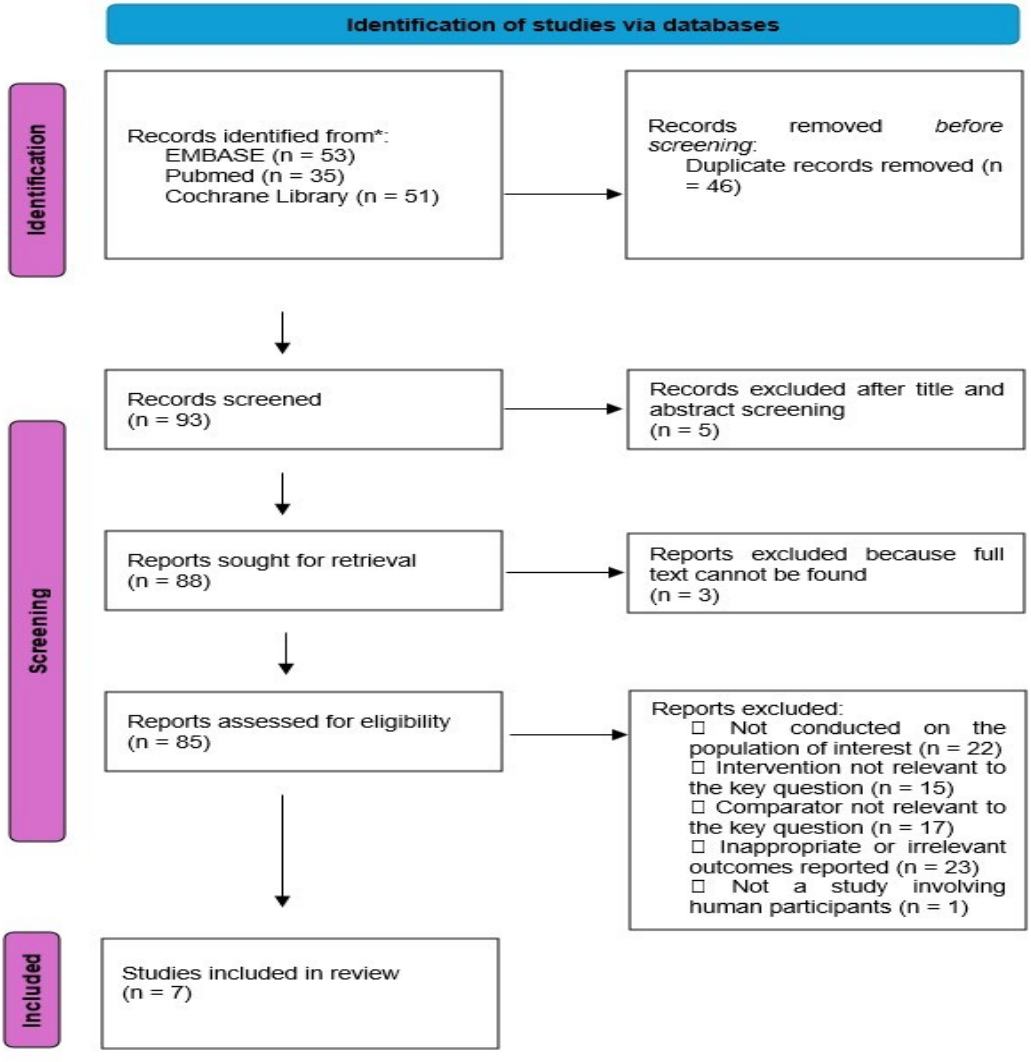
Supplement Table 59. Summary of studies evaluating nutritional therapy in critically ill adults with obesity (KQ24)

	Study	Design	Participants	Comparison	Summary
Early EN	Harris et al., 2017 [369]	Retrospective multicenter cohort (eICU-Research Institute DB, 2008–2015)	Adults ICU LOS >24 hr; entire cohort N=1,042,710; early EN subgroup N=74,771	Early EN = EN order placed ≤48 hr after ICU admission	In full cohort, classic BMI–mortality pattern (higher risk at BMI <25 and ≥50). In early-EN subgroup, BMI–mortality differences attenuated (e.g., BMI 35–39.9 with lower risk vs. 25–29.9). Suggests early EN may blunt BMI-related outcome gaps; not a direct early vs. delayed EN trial.
	Pardo et al., 2023 [370]	Prospective multicenter cohort (69 ICUs)	N=1,206 adult ICU patients (medical/surgical); overweight/obese patients included	Early nutrition support = start of EN and/or PN within 48 hr of ICU admission vs. no early nutrition (>48 hr)	Overweight/obese patients had lower uptake of early nutrition. Energy/protein target attainment was low (≈50% and ≈33%, respectively). GI intolerance to EN was common.
	Ramya et al., 2024 [371]	Single-center prospective observational study	Critically ill obese adults per WHO-Asian criteria; MV within 48 hr; ICU stay ≥3 days. N=140	Early EN (≤12 hr) after ICU admission (n=71) vs. Late EN (>12 hr) (n=69)	Early EN: shorter MV, ICU LOS, hospital LOS; no mortality difference. Day-3 target attainment slightly higher; baseline severity similar.
	Borel et al., 2014 [375]	Multicenter retrospective cohort	Adult ICU on MV; N=3,257 (obese n=663)	Framework: time to first feeding from intubation day; day 1/2/3 vs. later (time-dependent Cox)	Obesity independently associated with delayed feeding. In obese subgroup, no adjusted association between start day and 30-day mortality.
	Zaragoza-García et al., 2023 [376]	Prospective nationwide multicenter cohort (69 ICUs)	MV ≥48 hr, EN observed for 7 days; N=319 (includes obese; BMI >35 mostly excluded)	Not an early vs. delayed study (analyzed EN delivery days 3–7 vs. ICU-AW)	ICU-AW 68.9%; not independently linked to energy/protein intake. In obese, overfeeding more frequent and protein underdelivery common; GI intolerance low.
IC Energy Protein	Tweel LE et al., 2024 [372]	RCT Post-hoc (EFFORT Protein)	425 critically ill obese patients	High (≥2.2 g/kg) vs. Usual (≤1.2 g/kg) Protein	High protein (≥2.2 g/kg) did not improve time to discharge or mortality; potential harm signal observed in patients with BMI ≥40.
	Charles EJ et al., 2020 [373]	RCT Post-hoc	30 obese surgical ICU patients	Hypocaloric vs. Eucaloric feeding	Hypocaloric feeding did not improve outcomes and showed a trend toward higher infection rates (79% vs. 46%), possibly due to insufficient protein intake (~1.0 g/kg).

	Lopez-Delgado JC et al., 2025 [374]	Multicenter observational	150 obese ICU patients (Total n=525)	Energy (≥11 vs. <11 kcal/kg) & Protein (<0.8 vs. 0.8-1.3 vs. ≥1.3 g/kg)	Energy delivery ≥11 kcal/kg was associated with lower ICU mortality. Protein delivery of 0.8-1.3 g/kg showed better survival than <0.8 g/kg.
	Dickerson RN et al., 2013 [378]	Retrospective observational	74 trauma ICU patients (Older vs. Younger)	Hypocaloric-HP (Age ≥60 vs. <60)	Older obese patients achieved equivalent nitrogen balance to younger patients with high protein (2.3 g/kg IBW) without worsening renal failure, proving safety.
	Ridley EJ et al., 2020 [379]	Prospective observational	20 critically ill obese patients	Measured EE vs. Guideline (11-14 kcal/kg Actual BW)	The 11–14 kcal/kg formula underestimated energy needs by >1,000 kcal/d compared to IC; failed to account for increasing metabolic rate over time.
	de Heer G et al., 2025 [380]	Prospective observational	28 obese vs. 22 septic non-obese controls	IC-measured EE vs. Predictive formulas	Validated the ESPEN approach: Using Adjusted BW (IBW + 20% Excess BW) was the most accurate method to estimate energy needs when IC is unavailable.
	Mogensen KM et al., 2015 [381]	Retrospective validation (pilot)	31 critically ill obese patients	Predictive equations vs. IC target (65% MREE)	Validated ASPEN equations: 11-14 kcal/kg Actual BW for BMI 30-50, and 22-25 kcal/kg Ideal BW for BMI >50 accurately predicted the hypocaloric target (65% of MREE).
	Vest MT et al., 2019 [382]	Prospective observational	25 mechanically ventilated obese patients	ASPEN equations vs. IC targets vs. Delivered	Found that ASPEN equations underestimated energy needs compared to IC targets; actual delivery was very low, causing severe protein deficits.
	Tajchman SK et al., 2015 [383]	Retrospective observational	33 critically ill obese cancer patients	Measured EE vs. Guideline target (<25 kcal/kg IBW)	Obese cancer patients were hypermetabolic (mean MEE 28.7 kcal/kg IBW), exceeding standard hypocaloric guidelines. Caution against underfeeding in this subgroup.

ICU, intensive care unit; LOS, length of stay; EN, enteral nutrition; BMI, body mass index; PN, parenteral nutrition; GI, gastrointestinal; MV, mechanical ventilation; ICU-AW, intensive care unit-acquired weakness; RCT, randomized controlled trial; HP, high-protein; IBW, ideal body weight; EE, energy expenditure; IC, indirect calorimetry; BW, body weight; MREE, measured resting energy expenditure.


Identification of studies via databases
Identification
Records identified from*:
EMBASE (n = 53)
Pubmed (n = 35)
Cochrane Library (n = 51)
Records removed *before screening*:
Duplicate records removed (n = 46)
Screening
Records screened
(n = 93)
Records excluded after title and abstract screening
(n = 5)
Reports sought for retrieval
(n = 88)
Reports excluded because full text cannot be found
(n = 3)
Reports assessed for eligibility
(n = 85)
Reports excluded:
Not conducted on the population of interest (n = 22)
Intervention not relevant to the key question (n = 15)
Comparator not relevant to the key question (n = 17)
Inappropriate or irrelevant outcomes reported (n = 23)
Not a study involving human participants (n = 1)
Included
Studies included in review
(n = 7)