Supplemental box 1: Echocardiographic cardiac measurement formulae

The modified Simpson's algorithm using a combination of short-axis and long-axis views was used to calculate LV diastolic and systolic volumes [1], based on anticipated changes in LV mass and shape in malnutrition. The area-length formula was used to calculate the LV volumes [2-4]: Volume = 5/6 X parasternal short-axis basal area X Apical LV length.

The stroke volume (SV) was derived from the difference between the end-diastolic volume (EDV) and the end-systolic volume (ESV). Fractional shortening (FS) was measured as the percentage change in LV diameter during systole and diastole using the formula [4]: FS = [(LVEDD – LVESD)/LVEDD] X 100

Cardiac output (CO) was obtained by multiplication of the stroke volume (SV) with the heart rate (HR) recorded on the ECG. The systemic vascular resistance (SVR) was calculated using Darcy's formula that relates pressure, flow and resistance by dividing the mean blood pressure by the aortic velocity time integral (VTI) flow. Mean arterial pressure was derived from measured systolic and diastolic blood pressure values and height and weight data were directly entered at the beginning of the echo assessment. The measurements of SV, EDV, CO and SVR were all indexed to the patients' body surface area (BSA) derived in the *Vivid.i* echocardiogram using the configured Haycock formula [5]: BSA (m^2) = 0.024265 x weight (kg) $^{0.5378}$ x height (cm) $^{0.3964}$

The maximum and minimum inferior vena cava (IVC) diameter was measured 2cm from the right atrium in the sub-costal view and the IVC collapsibility index (IVCCI) calculated as a percentage using the formula [6]: IVCCI = [($IVCd_{max}$ - $IVCd_{min}$)/$IVCd_{max}$] X 100

Myocardial deformation was assessed by speckle tracking and quantification of the mean global radial, circumferential and longitudinal strain in the parasternal short axis and apical views with 2 dimensional speckle tracking [7, 8] and compared with published reference values [9]. Global strain analysis was quantified using vendor-specific offline analysis software EchoPAC BT13 (GE, Milwaukee). GLS was derived from the weighted average strain of all 17 segments from the images of 3 apical views (apical long-axis, 4- and 2-chamber). GCS and GRS were derived by taking the average strain values of the 6 segments in the mid LV short axis view. Care was taken to ensure all images were acquired within the recommended frame rate of 50-80 frames per second (FPS).

Myocardial performance was defined based on the Tei index, which was calculated by dividing the sum of the isovolumic contraction time (IVCT) and isovolumic relaxation time (IVRT) by the aortic valve ejection time (AVET) using the formula [10-13]: Tei index = [(IVCT + IVRT)/AVET.

Whereby, the sum of IVCT and IVRT is equivalent to the difference between the mitral valve closure to opening (MCO) time and the AVET (i.e. [IVCT + IVRT] = [MCO – AVET])

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