INVENT – A DECISION SUPPORT SYSTEM FOR MANAGING INSPIRED OXYGEN – PROSPECTIVE EVALUATION IN AN INTENSIVE CARE UNIT

Karbing, DS[1]; Allerød, C[1,2]; Thorgaard, P[2]; Andreassen,S[1]; Kjærgaard, S[2] & Rees, SE[1]
[1]Center for Model-based Medical Decision Support, Department of Health Science and Technology, Aalborg University, Aalborg, Denmark; [2]Anaesthesia and Intensive Care, Region North Jutland, Aalborg Hospital, Aarhus University, Aalborg, Denmark.

Introduction: INVENT is a model-based decision support system for ventilator management providing suggestions of tidal volume, respiratory frequency and FiO_2 [1]. As a first step, this study prospectively evaluated INVENT for managing FiO_2 in an ICU.

Methods: 13 patients were available for analysis with 45 experiments where both attending clinicians and INVENT managed FiO_2. Clinicians set FiO_2 as in normal practice. INVENT estimated model parameters and then suggested the FiO_2 representing the optimal compromise between oxygenation goals and minimizing FiO_2 to avoid adverse effects of hyperoxia [2, 3].

Results: Median (range) INVENT and clinician changes in FiO_2 from baseline were −0.03 (−0.16 to 0.12) and 0.00 (−0.10 to 0.05). Median SaO_2 changes from baseline for INVENT and clinicians were 0.00 (−0.04 to 0.05) and 0.00 (−0.05 to 0.03). INVENT FiO_2 and SaO_2 ranges were 0.26–0.54 and 0.94–0.99. Clinician FiO_2 and SaO_2 ranges were 0.25–0.70 and 0.91–0.99. Intra-patient SaO_2 variation across experiments was at most 0.02 in 12 patients for INVENT compared to 9 for clinicians.

Discussion: INVENT SaO_2 was within previously defined safe limits for ALI/ARDS [4]. INVENT accomplished narrower FiO_2 and SaO_2 distributions than clinicians, i.e. standardizing FiO_2 management, and better maintained adequate SaO_2 when patients changed status. INVENT may enable automatic regular reevaluations of patients improving care and freeing clinicians' focus.

REFERENCES

1. Rees SE et al. Using physiological models and decision theory for selecting appropriate ventilator settings. J Clin Monit Comput 2006; 20:421–9.
2. Altemeier WA, Sinclair SE. Hyperoxia in the intensive care unit: why more is not always better. Curr Opin Crit Care 2007; 13:73–8.
3. Aboab J et al. Effect of inspired oxygen fraction on alveolar derecruitment in acute respiratory distress syndrome. Intensive Care Med 2006; 32:1979–86.
4. The ARDS Network: Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome. N Engl J Med 2000; 342:1301–8.