

Hydrocortisone

Hydrocortisone Sodium Succinate - Short-Acting Glucocorticoid with Clinically Relevant Mineralocorticoid Activity

Corticosteroids / Corticosteroids

Evidence status: current

ICU High-Yield Summary

Short-acting glucocorticoid with mineralocorticoid activity used in acute adrenal crisis and commonly used when corticosteroids are chosen for adult septic shock; current guidelines support corticosteroids in septic shock but do not require a single vasopressor threshold or continuous-infusion strategy.

Mechanism of Action

Glucocorticoid & Mineralocorticoid Receptor Activation

1. Lipophilic molecule diffuses across plasma membrane and binds cytoplasmic glucocorticoid receptors (GR) and mineralocorticoid receptors (MR).
2. Receptor-ligand complex homodimerizes and translocates into the nucleus.
3. Transrepression: Inhibits NF- κ B and AP-1 transcription factors, suppressing pro-inflammatory cytokines (TNF- α , IL-1 β , IL-6) and inducible nitric oxide synthase (iNOS).
4. Transactivation: Upregulates anti-inflammatory proteins (lipocortin-1/annexin A1, IB- α , IL-10) and increases adrenergic receptor density/sensitivity on vascular smooth muscle.
5. MR Activation: Promotes renal distal tubular Na⁺/water reabsorption and K⁺ excretion, supporting intravascular volume in adrenal crisis.

ICU Clinical Reasoning

Why I Choose It

Supported by the 2024 SCCM focused update for adult septic shock (conditional recommendation) and severe bacterial community-acquired pneumonia (strong recommendation for corticosteroids). CAPE COD used IV hydrocortisone 200 mg/day with protocolized duration/taper and reduced 28-day mortality in its enrolled severe-CAP population. | Hydrocortisone is the standard corticosteroid used in vasopressor-dependent septic shock when an ongoing/escalating vasopressor requirement persists after appropriate initial resuscitation; do not require one universal norepinephrine dose-duration threshold. | Hydrocortisone is standard emergency glucocorticoid therapy for acute adrenal crisis; high stress-dose hydrocortisone provides sufficient mineralocorticoid activity during the acute phase, with fludrocortisone introduced later when appropriate for primary adrenal insufficiency as hydrocortisone is reduced. | Shorter biological half-life (8-12h) facilitates quick dose titration and rapid recovery of HPA axis compared to long-acting dexamethasone. | For septic shock, 200 mg/day hydrocortisone is commonly used either intermittently (for example 50 mg every 6 hours) or by continuous infusion; current 2026 sepsis guidance does not establish continuous infusion as universally superior.

Why I Avoid / Key Limitations

Current sepsis guidance supports IV corticosteroids for adults with septic shock; it does not support routine corticosteroids for sepsis without shock solely because infection is present. | Mineralocorticoid action induces fluid retention and hyponatremia, which can worsen pulmonary edema in volume-overloaded ARDS. | Hyperglycemia is more frequent with corticosteroids and may require adjustment of the ICU glucose-control regimen; avoid unsupported universal incidence figures. | Longer or higher cumulative corticosteroid exposure can increase adverse effects including hyperglycemia, infection risk and neuromuscular complications; tapering depends on indication, duration and prior steroid exposure rather than one universal day cutoff.

Bedside Pearl

In septic shock, continuous IV infusion of hydrocortisone (200 mg/day) results in significantly tighter glycemic control and fewer nursing interventions than 50 mg IV q6h boluses. When hydrocortisone is being used solely for septic shock and the patient is improving, either stopping without a taper or tapering can be reasonable depending on duration/exposure and local practice; the 2026 SSC does not mandate one universal taper strategy.

Dosing & Administration

Routine ICU Dosing

Septic shock: commonly hydrocortisone 200 mg/day IV, either as 50 mg every 6 hours or continuous infusion; current 2026 SSC does not designate continuous infusion as preferred. Acute adrenal crisis: 100 mg hydrocortisone IV/IM immediately, then 200 mg/24 h (continuous infusion preferred by endocrine emergency guidance, or 50 mg every 6 h) until clinical recovery and specialist-guided reduction.

Hemodialysis

No routine post-HD supplemental regimen is presented without a dialysis-specific source; use the indication-specific systemic dose and clinical monitoring.

CRRT

No fixed CRRT-specific regimen is presented; use the indication-specific systemic dose and monitor response/adverse effects.

Renal Dose Table

Any CrCl / AKI / ESRD: No fixed renal-replacement-specific dose is established for the ICU indications listed here; use the indication-specific regimen and monitor sodium, potassium, glucose, fluid status and clinical response.

Syndrome-Specific Regimens

Severe Community-Acquired Pneumonia (CAPE COD criteria): 200 mg/day IV continuous infusion initiated early (within 24h of ICU admission). 8-day course with adaptive 8-to-14 day taper per protocol. - Reduced 28-day mortality (6.2% vs 11.9%, $p=0.006$) in severe CAP requiring ICU admission (PSI class V, mechanically ventilated, or $\text{PaO}_2/\text{FiO}_2 < 300$). | Refractory Septic Shock (SSC 2026): Hydrocortisone 200 mg/day IV is a common regimen, given as intermittent doses or continuous infusion. Duration and discontinuation/taper strategy should follow the patient's course and local protocol rather than a mandatory 5-7 day course. - Consider when septic shock remains dependent on ongoing/escalating vasopressor support after appropriate initial resuscitation; exact timing is individualized rather than tied to one mandatory norepinephrine cutoff. | Acute Adrenal Crisis: 100 mg IV/IM immediately, then 200 mg/24h continuous IV infusion (or 50 mg IV/IM q6h) until clinical recovery; reduce and transition to maintenance replacement with endocrine guidance according to the underlying adrenal disorder. - At doses ≥ 100 mg/day, hydrocortisone provides maximal mineralocorticoid receptor saturation; fludrocortisone is unnecessary during acute high-dose IV phase. | CIRCI / critical-illness corticosteroid physiology: Do not use a fixed 7-day hydrocortisone course solely because the label CIRCI is applied. In septic shock, steroid use should follow current sepsis guidance; in suspected primary/secondary adrenal insufficiency, follow endocrine emergency guidance. - Do not require ACTH stimulation testing before giving indicated corticosteroids in septic shock or suspected adrenal crisis; diagnostic testing must not delay emergency adrenal-crisis treatment.

Organ Failure Considerations

Renal Failure & AKI

Mineralocorticoid activity can cause sodium retention, edema, and hypokalemia. In severe oligoanuric AKI, observe for fluid accumulation.

Hepatic Impairment

Hepatic clearance is impaired in cirrhosis or acute liver failure, leading to prolonged circulating half-life and enhanced glucocorticoid exposure; monitor glucose closely.

Toxicity & Safety

Major Warnings

Marked hyperglycemia: increases risk of secondary bacterial and fungal infections; blood glucose protocol required. | ICU-Acquired Weakness / Critical Illness Myopathy: synergistic myopathy risk when combined with neuromuscular blocking agents (NMBAs). | Steroid-induced leukocytosis: demargination of polymorphonuclear neutrophils can cause WBC elevation without signifying new infection. | HPA-axis suppression risk rises with greater dose/duration and prior glucocorticoid exposure; withdrawal strategy should reflect cumulative exposure rather than a rigid 7-14 day cutoff.

Organ Toxicities

Endocrine & Metabolic: Hyperglycemia, hypokalemia, hyponatremia, secondary adrenal insufficiency upon rapid withdrawal. | Neurological & Psychiatric: ICU delirium, steroid psychosis, insomnia, mood lability. | Gastrointestinal: Gastric mucosal ulceration, upper GI bleeding (especially with concurrent coagulopathy or mechanical ventilation). | Musculoskeletal: Acute quadriplegic myopathy, severe muscle catabolism.

Drug Interactions

Bedside Interactions

Neuromuscular Blockers (e.g., Cisatracurium, Rocuronium): Synergistic inhibition of muscle protein synthesis and receptor down-regulation; consequence: Prolonged critical illness myopathy and delayed ventilator weaning; ICU action: Minimize duration of concurrent NMBAs and steroids; monitor train-of-four and perform daily wake-up trials. | CYP3A4 Inducers (e.g., Rifampin, Phenytoin, Carbamazepine): Accelerated hepatic 11 β -HSD and CYP3A4 metabolism of hydrocortisone; consequence: Subtherapeutic corticosteroid levels and treatment failure in adrenal crisis; ICU action: Strong enzyme inducers can increase glucocorticoid clearance; in adrenal insufficiency or inadequate clinical response, involve endocrinology/pharmacy rather than applying an unsupported universal 50-100% increase. | Insulin / Oral Antidiabetics: Opposing physiological effect on hepatic gluconeogenesis and peripheral insulin sensitivity; consequence: Severe hyperglycemia; ICU action: Monitor glucose and treat clinically significant hyperglycemia according to the ICU glucose-management protocol; IV insulin is not automatically required solely because hydrocortisone is started.

Monitoring & TDM

Monitoring

Blood glucose at a frequency appropriate to illness severity, nutrition and insulin therapy; use the local ICU glycemic-control target/protocol | Serum potassium, sodium, and chloride daily (or q12h in unstable shock) | Vasopressor requirement and shock trajectory; discontinuation/taper strategy depends on duration, indication and local protocol | Surveillance for secondary superinfections (fungemia, VAP, bacteremia) | Mental status/delirium as clinically appropriate

Evidence & Source Traceability

Claim-Level Citations

Current U.S. prescribing information was reviewed for dosing, organ-failure handling, pharmacology, warnings and interactions relevant to this ICU monograph. - Current U.S. prescribing information / DailyMed, reviewed 2026-08-29. (<https://dailymed.nlm.nih.gov/dailymed/search.cfm?labeltype=all&query=hydrocortisone>) | Acute adrenal crisis: give hydrocortisone 100 mg IV/IM immediately, then 200 mg/24 h (continuous infusion or 50 mg every 6 h) until clinical recovery and specialist guidance. - Society for Endocrinology adrenal-crisis guidance. (<https://www.endocrinology.org/clinical-practice/clinical-guidance/adrenal-crisis/>) | SCCM 2024 conditionally supports corticosteroids in adult septic shock and strongly recommends corticosteroids for severe bacterial CAP; it recommends against high-dose/short-duration regimens >400 mg/day hydrocortisone equivalent for <3 days in septic shock. - Chaudhuri D, et al. 2024 Focused Update: Corticosteroids in Sepsis, ARDS, and CAP. Crit Care Med. 2024;52:e219-e233.

(<https://www.sccm.org/clinical-resources/guidelines/guidelines/use-of-corticosteroids-in-sepsis-ards-cap>) | CAPE COD randomized controlled trial demonstrated early IV hydrocortisone 200 mg/day continuous infusion significantly reduced 28-day mortality in severe CAP admitted to the ICU. - Dequin PF, Meziani F, Quenot JP, et al. Hydrocortisone in Severe Community-Acquired Pneumonia. N Engl J Med. 2023;388(21):1931-1941. PMID: 36942784. DOI: 10.1056/NEJMoa2215145. (<https://doi.org/10.1056/NEJMoa2215145>) | Surviving Sepsis Campaign 2026 conditionally suggests IV corticosteroids for adults with septic shock; 200 mg/day hydrocortisone is the dominant regimen in practice and major trials, but the guideline does not require a single vasopressor-dose threshold or continuous-infusion strategy. - Prescott HC, et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock 2026. Crit Care Med / Intensive Care Med. 2026. (<https://doi.org/10.1007/s00134-026-08361-1>) | ADRENAL trial showed hydrocortisone 200 mg/day continuous infusion significantly accelerated shock reversal and reduced ICU stay, without 90-day mortality difference. - Venkatesh B, et al. Adjunctive Glucocorticoid Therapy in Patients with Septic Shock. N Engl J Med 2018;378:797-808. (<https://doi.org/10.1056/NEJMoa1705835>) | APROCCHSS trial showed hydrocortisone plus fludrocortisone significantly reduced 90-day all-cause mortality in refractory septic shock. - Annane D, et al. Hydrocortisone plus Fludrocortisone for Adults with Septic Shock. N Engl J Med 2018;378:809-818. (<https://doi.org/10.1056/NEJMoa1705716>)

Guideline IDs

septic-shock-ssc2026-corticosteroids