

# The effect of obesity on intensive care morbidity and mortality

Obesity is not demonstrated to be associated with a higher ICU mortality. Obese patients have an increased morbidity on the ICU as evidenced by prolonged requirement for mechanical ventilation and intensive care admission length.

Level of evidence: 1<sup>+</sup> (Meta-analysis with a low risk of bias)

## Appraised by: James Brown

**Citation:** Akinnusi ME, Pineda LA, El Soth AA. Effect of obesity on intensive care morbidity and mortality: A meta-analysis. *Crit Care Med* 2008; 36: 151-58.

**Lead author:** Ali A. El Solh.

### Three-part clinical question:

**Patients:** Obese patients, medical and surgical, in the intensive care unit (BMI  $\geq 30$ kg/m<sup>2</sup>).

**Intervention:** Standard intensive care management.

**Outcome:** Primary – ICU mortality; Secondary – duration of mechanical ventilation, length of ICU admission.

**Search terms:** intensive care, critically ill, obesity, body mass index, mortality.

Search date 10th March 2008: Medline (1996-current) 41 hits, Embase (1996-current) 45 hits, CINAHL (1982-current) 28 hits.

**Data sources:** Cochrane Library, Medline, Embase, non-English sources, BIOSIS Previews, Pubmed, contact with expert informants.

### The study selection:

**Inclusion criteria:** Studies comparing obese and non-obese critically ill patients admitted to the ICU. Obesity defined as BMI  $\geq 30$ kg/m<sup>2</sup>. Severity of illness scores (APACHE II, SAPS II,

ISS) were comparable for both groups in all selected studies.

**Exclusion criteria:** Non-comparative studies. Those performed outside the ICU setting or utilising the same patient population as another included study.

**Data extraction:** Twenty nine studies initially identified. Fifteen identified potential studies from the available literature were excluded on eligibility criteria established *a priori*.

Total number of obese and non-obese patients = 62,045, 25% (15,347) of whom were obese.

Mortality rate: Fourteen considered for analysis – 7 retrospective, 7 prospective.

ICU length of stay – 13 studies.

Duration of mechanical ventilation – 6 studies.

Two reviewers independently rated studies for inclusion.

Studies were tested for heterogeneity.

### EBM comments:

1. *Do the methods allow the adequate testing of the hypothesis?*  
**Yes.** The association of chronic diseases such as hypertension, ischaemic heart disease, diabetes and obstructive sleep apnoea with obesity intuitively would seem to predispose ICU patients to a higher mortality. This meta-analysis demonstrates no difference in the primary outcome of mortality between obese and non-obese patients. The individual studies contributing to the meta-

### The evidence:

#### Primary outcome:

Patients (obese vs non-obese)	RR (95% CI) ICU mortality	P value
BMI $\geq 30$	1.0 (0.86-1.16)	0.97
BMI 30-39.9	0.86 (0.81- 0.91)	<0.001
BMI $\geq 40$	0.97 (0.74-1.26)	0.8

#### Secondary outcome:

Outcome BMI 30 vs non-obese	Mean difference in days (95% CI)	P value
Duration of ventilation	1.48 (0.07-2.89)	0.04
Duration of ICU stay	1.08 (0.27-1.88)	0.009

analysis varied in their mortality findings. The more recent studies appear to show a trend to improving outcome in obese patients; the authors postulate that this may reflect improvements in ICU management, especially closer consideration of glycaemic control.

2. *Do the statistical tests correctly test the results to allow differentiation of statistically significant result?* Yes.
3. *Are conclusions valid in light of results?* Yes. Heterogeneity of the studies must be considered, but it represents a valid attempted pooling and analysis of the best available current evidence. The authors discuss potential mechanisms of a counterintuitive survival advantage, shown in the subgroup analysis of obese patients (BMI 30-39.9) compared to non-obese (RR 0.86) or the morbidly obese. They suggest immunomodulation by adipose secreting hormones (leptin and IL-10) may have an influence. They also postulate that inclusion of poorly nourished chronically ill patients may adversely influence mortality in the non-obese group.
4. *Did results get omitted, and why?* No.
5. *Did they suggest areas of further research?* Yes. The authors suggest studies of interventions aimed at the obese population to reduce their greater resource utilisation in the ICU setting.
6. *Did they make any further recommendations based on the results and were they appropriate?* No.
7. *Is the study relevant to my clinical practice?* Yes. The incidence of obesity, in the UK and globally, is increasing. The increased morbidity (length of stay and ventilation days on ICU) has resource implications and potential future increasing costs for the NHS.
- 8) *What level of evidence does this study represent?* 1+ (meta-analysis with a low risk of bias). There is potential risk of publication bias, with reduced publication rates of negative studies and selection bias (7 of analysed studies for ICU mortality were retrospective).
9. *What grade of recommendation can I make on this result alone?* A.
10. *What grade of recommendation can I make when this study is considered along with other available evidence?* A.
11. *Should I change my practice because of the results?* No.
12. *Should I audit my current practice because of these results?* No.

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