Innovation/Impact Purpose: We developed a respiratory motion management program from MD consultation to treatment including respiratory trace acquisition, respiratory motion evaluation and visual-guided radiotherapy.

Key Results: The respiratory motion management program utilized a practical respiratory sensor for imaging and treatment, and multi-access software for data acquisition and analysis shown in Figure 1. Air-pressure sensor and barometer are MRI/CT-compatible hardware. Graphics User Interface (GUI) software system was developed for real-time patient respiratory trace acquisition, and afterwards respiratory pattern analysis. The real-time breathing trace GUI includes display with respiratory wave or bar mode as shown in Figure 2. The data analysis GUI provides tools for respiratory amplitude and period analysis for both breath and breath-holding activities as shown in Figure 3.
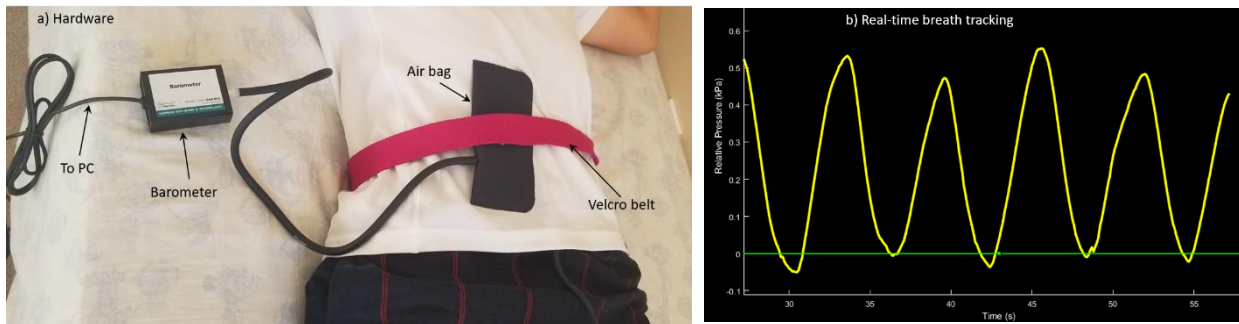
Figure 1. a) Respiratory sensor – Air bag, Velcro belt and Barometer (Vernier), b) Real-time breathing trace acquisition
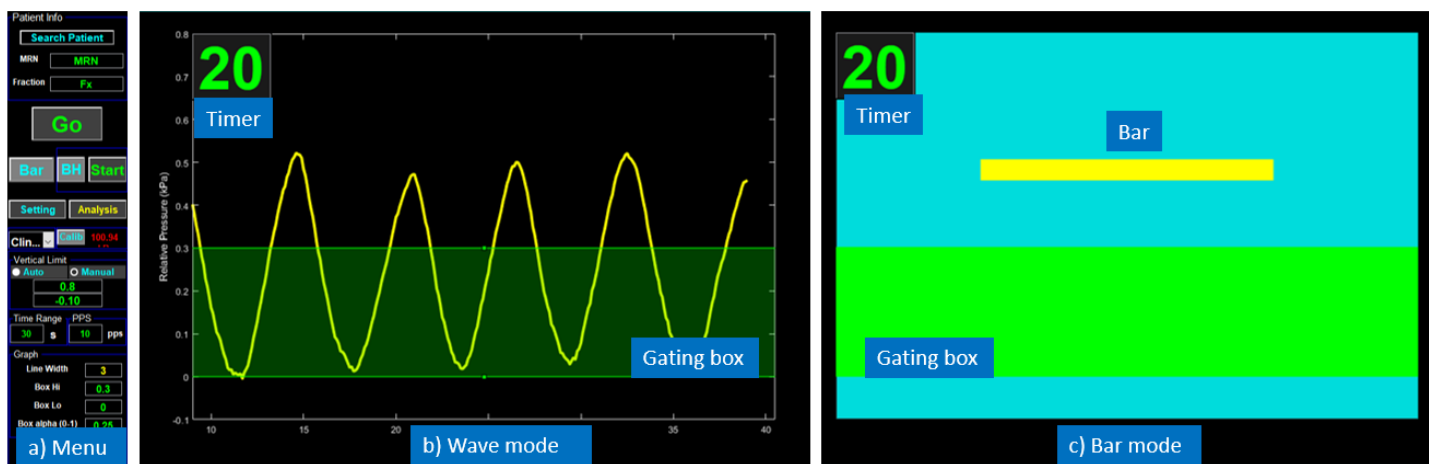
Figure 2. Visual guidance of real-time breathing trace. a) Control menu, b) wave mode, c) bar mode
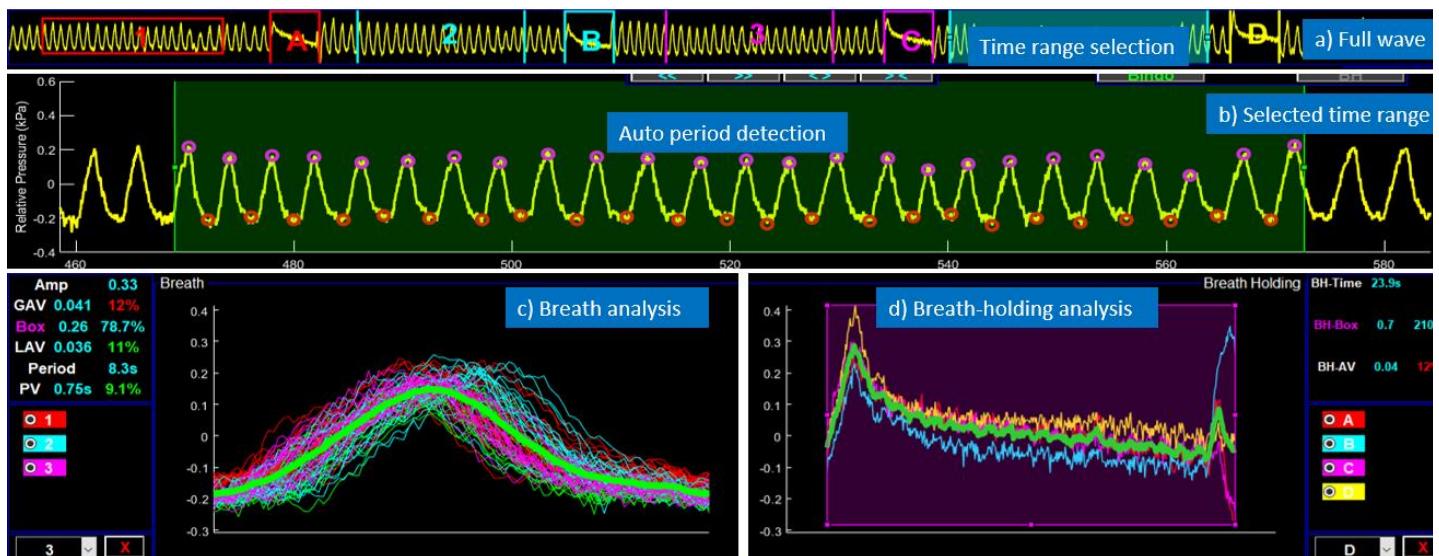
Figure 3. Respiratory trace analysis. a) Full-wave display, b) Selected time range with auto-detecting breathing phase, c) Breathing pattern analysis including Global Amplitude Variation (GAV), Period Variation (PV), d) breath-holding analysis including breath-holding time and AV.