**Title of the project**

**Systematic review and meta-analysis of circulating vitamin D in critically ill adult and paediatric patients**

This project is suitable for (please put an X next to the appropriate group):

|  |  |
| --- | --- |
| MSc in Epidemiology students: | x |
| MPH (General stream) students: | x |
| MPH (Global Health stream) students: |  |

**Background**

The care of acute and critically ill individuals is rising with a concomitant increase in cost and decrease in quality of life in survivors ([Halpern and Pastores, 2010](#_ENREF_4); [Capuzzo and Bianconi, 2015](#_ENREF_1)). Mortality and associated morbidity from severe sepsis and septic shock episodes remain high for example ([Dellinger, Levy et al., 2013](#_ENREF_3)). These trends are expected to worsen in an ageing population. A better understanding of risk markers and potential treatment options is needed. Vitamin D deficiency prevalence has recently been reported to be common and associated to higher risk of death in critically ill patients, particularly in those suffering sepsis ([Upala, Sanguankeo et al., 2015](#_ENREF_7); [de Haan, Groeneveld et al., 2014](#_ENREF_2)). Several studies have also looked at the degree of deficiency and association with clinical measures but more precise estimates and increased power are required to better understand this, particularly in patients suffering from sepsis syndrome and in the paediatric population.

* Study questions
  + How prevalent and severe is vitamin D deficiency in patients requiring critical care?
  + Is vitamin D deficiency associated with improved survival outcomes in patients requiring critical care?
* Study design
  + Systematic review and meta-analysis

**Aims**

The overall aim is to better understand the importance of vitamin D in acute conditions in adult and paediatric populations.

* Specific objectives
  + To systematically review the prevalence and severity of vitamin D deficiency (plasma/serum 25(OH)D levels) in critically ill with a sub-group analysis of septic patients in adults and children (separately);
  + To perform a systematic review and meta-analysis of the relationship between plasma/serum 25(OH)D levels and mortality in critically ill and septic patients;

**Skills required**

Skills required to successfully complete the project:

* Excellent skills in basic epidemiology and statistics
* Experience with one statistical package (e.g. R, SPSS, Stata)
* Strong interest in meta-analysis methodology, vitamin D and critical care epidemiology.
* General problem-solving and self-directed learning within a supportive environment

**Outcomes**

Students will gain knowledge and experience in:

* Statistical analysis of epidemiological data
* Systematic review and meta-analysis methodology
* Intensive care unit and sepsis epidemiology
* International standards and guidelines for study reporting (e.g. PRISMA ([Moher, Shamseer et al., 2015](#_ENREF_5)), MOOSE ([Stroup, Berlin et al., 2000](#_ENREF_6)))

There are further questions that will follow from this study, which may be suitable for someone interested in developing deeper knowledge and skills in this area, such as understanding how survivors of critical care fare in the long term (i.e. quality of life and outcomes months to years after discharge); and, for example, if higher levels of vitamin D in critically ill patients associate with better prognosis (and metrics such as lower scores of organ failure, reduced length of stay, younger age or lower rates of infection).

**Supervisor**:

Please give name, e-mail address and phone number.

Dr. Antonio J Berlanga-Taylor MBBS, MSc, DPhil

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**Co-supervisor**:

Please give name, e-mail address and phone number.

Dr. Ioanna Tzoulaki

Senior Lecturer in Epidemiology

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**Please detail any costs to be incurred and the amount you plan to claim from the School of Public Health:**

None anticipated

***Note:*** *Please also refer to the ‘Application for fieldwork funding’ document, if applicable*

Not applicable

**Key references**

Capuzzo, M. and Bianconi, M. (2015). "Our paper 20 years later: 1-year survival and 6-month quality of life after intensive care." Intensive Care Med 41(4): 605-614.

de Haan, K., Groeneveld, A. B., de Geus, H. R., Egal, M. and Struijs, A. (2014). "Vitamin D deficiency as a risk factor for infection, sepsis and mortality in the critically ill: systematic review and meta-analysis." Crit Care 18(6): 660.

Dellinger, R. P., Levy, M. M., Rhodes, A., et al. (2013). "Surviving sepsis campaign: international guidelines for management of severe sepsis and septic shock: 2012." Crit Care Med 41(2): 580-637.

Halpern, N. A. and Pastores, S. M. (2010). "Critical care medicine in the United States 2000-2005: an analysis of bed numbers, occupancy rates, payer mix, and costs." Crit Care Med 38(1): 65-71.

Moher, D., Shamseer, L., Clarke, M., et al. (2015). "Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement." Syst Rev 4: 1.

Stroup, D. F., Berlin, J. A., Morton, S. C., et al. (2000). "Meta-analysis of observational studies in epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in Epidemiology (MOOSE) group." JAMA 283(15): 2008-2012.

Upala, S., Sanguankeo, A. and Permpalung, N. (2015). "Significant association between vitamin D deficiency and sepsis: a systematic review and meta-analysis." BMC Anesthesiol 15: 84.