# Title: The Articulated Oral Airway as an Aid to Mask Ventilation, a Prospective Interventional, Non-Inferiority Study

NCT# 03144089

Ron Abrons, MD

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# AOA Testing

**PI:** Ron Abrons
IRB ID #: 201704829

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## Form Content

### I. Project Introduction

**I.1** ***Project to be reviewed by:***
IRB-01

**I.2** ***Project Title:***
The Articulated Oral Airway as an Aid to Mask Ventilation, a Prospective Interventional, Non-Inferiority Study

**I.3** ***Short Title (optional):***
AOA Testing

**I.4** ***Provide a short summary of the purpose and procedures of the study proposed in this IRB application.***

- ***DO NOT include information on studies not proposed in this application.***
- ***Use LAY terminology only. This must be easily understandable by IRB community members and nonscientists.***
- ***DO NOT cut and paste technical abstracts from funding applications that may not be understood by a general audience.***

The Articulated Oral Airway (AOA) is a new, FDA Class 1 (exempt from pre-market notification), device which assists in airway management, specifically mask ventilation. The AOA is currently being developed by the University of Iowa Research Foundation (UIRF Case# 2014-018) in conjunction with the Primary Investigator. The device has gone through two phases of human analog (mannequin) testing, with another round scheduled. After the third round of mannequin testing, bio-compatible (safe for oral use) prototypes will be made in a ISO 9001:2008 Certified molding facility. We plan to test these bio-compatible prototypes in healthy human volunteers to assess real-world function.
Patients who are predicted to be difficult to breath for after going to sleep (and meet inclusion criteria/do not meet exclusion criteria) will be offered enrollment in the study. Those that enroll will have their airway maintained with two different designs of oral airway (soft plastic oral stents) to see if one works as well as the other. To determine this we will be looking at how big a breath is achieved with a set pressure via the ventilator through each device. We will also be examining the devices after removal, and seeing the patients in the recovery room, to evaluate for any difference in oral or throat trauma. As patients will be anesthetized and breathed for regardless of their enrollment status, their day will be no different aside from speaking with a study team member prior to surgery and again in the recovery room.

**I.5** ***Specify your research question(s), study aims or hypotheses (do not indicate "see protocol")***
1) Does the AOA facilitate mask ventilation (as measured by inspiratory and expiratory tidal volumes and end-tidal CO2 waveforms) as well as a Guedel oral airway in patients with risk factors for difficult mask ventilation
2) Is the AOA non-traumatic as anticipated to the human airway

**I.6** ***Background and significance and/or Preliminary studies related to this project. (do not indicate "see protocol")***
Brief explanation: The Articulated Oral Airway (AOA) is a novel device in the field of Airway Management which actively facilitates both mask ventilation (breathing for an anesthetized patient without a breathing tube) and fiberoptic intubation (placement of a breathing tube using a flexible

camera). No device currently on the market has this dual functionality. In conjunction with the University of Iowa Research Foundation (UIRF Case# 2014-018) the AOA received US Patent 8,794,230 B2 in August of 2014.

Detailed explanation: A primary goal of all anesthetics is the establishment of a patent airway. The most commonly performed airway management technique is mask ventilation; using a mask over a patient's nose and mouth to breath for them. This technique is made significantly more difficult by certain anatomical features, the most common of which is a large tongue related to obesity. The AOA not only creates a conduit for delivering oxygen and anesthetic agents, but also actively displaces the tongue to optimize the space available for ventilation.

In addition, the AOA can act as a conduit for flexible fiberoptic intubation – a technique of utilizing a flexible guide to navigate airway anatomy and allow placement of a breathing tube ("endotracheal tube," or ETT) with minimal manipulation of a patient's neck and airway. A significant disadvantage of fiberoptic technique is that, for an image to be seen, an "airspace" (a space void of visual obstruction) must be created. If the tip of the fiberoptic scope is touching the patient's airway or any foreign objects in the patient's airway, the result would be analogous to leaving the lens cap on a camera and the necessary anatomy would not be seen.

To address these anatomical and technical difficulties, inventors of medical devices have attempted to design instruments which both 1) displace airway anatomy to create the needed "airspace" and 2) act as a conduit through which an ETT threaded over a flexible fiberoptic scope can be passed. Multiple devices attempt to facilitate fiberoptic intubation via specially designed oral airways. US. Pat. No.4,338,930 (Williams Oral Airway) is an oral airway with a cross-sectional shape which allows the passage of an ETT-sheathed fiberoptic scope and has a distal end which is open along its anterior surface to facilitate this passage. Two important disadvantages of this design are that 1) the static conformation of the distal end does not allow active displacement of airway obstructions and 2) once the ETT is passed via the device, the proximal end of the tube must be disassembled to allow device removal, carrying significant risk of inadvertent repositioning of the tube. The first above disadvantage was addressed by Greenberg (US. Pat. No. 5,443,063) who designed an intubating oral airway with a proximal end similar in function to that of Williams, but added a distal inflatable cuff to displace oropharyngeal obstructions. While addressing the first-listed disadvantage, the design of US. Pat. No. 5,443,063 does not address the second. US. Pat. No. 4,553,540 is a device with hinged/articulated upper and lower segments which act together to displace oropharyngeal obstructions but, like US. Pat. No. 5,443,063, does not permit the passage of an ETT via the device. US. Pat. No. 5,024,218 addresses the second disadvantage via flexible guidewalls which allow removal of the device after intubation but does not actively displace oropharyngeal obstructions. Patent Application WO/ 2008/ 083368 is another oral airway which can be removed after intubation utilizing a two-component system which can couple and uncouple around an endotracheal tube using magnets. However, similar to US. Pat. No. 5,024,218, Patent Application WO/2008/083368 does not have a segment that actively displaces the tongue to create a larger airspace. Insofar as I am aware no existing intubating oral airway allows for both significant displacement of oropharyngeal obstruction and for device removal without manipulation of the ETT. The AOA promises to address both of these concerns.

**I.7** ***Literature cited / references (if attaching a grant or protocol enter N/A).***

1. Kheterpal S, Han R, Tremper KK et al. Incidence and predictors of difficult and impossible mask ventilation. Anesthesiology. 2006;105:885-891.

2. Kheterpal S, Martin L, Shanks AM et al. Prediction and outcomes of impossible mask ventilation: a review of 50,000 anesthetics. Anesthesiology. 2009;110:891-897.

3. Koga K, Sata T, Kaku M et al. Comparison of no airway device, the Guedel-type airway and the Cuffed Oropharyngeal Airway with mask ventilation during manual in-line stabilization. Journal of clinical anesthesia. 2001;13:6-10.

4. Langeron O, Masso E, Huraux C et al. Prediction of difficult mask ventilation. Anesthesiology. 2000;92:1229-1236.

# II. Research Team

**II.2** ***Team Members***

**UI Team Members**

**II.3** ***The Principal Investigator of this study is:***
Faculty

**II.6** ***Identify the key personnel. The system will automatically designate the PI and all faculty members on the project as "key personnel." For information about other team members who should be designated as "key personnel" please click on the help information.***

| Name | Is Key Personnel |
|---|---|
| Ron Abrons, MD | Yes |

## III. Funding/Other Support

**II** ***Funding Sources***
**I.**
**1**

| | Type | Source |
|---|---|---|
| * | UI Institutional Grant/Award | The University of Iowa ICE Commercialization GAP Fund. Grant Title: Articulated Oral Airway Functional Prototyping. Name of PI on Grant: Ron O. Abrons, MD |

* new source name

**III.3** ***Does any member of the research team have a financial conflict of interest related to this project according to the Conflict of Interest in Research policy? If yes, please indicate which members below.***

| Name | Has Conflict of Interest |
|---|---|
| Ron Abrons, MD | No |

**III.5** ***What is the current status of this funding source?***

| Source | Status | Other Status Description |
|---|---|---|
| The University of Iowa ICE Commercialization GAP Fund. Grant Title: Articulated Oral Airway Functional Prototyping. Name of PI on Grant: Ron O. Abrons, MD | Awarded | |

## IV. Project Type

**IV.1** ***Do you want the IRB to give this project***
Regular (expedited or full board) review

**IV.2** ***Enter the date you will be ready to begin screening subjects/collecting data for this project. (If you do not have a specified date, add "upon IRB approval")***
5/22/2017

**IV.3** ***Are you requesting a waiver of informed consent/authorization (subjects will not be given any oral or written information about the study)?***
No

## V. Other Committee Review

**V.1** ***Does this project involve any substance ingested, injected, or applied to the body?***

- *Do not answer yes, if the involvement includes a device, wire, or instrument*

- No

**V.2** ***Are any contrast agents used for any purpose in this study?***
No

**V.9** ***Will any subject be asked to undergo a diagnostic radiation procedure (including radiographic, nuclear medicine, DEXA)?***
No

**V.14** ***Will any subject be asked to undergo a radiation therapy procedure (including external beam therapy, brachytherapy, or nuclear medicine therapy)?***
No

**V.20** ***Does this project involve the deliberate transfer of recombinant or synthetic nucleic acid molecules, or DNA or RNA derived from recombinant or synthetic nucleic acid molecules, into one or more human research participant?***
No

**V.21** ***Will any portion of this project be conducted in the CRU, or does it use any CRU resources?***
No

**V.22** ***Will this project use any resource/patients of the HCCC?***
No

**V.25.a** ***Will the study involve <u>any</u> of the following activity at UI Health Care, even if subjects or their insurance will not be billed for the item or service, and regardless of the study funding source (including studies with departmental or no funding)?***

- ***Procedures, tests, examinations, hospitalizations, use of Pathology services, use of clinic facilities or clinical equipment, or any patient care services, including services conducted in the Clinical Research Unit; or***
- ***Physician services or services provided by non-physicians who are credentialed to bill (ARNPs, Physician Assistants, etc.)***

- Yes
Exempt on 2017-06-07

**V.25.b** ***Will there be any procedures or services that may happen as part of a subject's regular medical care and as part of the study?***
Yes, but all procedures/services will be paid for by the sponsor, even if the service is standard care

**V.25.c** ***Will any study equipment or devices be supplied by a study sponsor?***
Yes

**V.25.d** ***Please describe the equipment or device(s) being provided and what it will be used for***
The Articulated Oral Airways (AOAs)are provided by the University of Iowa via the GAP funding grant as previously detailed. The AOA is the investigational oral airway.

**V.25.e** ***Is there or will there be an internal budget for this study?***
No

**V.25.f** ***Is there or will there be an external budget for this study?***
Yes

**V.26** ***The study involves Department of Nursing Services and Patient Care nursing, nursing resources or evaluates nursing practices at UI Health Care.***
No

## VI. Subjects

**VI.1** ***How many adult subjects do you expect to consent or enroll for this project?***
58

**VI.2** ***What is the age of the youngest adult subject?***
18.0

**VI.3** ***What is the age of the oldest adult subject?***
99.0

**VI.4** ***What is the percentage of adult male subjects?***
70

**VI.5** ***What is the percentage of adult female subjects?***
30

**VI.6** ***How many minor subjects do you expect to consent or enroll for this project?***
0

**VI.13** ***Describe EACH of your subject populations***

- ***Include description of any control group(s)***
- ***Specify the Inclusion/Exclusion criteria for EACH group***

Control group(s): None, each patient will be their own control
Inclusion Criteria: Patients undergoing non-emergent surgery who have two or more of the following risk factors for difficult mask ventilation:
i. Age > 55 years
ii. BMI > 30kg/m2
iii. Beard
iv. Lack of teeth
v. History of snoring

Exclusion Criteria:
a. Documented history of impossible MV
b. Planned omission of mask ventilation [i.e. Rapid Sequence Intubation ("RSI," a modified induction routine which omits mask ventilation and is used when risk of aspiration is high)]
c. Planned omission of long-acting paralytics
d. Need for awake airway management
e. Need for emergent airway protection
f. Presence of oropharyngeal anatomic abnormalities
g. Distance from the maxillary incisors to the angle of the mandible <11cm
h. <18 years of age
i. Known pregnant state
j. Current incarceration
k. Refusal to be involved in the study

With the above inclusion (i.e. presence of beard) and exclusion (maxillary incisor to angle of mandible distance <11cm) criteria, we anticipate that roughly 70% of eligible patients to be male, as women are less likely to have a beard or high maxillary incisor to angle of mandible distance.

**VI.14** ***Provide an estimate of the total number of subjects that would be eligible for inclusion in each of your study populations (include your control population if applicable)***
Review of EPIC UIHC Main Operating Room (MOR) and Ambulatory Surgery Center (ASC) schedules show that a typical day consists of 90-110 surgeries. Of these patients, roughly 4-8 patients would be expected to meet inclusion (and not meet exclusion) criteria per day.

**VI.15** ***Describe how you will have access to each of your study populations in sufficient number to meet your recruitment goals.***
As per above, there are historically 4-8 patients per day who would qualify for the study. With the goal of consenting 1-2 per day, we should be able to enroll 58 patients in 50-60 OR days, or 10-12 weeks.

**VI.16** ***Do you plan to recruit/enroll non-English speaking people?***
No

**VI.18** ***Do you propose to enroll any of the following in this study as subjects?***

- ***Employee of the PI or employee of a research team member***
- ***Individual supervised by PI or supervised by member of research team***
- ***Individual subordinate to the PI or subordinate to any member of the research team***
- ***Student or trainee under the direction of the PI or under the direction of a member of the research team***

- No

**VI.20** ***Will subjects provide any information about their relatives?***
No

**VI.23** ***Will anyone (other than the subject) provide you with information about the subject (e.g. proxy interviews)?***
No

**VI.26** ***Is this project about pregnant women?***
No

**VI.27** ***Will this project involve fetuses?***
No

**VI.28** ***Does this project involve adult subjects who may be incompetent or have limited decision-making capacity on initial enrollment into the study?***
No

**VI.32** ***Does this project involve subjects whose capacity to consent may change over the course of the study?***
No

**VI.37** ***Does this project involve prisoners as subjects?***
No

## VII.A. Project Description (A)

**VII.A.1** ***Where will project procedures take place (check all that apply)?***

- UIHC - Procedures will take place in the UIHC main operating room and Ambulatory Surgical Center. Data analysis will take place on the UIHC network computers in the offices of the research assistants, Dr. Abrons, and the study statistician.

**VII.A.2** ***Is this project also being conducted by other researchers at their own sites (e.g. a multi-site collaborative project)?***
No

## VII.B. Project Description (B)

**VII.B.1** ***Does this project involve any of the following (Check all that apply):***

- ☐

  **Registry** – The collection and maintenance of data (not including biologic samples) in which: (1) the individuals in the registry have a common or related condition(s), and/or (2) the individuals in the registry are interested in being contacted for future studies by investigators other than those listed in Section II of this project.(UI Guide)

- ☐

  **Repository** – The collection, storage, and distribution of human biologic samples and/or data materials for research purposes. Repository activities involve three components: (i) the collection of data and/or specimens such as blood, tissue, saliva, etc.; (ii) the storage of data or specimens, and data management function; and (iii) the sharing of data/specimens with recipient investigators other than the original investigators. (paraphrased from OHRP)

- ☐

  **Expanded Access** – A process regulated by the Food and Drug Administration (FDA) that allows manufacturers to provide investigational new drugs to patients with serious diseases or conditions who cannot participate in a clinical trial. Examples of expanded access include non-protocol access to experimental treatments, including protocol exception, single-patient IND, treatment IND, compassionate use, emergency use, continued access to investigational drug, and parallel track (ClinicalTrials.gov & FDA).

- ☑

  **Clinical (or Treatment) trial** – A prospective biomedical or behavioral research study of new treatments, new drug or combinations of drugs, new devices, or new approaches to surgery or radiation therapy. (NIH and ClinicalTrials.gov & FDA)

- ☐

  **Physiology intervention/study** – A pharmacologic or measurement study aimed at understanding basic mechanisms of disease and/or of normal human physiology, often without any therapeutic intent (though a clinical trial could include such components, often labeled as “translational” or “basic science” aims.) Measurements in such studies could include, but are not limited to, a blood draw, EKG, EEG, MRI, auditory or sensory testing, checking vital signs, DEXA scans, eye tracking, specimen collection, exercise, fasting, special diets, etc.

- ☐

  **Behavioral intervention/study** – May be used to refer to studies of individual or group behavior. This option does not include drugs, biologics, or devices but could include psychotherapy, lifestyle counseling, behavior modification, etc.

- ☐

  **Diagnostic trial** – Protocol designed to evaluate one or more interventions aimed at identifying a disease or health condition (ClinicalTrials.gov & FDA)

- ☐

**Non-clinical** – any college/department that would regularly submit to IRB-02

- ☐ **Other**

**VII.B.1.a** ***Does this project involve any of the following (Check all that apply):***

- ☐ **Phase I trials** – include initial studies to determine the metabolism and pharmacologic actions of drugs in humans, the side effects associated with increasing doses, and to gain early evidence of effectiveness; may include healthy participants and/or patients (ClinicalTrials.gov & FDA)
- ☐ **Phase II trials** – include controlled clinical studies conducted to evaluate the effectiveness of the drug for a particular indication or indications in patients with the disease or condition under study and to determine the common short-term side effects and risks(ClinicalTrials.gov & FDA)
- ☐ **Phase III trials** – include expanded controlled and uncontrolled trials after preliminary evidence suggesting effectiveness of the drug has been obtained, and are intended to gather additional information to evaluate the overall benefit-risk relationship of the drug and provide an adequate basis for physician labeling(ClinicalTrials.gov & FDA)
- ☐ **Phase IV trials** – studies of FDA-approved drugs to delineate additional information including the drug's risks, benefits, and optimal use(ClinicalTrials.gov & FDA)

**VII.B.2** ***Does this project involve a drug washout (asking subject to stop taking any drugs s/he is currently taking)?***
No

**VII.B.6** ***Will any subjects receive a placebo in this study when, if they were not participating, they could be receiving an FDA-approved treatment for their condition?***
No

**VII.B.11** ***Is there a separate, written protocol that will be submitted in addition to this IRB New Project form? (Note: a grant application is not considered to be a protocol)***
No

**VII.B.18** ***Does this project involve testing the safety and/or efficacy of a medical device?***
Yes

**VII.B.19** ***Describe in detail procedures in place for maintaining device shipment and receipt records:***
Articulated Oral Airways will be kept in a secure and locked area in Dr. Abrons' office. Records will be stored in a locked file with study files. As per UIHC department of Bioengineering (John Marner) the Articulated Oral Airways (AOAs) do not have to be pre-approved by his department.

**VII.B.20** ***Who will be responsible for maintaining these shipment and receipt records?***
Dr. Abrons will be responsible for maintaining shipment and receipt records in a secured location at the investigational site.

**VII.B.21** ***Describe in detail procedures in place for tracking use and disposition of devices described in this study:***

As per UIHC department of Bioengineering (John Marner) the Articulated Oral Airways (AOAs) do not have to be pre-approved by his department. AOAs will be delivered from the secured site in Dr. Abrons' office to the operating room by a research team member during OR setup times for the cases in which they will be used. As single-use devices, the AOAs will be discarded in the operating room trash, along with the Guedel orals airways, as per routine for used oral airways.

**VII.B.22** ***Who will be responsible for maintaining these use and disposition tracking records?***
Research assistants, primary investigator and co-investigators

**VII.B.23** ***Describe in detail procedures in place to limit access to authorized study personnel for the storage, control, and dispensing of the investigational devices. (For example, investigational devices are kept in a locked area away from approved devices or have a keyed interlock, and only study personnel authorized to dispense the device have the keys)***
Investigational devices will be kept in a locked area away from approved devices, as per above. Investigational devices will also be labelled as such as per FDA regulations (Code of Federal Regulations 21CFR812.5, Labeling of investigational devices). Only study personnel will have access to the devices.

**VII.B.24** ***Is the device FDA-approved for the way it will be used in this study?***
Yes

## VII.C. Project Description (C)

**VII.C.1** ***Does this project involve any research on genes or genetic testing/research?***
No

## VII.D. Project Description (D)

**VII.D.1** ***Check all materials/methods that will be used in recruiting subjects (you will need to attach copies of all materials at the end of the application):***

- Use of any information available to the researchers or their colleagues because this person is a patient OR use of any information considered to be Protected Health Information (PHI) OR review of patient/clinic records - Main operating room and Ambulatory Surgical Center operating room schedules will be used for patient screening. The records of patients who are potentially eligible will be looked at to obtain the following information only: BMI, history of snoring or sleep apnea/CPAP use, status of dentition, status of facial hair (+/- beard), and anesthetic history (for reference to past difficulties with airway management).

**VII.D.2** ***List the individual data elements you will need to access/use from the patient or clinic records to identify potential subjects for recruitment***
Age, Body Mass Index (BMI), presence or absence of dentition, history of snoring or sleep apnea, type of surgery scheduled, and airway management history.

**VII.D.3** ***Describe why you could not practicably recruit subjects without access to and use of the information described above***
It would be impractical to interview every operating room patient (90-110 per day). Pre-screening will allow for us to approach <10 patients per day instead of >90.

**VII.D.4** ***Describe why you could not practicably obtain authorization from potential subjects to review their patient or clinic records for recruitment purposes.***
It would be impractical to call and obtain authorization for chart review of every operating room patient (90-110 per day).

**VII.D.5** ***Describe plans to protect the identifiers from improper use or disclosure***
If inclusion criteria are met via chart review, only the patients Medical Record Number (MRN) and scheduled time of surgery will be recorded. No additional information (medical or otherwise) will be recorded along with the MR. Recorded information will be

only be seen by study members and will be confidentially destroyed after patient recruitment.

**VII.D.6** ***Describe plans to destroy identifiers at the earliest opportunity consistent with conduct of the research***

Once a patient is consented for the study, they will be assigned a study patient number which will not be associated with the patient's medical record or MRN. If a patient declines participation in the study, the patient information will be immediately disposed of (either shredded or placed in a locked hospital provided confidential information disposal bin).

**VII.D.7** ***Does the research team agree that the requested information will not be reused or disclosed to any other person or entity, except as required by law, for authorized oversight of the study, or for other research for which the use or disclosure of the requested information would be permitted by the HIPAA Privacy Rule***

Yes

**VII.D.8** ***Will a member of the research team discuss the study with the subject in person prior to the subject agreeing to participate?***

Yes

**VII.D.9** ***Describe the physical location where the consent process will take place:***

The consent process will take place in the Day of Surgery Area (DOSA, UIHC Main OR), Pre-operative waiting area (UIHC Ambulatory Surgery Center), or UIHC inpatient rooms.

**VII.D.10** ***Will a member of the research team discuss the study with the subject by phone prior to the subject agreeing to participate?***

No

**VII.D.12** ***Who will be involved in the consent process (including review of consent document, answering subjects' questions)?***

| Name | Consent Process Involvement |
|---|---|
| Ron Abrons, MD | Yes |

**VII.D.15** ***Check all materials that will be used to obtain/document informed consent:***

- Consent Document

**VII.D.16** ***Are you requesting a waiver of documentation of consent (either no subject signature or no written document)?***

No

**VII.D.19** ***Before the subject gives consent to participate are there any screening questions that you need to directly ask the potential subject to determine eligibility for the study?***

Yes

**VII.D.20** ***List any screening questions you will directly ask the potential subject to determine eligibility.***

Do you have any teeth?
Have you ever been told that you have been difficult to intubate?
Do you have any airway anatomic abnormalities?
Do you snore?
Do you have sleep apnea?

**VII.D.21** ***Will you keep a screening log or other record that would include information on people who do not enroll in the study?***

Yes

**VII.D.22** ***Describe the information being collected and the purpose for keeping this information.***
We will keep the name of the patient, MRN, date of surgery, reason exclusion or declined & initials of RA that screened patient.

**VII.D.23** ***Will this information be shared with anyone outside the UI research team members?***
No

**VII.D.25** ***<u>After</u> the subject agrees to participate (signs consent), are there any screening procedures, tests, or studies that need to be done to determine if the subject is eligible to continue participating?***
No

**VII.D.27** ***Discuss how much time a potential subject will have to agree to consider participation and whether or not they will be able to discuss the study with family/friends before deciding on participation.***
Patients will have as long as they would like to consider participation and discussion with family will be encouraged. If the period of consideration is not complete by the time the anesthesia/surgical team are ready to proceed to the operating room (typically about an hour), the patient will not be recruited.

**VII.D.28** ***How long after the subject agrees to participate do study procedures begin?***
The study begins with induction of anesthesia, which typically occurs sometime between 15 to 120 minutes after patient consent

**VII.D.29** ***Provide a description of the enrollment and consent process for adult subjects***

- ***Describe each study population separately including control population***
- ***Include when recruitment and consent materials are used***
- ***Use 3rd person active voice "The Principal Investigator will identify subjects. For example, the principal investigator will identify potential subjects, the study coordinator will discuss the study with subjects over the telephone and schedule the first study visit, etc..."***
- ***Describe the steps that will be taken by the research team to minimize the possibility of coercion or undue influence during the consent process***

The research team will consist of the Principal Investigator (PI), Research Assistants (RAs), and Carver College of Medicine Medical Student (MS). 1-4 days prior to scheduled surgery, a member of the research team (and no one outside the research team) will review UIHC Main OR and Ambulatory OR schedules for potential study subjects. On the day of surgery, potential subjects will be seen by a member of the research team and a determination will be made as to their eligibility. If the patient is eligible, the study will be described both verbally by the team member and in writing via the study consent document. After questions are answered, the opportunity to consent will be given. If at any point the patient declines discussion of, or enrollment in, the study, the patient will no longer be eligible for the study and will be removed from the list of potential subjects. To avoid the possibility of coercion or undue influence during the consent process, the study team will make it clear that participation is completely voluntary and that patients will receive the same standard of care whether or not they opt to enroll. If, after discussion, patients are unsure whether they wish to enroll they will be encouraged to decline participation. In addition, if at any point after the time of consent the patient no longer wishes to be involved in the study, they will immediately be excluded from involvement without question.

**VII.D.37** ***Does the study include any form of deception (e.g., providing participants with false information, misleading information, or withholding information about certain study procedures)?***
***Examples:***

- ***Procedure includes a cover story that provides a plausible but inaccurate account of the purposes of the research.***
- ***Participants will be provided with false information regarding the particular behaviors of interest in the research.***
- ***Procedures include a confederate pretending to be another participant in the study.***
- ***Participants will be told that the research includes completion of a particular task, when in fact, that task will not be administered.***
- ***Study is designed to introduce a new procedure (or task) that participants are not initially told about.***
- ***If yes, a waiver of informed consent must be requested under question IV.3.***

- No

## VII.E. Project Description (E)

**VII.E.1** ***Will subjects be randomized?***
Yes

**VII.E.1.a** ***Will any subjects be blinded to which study arm they have been assigned?***
No

**VII.E.2** ***Describe randomization scheme/assignment including ratio such as 1:1, 2:1 etc.***
This study involves a random allocation, cross-over design. All patients will receive both devices - the randomization will determine which of the devices they receive first. There are two reasons for the randomization: 1) As we are evaluating for blood on the airway upon its removal, the order of placement is important as we can only evaluate the first-placed device (we won't know if blood on the second-placed device if from that device or left over from the first device. 2) Without randomization, the CRNA would not be blinded as they would know which device they are using first and second which could introduce bias.

**VII.E.3** ***Will any questionnaires, surveys, or written assessments be used to obtain data directly from subjects in this study?***
No

**VII.E.5** ***Does this project involve creating any audiotapes, videotapes, or photographs?***
Yes

**VII.E.6** ***Provide a detailed description in sequential order of the study procedures following the consent process - DO NOT cut and paste from the Consent Document.***

***Describe study populations separately if they will be participating in different procedures - include CONTROL population if applicable.***

***DESCRIBE:***

- ***What subjects will be asked to do/what happens in the study (in sequential order)***
- ***The time period over which procedures will occur***
- ***The time commitment for the subject for individual visits/procedures***
- ***Long-term followup and how it occurs***

- A. Staff anesthesiologist will perform an airway exam and note the following
- Age
- BMI
- Presence or absence of beard

- Patient dentition
- History of snoring
- Any formal diagnosis of sleep apnea and CPAP/BiPap use and settings
- Mallampati grade (I-IV)
- Mouth opening (in cm)
- Neck extension (full, limited or none)
- Retrognathia (none, mild, significant)
- Any apparent nasal or oral anatomic abnormalities

B. Operating room preparation (performed by research assistant or study medical student):
-A tongue depressor, AOA, and 100mm Guedel oral airway will be available, but out of sight of the clinical providers
-A 28Fr nasopharyngeal airway and water-soluble lubricant will be set on the anesthesia machine next to the laryngoscopy equipment
-The anesthesia circuit facemask will be opacified by internal application of lip balm (as per pediatric routine)
-A pump for delivery of propofol infusion will be available
-The anesthesia ventilator will be pre-programmed to Pressure Control mode at 15cm H2O with a rate of 10 breaths/minute and an inspiratory:expiratory ratio of 1:3
-A video recording device will be available to record data from the anesthetic monitor

C. Induction/Airway Management. On arrival to the operating room:
1) Apply standard ASA monitors
2) Apply Entropy monitor (measures depth of anesthesia via evaluation of brain EEG) and quantitative Train of Four (TOF, routine intraoperative monitor which measures level of paralysis via evaluation of the response to electrical stimulus)monitors
3) Pre-oxygenate until end tidal O2 is >90% or for >3 minutes
4) Research assistant will open the randomization envelope but not disclose the randomized device order to the clinical team
5) IV Induction: 1-2mg midazolam, 50-100mcg fentanyl, 60-100mg lidocaine and 1-2mg/kg propofol.
6) Maintenance of anesthesia: 100mcg/kg/min propofol started at time of induction.
7) Once lid reflex is lost, obtain a baseline quantitative train-of-four (TOF) and administer rocuronium 1mg/kg of real body weight
8) One-handed mask ventilation (MV), without an oral airway, is initiated by the Certified Nurse Anesthetist (CRNA). If one-handed MV without an oral airway is insufficient to return any EtCO2, a “two-handed jaw-thrust” technique, without an oral airway, is utilized until paralysis/anesthetic depth measures are met. If two-handed technique is insufficient, the 28Fr nasopharyngeal airway is placed and two-handed technique restarted. If two-handed MV with a 28Fr nasopharyngeal airway does not return any EtCO2, proceed to step #10.
9) Once the quantitative TOF is <20% and Entropy reading is 40-60[3], proceed to step 10
- If, after 90 seconds, the TOF is not <20%, continue to MV until the TOF is <20%
- If, after 90 seconds, the Entropy reading is not 40-60, increase propofol by 50mcg/kg/min every minute and continue MV until reading is 40-60
10) The CRNA (who is performing MV) is asked to turn away so as to be blinded to oral airway placement order
11) The RN research assistant or study medical student (both formally trained, with documentation, in oral airway placement) will place the device randomized to be first using the below methods and then cover the patients nose and mouth with the opacified anesthesia mask
- Guedel oral airway: Insert with concavity facing upward then turn 180 degrees as advancing the proximal bevel to the level of the teeth

- AOA: In the “closed” conformation, insert with concavity facing upward then turn 180 degrees as advancing the proximal bevel to the level of the teeth. Once at the level of the teeth, bring proximal ends together to lock in the fully ‘open’ conformation
l2) The CRNA will turn back to the patient and secure the anesthesia mask utilizing “2-handed jaw-thrust” technique.
13) The ventilator is turned on and the following data is recorded, via video of the anesthetic monitor, for breaths # 6-10:
-Inspiratory tidal volumes
-Expiratory tidal volumes
-EtCO2 waveform
Note (a): If EtCO2 is not achieved after 5 breaths with first device, proceed immediately to step #14
Note (b): No video or images will be taken of the patient or patient identifiers, just the anesthesia monitor and the device randomized to be placed first
14) The CRNA will then turn away from the patient and the RN research assistant or study medical student will remove the oral airway, noting the presence of any blood on the device (first device only)
15) Steps 10-13 will be repeated for the device randomized to be placed second, then the anesthetic will proceed at the discretion of the providers
Note: If EtCO2 is not achieved after 5 breaths with the second device, the protocol is ended and the ASA Difficult Airway Algorithm is followed

D. Post-operative:
15-45 minutes after "Anesthesia Stop" time, the research assistant or study medical student will:
- Perform an oropharyngeal exam for signs of trauma
- Ask the patient to grade their degree of “sore throat” (subjectively, from 0-10)

E. Data Review:
-The video taken during step 13 above will be uploaded to a password-protected server to which only study personnel will have access. The video will contain no images of the patient or patient identifiers, just the anesthesia monitor and the device randomized to be placed first
-The blinded primary investigator (Dr. Abrons) will transcribe clinical data (expiratory and inspiratory tidal volumes and EtCO2 waveforms) from the above video

**VII.E.7** ***Will you attempt to recontact subjects who are lost to follow-up?***
No - followup is not required in this study

**VII.E.9** ***Will subjects be provided any compensation for participating in this study?***
No

## VIII. Risks

**VIII.1** ***What are the risks to subjects including***
***- emotional or psychological***
***- financial***
***- legal or social***
***- physical?***
- Emotional or psychological: None foreseen
- Financial: None forseen
- Legal or social: None forseen
- Physical: Potential for risks associated with routine airway management with an oral airway (difficult or failed airway management/oropharyngeal trauma). Potential for risks associated with placement of two oral airways instead of just one or none.

**VIII.2** ***What have you done to minimize the risks?***

- ***If applicable to this study ALSO include:***
  - ***How you (members of your research team at Iowa) will monitor the safety of individual subjects.***
  - ***Include a description of the availability of medical or psychological resources that subjects might require as a consequence of participating in this research and how referral will occur if necessary (e.g. availability of emergency medical care, psychological counseling, etc.)***

Pre-procedure: The Articulated Oral Airway is made of bio-compatible material in a ISO 9001:2008 Certified molding facility. The AOA has been tested in manakin models, including pressure testing by members of the UIowa Biomedical Engineering program.
Intraoperative: Per protocol, if difficulty in airway management is encountered, the study is abandoned and emergency airway management protocols (ASA Difficult Airway Algorithm) followed.
Post-operative: An interim safety review will be performed after 20 patients have been enrolled. If there is any significant increase in either trauma or difficult in mask ventilation noted, the study will be stopped.

**VIII.3** ***Does this study have a plan to have an individual or committee review combined data from all subjects on a periodic basis (such as summary or aggregate safety and/or efficacy data)?***
Yes

**VIII.4** ***Describe the plan to review combined data from all subjects, such as summary or aggregate safety and/or efficacy data. Include the following:***

- ***Describe what data will be summarized and reviewed***
- ***Describe how frequently data will be reviewed.***

- After the first 20 patients (and any time earlier if concerns are raised by the research team/clinical staff caring for the patients), a unbiased faculty anesthesiologist (Dr. Timothy Brennan, as per below) will review intraoperative tidal volumes (marker for adequate ventilation), incidence of blood on first-placed device, and post-anesthesia care unit (PACU) data on post-operative pharyngeal trauma.

**VIII.5** ***Will overall safety monitoring be performed by individual(s)/committee at The University of Iowa. (NOTE: If this study involves more than minimal risk, in most cases these should be individuals who are not members of the study research team.)?***
Yes

**VIII.6** ***List names:***
Dr. Timothy Brennan, MD, PhD, Professor of Anesthesiology, Department of Anesthesiology, UIHC.

**VIII.7** ***Will overall safety monitoring be performed by individuals or committee not associated with The University of Iowa (such as a study Data Safety Monitoring Board)?***
No

## IX. Benefits

**IX.1** ***What are the direct benefits to the subject (do not include compensation or hypothesized results)?***
None

**IX.2** ***What are the potential benefits to society in terms of knowledge to be gained as a result of this project?***

Difficult and failed mask ventilation are a significant risk after induction of anesthesia. As risk factors for difficult and failed mask ventilation (such as obesity and age >55) are increasing in the population as a whole, methods for optimizing mask ventilation are becoming even more crucial. There are no oral airways currently available which actively displace oropharyngeal obstructions, as the AOA does. The potential benefits of the AOA relate to better caring for patients who are at risk for difficult mask ventilation. The AOA also has the additional functionality of facilitating flexible scope (fiberoptic) intubation, though that functionality is not being tested as part of this protocol.

## X. Privacy & Confidentiality

**X.1** ***What are you doing to protect the privacy interests of the subjects?***

All communication with subjects will be done in a private room with the doors closed. Information that can not be obtained from the medical record will be asked in person. There will be no pictures or videos taken of patients or patient identifiers. Only information related to the study will be collected
and only the minimum amount of personal/private information needed to answer the study questions will be collected.

**X.2** ***Are you collecting the Social Security Number of any subjects for any purpose?***

No

**X.4** ***How will information/data be collected and stored for this study (check all that apply):***

- Paper/hard copy records (hard copy surveys, questionnaires, case report forms, pictures, etc.) - Paper/hard copy records (hard copy surveys, questionnaires, case report forms, pictures, etc.) - Case report forms will be kept separate from informed consents in 3 hole punched binder. They will be kept in locked file cabinets in a locked office of one of the research assistants. The CRF will have a study ID number for identification. One data list will be kept of the subjects name and ID number for identification purposed on a password protected document within a password protected file. The intraoperative video will contain no images of the patient or patient identifiers, just the anesthesia monitor and the device randomized to be placed first. The video will be uploaded to a password-protected server (backed up and overseen by UI department of anesthesia ITS) to which only study personnel will have access. After upload, the original video will be deleted.
- Electronic records (computer files, electronic databases, etc.) - Electronic records (computer files, electronic databases, etc.) - One data list will be kept of the subjects name and ID number for identification purposed on a password protected document within a password protected file.
    - Name - Dave Griffiths
    - Title - Information Technology Security Officer
    - University Job Classification - System Administrator and Systems Programmer II

**X.5** ***Do the confidentiality protections indicated above allow only members of the research team to access the data/specimens?***

Yes

**X.7** ***Does your study meet the NIH criteria for a Certificate of Confidentiality or will you be applying for Certificate of Confidentiality?***

No

## XI. Data Analysis

**XI.1** ***Describe the analysis methods you will use, including, if applicable, the variables you will analyze***

We will use non-inferiority testing for the analysis of the primary outcome variable in this study. We will assume that the Articulated Oral Airway is non-inferior to the Guedel oral airway if the difference in expiratory tidal volume measurements between the two devices is less than 1ml/kg.

**XI.2** ***Provide the rationale or power analysis to support the number of subjects proposed to complete this study.***

We will assume that the AOA is non-inferior to the GDA if the difference in expiratory tidal volume measurements between the two devices is less than 1ml/kg. With a sample size of 55 patients, a paired t-test of equivalence of means with a 0.050 one-sided significance level will have 90% power to reject the null hypothesis that expiratory tidal volumes with a GDA and AOA are not equivalent (> 1ml/kg difference in expiratory tidal volumes) (SD of difference is 2.5ml-kg). To allow for 3 protocol failures, we will recruit a total of 58 patients. Note that, if the non-inferiority is satisfied, we will also explore the superiority of the AOA to the GDA. With this number of patients, the paired t-test will have >95% power to test the hypothesis that the expiratory tidal volumes measured with the AOA are 1.5ml/kg greater than with the GDA (SD of difference: 2.5ml/kg).

## XII. Future Research

**XII.1** ***Do you wish to keep any information about subjects involved with this research project so that members of the current research team may contact them in the future for your own research projects?***

No

**XII.2** ***Do you wish to keep any information about subjects involved with this research project so that other researchers may contact them for future research?***

No

**XII.4** ***Does this project involve storing any data, tissues or specimens for future research?***

No

## New Project Form Attachments

| Attachment Name | Category | Ver | Size | | Attached |
|---|---|---|---|---|---|
| Articulated Oral Airway study_Informed_consent.rtf | Informed Consent | 5 | 181 k | E | 06/28/17 |
| Articulated Oral Airway study_Record of consent.rtf | Record of Consent | 1 | 53 k | E | 04/19/17 |
| Abrons GAP 2017 Aluminum Mold Upgrade Request.pdf | Funding Source Grant | 1 | 99 k | E | 04/18/17 |
| GAP Funding Proposal (part 2, aluminum molds and biocompatible AOAs) | | | | | |
| Abrons GAP-award-letter-forms_3x_FY16 2-1-16.docx | Funding Source Grant | 1 | 287 k | E | 04/18/17 |
| GAP Funding Award Letter (Part 1) | | | | | |
| Abrons GAP-award-letter-forms_3x_FY17.docx | Funding Source Grant | 1 | 294 k | E | 04/18/17 |
| GAP Funding Award Letter (Part 2, aluminum molds a bio-compatible AOAs) | | | | | |
| GAP Funding Proposal (d) Articulating Oral Airway Functional Prototyping Ron Abrons MD_JK.pdf | Funding Source Grant | 1 | 246 k | E | 04/18/17 |

| | | | | | |
|---|---|---|---|---|---|
| GAP funding proposal (part 1) | | | | | |
| CFR - Code of Federal Regulations Title 21.pdf | Device Documentation | 1 | 266 k | E | 04/18/17 |
| The Articulated Oral Airway had been determined by the FDA to meet exclusion criteria 2 (highlighted) and thus allowed for use in this study. | | | | | |
| FDA_Airway, Oropharyngeal, Anesthesiology_Class 1 Classification.pdf | Device Documentation | 1 | 105 k | E | 05/16/17 |
| From the FDA website: https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpcd/classification.cfm?start_search=1&DeviceName=&ProductCode=&ThirdParty=&DeviceClass=1&SUBMISSION_TYPE_ID=4&GMPExempt=N&Panel=&RegulationNumber=868.5110&PAGENUM=10&SortColumn=DeviceName | | | | | |
| AOA Blinded Video Review Data Collection Form.xlsx | Screening: Screening Log | 1 | 21 k | E | 04/27/17 |
| AOA Study Attending Data Collection Log.xlsx | Screening: Screening Log | 1 | 18 k | E | 04/27/17 |
| AOA Study: Attending anesthesiologist data collection log | | | | | |
| AOA Study Research Assistant Checklist and Data Collection log.xlsx | Screening: Screening Log | 1 | 17 k | E | 04/27/17 |
| Dr Abrons AOA Current Enrollment Log.xlsx | Screening: Screening Log | 1 | 12 k | E | 04/27/17 |
| Dr Abrons AOA Declined Log.xlsx | Screening: Screening Log | 1 | 11 k | E | 04/27/17 |
| AOA Study Attending Data Collection Form.docx | Miscellaneous | 1 | 33 k | E | 04/26/17 |
| AOA Study: Attending Data Collection Form | | | | | |
| AOA Study Blinded Video Review Data Collection Form 4.26.17.docx | Miscellaneous | 1 | 320 k | E | 04/26/17 |
| AOA Study: Blinded Video Review Data Collection Form | | | | | |
| AOA Study Checklist, Data Collection Form 4.26.17.docx | Miscellaneous | 1 | 46 k | E | 04/26/17 |
| AOA Study: Research Assistant Checklist and Data Collection Form | | | | | |
| AOA Study Protocol, 4_26_17.docx | Miscellaneous | 1 | 28 k | E | 04/26/17 |
| AOA Study Protocol (full) | | | | | |
| AOA Study Roles - Attending Anesthesiologist.docx | Miscellaneous | 1 | 18 k | E | 04/26/17 |
| Study Roles: Attending Anesthesiologist | | | | | |
| AOA Study Roles - CRNA.docx | Miscellaneous | 1 | 159 k | E | 04/26/17 |
| Study Roles: Certified Registered Nurse Anesthetist | | | | | |
| AOA Study Roles - Research Assistant.docx | Miscellaneous | 1 | 19 k | E | 04/26/17 |

| | | | | | |
|---|---|---|---|---|---|
| Study roles: Research Assistant | | | | | |
| AOA.jpg | Miscellaneous | 1 | 102 k | E | 06/28/17 |
| AOA (investigational device) | | | | | |
| Abron patent for airway device.pdf | Miscellaneous | 1 | 303 k | E | 06/26/17 |
| Email, Verification of no conflict of interest regarding clinical study of the Articulated Oral Airway.msg.pdf | Miscellaneous | 1 | 72 k | E | 04/26/17 |
| Email from Martha Hegberg, MPA (COI Specialist/Human Subjects Office Operations Manager) verifying that the primary investigator, Ron Abrons, MD does not have any conflicts of interest which would preclude him from involvement in study of the Articulated Oral Airway (AOA) in any capacity he would otherwise fulfill if he had no history with the studied device. Dr. Abrons was the original inventor of the AOA (prior to his employment at the University of Iowa), but subsequently signed the intellectual property over the the University of Iowa who now has full ownership. | | | | | |
| Guedel.jpg | Miscellaneous | 1 | 85 k | E | 06/28/17 |
| Guedel oral airway (standard device) | | | | | |
| diagram of oral pathway aid.pdf | Miscellaneous | 1 | 19 k | E | 06/26/17 |
| Assurance document  Articulated Oral Airway Study  Abrons.pdf | Assurance Document | 1 | 585 k | E | 04/19/17 |