

All India Difficult Airway Association 2016 guidelines for the management of unanticipated difficult tracheal intubation in obstetrics

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ABSTRACT

The various physiological changes in pregnancy make the parturient vulnerable for early and rapid desaturation. Severe hypoxaemia during intubation can potentially compromise two lives (mother and foetus). Thus tracheal intubation in the pregnant patient poses unique challenges, and necessitates meticulous planning, ready availability of equipment and expertise to ensure maternal and foetal safety. The All India Difficult Airway Association (AIDAA) proposes a stepwise plan for the safe management of the airway in obstetric patients. These guidelines have been developed based on available evidence; wherever robust evidence was lacking, recommendations were arrived at by consensus opinion of airway experts, incorporating the responses to a questionnaire sent to members of the AIDAA and the Indian Society of Anaesthesiologists (ISA). Modified rapid sequence induction using gentle intermittent positive pressure ventilation with pressure limited to ≤ 20 cm H₂O is acceptable. Partial or complete release of cricoid pressure is recommended when face mask ventilation, placement of supraglottic airway device (SAD) or tracheal intubation prove difficult. One should call for early expert assistance. Maternal SpO₂ should be maintained $\geq 95\%$. Apnoeic oxygenation with nasal insufflation of 15 L/min oxygen during apnoea should be performed in all patients. If tracheal intubation fails, a second-generation SAD should be inserted. The decision to continue anaesthesia and surgery via the SAD, or perform fiberoptic-guided intubation via the SAD or wake up the patient depends on the urgency of surgery, foeto-maternal status and availability of resources and expertise. Emergency cricothyroidotomy must be performed if complete ventilation failure occurs.

Key words: Cricoid pressure, difficult airway, face mask ventilation, failed intubation, high-flow nasal cannula, intubation, modified rapid sequence induction, obstetrics, parturient, perimortem caesarean delivery, preoxygenation

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INTRODUCTION

Decision-making during obstetric anaesthesia needs to take into account the clinical condition of both the mother and foetus, with maternal safety taking priority over that of the infant at all times. Lessons learnt from the Confidential Enquiries into Maternal Deaths in the United Kingdom as well as reports of anaesthesia-related maternal mortality in the USA have clearly indicated that neuraxial anaesthesia is a safer alternative to general anaesthesia (GA) in obstetrics.^[1,2] Incorporation of this knowledge into anaesthetic management strategies has resulted in a dramatic improvement in maternal (as well as foetal) safety. Despite this, airway misadventures still occur resulting in maternal morbidity and mortality during caesarean delivery. The incidence of failed intubation in the obstetric population is quoted as one in 224 anaesthetics in the United Kingdom.^[3] This is eight times higher than the incidence of failed intubation in the general population. Such statistical data are not available in the Indian context due to lack of similar studies in this patient population.

Pregnancy-related changes in maternal anatomy such as airway oedema and breast enlargement predispose to this higher incidence, especially so in the obese parturient. Physiological changes that accompany pregnancy such as decrease in functional residual capacity and increased oxygen demand result in a very narrow margin of safety for the development of hypoxaemia in the event of failure to secure the airway. Delayed gastric emptying and decreased lower oesophageal sphincter tone that accompany pregnancy further add to risks during airway management as a result of regurgitation and aspiration of gastric contents. Onset of labour and straining at vaginal delivery can worsen airway oedema rendering a potentially difficult airway even more difficult.^[4] Coexistence of eclampsia can pose additional airway-related issues. It is also believed that with fewer general anaesthetics being given for caesarean delivery, trainees in anaesthesiology may be getting less clinical exposure to airway management in obstetrics, making them less familiar and therefore more prone to encountering airway management difficulties while managing obstetric patients.^[5,6] These guidelines should be used in conjunction with 'All India Difficult Airway Association 2016 Guidelines for the Management of Unanticipated Difficult Tracheal Intubation in Adults'.^[7]

METHODS

The methodology adopted for the development of All India Difficult Airway Association (AIDAA) guidelines including guidelines for anticipated difficult tracheal intubation in obstetrics has been described previously.^[7] A thorough literature search was done using databases/search engine (Medline, PubMed, Google Scholar, and websites of National Societies for airway guidelines) till September 2016. The articles were manually searched from cross referencing. All manuscripts and abstracts published in English were searched. The key words used included 'cricoid pressure; difficult airway; face mask ventilation; failed intubation; high-flow nasal cannula; intubation; modified rapid sequence induction; obstetrics; parturient; perimortem caesarean delivery; preoxygenation'. For areas that did not have robust evidence, opinions of experts and members of the societies were taken regarding issues related to tracheal intubation in obstetrics.

PREOPERATIVE PATIENT EVALUATION

A detailed medical examination including airway assessment is ideally done in the third trimester of pregnancy. One may need to reassess airway anatomy as the parturient approaches term or goes into labour. It is prudent to examine the neck of the parturient scheduled for caesarean delivery to palpate and identify the cricothyroid membrane, should the need arise for emergency cricothyroidotomy. Obstetric indications for operative delivery and the foetal condition should be noted. The obstetrician, neonatologist and anaesthesiologist should carefully assess the clinical situation as this can impact the decision to continue with surgery to deliver the infant vis-à-vis awakening the mother when faced with a situation of failed intubation or oxygenation.

PREOPERATIVE FASTING

The increased gastric emptying time and increased intra-abdominal pressure due to a gravid uterus enhance the risk of pulmonary aspiration in obstetric patients. Thus, adequacy of preoperative fasting should be determined in any parturient who is scheduled to undergo caesarean delivery. While clear fluids are allowed up to 2 h before surgery, solids are best avoided for 6 h. It is suggested that women in active labour or having requested opioid analgesia should refrain from solids or semisolids.

The hormonal imbalance in pregnancy decreases the tone of the upper oesophageal sphincter, and therefore there is always a risk of aspiration in these patients in spite of adequate fasting which necessitates the use of rapid sequence induction (RSI) in these patients.

PREMEDICATION

Pregnant women are at risk of acid regurgitation and aspiration (Mendelson's syndrome) and measures to prevent this are essential. The risk of developing acid aspiration syndrome is related to the pH and volume of aspirate, and thus measures must be taken to modulate these factors which in turn reduce the risk. Premedication should aim to reduce acidity of gastric contents, decrease the volume of gastric contents and increase gastric motility.

Intravenous histamine-2 receptor antagonists (ranitidine 50 mg) or proton pump inhibitors (pantoprazole 40 mg) help to reduce gastric acidity. A gastric prokinetic agent (metoclopramide 10 mg) enhances gastric emptying and increases lower oesophageal sphincter tone.^[8,9] Measures to reduce gastric acidity should be considered in all parturients undergoing caesarean delivery as surgery started under neuraxial anaesthesia may require conversion to GA.

PREPARATION

The operating suite should be made ready for performing a caesarean delivery, and a reliable assistant should be available. The checklist should ensure a functioning anaesthesia machine and suction equipment, a tilting table, and anaesthetic and emergency drugs drawn up in appropriate dilutions in clearly labelled syringes. Airway equipment that should be available includes a range of anaesthesia masks, oropharyngeal and nasopharyngeal airways, conventional direct laryngoscopes (including short-handle laryngoscope) with Macintosh/McCoy blades, videolaryngoscopes, range of endotracheal tubes, second-generation supraglottic airway devices (SADs) and equipment for emergency cricothyroidotomy. It is reassuring to have a difficult airway cart available nearby and a senior anaesthesiologist identified should assistance be needed.

PATIENT POSITION

The side profile of a pregnant patient in whom GA is to be induced should indicate the presence of

adequate space between the chin and the upper chest to facilitate the unhindered introduction of the laryngoscope blade. A ramped position can be obtained by supporting the back and head of the patient on pillows and folded sheets such that the external auditory meatus is at the level of the suprasternal notch. This is particularly important in the obese parturient.^[10] A 20°–30° head-up tilt can provide additional advantage for performing intubation.^[11] Time spent in positioning the parturient can facilitate the unhindered introduction of the laryngoscope blade either directly or at a 90° angle with the handle facing the shoulder before rotating it into the anatomical position.

PREOXYGENATION AND ANAESTHETIC INDUCTION

A thorough airway examination and optimal patient positioning should precede the initiation of modified RSI. As mentioned earlier, a competent assistant who is familiar with the equipment available in the airway cart should be in attendance and the drugs needed for RSI should be drawn up. The assistant should also be familiar with the proper technique of applying cricoid pressure (an initial force of 10 Newtons when the patient is awake which is increased to 30 Newtons as the patient becomes unconscious). Intravenous access should be established and baseline monitoring including a 5-electrode electrocardiogram, noninvasive blood pressure, pulse oximetry and capnography initiated.

Preoxygenation is mandatory and is performed by administering oxygen at flows of at least 10 L/min for 3–5 min using a well-fitting mask. A fraction of end-tidal oxygen of >0.9 is considered to be indicative of adequate preoxygenation.^[12,13] As an additional precaution, the anaesthesiologist should start administering oxygen at 15 L/min through a nasal cannula and continue doing so till a definitive airway has been secured.

Anaesthesia should be induced using a titrated dose of an induction agent till the loss of consciousness. While thiopentone sodium 3–5 mg/kg or propofol 2 mg/kg are acceptable induction agents in haemodynamically stable patients, etomidate in a dose of 0.2–0.3 mg/kg may be appropriate in haemodynamically unstable patients. Neuromuscular blockade is achieved using succinylcholine hydrochloride 1.5 mg/kg (or rocuronium 1.2 mg/kg in situations where succinylcholine is contraindicated).

While the classical RSI does not allow for active ventilation, gentle mask ventilation with application of full cricoid pressure (adjustable pressure limiting valve set to ≤ 20 cm H₂O) using small tidal volume breaths until complete muscle paralysis occurs can be useful to prolong the time to desaturation in parturients. This manoeuvre also provides crucial information regarding the ability to mask ventilate should the need arise later. Laryngoscopy should be performed using a conventional laryngoscope or a videolaryngoscope as dictated by local practice. If laryngoscopic view is suboptimal, cricoid pressure should be released in a graded manner with the laryngoscope in place and external laryngeal manipulation performed with the idea of improving laryngoscopic view. A good working suction should be available at all times to deal with regurgitation of gastric contents. Alternate laryngoscope blades such as McCoy or Miller blades should also be available.

Successful tracheal intubation is confirmed by the presence of six consistent waveforms on capnography. Once correct tracheal intubation has been confirmed and the cuff inflated, the assistant can release the cricoid pressure and the tube taped in place before the surgery begins.

Gentle intermittent positive pressure breaths with the APL valve closed down to ≤ 20 cm H₂O may be permitted for obstetric patients keeping in mind the low oxygen reserves that are seen in this population. Although the routine use of cricoid pressure during RSI for non-obstetric patients is currently being questioned, its use in the obstetric subset of patients is still considered appropriate. One must remember that application of cricoid pressure can distort the pharynx and hinder mask ventilation, placement of a SAD, laryngoscopy and tracheal intubation.^[14] The anaesthetic assistant should, therefore, be prepared to release the cricoid pressure either partially or completely to facilitate mask ventilation, proper placement of SAD and tracheal intubation. Inability to generate adequate tidal volumes should raise the suspicion of overenthusiastic application of cricoid pressure. Reduction of cricoid pressure under these circumstances usually improves tidal volumes.^[15]

The communication of information concerning patients with difficult airways is recognised as a vital component in avoiding future airway management difficulties.^[16] The 2013 American Society of Anesthesiologists practice guidelines for the

management of the difficult airway recommend that a patient should be notified of their difficult airway by a written report or letter including a summary of the airway difficulty and airway management, plus a review of the outcome of that management. The Canadian Airway Focus Group provides similar guidance. Although the mode of communication may differ in each country, AIDAA recommends handing over a summary of the airway difficulty encountered and the subsequent management and outcome to the parturient and her relatives (airway alert card).

STEPWISE APPROACH TO MANAGEMENT OF UNANTICIPATED DIFFICULT INTUBATION IN OBSTETRICS

The Algorithm for Management of Unanticipated Difficult Tracheal Intubation in Obstetrics developed by AIDAA is a comprehensive guideline for the management of failed tracheal intubation in obstetrics, keeping in mind its relevance in the Indian context. AIDAA proposes a stepwise approach for the management of tracheal intubation in obstetrics [Figure 1]. It is important to remember that while following any step in the algorithm, if the oxygen saturation is not maintained or starts rapidly falling or bradycardia develops, one can bypass one or more steps and proceed to rescue ventilation and even emergency cricothyroidotomy. This article should be considered as mandatory reading for Indian anaesthesiologists whose practice includes obstetrics. The algorithm is broadly divided into four steps.

Step 1

When intubation is successful at first laryngoscopy, the obstetrician proceeds to deliver the infant. However, if the first attempt at intubation fails, the anaesthesiologist should 'Call for help' immediately and focus on reoxygenation. Bag-mask ventilation with the APL valve set to ≤ 20 cm H₂O should be resumed, preferably a two-handed two-person technique with use of airway adjuncts such as an oropharyngeal or nasopharyngeal airway as deemed appropriate. The anaesthetic assistant should be instructed to release the cricoid pressure in a graded manner while the first anaesthesiologist constantly checks the ability to ventilate. Should bag-mask ventilation prove successful, the anaesthesiologist should attempt a second laryngoscopy after optimising head/neck position and releasing the cricoid pressure in a graded manner. The second attempt at laryngoscopy should be performed using a videolaryngoscope, alternate

AIDAA 2016 Guidelines for the Management of Unanticipated Difficult Tracheal Intubation in Obstetrics

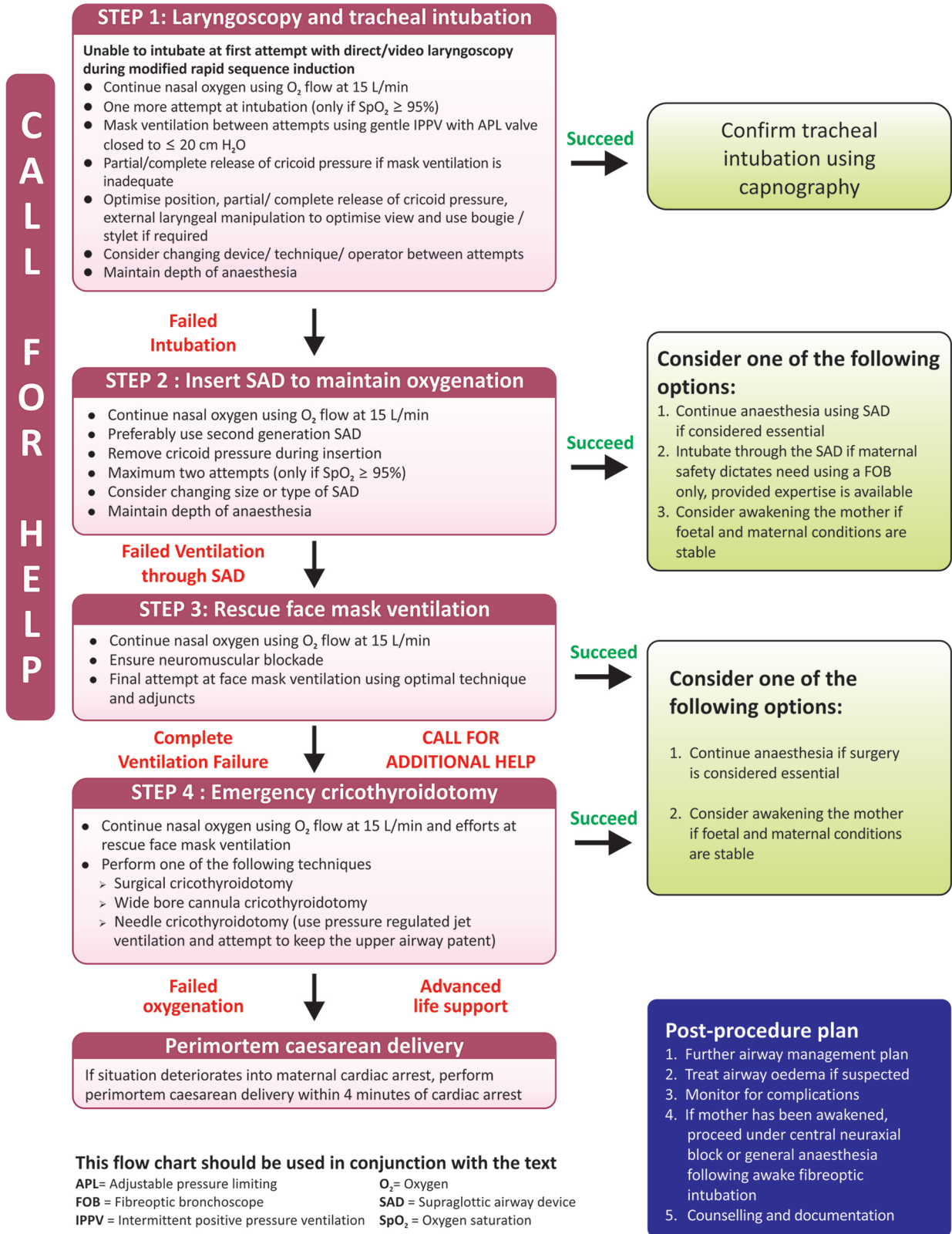


Figure 1: All India Difficult Airway Association 2016 guidelines for the management of unanticipated difficult tracheal intubation in obstetrics

blades and use of a bougie as dictated by availability of equipment and expertise. A videolaryngoscope provides an additional advantage to the assistant who can now release the cricoid pressure in a graded manner while observing the impact on laryngoscopic view.^[17] Should the second attempt at intubation be successful, the obstetrician proceeds to deliver the infant. However, should this attempt also fail, this is now a 'failed intubation' and one should proceed to Step 2.

Step 2

While nasal oxygen continues to be administered at 15 L/min, the anaesthesiology team now focuses attention on placing a SAD to facilitate anaesthesia and oxygenation. A maximum of two attempts may be allowed in placing a second generation SAD with graded release of cricoid pressure as described earlier. Once the SAD is properly placed, the team proceeds depending on the foetal and maternal condition. If the indication for caesarean delivery was a nonreassuring foetal status, the obstetrician proceeds to deliver the infant with anaesthesia being continued through the SAD despite a definite albeit low risk of pulmonary aspiration. Once the foetus is delivered, the anaesthesiologist may consider intubating through the SAD should maternal haemorrhage, imminent seizures and high risk for aspiration exist. Intubation through the SAD should be done only using fiberoptic bronchoscopy provided expertise is available.

On the other hand, if foetal and maternal conditions are stable (not warranting immediate delivery of the infant), the team is advised to awaken the mother. The anaesthesiologist can then consider performing caesarean delivery under central neuraxial block or GA following awake fiberoptic-aided intubation. Should placement of a SAD fail after 2 attempts, this is now a 'failed ventilation through supraglottic airway device' and one should proceed to Step 3.

Step 3

While nasal oxygen continues to be administered at 15 L/min, one final attempt is made at rescue face mask ventilation using optimal technique and airway adjuncts as deemed appropriate. The anaesthesiologist should ensure that neuromuscular blockade is adequate before making this final attempt at face mask ventilation. Should this also fail, the situation is now that of a 'complete ventilation failure' and the anaesthesiologist should seek urgent expert assistance.

Step 4

This situation of complete ventilation failure is serious and demands emergent management. The team should 'Call for additional help' and start positioning the patient for emergency cricothyroidotomy. Based on the availability of equipment and expertise, the team can opt for one of the following three options - a surgical cricothyroidotomy, wide bore cannula cricothyroidotomy or needle cricothyroidotomy (with concomitant use of pressure-regulated jet ventilation while maintaining patency of the upper airway). As outlined before, the maternal and foetal condition will determine whether the team proceeds to deliver the infant or awaken the mother.

Failure of emergency cricothyroidotomy can potentially deteriorate into a maternal cardiac arrest. In the unfortunate event of a maternal cardiac arrest, cardiopulmonary resuscitation in the form of chest compressions is continued with another team member providing left uterine displacement. Perimortem caesarean delivery performed within 4 minutes of cardiac arrest could enhance chances of foetal survival.^[18]

Although a number of guidelines from various countries exist, AIDAA has embarked on this endeavour to formulate guidelines of our own keeping in mind the infrastructure and varying standard of care at different healthcare set-ups in our country.

Indian guidelines specially emphasise:

- SpO₂ of equal to or more than 95% as a cut-off for escalating airway interventions
- Limiting the number of intubation attempts to two before proceeding to the next step
- Continuous administration of nasal oxygenation through nasal cannula to prolong apnoea time

We also aim to enforce a minimum standard of care through these guidelines (such as, for instance, confirmation of tracheal intubation by ETCO₂ monitoring).

Extubation

Every extubation should be considered as a potential reintubation, and this is especially true when extubating a difficult airway. A planned extubation strategy should be ready before extubating a difficult airway. AIDAA guidelines for extubation deal with strategising extubation and other advance methods of extubation which can be applied in the obstetric scenario as well.

SUMMARY

Difficult airway in obstetrics constitutes a unique situation, wherein an orchestrated team effort between the obstetrician, neonatologist and anaesthesiologist often ensures good maternal and foetal outcome. As in any other scenario, an unanticipated difficult airway in obstetrics also progresses from failed intubation and difficult mask ventilation, through failed placement of a SAD to complete ventilation failure needing emergency cricothyroidotomy. Thorough planning and precise execution of an airway management strategy are central to a successful outcome.

The AIDAA stepwise approach to the management of unanticipated difficult tracheal intubation in obstetrics emphasises the importance of adequate preoxygenation, insufflation of oxygen at 15 L/min throughout the period of apnoea, limiting the number of intubation attempts to two and maintaining an SpO₂ ≥ 95%. Tracheal placement of the ET tube should be confirmed by capnography. SADs have an important role in difficult airway management, and cricothyroidotomy should be the procedure of choice when there is complete ventilation failure. We hope that diligent application of the actions outlined in the AIDAA 2016 guidelines for the management of unanticipated difficult tracheal intubation in obstetrics will translate to maternal as well as foetal safety.

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Conflicts of interest

There are no conflicts of interest.

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