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To cite this version:

Audrey de Jong, Boris Jung, Gerald Chanques, Samir Jaber, Nicolas Molinari. Obesity and mortality in critically ill patients: another case of the simpson paradox?. Chest, 2012, 10.1378/chest.11-3302 . hal-02549544

HAL Id: hal-02549544

https://hal.umontpellier.fr/hal-02549544

Submitted on 21 Apr 2020

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Obesity and Mortality in Critically Ill Patients

Another Case of the Simpson Paradox?

To the Editor:

We read with interest the article of Martino et al[1] in a recent issue of *CHEST* (November 2011) reporting that obese critically ill patients survive at least as often as patients who are of normal weight. However, we believe this conclusion could send a misleading message. Although mortality rate has been adjusted on the APACHE (the Acute Physiology and Chronic Health Evaluation) II score in a multivariate analysis, a strong limit of this study

is the assessment of illness severity at ICU admission in obese patients. To our knowledge, no severity score in the ICU adapted to obese patients has been validated in the literature. Indeed, BMI is not used in the severity scores designed for patients in the ICU, such as the APACHE II or III, Sequential Organ Failure Assessment, and Simplified Acute Physiology Score II.[2] In fact, these scores may not be adapted to patients who are obese. For instance, alveolar arterial gradient is often decreased in the basal state in obese patients, with a high prevalence of obese hypoventilation syndrome and apnea syndrome. A minor pulmonary infection could lead to a very low alveolar arterial gradient, increasing artificially the APACHE II score. In the same way, APACHE II could be increased by an overestimation of renal dysfunction due to a low urine output in some obese patients.[3]

As a consequence, real severity of obese patients at admission could be a confounding factor on their real outcome. An extreme example of confounding is the Simpson paradox,[4] in which a factor reverses the effect first observed. For example, in a study[5] comparing mortality between closed and opened ICU systems, taking into account overall patients for analysis, mortality was increased in closed ICU, but, paradoxically, mortality was decreased for intubated patients and, likewise, for nonintubated patients. If the authors had not taken into account the confounding factor "intubation status," the conclusion would have been wrong. In this study,[1] in order to better control the severity despite the lack of a severity score validated on obese patients, would it be possible to match a posteriori the cause of admission in addition to the multivariate analysis?

In summary, the conclusion reported by Martino et al[1] is another example of the Simpson paradox, whereby the confounding factor "severity of disease" would reverse the link between obesity and mortality. The development of a severity score more adapted to obese patients would be welcome before concluding that there is an equal or lower mortality of obese patients in ICU.

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Financial/nonfinancial disclosures: The authors have reported to *CHEST* that no potential conflicts of interest exist with any companies/organizations whose products or services may be discussed in this article.
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DOI: 10.1378/chest.11-3302

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