COMPARISON OF AEROSOL BOX VS ENHANCED AEROSOL BOX: EFFECTIVENESS & ERGONOMIC PERSPECTIVE

DR SAIYIDI MOHD AZIZI BIN MOHD ADIBI

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AKU JANJI

Diperakui bahawa disertasi yang bertajuk **COMPARISON OF AEROSOL BOX VS ENHANCED AEROSOL BOX: EFFECTIVENESS & ERGONOMIC PERSPECTIVE** merupakan kerja dan penyelidikan asli daripada **SAIYIDI MOHD AZIZI BIN MOHD ADIBI**, No Kad Pengenalan: 881217-11-5793, No Matrik: PUM0390/18, dari tempoh 2018-2022 dan adalah di bawah penyelian kami. Disertasi ini merupakan sebahagian daripada syarat untuk penganugerahan **SARJANA PERUBATAN KECEMASAN.**

Segala hasil penyelidikan dan data yang diperolehi adalah hak milik terpelihara Universiti Sains Malaysia.

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Tandatangan Ketua Jabatan
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LIST OF ABBREVIATIONS

AGP	Aerosol Generating Procedure
COPD	Chronic obstructive pulmonary disease
COVID-19	Coronavirus disease 2019
CPR	Cardiopulmonary resuscitation
ED	Emergency Department
ETT	Endotracheal tube
HCW	Health care worker
HUSM	Hospital Universiti Sains Malaysia
MSD	Musculoskeletal disorder
NIV	Non-invasive ventilation
PAPR	Powered-air purifying respirator
PID	Prolapse Intervertebral Disc
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
REBA	Rapid Entire Body Assessment
RSI	Rapid Sequence Intubation
SARS	Severe Respiratory Syndrome
SPSS	Statistical Package for Social Science
VL	Video laryngoscopy
WHO	World Health Organisation

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COMPARISON OF AEROSOL BOX VS ENHANCED AEROSOL BOX: EFFECTIVENESS & ERGONOMIC PERSPECTIVE

ABSTRAK

Disebabkan oleh kadar penularan koronavirus yang tinggi dan menjejaskan petugas kesihatan (HCW) serta peralatan perlindungan peribadi (PPE) terhad, kotak aerosol telah dicipta untuk meningkatkan keselamatan petugas semasa intubasi. Pengubahsuaian tertentu dibuat pada kotak aerosol untuk menjadikan kotak aerosol dipertingkatkan untuk keselamatan dan manfaat yang lebih baik untuk pesakit dan petugas. Terdapat kebimbangan yang semakin meningkat tentang faktor ergonomik yang mempengaruhi petugas kesihatan terutamanya semasa intubasi. Kajian ini bertujuan untuk menganalisis keberkesanan kedua-dua kotak aerosol dan kotak aerosol yang dipertingkatkan dalam konteks kadar kejayaan, masa intubasi yang berjaya dan ergonomik. Dalam kajian ini para peserta dikehendaki mengintubasi patung dewasa menggunakan laringoskop berpandukan video (VAL). Peserta akan mengintubasi manekin menggunakan kotak aerosol yang berbeza; kotak aerosol dan kotak aerosol yang dipertingkatkan. Prosedur intubasi direkodkan sepanjang prosedur dari kedua-dua belah peserta untuk menilai kadar kejayaan intubasi, masa intubasi yang berjaya dan postur badan peserta untuk pengiraan skor REBA. Kami telah mengambil seramai 47 pelajar pasca siswazah. Semua peserta boleh melakukan intubasi menggunakan kedua-dua kotak aerosol dalam satu percubaan. Skor min menunjukkan tempoh intubasi yang berjaya menggunakan kotak aerosol yang dipertingkatkan lebih lama berbanding kotak aerosol iaitu masing-masing 32.4 saat dan 26.9 saat. Analisis lanjut menggunakan Paired T test menunjukkan signifikan secara statistik dalam masa min yang diambil untuk menjayakan intubasi endotrakeal menggunakan kotak aerosol

yang dipertingkatkan (nilai-p = 0.000). Skor REBA diperhatikan adalah tertinggi dengan skor 3.2 semasa menggunakan kotak aerosol yang dipertingkatkan, manakala skor REBA terendah diperhatikan ialah skor 2.6 dalam kotak aerosol. Berdasarkan analisis REBA menggunakan Independent T Test menunjukkan skor signifikan secara statistik antara kotak aerosol dan peningkatan kotak aerosol dengan nilai p = 0.045 Sebagai kesimpulan kotak aerosol yang dipertingkatkan mempunyai kadar kejayaan yang sama untuk intubasi tetapi mengakibatkan tempoh intubasi yang berjaya yang lebih panjang dan skor REBA yang lebih tinggi. Kami menasihatkan pengubahsuaian selanjutnya dibuat untuk meningkatkan keberkesanan kotak aerosol yang dipertingkatkan.

Kata Kunci: intubasi, COVID-19, kotak aerosol, kotak aerosol yang dipertingkatkan, REBA

COMPARISION OF AEROSOL BOX VS ENHANCED AEROSOL BOX: EFFECTIVENESS & ERGONOMIC PERSPECTIVE

ABSTRACT

Due to high rate of transmission of coronavirus affecting healthcare worker (HCW) and limited personnel protective equipment (PPE), aerosol box was invented to improve the safety of HCW during intubation. Certain modifications was made to the aerosol box to make enhanced aerosol box for better safety and benefit for both patient and intubator. There was growing concern of ergonomic factors that affect the HCW particularly during intubation. This study aimed to analyse the effectiveness of both aerosol box and enhanced aerosol box in the context of success rate, time of successful intubation and ergonomics. In this study the participants were required to intubate an adult mannequin using video assisted laryngoscope (VAL). The participant intubated the mannequin using different type of box; aerosol box and enhanced aerosol box. The intubation procedure was recorded throughout the procedure from both side of participant to asses for success rate of intubation, the time of successful intubation and body posture of the participant for calculation of REBA score. We have recruited a total of 47 post graduate student. All participants were able to intubate using both aerosol box in single attempt. Usage of enhanced aerosol box associated with longer duration of successful intubation. The mean score showed longer duration of successful intubation of using enhanced aerosol box compared to aerosol box that was 32.4 sec and 26.9 sec respectively. Further analysis using paired T test show statistically significant in mean time taken to successful endotracheal intubation using enhanced aerosol box (p-value = 0.000). The REBA score was observed to be the highest with 3.2 score while using enhanced aerosol box, while lowest REBA score observed was 2.6 score in aerosol box. Based on REBA analysis using Independent T test

show statistically significant score between aerosol box and enhance of aerosol box with p value = 0.045 As a conclusion enhanced aerosol box has similar success rate for intubation but result in prolonged duration of successful intubation and higher REBA score. We advise further modifications made to improve the effectiveness of enhanced aerosol box.

Keyword: intubation, COVID-19, aerosol box, enhanced aerosol box, REBA

CHAPTER 1

INTRODUCTION

COVID-19 pandemic has transformed our health care system due to high infectivity via air droplets (W. Joost Wiersinga., 2020). It also carries high morbidly and mortality to the patient. Patient rapidly progress into acute hypoxic respiratory failure and around 8% of patient require intubation (Grasseli G et all., 2020).

Concurrently there is rapid rise in health care worker that was infected with COVID-19 (WHO). The personnel that involved with patient care is at high risk of transmission especially during aerosol generating procedure. One of the most highly aerosol generating procedure is intubation as it involves high oxygen flow and airway manipulation (Khai Tran et all., 2012).

There is high demand and inequality distribution of PPE due to surge of COVID-19 (Bukri Talha., 2020). This then cause people to make new and cheap invention that is aerosol box as to increase barrier to reduce AGP transmission with the aim to increase safety to both patient and healthcare worker. It was first invented by Dr Lai Hsien Yung in China as an adjunct to the PPE. The aerosol box is a transparent box that are placed on the patient head with two holes for intubator hands (Chang Devon., 2020). Unfortunately, aerosol box reputation is debatable. Some study show that it is associated with increased intubation time (Zheng Jie Lim et all., 2021).

Significant modification was done to the design of the aerosol box for example a slanting viewer panel, plastic valve and additional hole for assistant hand and we call it enhanced aerosol box. This study we intend to compare its effectiveness that is the success rate and time of intubation and ergonomic position of both aerosol box and enhanced aerosol box

CHAPTER 2

STUDY PROTOCOL

2.1 INTRODUCTION

The respiratory system can be divided into upper and lower airway. The upper airway consistsof the nasal cavity, pharynx and larynx while the lower airway consists of trachea, bronchi and lungs. In emergency setting, maintaining adequate oxygenation takes priority and this includesecuring the airway with definitive airway such as endotracheal tube or surgical airway. Patient can develop respiratory failure and unable to maintain ventilation due to various causes such as failure of oxygenation (eg acute pulmonary oedema and pneumonia) or failure of ventilation (asthma or COPD). Endotracheal tube is the commonest way to secure the airway of the patient and proceeded by procedure called Rapid Sequence Intubation (RSI).

Coronavirus emerge at the end of 2019 in which first discovered in Wuhan, a city in the Hubei province of China (Joseph Tingku et all., 2020). The rapid spread of coronavirus cause a world wide pandemic inearly 2020. Genomic analysis noted that coronavirus is a betacoronavirus that is the subgenus as the Severe Respiratory Syndrome (SARS) virus **(**uptodate**)**. It has infected more than 12 million people world wide. Coronavirus can cause both upper and lower respiratory tract infection (Joseph Tingku et all., 2020). It is estimated at 8% of COVID-19 patient require intubation and mechanical ventilation (Grasseli G et all., 2020). It is proposed that COVID-19 are transmitted via respiratory droplets.

There is the rise in prevalence of work related musculoskeletal disorder (MSD) in medical personnel performing any procedure due to lack of physical ergonomics. According

to Palm (1997), a workplace that is ergonomically deficient may not cause acute pain but may result in chronic pain, mental stress, decrease performance and poor quality of work. Medical personnel does a lot of procedure during their clinical working hours such as intubation, cardiopulmonary resuscitations and phlebotomy. This require a lot of movement and burden especially to both upper limbs and back. Improper position and awkward body posture predispose health care worker towards MSD. The musculoskeletal disorder can be assessed using Rapid Entire Body Assessment (REBA) (Hignett S et all., 2000)

2.2 LITERATURE REVIEW

Due to airborne transmission and high rate of transmission, coronavirus has infected 22,073 healthcare workers worldwide (WHO). It also had infected 416 healthcare worker in Malaysia (Abdullah R, 2020). The risk of transmission from a patient with COVID-19 increase with the proximity, durationof contact and also prolonged contact in indoor setting (uptodate). Healthcare worker are highly susceptible due to this reason as they are required to do examination and certain procedure to the patients.

Intubation is recognised as the highest ranking Aerosol Generating Procedure (AGP) (Tran Khai et all., 2012). Other list of AGP is chest compression, nebulization, high flow oxygen more than 15 lites per minute, non-invasive ventilation (NIV) and bronchoscopy. These procedures increased the risk of transmission of aerosol to intubator and airway assistants. Few measures had been done to reduce the transmission use as limiting the staff and

the use of powered-air purifying respirator (PAPR). Unfortunately, the PAPR is costly and not readily available in all hospital.

Due to high infectivity of COVID-19 and reducing number of personal protective equipment(PPE), Dr Lai Hsien Yung invented aerosol box to reduce the transmission of aerosol during intubation procedure. The aerosol box is a transparent box that will cover the patient head and shoulder with two holes for intubator hands (Devon Chang,. 2020). The invention of aerosol box is cheap and use a simple technology. The use of aerosol box is being recognised as an adjunct to PPE to protect the healthcare worker during intubation.

This new norm of intubation using aerosol box create inconvenient body position as it isnot normally done and it potentially cause harm especially on intubator wrist and back bringing about musculoskeletal disorder. There are emerging numbers of research done on ergonomic body posture and musculoskeletal disorder to medical personnel performing procedure. Musculoskeletal disorders defines as an injury or disorder of the muscles, nerve, tendon joints, cartilage and spinal disc (CDC). There is a study of Ergonomic risk assessment of MSD in endotracheal intubation using 3 different bed levels and it show the lowest REBA score is to intubate at a sub-xyphoid levels (Wahab S.F.A et all., 2019). Another study shows that using video laryngoscope has better ergonomic posture comparing to direct laryngoscopy (T. Grundegeiger. O. Happel et all.,2014).

Currently there is no study researching on ergonomics assessment of intubator using aerosol box. Better body ergonomic during intubation will reduce the burden on

the intubator and potentially enhance clinical safety and higher success rate (D. Caldririlo et all., 2013).

2.3 PROBLEM STATEMENT AND STUDY RATIONALE

The aerosol box has been described to have utility in preventing cough dispersion of particleon the intubator and airway assistants **(**Canelli R et tall., 2020**).**

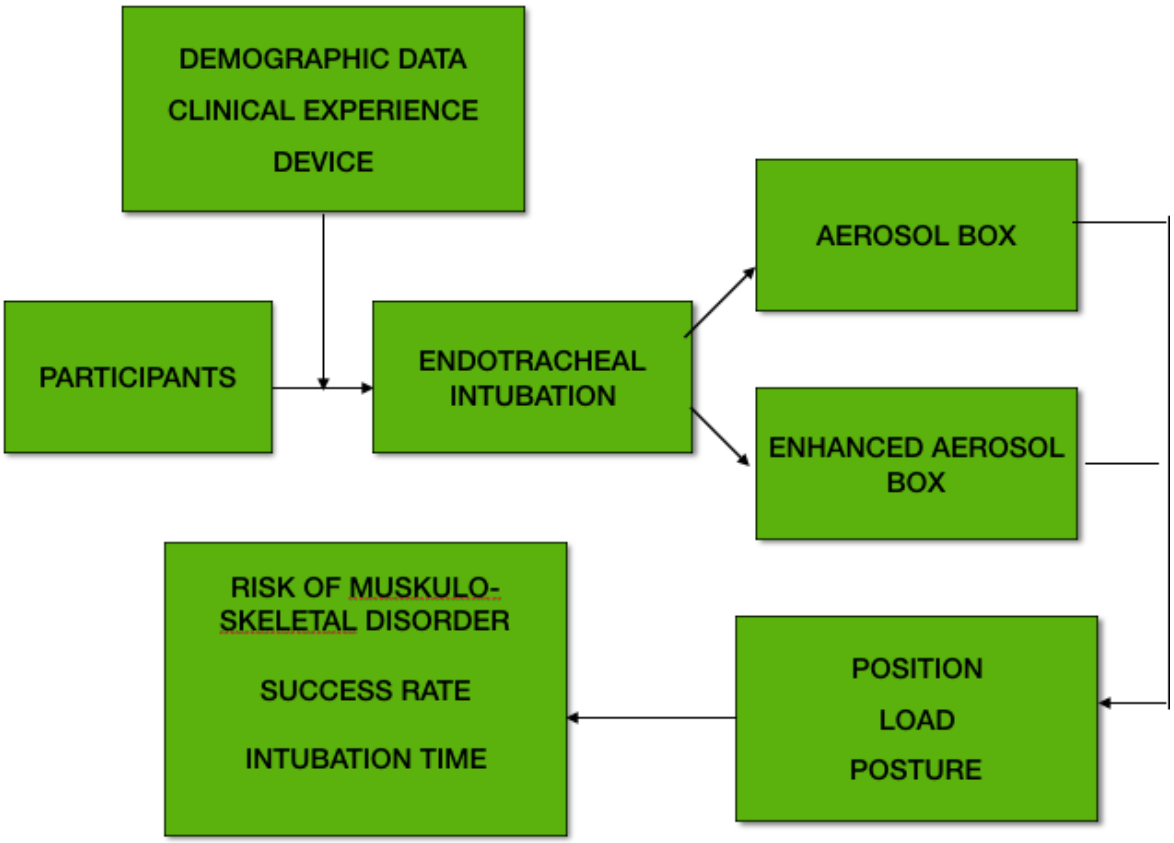
However, there are few studies that suggest against the use of aerosol box because of certain factors such as glare from overhead light, crowding in the box and delay in intubation by at least 30 seconds. Other than that, the intubator also noted difficulty manipulating bougie, rigid stylet and suction during intubation. Other study also show that first pass success is less likely with aerosol boxes and there is risk of breach of PPE(14)

Significant modification was done to the design of the aerosol box to improve both patient intubator safety and also intubator ergonomics. The modification includes a slanting viewer for the intubator toreduce the glare. Additional hole added at the side of the box for the assistant hand to assist in intubation. All holes are covered with a plastic valve to reduce the aerosol dispersion. It have increased height to increase more working space and mobility.

We intend to compare its effectiveness that is the success rate and time of intubation and ergonomic position of both aerosol box and enhanced aerosol box. Improvement of body

ergonomic can improve intubation success and time consumed for intubation. It can both increase the safety of both patient and the intubator.

2.4 CONCEPTUAL FRAMEWORK



1.RESEARCH QUESTION

- Which aerosol box is more effective in intubation procedure and the have better body position and lower risk of musculoskeletal disorder?

2.5 OBJECTIVES

2.5.1 General Objectives

- to determine the effectiveness and ergonomic body posture of medical personnelduring simulated intubation using both aerosol box and enhanced aerosol box

2.5.2 Specific Objectives

-To determine the success rate of intubation comparing aerosol box vs enhanced aerosol box

-To compare mean time between aerosol box vs enhanced aerosol box

-To compare mean Rapid Entire Body Assessment (REBA) score during intubation between aerosol box and enhanced aerosol box

2.6 METHODOLOGY

2.6.1 Study Design

-This is prospective cross-sectional study going to perform from May 2020 to May2021. Ethical clearance will be obtained from USM Research Ethical Committee.

2.6.2 Study Area

This study will be held at Emergency Department Hospital Universiti Malaysia(HUSM), Kubang Kerian, Kelantan.

2.6.3 Study Population

All master student in emergency medicine.

2.6.4 Subject Criteria Inclusion criteria:

- Emergency master student in HUSM
- This study is performed using emergency master student has experience on airway management. All emergency master students had regular training in airway management and required to pass clinical examination for airway procedure during part 1 exam. This procedure was regularly performed during clinical work.

Exclusion criteria:

- Student who not consented for study
- Student who had musculoskeletal problem
- Underlying prolapse intervertebral disc
- History of fracture of spine or long bone
- Pregnancy

2.6.5 Definitions

7.5.1. Intubation time : time taken between introduction of laryngoscope and the secure placement of the endotracheal tube

7.5.2. Fail intubation : endotracheal tube not in place after 3 attempt

7.5.3. Musculoskeletal disorders (MSD)- an injury or disorder of the muscles,nerves and tendon joints, cartilage and spinal disc

2.6.6 Sampling method and sample Size Estimation

There is no previous study on body ergonomic assessment of enhanced aerosol box.

The total Emergency Master student in HUSM is 61.

Using Epiinfo

Total population size = 61

Expected frequency 90%

Based on 95% confidence interval : sample required 42

Add 10% dropout rate : 4.2

Total sample required : 47 samples

Subject recruitment based on voluntary basis. The participant will be checked if they fulfilled the inclusion criteria. The objectives and process of the research will be explained to the eligible participants prior to obtaining their consent.

The risks of musculoskeletal injury and duration of study about 1 hour also explain to participant prior to get consent. They also informed that the study not compulsory for all emergency master student and only proceed if consented. Informed consent will then be obtained from the participant before proceed with the study.

2.6.7 Research Tool

1. Aerosol Box

- material acrylic or transparent polycarbonate sheets
- dimension: 50 cm (width) x 40cm (length) x 50cm (height)
- 2 x 10cm diameter hole (for intubator)
- thickness 5mm

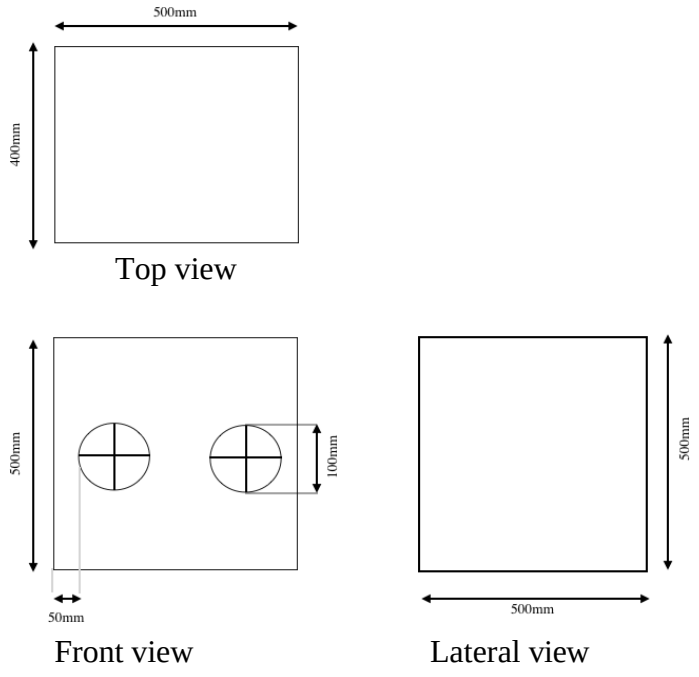


Figure 1 : Plan of aerosol box

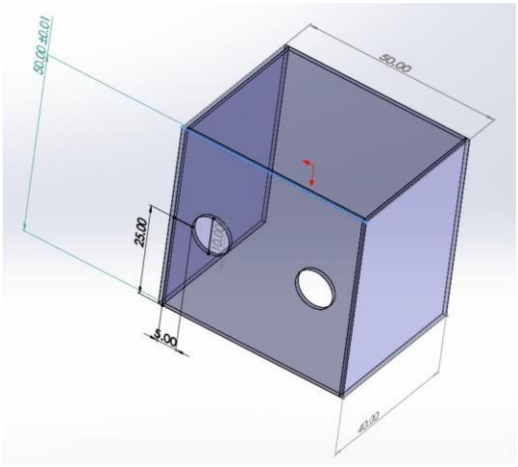


Figure 2: 3D illustration of aerosol box

2. Enhanced aerosol box
   - material : acrylic
   - dimension: 50 cm (width) x 40cm (length) x 60cm (height)
   - 3 x 10cm diameter hole (2 for intubator, 1 for assistant)
   - valve on every opening of the box
   - addition of viewing panel
   - thickness 5mm

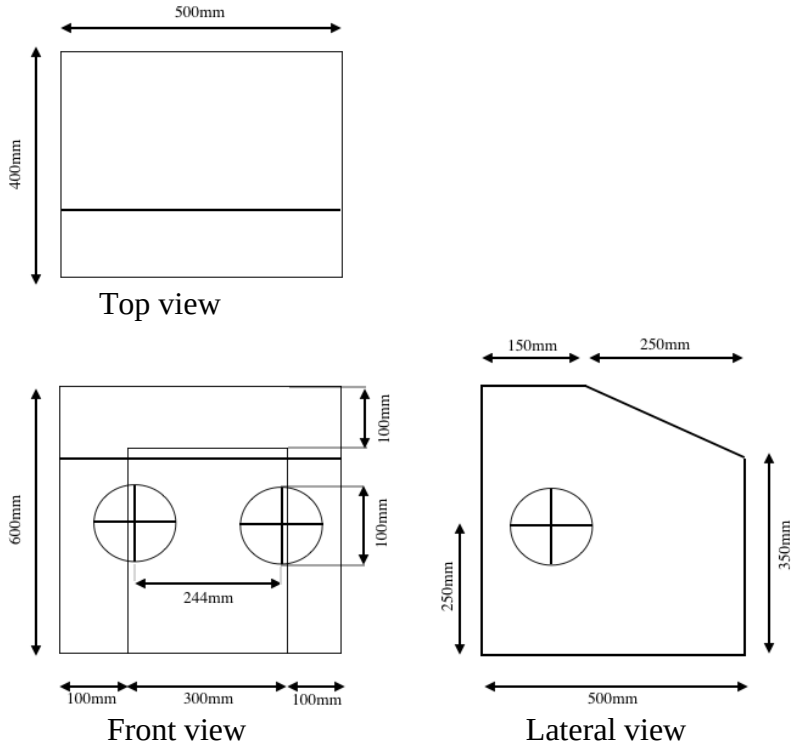


Figure 3 : Plan of enhanced aerosol box

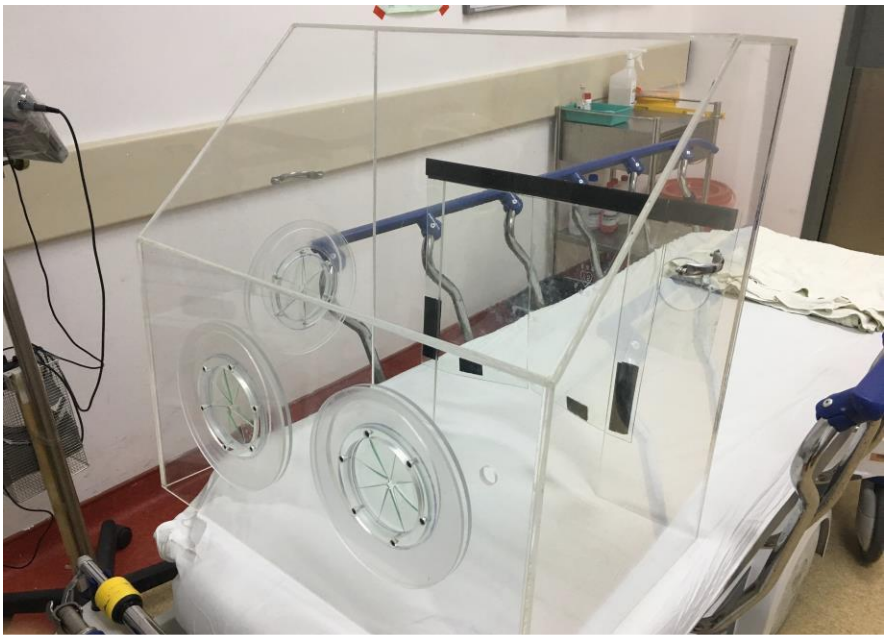


Figure 4: Front view of enhanced aerosol box (intubator view)

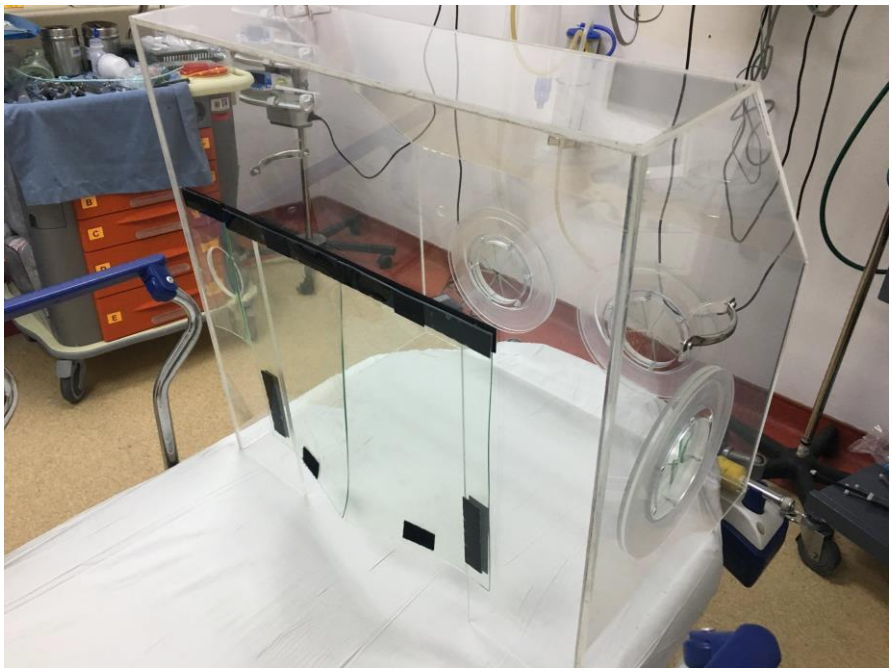


Figure 5 : Back view of enhanced aerosol box

2.6.8 Data Collection Method

Each participant is required to intubated a mannequin using video assisted laryngo- scope (VAL) and endotracheal tube (ETT) with stylet inside the ETT. Mannequin placed spine over the bed. The level of the bed is depending on laryngoscopist preferences. Participant will be randomised and divided to 2 groups. During the first session one group will intubate with aerosol box and another group will intubateusing enhanced aerosol box. The next session of sampling will be done 1 month after the first sampling and the group will change to intubate with another aerosol box. The researcher records the video from the left side of the laryngoscopist using a standard camera and tripod. This is to visualise the position and degree of up-per arm holding the laryngoscope. A trial is completed when the ETT cuff is inflated and laryngoscope is removed from mannequin airway. Video captured, stored and coded. The video will be analysed, body posture taken and REBA work sheet will be filled. The time of intubation and success rate are also recorded and analysed.

2.6.9 Ethical Consideration

During the study, all data involving the video will be held confidential and will be only accessible to the investigator and his team. The investigator also declared no conflict of interest with regard to this study. All subject is a post graduate student in Emergency Department and participation is voluntary basis. No patient will be involved in this study. Participant's safety and right will not be jeopardised and will always be prioritised over this study.If participant develop any form of musculoskeletal disorder during or immediately after the test, participant will be assessed and treatment will be initiated accordingly. All

subjects are told that we wish to film them as part of a study and that is not part of any assessment of them. No honorarium will be given to the participant. The participant will be awarded with a good ergonomic body posture and back care pamphlet and also advise on effectiveness of intubation method. Performance of participant will be held confidential. This study does not involve the community sensitivities. This study will benefit the community by introduce better and effective aerosol box which can be used during intubation procedure apart from teaching and learning purposes. Relevant permission will be obtained prior to publication. No personal information will be disclosed, nor subject will be traced or highlighted when finding of the research are published. This is internal study and intubation is not done on real patient, so there is no need to seek approval by Kementerian Kesihatan Malaysia (KKM) or related agencies and it would not harm any patient.

2.6.9 Data Entry and Analysis

1. Variable

- Demographic data
    - Age, gender, weight, height and working experiences

-REBA score during endotracheal intubation

-Intubation rate
    - Success - (Attempt) and non-success

-Intubation Time

2. Data Entry

Data will be entered and analysed using Statistical Package for Social Science (SPSS) for windows, version 24.0.

- Statistical Analysis

Objective 1 will be analysed using paired t test
Objective 2 will be analysed using paired t test
Objective 3 will be analysed using Independent t test

- Dummy tables

Table 1: socio demographic characteristic of study sample

Variables	**(Mean sd)**	**N(30)**
Demographic		
Age ,mean ± SD		
Gender		
Male Female		
Weight		
Height		
BMI		
Years of practice		

Table 2: Mean REBA score of participants performing endotracheal intubation with 2 different box

Variable	REBA score
Aerosol Box	
Enhanced Aerosol Box	

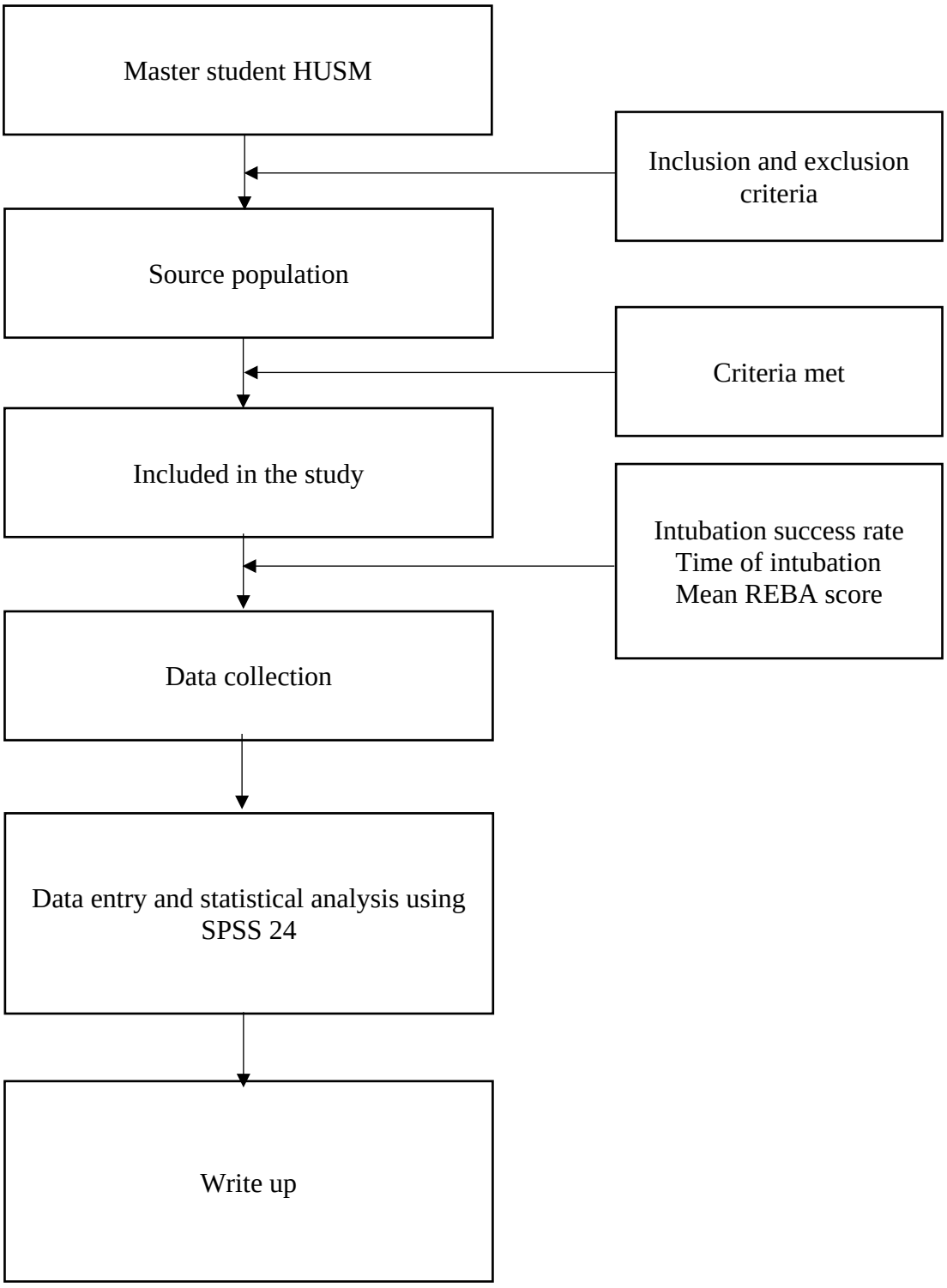
Table 3: Score of participants performing endotracheal intubation at 2 different box with success rate of intubation

Variables	Success	Attempt 1	Attempt 2
Aerosol Box			
Enhanced Aerosol Box			

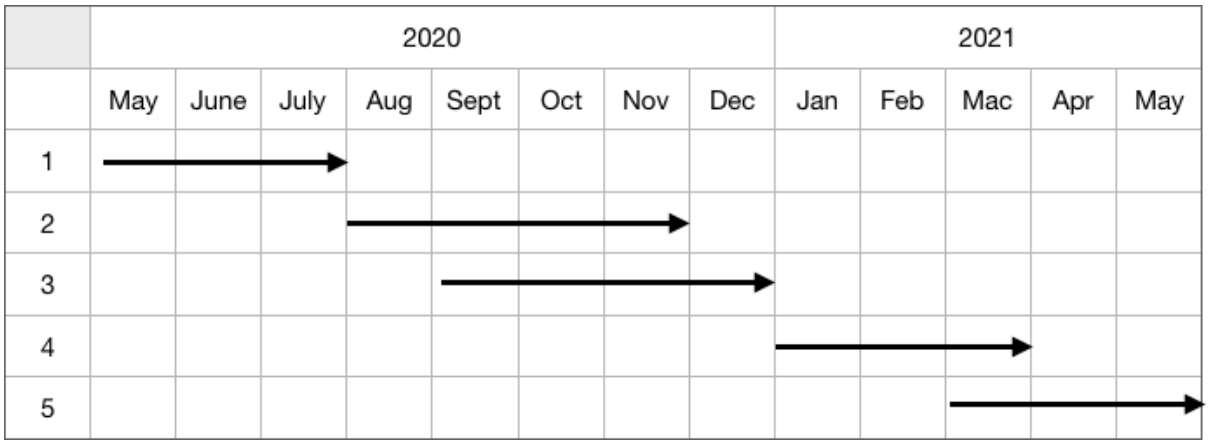
Table 4: Mean of time participant performing endotracheal intubation at 2 different box:

Variables	(Mean sd)	N(47)
Aerosol Box		
Enhanced Aerosol Box		

26.11 Flow Chart



11.0 GANTT CHART



1. Proposal presentation and preparation

2. Data collection

3. Data entry and analysis

4. Report preparation

5. Submission of draft

Milestone:

1. Designing the assessment tools is expected to be completed by the end of June 2020
2. Data collection is expected to be completed by the end of October 2020Data entry and analysis is expected to be completed by the end of December 2020
3. Report preparation is expected to be completed by the end of March 2021
4. Submission of draft is expected to be done by May 2021

13.0 REFERENCES:

1. International Pulmonologist Concensus on COVID-19 2nd edition

2. Covid-19: Epidemiology, Virology and prevention. retrieved from site https://www.uptodate.com/contents/coronavirus-disease-2019-covid-19-epidemiology-virology-and-prevention?search=covid-19&source=search_result&selectedTitle=8~150&usage_type=default&display_rank=8

3. Grasseli G, Zangrillo A, ZAnalia Et al. (2020) Baseline characteristic and outdome of 1591 patient infected with SARS-COV-2 admitted to ICUs of the Lombbardy Region Italy. 323(16) : 1574-1582

4. Hignett, S & Mc Atamney, L. (2000) Rapid Entire Body Assemsment (REBA). Applied Ergonomics, 31(2), 201-205.

5. World Health organisation : https://who.int/docs/default-sources/coronavirus/situation-reports/20200411-sitrep-82-covid-19.pdf

6. COVID-19: seramai 416 petunias kesihatan dijangkiti. Kementerian kesihatan malaysia

7. Khai Tran, Karen Cimon, Melissa Severn, Carmem L. Pessoa-Silva, John Conly. (2012) Aerosol Generating Procedures and Risk of Transmission of Acute Respiratory Infections to Healthcare Workrs: A Sytematic Review 7(4): e35797

8. Lai Hsien Yung (mennonite Christian Hospital, Hua Lian , T (2020) retrieved from https://sites.google.com/view/aerosolbox/home?authser=0

9. Musculoskeletal Disorders (2010). Retrieved from https//www.bls.gov/iif/osdef.htm

10. Wahab S.F.A, Noor M.H.M, Othman R (2019) Ergonomic Risk Assessment of Musculoskeletal Disorder (MSD) during simulated Endotracheal Intubation in Hospital University Sains Malaysia (HUSM). In : Lightner N. Advances in Human Factors and Ergonomics in Healthcare and Human Devices. AHFE 2018. Advances in Intelligent Systems and Computing, vol 779. Springer Cham

11. T. Grundegeiger. O. Happel, J Grundgeiger, N. Roewer (2014) Body Posture during Simulated Tracheal Intubation: Comparison of the Effects of Video Laryngoscopy and Direct Laryngoscopy. Sage Journal, Volume :58 issue 1, page 1184-1188

12. D. Caldrirolo, F. Molteni, A. Sommariva, S. Frittoli, E. Guanziroli, P. Cortellazzi, E.F Orena (2013) Upper limb muscular activety and perceived workload during larynxscopy: comparison of glidescope and Macintosh larynxscopy in amnion: an observational study. British Journal of Anaesthesia; 563-569

13. Canelli, R, Connor, C.W. , Gonzalez, M. NOzari, A & Ortega, R (2020) Barrier Enclosure during Endotracheal Intubation. N England Journal Med 202; 381:1957-1958

14. J.L Beley, K.E. Lavery, C.P NIckson, D.J Brewster. May 2020 The Aerosol box for intubation in coronavirus disease 2019 patients: an in-situ simulation crossover study. Anaes-theisa 2020, 75, 1014-1221

CHAPTER 3
MANUSCRIPT

3.1 TITLE PAGE

COMPARISON OF AEROSOL BOX VS ENHANCED AEROSOL BOX: EFFECTIVENESS & ERGONOMIC PERSPECTIVE

Saiyidi Mohd Azizi **Mohd Adibi**, MD[1,2], Shaik Farid **Wahab,** MMed[1,2]**,** Tuan Hairunizam **Tuan Kamauzaman** MMed[1,2]**,** MMed[1,2] Rohayu **Othman,** Phd[3]

[1]Department of Emergency Medicine, School of Medical Sciences, Universiti Sains Malaysia (USM), Kubang Kerian, Kelantan, Malaysia

[2]Hospital Universiti Sains Malaysia, Kubang Kerian, Kelantan, Malaysia

[3]Universiti Malaysia Kelantan (UMK)

Corresponding author:

Shaik Farid ABD WAHAB, Department of Emergency Medicine, Universiti Sains Malaysia, School of Medical Sciences, 16150 Kubang Kerian, Malaysia
Email: drsfarid@usm.my

3.2 ABSTRACT

Introduction

Due to high rate of transmission of coronavirus affecting healthcare worker (HCW) and limited personnel protective equipment (PPE), aerosol box was invented to improve the safety of HCW during intubation. Certain modification made to the aerosol box to make enhanced aerosol box for better safety and benefit for both patient and intubator. There is growing concern of ergonomic factors that affect the HCW particularly during intubation. This study aims to analyse the effectiveness of both aerosol box and enhanced aerosol box in the context of success rate, time of successful intubation and ergonomics.

Material and Methods

In this study the participants were required to intubate an adult mannequin using video assisted laryngoscope (VAL). The participant intubated the mannequin using different type of box; aerosol box and enhanced aerosol box. The intubation procedure was recorded throughout the procedure from both side of participant to asses for success rate of intubation, the time of successful intubation and body posture of the participant for calculation of REBA score.

Results

We recruited a total of 47 post graduate students. All participants were able to intubate using both aerosol box in single attempt. Usage of enhanced aerosol box was associated with longer duration of successful intubation. The mean score showed longer duration of successful intubation of using enhanced aerosol box compared to aerosol box that was 32.4 sec and 26.9 sec respectively. Further analysis using paired T test showed statistically significant in mean time taken to successful endotracheal intubation using enhanced aerosol box (p-value = 0.000).