

BIOIMPEDANCE SPECTROSCOPY (BIS) IN ONCOLOGY

Monitoring fluid balance and weight is critical in cancer patients, especially those undergoing chemotherapy with nephrotoxic agents or those at risk of dehydration or electrolyte imbalances.

This practice is equally important for patients with metastatic spinal cord compression, particularly those who are immobilised or receiving corticosteroids. These conditions can significantly influence fluid retention and weight management (NICE 2014).

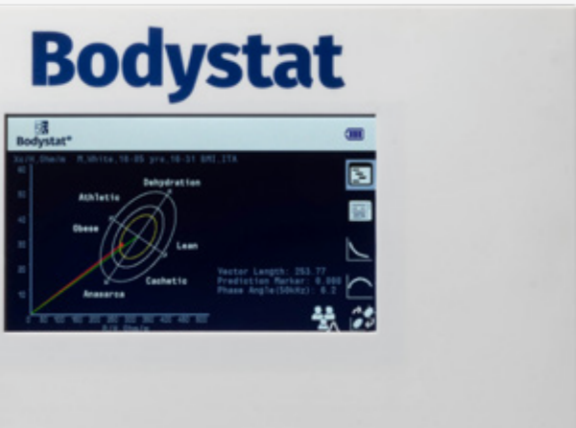
Peripheral oedema can be associated with various types of cancer, particularly those affecting areas near the pelvic veins, such as kidney, liver, ovarian, and uterine cancers. Cancer treatments, including chemotherapy, hormone therapy, immunotherapy, and targeted therapy, may also lead to fluid retention in the extremities (2).

Phase Angle (PhA) is a prognostic marker in the field of clinical nutrition and reflects the integrity and function of cell membranes (3). There is an inverse relationship between phase angle and tumour size. Specifically, as tumour size increases, phase angle decreases (4). It also has a practical application in accessing muscle hypertrophy, as well as in identifying the severity of skeletal muscle injury, sarcopenia, frailty and weight loss. Thus, higher PhA may indicate better prognosis in cancer patients.

BIS can be applied as an early warning system and a monitoring tool with the potential to improve patient care and outcomes.

- **B - Electrodes placed on foot and hand:** Measures whole body.
- **T - Electrodes placed on ribs:** Transthoracic measurement (central oedema).
- **F - Electrodes placed on two legs:** Measures lower limbs only.
- **H - Electrodes placed on two hands:** Measures upper limbs.

The Prediction Marker, Phase Angle, and Characteristic Frequency are highly reliable indicators of fluid overload and should function effectively even in the context of segmental measurements.



HOW FLUID BALANCE IS CURRENTLY MEASURED IN CLINICAL SETTINGS

Input Output

FLUID BALANCE CHARTS

PHYSICAL ASSESSMENT OF FLUID BALANCE

MONITORING OF BLOOD RESULTS

HOW CAN CLINICIANS ENHANCE FLUID BALANCE MONITORING WITH MULTISCAN 5000?

Total Body Water

TBW

ECW 40% ICW 60%

ICW ECW

OHY

PREDICTION MARKER INFINITY

NUTRITIONAL INDEX

Resources can be found on our website

Bodystat
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THE MULTISCAN 5000 IS NON-INVASIVE, PORTABLE, HANDHELD AND CAN PROVIDE FREQUENT MONITORING.

The Multiscan 5000 distinguishes ICW (Intracellular Water) and ECW (extracellular Water) separately, helping to build an accurate **Total Body Water (TBW)**. Monitoring TBW is essential for assessing overall hydration status. The analyser is capable of detecting fluid shifts between these compartments (e.g., from ICW to ECW) and evaluating the equilibrium between fluid intake and output.

The **OHY** (Overhydration) parameter is a critical measure used to assess and quantify the excess fluid in the body, beyond what is physiologically necessary. This parameter plays a significant role in evaluating fluid balance in clinical settings where fluid overload can be a concern. The OHY parameter estimates the volume of excess fluid retained in the body by comparing the measured Total Body Water (TBW) with the expected normal hydration level for an individual, based on their body composition.

Bodystat's BIS Multiscan 5000 can assist the adjustment of nutritional, physical and medical intervention. This approach can aid in preventing complications such as oedema, fluid overload, malnutrition, and cachexia in cancer patients.

IMPORTANT PARAMETERS

PHASE ANGLE	BIVA	OHY	PREDICTION MARKER INFINITY (TBW/ECW)	BASIC METABOLIC RATE/RESTING ENERGY EXPENDITURE (BMR/REE)
<p>Phase Angle (PhA), which is directly measured has been explored as a potential prognostic marker for cancer progression.</p> <p>PhA offers critical insights into both patient health and disease status.</p> <p>Evidence shows PhA can be used for monitoring treatment of patients with disease-related fluid imbalance and malnutrition.</p> <p>Inflammation with potential oxidative damage is a common mechanism affecting PhA in health and pathology ⁽⁴⁾. This is because phase angle reflects cell membrane integrity and body cell mass, which are often compromised in individuals with cancer ⁽³⁾.</p>	<p>BIVA is an accurate, non-invasive, accessible and cost-effective tool that assesses fluid balance.</p> <p>It shows high specificity and positive predictive value for detecting peripheral oedema and effectively predicts length of stay and all-cause mortality in these patients ^(5,6).</p> <p>By identifying cachexia early, BIVA can provide crucial prognostic insights, enabling timely interventions to improve patient outcomes.</p> <p>BIVA provides detailed insights into both fluid balance and nutritional status, which are critical in managing cancer patients who often struggle with fluid overload and malnutrition.</p>	<p>The OHY parameter estimates the volume of excess fluid retained in the body by processing the ECW, ICW and other body parameters.</p> <p>The OHY parameter is critical to assess and quantify the excess fluid in the body, beyond what is physiologically necessary. Making OHY a valuable prognostic marker for assessing the severity of the disease and the likelihood of complications.</p>	<p>PM[∞] allows the monitoring of the TBW and ECW ratio, based of raw data.</p> <p>For instance, the expansion of ECW and loss of ICW are typically features of systemic illness, arising from protein leakages into the extracellular space and loss of intracellular protein.</p> <p>PM[∞] and extracellular water parameters are useful in monitoring fluid overload. Tracking these changes overtime can help to identify when patients are at risk.</p> <p>Elevated ECW levels have been associated with poor outcomes in patients. Higher ECW often correlates with more severe disease and a higher risk of adverse events, including hospitalisation and mortality ⁽⁷⁾.</p>	<p>Resting Energy Expenditure (REE) is the amount of energy (measured in calories) that your body needs to maintain basic physiological functions while at rest.</p> <p>When there is a tumour, the body starts producing cytokines. These are chemicals produced by the immune system as a normal response to tumour cells in the body. Cytokine induced hyper metabolism in cancer patients elevates resting energy expenditure (REE) due to accelerated breakdown of fat, lean body mass, and inefficient glucose recycling. This highlights the importance of accurately assessing BMR/REE for effective nutritional management.</p>

Up to 85% of cancer patients are affected by malnutrition and up to 80% suffering from advanced stages experience cachexia. This is associated with decreased survival, increased complications of therapy, negative effects on prognosis, and survival. Evidence suggests that nutritional status impacts various clinical outcomes including quality of life, survival and the ability to tolerate treatment ^(8,9).

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