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Comparing Retrospective PSU Measurements With the LEEP-COVID 2020 Study to Ascertain Similarities in Calories per Kilogram of Body Weight for Ventilator-Dependent COVID-19 Patients

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Introduction

Critically ill COVID-19 patients are suspected to have high caloric needs.[1] Indirect calorimetry (IC) is the gold standard used to measure resting energy expenditure (mREE), but it is expensive and not widely available. Predictive equations are often used to assess metabolic requirements and the Pennsylvania State University (PSU) equation has demonstrated comparable results to IC in identifying caloric requirements for critically ill patients.

This poster describes a simple, comparative retrospective presentation of PSU calculations to that of the study published in 2020 by Whittle et al. on Longitudinal Energy Expenditure in Critically Ill Patients with COVID-19 (LEEP-COVID).[1] PSU measurements were compared to the IC data by the LEEP-COVID study to ascertain similarities in calories per kilogram (kcal/kg) of body weight for ventilator-dependent COVID-19 patients over a duration of 30 days.

Methods

A retrospective chart review was performed on critically ill COVID-19 patients between March and June of 2020 to collect their PSU calculations. Patients on extracorporeal membrane oxygenation (ECMO) and volumetric diffusive respirator (VDR), were excluded as these devices could skew the minute ventilation and yield an inaccurate PSU calculation. Patients for whom the PSU data was not clearly labeled were also removed, leaving 38 adult ventilator-dependent COVID-19 patients for review. PSU data was then compared to the LEEP-COVID 2020 study by Whittle et al.

Results

Out of the 38 ventilator-dependent COVID-19 patients, the median age was 65 years old, 65.8% were male and 48% had a BMI > 30.

Ventilator days 0 - 15	LEEP-COVID 2020 study	Our retrospective study
Non-obese (BMI <30)	19.2 – 26 kcal/kg ABW	21.9 – 24 kcal/kg ABW
Obese (BMI 30-40)	17.5 – 21 kcal/kg ABW	18 – 19.8 kcal/kg ABW

The LEEP-COVID 2020 study identified that non-obese ventilated COVID-19 patients from days 0 – 14 had a mREE using IC of 19.2 – 26 kcal/kg ABW and obese patients 17.5 – 21 kcal/kg ABW.

Our retrospective study using the PSU equation from days 0 – 15 revealed caloric needs of 21.9 – 24 kcal/kg ABW for non-obese patients and 18 – 19.8 kcal/kg ABW for obese patients.

Conclusion

In performing a simple comparative review of the LEEP-COVID study to our retrospective data, we identified that the PSU equation may be useful in estimating the caloric needs for ventilated COVID-19 patients from days 0– 15.

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DEMOGRAPHICS AND BASELINE CHARACTERISTICS

Age, years, (median, range)	65 (30-84)
Gender (n, %)	
Male	25 (65.8)
Female	13 (34.2)
Race (n, %)	
Hispanic	19 (50)
Asian	1 (2.6)
African American	2 (5.3)
White	15 (39.5)
Other	1 (2.6)
BMI, median (range)	28.7 (19.7-40.0)
BMI >30 (n, %)	19 (48)
ICU LOS (mean, range)	22.8 (5-46)
Mortality (30-day study period only) (n, %)	18 (47)

ENERGY EXPENDITURE DATA

	PSU kcal/day, all patients (mean calories)	PSU kcal/kg actual BW non-obese, BMI <30 (mean calories)	PSU kcal/kg actual BW, obese, BMI 30-40 (mean calories)	Mifflin stress factor (caloric equivalent)
Day 0-3	20.0 (1922.5)	21.9 (1553.5)	19 (2047.1)	1.10 (180.7)
Day 4-6	20.7 (1706.3)	23.5 (1638.2)	18.1 (1766.8)	1.16 (234.2)
Day 7-9	21.1 (1693.8)	23.4 (1650.8)	18.2 (1871.8)	1.19 (284.7)
Day 10-12	21.5 (1759.7)	24.0 (1713.0)	19.6 (1811.8)	1.19 (278.2)
Day 13-15	20.8 (1768.3)	23.1 (1604.3)	18.6 (1841.5)	1.18 (265.7)
Day 16-18	21.1 (1665.8)	22.4 (1502.4)	20.4 (1813)	1.17 (242.3)
Day 19-21	20.0 (1749.4)	21.3 (1712.3)	19.2 (1777.3)	1.11 (169.3)
Day 22-24	22.6 (1526.9)	24.6 (1437.4)	21.0 (1660.5)	1.14 (194.1)
Day 25-27	19.6 (1664.3)	19.5 (2112.0)	17.8(1594)	1.11 (163.6)
Day 28-30	21.3 (1921.4)	22.9 (1884.3)	19.4 (1977)	1.16 (265.8)

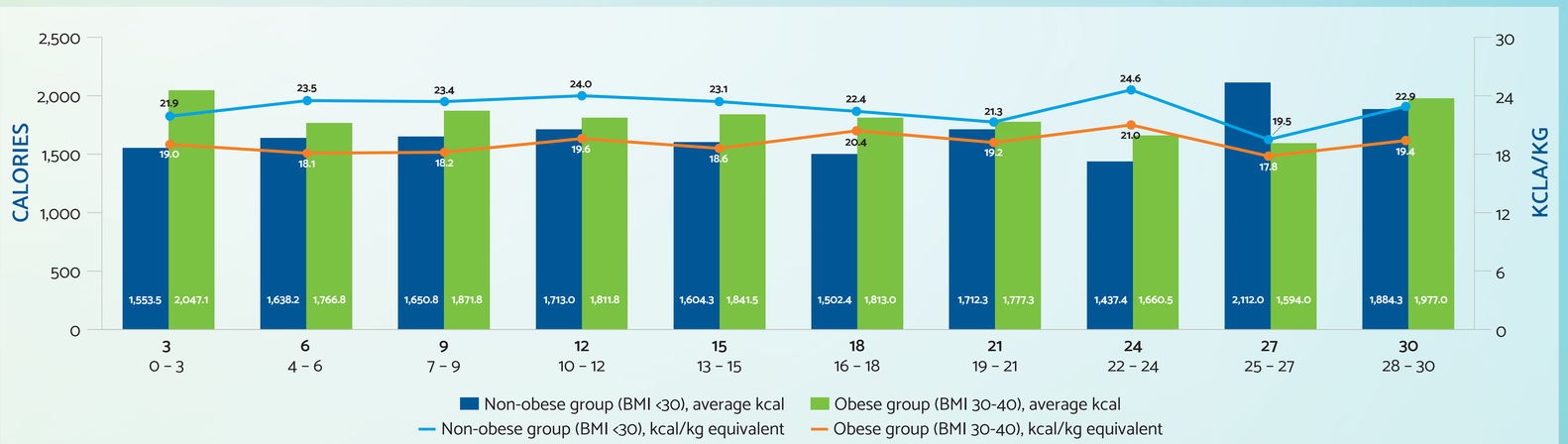

Figure 1: Average calories and calories per kilogram (kcal/kg) equivalent for each BMI group over 30 ventilator days

[1]Whittle J, et al. Persistent hypermetabolism and longitudinal energy expenditure in critically ill patients with COVID-19. Critical Care. 2020 Dec;24(1):1-4.

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