CLAIMS

1. An inhaler monitoring device for automatically monitoring and improving user inhaler technique competence comprising:

a body comprising an inlet and an outlet which are in fluid communication with respect to one another to define a channel therebetween;

wherein the inlet is for coupling to an inhaler for dispensing a medication and the outlet is for coupling to a spacer through which a user can inhale the dispensed medication from the inhaler;

one or more sensors which are configured to measure one or more inhalation characteristics when the user inhales the dispensed medication from the inhaler through the inhaler monitoring device via the spacer in-use; and

processing means which is configured to determine feedback information based on one or more of the inhalation characteristics of the user;

wherein the processing means is configured to wirelessly communicate with an external computing device and/or a remote computing device to apply an AI algorithm to the inhalation characteristics to dynamically and automatically learn and adapt the feedback information and provide the feedback information to a user for improved user inhaler technique competence.

2. The inhaler monitoring device as claimed in claim 1, wherein the inhalation characteristics comprise one or more of:

airflow characteristics;

threshold and duration of shake of the inhalation monitoring device, prior to, the dispensation of medication from the inhaler;

the time between end of shake and dispense of medication;

the time between dispensation of medication and start of inhalation;

inhalation rate;

volume of medication inhaled

and/or

medication dosage information.

3. The inhaler monitoring device as claimed in any preceding claim, further comprising feedback means which is configured to provide visual, audible and/or haptic feedback to

the user based on the feedback information and/or one or more of the inhalation characteristics.

4. The inhaler monitoring device as claimed in claim 3, wherein the feedback means is configured to provide the feedback to the user in real time, and preferably wherein the feedback means comprises a plurality of LEDs which are located on the body of the device, which are configured to illuminate in a predetermined sequence based on the one or more inhalation characteristics of the user.

5. The inhaler monitoring device of any preceding claim, wherein the one or more sensors comprise: at least one air pressure sensor; at least one movement sensor and/or at least one environmental sensor.

6. The inhaler monitoring device of any preceding claim, wherein the feedback information comprises at the least the inhalation characteristics of the user.

7. The inhaler monitoring device of any preceding claim, wherein the feedback information comprises a user score which is determined based on the user's inhalation characteristics, preferably a separate user score is determined in respect of the each of the different inhalation characteristics of the user.

8. The inhaler monitoring device of claim 7, wherein the user score is determined based on the user's inhalation characteristics with respect to one or more pre-determined thresholds for the one or more inhalation characteristics.

9. The inhaler monitoring device of claim 7 or 8, wherein the processing means is configured to continuously monitor the user's inhalation characteristics over a period of time and alter the user score(s) based on one or more changes in the user's inhalation characteristics over the period of time.

10. The inhaler monitoring device of claims 8 or 9, wherein the processing means is configured to continuously monitor the user's inhalation characteristics over a period of time and alter the one or more pre-determined thresholds for the inhalation characteristics based on one or more changes in the user's inhalation characteristics over the period of time.

11. The inhaler monitoring device of any of claims 8 to 10, wherein the pre-determined thresholds for the one or more inhalation characteristics vary based on one or more user attributes such as age, medical condition(s), gender or any other suitable user attribute.

12. The inhaler monitoring device of any preceding claim which comprises spirometry functionality to acquire and/or determine spirometry measurements of a user;

wherein the inlet is for coupling to a mouthpiece into which a user can exhale; and

wherein the sensors are configured to acquire spirometry data.

13. The inhaler monitoring device of claim 12 wherein the spirometry measurements comprise peak expiratory flow, forced vital capacity, and/or expiratory volume.

14. An inhaler apparatus comprising:
An inhaler configured to dispense medication;
A spacer; and
An inhaler monitoring device according to any preceding claim.

15. An inhaler monitoring system comprising:

the inhaler apparatus as recited in claim 14; and a computing device;

wherein the inhaler monitoring device is configured to transmit the feedback information to the computing device;

wherein the computing device is configured to receive the feedback information and provide this to the user.

16. The inhaler monitoring system of any preceding claim, wherein the feedback information comprises media data which is provided to the user by the computing device.

17. The inhaler monitoring system of any preceding claim, wherein the feedback information comprises a user score, ideally wherein a separate user score is determined for each of the one or more inhalation characteristics of the user, preferably, wherein the user score for each of the inhalation characteristics is dynamically weighted based on one or more of the user’s inhalation characteristics.

18. The inhaler monitoring system of claim 15, further comprising a central server which is communicatively coupled to the computing device and/or inhaler monitoring device, , wherein the central server is preferably configured to consolidate the feedback information provided by the inhaler monitoring device and/or the user inhalation characteristics with supplemental data to determine an advisory action based on the consolidated user inhalation characteristics and supplemental data,

wherein the supplemental data preferably comprises further clinical or physiological data regarding the user, further data regarding the medication being received by the user and/or further environmental information regarding the location where the user made use of the inhaler apparatus and/or third party user data and wherein the advisory action preferably comprises a non-adherence action and/or a risk action, preferably wherein a non-adherence action comprises wherein the central server is configured to communicate with the computing device to notify the user of one or more actions to take to improve their inhalation characteristics, optionally wherein a risk action comprises wherein the central server is configured to communicate with the computing device to notify the user of their risk of their medical condition deteriorating or improving based on their inhalation characteristics.

19. The inhaler monitoring system of any of claims 15 to 18, wherein the AI algorithm is trained with the user's inhalation characteristics over a period of time and/or supplemental data received from the central server such that the user specific feedback provided to the user dynamically adapts over time; and /or wherein the central server is configured to apply an AI algorithm to, the user inhalation characteristics or the user inhalation characteristics and supplemental data, when the central server determines the advisory action.

20. A method for monitoring inhaler technique competence, the method comprising:

receiving one or more inhalation characteristics of a user;

determining feedback information based on the one or more inhalation characteristics of the user; and

providing the feedback information to the user;

wherein the feedback information comprises a user score which is determined based on the user's inhalation characteristics;

wherein the processing means wirelessly communicates data regarding the inhalation characteristics with an external computing device and/or a remote computing

device to apply an AI algorithm to the inhalation characteristics to dynamically and automatically learn and adapt the feedback information and provide the feedback information to a user for improved user inhaler technique competence;

wherein the method optionally further comprises receiving one or more spirometry measurements of the user, wherein the spirometry measurements preferably comprise peak expiratory flow, forced vital capacity and/or forced expiratory volume.