CLAIMS

1. A method for detecting obstructive apnea, comprising: receiving a bioelectric signal from a mammal by an amplifier, the bioelectric signal comprising an electromyographic activity signal from muscles of respiration of the mammal and at least one of an electrocardiographic signal, an electroencephalographic signal, or an electromyographic signal from the mammal; processing of the bioelectric signal to isolate electromyographic activity by at least subjecting the bioelectric signal to a bandpass filter having a passband between 300 Hz to 1 kHz; determining a timing of inspiratory efforts and an amplitude of inspiratory efforts based on the amplitude of the electromyographic activity signal from muscles of inspiration; determining a baseline amplitude of inspiratory efforts; comparing an amplitude of inspiratory efforts based on the amplitude of the electromyographic activity signal from muscles of inspiration with the determined baseline amplitude of inspiratory efforts; identifying a series of inspiratory efforts have an increasing amplitude of inspiratory efforts based on the amplitude of the electromyographic activity signal from muscles of inspiration over time, above the baseline amplitude of inspiratory efforts; and determining an occurrence of obstructive apnea based on the identified series of inspiratory efforts that has an increasing amplitude of inspiratory efforts.

2. The method according to claim 1, further comprising determining a baseline timing of inspiratory efforts, and comparing the timing of inspiratory efforts with the determined baseline timing of inspiratory efforts, wherein the occurrence of the obstructive apnea is determined if a series of inspiratory efforts have increasing amplitude above the baseline amplitude over time, and a baseline timing.

3. The method according to claim 1, wherein the bioelectric signal component is an electrocardiographic signal.

4. The method according to claim 3, wherein the timing and amplitude of inspiratory efforts based on the amplitude of the electromyographic activity signal from muscles of inspiration are determined over a series of at least three inspiratory efforts before the occurrence of the obstructive apnea is determined.

5. The method according to claim 1, wherein the bioelectric signal component is an electroencephalographic signal.

6. The method according to claim 1, wherein the bioelectric signal is acquired from a single extremity.

7. The method according to claim 1, further comprising generating an audible alarm in response to determining the occurrence of the obstructive apnea.

8. The method according to claim 1, further comprising selectively wirelessly communicating a signal in response to determining the occurrence of the obstructive apnea.

9. The method according to claim 1, wherein the processing of the bioelectric signal to isolate electromyographic activity comprises determining a signal power within a passband over time.

10. The method according to claim 1, wherein said comparing an amplitude of inspiratory efforts based on the amplitude of the electromyographic activity signal from muscles of inspiration with the determined baseline amplitude of inspiratory efforts comprises comparing a series of the amplitudes of inspiratory efforts and timings of inspiratory efforts with a baseline window representing a normal range of amplitudes of inspiratory efforts based on the amplitude of the electromyographic activity signal from muscles of inspiration and timings of inspiratory efforts.

11. The method according to claim 1, further comprising: determining a baseline inter-heartbeat interval and a normal range of variation for a respective respiratory rate within a respiratory interval; determining an inter-heartbeat interval and a respiratory rate of a patient; determining a commencement of a series of at least one inter-heartbeat interval which is outside the normal range of variation, below the baseline inter-heartbeat interval, for the respective respiratory rate; and determining commencement of the obstructive apnea if within the respiratory interval, a number of commencements above a threshold, of the series of the at least one inter-heartbeat interval which is outside the normal range of variation, below the baseline inter-heartbeat interval for the respective respiratory rate.

12. The method according to claim 11, wherein the threshold is three.

13. The method according to claim 11, wherein the inter-heartbeat interval and the respiratory rate are determined based on the bioelectric signal.

14. The method according to claim 13, wherein the bioelectric signal comprises an electrocardiographic signal.

15. The method according to claim 14, wherein the inter-heartbeat interval is determined by determining an R-R interval of the electrocardiographic signal, further comprising: establishing a window distinguishing a normal inter-heartbeat interval from a short inter-heartbeat interval for the respective respiratory rate; and recording a time of inter-heartbeat intervals which is outside the window for the respective respiratory rate.

16. The method according to claim 1, further comprising automatically generating an e911 (enhanced 911) call through a telephone network in response to determining the commencement of the obstructive apnea.

17. The method according to claim 1, wherein said determining an occurrence of the obstructive apnea if a series of inspiratory efforts have an increasing amplitude of inspiratory efforts based on the amplitude of the electromyographic activity signal from muscles of inspiration over time, above the baseline amplitude of inspiratory efforts based on the quantified electromyographic activity from muscles of inspiration, comprises determining if three successive inspiratory efforts have an amplitude of inspiratory effort based on the quantified electromyographic activity from muscles of inspiration above a threshold with at least one of: a steady amplitude of inspiratory effort based on the quantified electromyographic activity from muscles of inspiration and or an increasing amplitude of inspiratory effort based on the quantified electromyographic activity from muscles of inspiration, while an interval between inspiratory efforts is within a normal range.

18. A system for detecting obstructive apnea, comprising: an input configured to receive a bioelectrical signal from a mammal by an amplifier, the bioelectrical signal comprising at least one of electromyographic activity of muscles of respiration of the mammal and at least one of an electrocardiographic signal, an electroencephalographic signal from the mammal; at least one processor configured to: (a) (1) process the bioelectric signal to isolate electromyographic activity by at least subjecting the bioelectric signal to a bandpass filter having a passband between 300 Hz to 1 kHz, (2) determine a baseline amplitude of inspiratory efforts; and (3) determine an occurrence of the obstructive apnea if a series of inspiratory efforts have an increasing amplitude over time, above the baseline amplitude of inspiratory efforts; or (b) (1) determine a baseline inter-heartbeat interval and a normal range of variation for a respective respiratory rate within a respiratory interval from analysis of the bioelectric signal; (2) determine an inter-heartbeat interval and a respiratory rate of a patient from analysis of the bioelectric signal; (3) determine a commencement of a series of inter-

heartbeat intervals which is outside the normal range of variation below the baseline inter-heartbeat interval for the respective respiratory rate; and (4) determine an occurrence of the obstructive apnea if a number of commencements of the series of at least one inter-heartbeat interval, which is below the baseline inter-heartbeat interval for the respective respiratory rate within the respiratory interval, is above a threshold; and an output for communicating a signal dependent on the determined occurrence of the obstructive apnea.