

# Higher operating tables provide better laryngeal views for tracheal intubation



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# Background



- the quality of laryngeal view
- the discomfort of the anaesthetist during endotracheal intubation

# Methods

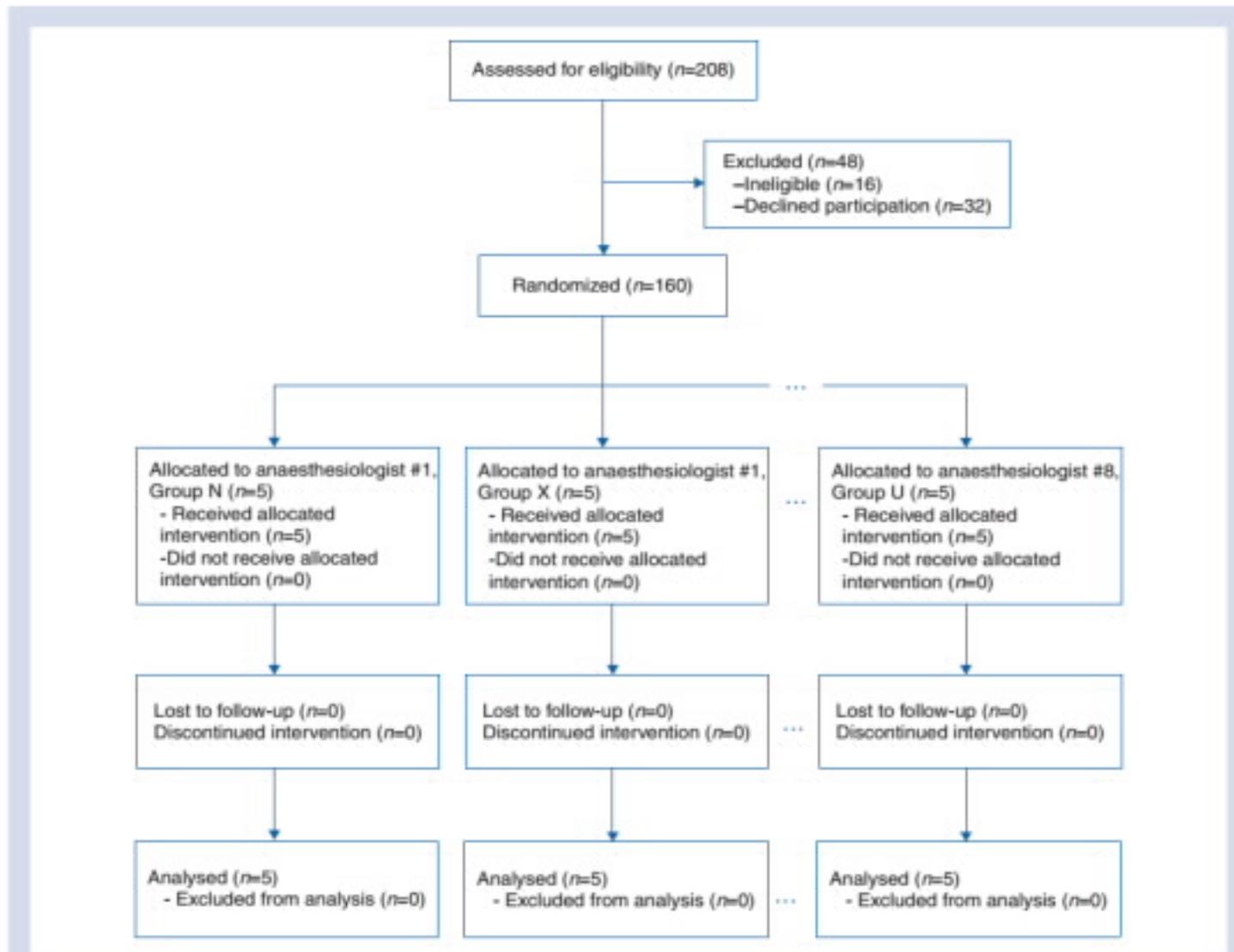


Fig 2 CONSORT flowchart for the effects of four table heights on laryngeal view and discomfort score during direct laryngoscopy.

# Methods

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纳入标准：ASA I –III

排除标准：body mass index (BMI) > 30

aged < 18 or > 85 y

congenital or acquired airway abnormalities

loose teeth or edentulous jaws

increased risk of aspiration

# Methods

## The airway assessments

A: inter-incisor distance

B: thyromental distance



A: 正常值3.5~5.6cm

B: 成人通常大于6.5cm

# Methods

## The airway assessments

C: neck circumference

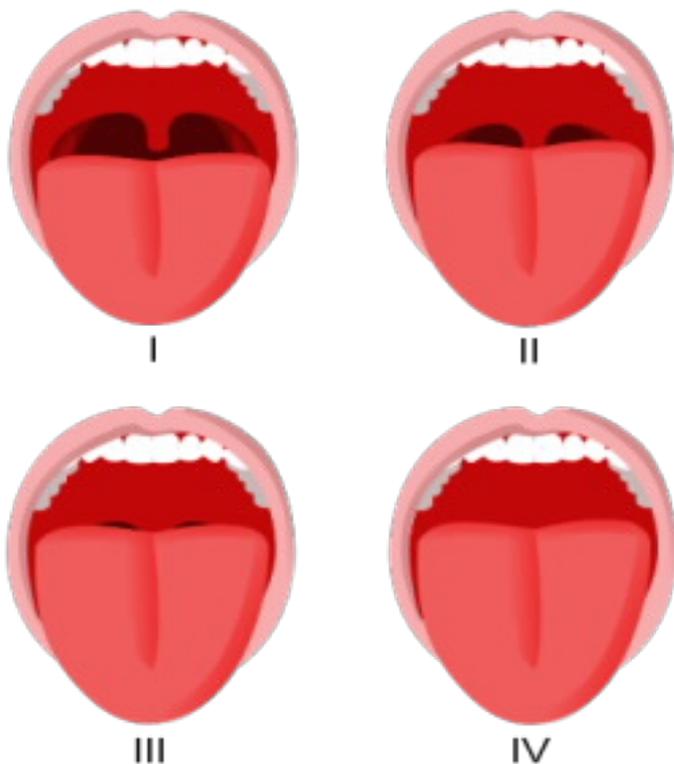


C: neck circumference  $< 45\text{cm}$

# Methods

## The airway assessments

### D: Mallampati classification



MP Class I- Soft palate, tonsillar fauces, tonsillar pillars, and uvula

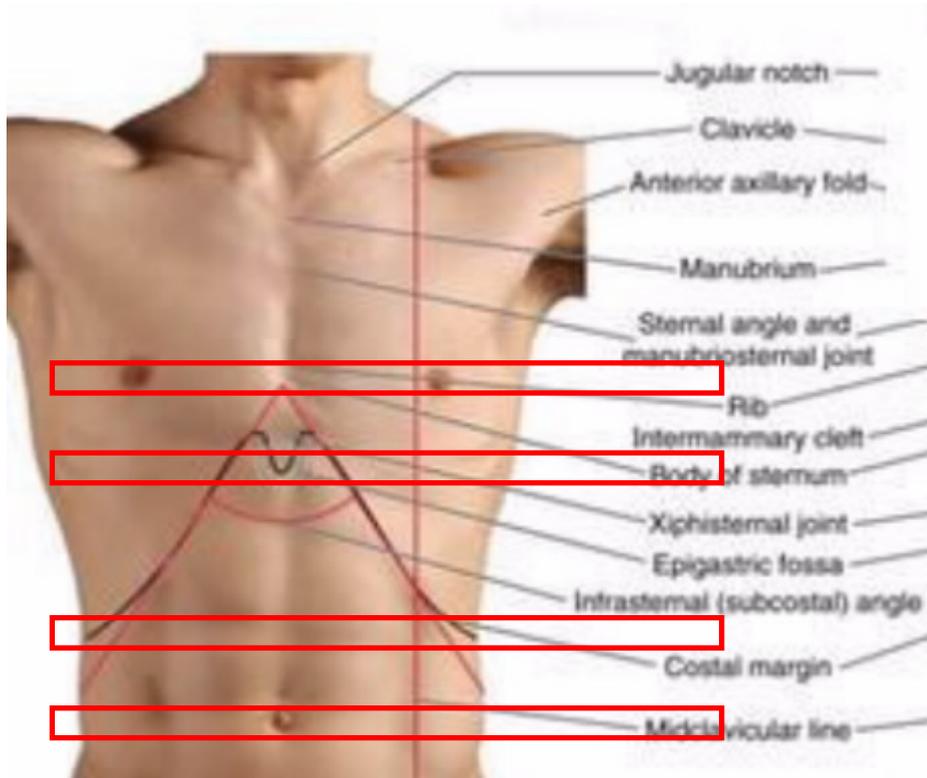
MP Class II- Soft palate, tonsillar fauces, partial uvula

**MP Class III-** Soft palate, base of uvula

**MP Class IV-** Hard palate only

MP III and MP IV are associated with greater likelihood of a difficult airway.

# Methods



(Group **N**) nipple

(Group **X**) xiphoid process

(Group **R**) lowest rib margin

(Group **U**) umbilicus

# Methods

- (Group **N**) nipple
- (Group **X**) xiphoid process
- (Group **R**) lowest rib margin
- (Group **U**) umbilicus

i.v. midazolam (0.03 mg/kg) 10 min before anaesthesia

Routine monitoring (non-invasive arterial pressure Measurement, SpO<sub>2</sub>, electrocardiography)

The height of the operating table was adjusted

pre-oxygenation

anaesthesia was induced with i.v. propofol (1.5 mg/kg) and alfentanil (0.01Mg/kg)

i.v. rocuronium (0.6 mg/kg)

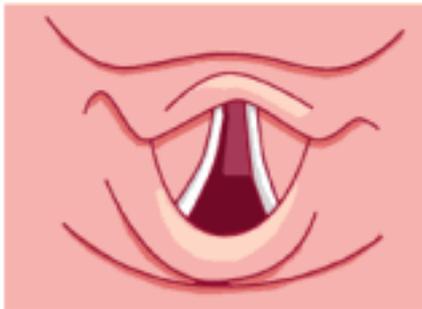
a gradual increase of inspired sevoflurane to 6– 8 vol%

Two minutes after rocuronium injection, tracheal intubation was performed under direct laryngoscopy

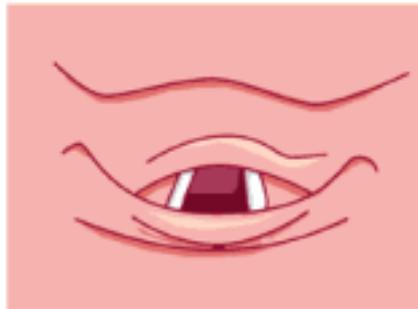
# Methods

## Outcome measures

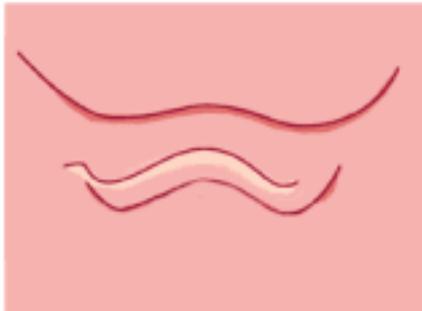
### A. Cormack and Lehane criteria



Grade 1



Grade 2



Grade 3



Grade 4

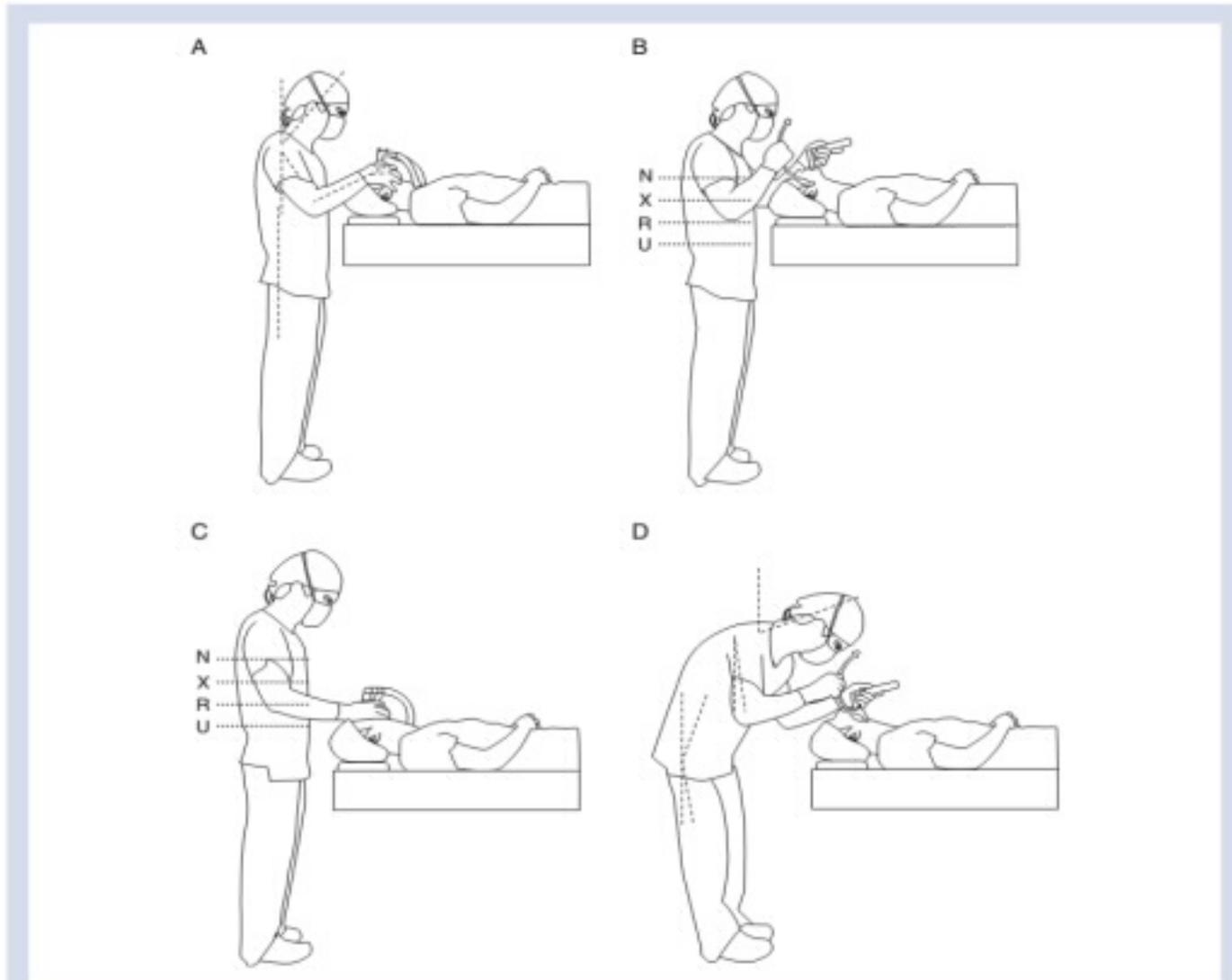
Grade 1, complete visualization of the vocal cords;

Grade 2, visualization of the inferior portion of the glottis;

Grade 3, visualization of only the epiglottis;

Grade 4, non-visualization of the epiglottis

# Methods

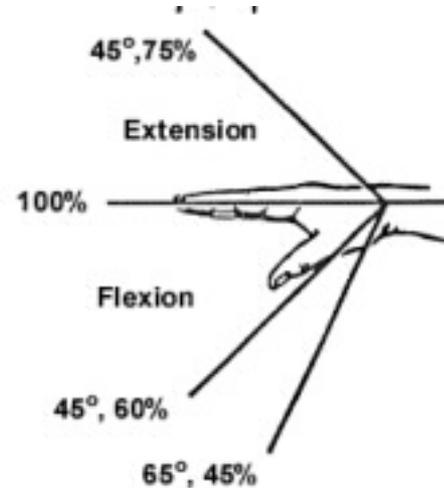


**Fig 1** Illustration of the nipple level (A and a) and the umbilicus level (C and c) operating table height during mask ventilation (A and C) and tracheal intubation (B and b). The measured angles of arm elevation, neck, low back, knee flexion, and wrist deviation are indicated with dashed lines. The levels of landmarks are marked as dotted lines. N, nipple; X, xiphoid process; R, lowest rib margin; U, umbilicus.

# Methods

## Outcome measures

**B. assessment of wrist exertion during mask ventilation and joint strains.**



**C. The degrees of task discomfort during mask ventilation or tracheal intubation were graded.**

1=no discomfort,

2=mild discomfort,

3=moderate discomfort,

4=severe discomfort

# Results

**Table 1** Patient characteristics. Continuous variables are expressed as mean (standard deviation), whereas categorical variables are presented as number of patients. BMI, body mass index in  $\text{kg m}^{-2}$ ; ASA PS, American Society of Anaesthesiologists Physical Status score

Group	U (n = 40)	R (n = 40)	X (n = 40)	N (n = 40)
Gender (M/F)	24/16	16/24	23/17	19/21
Age (yr)	46.4 (46.4)	51.0 (16.0)	52.1 (16.3)	49.7 (16.5)
ASA PS (I/II/III)	30/9/1	25/15/0	26/12/2	24/15/1
Weight (kg)	65.2 (10.4)	61.3 (11.2)	64.1 (9.9)	64.8 (11.9)
BMI ( $\text{kg m}^{-2}$ )	24.1 (3.1)	23.4 (2.8)	23.8 (2.5)	24.5 (3.4)

**Table 2** Pre-anaesthetic airway evaluation. Continuous variables are expressed as mean (SD), whereas categorical variables are presented as number of subjects

Group	U (n = 40)	R (n = 40)	X (n = 40)	N (n = 40)
Mallampati (1/2/3/4)	16/16/8/0	20/15/3/2	15/21/3/1	20/15/4/1
Inter-incisor distance (cm)	4.7 (1.1)	4.6 (0.9)	4.4 (0.6)	4.6 (0.6)
Thyromental distance (cm)	8.1 (1.1)	7.3 (0.6)	7.4 (0.2)	7.3 (1.0)
Neck circumference (cm)	35.4 (1.6)	36 (4.9)	34.2 (5.4)	38.4 (3.1)

# Results

**Table 3** Discomfort score, and objective measured angle of joint deviation or flexion during mask ventilation. Data are presented as the number of patients or mean (so). \* $P < 0.05$  vs Group U. † $P < 0.05$  vs Group R. ‡ $P < 0.05$  vs Group X

Group	U (n=40)	R (n=40)	X (n=40)	N (n=40)	P-value
Mask discomfort (1/2/3/4)	35/4/1/0	36/3/1/0	18/18/4/0 <sup>†</sup>	18/16/5/1 <sup>†</sup>	<0.001
Wrist-deviation angle	10 (8)	7 (8)	14 (10)	21 (6)	<0.01
Arm-elevation angle	23 (7) <sup>‡</sup>	23 (10)	35 (11) <sup>‡</sup>	48 (11) <sup>‡</sup>	<0.01
Neck-flexion angle	32 (7) <sup>‡</sup>	26 (5)	25 (9) <sup>*</sup>	19 (7) <sup>‡</sup>	<0.01

**Table 4** Laryngeal view, discomfort scores for intubation, number of attempts at laryngoscopy, and intubation duration. Categorical variables are presented as the number of subjects, whereas continuous variables are expressed as mean (so). \* $P < 0.05$  vs Group U

Group	U (n=40)	R (n=40)	X (n=40)	N (n=40)	P-value
Laryngeal view (1/2/3/4)					
Before	11/10/11/8	19/12/4/5	11/19/5/5	19/16/5/0 <sup>*</sup>	0.007
After	25/12/2/1	22/15/2/1	24/10/5/1	25/14/1/0	0.907
Intubation discomfort (1/2/3/4)	17/12/7/4	25/11/4/0	28/11/0/1 <sup>*</sup>	28/11/1/0 <sup>*</sup>	0.010
Number of attempts at laryngoscopy (1/2)	40/0	38/2	39/1	38/2	0.757
Intubation duration (s)	15 (6.2)	13 (8.9)	14 (7.0)	15 (5.4)	0.239

# Results

**Table 5** Subjective exertion or flexion of joint and objective measured angle of joint flexion during tracheal intubation. Data are presented as number of patients or mean (sd). \* $P < 0.01$  vs Group U. † $P < 0.01$  vs Group R. ‡ $P < 0.01$  vs Group X. LB, low back; S, subjective; O, objective

Group	U (n=40)	R (n=40)	X (n=40)	N (n=40)	P-value
Wrist exertion (S)	0	0	2	12 <sup>†</sup>	<0.0001
Arm exertion (S)	0	0	1	11 <sup>†</sup>	<0.0001
Elevation angle (O)	27 (6)	28 (7)	34 (6)*	44 (9) <sup>‡</sup>	<0.01
Neck flexion (S)	18	13	3*	0 <sup>†</sup>	<0.0001
Angle (O)	69 (17)	63 (11)	54 (13)*	36 (15) <sup>‡</sup>	<0.01
LB flexion (S)	14	5	0*	0*	<0.0001
Angle (O)	42 (12)	35 (13)	22 (7) <sup>†</sup>	8 (6) <sup>‡</sup>	<0.01
Knee flexion (S)	5	4	2	0	0.1
Angle (O)	18 (13)	15 (13)	5 (8) <sup>†</sup>	1 (3) <sup>‡</sup>	<0.01

# Limitations

1. It was not possible to blind anaesthetists to the relative table height.
2. Objective assessment of muscle strains, such as electromyography of the biceps or trapezius, and measurements of three-dimensional orientation were not performed.
3. In more obese anaesthetists, the umbilicus and lowest rib margin have an uncertain vertical relationship to one another
4. The laryngeal views were not captured using an endoscope so as to be graded by other blinded investigators.
5. The patient's head and neck posture during laryngoscopy was neither controlled nor monitored.





THANK YOU