Crit Care Shock (2025) 28:233-238

Strengthening Iraq's critical care landscape: The role of step-down units and extended care monitoring zones (ECMZ)

Santiago Herrero[1], *Karrar Hammoodi Hadi*[2]

Abstract

***Background*: Iraq faces critical pressure on its intensive care units (ICUs) due to high occupancy rates, limited resources, and a lack of transitional care infrastructure.**

***Objectives*: This paper explores the current challenges of ICU delivery in Iraq's public and private sectors and evaluates the role of Step-Down Units (SDUs) and Extended Care Monitoring Zones (ECMZs) as scalable, sustainable interventions.**

***Methods*: A literature review and healthcare analysis were performed using national reports, international ICU frameworks, and observational insight.**

***Results*: Evidence suggested that SDUs and ECMZs improved ICU throughput, reduced mortality, and supported structured recovery for both public and private systems.**

***Conclusions*: Strategic integration of these units could enhance Iraq's critical care resilience while expanding quality care access.**

Keywords: Intensive care units (ICU), step-down units (SDU), extended care monitoring zone (ECMZ), transitional care, Iraq health system, intermediate care, health system strengthening.

Introduction

Iraq's critical care services are experiencing intense strain due to a combination of systemic fragility, post-conflict infrastructure limitations, and an increasingly complex patient population. While tertiary hospitals offer intensive care unit (ICU) care in most governorates, the disparity in quality, capacity, and continuity of care remains stark between regions and between the public and private sectors. As the demand for critical care increases, the need for structured intermediate care models has become more urgent. The coronavirus disease 2019 (COVID-19) pandemic exposed systemic limitations in Iraq's health system, particularly in critical care delivery, staffing readiness, and infrastructure scalability. (1,2)

The current ICU landscape in Iraq

Public hospitals in Iraq fall under the jurisdiction of the Ministry of Health and frequently incorporate ICU, emergency, surgical, and internal medicine services within teaching hospital complexes such as Baghdad Medical City and Al-Yarmouk Teaching Hospital. These facilities regularly experience high patient loads, with occupancy rates reported up to 80% in certain regions. (3) Many healthcare facilities in Iraq demonstrate significant infrastructure and procedural gaps—emergency units often lack essential monitoring systems and infection control spaces, and private hospitals frequently operate without standardized audits or oversight. Although nurse-to-patient ratios are not consistently documented, these systemic shortcomings seriously im-

[1] Intensive and Critical Care Unit, Gruppo San Donato, Najaf Branch, Najaf, Iraq; Al-Najaf Al-Ashraf Teaching Hospital, Iraq
[2] Al-Najaf Al-Ashraf Teaching Hospital, Iraq

Address for correspondence:
Santiago M. Herrero, MD, FCCP
Chief of Intensive and Critical Care Unit, Gruppo San Donato, Najaf Branch, Najaf, Iraq
Al-Najaf Al-Ashraf Teaching Hospital, Iraq
Email: santiago.herrero@grupposandonato.it

pact the quality and scalability of critical care delivery. (4,5)

Key systemic challenges

Structural deficiencies significantly exacerbate the crisis. First, a mismatch between ICU capacity and rising demand often leads to delays in admission or prolonged stays in emergency departments due to a lack of discharge options, with ICU bed shortages reported as the main barrier in up to 65% of cases and bed blocking associated with early discharges and worse outcomes. Second, most hospitals lack early warning score (EWS) protocols—key tools in detecting deterioration among ward patients and enabling timely step-up interventions. Third, patients discharged from the ICU are frequently transferred to general wards without structured monitoring or support, heightening the risk of readmission or adverse events. Together, these gaps underscore the absence of a tiered care model within Iraq's critical care architecture. (6,7)

Step-down units: Concept and role

Step-down units (SDUs) serve as intermediate care areas bridging the gap between ICUs and general hospital wards. They are specifically designed to accommodate patients who are clinically stable following ICU discharge or those in the general ward who require closer observation, typically for a duration of 24 to 72 hours. Globally, SDUs have been shown to enhance ICU efficiency, reduce patient mortality, and shorten overall hospital stays.

In the Iraqi healthcare context, SDUs should be equipped with continuous vital-sign monitoring, continuous positive airway pressure (CPAP) support capabilities, and an optimal nursing ratio of approximately 1:2–2.5 to ensure safe surveillance. These units are most effective when located in close physical proximity to the ICU or within high-dependency wards, yet remain operationally distinct to prevent misuse as 'covert ICUs.' Such clear delineation preserves the tiered structure of care and supports the transitional role of SDUs under ICU oversight. (8,9).

Extended care monitoring zones (ECMZs): A higher surveillance model

ECMZ represents a new and advanced model of intermediate care, designed by Al-Najaf Al-Ashraf Teaching Hospital (Najaf, Iraq) for patients requiring close monitoring following ICU discharge or those in the ward at high risk of deterioration. ECMZs differ from standard SDUs by offering expanded clinical capabilities—such as point-of-care arterial blood gas (ABG) analyzers, CPAP/bilevel positive airway pressure (BiPAP) support, central venous catheter readiness, and 24/7 ICU physician call coverage—without requiring full ICU infrastructure. **Table 1** shows a comparative analysis: ICU step-down vs. ECMZ, while **Figure 1** shows a sample layout diagram.

While ECMZs are ideally positioned to support tiered private care services (basic, advanced, very important person [VIP]), they are not limited to the private sector. In Iraq, where many public hospitals integrate private wings or revenue-generating services, ECMZs provide a hybrid solution. (10) They can serve public patients during surge periods or as part of structured ICU decongestion protocols, while also delivering enhanced monitoring for paying patients in adjacent private service lines.

This dual functionality makes ECMZs highly adaptable to the Iraqi context. They align with the infrastructure and economic realities of the public health system while enabling flexible, financially sustainable models. Their strategic placement—within surgical or medical wards, but under ICU supervision—offers continuity of care, optimizes ICU bed use, and creates safer transitions for vulnerable patients. Whether applied in full public institutions, mixed-care hospitals, or private centers, ECMZs offer a pragmatic and scalable innovation for Iraq's evolving critical care landscape. (10,11)

Clinical and operational benefits

The implementation of SDUs and ECMZs in Iraq could significantly reduce ICU congestion, facilitate earlier discharges, and improve safety margins in critical care transitions. Studies from Europe demonstrate that hospitals with dedicated step-down or intermediate care units (IMCUs) achieve up to a 37% reduction in ICU-associated mortality compared to institutions without them. In Australia, workarounds such as after-hours step-downs—often adopted to manage ICU capacity—have been linked to an estimated 91 avoidable patient deaths annually, highlighting the necessity for properly structured and staffed transitional care units. (12,13)

ECMZs offer the added benefit of generating revenue in private hospitals, with daily billing rates ranging from 600,000 to 1,000,000 IQD. Public hospitals may also benefit from ECMZ implementation during surge periods, such as mass casualty events or epidemics. (10)

Human resources and training impact

Introducing SDUs and ECMZs also enables progressive training environments for junior residents, ICU fellows, and nursing staff. By managing cases with intermediate complexity, healthcare profes-

sionals gain essential experience in early deterioration signs, structured documentation, and interdisciplinary communication. The phased implementation of these units could be accompanied by standardized training on early warning scores, sepsis monitoring, and transitional care planning.

Economic and strategic value

From a financial perspective, ECMZs offer a profitable model for private sector expansion, particularly in cities like Najaf, Erbil, and Baghdad, where medical tourism and upper-income patients seek premium care. A 4-bed ECMZ running at 75% capacity could generate over 45 million IQD monthly. Public-sector SDUs could help reduce unnecessary ICU admissions, creating significant savings by reallocating limited ICU resources to the most critical cases. Strategically, both units increase institutional resilience, allowing for greater flexibility during system shocks, whether due to conflict, pandemic, or seasonal influx. In Spain, intermediate ICUs are widely designed in tertiary hospital plans. (14)

Bridging strategies in emergency departments: A practical case

In many Iraqi hospitals, including Al-Najaf Al-Ashraf Teaching Hospital (Najaf, Iraq), the critical care system has developed practical bridging strategies to address ICU bed shortages. For instance, in the Emergency Department–High Dependency Unit (ED-HDU), two ventilator-equipped beds are routinely activated as temporary stabilization spaces for patients requiring urgent intubation and mechanical ventilation. These patients often present with acute cerebrovascular accidents (CVA), traumatic brain injuries with intracerebral hemorrhage (ICH), or decompensated heart failure, all of which necessitate immediate respiratory support prior to full ICU admission.

This model functions as a short-term ICU extension, allowing life-saving interventions without delay. According to the Iraqi Ministry of Health, emergency high-dependency beds are designated as temporary stabilization areas and are not intended to substitute ICU-level care. In line with international standards, the maximum allowable stay in these ED-HDU beds is generally limited to 24 hours, reinforcing their role as a time-limited bridge rather than a covert ICU. (15)

Incorporating such flexible, real-world adaptations highlights the necessity of tiered care solutions such as SDUs and ECMZs. These initiatives reflect a broader effort to optimize critical care flow, especially in settings where demand routinely outpaces infrastructure.

Integration roadmap

A phased, tiered implementation strategy is recommended to ensure sustainable integration of SDUs and ECMZs within Iraq's healthcare infrastructure.

Phase 1 should prioritize the establishment of 2-bed SDUs in major public teaching hospitals, strategically located near medical and surgical wards to facilitate timely step-up and step-down transitions. This phase must be supported by targeted training in EWS protocols, development of clinical handover tools, and structured pilot audits to evaluate safety and workflow efficiency.

Phase 2 should focus on the deployment of 4-bed ECMZs in hospitals with hybrid structures—public institutions with integrated private services or facilities operating under mixed financing models. These ECMZs should be built with modular layouts, equipped with advanced monitoring systems, and designed to accommodate scalable service packages, including revenue-generating private care tiers.

Endorsement from the Ministry of Health, along with revisions to accreditation standards and hospital licensing criteria, will be essential to ensure compliance and encourage adoption across regions. Collaboration with national nursing councils, medical education programs, and clinical residency boards will be critical to ensure adequate staffing, ongoing training, and institutional capacity building.

Conclusion

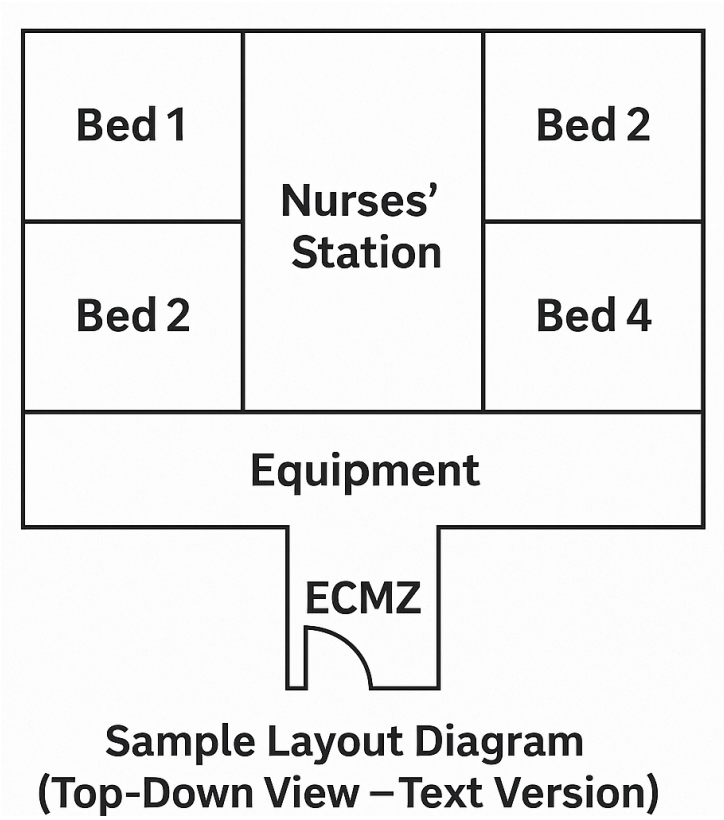
The integration of SDUs and ECMZs represents a vital evolution in Iraq's approach to critical care. These units offer a scalable, evidence-based model to address ICU overcrowding, improve patient safety, and promote continuity of care. They also support training, private and public sector growth, and system-wide resilience. In a healthcare environment marked by chronic strain and intermittent surges, SDUs and ECMZs may be the most cost-effective and clinically sound interventions Iraq can adopt over the next decade.

Table 1. Comparative analysis: ICU step-down vs. ECMZ

Category	ICU SDU	ECMZ
Purpose	Transitional unit for ICU patients no longer needing full ICU care	Surveillance and intermediate care for high-risk, early ICU discharges or private patients (hybrid solution)
Level of care	Level 2 (intermediate care)	Level 2+ (enhanced ward care with partial ICU oversight)
Location	Dedicated section of surgical or medical ward with 2–10 beds	4-bed high-surveillance area within surgical or medical ward
Admission criteria	ICU patients clinically improving- Stable vitals, no pressors	Early ICU discharges in poor condition- High-risk private or post-op patients EWS>5 points
Exclusion criteria	Requires mechanical ventilation, vasoactive drugs, advanced monitoring	Requires full ICU, multiorgan support, unstable shock
Monitoring	Continuous SpO2, NIBP, HR	Continuous ECG, SpO2, NIBP, respiratory rate
Respiratory support	Oxygen therapy, CPAP/BiPAP	Non-invasive ventilation (CPAP/BiPAP), O2 via wall source
Invasive procedures	IV, peripheral lines only	Central line placement allowed with aseptic conditions
Special equipment	Monitors, O2 supply, suction, IV poles	Monitors, O2, suction, dedicated ABG machine, procedure corner
Nursing ratio	1 nurse : 2–4 patients	1 nurse : 2 patients
Physician oversight	ICU resident or specialist visits once or twice daily	ICU consultant or senior oversight daily + 24/7 on-call coverage
Length of stay	2–5 days average	1–3 days typical, extendable based on daily evaluation
Documentation	Modified ICU charting, early warning scores (NEWS, MEWS)	ICU-linked observation charts, structured handover sheet, EWS (NEWS, MEWS)
Infection control	Basic protocols	Strict donning/doffing station, single-patient curtains, ABG sanitation protocols
Emergency readmission	Direct ICU recall procedure in place	Direct ICU transfer within 15–20 min supported by ICU team (first call consultant)
Bed capacity	2–10 beds (modular or integrated within ward)	4 beds (maximum per unit)
Flexibility of use	Can be used for high-dependency public overflow	Prioritizes private patients or overflow from ICU when full

Legend: ICU=intesive care unit; ECMZ=extended care monitoring zone; SDU=step-down unit; EWS=early warning score; SpO2=peripheral capillary oxygen saturation; NIBP=non-invasive blood pressure; HR=heart rate; ECG=electrocardiogram; CPAP=continuous positive airway pressure; BiPAP=bilevel positive airway pressure; O2=oxygen; IV=intravenous; ABG=arterial blood gas; NEWS=national early warning score; MEWS=modified early warning score.

Figure 1. Sample layout diagram



Legend: ECMZ=extended care monitoring zone.

References

1. Al Janabi T, Chung S. Current Impact and Long-Term Influence of the COVID-19 Pandemic on Iraqi Healthcare Systems: A Case Study. Epidemiologia (Basel) 2022;3:41–433.
2. Al-Saiedi A, Haddad M. Challenges Faced by the Iraqi Health Sector in Responding to COVID-19 [Internet]. 2021 Apr 6 [updated 2025 Aug 17; cited 2025 Aug 17]. Available from: https://phr.org/our-work/resources/challenges-faced-by-the-iraqi-health-sector-in-responding-to-covid-19/
3. Ministry of Health (Iraq) [Internet]. 2025 [cited 2025 Aug 17]. Available from: https://en.wikipedia.org/wiki/Ministry_of_Health_%28Iraq%29?
4. Lafta RK, Al-Nuaimi MA. National perspective on in-hospital emergency units in Iraq. Qatar Med J 2013;2013:19–27.
5. Tappis H, Lak R, Alhilfi R, Zangana AH, Wadi F, Hipgrave D, et al. Quality of maternal and newborn health care at private hospitals in Iraq: a cross-sectional study. BMC Pregnancy Childbirth 2023;23:331.
6. Teklie H, Engida H, Melaku B, Workina A. Factors contributing to delay intensive care unit admission of critically ill patients from the adult emergency Department in Tikur Anbessa Specialized Hospital. BMC Emerg Med 2021;21: 123.
7. Anagi S, Chamberlain D, Taypin-Shaw D, Jennings C, Pusapati R, Lin F. Exploring delayed admissions to ICU: a qualitative study of clinician perceptions and observations of the ICU admission process. Intensive Crit Care Nurs 2025;89:104075.
8. Plate JDJ, Leenen LPH, Houwert M, Hietbrink F. Utilisation of Intermediate Care Units: A Systematic Review. Crit Care Res Pract 2017; 2017:1–10.
9. Halpern NA, Pastores SM. Critical care medicine in the United States 2000–2005: an analysis of bed numbers, occupancy rates, payer mix, and costs. Crit Care Med. 2010;38:65–71.
10. Herrero SM. Definition: Extended ICU in the Wards (Enhanced Surveillance and Transitional Care Model) [Internet]. 2025 [cited 2025 Aug 17]. Available from: https://www.dropbox.com/scl/fi/ryg9oa37l8l447sgmyltv/ECMZ-FINAL-PROJECT-AL-NAJAF.pdf?rlkey=12f4e2vm1f92exvad1s8cs9ws&st=r3riy3vj&dl=0
11. Tiruvoipati R, Botha J, Fletcher J, Gangopadhyay H, Majumdar M, Vij S, et al. Intensive care discharge delay is associated with increased hospital length of stay: a multicentre prospective observational study. PLoS ONE 2017;12: e0181827.
12. Capuzzo M, Volta CA, Tassinati T, Moreno R, Valentin A, Guidet B, et al. Hospital mortality of adults admitted to Intensive Care Units in hospitals with and without Intermediate Care Units: a multicentre European cohort study. Crit Care 2014;18:551.
13. Duke GJ, Buist MD, Pilcher D, Scheinkestel CD, Santamaria JD, Gutteridge GA, et al. Interventions to circumvent intensive care access block: a retrospective 2-year study across metropolitan Melbourne. Med J Aust 2009;190: 375–8.
14. Herrero Fernández S, Abizanda Campos R. The Service Portfolio in Intensive Care Medicine. In: Roca J, Ruiz J, editors. Strategic Management in Intensive Care Medicine. Monographs in Practical Critical Care Medicine. Barcelona: EdikaMed; 2006.
15. Iraq Ministry of Health. National Action Plan for Health Security (2019–2023) [Internet]. 2022 [cited 2025 Aug 17]. Available from: https://moh.gov.iq/upload/998.pdf