Biometric Health Screening (Cardiometabolic Risk Assessment)

The CDC defines biometric screening as the measurement of physical characteristics such as **height, weight, BMI, blood pressure, blood cholesterol, blood glucose, and aerobic fitness** used to benchmark and evaluate health status over time. The AHA policy statement identifies 7 traditional biometric measures — blood pressure, glucose, cholesterol, physical activity, diet, body habitus (BMI), and tobacco use — as the foundation for cardiovascular risk stratification. Adding waist circumference to BMI improves identification of cardiometabolic risk, particularly in overweight and grade I obesity, as abdominal adiposity provides a more refined indicator of cardiovascular death risk than BMI alone. However, a Cochrane review of 15 trials found that general health checks (broad biometric screening) did **not reduce all-cause mortality, cardiovascular mortality, or cancer mortality** in the general population, though they did increase the number of new diagnoses made.

Body Composition and Nutritional Assessment

Body composition analysis has particular value in **surgical populations**:

- In spine surgery, reliance on BMI alone is insufficient — **central adiposity and sarcopenic obesity** are independent predictors of wound complications, mechanical failure, and delayed recovery. Radiographic abdominal circumference outperformed BMI for predicting diabetes (Cohen's d = -0.84) and hypertension in orthopedic patients.
- A validated nutritional and metabolic burden score (ASD-NMBS) incorporating age, BMI, diabetes status, anemia, vitamin D, hypertension, peripheral vascular disease, and smoking achieved an **AUC of 92.9%** for predicting postoperative complications in adult spinal deformity surgery, with scores >175 correlating with ≥1 complication.
- Malnutrition is present in **40–50% of older surgical patients** and is a modifiable risk factor associated with increased complications, length of stay, and costs. Preoperative nutritional optimization (protein 1.2–1.5 g/kg/day, vitamin D, micronutrients) reduces postoperative complications and mortality.

Cardiorespiratory Fitness Testing (CPET/VO2 Max)

The 2024 AHA/ACC Perioperative Guidelines recognize cardiopulmonary exercise testing (CPET) as the **gold-standard assessment of functional capacity**, beneficial for risk stratification in high-risk patients undergoing elevated-risk procedures. Reduced cardiorespiratory fitness increases the risk of postoperative complications, and CPET can diagnose the etiology of exercise intolerance, guide preoperative optimization, and inform prehabilitation. Adults in the best quartile of cardiorespiratory fitness have as low as **one-fourth the risk** of developing common chronic metabolic and cardiovascular diseases compared to those in the poorest quartile.

Biometric-Guided Prehabilitation

The strongest evidence for biometric testing's clinical impact comes from its role in guiding **preoperative prehabilitation programs**. A 2026 meta-analysis of 23 RCTs (2,182 participants) found that exercise- or nutrition-based prehabilitation — guided by baseline biometric assessment — reduced postoperative complications by **48%** (OR 0.52, $p < 0.002$) and length of stay by 0.44 days. The PREHAB trial demonstrated that multimodal prehabilitation improved functional capacity before surgery and resulted in faster postoperative recovery across cardiorespiratory fitness and strength measures.

Myotonometry and Tissue Biomechanics

Myotonometry — a biometric tool quantifying musculotendinous stiffness, compliance, tone, and elasticity — has demonstrated strong correlations with force production and muscle activation. Optimal stiffness levels may promote athletic performance, while extremes increase injury risk, suggesting utility in **guiding rehabilitation programs and return-to-activity decisions**.

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