large drop in the intensity of care with patients transitioning from a high acuity unit to a general care unit. ICUs are specially staffed, self-contained hospital units, dedicated to the management and continuous monitoring of patients with life-threatening illnesses.[32] The medical support available to patients in the ICU includes multidisciplinary teams of healthcare providers (i.e. physicians, nurses, pharmacists, therapists) that typically see each patient multiple times a day.[33, 34] In general there is a nurse for every one or two patients and a physician for every eight to ten patients.[35, 36] In contrast, general medical and surgical care units have fewer resources with a nurse for every four to eight patients[37] and physicians responsible for up to as many as 65 patients during regular working hours and 400 patients outside of regular working hours.[38] Other health care providers are often less available.

When a patient is transferred from ICU to a general care unit typically there is a complete transition in healthcare providers, most patients being assigned new teams of physicians, nurses, pharmacists, therapists etc. However, communication between providers discharging patients from the ICU and providers admitting these patients to general care units has been documented to be infrequent, incomplete and of poor quality.[29, 39] An observational study done by our research team in preparation for this protocol found direct verbal communication between ICU discharging physicians and ward admitting physicians to occur in only 15-25% of the ICU discharges.[29] Optimal transfers of care require effective communication between discharging and admitting physicians that includes direct communication (in person or via telephone); concise, accurate, up-to-date discharge summaries; and physician notification at the time of transfer.[3, 29] However, communication during transfer is challenged by provider workloads, available resources, and variations in clinical focus between specialties.[11, 13, 24]

Communication between physicians and patients/families at the time of ICU discharge is also frequently suboptimal with the same local observational study finding 68% of patient/families reporting a desire for increased opportunities to ask questions about the transfer.[29] This lack of information about the ICU transfer process can act as a catalyst for stress and anxiety for patients and families.[40-42] Effective communication between providers and patients/families to provide early notification of an upcoming transfer,[29] and present information on current medical conditions and future plans prior to transfer would likely better manage expectations and reduce anxiety.

Standardizing the process of patient discharge from ICU could improve the safety, quality and efficiency of care. Multiple interventions to improve ICU discharge have been developed (e.g. transitional care units, ICU outreach, nursing liaison, etc.),[27, 43-46] but there is no consensus on an ideal ICU discharge model to optimize the quality of patient care[27] and few organizations have implemented standardized guidelines or procedures for transitions of care.[44, 47] Government agencies,[48] specialty groups[3, 49, 50] and the Institute for Healthcare Improvement[51] have all advocated standardizing ICU discharge structure and processes to improve continuity of care, patient safety, patient and provider satisfaction, and resource use.[45, 52]

The challenges of ICU discharge are well recognized.[27, 53] Very little is known about the quality of patient care during ICU discharge. A comprehensive review of ICU discharge planning tools has not been previously completed. The scope and magnitude of tools to facilitate

patient discharge from ICU has not previously been defined. For tools already developed, it is unclear how effectively these have been implemented and how they may have affected patient clinical outcomes and/or patient and family satisfaction with care. In response to these challenges, we will conduct a scoping review to identify ICU discharge planning tools and the supporting evidence base for these tools including barriers and facilitators to their use.

METHODS AND ANALYSIS

Conceptual model

Our scoping review will adopt the model of system theory first introduced in 1966 by Avedis Donabedian.[54, 55] In Donabedian's framework, the three components of healthcare quality are *structure*, *process* and *outcome*. The *structure* is the environment in which health care is provided and includes material and health resources, operational factors, and organizational characteristics of the healthcare facility. The *process* is the method by which healthcare is provided and includes the giving and receiving of care by the providers and healthcare system. The *outcome* is the consequence of healthcare and includes the health status of patients. We will examine *structural* devices (tools) used to facilitate ICU discharge and evaluate their association with *processes* and *outcomes* of care for patients discharged from ICU (Figure 1).

In addition, we will incorporate the Institute of Medicine's (IOM) six aims for the 21st Century Health Care System into our research. ICU discharge tools should foster safe, effective, efficient, timely, equitable, and patient-centered discharge from ICU. We have developed a conceptual model for our scoping review that merges the Donabedian model and the IOM's six aims (Table 1). We recognize that our conceptual model is a relatively basic and simple representation of

ICU discharge, but no other simple validated framework exists and we have successfully used a variation of this model to develop quality indicators for injury care.[56-59]

Objectives

This is a protocol for a scoping review to identify ICU discharge planning tools and the supporting evidence base for these tools including barriers and facilitators to their use. Methods for inclusion and analysis of articles and reporting of their results will be performed as recommended by Arksey and O'Malley[60] and refined by Levac and colleagues.[61]

We define an ICU as a distinct hospital ward that is staffed by specialized healthcare professionals and where immediate and continuous life sustaining treatment (e.g. invasive monitoring, vasoactive medications, invasive mechanical ventilation) is administered to hospitalized patients suffering from life-threatening conditions (e.g. severe respiratory failure).[35] Patient discharge from ICU is defined as the transfer of accountability and responsibility for patient care from the ICU to a hospital ward. Tools are defined as structural devices (e.g. protocols, reminders, order sets, bundles, checklists, forms, decision-aids) designed to aid health care providers or patients/families with decision making and/or communication.[62]

The specific objectives of the scoping review are:

1. To complete a systematic search of the literature to identify existing ICU discharge planning tools and evaluate the evidence base in support of the tools.
2. To map the ICU discharge tools and supporting evidence to our conceptual framework to identify gaps in the evidence where primary evidence or systematic reviews are required.

3. To evaluate the tools according to their relevance to knowledge users (importance, feasibility, usability, scientific acceptability).
4. To describe barriers and facilitators to implementation and utilization of ICU discharge planning tools.

Eligibility Criteria

Research studies (no methodological restrictions – case series, cohort, cross-sectional, nonrandomized controlled, consensus method, case-control, randomized controlled) and non-research study designs (editorial, guideline, letter to the editor, narrative review) are eligible. We will include studies with all human patients discharged from any ICU regardless of subspecialty (e.g. medical, neuroscience, etc.). There is no restriction on age as tools identified for neonatal and pediatric patients may provide relevant information for the discharge of adult patients.

Eligible studies must include any electronic or paper tool (including guidelines, protocols, questionnaires, checklist, etc.) intended to facilitate discharge from ICU by aiding healthcare providers and/or patients/families with decision making and/or communication. A comparison group is not required as we will be looking for studies that describe the implementation or evaluation of a tool. If evaluation studies are identified, details on the comparison group will be assessed including patients and type of ICU (e.g. medical, neuroscience etc.). Outcome measures include (1) any severe adverse events post-ICU discharge (e.g. ICU readmission, hospital mortality), (2) any provider reported outcomes (e.g. quality of communication, satisfaction), or (3) any patient/family reported outcomes (e.g. quality of information, engagement, satisfaction).

Studies will be excluded if they include patient discharges predominantly from coronary care units, high dependency units, and step-down units.

Search Strategy

We will search the following electronic databases: Medline (OVID interface, 1946 onwards), EMBASE (OVID interface, 1947 onwards), CINAHL (EBSCO interface, 1981onwards) and the Cochrane Library (current issue). Bibliographies of retrieved articles will be searched for additional relevant articles. We will also search conference proceedings from the past five years, including the Canadian Critical Care Conference, Society of Critical Care Medicine, Australian and New Zealand Intensive Care Society Conference, European Society of Intensive Care Medicine Conference, American Thoracic Society Conference, and International Symposium on Intensive Care and Emergency Medicine. Experts in the field, identified from the references of included studies, will be contacted to determine whether they are aware of any additional studies.

An experienced information specialist (LP) will conduct the literature searches. They will be performed with no year or language restrictions and will use combinations and synonyms of the following search terms: intensive care, critical care, discharge plan, patient transfer and patient discharge. Appropriate wildcards will be used to account for plurals and variations in spelling. A draft literature search is available in Additional File 1.

Study selection process

Two investigators will independently review the retrieved abstracts (Screen 1) to identify those that meet the inclusion criteria. The full text of those articles deemed relevant by either reviewer

will be obtained. Two investigators will independently assess the full text articles (Screen 2) to determine if they meet the inclusion criteria. Two investigators will discuss disagreements on inclusion and a third investigator will resolve disagreements if needed. Bibliographic details will be downloaded to EndNote.[63] The study selection process will be pilot tested using 50 citations from the literature search. The inclusion and exclusion criteria will be serially clarified and reviewer training sequentially revised until reliable study selection can be demonstrated (estimated $\kappa \geq 0.6$).[64]

Data items and data collection process

The data collection instruments will include information on both citations and identified tools. We will document the type of citation (e.g. original research), country, setting (e.g. subspecialty of unit), study design, study population, recruitment and sampling, diagnostic criteria, reference standard, blinding, statistical methods and outcomes. For each tool we will document the name, purpose (e.g. risk stratification), components (single component vs. multi-component), how it is applied (e.g. electronic) and the timing of activation (e.g. discharge planning vs. discharge execution). If available, we will record any measurement properties documented (sensitivity/specificity), reported impact on processes and outcomes of care for patients, families and providers and barriers and facilitators identified to use of the tool. The data collection instrument and reviewer training will be sequentially revised until reliable data abstraction can be demonstrated (estimated $\kappa \geq 0.8$).[64] Differences in coding between the two reviewers will be resolved by discussion and a third reviewer consulted if an agreement cannot be reached. Original research studies will have the quality of their methodology assessed using the framework of Caldwell et al.[65] for evaluating both quantitative and qualitative study designs.

Two clinical decision-makers (Zygun, Boiteau, Zuege) will independently judge the relevance of each tool for decision-making according to four dimensions derived from the Strategic Framework Board in the United States:[66] 1) targets important improvements in continuity of patient care, 2) feasible to implement, 3) easy to use, 4) strength of scientific evidence (using the GRADE criteria).[67]

Analysis

Quantitative and qualitative analyses will be performed. The articles and tools will be categorized according to their respective criteria. Agreement on data abstraction and article classification will be assessed with Cohen κ reliability coefficients.[64] A comprehensive list of the tools will be developed and summarized using simple numerical counts. We will present the distribution of tools according to the cells of our conceptual model along with binomial 95% confidence intervals as well as detailed tabulations by type of article (original research, non-research) and study design. We will examine the purpose and components of the tools from each study as well as reported measurement properties (e.g. sensitivity/specificity of risk stratification tools) and reported processes (e.g. hospital length of stay) and outcomes (e.g. readmission to ICU) of care. A descriptive summary will be developed of each tool's purpose, components, conceptual model classification, measurement properties and relevance to knowledge users.

Qualitative studies will be evaluated by identifying the key outcomes and themes presented by each study (e.g. reported barriers and facilitators to discharge tool utilization), preserving the meaning from their original source, and tabulating them within the review. Translation of key concepts from all studies will be performed to identify novel concepts not explored by individual

studies. Analysis will focus on identifying the overlap of key concepts between studies. Finally, the translated concepts will be synthesized and refined to identify core themes.[68]

Using the above categorization scheme, we will be able to provide a scoping review of what research is available in the area of ICU discharge planning tools and the evidence base supporting available tools. From this we will identify where there is a need for a systematic review of the literature (e.g. there may be sufficient literature on validated risk stratification techniques) and where gaps in the literature exist and primary prospective studies are needed.

ETHICS AND DISSEMINATION

This scoping review is the first step in a major empiric work to measure and improve ICU discharge processes (focused on adult patients). It will identify the fundamental information needed to implement an ICU discharge planning tool. This review will identify existing tools to facilitate ICU discharge, the supporting evidence base as well as facilitators and barriers to implementation. All data will be obtained from publicly available materials, and therefore this study will not require ethics approval.

Our knowledge translation strategy will involve, among other approaches, a workshop to be held in conjunction with the annual January Canadian Critical Care Trials Group meeting that will bring together key target audiences across disciplines for our research. By engaging multidisciplinary stakeholders we will enhance linkages necessary for dissemination of our results. We will engage stakeholders in a discussion of the results and develop and prioritize a research agenda for implementation of a standardized ICU discharge planning tool. We will

publish in health services research and discipline-based journals. In addition, we will encourage presentation of findings at health services research conferences at national and international meetings including the annual meetings of the Canadian Critical Care Trials Group, and International Symposium of Intensive Care and Emergency Medicine amongst others.

Our scoping review results have the potential to influence the care of many patients. We will synthesize the literature for ICU discharge planning tools and identify opportunities for knowledge to action and gaps in evidence where primary evidence is necessary. ICUs are specialized units that have been widely implemented around the world to care for the sickest patients in the health care system.[53] Discharge from ICU is a high risk process because vulnerable patients, move from a resource rich environment to a relatively resource poor environment using a process that is non-standardized, inefficient and characterized by poor communication and frequent adverse events.[28, 29, 39, 43, 44, 69, 70] To improve patient care we need evidence-based tools to standardize and improve the quality of care provided to patients during ICU discharge. Our results will help implement an evidence-based ICU discharge planning tool to ensure that discharge from the ICU is safe, effective, efficient, timely, equitable and patient-centered so that the *right patient* is discharged at the *right time* using a *process* that improves patient care and reduces the risk of adverse events and hospital mortality while facilitating patients' care journey.

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List of Abbreviations

Intensive Care Unit, ICU

Institute of Medicine, IOM

Authors' Contributions

Study concept: Stelfox, Perrier, Straus, Ghali, Zygun, Boiteau, Zuege

Study design: Stelfox, Perrier, Straus, Ghali, Zygun, Boiteau, Zuege

Obtained funding: Stelfox, Perrier, Straus, Ghali, Zygun, Boiteau, Zuege

Drafted protocol: Stelfox

Edited protocol: Stelfox, Perrier, Straus, Ghali, Zygun, Boiteau, Zuege

Registered protocol: Stelfox

All authors read and approved the final protocol.

Competing Interests

The authors declare they have no competing interests.

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Table 1. Conceptual model of ICU discharge*

IOM Aims	Structure (Discharge Tool)	Process	Outcome
Safe	Risk stratification	Patient to right ward	↓ ICU readmission
Effective	Medication reconciliation	Right medications	↓ adverse event
Efficient	Information for providers	Providers informed	↓ duplication of tests
Timely	Risk stratification	Discharged when ready	↓ length of stay
Patient-Centered	Information for patients	Patients engaged	↑ Patient satisfaction
Equitable	Checklist	Equal access	↓ inequalities

*Table populated with sample tool components and consequent processes and outcomes

Figure legends

Figure 1. Conceptual evidence-based ICU discharge planning tool

Additional Files

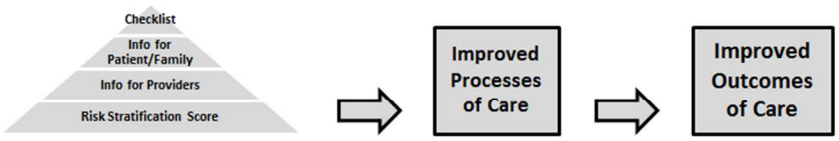
File name: Additional File 1

File format: PDF

Title of data: Draft Search Strategy for Medline

Description of data: literature search strategy

Figure 1. Conceptual evidence-based ICU discharge planning tool



229x72mm (96 x 96 DPI)

Additional File 1. Draft Search Strategy for Medline:

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1 (critical adj care).tw.
2 (critical$ adj ill$).tw.
3 (intensive adj care).mp.
4 ICU?.tw.
5 (cardiovascular adj unit?).tw.
6 (coronary adj care).tw.
7 CCU?.tw.
8 (step-down adj unit?).tw.
9 (burn adj unit?).tw.
10 "high dependency unit?".tw.
11 (neurosurgical adj unit?).tw.
12 (observation adj unit?).tw.
13 exp Intensive Care Units/
14 exp Critical Care/
15 Critical Illness/
16 or/1-15
17 (discharg$ adj1 plan$).tw.
18 (discharg$ adj1 process$).tw.
19 (discharg$ adj1 protocol?).tw.
20 (discharg$ adj1 method$).tw.
21 (discharg$ adj1 transition$).tw.
22 "discharg$ of patient?".tw.
23 (patient$ adj1 transition$).tw.
24 (patient$ adj1 discharg$).tw.
25 (patient$ adj1 transfer$).tw.
26 (transfer$ adj1 process$).tw.
27 (transfer$ adj1 plan$).tw.
28 (transfer$ adj3 ward$).tw.
29 "transfer$ of patient?".tw.
30 Patient Discharge/
31 Patient Transfer/
32 or/17-31
33 16 and 32
34 Animals/ not (Animals/ and Humans)
35 33 not 34

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Identifying Intensive Care Unit Discharge Planning Tools: Protocol for a Scoping Review

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Identifying Intensive Care Unit Discharge Planning Tools: Protocol for a Scoping Review

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ABSTRACT

Background: Transitions of care between providers are vulnerable periods in health care delivery that expose patients to preventable errors and adverse events. Patient discharge from the intensive care unit (ICU) to a medical or surgical hospital ward is one of the most challenging and high risk transitions of care. Approximately one in twelve patients discharged will be readmitted to ICU or die before leaving hospital. Many more patients are exposed to unnecessary health care, adverse events and/or are disappointed with the quality of their care. Our objective is to conduct a scoping review by systematically searching the literature to identify ICU discharge planning tools and their supporting evidence-base including barriers and facilitators to their use.

Methods and analysis: Systematic searching of the published health literature will be conducted to identify existing ICU discharge planning tools and supporting evidence. Literature (research and non-research) reporting on tools used to facilitate decision making and/or communication at ICU discharge, with patients of any age will be included. Outcomes will include adverse events and provider and patient/family reported outcomes. Two investigators will independently review the abstracts (Screen 1) to identify those meeting inclusion criteria and then independently assess the full text articles (Screen 2) to determine if they meet inclusion criteria. Data collection will include information on citations and identified tools. A quality assessment will be performed on original research studies. A descriptive summary will be developed for each tool.

Ethics and dissemination: Our scoping review will synthesize the literature for ICU discharge planning tools and identify opportunities for knowledge to action and gaps in evidence where primary evidence is necessary. This will serve as the foundational element in a multi-step

research program to standardize and improve the quality of care provided to patients during ICU discharge. Ethics approval is not required for this study.

BACKGROUND

The transfer of responsibility for patient care (synonyms include transition of care, handoff, sign over etc.) is a common practice in acute-care hospitals.[1] During transfers of patient care, crucial information on patient conditions, tests undertaken, and treatments received is transferred between providers, so that care plans can be effectively continued by receiving providers. A handoff between health care providers is not only a process to provide accurate and vital information regarding a patients' care, but is also a transfer of accountability and responsibility for patient care.[2-7] Healthcare organizations recognize the importance of transitions of care and have proposed organizational practices to improve the effectiveness and coordination of communication among providers and recipients of care across the care continuum.[3, 8, 9]

Unfortunately, the practice of provider handoff is often suboptimal due to communication barriers[6, 10-12] and is a major contributor to medical errors and adverse events.[2, 7, 13-19] The Harvard Medical Practice Study[20] found that adverse events occur in approximately 4% of patients discharged from hospital, with three quarters of these adverse events resulting in patient disability (ranging from less than one month duration to permanent) . A similar Australian study reported adverse events resulting in disability or increased length of stay for 17% of patients admitted to hospital.[21] In 2006, the Joint Commission for Accreditation of Health Care Organization (JCAHO) reported that 63% of deaths related to medical error in its sentinel events database involved a breakdown in communication.[22] Most research on handoffs for in-hospital patient transfers has focused on patient transfers from the perspective of a single discipline, such as physician end-of-shift[1, 6, 11, 18, 23] or end-of-service[2, 16, 17, 24] handoffs. In contrast, relatively little is known about handoffs between non-physician providers.[10, 25]

Multidisciplinary handoffs though are required to optimally transition care and likely face relatively greater communication hurdles due to cultural differences, work load challenges, and differences in clinical focus between specialties and disciplines, and thus may lead to greater potential for medical errors and adverse events.[10, 12, 25]

Numerous types of patient transfers and provider handoffs occur every day.[4, 6] A transition of care occurs each time a patient is referred to a specialist by their family doctor, assigned a new nurse during hospital shift change or discharged from hospital. Among these, patient transfers from the Intensive Care Unit (ICU) to a medical or surgical hospital ward are likely of particularly high risk due to the number, complexity and acuity of the medical conditions that characterize this patient group;[26-29] the large "voltage" drop in available resources when patients move from the ICU, where medical care is intensive and resources are rich, to ward environments, where patients typically receive much less intensive monitoring and patient care;[26] the multitude of communication barriers that providers often face during inter-specialty and multidisciplinary handoffs;[30] the lack of standardization in patient transfer processes overall; and in particular the lack of standardized written and/or electronic tools to facilitate an optimal transfer process.[28]

Patients admitted to the ICU are of the highest acuity requiring management with life support technologies and aggressive interventions to sustain life and progress towards a clinically stabilized condition.[28] Approximately one in ten patients admitted to an acute care facility are admitted to an ICU.[31] Transition of care is extremely common with 90% of ICU patients being eventually discharged to medical or surgical hospital wards.[32] With millions of

hospitalizations in acute care facilities in most countries each year,[31] hundreds of thousands of patients will be admitted to ICU and experience challenging and high risk transfers to hospital wards.

ICU discharge represents a large drop in the intensity of care with patients transitioning from a high acuity unit to a general care unit. ICUs are specially staffed, self-contained hospital units, dedicated to the management and continuous monitoring of patients with life-threatening illnesses.[33] The medical support available to patients in the ICU includes multidisciplinary teams of healthcare providers (i.e. physicians, nurses, pharmacists, therapists) that typically see each patient multiple times a day.[34, 35] In general there is a nurse for every one or two patients and a physician for every eight to ten patients.[36, 37] In contrast, general medical and surgical care units have fewer resources with a nurse for every four to eight patients[38] and physicians responsible for up to as many as 65 patients during regular working hours and 400 patients outside of regular working hours.[39] Other health care providers are often less available.

When a patient is transferred from ICU to a general care unit typically there is a complete transition in healthcare providers, most patients being assigned new teams of physicians, nurses, pharmacists, therapists etc. However, communication between providers discharging patients from the ICU and providers admitting these patients to general care units has been documented to be infrequent, incomplete and of poor quality.[30, 40] An observational study done by our research team in preparation for this protocol found direct verbal communication between ICU discharging physicians and ward admitting physicians to occur in only 15-25% of the ICU discharges.[30] Optimal transfers of care require effective communication between discharging

and admitting physicians that includes direct communication (in person or via telephone); concise, accurate, up-to-date discharge summaries; and physician notification at the time of transfer.[3, 30] However, communication during transfer is challenged by provider workloads, available resources, and variations in clinical focus between specialties.[10, 12, 25]

Communication between physicians and patients/families at the time of ICU discharge is also frequently suboptimal with the same local observational study finding 68% of patient/families reporting a desire for increased opportunities to ask questions about the transfer.[30] This lack of information about the ICU transfer process appears to be associated with patient and family anxiety.[41-44]Effective communication between providers and patients/families to provide early notification of an upcoming transfer,[30] and present information on current medical conditions and future plans prior to transfer would likely better manage expectations and reduce anxiety.

Standardizing the process of patient discharge from ICU could improve the safety, quality and efficiency of care. Multiple interventions to improve ICU discharge have been developed (e.g. transitional care units, ICU outreach, nursing liaison, etc.),[28, 45-48] but there is no consensus on an ideal ICU discharge model to optimize the quality of patient care[28] and few organizations have implemented standardized guidelines or procedures for transitions of care.[46, 49] Government agencies,[50] specialty groups[3, 51, 52] and the Institute for Healthcare Improvement[53] have all advocated standardizing ICU discharge structure and processes to improve continuity of care, patient safety, patient and provider satisfaction, and resource use.[47, 54]

The challenges of ICU discharge are well recognized.[28, 55] Very little is known about the quality of patient care during ICU discharge. A comprehensive review of ICU discharge planning tools has not been previously completed. The scope and magnitude of tools to facilitate patient discharge from ICU has not previously been defined. For tools already developed, it is unclear how effectively these have been implemented and how they may have affected patient clinical outcomes and/or patient and family satisfaction with care. In response to these challenges, we will conduct a scoping review to identify ICU discharge planning tools and the supporting evidence base for these tools including barriers and facilitators to their use.

METHODS AND ANALYSIS

Conceptual model

Our scoping review will adopt the model of system theory first introduced in 1966 by Avedis Donabedian.[56, 57] In Donabedian's framework, the three components of healthcare quality are *structure*, *process* and *outcome*. The *structure* is the environment in which health care is provided and includes material and health resources, operational factors, and organizational characteristics of the healthcare facility. The *process* is the method by which healthcare is provided and includes the giving and receiving of care by the providers and healthcare system. The *outcome* is the consequence of healthcare and includes the health status of patients. We will examine *structural* devices (tools) used to facilitate ICU discharge and evaluate their association with *processes* and *outcomes* of care for patients discharged from ICU (Figure 1).

In addition, we will incorporate the Institute of Medicine's (IOM) six aims for the 21st Century Health Care System into our research. ICU discharge tools should foster safe, effective, efficient, timely, equitable, and patient-centered discharge from ICU. We have developed a conceptual model for our scoping review that merges the Donabedian model and the IOM's six aims (Table 1). We recognize that our conceptual model is a relatively basic and simple representation of ICU discharge, but no other simple validated framework exists and we have successfully used a variation of this model to develop quality indicators for injury care.[58-61]

Objectives

This is a protocol for a scoping review to identify ICU discharge planning tools and the supporting evidence base for these tools including barriers and facilitators to their use. Methods for inclusion and analysis of articles and reporting of their results will be performed as recommended by Arksey and O'Malley[62] and refined by Levac and colleagues.[63]

We define an ICU as a distinct hospital ward that is staffed by specialized healthcare professionals and where immediate and continuous life sustaining treatment (e.g. invasive monitoring, vasoactive medications, invasive mechanical ventilation) is administered to hospitalized patients suffering from life-threatening conditions (e.g. severe respiratory failure).[36] Patient discharge from ICU is defined as the transfer of accountability and responsibility for patient care from the ICU to a hospital ward. Tools are defined as structural devices (e.g. protocols, reminders, order sets, bundles, checklists, forms, decision-aids) designed to aid health care providers or patients/families with decision making and/or communication.[64]

The specific objectives of the scoping review are:

1. To complete a systematic search of the literature to identify existing ICU discharge planning tools and evaluate the evidence base in support of the tools (including impact on patient outcomes).
2. To map the ICU discharge tools and supporting evidence to our conceptual framework to identify gaps in the evidence where primary evidence or systematic reviews are required.
3. To evaluate the tools according to their relevance to knowledge users (importance, feasibility, usability, scientific acceptability).
4. To describe barriers and facilitators to implementation and utilization of ICU discharge planning tools.

Eligibility Criteria

Research studies (no methodological restrictions – case series, cohort, cross-sectional, nonrandomized controlled, consensus method, case-control, randomized controlled) and non-research study designs (editorial, guideline, letter to the editor, narrative review) are eligible. We will include studies with all human patients discharged from any ICU regardless of subspecialty (e.g. medical, neuroscience, etc.). There is no restriction on age as tools identified for neonatal and pediatric patients may provide relevant information for the discharge of adult patients (and vice versa).

Eligible studies must include an electronic or paper tool (including guidelines, protocols, questionnaires, checklist, etc.) intended to facilitate discharge from ICU (regardless of discharge destination) either by providing decision-support for healthcare providers and/or

patients/families to determine readiness for discharge or aid in guiding the process of patient discharge. A comparison group is not required as we will be looking for studies that describe the development, implementation or evaluation of a tool. If evaluation studies are identified, details on the comparison group will be assessed including patients, type of ICU (e.g. medical, neuroscience etc.) and discharge destination (e.g. high dependency step down unit, hospital ward etc.). Outcome measures will include (1) any severe adverse events post-ICU discharge (e.g. ICU readmission, hospital mortality), (2) any provider reported outcomes (e.g. quality of communication, satisfaction), or (3) any patient/family reported outcomes (e.g. quality of information, engagement, satisfaction).

Studies will be excluded if they include patient discharges predominantly from coronary care units, high dependency units, and step-down units.

Search Strategy

We will search the following electronic databases: Medline (OVID interface, 1946 onwards), EMBASE (OVID interface, 1947 onwards), CINAHL (EBSCO interface, 1981onwards) and the Cochrane Library (current issue). Bibliographies of retrieved articles will be searched for additional relevant articles. We will also search conference proceedings from the past five years, including the Canadian Critical Care Conference, Society of Critical Care Medicine, Australian and New Zealand Intensive Care Society Conference, European Society of Intensive Care Medicine Conference, American Thoracic Society Conference, and International Symposium on Intensive Care and Emergency Medicine. Experts in the field, identified from the references of included studies, will be contacted to determine whether they are aware of any additional studies.

An experienced information specialist (LP) will conduct the literature searches. They will be performed with no year or language restrictions and will use combinations and synonyms of the following search terms: intensive care, critical care, discharge plan, patient transfer and patient discharge. Appropriate wildcards will be used to account for plurals and variations in spelling. A draft literature search is available in Additional File 1.

Study selection process

Two investigators will independently review the retrieved abstracts (Screen 1) to identify those that meet the inclusion criteria. The full text of those articles deemed relevant by either reviewer will be obtained. Two investigators will independently assess the full text articles (Screen 2) to determine if they meet the inclusion criteria. Two investigators will discuss disagreements on inclusion and a third investigator will resolve disagreements if needed. Bibliographic details will be downloaded to EndNote.[65] The study selection process will be pilot tested using 50 citations from the literature search. The inclusion and exclusion criteria will be serially clarified and reviewer training sequentially revised until reliable study selection can be demonstrated (estimated $\kappa \geq 0.6$).[66]

Data items and data collection process

The data collection instruments will include information on both citations and identified tools. We will document the type of citation (e.g. original research), country, setting (e.g. subspecialty of unit), study design, study population, recruitment and sampling, diagnostic criteria, reference standard, blinding, statistical methods and outcomes. For each tool we will document the name,

purpose (e.g. patient evaluation for discharge, planning patient discharge etc.), components (single component vs. multi-component), how it is applied (e.g. electronic) and the timing of activation (e.g. discharge planning vs. discharge execution). If available, we will record any measurement properties documented (sensitivity/specificity), reported impact on processes (e.g. medication reconciliation) and outcomes (e.g. patient readmission to ICU) of care for patients, families and providers and barriers and facilitators identified to use of the tool (e.g. organizational culture). The data collection instrument and reviewer training will be sequentially revised until reliable data abstraction can be demonstrated (estimated $\kappa \geq 0.8$).[66] Differences in coding between the two reviewers will be resolved by discussion and a third reviewer consulted if an agreement cannot be reached. Original research studies will have the quality of their methodology assessed using the framework of Caldwell et al.[67] for evaluating both quantitative and qualitative study designs. Two clinical decision-makers (Zygun, Boiteau, Zuege) will independently judge the relevance of each tool for decision-making according to four dimensions derived from the Strategic Framework Board in the United States:[68] 1) targets important improvements in continuity of patient care, 2) feasible to implement, 3) easy to use, 4) strength of scientific evidence (using the GRADE criteria).[69]

Analysis

Quantitative and qualitative analyses will be performed. The articles and tools will be categorized according to their respective criteria. Agreement on data abstraction and article classification will be assessed with Cohen κ reliability coefficients.[66] A comprehensive list of the tools will be developed and summarized using simple numerical counts. We will present the distribution of tools according to the cells of our conceptual model along with binomial 95%

confidence intervals as well as detailed tabulations by type of article (original research, non-research) and study design. We will examine the purpose and components of the tools from each study as well as reported measurement properties (e.g. sensitivity/specificity of risk stratification tools) and reported processes (e.g. hospital length of stay) and outcomes (e.g. readmission to ICU) of care. A descriptive summary will be developed of each tool's purpose, components, conceptual model classification, measurement properties and relevance to knowledge users.

Qualitative studies will be evaluated by identifying the key outcomes and themes presented by each study (e.g. reported barriers and facilitators to discharge tool utilization), preserving the meaning from their original source, and tabulating them within the review. Translation of key concepts from all studies will be performed to identify novel concepts not explored by individual studies. Analysis will focus on identifying the overlap of key concepts between studies. Finally, the translated concepts will be synthesized and refined to identify core themes.[70]

Using the above categorization scheme, we will be able to provide a scoping review of what research is available in the area of ICU discharge planning tools and the evidence base supporting available tools. From this we will identify where there is a need for a systematic review of the literature (e.g. there may be sufficient literature on validated risk stratification techniques) and where gaps in the literature exist and primary prospective studies are needed.

ETHICS AND DISSEMINATION

This scoping review is the first step in a major empiric work to measure and improve ICU discharge processes (focused on adult patients). It will identify the fundamental information

needed to implement an ICU discharge planning tool. This review will identify existing tools to facilitate ICU discharge, the supporting evidence base as well as facilitators and barriers to implementation. All data will be obtained from publicly available materials, and therefore this study will not require ethics approval.

Our knowledge translation strategy will involve, among other approaches, a workshop to be held in conjunction with the annual January Canadian Critical Care Trials Group meeting that will bring together key target audiences across disciplines for our research. By engaging multidisciplinary stakeholders we will enhance linkages necessary for dissemination of our results. We will engage stakeholders in a discussion of the results and develop and prioritize a research agenda for implementation of a standardized ICU discharge planning tool. We will publish in health services research and discipline-based journals. In addition, we will encourage presentation of findings at health services research conferences at national and international meetings including the annual meetings of the Canadian Critical Care Trials Group, and International Symposium of Intensive Care and Emergency Medicine amongst others.

Our scoping review results have the potential to influence the care of many patients. We will synthesize the literature for ICU discharge planning tools and identify opportunities for knowledge to action and gaps in evidence where primary evidence is necessary. ICUs are specialized units that have been widely implemented around the world to care for the sickest patients in the health care system.[55] Discharge from ICU is a high risk process because vulnerable patients, move from a resource rich environment to a relatively resource poor environment using a process that is non-standardized, inefficient and characterized by poor

communication and frequent adverse events.[29, 30, 40, 45, 46, 71, 72] To improve patient care we need evidence-based tools to standardize and improve the quality of care provided to patients during ICU discharge. Our results will help implement an evidence-based ICU discharge planning tool to ensure that discharge from the ICU is safe, effective, efficient, timely, equitable and patient-centered so that the *right patient* is discharged at the *right time* using a *process* that improves patient care and reduces the risk of adverse events and hospital mortality while facilitating patients' care journeys.

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List of Abbreviations

Intensive Care Unit, ICU

Institute of Medicine, IOM

Authors' Contributions

Study concept: Stelfox, Perrier, Straus, Ghali, Zygun, Boiteau, Zuege

Study design: Stelfox, Perrier, Straus, Ghali, Zygun, Boiteau, Zuege

Obtained funding: Stelfox, Perrier, Straus, Ghali, Zygun, Boiteau, Zuege

Drafted protocol: Stelfox

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All authors read and approved the final protocol.

Competing Interests

The authors declare they have no competing interests.

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Table 1. Conceptual model of ICU discharge*

IOM Aims	Structure (Discharge Tool)	Process	Outcome
Safe	Risk stratification	Patient to right ward	↓ ICU readmission
Effective	Medication reconciliation	Right medications	↓ adverse event
Efficient	Information for providers	Providers informed	↓ duplication of tests
Timely	Risk stratification	Discharged when ready	↓ length of stay
Patient-Centered	Information for patients	Patients engaged	↑ Patient satisfaction
Equitable	Checklist	Equal access	↓ inequalities

*Table populated with sample tool components and consequent processes and outcomes

Figure legends

Figure 1. Conceptual evidence-based ICU discharge planning tool

Additional Files

File name: Additional File 1

File format: PDF

Title of data: Draft Search Strategy for Medline

Description of data: literature search strategy

Identifying Intensive Care Unit Discharge Planning Tools: Protocol for a Scoping Review

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ABSTRACT

Background: Transitions of care between providers are vulnerable periods in health care delivery that expose patients to preventable errors and adverse events. Patient discharge from the intensive care unit (ICU) to a medical or surgical hospital ward is one of the most challenging and high risk transitions of care. Approximately one in twelve patients discharged will be readmitted to ICU or die before leaving hospital. Many more patients are exposed to unnecessary health care, adverse events and/or are disappointed with the quality of their care. Our objective is to conduct a scoping review by systematically searching the literature to identify ICU discharge planning tools and their supporting evidence-base including barriers and facilitators to their use.

Methods and analysis: Systematic searching of the published health literature will be conducted to identify existing ICU discharge planning tools and supporting evidence. Literature (research and non-research) reporting on tools used to facilitate decision making and/or communication at ICU discharge, with patients of any age will be included. Outcomes will include adverse events and provider and patient/family reported outcomes. Two investigators will independently review the abstracts (Screen 1) to identify those meeting inclusion criteria and then independently assess the full text articles (Screen 2) to determine if they meet inclusion criteria. Data collection will include information on citations and identified tools. A quality assessment will be performed on original research studies. A descriptive summary will be developed for each tool.

Ethics and dissemination: Our scoping review will synthesize the literature for ICU discharge planning tools and identify opportunities for knowledge to action and gaps in evidence where primary evidence is necessary. This will serve as the foundational element in a multi-step

research program to standardize and improve the quality of care provided to patients during ICU discharge. Ethics approval is not required for this study.

BACKGROUND

The transfer of responsibility for patient care (synonyms include transition of care, handoff, sign over etc.) is a common practice in acute-care hospitals.[1] During transfers of patient care, crucial information on patient conditions, tests undertaken, and treatments received is transferred between providers, so that care plans can be effectively continued by receiving providers. A handoff between health care providers is not only a process to provide accurate and vital information regarding a patients' care, but is also a transfer of accountability and responsibility for patient care.[2-7] Healthcare organizations recognize the importance of transitions of care and have proposed organizational practices to improve the effectiveness and coordination of communication among providers and recipients of care across the care continuum.[3, 8, 9]

Unfortunately, the practice of provider handoff is often suboptimal due to communication barriers[6, 10-12] and is a major contributor to medical errors and adverse events.[2, 7, 13-19] The Harvard Medical Practice Study[20] found that adverse events occur in approximately 4% of patients discharged from hospital, with three quarters of these adverse events resulting in patient disability (ranging from less than one month duration to permanent) . A similar Australian study reported adverse events resulting in disability or increased length of stay for 17% of patients admitted to hospital.[21] In 2006, the Joint Commission for Accreditation of Health Care Organization (JCAHO) reported that 63% of deaths related to medical error in its sentinel events database involved a breakdown in communication.[22] Most research on handoffs for in-hospital patient transfers has focused on patient transfers from the perspective of a single discipline, such as physician end-of-shift[1, 6, 11, 18, 23] or end-of-service[2, 16, 17, 24] handoffs. In contrast, relatively little is known about handoffs between non-physician providers.[10, 25]

Multidisciplinary handoffs though are required to optimally transition care and likely face relatively greater communication hurdles due to cultural differences, work load challenges, and differences in clinical focus between specialties and disciplines, and thus may lead to greater potential for medical errors and adverse events.[10, 12, 25]

Numerous types of patient transfers and provider handoffs occur every day.[4, 6] A transition of care occurs each time a patient is referred to a specialist by their family doctor, assigned a new nurse during hospital shift change or discharged from hospital. Among these, patient transfers from the Intensive Care Unit (ICU) to a medical or surgical hospital ward are likely of particularly high risk due to the number, complexity and acuity of the medical conditions that characterize this patient group;[26-29] the large "voltage" drop in available resources when patients move from the ICU, where medical care is intensive and resources are rich, to ward environments, where patients typically receive much less intensive monitoring and patient care;[26] the multitude of communication barriers that providers often face during inter-specialty and multidisciplinary handoffs;[30] the lack of standardization in patient transfer processes overall; and in particular the lack of standardized written and/or electronic tools to facilitate an optimal transfer process.[28]

Patients admitted to the ICU are of the highest acuity requiring management with life support technologies and aggressive interventions to sustain life and progress towards a clinically stabilized condition.[28] Approximately one in ten patients admitted to an acute care facility are admitted to an ICU.[31] Transition of care is extremely common with 90% of ICU patients being eventually discharged to medical or surgical hospital wards.[32] With millions of

hospitalizations in acute care facilities in most countries each year,[31] hundreds of thousands of patients will be admitted to ICU and experience challenging and high risk transfers to hospital wards.

ICU discharge represents a large drop in the intensity of care with patients transitioning from a high acuity unit to a general care unit. ICUs are specially staffed, self-contained hospital units, dedicated to the management and continuous monitoring of patients with life-threatening illnesses.[33] The medical support available to patients in the ICU includes multidisciplinary teams of healthcare providers (i.e. physicians, nurses, pharmacists, therapists) that typically see each patient multiple times a day.[34, 35] In general there is a nurse for every one or two patients and a physician for every eight to ten patients.[36, 37] In contrast, general medical and surgical care units have fewer resources with a nurse for every four to eight patients[38] and physicians responsible for up to as many as 65 patients during regular working hours and 400 patients outside of regular working hours.[39] Other health care providers are often less available.

When a patient is transferred from ICU to a general care unit typically there is a complete transition in healthcare providers, most patients being assigned new teams of physicians, nurses, pharmacists, therapists etc. However, communication between providers discharging patients from the ICU and providers admitting these patients to general care units has been documented to be infrequent, incomplete and of poor quality.[30, 40] An observational study done by our research team in preparation for this protocol found direct verbal communication between ICU discharging physicians and ward admitting physicians to occur in only 15-25% of the ICU discharges.[30] Optimal transfers of care require effective communication between discharging

and admitting physicians that includes direct communication (in person or via telephone); concise, accurate, up-to-date discharge summaries; and physician notification at the time of transfer.[3, 30] However, communication during transfer is challenged by provider workloads, available resources, and variations in clinical focus between specialties.[10, 12, 25]

Communication between physicians and patients/families at the time of ICU discharge is also frequently suboptimal with the same local observational study finding 68% of patient/families reporting a desire for increased opportunities to ask questions about the transfer.[30] This lack of information about the ICU transfer process appears to be associated with patient and family anxiety.[41-44]Effective communication between providers and patients/families to provide early notification of an upcoming transfer,[30] and present information on current medical conditions and future plans prior to transfer would likely better manage expectations and reduce anxiety.

Standardizing the process of patient discharge from ICU could improve the safety, quality and efficiency of care. Multiple interventions to improve ICU discharge have been developed (e.g. transitional care units, ICU outreach, nursing liaison, etc.),[28, 45-48] but there is no consensus on an ideal ICU discharge model to optimize the quality of patient care[28] and few organizations have implemented standardized guidelines or procedures for transitions of care.[46, 49] Government agencies,[50] specialty groups[3, 51, 52] and the Institute for Healthcare Improvement[53] have all advocated standardizing ICU discharge structure and processes to improve continuity of care, patient safety, patient and provider satisfaction, and resource use.[47, 54]

The challenges of ICU discharge are well recognized.[28, 55] Very little is known about the quality of patient care during ICU discharge. A comprehensive review of ICU discharge planning tools has not been previously completed. The scope and magnitude of tools to facilitate patient discharge from ICU has not previously been defined. For tools already developed, it is unclear how effectively these have been implemented and how they may have affected patient clinical outcomes and/or patient and family satisfaction with care. In response to these challenges, we will conduct a scoping review to identify ICU discharge planning tools and the supporting evidence base for these tools including barriers and facilitators to their use.

METHODS AND ANALYSIS

Conceptual model

Our scoping review will adopt the model of system theory first introduced in 1966 by Avedis Donabedian.[56, 57] In Donabedian's framework, the three components of healthcare quality are *structure*, *process* and *outcome*. The *structure* is the environment in which health care is provided and includes material and health resources, operational factors, and organizational characteristics of the healthcare facility. The *process* is the method by which healthcare is provided and includes the giving and receiving of care by the providers and healthcare system. The *outcome* is the consequence of healthcare and includes the health status of patients. We will examine *structural* devices (tools) used to facilitate ICU discharge and evaluate their association with *processes* and *outcomes* of care for patients discharged from ICU (Figure 1).

In addition, we will incorporate the Institute of Medicine's (IOM) six aims for the 21st Century Health Care System into our research. ICU discharge tools should foster safe, effective, efficient, timely, equitable, and patient-centered discharge from ICU. We have developed a conceptual model for our scoping review that merges the Donabedian model and the IOM's six aims (Table 1). We recognize that our conceptual model is a relatively basic and simple representation of ICU discharge, but no other simple validated framework exists and we have successfully used a variation of this model to develop quality indicators for injury care.[58-61]

Objectives

This is a protocol for a scoping review to identify ICU discharge planning tools and the supporting evidence base for these tools including barriers and facilitators to their use. Methods for inclusion and analysis of articles and reporting of their results will be performed as recommended by Arksey and O'Malley[62] and refined by Levac and colleagues.[63]

We define an ICU as a distinct hospital ward that is staffed by specialized healthcare professionals and where immediate and continuous life sustaining treatment (e.g. invasive monitoring, vasoactive medications, invasive mechanical ventilation) is administered to hospitalized patients suffering from life-threatening conditions (e.g. severe respiratory failure).[36] Patient discharge from ICU is defined as the transfer of accountability and responsibility for patient care from the ICU to a hospital ward. Tools are defined as structural devices (e.g. protocols, reminders, order sets, bundles, checklists, forms, decision-aids) designed to aid health care providers or patients/families with decision making and/or communication.[64]

The specific objectives of the scoping review are:

1. To complete a systematic search of the literature to identify existing ICU discharge planning tools and evaluate the evidence base in support of the tools (including impact on patient outcomes).
2. To map the ICU discharge tools and supporting evidence to our conceptual framework to identify gaps in the evidence where primary evidence or systematic reviews are required.
3. To evaluate the tools according to their relevance to knowledge users (importance, feasibility, usability, scientific acceptability).
4. To describe barriers and facilitators to implementation and utilization of ICU discharge planning tools.

Eligibility Criteria

Research studies (no methodological restrictions – case series, cohort, cross-sectional, nonrandomized controlled, consensus method, case-control, randomized controlled) and non-research study designs (editorial, guideline, letter to the editor, narrative review) are eligible. We will include studies with all human patients discharged from any ICU regardless of subspecialty (e.g. medical, neuroscience, etc.). There is no restriction on age as tools identified for neonatal and pediatric patients may provide relevant information for the discharge of adult patients (and vice versa).

Eligible studies must include an electronic or paper tool (including guidelines, protocols, questionnaires, checklist, etc.) intended to facilitate discharge from ICU (regardless of discharge destination) either by providing decision-support for healthcare providers and/or

patients/families to determine readiness for discharge or aid in guiding the process of patient discharge. A comparison group is not required as we will be looking for studies that describe the development, implementation or evaluation of a tool. If evaluation studies are identified, details on the comparison group will be assessed including patients, type of ICU (e.g. medical, neuroscience etc.) and discharge destination (e.g. high dependency step down unit, hospital ward etc.). Outcome measures will include (1) any severe adverse events post-ICU discharge (e.g. ICU readmission, hospital mortality), (2) any provider reported outcomes (e.g. quality of communication, satisfaction), or (3) any patient/family reported outcomes (e.g. quality of information, engagement, satisfaction).

Studies will be excluded if they include patient discharges predominantly from coronary care units, high dependency units, and step-down units.

Search Strategy

We will search the following electronic databases: Medline (OVID interface, 1946 onwards), EMBASE (OVID interface, 1947 onwards), CINAHL (EBSCO interface, 1981onwards) and the Cochrane Library (current issue). Bibliographies of retrieved articles will be searched for additional relevant articles. We will also search conference proceedings from the past five years, including the Canadian Critical Care Conference, Society of Critical Care Medicine, Australian and New Zealand Intensive Care Society Conference, European Society of Intensive Care Medicine Conference, American Thoracic Society Conference, and International Symposium on Intensive Care and Emergency Medicine. Experts in the field, identified from the references of included studies, will be contacted to determine whether they are aware of any additional studies.

An experienced information specialist (LP) will conduct the literature searches. They will be performed with no year or language restrictions and will use combinations and synonyms of the following search terms: intensive care, critical care, discharge plan, patient transfer and patient discharge. Appropriate wildcards will be used to account for plurals and variations in spelling. A draft literature search is available in Additional File 1.

Study selection process

Two investigators will independently review the retrieved abstracts (Screen 1) to identify those that meet the inclusion criteria. The full text of those articles deemed relevant by either reviewer will be obtained. Two investigators will independently assess the full text articles (Screen 2) to determine if they meet the inclusion criteria. Two investigators will discuss disagreements on inclusion and a third investigator will resolve disagreements if needed. Bibliographic details will be downloaded to EndNote.[65] The study selection process will be pilot tested using 50 citations from the literature search. The inclusion and exclusion criteria will be serially clarified and reviewer training sequentially revised until reliable study selection can be demonstrated (estimated $\kappa \geq 0.6$).[66]

Data items and data collection process

The data collection instruments will include information on both citations and identified tools. We will document the type of citation (e.g. original research), country, setting (e.g. subspecialty of unit), study design, study population, recruitment and sampling, diagnostic criteria, reference standard, blinding, statistical methods and outcomes. For each tool we will document the name,

purpose (e.g. patient evaluation for discharge, planning patient discharge etc.), components (single component vs. multi-component), how it is applied (e.g. electronic) and the timing of activation (e.g. discharge planning vs. discharge execution). If available, we will record any measurement properties documented (sensitivity/specificity), reported impact on processes (e.g. medication reconciliation) and outcomes (e.g. patient readmission to ICU) of care for patients, families and providers and barriers and facilitators identified to use of the tool (e.g. organizational culture). The data collection instrument and reviewer training will be sequentially revised until reliable data abstraction can be demonstrated (estimated $\kappa \geq 0.8$).[66] Differences in coding between the two reviewers will be resolved by discussion and a third reviewer consulted if an agreement cannot be reached. Original research studies will have the quality of their methodology assessed using the framework of Caldwell et al.[67] for evaluating both quantitative and qualitative study designs. Two clinical decision-makers (Zygun, Boiteau, Zuege) will independently judge the relevance of each tool for decision-making according to four dimensions derived from the Strategic Framework Board in the United States:[68] 1) targets important improvements in continuity of patient care, 2) feasible to implement, 3) easy to use, 4) strength of scientific evidence (using the GRADE criteria).[69]

Analysis

Quantitative and qualitative analyses will be performed. The articles and tools will be categorized according to their respective criteria. Agreement on data abstraction and article classification will be assessed with Cohen κ reliability coefficients.[66] A comprehensive list of the tools will be developed and summarized using simple numerical counts. We will present the distribution of tools according to the cells of our conceptual model along with binomial 95%

confidence intervals as well as detailed tabulations by type of article (original research, non-research) and study design. We will examine the purpose and components of the tools from each study as well as reported measurement properties (e.g. sensitivity/specificity of risk stratification tools) and reported processes (e.g. hospital length of stay) and outcomes (e.g. readmission to ICU) of care. A descriptive summary will be developed of each tool's purpose, components, conceptual model classification, measurement properties and relevance to knowledge users.

Qualitative studies will be evaluated by identifying the key outcomes and themes presented by each study (e.g. reported barriers and facilitators to discharge tool utilization), preserving the meaning from their original source, and tabulating them within the review. Translation of key concepts from all studies will be performed to identify novel concepts not explored by individual studies. Analysis will focus on identifying the overlap of key concepts between studies. Finally, the translated concepts will be synthesized and refined to identify core themes.[70]

Using the above categorization scheme, we will be able to provide a scoping review of what research is available in the area of ICU discharge planning tools and the evidence base supporting available tools. From this we will identify where there is a need for a systematic review of the literature (e.g. there may be sufficient literature on validated risk stratification techniques) and where gaps in the literature exist and primary prospective studies are needed.

ETHICS AND DISSEMINATION

This scoping review is the first step in a major empiric work to measure and improve ICU discharge processes (focused on adult patients). It will identify the fundamental information

needed to implement an ICU discharge planning tool. This review will identify existing tools to facilitate ICU discharge, the supporting evidence base as well as facilitators and barriers to implementation. All data will be obtained from publicly available materials, and therefore this study will not require ethics approval.

Our knowledge translation strategy will involve, among other approaches, a workshop to be held in conjunction with the annual January Canadian Critical Care Trials Group meeting that will bring together key target audiences across disciplines for our research. By engaging multidisciplinary stakeholders we will enhance linkages necessary for dissemination of our results. We will engage stakeholders in a discussion of the results and develop and prioritize a research agenda for implementation of a standardized ICU discharge planning tool. We will publish in health services research and discipline-based journals. In addition, we will encourage presentation of findings at health services research conferences at national and international meetings including the annual meetings of the Canadian Critical Care Trials Group, and International Symposium of Intensive Care and Emergency Medicine amongst others.

Our scoping review results have the potential to influence the care of many patients. We will synthesize the literature for ICU discharge planning tools and identify opportunities for knowledge to action and gaps in evidence where primary evidence is necessary. ICUs are specialized units that have been widely implemented around the world to care for the sickest patients in the health care system.[55] Discharge from ICU is a high risk process because vulnerable patients, move from a resource rich environment to a relatively resource poor environment using a process that is non-standardized, inefficient and characterized by poor

communication and frequent adverse events.[29, 30, 40, 45, 46, 71, 72] To improve patient care we need evidence-based tools to standardize and improve the quality of care provided to patients during ICU discharge. Our results will help implement an evidence-based ICU discharge planning tool to ensure that discharge from the ICU is safe, effective, efficient, timely, equitable and patient-centered so that the *right patient* is discharged at the *right time* using a *process* that improves patient care and reduces the risk of adverse events and hospital mortality while facilitating patients' care journeys.

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List of Abbreviations

Intensive Care Unit, ICU

Institute of Medicine, IOM

Authors' Contributions

Study concept: Stelfox, Perrier, Straus, Ghali, Zygun, Boiteau, Zuege

Study design: Stelfox, Perrier, Straus, Ghali, Zygun, Boiteau, Zuege

Obtained funding: Stelfox, Perrier, Straus, Ghali, Zygun, Boiteau, Zuege

Drafted protocol: Stelfox

Edited protocol: Stelfox, Perrier, Straus, Ghali, Zygun, Boiteau, Zuege

All authors read and approved the final protocol.

Competing Interests

The authors declare they have no competing interests.

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Table 1. Conceptual model of ICU discharge*

IOM Aims	Structure (Discharge Tool)	Process	Outcome
Safe	Risk stratification	Patient to right ward	↓ ICU readmission
Effective	Medication reconciliation	Right medications	↓ adverse event
Efficient	Information for providers	Providers informed	↓ duplication of tests
Timely	Risk stratification	Discharged when ready	↓ length of stay
Patient-Centered	Information for patients	Patients engaged	↑ Patient satisfaction
Equitable	Checklist	Equal access	↓ inequalities

*Table populated with sample tool components and consequent processes and outcomes

Figure legends

Figure 1. Conceptual evidence-based ICU discharge planning tool

Additional Files

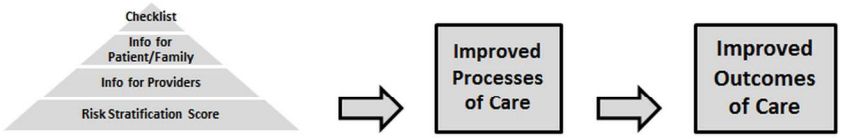
File name: Additional File 1

File format: PDF

Title of data: Draft Search Strategy for Medline

Description of data: literature search strategy

Figure 1. Conceptual evidence-based ICU discharge planning tool



283x90mm (300 x 300 DPI)

Additional File 1. Draft Search Strategy for Medline:

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1 (critical adj care).tw.
2 (critical$ adj ill$).tw.
3 (intensive adj care).mp.
4 ICU?.tw.
5 (cardiovascular adj unit?).tw.
6 (coronary adj care).tw.
7 CCU?.tw.
8 (step-down adj unit?).tw.
9 (burn adj unit?).tw.
10 "high dependency unit?".tw.
11 (neurosurgical adj unit?).tw.
12 (observation adj unit?).tw.
13 exp Intensive Care Units/
14 exp Critical Care/
15 Critical Illness/
16 or/1-15
17 (discharg$ adj1 plan$).tw.
18 (discharg$ adj1 process$).tw.
19 (discharg$ adj1 protocol?).tw.
20 (discharg$ adj1 method$).tw.
21 (discharg$ adj1 transition$).tw.
22 "discharg$ of patient?".tw.
23 (patient$ adj1 transition$).tw.
24 (patient$ adj1 discharg$).tw.
25 (patient$ adj1 transfer$).tw.
26 (transfer$ adj1 process$).tw.
27 (transfer$ adj1 plan$).tw.
28 (transfer$ adj3 ward$).tw.
29 "transfer$ of patient?".tw.
30 Patient Discharge/
31 Patient Transfer/
32 or/17-31
33 16 and 32
34 Animals/ not (Animals/ and Humans)
35 33 not 34