Author's response

We would like to thank Drs Campbell-Taylor¹ and Iqbal *et al*² for their letters of interest regarding our paper.³ Nonetheless, we are unclear as to the nature of Dr Campbell-Taylor's 'quibble' with our methodology. In contrast to the assertion that we did not take confounders into account, we actually adjusted for comorbidities, previous pneumonia, smoking status and alcohol intake as well as age and social deprivation. The concern over whether pneumonitis and pneumonia can be differentiated from our data is more valid and we agree that there may be some errors in diagnosis and/or coding. However, these errors are unlikely to bias the results, and the mortality data indicate significant harm; therefore, 'quibbles' over the diagnosis do not negate the potential impact on health. It is certainly possible that benzodiazepines increase the risk of aspiration and we are grateful to Dr Campbell-Taylor for emphasising this point.

We are honoured that our paper prompted Iqbal *et al* to research their own database. This is an important step in

progressing this area of research. Certain methodological aspects of their analysis are not explained, such as whether they adjusted for confounders, as we have done; therefore, we will not qualitatively compare their data with ours. Rather, this analysis shows that there is equipoise as to whether these drugs are harmful in the setting of pneumonia, mandating prospective studies on this issue. Relating to this, the authors quote a series of studies that did not find any effect of benzodiazepines on pneumonia but ignored data suggesting a deleterious effect on infection.^{4–6} Furthermore, a meta-analysis of randomised controlled trials of eszopiclone, ramelteon, zaleplon and zolpidem showed an increased risk of infection (risk ratio 1.44, 95% CI 1.25 to 1.64, $p < 0.00001$ ⁷), implicating non-benzodiazepine drugs (similar to our finding with zopiclone³). Therefore, planning a randomised controlled trial on this issue may be complex due to the difficulty in identifying an alternative therapy to compare, though non-pharmacological intervention

may be an option. We encourage exploration of similar datasets to provide further evidence for an effect of benzodiazepines and non-benzodiazepine drugs on pneumonia and/or infection; however, we stress that prospective study is also required.

Robert D Sanders

Correspondence to Dr Robert D Sanders, Wellcome Department of Imaging Neuroscience, Institute of Cognitive Neuroscience, University College London, 17 Queen's Square, London, WC1N 3AR, UK; robert.sanders@imperial.ac.uk

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