Local multivariate modeling for predicting body composition indifferent segmental compartments

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and children, taurolidine was well tolerated, no side effects were reported. Taurolidine 2% solution reduced CBRSI by 79% in adults and children compared to heparin. No changes in catheter care occurred between 2009 and 2010.
Conclusion: Locking the central venous access with taurolidine in adults and children on chronic HPN reduces the incidence of central venous catheter related blood stream infections significantly. A prospective randomized controlled trial is necessary to confirm this retrospective analysis. Moreover Taurosept® catheter locks might provide a novel prevention strategy in all patients carrying a central venous catheter.

Disclosure of Interest: None Declared.

PP167-MON
MULTIVARIATE MODELING FOR PREDICTING BODY COMPOSITION IN DIFFERENT SEGMENTAL COMPARTMENTS

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Rationale: Assessment of human body composition is an important factor in determining health and nutritional status, but currently most of available regression equations are built to predict only the contribution of body fat in body weight (%bF). Our aim was to propose a multivariate model for predicting several segmental compartments together from easily measured anthropometric covariates.
Methods: A dual-energy X-ray absorptiometry (DXA) measurement database (1999–2004 National Health and Nutrition Examination Survey [NHANES]) was randomly divided to either training, test or validation sub-database (1989, 994 and 994 men, 1846, 923 and 923 women respectively in 3 sub-databases). The multivariate model was developed based on NHANES training part from age, weight, height and waist circumference. The NHANES validation and a French DXA database were used to assess prediction accuracy given by the model.
Results: Three previously published linear models were applied to the databases NHANES validation and French DXA for comparison with our multivariate predictions. Our multivariate model was highly accurate to predict %bF in NHANES validation [Standard Error of Prediction (SEP) 3.26% for men, 3.47% for women]. Despite a different population context between French subjects and American NHANES subjects, multivariate predictions were more reliable for French %bF prediction (SEP 3.74% for men and 3.95% for women). In addition, prediction of body lean mass, trunk fat and other segmental compartments was also well provided (SEP ranging from 0.32% to 3.47% in NHANES validation, from 0.37% to 3.95% in French DXA).
Conclusion: This proposed model provided both accuracy and multivariate ability of segmental body composition prediction. The use of such model in large populations could be of interest for many public health issues.

Disclosure of Interest: None Declared.

PP168-MON
MEASUREMENT OF PARTICLE RELEASE FROM DIFFERENT INFUSION SETS DURING THE OUTFLOW OF PARENTERAL NUTRITION

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Rationale: Particle release during parenteral nutrition (PN) may occur depending on the plastic type of the infusion set. This study aimed at measuring the particle release from different infusion sets during PN outflow.
Methods: Either Water For Injection (WFI) or PN w/o lipids (NuTRIflex® + Cernevit® + Tracutil®) were passed at 50 ml/h through polypropylene (PP), polyvinyl chloride (PVC) and polyurethane (PU) made infusion sets, using a dynamic injection system. Particle release was obtained by the difference in the number of particles measured between the piercing spike and injection site of the infusion set, using a laser light extinction particle counter (Hyac/Royco 90/64) and Pharmaspec software.
Results: Compared to WFI, the total number of particles $\geqslant 2\,\mu m$ was increased by about 5 times in NP w/o lipids, regardless of the infusion set used. In constrast to PVC and PP made infusion sets, the number of particles $\geqslant 10\,\mu m$ was significantly increased in PU made infusion sets, while there was no significant release of particles $\geqslant 25\,\mu m$.

Table: Difference in the number of particles measured between the piercing spike and injection site of the different infusion sets (mean±SD of triplicate samples)

	PP	PVC	PU	
Particles $\geqslant 10\,\mu m$	WFI	0.3±0.2	1.4±1.8	2.8±1.7*
	PN w/o lipids	2.3±9.4	14.8±9.1	14.3±6.6*
Particles $\geqslant 25\,\mu m$	WFI	0.1±0.2	0.0±0.0	0.7±0.9
	PN w/o lipids	−0.1±0.3	1.8±2.2	0.1±0.4

*$P < 0.05$, significant increase in particle release (Student's t test).

Conclusion: Compared to WFI, particle release during NP outflow is increased and may exceed the maximum of 12 particles $\geqslant 10\,\mu m$ per mL allowed by the European Pharmacopoeia n° 7 when using PU made infusion set. However, a qualitative analysis of these particles should be performed to confirm these preliminary results.

Disclosure of Interest: None Declared.

PP169-MON *Outstanding abstract*
THE EFFECTS OF LIPID AND GLUCOSE CONCENTRATION IN PARENTERAL NUTRITION ON THE GROWTH OF *CANDIDA ALBICANS*

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Rationale: Current guidelines limit administration of parenteral nutrition (PN) containing lipid to 24 hours because lipid putatively encourages contaminant growth. As removal of lipid may require replacement with isoenergetic amounts of glucose, this study considers if

the inclusion of lipid and increasing glucose concentration in PN affect the growth of *Candida albicans*.
Methods: *Candida albicans* (NCPF 3179) was inoculated into multilayered PN bag infusates with final concentrations of 8, 11, 14, and 17% w/v glucose (×4 of each) in both the absence and presence (5% w/v) of lipid (Clinoleic). Trace elements, vitamins, electrolytes and amino acids (Synthamin; final concentration 4.5 gN/L) were constant in all regimens. Microbial colony forming units (cfu)/ml were obtained at time 0 (after inoculation aiming to yield about 50 cfu/ml) and at 48 hours using blood agar plates. Results were log transformed to normalise the data, which were then examined using ANCOVA after adjusting for baseline $\log_{10}$ cfu/ml and pH.
Results: Overall growth increased from a mean±se of 1.81±0.01 $\log_{10}$ cfu/ml to 3.73±0.06 $\log_{10}$ cfu/ml, and was decreased by increasing concentrations of glucose in both the presence and absence of lipid (0.438±0.174 decrease in $\log_{10}$ cfu/ml per 10% glucose increase; $P = 0.018$). At a fixed glucose concentration the presence of lipid had no significant effect (0.246±0.156 decrease in $\log_{10}$ cfu/ml in the presence of 5% lipid; $P = 0.127$).
Conclusion: *Candida albicans* was not significantly affected by the inclusion of lipid, and independently suppressed by increasing glucose concentration. This implies that recommendations on the duration of PN administration should not only consider the presence or absence of lipid, but also the relative effects of lipid and glucose on contaminant growth.

Disclosure of Interest: None Declared.

PP170-MON
GREATER GROWTH OF *CANDIDA ALBICANS* IN LIPID ALONE THAN IN PARENTERAL NUTRITION WITH AND WITHOUT A LIPID COMPONENT

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Rationale: Current guidelines limit administration of parenteral nutrition (PN) regimens to 24 hours if they contain lipid, which may encourage contaminant growth. However, thereis some confusion as to whether the putative effect of lipid occurs in lipid alone and/or when lipid is mixed with PN. This study aimed to examine whether growth of *Candida albicans* was different in lipid alone, lipid containing PN and lipid free PN.
Methods: *Candida albicans* (NCPF 3179) was inoculated into three infusates (×4 each) in multilayer bags to yield about 50 colony forming units (cfu)/ml. Microbial cfu/ml were measured at time 0 (after inoculation) and at 48 hours using blood agar plates. The three infusates were lipid alone (Clinoleic), PN with lipid (Clinoleic; final concentration 5% w/v) and PN without lipid. Both PN infusates had final concentrations of 11% w/v glucose and 4.5 gN/L amino acids (Synthamin) and fixed amounts of trace elements, vitamins and electrolytes. Results were normalised by log transformation and analysed using ANCOVA, after adjusting for baseline $\log_{10}$ cfu/ml.
Results: The mean±se baseline $\log_{10}$ cfu/ml for the above three infusates were 1.842±0.02, 1.815±0.02 and 1.804±0.02 respectively. The change in growth was significantly greater in lipid alone than lipid PN (3.159±0.13 v 2.058±0.13 $\log_{10}$ cfu/ml; $p = 0.002$), greater in lipid alone than lipid free PN (3.201±0.12 v 2.004±0.12 $\log_{10}$ cfu/ml; $p = 0.001$), but not in lipid PN compared to lipid free PN (1.988±0.16 v 1.989±0.158 $\log_{10}$ cfu/ml; $p = 0.998$). The pH of the lipid PN (6.11±0.01) was lower than the lipid alone (8.35±0.03) and comparable to the lipid free PN (6.17±0.01).
Conclusion: *Candida albicans* grew much more in lipid alone than in lipid PN or lipid free PN. Policies on the maximum duration of infusion of lipid containing PN should therefore differentiate between lipid alone and lipid containing PN.

Disclosure of Interest: None Declared.

PP171-MON
SUBSTITUTION OF RECYCLED PRESCRIPTIONS WITH PRINTED ELECTRONIC PRESCRIPTIONS FOR PARENTERAL NUTRITION REDUCES MICROBIAL SURFACE CONTAMINATION

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Rationale: Prescription of parenteral nutrition (PN) often utilises paper prescriptions recycled between hospital wards and pharmacy, which may become a concentrated source of viable contaminants, including pathogens. This study considers the effect on these contaminants if printouts of electronic prescriptions are used.
Methods: The surfaces of PN prescriptions were sampled using cellulose sponge stick swabs with neutralising buffer on their entry to the pharmacy (n = 32 recycled; n = 32 electronic) and a different set of prescriptions on their arrival to hospital wards (n = 38 recycled; n = 34 electronic). Each swab was mixed with 10 mL of maximum recovery diluent before 0.5 mL aliquots of the resulting liquid were distributed onto a series of media growth plates to identify non-specific aerobic organisms, *Staphylococcus aureus*, moulds, yeasts, and enterococci using standard microbiological procedures.
Results: Non-specific aerobes more frequently contaminated recycled prescriptions (into pharmacy 94% v 44%, Fisher's exact test $P < 0.001$; and onto wards 76% v 50%, $P = 0.028$), and with a greater number of organisms [into pharmacy median 6.50 (interquartile range (IQR) 3.25, 13.00) v median 0.00 (IQR 0.00, 3.75), Mann Whitney U test, $P < 0.001$; and onto wards median 6.00 (IQR 0.75, 16.00) v median 0.50 (IQR 0.00, 2.00); $P = 0.001$). No enterococci were found, and no significant differences

Local multivariate modeling for predicting body composition in different segmental compartments. *(Poster number: PP167-MON)*

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Abstract

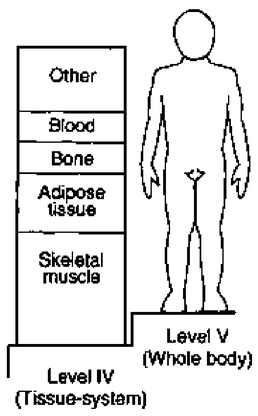
Body composition is an important indicator for public health issues. The two main components, body fat and body lean masses, enable to assess nutritional and physio-pathological status of individuals. Body fat, particularly abdominal fat mass, is associated with an increase in cardio-metabolic morbidity and mortality. The decrease in body lean masses during aging is linked with loss of autonomy. The ability to predict body composition from simple anthropometric covariates such as gender, age, height, weight and waist circumference, is an important issue. The aim is not to replace measurement methods (DXA), but to propose a pre-diagnostic tool to determine whether a DXA measurement is required or not.
A locally weighted multivariate regression was proposed to predict simultaneously several compartments. The aim of the approach is to build a good prediction from a reference dataset (NHANES). Among all tried methods, after applying the models on differents datasets, it turns out that the locally weighted approach gives the more reliable prediction, also comparing to published methods.

Key-words : Multivariate model, body composition, prediction, DXA.

Introduction

What is body composition ?

Body composition refers to the contribution of different components including tissues and organs in different body regions such as appendages, trunk and head. Some components are single solid organs such as brain, heart and liver. Others, such as body fat and body lean, are dispersed throughout the body.



Body composition

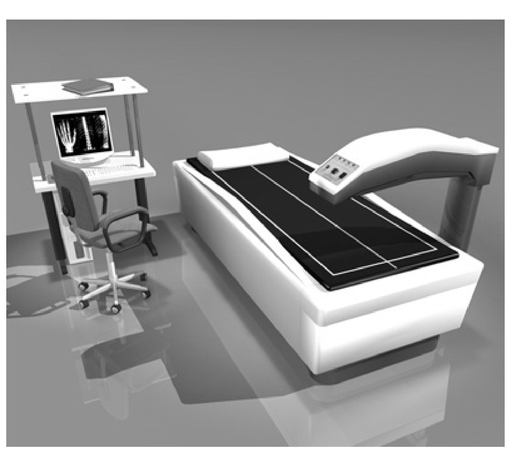
Overview of the body composition research

Body composition is an important indicator to public health, it enables to

- assess nutritional status of individuals ;
- analyze malnutrition, growing and aging issues ;
- and interpret the energy metabolism, ...

Measurement methods for body composition

- Hydrodensitometry
- Neutron Activation Analysis
- Dilution Methods
- Bioelectrical Impedance Analysis (BIA)
- Dual energy X-ray absorptiometry (DXA), ...



DXA machine

Conclusions

(I) **Comparison with published methods**
- simultaneous prediction for several segmental compartments
- providing more accuracy

(II) **Comparison with measurement methods**
- covariables easily acquired
- simple to manipulate
- reliable prediction
- not replacing a physical measurement

Statistical methodology

Locally weighted multivariate regression has been proposed to assess body composition prediction for different segments (SVM and bayesian regression have also been tried, but not retained). This approach follows two steps :

1. For a given individual to predict, we build adapted weighted sample
   - we define a distance d based on covariates to calculate dissimilarities for each individual of the reference dataset ;
   - we use a function of membership $\omega = f(d)$ as follows : $\omega = \begin{cases} 1 & \text{if } d \leq \varepsilon \\ exp(-\pi(d-\varepsilon)^2) & \text{else} \end{cases}$ to transform the distance into weights.

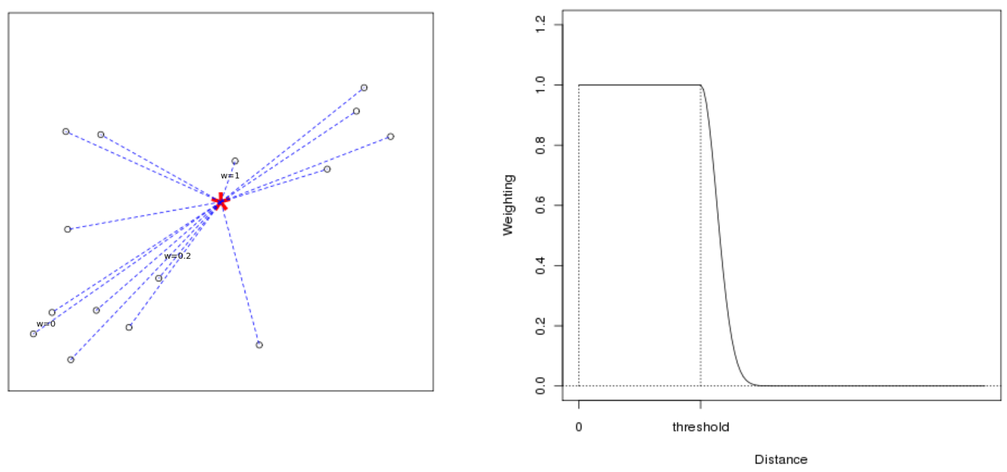


FIGURE: On the left : distance between given individual (red point) and individuals of reference dataset (other points) ; on the right : passage from the distance value to weighting.

2. We apply the locally weighted multivariate regression to each individual
   - this method is used to model target compartment Y :

$$Y \simeq f(AGE, HGT, WGT, WAI)$$
$$E(Y) = \alpha \times AGE + \beta \times HGT + \gamma \times WGT + \delta \times WAI$$

   - With the weighting value, optimization problem becomes :

$$min \sum_{i=1}^{n} w_i (y_i - E(Y_i))^2$$

Results

Criterion of prediction quality

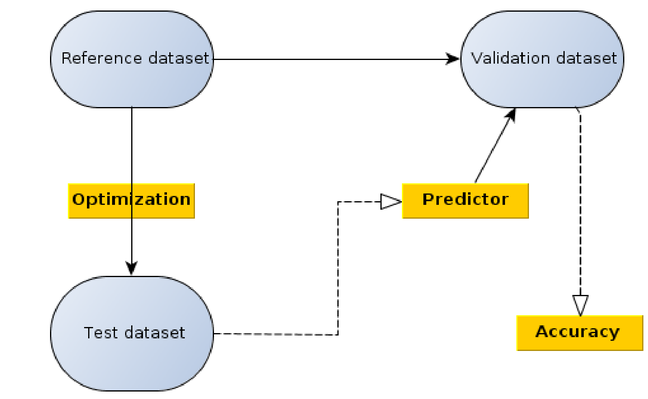
To compare with other methods, several criterions are defined :

- Standard Error of Prediction (SEP) :

$$SEP = \frac{1}{n} \sum_{i=1}^{n} |obs_i - pred_i|$$

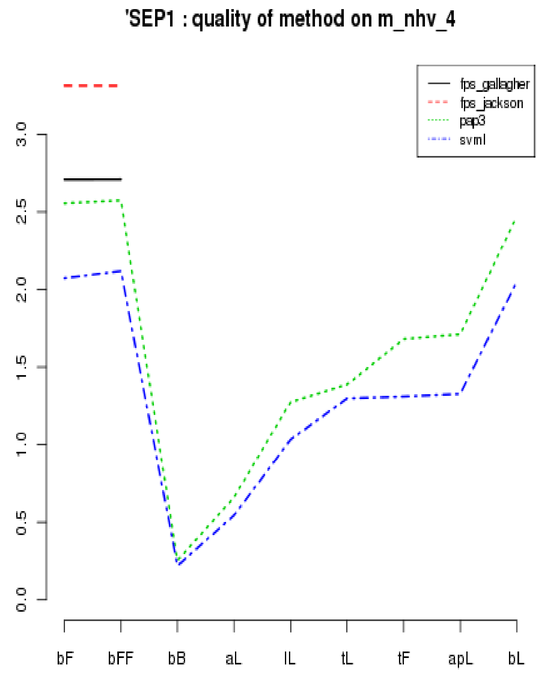
- Relative Error of prediction (REP) :

$$REP = \frac{1}{n} \sum_{i=1}^{n} |\frac{obs_i - pred_i}{obs_i}|$$



Scheme of locally weighted approach

Results



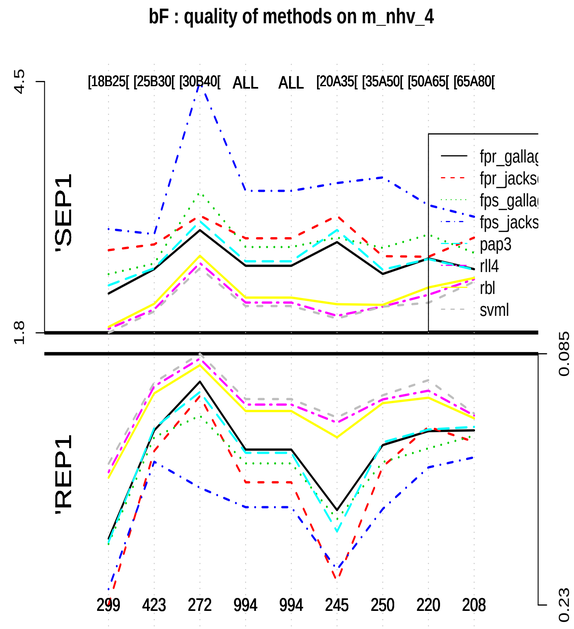


FIGURE: On the left : SEP value for 9 compartments from different statistical models ; on the right : for body fat mass (**bF**), accuracy of prediction in differents age and BMI categories.

Perspectives

A bayesian network is under construction to : (1) study aging issue of several anthropometric covariates ; (2) predict a distribution, not a single value ; (3) better assess the relationships between anthropometric covariates and body composition, ...

Ref : **[1]** Gallagher, D. et al. (2000). Healthy percentage body fat ranges : an approach for developing guidelines based on body mass index. The American Journal of Clinical Nutrition, 72(3) : 694-701. ; **[2]** Jackson, A. et al. (2002). The effect of sex, age and race on estimating percentage body fat from body mass index : The Heritage Family Study. International Journal of Obesity, 26(6) : 789-796. ; **[3]** Mioche, L. et al. (2011). Body composition predicted with a Bayesian network from simple variables. British Journal of Nutrition, 105(8) : 1265-1271.