PHASE ANGLE AND EXTRACELULAR HYPERVOLEMIA, AS A PROGNOSTIC MARKERS IN ACUTE KIDNEY INJURY.

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INTRODUCTION

Bioelectrical impedance analysis (BIA) is a **simple**, **cheap** and **non-invasive** tool for monitoring nutritional and hydration status in several diseases, including renal pathology.

There are prognostic markers that guide us through the evolution of a kidney disease, both acute and chronic presentation; however it's a rising trend to develop more **simplified**, **economic** and **comfortable** techniques.

The aim of this prospective study was to evaluate BIA in the prognosis of Acute Kidney Injury (AKI).

INTRODUCTION – Bioimpedance analysis

Bodycomp MF
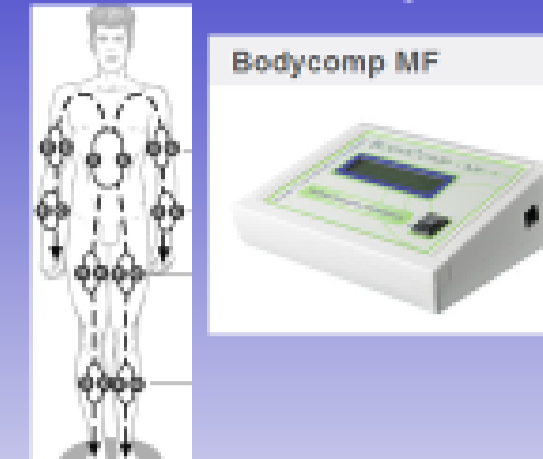
Its performed by applying an alternating electric current of low voltage to the patient's body, which acts as a conductor and can measure the resistance and reactance, two components of the impedance, which are strongly correlated with the volume of total body water and hence also with fat free mass, which mainly contains water and electrolytes

The phase angle (PA) is associated with the integrity of the cell membrane and disturbance in the water balance. The phase angle indicates changes in the quantity and quality of the soft tissues and therefore the permeability of the cell membrane and hydration. PA can be interpreted as an indicator of fluid distribution or electric resistance and cellular membranes capacitance of the human body.
The Extracellular/Intracellular Watter ratio indicates the fluid distribution intra or extracellular. Extracellular water depends on overhydration or changes in cell membrane permeability.
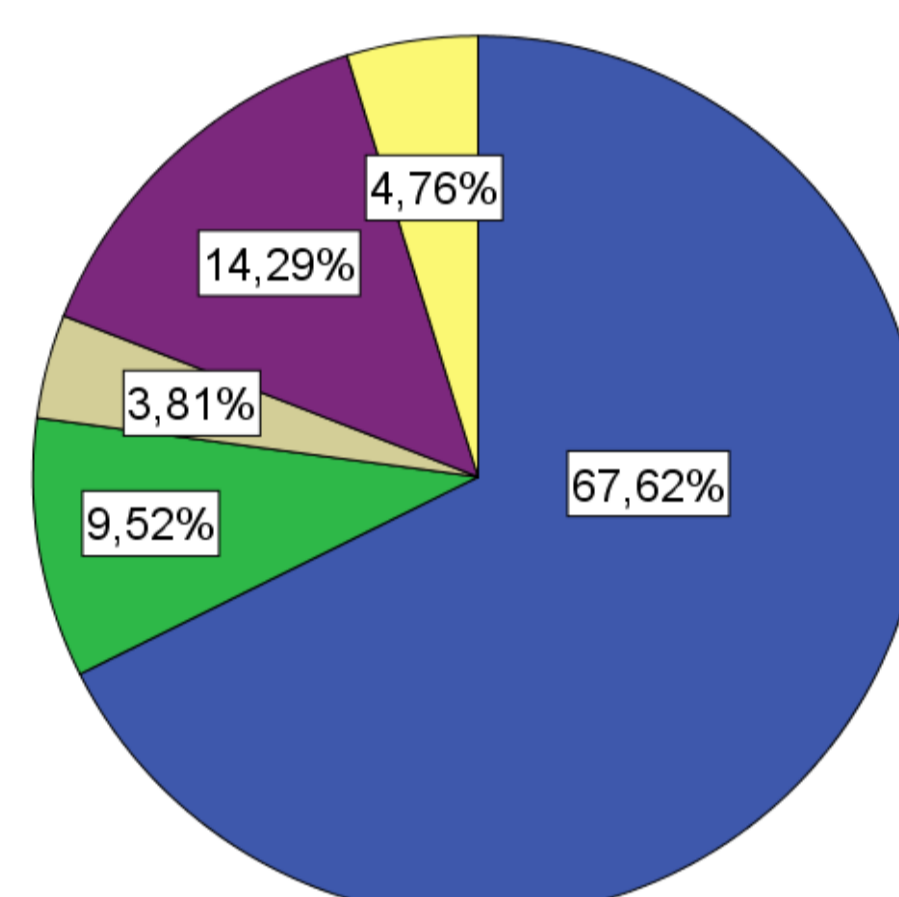
• BACKGROUND AND AIM

• The bioelectrical impedance analysis (BIA) is a noninvasive and painless technique is easy to perform , which is used for determining body composition . Can offer information about membrane cell integrity, volemia and clinical status. We evaluate use of BIA and two bioelectrical parameters (Phase angle –PA-, and extracelular/intracelular watter ratio –ECW/ICW-) as a prognostic markers in acute kidney injury (AKI)
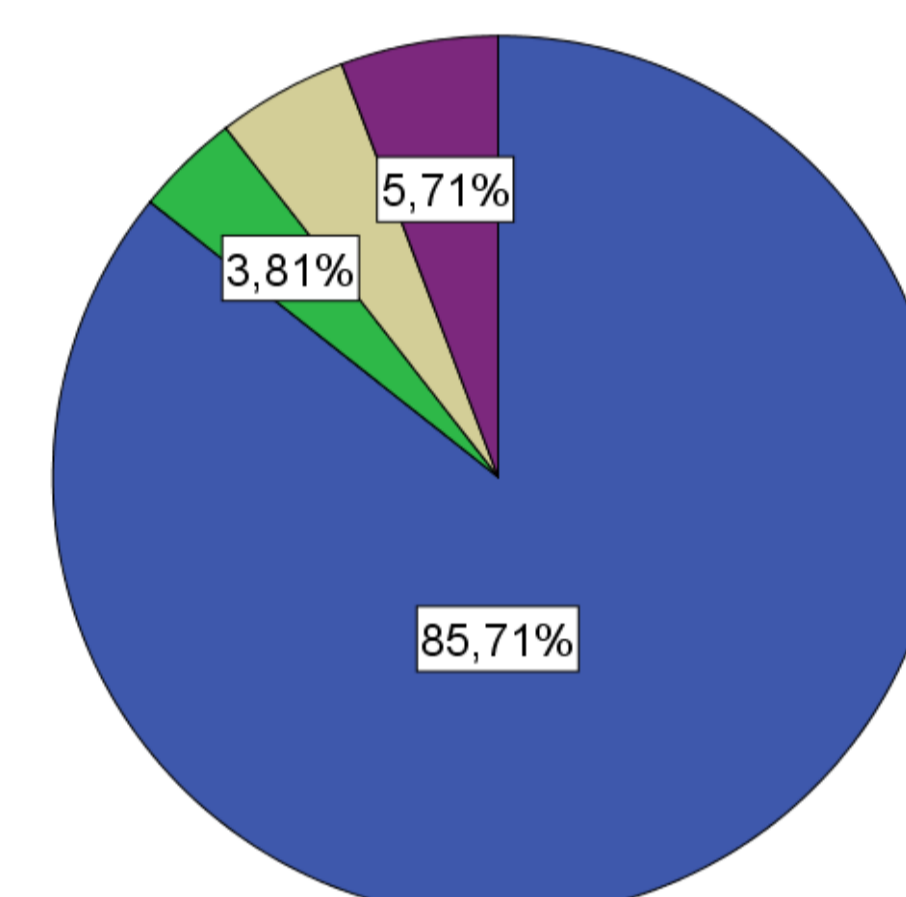
MATERIAL AND METHODS

• PA, ECW/ICW and death were prospectively registered in AKI patients.
• ISI formula=0.032*(age decade) -0.086*(male) 0.109*(nephrotoxic) +0.109*(oliguria) +0.116*(hypotension) +0.122*(jaundice) +0.150*(coma) -0.154*(consciousness) +0.182*(assisted respiration) +0.210. Each variable is evaluated when the nephrologist sees the patient the first time, and takes a value of 1(presence) or 0(absence), except for the age.

MATERIAL AND METHODS

• We include a cohort of 83 patients (médium age 64 years SD 1.8, and male 72.3 % with AKI, and BIA.
• We evaluate clinical prognostic index (individual severity index –ISI-), analitical inflammatory and protein metabolism parameters (C-reactive protein, albumin, prealbumin) and chronic health index (Karnofsky –K-).
• Use SPSS 20.0.

AKI ETIOLOGY — PRERENAL, RENAL, POSTRENAL, PRE-RENAL, OTHERS: 67,62%, 9,52%, 3,81%, 14,29%, 4,76%

AKI TREATMENT — CONSERVATIVE, HD, CRRT, HD AND CRRT: 85,71%, 3,81%, 5,71%

RESULTS

• Exitus 14.5%. PA and ECW/ICW was associated with prognosis in AKI (table 1).
• PA was associated with protective risk mortality OR 0.425, p=0.007, CI 95% 0.229-0.780 and ECW/ICW with risk mortality OR 2.247 CI 95% 1.266-3.98.
• The AUC with PA was 0.770 (p=0.003, CI 95% 0.652-0.888) and with ECW/ICW was 0.778 (p=0.001, CI 95% 0.678- 0.879).
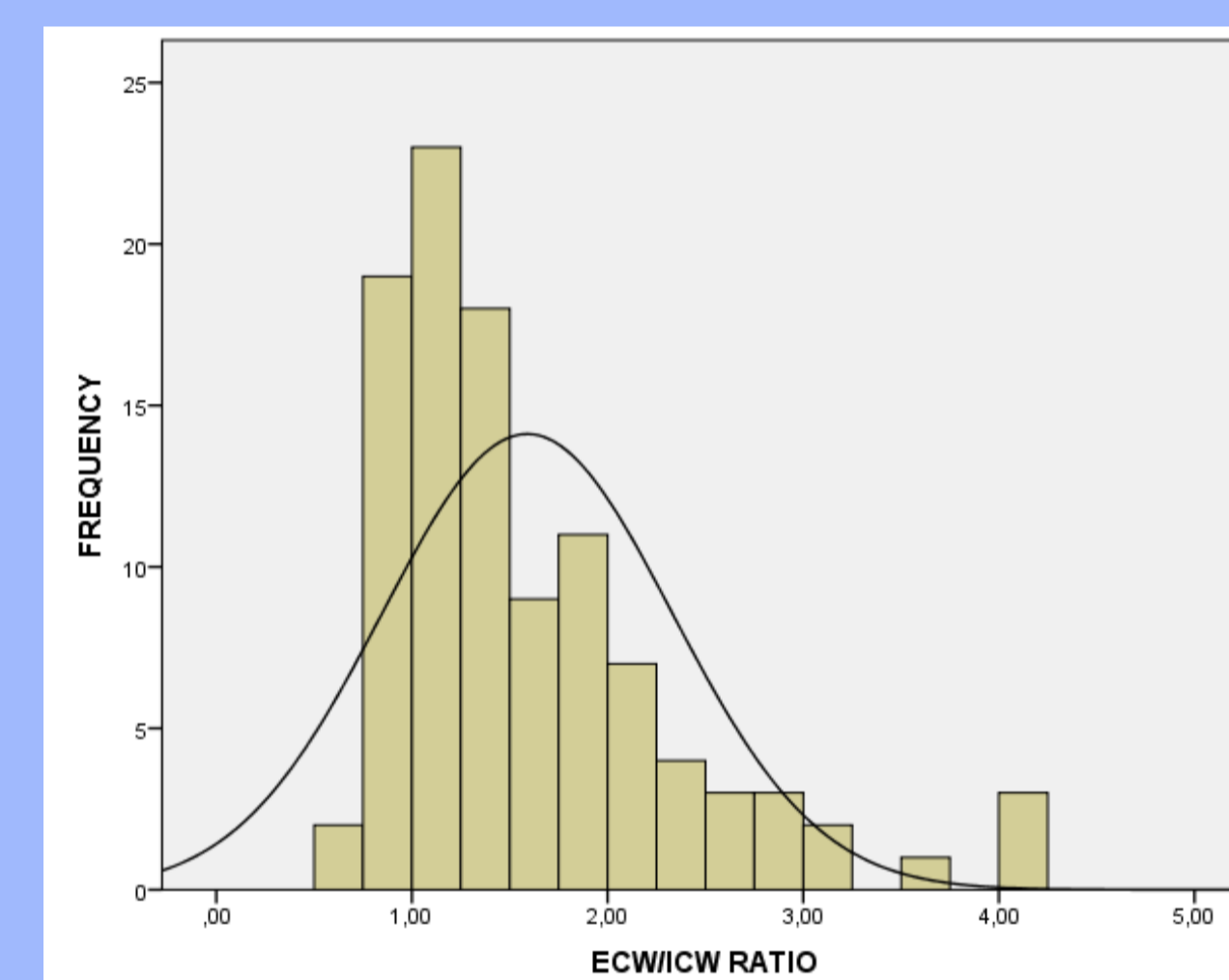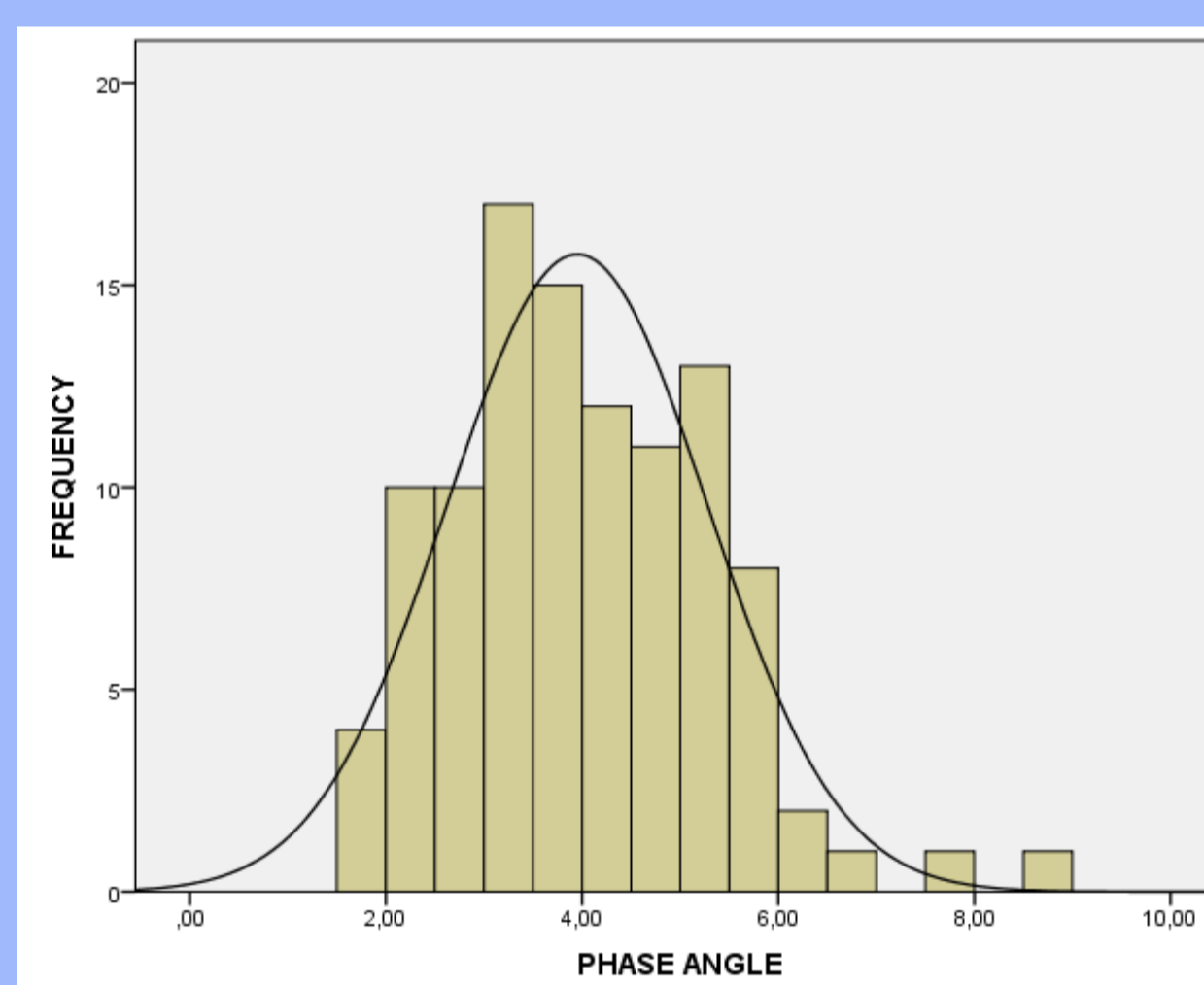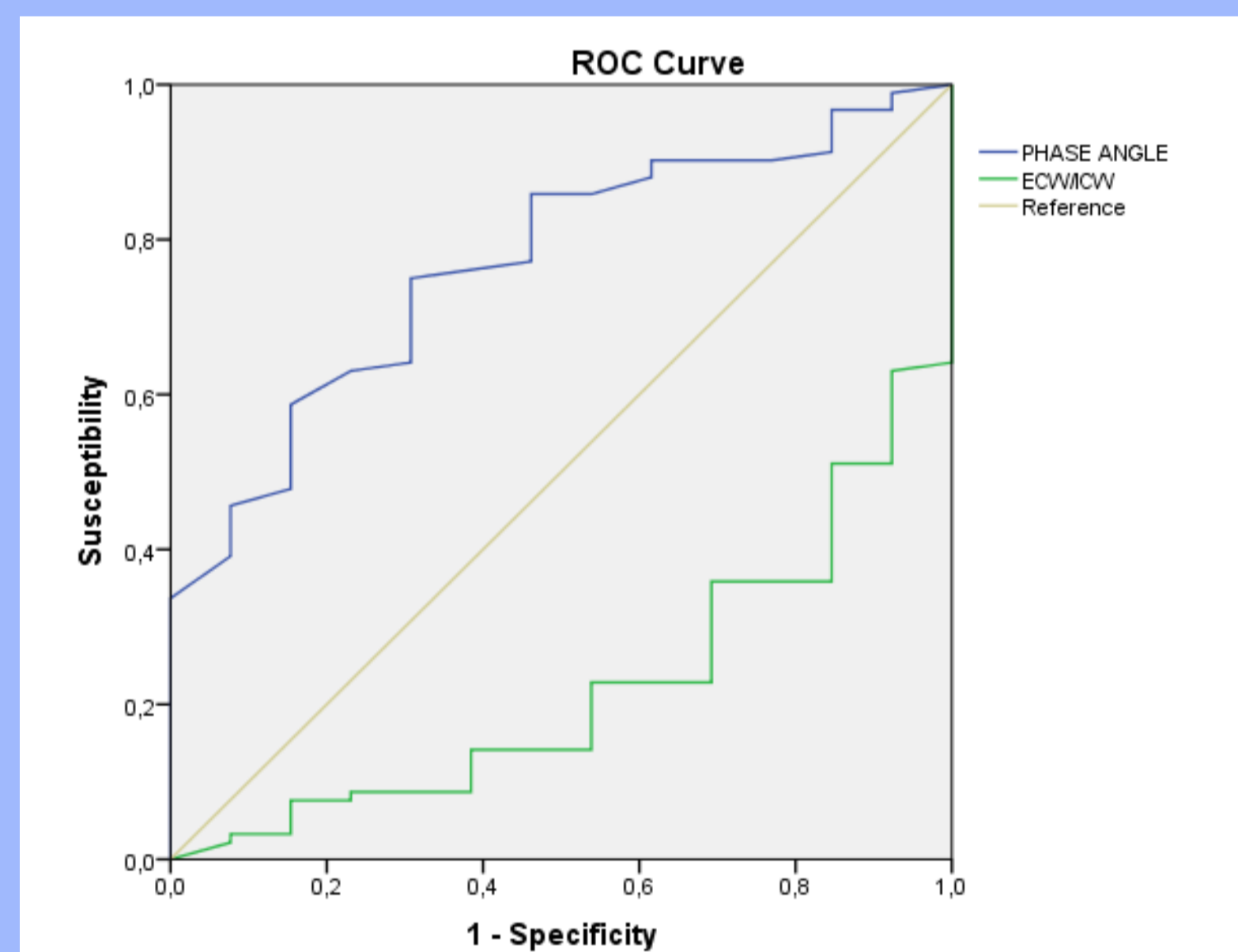
Table. 1:

	ISI	CRP	Alb	PreAlb	K
PA	r=-0.228, p=0.038	r=0.250, p=0.027	r=0.369, p=0.006	NS	r=0.516, p<0.001
ECW/ICW	r=-0.271, p=0.001	r=0.248, p=0.004	NS	r=-0.410, p=0.008	r=-0.253, p=0.003

PA: PHASE ANGLE ECW/ICW: EXTRACELLULAR/INTRACELLULAR WATTER RATIO. ISI: INDIVIDUAL SEVERITY INDEX. CRP: C-REACTIVE PROTEIN. Alb: ALBUMIN. PreAlb: PREALBUMIN. K: KARNOFSKY.

ROC Curve — PHASE ANGLE, ECW/ICW, Reference

CONCLUSIONS

Lower PA and higher ECW/ICW are associated with poor prognosis in AKI. There are relation with inflammatory and proteín metabolism status, and with health status prior to the event.

CONCLUSIONS

INTERSTITIAL OEDEMA DIMINISHED EFFECTIVE VOLEMIA

OLIGURIA MOF

SHIFT FROM **IBW** TO **ECW**

PREVENTION

HYPERVOLEMIA

PA

LOST OF FAT FREE MASS AND FAT MASS

LOST OF CELULAR INTEGRITY

PREVENTION

NUTRITIONAL STATE
PROTEIC METABOLISM
INFLAMMATORY STATE

ACUTE FAILURE CHRONIC STATE

CONCLUSIONS

CELL MEMBRANE

EXTRACELULAR WATER
ENDOTHELIUM

INTRACELULAR WATER

INTERSTITIAL

Vascular

ENDOTHELIAL DYSFUNCTION
FLUID OVERLOAD

Kf

PRESSURE

HIDROSTATIC VASC.
INTERSTITIAL ONCOT.

FLUID

HIDROSTATIC INTERS.

NUTRITIONAL STATE
PROTEIC METABOLISM

INTERSTITIAL ONCOT.

CONCLUSIONS

FLUID OVERLOAD

HYPERVOLEMIA

ENDOTHELIUM

HIPOXEMIA

LUNG

EXTRACELULAR WATER

INTERSTITIAL

VASCULAR

OEDEMA

SYSTEMIC

HIPOPROTEINEMIA

EXTRACELULAR OVERLOAD: PROGNOSTIC FACTOR

INCREASE VASCULAR VOLUME