1. 請說明肥胖診斷的標準（5%）與分級治療策略（5%）。
2. 請描述各種身體組成的評估方式，並比較其優缺點（15%）。
3. 請閱讀下列節錄文章後，說明何謂心因性惡質病（cardiac cachexia），可能原因與治療策略（25%）。

Heart failure (HF) affects up to 2% of the population in the developed countries and is therefore considered to be a massive socio-economic health burden. Cachexia in the context of HF has been termed cardiac cachexia and describes a significant, progressive involuntary weight loss, which cannot be treated by an increased nutritional intake alone. The cachectic condition is mainly due to loss of skeletal muscle and fat mass, and this weight loss might be a sensitive indication of hormonal and immunological abnormalities in cachectic patients. Common symptoms of cardiac cachexia include breathlessness, fatigue and exercise intolerance, which occurs in 5-15% of advanced HF patients. Unfortunately, cachectic HF patients have a decreased efficacy of HF treatments, which is independent of the left ventricular ejection fraction resulting in a devastating prognosis.

Muscle wasting affects 20% of patients with HF, and is mainly the result of an imbalance in the homeostasis of muscle protein synthesis and degradation. Patients with cardiac cachexia show a lower activity of protein synthesis pathways, while an over-activation of protein degradation is observed. This is caused by reduced levels or reduced activity of anabolic mediators such as growth hormone, insulin-like growth factor-1 (IGF-1), testosterone, ghrelin and insulin, while we observe increased levels or increased activity of catabolic mediators and pathways including glucocorticoids, catecholamines, pro-inflammatory cytokines, angiotensin II and myostatin. These expressional alterations lead to severe change in the activity of intracellular signaling pathways. Additional to the loss of muscle mass, characteristic insufficiencies in the "quality" of skeletal muscle have been described in HF patients, histological studies demonstrated that patients with HF have a fiber type inversion, with a lower percentage of slow-twitch type I fibers and a higher percentage of fast-twitch type II. On the other hand, sarcopenia is characterized by muscle loss and decrease in the number of the muscle fibers, especially the type IIa compared to type I muscle fibers, which leads to reduced muscle strength and physical performance in symptomatic HF patients compared to healthy subjects. Thus, sarcopenia and cachexia not only act to exacerbate tissue wasting but also skeletal muscle function and performance in HF patients.

Importantly, exercise training has anti-inflammatory effects, with the potential to reduce local cytokine expression and increase the expression of anti-apoptotic factors, including that this type intervention could partially reverse the catabolic state in skeletal muscle. A further major contributor to muscle wasting is disuse, which is often caused by physical inactivity and sedentary lifestyle. Physical inactivity is worsened by increase with ageing and HF symptom, and led to muscle wasting in HF patients, suggests that exercise training should be considered a effective therapeutic

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intervention of sarcopenia and cachexia.

(以上摘要修改自Saitoh MP, et al. Sarcopenia, cachexia, and muscle performance in heart failure: review update 2016. Int J Cardiol 2017;238:5-11.)已知慢性阻塞性肺部疾病（COPD）會影響患者的呼吸肌肉和周邊肌肉

4. 試列出呼吸肌肉會如何被影響的機制，及如何測量其功能（15 分）
5. 試列出周邊肌肉會如何被影響的機制，及如何測量其功能（15 分）
6. 試寫下面摘要的結論（10 分）並分析姿勢影響 diaphragm 收縮的可能機制（10 分）（出處：Brown C, Tseng SC, Mitchell K, Roddey T. Body Position Affects Ultrasonographic Measurement of Diaphragm Contractility. Cardiopulm Phys Ther J. 2018;29(4):166-172.）

Purpose: (1) Determine whether ultrasonography can detect differences in diaphragm contractility between body positions. (2) Perform reliability analysis of diaphragm thickness measurements in each test condition. **Methods:** We used a repeated-measures experimental design with 45 healthy adults where 3 B-mode ultrasound images were collected at peak-inspiration and end-expiration in supine, sitting, and standing. Mean diaphragm thickening fractions were calculated for each test position. Statistical significance was tested using 1-way repeated-measures analysis of variance with planned comparisons. For reliability analysis, the intra-class correlation coefficient (3, 3) was calculated. **Results:** Mean diaphragm thickening fraction increased from 60.2% (95% confidence interval [CI] 53.0%, 67.9%) in supine, to 96.5%(95%CI 83.2%, 109.9%)while seated and to 173.8%(95%CI 150.5%, 197.1%) while standing. Body position was a significant factor overall ($P < 0.001$), as were comparisons between each individual position ($P < .001$). Intra-observer reliability was excellent (> 0.93) for all body positions tested.

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