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**Title:** Health care delivery and recovery after critical illness

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**Structured Abstract:**

**Purpose of review:** To summarize improvements & innovations in healthcare delivery which could be implemented to improve the recovery experience after critical illness for adult survivors and their families.

**Recent Findings:** For survivors of critical illness, the transitions in care during their recovery journey are points of heightened vulnerability associated with adverse events. Survivors of critical illness often have errors in the management of their medications during the recovery period. A multicomponent intervention delivered for 30 days that focused on four key principles of improved recovery care after sepsis care was associated with a durable effect on 12-month rehospitalization and mortality compared with usual care. A recent multi-centre study which piloted integrating health and social care for critical care survivors demonstrated improvements in health-related quality of life and self-efficacy at 12-months. Multiple qualitative studies provide insights into how peer support programs could potentially benefit survivors of critical illness by providing them mechanism to share their experiences, to give back to other patients, and to set more realistic expectations for recovery.

**Summary:** Future research could focus on exploring safety outcomes as primary endpoints and finding ways to develop & test implementation strategies to improve the recovery after critical illness.

**Keywords:** critical care; recovery; care transitions; rehabilitation and peer support

## **Introduction**

Survivors of critical illness suffer high rates of physical, emotional, social, and psychological impairments following hospital discharge (1). There is evidence to suggest that many survivors of critical illness and their families are dissatisfied with their recovery care (2). This paper will focus on the critically ill patients' journey to recovery and the improvements in healthcare delivery which could be implemented to improve recovery after critical illness. We will summarize actionable processes which can be implemented to improve the experiences and outcomes for critical illness survivors and their family members. We will focus on the various transitions of care during the process of recovery from critical illness and explore potential strategies to improve recovery care delivery.

### **Transitions of care: ICU to Hospital Ward**

During their journey to recovery, critically ill patients can encounter several transfers between distinct care locations (3). Whether they are moving from the Intensive Care Unit (ICU) to the ward environment, or the hospital ward to a subacute care facility or from a care facility back to home (3), these transition points are periods of heightened vulnerability associated with medical errors, adverse events, and poor patient and family satisfaction (4). In a recent multi-centre cohort study for example, almost 20% of patients experienced an adverse event following discharge from intensive care unit (ICU) to the hospital ward (5). The patients who experienced an adverse event during the transition were more likely to be readmitted to the ICU, spent an average of 16 days more in the hospital than those without these adverse events, and were more likely to die in the hospital (5).

A multi-centre cohort study, across 10 Canadian ICUs, provided a 360-degree description of ICU to ward transfers by examining transfer processes and care documentation, alongside patient and provider perspectives, to understand improvements in patients moving from ICU to the ward (6). This study characterized important deficiencies and communication failures in the transfer process from the ICU to the wards. The four most common recommendations that emerged from the qualitative analysis of the comments from the physicians, nurses and patients were to: 1) document a physical care plan which travelled with patients across care transitions; 2) avoid transferring patients during shift change or at night and ensure that the receiving team is ready for the patient; 3) conduct standardized face-to face handover; 4) inform patients & families about upcoming transfer before it occurs (6).

Improving the management of medications may be another important means through which we can improve patient care following ICU discharge. Survivors of critical illness can often have medications inappropriately continued, inappropriately withheld, or inappropriately delivered during the critical care recovery period (7). These medication related problems are not benign and occur frequently. For example, in a recent multicentre cohort study, over 60% of patients seen in an ICU recovery program needed at least one pharmacy intervention; of the 198 problems identified, over 85% were classified as clinically significant (8). However, these problems are not intractable; a recent meta- analysis which examined medication related interventions aimed at improving safety and patient outcomes during transition from adult ICU settings, found that multi-component interventions which included educational components, alongside the implementation of clinical guidelines, improved patient outcomes (9).

### **Transitions of care: Discharge Home from hospital**

Like the transition from ICU to the hospital ward, survivors of critical illness and their caregivers can face challenges during the transition from hospital to home. Patients can often have problems accessing services, especially in relation to physical and emotional rehabilitation (10). These issues can have multiple negative consequences, including high unscheduled care requirements, and increased morbidity and mortality (10,11). Expert guidance for post hospital discharge has focused on key principles such as: screening for common impairments; reviewing and adjusting long-term medications; anticipating and mitigating risk of health deterioration and readdressing goals of care and offering palliative care when appropriate (12). In a large retrospective study that consisted of adults admitted to large health system with sepsis, only 11% of the patients had documented receipt of all four of the post sepsis care elements (13).

The Improving Morbidity during Post-Acute Care Transitions for Sepsis (IMPACTS) trial evaluated the effectiveness of a potential health care delivery solution for adult survivors of sepsis: the use of a nurse navigator to optimize the bundle of practices that have been associated with reduced mortality and readmission (14). Adults who had been admitted to the hospital through the emergency room and were deemed to be at high risk of readmission or mortality were eligible for participation into the study (14). The nurse navigator provided support to the patient through telephone and electronic health record communication. The appropriate escalation of care was provided to patients in the intervention group through weekly discussions between the nurse navigator and the lead physician. The study found that the adjusted risk of 30-day hospital readmission or mortality was lower in the group of patients who treated in the intervention group when compared to the patients treated in the

usual care arm (14). This multicomponent program that was delivered for 30 days was also associated with a durable effect on 12-month rehospitalization and mortality: compared with usual care (15).

Recent data have also highlighted challenges in the interaction between the hospital and the primary care setting during the transition from hospital to home for acute illness survivors (16). Primary care providers often have limited or incorrect information about the critical care journey, making it difficult for them to guide treatment modalities following discharge. A recent single centre US study explored the primary care providers' perspectives on how hospital discharge summaries could improve. Primary care providers wanted hospital discharge summaries to provide information about: 1) why patients were admitted; 2) what interventions were undertaken; 3) what complications occurred; 4) what treatment choices were made by the patient, 5) what potential post ICU problems may be encountered by the patient (17).

### **Transitions of care: Adaptation and Recovery**

There are two principal areas of innovation that have focused on improving the adaptation and recovery for survivors of critical illness after hospital discharge: ICU follow-up clinics and support groups. International reports indicate varying structure, format, and content for each of these interventions, with no standardised model of service delivery (18, 19).

#### *ICU Follow up clinics*

At present there is no randomised controlled study which demonstrates patient level benefit from the delivery of post-ICU clinics (20). Despite this, increasing numbers of health systems

are now delivering these programmes to critical care survivors. A recent survey of UK ICUs for example, demonstrated an exponential increase in the delivery of these clinics in the last decade, often unfunded, to provide patient and caregivers benefit (21). Yet, there is cause for tempered optimism in this field. A multi-centre, non-randomised interventional study from the UK, which piloted an integrated health and social care programme for critical care survivors, demonstrated improvements in health-related quality of life and self-efficacy at 12 months, in comparison to a propensity matched cohort who did not receive the intervention (22). Similarly, for those caregivers who received the programme, at 12 months, caregivers reported less strain and better sleep patterns compared to those caregivers who did not receive the intervention (23). This work signals that delivering a complex intervention in this population, alongside traditional biomedical interventions such as physiotherapy and medicines reconciliation, is feasible, safe, and scalable to different contexts. Future work should build on supporting trials in this area to understand the effectiveness of similar integrated models.

### *Support Groups*

Peer support is a system of giving and receiving support among people with similar experiences, with the aim of promoting resilience and increasing survivors' capacity to self-manage their health challenges through social, emotional, information, appraisal, and instrumental support (24, 25). Although, there is no randomized clinical intervention showing benefit of peer support in survivors of critical illness (25), multiple qualitative studies provide insights into how these programs potentially benefit patients and families. For example, patients in an ICU recovery program identified that in the context of a fragmented health care systems, finding ways to manage their expectations, validate their own progress and normalize their emotions were important components of recovery (26). Another qualitative



study found that participation in a peer support program possibly provided a mechanism for patients to share their experiences and provided them with a more intuitive understanding of the recovery process, which then allowed for more realistic expectations while also providing them opportunity to give back to other patients (27). Future studies evaluating the effectiveness of peer support in survivors of critical illness should consider measuring such outcomes as self-efficacy, expectation management and psychological symptoms like anxiety.

### **The impact of the COVID-19 pandemic**

The COVID-19 pandemic has made more visible the challenges of the healthcare delivery system for critically ill adults across the recovery trajectory. Multiple studies have highlighted the unequal distribution of SARS-CoV-2 infection and COVID-19 adverse outcomes by certain social & structural factors like race, ethnicity, socio-economic status (28, 29). These data invite broader types of interventions that can address survivorship not merely as a health challenge but also as an economic, social, and political problem as well. For example, data from the UK and the US has shown high rates of new unemployment following severe COVID-19, with those from the most deprived areas of society less likely to return to employment following infection (10, 30).

Moreover, the recent literature on outcomes after COVID-19 highlighted the negative impact of restricting visitations from family members. For example, in a recent French multi-centre cohort study, among family members of patients hospitalized in the ICU with ARDS COVID-19 disease, compared with non-COVID related ARDS, was significantly associated with increased risk of symptoms of PTSD at 90 days after discharge (22). While the complex interplay between socio-economic deprivation and health, and supporting vulnerable family members,

may seem outside the professional boundaries of critical care providers, small scale actionable processes may alleviate these issues. A recent multicentre, international qualitative study conducted with interprofessional clinicians involved in the delivery of recovery services, demonstrated that addressing financial support needs and reconstructing the illness narrative in more detail can feasibly be implemented and was deemed priority by those providing services (31).

### **Future directions**

The field of long-term outcomes is still in its infancy; researchers are still exploring and defining the potential issues faced by patients, as well as how to manage and improve patient outcomes (32). Yet, we offer some bold suggestions which could help make important gains in the field. First, future trials of post-ICU services should consider including broad safety and harm reduction outcomes. Studies that have examined the effectiveness of post-ICU services have largely aimed at improving person-centred outcomes (32, 33). While we do not advocate a change in this focus, future research and trials should also consider incorporating service level 'priorities, such as unplanned hospital readmissions as well as adverse events encountered by patients following unsupported recovery. This step may also improve future funding and commissioning within healthcare services. Second, we need more research describing phenotypes of recovery trajectories (33). Evidence has shown that those with poorer pre-morbid health status and complex comorbidities, are more likely to encounter challenges and decreased functional abilities following discharge (34). Future research should examine these trajectories in more detail to understand if recovery services might be more beneficial to certain subgroups of survivors. More research is needed on ways to enrich our future study samples with participants at higher risk of adverse outcomes (prognostic

enrichment) and/or with participants more likely to respond to specific types of recovery interventions (predictive enrichment) (35). Third, since the resources for health system change are often driven by social and political factors, methodological advances such as step wedged trials may be an important approach to studying complex interventions in a pragmatic way (36). Fourth, given the high level of intra- and inter-individual variability in symptoms during the recovery process, rigorous N-of-1 trials may have an important role in our research armamentarium (37).

## **Conclusion**

Patients can face complex problems following critical illness, with limited evidence supporting any definitive intervention. This review has identified actionable processes across the patient pathway which could potentially improve outcomes across transitions of care (see Figure 1). However, further evaluation and innovation is needed to develop and empirically test implementation strategies to improve recovery after critical illness.

**Key points:**

- The transitions of care experienced by ICU survivors often reflect fracture points in the patient journey, causing fragmented care and in some cases, patient harm.
- This review focusses on actionable processes which can improve the patient and caregiver journey, across transitions of care.
- Improved discharge planning and documentation, timely medicines reconciliation and the provisions of holistic ICU recovery programmes, may improve outcomes in this area.
- Future research could focus on exploring safety outcomes as primary endpoints and delineate patients most at risk of adverse outcomes following critical illness.

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**Figure Legend:**

Figure 1. Actionable processes which could potentially improve recovery outcomes for critically ill adults.

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Figure 1. Actionable processes which could potentially improve recovery outcomes for critically ill adults.

### ICU to Ward

- Document a care plan that can physically travel with patient
- Conduct standardized handover, preferably in-person
- Confirm that patient & families were informed about transfer before moving patient
- Optimize medications
- Summarize relevant diagnoses & care preferences that were made during ICU
- Summarize potential post-ICU problems that may be encountered

### Hospital to Home

- Screen & Treat for new physical, cognitive & mental impairments
- Closely monitor co-morbid conditions for worsening after discharge
- Optimize medications
- Offer palliative care services to patients with end-stage illness
- Assess patients for new social & financial impairments following hospital discharge