PURPOSE
To create a patient respiratory management system using a widely available low cost consumer hardware.

MATERIAL AND METHODS
The Wii remote (Wiimote) (Nintendo, Redmond, WA) contains an IR camera that can track up to 4 spots whose coordinates are reported to host computer via Bluetooth. The Wiimote is capable of tracking a fiducial box currently used by a commercial monitoring system (RPM, Varian Associates, Palo Alto, CA) if correct IR source is used. We validated the Wiimote tracking by comparing amplitudes of signals between reported vs. known movements from an in-house servo driven respiratory simulator and from those measured with RPM. In the simulator comparison, the Wiimote and an infrared LED source 5cm apart were mounted approximately perpendicular to the fiducial box on the simulator at the same level with a distance of 1.0 meter. The fiducial box attached to the servo motor were programmed to follow recorded patient respiratory traces and was monitored by the Wiimote. The RPM comparisons were done by simultaneously recording the RPM reflective box position with the Wiimote and the RPM. Timing was compared between these two systems by using the digital beam-on signal from the CT scanner for the 4DCT to synchronize these acquisitions.

RESULTS
The data acquisition rate from the Wiimote was 96.7 ± 6.4 Hz with a version 2.1 Bluetooth adaptor. The standard deviation of the height of the motion extrema were 1.1 mm compared those measured by the Wiimote and the servo motor encoder. The standard deviation of the amplitude of motion extrema between the Wiimote and RPM were 0.9 mm and the timing difference was 253 ms.

CONCLUSION
The Wiimote shows promise for respiratory monitoring at institutions that are not able to implement a commercial system. If used with care it can deliver reasonable spatial and temporal accuracy.