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MINIREVIEWS

Discharging patients home from the intensive care unit: A new trend

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Abstract

Discharging patients directly to home from the intensive care unit (ICU) is becoming a new trend. This review examines the feasibility, benefits, challenges, and considerations of directly discharging ICU patients. By analyzing available evidence and healthcare professionals' experiences, the review explores the potential impacts on patient outcomes and healthcare systems. The practice of direct discharge from the ICU presents both opportunities and complexities. While it can potentially reduce costs, enhance patient comfort, and mitigate complications linked to extended hospitalization, it necessitates meticulous patient selection and robust post-discharge support mechanisms. Implementing this strategy successfully mandates the availability of home-based care services and a careful assessment of the patient's readiness for the transition. Through critical evaluation of existing literature, this review underscores the significance of tailored patient selection criteria and comprehensive post-discharge support systems to ensure patient safety and optimal recovery. The insights provided contribute evidence-based recommendations for refining the direct discharge approach, fostering improved patient outcomes, heightened satisfaction, and streamlined healthcare processes. Ultimately, the review seeks to balance patient-centered care and effective resource utilization within ICU discharge strategies.

Key Words: Intensive care unit; Critical care; Early discharge; Cost effective critical care; Patient comfort; Early recovery

Core Tip: Intensive care unit (ICU) discharge without transferring to a lower dependency unit is gaining attention as an alternative to traditional discharge methods. This approach offers potential cost savings, increased patient comfort, and reduced complications associated with prolonged hospital stays. However, successful implementation requires careful patient selection and robust post-discharge support services. Establishing specific criteria for patient selection and ensuring comprehensive post-discharge care is crucial, ultimately balancing patient-centered care with efficient resource utilization in ICU discharge practices. The potential for early patient recovery and cost saving is magnanimous, as seen in recent studies.

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INTRODUCTION

Discharging patients from the intensive care unit (ICU) is critical in their recovery journey. It signifies a transition from acute care to a lower level of dependency, allowing patients to regain functional independence. Conventionally, patients are transferred from the ICU to a lower dependency unit (LDU) before being discharged home[1]. The bridges the presence of the continuous monitoring and support of the ICU to the lack of it in the outpatient setting. However, growing interest is in exploring the feasibility of discharging ICU patients directly without an LDU transfer[2].

This review aims to research the practice of discharging ICU patients directly and examine the potential outcomes and feasibility of this approach[3]. By exploring the available evidence and considering the experiences of healthcare professionals[3,4].

Direct disposition from the ICU can potentially reduce costs, preserve patient comfort, and prevent complications of prolonged hospitalization. A strict selection criterion, robust post-discharge support systems, and the availability of home-based care services are crucial factors to consider in ensuring the safety and success of this discharge strategy[5].

By critically analyzing the existing literature, this review aims to provide evidence-based recommendations for implementing an effective discharge process from the ICU that maintains optimized patient clinical and social outcomes.

Why discharge directly from the ICU

Discharging ICU patients directly presents several potential advantages. First, it reduces healthcare costs. By bypassing the LDU stay, healthcare resources such as beds, personnel, and equipment can be utilized more efficiently. This approach may contribute to cost savings, particularly in healthcare systems with limited resources and high demand for ICU beds[2,6], as well as surgical patients, where it can reduce Medicare costs significantly[2,4] and reduce monthly costs by 10000 USD on average[2,5].

Second, direct discharge allows for preserving patient comfort and familiarity. Familiar surroundings and the support of family and loved ones can contribute to emotional well-being and aid in the patient's recovery process[6].

Furthermore, direct discharge can potentially prevent potential complications associated with LDU stays, such as hospital-acquired infections, physical and occupational deconditioning, malnutrition, and delirium[7].

There are some challenges that complicate the direct-to-discharge process. First, appropriate patient selection criteria are crucial to ensure patient safety. Not all ICU patients would be suitable for direct home discharge, and the studies we looked at did not provide or have access to the providers reasoning behind why certain patients were directly discharged to home. However, they noted among the cohort that were discharged directly home, patients tended to have minimal invasive intervention (*i.e.*, mechanical ventilation) requirements ($P < 0.001$), lack significant comorbidities, and did not require vasopressors, which is an indirect marker of severity of illness[3,8].

Direct discharge requires robust follow-up care, including access to healthcare professionals, monitoring, and assistance with activities of daily living. Establishing effective post-discharge support systems, such as home care services and outpatient clinics, is essential to address ongoing medical needs and ensure the patient's well-being[3].

Collaboration between the healthcare team and community-based care providers is necessary to facilitate a smooth transition and ensure continuity of care[6,9-12].

PATIENT SELECTION CRITERIA

The current guidelines from the society of critical care medicine published in 2016, and much of the literature on this topic do not provide guidelines or specific patient selection criteria for discharging ICU patients. However, the society of critical care medicine recommends following a standardized process and stipulating a specific discharge criterion in every ICU admission, discharge, and transfer[13]. One study evaluating direct discharging (DD) in 174 ICUs found that the likelihood of discharge for an identical patient varied by a factor of two-fold depending on the ICU[7]. They concluded that practice variations between ICUs are one of the strongest predictors for discharging patients from the ICU. Furthermore, in our review of the literature, it became apparent that there were factors intrinsic and extrinsic to the patient that determined whether the patient would be discharged from the ICU. Extrinsic factors included the number of beds available in the acute care ward, better social home support, and the location (*i.e.*, hospital ward, operating room) from which they were admitted to the ICU[3,14-15]. The intrinsic included age, sex, and comorbidities.

Adult

When examining the literature for patient characteristics, patients who had DD tended to be younger, with Stelfox *et al*[3] finding the median age of patients to be 47 years (P < 0.001) in the cohort that was DD[7]. Martin *et al*[7] found 64% greater odds of having DD if patients were 18-39 years of age compared to patients who were 80-105 years of age. DD patients from the ICU had few comorbidities and were less critically ill at the time of ICU admission[3,6]. Studies generally reported a Charlson morbidity index score of 0-1 [odds ratio (OR): 1.74; 95% confidence interval (CI): 1.63-1.85] or a median acute physiology and chronic health evaluation II score of 15 (P < 0.001) for patients among the DD cohort[3,7]. Men tended to make up most of the DD cohort, with Lau *et al*[2] reporting that 66.4% of the DD patient cohort they examined were male.

Most studies did not include data based on race or ethnicity; however, Patel *et al*[8] showed that the DD patient cohort was 87.9% white and black patients. ICU length of stay ranged from 2-4 days with an average of 2.41 days (P < 0.001). Patients were often admitted with a diagnosis of overdose/withdrawal, seizures, day procedure, or a diabetic complication[2,3,7,8,16].

Pediatric

Patients who had DD patients in the pediatric population were similar to the adult studies we reviewed in regard to patients' age. The median age was two years in most of the studies[14,17]. However, age was not statistically significant, with Pizzuto *et al*[14] reporting the same distribution in age for patients who were transferred to an acute care ward (P = 0.21). Kennedy and Numa[17] reported that 66.4% of the DD patient cohort were male. Admitting or discharge diagnoses included asthma, bronchiolitis, respiratory failure, and ones similar to what we have seen in the adult population of seizures, intoxication, diabetic ketoacidosis, and post-operative/procedure care[14,17-19]. A common theme among DD patients was the requirement of a home ventilator, with Pizzuto *et al*[14] finding that 24% of the DD *vs* 1% (P < 0.01) of the acute care ward cohort required a home ventilator. In addition, if the patient required a vasoactive agent while in the ICU, they were less likely to have had DD, with Roumeliotis *et al*[19] finding decreased odds of 30% of being DD.

IMPLEMENTING DIRECT HOME DISCHARGE

Empirical evidence suggests that patients with fewer diagnoses or comorbidities, with lower mortality index, who are younger, with stable housing, and with reduced requirement for ventilatory support are safe candidates for DD[2,6,18]. After an extensive analysis of 197089 patients in 174 ICUs, Martin *et al*[7] recommend implementing DD for: (1) Patients who were admitted for a day procedure or from a hospital clinic; (2) Patients with preexisting conditions such as chronic dialysis or diabetes, and (3) Patients with a discharge diagnosis of diabetic ketoacidosis or overdose after careful evaluation. A study by Shimogai *et al*[20] echoed the importance of the previously stated findings of patients' age, mortality index, and comorbidities for the patients' readiness for DD. They further added to the growing body of literature by suggesting implementing DD for patients with independence at home before admission and iterating early mobilization at the ICU as a strong predictive factor in patients being considered for DD[20]. Furthermore, Plotnikoff *et al*[21] examined the requirements for a successful discharge from the ICU, and they found involving patients and family members in the discharge process, and communication between healthcare providers was a common motif in a successful discharge. The details of the studies are shown in Table 1.

OUTCOMES

A meta-analysis of > 40000 patients by Lau *et al*[15] found that observational data evaluating outcomes in patients who were directly discharged did not significantly differ in rates of events witnessed. No increase in 90-day mortality or readmissions was found. Another cohort study complemented the results of this meta-analysis by showing that in > 6000 patients, selective DD did not result in any increase in mortality or healthcare utilization[3].

One of the largest studies (> 140000 patients) evaluating the impact of DD on outcomes was conducted in 2015. This 2-year study found no significant difference in outcomes and identified a reduced length of hospital stay in DD patients. While numerous studies, though observational, continue to show a lack of difference in outcomes, interestingly, physician satisfaction is often lacking when practicing DD. Patients and their families are more satisfied with the DD practice[22].

Chawla *et al*[10] report a readmission rate of almost 25% in DD patients, much higher than that reported by Lau *et al*[15], which was only 8% of patients.

Table 1 Patient characteristics

Ref.	Sample size (*n*)	Age	Sex (%)	Race/ethnicity	Comorbidities (%)	Admitting/discharge diagnoses	Morbidity index	LOS (days)	Location before ICU (%)
Studies looking at adult population									
Martin *et al* [7]	197089	80-105 *vs* 18-39 (OR: 0.36; 95%CI: 0.34-0.39)	Male > female (OR > 1)	-	Chronic dialysis (OR > 1), diabetes (OR > 1)	Day procedure (OR: 2.82; 95%CI: 2.46-3.23), seizure, overdose or poisoning (OR: 1.35; 95%CI: 1.23-1.47), diabetic ketoacidosis or diabetic complications (OR: 1.35; 95%CI: 1.2-1.51), GI bleed (OR > 1)	Charlson comorbidity index of 0 and 1 (OR: 1.74; 95%CI: 1.63-1.85)	-	Day procedure (OR: 2.82; 95%CI: 2.46-3.23), clinic (OR > 1), prior ICU admission (OR > 1), prior hospital-ization (OR > 1)
Lau *et al*[2]	137	44.5 ± 16.7 (P = 0.004)	Female 46 (33.6) (P = 0.13)	-	(P < 0.0001) hypertension (27), GERD (17.5), depression (16.1), diabetes (10.2), substance abuse/overdose (14.6)	Number of discharge diagnoses (P = 0.002) overdose, subglottic stenosis/angioedema/laryngospasm, trauma, pulmonary embolism, and seizure	Charlson comorbidity index score: 1.65 ± 2.1 (P = 0.01), NMES (at admission) 26.6 ± 7.2, NMES (at discharge/transfer) 16.85 ± 8.3 (P = 0.02)	2.7 ± 3.7 (P = 0.001)	Emergency department 188 (56.8), another hospital 78 (23.7), home (direct ICU admission) 17 (7.5), floor 25 (7.6), OR/PACU 9 (2.7), other/unknown 14 (4.2)
Patel *et al*[8]	331	54.1 ± 17.25	158 (47.7)	White (46.2), Black (41.7), Asian/pacific-islander (3.6), Hispanic/Latino (5.1), other/unknown (3.3)	-	Monitoring (n = 13), sepsis/septic shock (n = 25), diabetic ketoacidosis (n = 13), electrolyte abnormalities due to alcohol abuse (n = 7), hyperkalemia (n = 5), hemodynamic instability (n =11), arrhythmia (n = 10), hypertensive urgency or emergency (n = 5), systolic and diastolic heart failure exacer-bation (n = 5), angioedema (n = 29), medication desensitization (n = 19), pneumonia (n = 28), pulmonary embolism (n = 25), COPD exacerbation (n = 21), acute respiratory disease syndrome (n = 20), asthma exacerbation (n = 10), gastrointestinal hemorrhage (n = 34), hepatic failure (n = 9)	MPM0-III predicted mortality % 15.9 ± 11.1, NEMS on admission 19.45 ± 8.58	2.41 (P = 0.001)	-
Stelfox *et al* [3]	6732	47 (P < 0.001)	Female 393 (P = 0.67)	-	Diabetes 143 (P < 0.001), chronic lung disease 151 (P = 0.11), chronic kidney disease 23 (P < 0.001), liver disease 37 (P < 0.001), cancer 31 (P < 0.001), chronic heart or peripheral vascular disease 72 (P < 0.001), neurological disease 17 (P < 0.001), any comorbidity 360 (P < 0.001)	Admitting diagnosis (P < 0.001): Overdose, withdrawal, seizures, or metabolic coma 295, pneumonia 104, respiratory other 133, medical or neurological additional 107, trauma or orthopedic 79, cardiovascular 67, sepsis (non-pulmonary) 52, gastrointestinal 45, pregnancy or genitourinary 21, cancer 8	Charlson Score 0-1 (P < 0.001), APACHE II score, 15 (P < 0.001)	2.9 (P < 0.001)	Location before ICU (P < 0.001): Emergency department 607, ward 160, operating or recovery room 98, other Hospital 55
Basmaji *et al* [16]	-	-	-	-	-	-	-	-	-
Chawla *et al* [10]	95	61.1	Male (60)	-	-	Respiratory failure, sepsis, cardiac syndromes, gastrointestinal bleeding	MPM0II Score 31.4	4.5	-

Lau *et al*[6]	642	49	Male (54.9)	-	-	Overdose, pneumonia, seizures, diabetic ketoacidosis	Multiple organ dysfunction scores 7	3	-
Lam *et al* [22]	137	45.75	Male (66.4)	-	-	Overdose, upper airway compromise, trauma, pulmonary embolism, seizures	Multiple organ dysfunction scores 7	1.8	-
Martin *et al* [12]	46859	60.79 ± 17.42	Male (59)	-	COPD, diabetes, congestive heart failure, seizure, overdose	Overdose/poisoning, pneumonia (respiratory tract infection or empyema, sepsis-other, seizure/convulsions, diabetic ketoacidosis or complications of diabetes	-	0	-
Studies looking at pediatric population									
Pizzuto *et al* [14]	532	2	Female (44)	White or Caucasian (45), black or African American (27), American Indian or Alaska Native (3), Asian (2), other (19), unknown (4)	-	Respiratory failure; insufficiency; arrest (9), diabetic ketoacidosis (6), asthma (5), acute bronchiolitis (3), sleep apnea (3), pneumonia (3), acute tracheitis (3), septicemia (3), complication of device; implant or graft (3), anomalies of cerebrovascular system, congenital (2)	-	2.1	-
Gal *et al*[18]	308	4.6	Female (39)	-	Atrial or ventricular septal defects, valve replacement, or conduit replacement	Cardiac procedure [191 (*i.e.* Catheterization)], cardiac surgery [70 (*i.e.* implantable)], medical condition [53 (*i.e.* Arrhythmia or infection)]	STAT Score 2	1	Emergency department (177), Operating room (45), post anesthesia (39), home (9), floor (8), clinic (5)
Kennedy *et al*[17]	702	2	Male (64.4)	-	-	Bronchiolitis, seizures, asthma, lower respiratory tract infection	-	Approximately 2	Emergency department directly admitted
Roumeliotis *et al*[19]	594	3	61.6	-	-	Acute intoxication, postoperative ear-nose-throat care, shock	95% of the cohort had PELOD 2 score of 0-8 (P < 0.001)	83% of patients had LOS 1-6 days. 17% had LOS > 7 days	-

LOS: Length of stay; ICU: Intensive care unit; OR: Odds ratio; CI: Confidence interval; GI: Gastrointestinal; GERD: Gastroesophageal reflux disease; NMES: Neuromuscular electrical stimulation; PACU: Post-acute care unit; MPM0-III: Mortality probability admission model-III; COPD: Chronic obstructive pulmonary disease; STAT Score: The society of thoracic surgeons-European association of cardio-thoracic surgery; PELOD 2: Pediatric logistic organ dysfunction 2; APACHE II: Acute physiology and chronic health evaluation II.

FUTURE DIRECTIONS

Studies have not shown a difference between complex outcomes such as length of hospital stay and mortality between DD and traditional ward discharge. While this represents a potential argument for using DD to curb resource waste and improve patient comfort, the observational nature of the studies needs to be considered. Before guidelines recommending DD are ushered into the norm, additional research must be conducted to prevent potential patient harm.

First, patient selection for DD needs to be refined and specified. Currently, physician discretion is the standard for patient selection criteria. A study found that younger patients suffering from overdose, withdrawal, seizures, and < 48 hours of mechanical ventilation were more likely to be discharged home than older patients, those with an acute high degree illness, or those who had received surgical care. While these parameters intuitively make sense, they need to be studied in a blinded, randomized fashion to measure outcomes precisely[3].

Second, almost all studies focusing on DD have been observational, with various included participants. Additional, tightly controlled randomized trials are needed if confidence in outcome measures is required. A trial demonstrating non-inferiority would lend reliability to the practice of DD and help in tailoring patient-specific guidelines.

Finally, there is a need to explore the role of telemonitoring in DD patients. Combining modern, virtual healthcare delivery methods with DD can drastically reduce the burden on the intensive care system. When such methods were employed in COVID-19 patients, a weeklong reduction in hospital length of stay was noted[23]. This suggests the dearth of potential that is yet to be realized with such measures in everyday ICU care.

CONCLUSION

Our review has highlighted the emerging concept of direct discharge from the ICU as an alternative to traditional transfer to LDU. The literature suggests that carefully selected patients with stable clinical conditions and robust support systems at home can benefit from this approach. While mortality rates and patient satisfaction appear comparable to those of the conventional LDU transfer, successful implementation hinges on stringent patient selection, robust risk assessment, and comprehensive post-discharge care strategies. Direct discharge offers potential benefits such as reduced strain on healthcare resources, minimized exposure to hospital-acquired infections, and improved patient experience within familiar surroundings. However, challenges include accurate patient identification, effective remote monitoring, and timely intervention in case of complications. Balancing these aspects is crucial to ensuring patient safety and successful outcomes. The findings of this review underscore the importance of further exploration and thoughtful implementation of direct discharge from the ICU. As we move forward, tailored patient selection based on rigorous criteria and risk assessment is paramount. Additionally, comprehensive post-discharge support mechanisms should be established to ensure patients' well-being beyond the hospital walls, including telehealth services and clear communication channels. Combining evidence-based approaches with multidisciplinary collaboration can pave the way for a more patient-centered and resource-efficient healthcare model. We hope that continued research and innovative strategies will lead to improved guidelines and practices, enhancing the viability of direct home discharge and benefiting patients and the healthcare system.

FOOTNOTES

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