Monitoring Cough Device – step 1 and 2 (MCD1-2)

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I. Purpose, Aim, and Background of Study

A. Specific Aim and Purpose of Study:

The aim of the study is to establish the accuracy of a new device designed specifically to record and detect cough episodes.

B. Background and Significance

Cough is an important defense mechanism of the respiratory tract. The presence of chronic cough may indicate the presence of underlying diseases, including reflux. Despite the increased number of patients suffering from cough in the ENT and GI practice, to date, there has been no method/device to objectively assess the frequency of cough episodes in a given patient.

PULMOTRACK-CC, manufactured by KarmelSonix (Haifa, Israel), has recently introduced an innovative device that is able to record cough episodes and then automatically detect and count them with the help of a specific software program. This study will assess the accuracy of this novel cough monitoring and counting technology and validate potential clinical use in patients with chronic cough.

II. Characteristics of Study Subject Population

It has been determined by the statistician that 5 healthy volunteers and 20 patients will be needed to address the study problem.

A. Inclusion Criteria:
Arm 1: healthy volunteers:
1. Male and female volunteers 18 years of age and older
2. No history of chronic or acute cough and throat clearing
3. Ability to read a 5th grade script written in English for approximately 20 minutes

Arm 2: patients:
1. Male and female volunteers 18 years of age and older
2. Cough as chief complaint
3. Referred to the GI clinic to evaluate if reflux is the cause of their chief complaint
4. pH testing for standard of care purposes

Arm 3: healthy volunteers:
1. Male and female volunteers 18 years of age and older
2. No history of chronic or acute cough and throat clearing

B. Exclusion Criteria:

1. Subjects who are not able to give informed consent.

Methods and Procedures

A. Study Design
After giving informed consent, the participant will be instructed as to how to follow the technical steps described below in the paragraph labeled, “Procedure”.

Arm 1: healthy volunteers:
The participant will read a script for 20 minutes; the script will be randomly designed by the statistician and will be composed of self-induced cough episodes, throat clearing episodes in between loud talking and forced laugh moments.

Arm 2: patients:
The participant will undergo manometry, pH probe placement and the cough device placement. S/he will wear the pH device and the cough device for 24 hours and return to the GI motility center to have both devices removed, as a standard of care procedure.

Arm 3: healthy volunteers
The participant will undergo manometry, pH probe placement and the cough device placement. S/he will wear the pH device and the cough device for 24 hours and return to the GI motility center to have both devices removed, as a standard of care procedure.

B. Procedure
Arm 1: healthy volunteers:
The participant will be equipped with the cough device (appendix A):
1. 2 acoustic sensors will be placed on the patient using adhesive pads
   i. At right of trachea, interior to SCM muscle, midway between “Adams Apple” and sternal notch
   ii. At mid clavicular line in second intercostal space
2. 1 microphone will be clipped to participant’s collar
3. The respiration belt (with sensor holder) will be placed just above the participant’s lowermost ribs.
4. The 2 acoustic sensors, the microphone and the respiration belt will be plugged in the WHolter® system.

Arm 2: patients:
The participant will undergo the same procedure as the healthy volunteer, after placement pH probe and cough device will be synchronized by a specific noise.
After 24 hours, the patient will come back to the clinic in order to have both devices removed.

Arm 3: healthy volunteers
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After 24 hours, the patient will come back to the clinic in order to have both devices removed.

III. Data Collection, Analysis and Interpretation

A. Data Collection & Analysis
Arm 1: healthy volunteers:
1. Once the study has been completed and the PULMOTRACK-CC has been removed from the study subject, the data from the WHolter® system will be downloaded to a computer dedicated to the study and password protected.

2. Two separate study personnel blinded to the random script read by the patient will listen to the recorded track (acoustic sensors) and interpret the data in terms of number of cough episodes. For HIPPA purposes, the sounds captured by the external microphone are encrypted so that no-one can understand or recognize the participant’s voice.

3. A third study personnel will analyze the same recorded track via PulmoTrack software.

4. A two-step statistical analysis will be performed:
   - compare the random script to the human review
   - compare the software findings to the human review

Arm 2: patients:

1. Once the study has been completed and the PULMOTRACK-CC has been removed from the study subject, the data from the WHolter® system will be downloaded to a computer dedicated to the study and password protected.

2. Two separate study personnel will blindly review the 24-hour records and interpret the data in terms of number of cough episodes. For HIPPA purposes, the sounds captured by the external microphone are encrypted so that no-one can understand or recognize the participant’s voice.

3. A third study personnel will analyze the same recorded track via PulmoTrack software.

4. A statistical analysis will be performed to compare the software findings to the human review.

Arm 3: healthy volunteers

1. Once the study has been completed and the PULMOTRACK-CC has been removed from the study subject, the data from the WHolter® system will be downloaded to a computer dedicated to the study and password protected.

2. Two separate study personnel will blindly review the 24-hour records and interpret the data in terms of number of cough episodes. For HIPPA purposes, the sounds captured by the external microphone are encrypted so that no-one can understand or recognize the participant’s voice.

3. One third study personnel will analyze the same recorded track via PulmoTrack software.

4. A statistical analysis will be performed to compare the software findings to the human review.

Risk/Benefit Assessment

A. Potential Risks

Both arms:
There are no known risks of using the PULMOTRACK-CC device.

Arm 2/3:

**Oral Lidocaine**
Lidocaine, a numbing drug, has an awful taste and causes a strange feeling in the mouth. There is a rare side effect that this drug may cause hoarseness and loss of voice. There is a very rare risk that this drug may cause problems with heart rhythm.

**Manometry**
Side effects include gagging, nausea, vomiting and sore throat. Rupture of the esophagus is another risk which may require an operation. An allergic reaction is rare but possible and may involve a skin rash, hay fever, asthma or feeling faint. A rare cardiac (heart) reaction may include low blood pressure, slow heart rate, and possibly cardiac arrest (heart stops).

**24-hour Dx pH study**
Possible risks for the participants during 24-hour short & long tube study include: nasal discomfort, injury to nasal passages such as nose bleeds, allergic reaction to lidocaine gel used to numb the nasal passages for placement of tube, and rupture of the esophagus by the long tube which may require an operation.

**B. Risk Classification of the cough device**
The FDA has classified this device as “non-significant risk device”.

**C. Data Safety Monitoring Plan**

1. Monitoring of the study will be performed by the principal investigator in accordance with IRB requirements of Vanderbilt and in accordance with our institution’s privacy policy.
2. Strict safeguarding of subject information will be maintained to protect the privacy of study subjects during and after the study in accordance with HIPAA and IRB guidelines. The data will be coded, password protected, and stored in a locked room with access only granted to those directly involved in the analysis of the data.

**D. Potential Benefits**
The benefits to science and humankind that might result from this study are to help validate a device that might help patients with chronic cough. There are no direct personal benefits from being in the study.

**Subject Identification, Recruitment, and Consent**

**A. Method of Subject Identification and Recruitment**

1. The Arm 1 will be composed of asymptomatic volunteer subjects agreeing to undergo the placement of the device and to read the script for approximately 20 minutes.
2. Recruitment will be made within the Vanderbilt community through invited inclusions. The subjects will be limited to the number needed to complete the
study, details of the experiment will be given orally and a written copy provided, and terms of compensation will be given.

B. **Subject Competency & Process of Informed Consent**

1. All subjects must be fully capable of making their own decisions to volunteer in this study as determined by the Study Coordinators or Principal Investigator.
2. Subjects will be given the consent, sufficient time to read, ask questions, and sign the consent form. A copy of the consent form will be given to each study participant. No coercion or manipulation will be applied to participants.
3. Subjects will not be allowed to disconnect or remove the study equipment or they will be withdrawn from the study.

C. **Consent Forms and Documentation of Consent**

The consent form used for this study complies with the guidelines provided under the Vanderbilt IRB requirements and according FDA regulations for informed consent in Section 21 CFR 50.25.

IV. **Financial Obligation and Compensation**

A. **Financial Obligation of the Subject**

There will be no costs incurred by the healthy volunteers. There is no additional cost other than standard of care procedure costs incurred by the patient.

B. **Financial Compensation for Participation**

No compensation will be provided to healthy volunteers. A compensation of $100.00 will be provided to the patients participating as research volunteers.