# Chapter 7

## Conclusions

The general conclusion of this thesis is that bioimpedance measurements considered as random vectors without prediction equations can provide useful information also in clinical conditions of abnormal body hydration as are observed in dialysis patients. The study of extreme clinical situations like dialysis is important because it allows to determine limit vector trajectories with which mild alterations of body hydration can be compared. Vector BIA with the RXc graph method that is based on single frequency whole-body bioimpedance analysis can likely be improved by adding information from segmental impedance measurements. Further studies with larger sample size will establish this working hypothesis.

The specific conclusions, for the three different population groups analyzed in the thesis are:

**Healthy reference population**

1. In order to establish the normal BIVA parameters for the Cuban healthy population, that has a strong mixture between race-ethnicities and intercultural influences, it is not necessary to differentiate by race-ethnicities and only by gender.

**Hemodialysis Patients**

2. There is a strong correlation between mortality and hyperhydration (oedema) in patients undergoing periodic hemodialysis, due to risk of cardiac failure and die, and this risk could be identified using the BIVA method using the impedance phase angle.

3. BIVA is a powerful method for identifying HD patients in critical conditions. BIVA could be a low-cost, non-invasive, objective and fast method to complement the clinical diagnosis and follow-up of HD patients. The follow-up of patients using the RXc graph allows a better adjustment of dialysis sessions, diuretics, hypotensors and diet.

**Continuous ambulatory peritoneal dialysis**

4. The real part of the impedance R has more sensibility for the detection of fluid changes produced by a dialysis session (APD-BPD) that if we used other terms, such as R/H or RBMI

5. The segments with bigger changes after the dialysis session are the segmental measurements in the abdomen (longitudinal and transversal). The changes in RS and longitudinal leg measurements are also significant.

6. The use of ZBMI is not a good index for the detection of fluid changes because it gives information about the specific resistivity of tissues and not to fluid and fat mass changes, this is only true for a cylindrical geometry.

7. We confirm that the BIVA method (Z/H, righ-side measurements) in CAPD patients could be useful to separate hyper-hydrated patient (in whole body) and normo-hydrated patients, as we can see in Piccoli et al (2004).

8. The Spearmen correlation between transversal measurements and clinical assessment shows that the transversal measurements in the leg region and in the thorax region could be useful to confirm the hydration and nutritional state in CAPD patients.

9. The use of ZBMI increases the correlation with clinical assessment of nutrition (albumin) for the thorax segment and with inflammation (CRP) for the right leg.

10. To apply at the same time BIVA and segmental measures, could be an alternative method to know the hydric and nutritional state in CAPD patients. The best segments are the thorax and the right leg using longuitudinal and transversal measurements.

11. The segmental impedance of the thoracic region can identify overhydrated patients with an increased risk for CVD more accurately than right-side measurements in CAPD.

12. Using the resistance of the thorax region in conjunction with calculated mean blood pressure allows a complete separation between unstable and stable groups in CAPD.