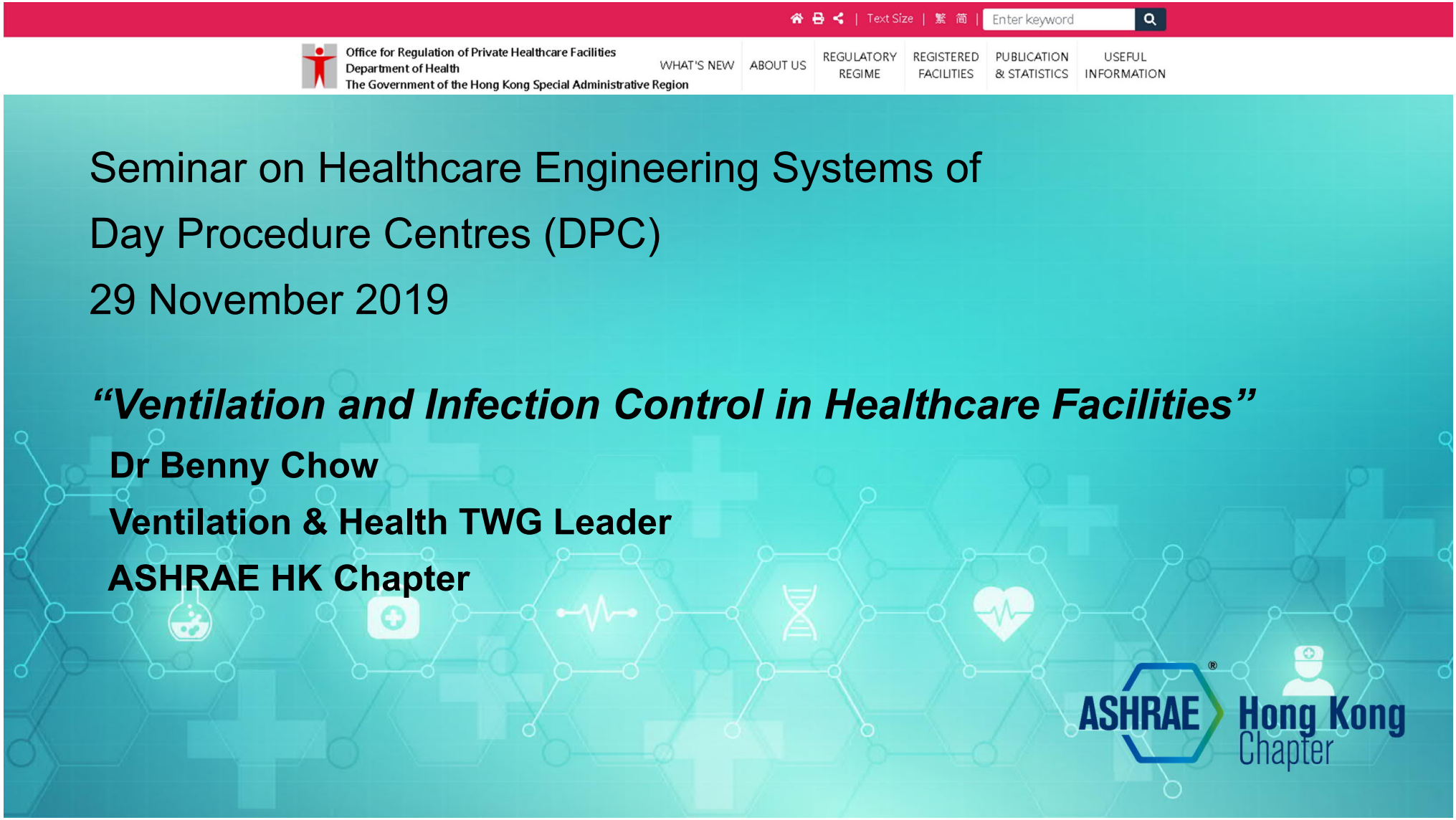
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Office for Regulation of Private Healthcare Facilities
Department of Health
The Government of the Hong Kong Special Administrative Region
WHAT'S NEW
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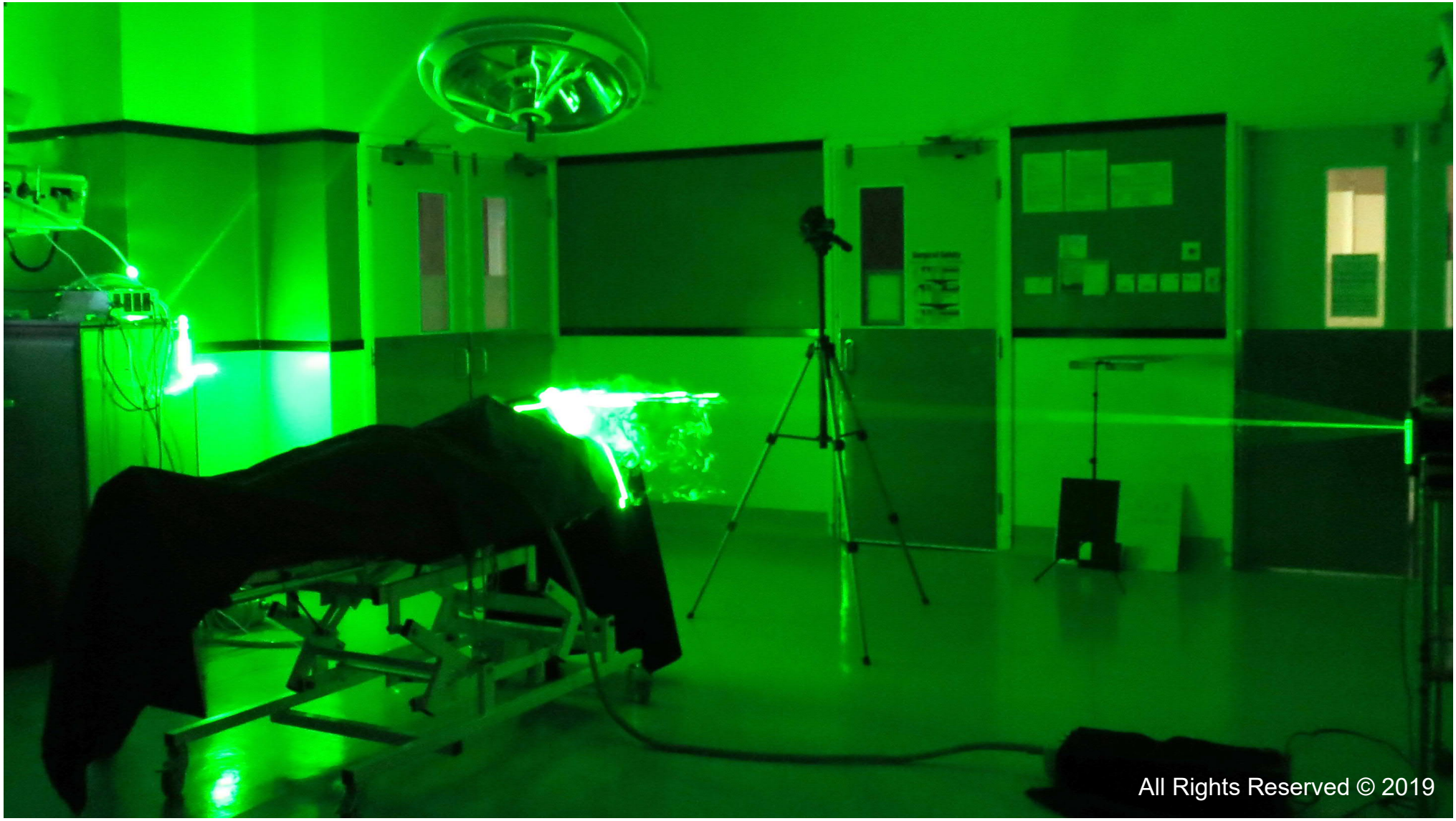
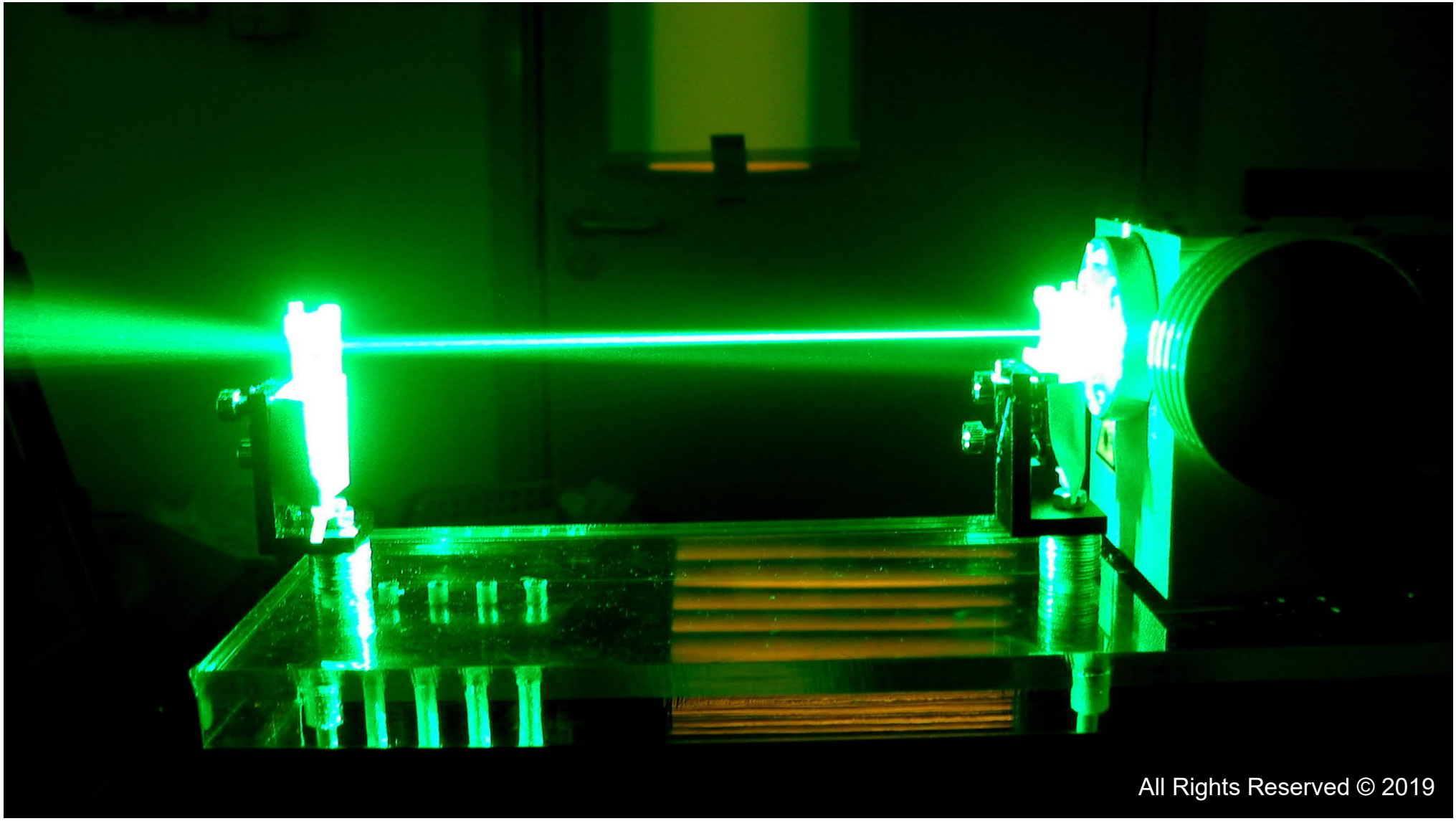
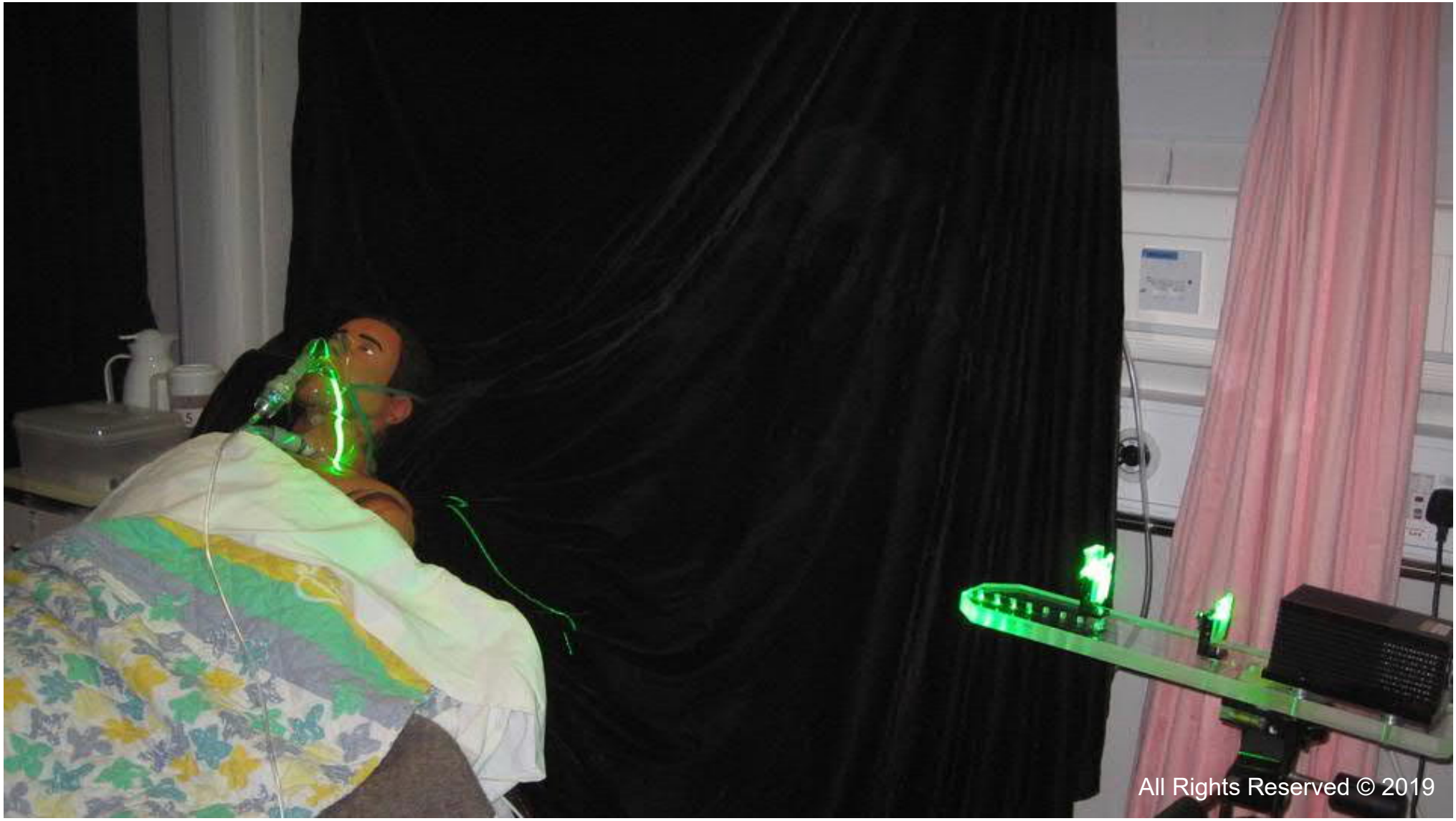
REGISTERED FACILITIES
PUBLICATION & STATISTICS
USEFUL INFORMATION
Seminar on Healthcare Engineering Systems of
Day Procedure Centres (DPC)
29 November 2019
"Ventilation and Infection Control in Healthcare Facilities"
Dr Benny Chow
Ventilation & Health TWG Leader
ASHRAE HK Chapter
ASHRAE
Hong Kong
Chapter







Outline of the Presentation

1. **“Specialized Ventilation System”** (SVS) – OT/OR in a DPC
2. **Design and Installation of SVS**
3. Ongoing **Routine Maintenance** & Maintenance Record
4. **Resuscitation** of Patients

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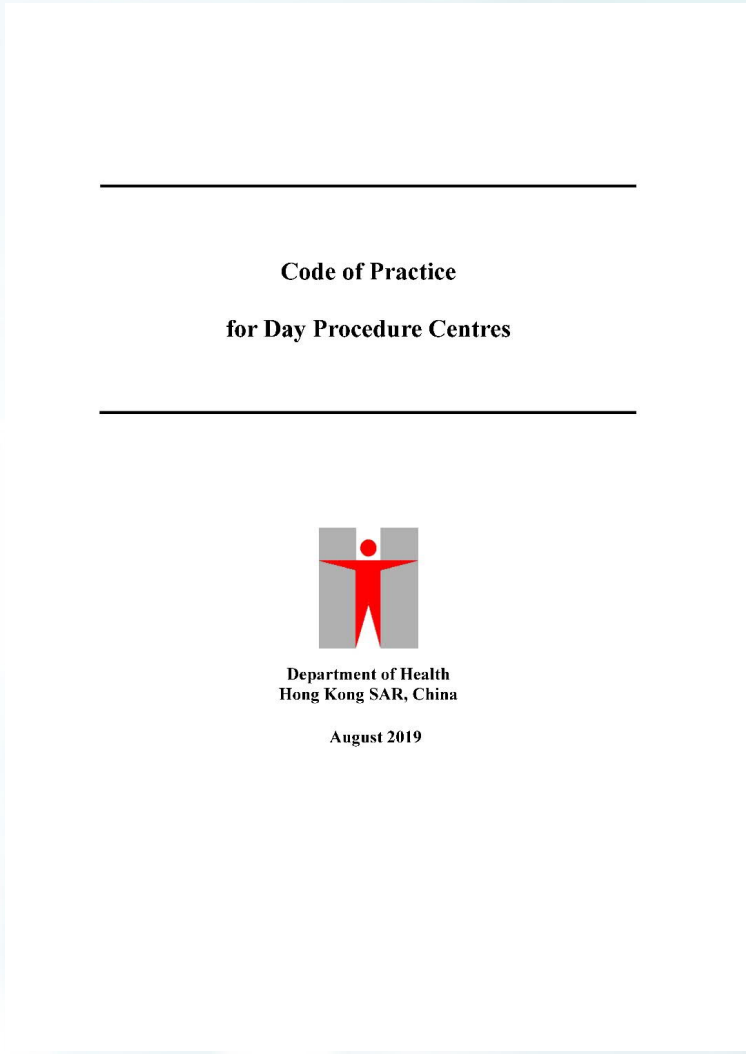

Code of Practice for Day Procedure Centres

Department of Health
Hong Kong SAR, China
August 2019
(140 pp.)

PART 1

Specialized Ventilation System (SVS) for Operating Theater / Procedural Room in DPC

ASHRAE Hong Kong Chapter

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(ASHRAE-HKC/Med.CUHK)

PART 1

“Specialized Ventilation System” (SVS) – OT/OR in a DPC

- Prevention of the Spread of **Airborne Infectious (AI)** Disease
- Prevention and Control of **Healthcare-associated** Infection
- **Dilution and Removal** of Contaminants and Fumes Where Used.

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Specialized Ventilation System for DPC

Scope under CoP of DPC – Operative/Procedural Area)

1. **Surgical Procedure** (Section 2.2.2,OR is equipped with SVS)
2. **Dental Procedure** (Section 4.2.2, OR is equipped with SVS)
3. **Interventional Radiology and Lithotripsy**
   (Section 7.2.2.3, OR is equipped with SVS)

Notes: No SVS requirements on Endoscopic, Chemotherapy, Haemodialysis, Anaesthetic Procedure, Radiotherapy

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Specialized Ventilation System for DPC

Specialized Ventilation System of Operating Room

1. Internationally acceptable standards of air quality (such as **ASHRAE 170** / **HTM 03-01**)
2. Adequate number of fresh **Air Exchange per hour (ACH)**
3. Prevent the **spread of airborne infectious diseases** and to minimize surgical site infection

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Specialized Ventilation System for DPC

Relevant Statutory Requirements (including but not limited to)

1. *Buildings Ordinance (Cap. 123);*
2. *Electricity Ordinance (Cap. 406);*
3. *Fire Services Ordinance (Cap. 95);*
4. *Building Energy Efficiency Ordinance (Cap. 610);*
5. *Public Health and Municipal Services Ordinance (Cap. 132).*

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Specialized Ventilation System for DPC

Relevant Local Guidance on Ventilation

(including but not limited to)

1. *"ICB Infection Control Guidelines" promulgated by the **Centre for Health Protection (CHP**) should be observed;*
2. *"Fresh Water Cooling Towers Scheme Brochure and Code of Practice for Fresh Water Cooling Towers: Parts 1, 2 and 3 promulgated by the **Electrical and Mechanical Services Department (EMSD)**.*

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PART 2

Design and Installation of Specialized Ventilation System

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(ASHRAE-HKC/Med.CUHK)

Design & Installation of SVS

1. Internationally Acceptable Healthcare Standards;
2. Ventilation Design Parameters and Requirements;
3. Pressure Relationship to Adjacent Areas
4. Ventilation Rate in Air Exchange Rate (ACH)
5. Filter Efficiency
6. Design Temperature & Relative Humidity

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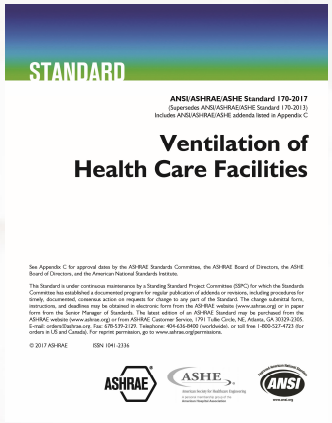
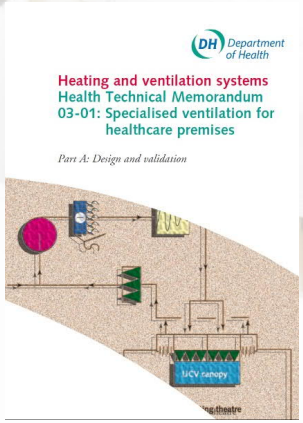
Internationally Acceptable Healthcare Standards

1. ANSI/ASHE/**ASHRAE Standard 170 – Ventilation of Health Care Facilities** or **Health Technical Memorandum (HTM) 03-01** – Specialized ventilation for healthcare premises or equivalent.





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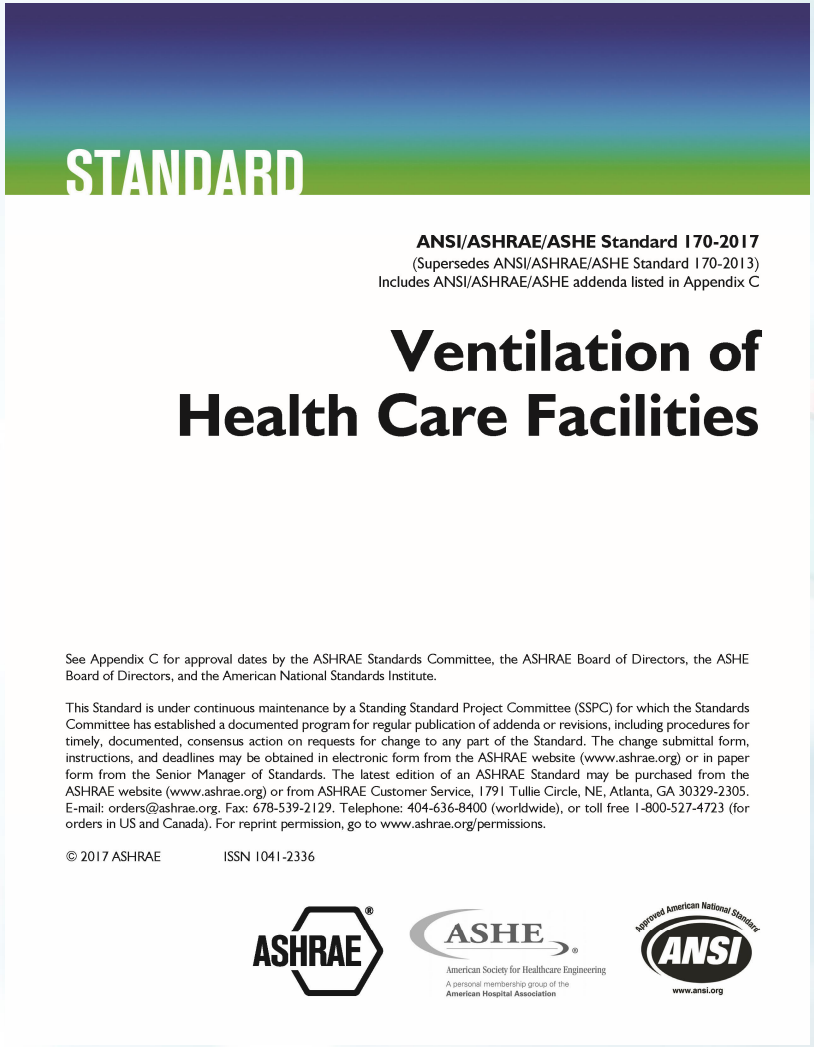
ASHRAE Standard 170 (2017 Edition)

(Supersedes ASHRAE Standard 170-2013) Includes ANSI/ASHRAE/ASHE addenda listed in Appendix C


STANDARD

ANSI/ASHRAE/ASHE Standard 170-2017
(Supersedes ANSI/ASHRAE/ASHE Standard 170-2013)
Includes ANSI/ASHRAE/ASHE addenda listed in Appendix C

Ventilation of Health Care Facilities

See Appendix C for approval dates by the ASHRAE Standards Committee, the ASHRAE Board of Directors, the ASHE Board of Directors, and the American National Standards Institute.

This Standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the Standard. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE website (www.ashrae.org) or in paper form from the Senior Manager of Standards. The latest edition of an ASHRAE Standard may be purchased from the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

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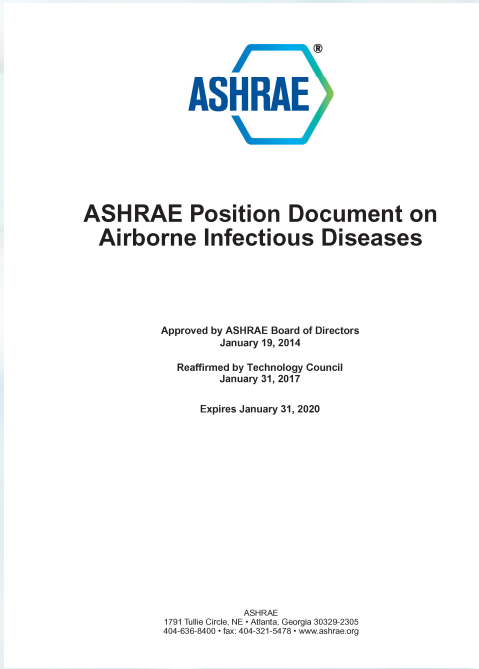
ASHE
American Society for Healthcare Engineering
A personal membership group of the American Hospital Association

Approved American National Standard
ANSI
www.ansi.org


ASHRAE

ASHRAE Position Document on Airborne Infectious Diseases

Approved by ASHRAE Board of Directors
January 19, 2014

Reaffirmed by Technology Council
January 31, 2017

Expires January 31, 2020

ASHRAE
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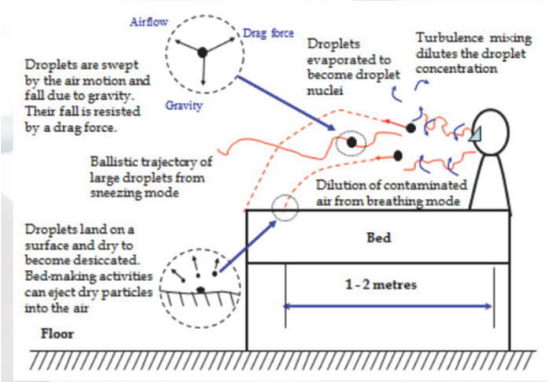

Source: ASHRAE Position Document on Airborne Infectious Diseases (2014)

Dr. Benny CHOW
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ASHRAE 170–2017 (Ventilation of Health Care Facilities)

Table 7.1 Design Parameters—Hospital Spaces

Function of Space	Pressure Relationship to Adjacent Areas (n)	Minimum Outdoor ach	Minimum Total ach	All Room Air Exhausted Directly to Outdoors (j)	Air Recirculated by Means of Room Units (a)	Design Relative Humidity (k), %	Design Temperature (l), °F/°C
SURGERY AND CRITICAL CARE							
Critical and intensive care	NR	2	6	NR	No	30–60	70–75/21–24
Delivery room (Caesarean) (m), (o)	Positive	4	20	NR	No	20–60	68–75/20–24
Emergency department decontamination	Negative	2	12	Yes	No	NR	NR
Emergency department exam/treatment room (p)	NR	2	6	NR	NR	Max 60	70–75/21–24
Emergency department public waiting area	Negative	2	12	Yes (q)	NR	Max 65	70–75/21–24
Intermediate care (s)	NR	2	6	NR	NR	Max 60	70–75/21–24
Laser eye room	Positive	3	15	NR	No	20–60	70–75/21–24
Medical/anesthesia gas storage (r)	Negative	NR	8	Yes	NR	NR	NR
Newborn intensive care	Positive	2	6	NR	No	30–60	72–78/22–26
Operating room (m), (o)	Positive	4	20	NR	No	20–60	68–75/20–24
Operating/surgical cystoscopic rooms (m), (o)	Positive	4	20	NR	No	20–60	68–75/20–24
Procedure room (o), (d)	Positive	3	15	NR	No	20–60	70–75/21–24
Radiology waiting rooms	Negative	2	12	Yes (q), (w)	NR	Max 60	70–75/21–24
Recovery room	NR	2	6	NR	No	20–60	70–75/21–24
Substerile service area	NR	2	6	NR	No	NR	NR
Trauma room (crisis or shock) (c)	Positive	3	15	NR	No	20–60	70–75/21–24
Treatment room (p)	NR	2	6	NR	NR	20–60	70–75/21–24
Triage	Negative	2	12	Yes (q)	NR	Max 60	70–75/21–24
Wound intensive care (burn unit)	NR	2	6	NR	No	40–60	70–75/21–24

Ventilation Design Requirements of Operating Theatres/Rooms (I)

(a) Ventilation design parameters

Pressure Relationship to Adjacent Areas	Min. Outdoor ACH	Min. Total ACH	Min. Filter Efficiency	Design Temp. ^{0}C	Design Relative Humidity %
Positive (at least +2.5Pa)	4	20	MERV-14	20 - 24	20 - 60

(b) Recirculating devices with high-efficiency particulate air (HEPA) filters may be used to achieve the required room air changes per hour (ACH), provided the specified minimum outdoor ACH is supplied.

(c) Air recirculated by means of room units should not be used.

(d) Each room has individual temperature control.

Dr. Benny CHOW
(ASHRAE-HKC/Med.CUHK)

Guidelines for Healthcare Engineering Systems of Private Hospitals vs Day Procedure Centres

	Function of Space	Pressure Relationship to Adjacent Areas	Min. Outdoor ACH	Min. Total ACH	All Room Air Exhausted Directly to Outdoors	Air Recirculated by Means of Room Units[1]	Design Relative Humidity %	Deign Temp. ^{0}C	Min. Filter Efficiency
1	Operating theatre / room (OT/OR)	Positive	4	20	NR	No	20-60	20-24	MERV-14
2	Airborne Infection Isolation (AII) room	Negative	2	12	Yes	No	Max 60	21-24	MERV-14
3	Protective Environment (PE) room	Positive	2	12	NR	No	Max 60	21-24	HEPA

Note:

NR – no requirement

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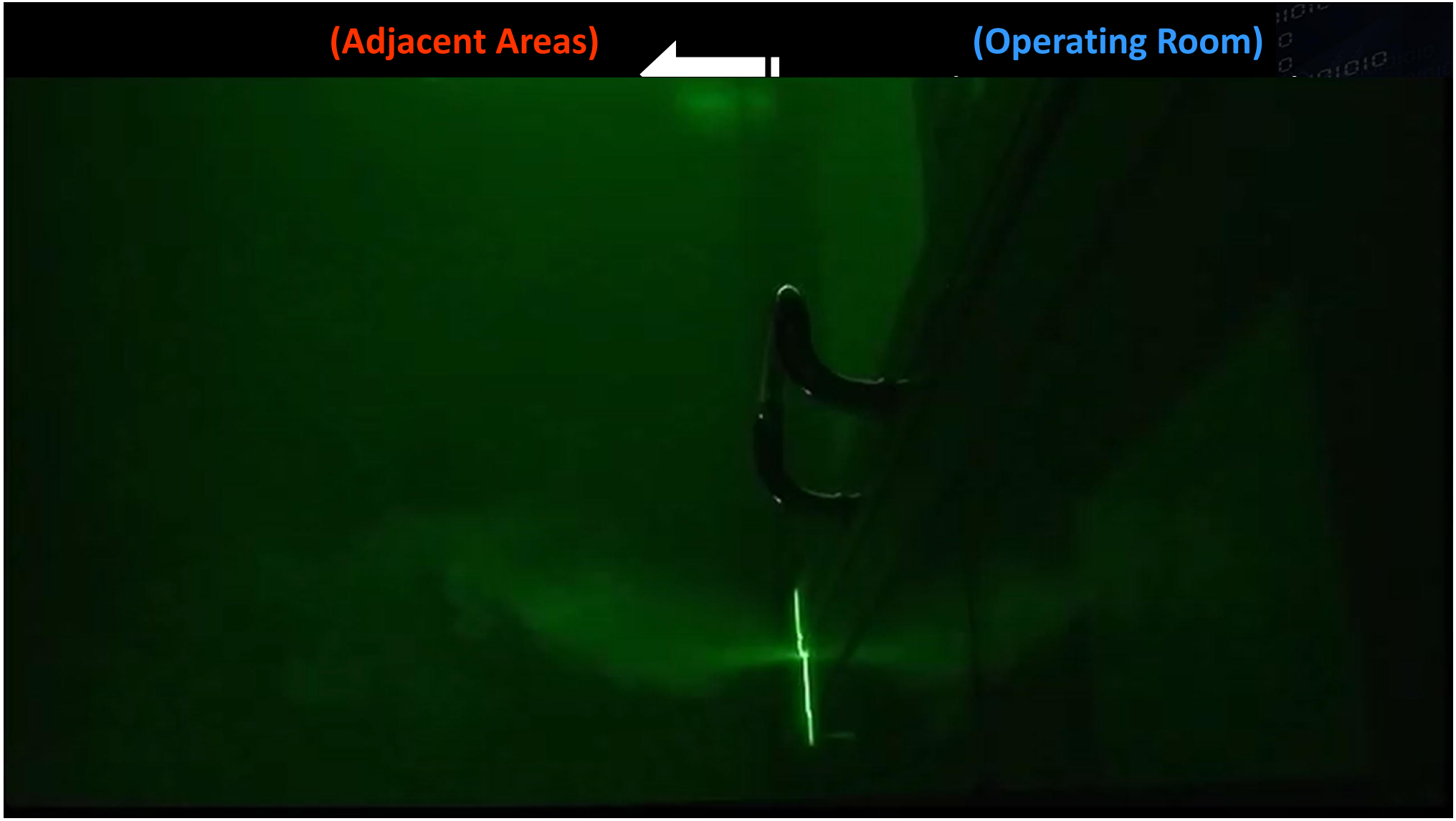
(Adjacent Areas)
(Operating Room)

Ventilation Design Requirements of Operating Theatres/Rooms (II)

(e) Operating theatres/rooms are provided with a primary supply diffuser array to provide an airflow pattern over the patient and surgical team. The air flow is unidirectional and downwards.

(f) The room is provided with at least two low sidewall return or exhaust grilles spaced at opposite corners or as far apart as possible.

The designed ventilation rate and pressure gradient are maintained by back-up power supply in the event of loss of normal electrical power supply. Where it is not feasible to maintain the designed ventilation rate and pressure gradient by back-up power supply, an operational policy is established to ensure patient safety in that event.

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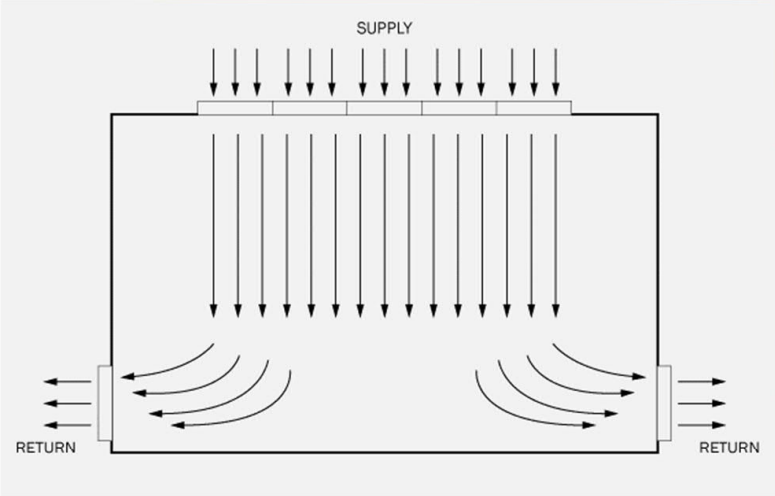
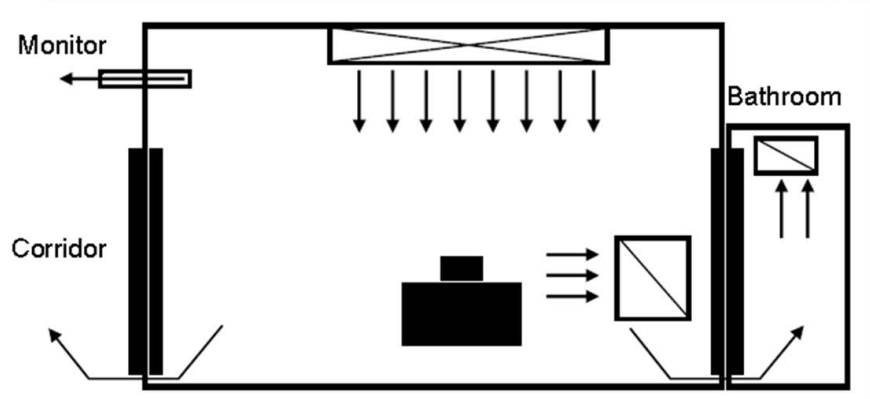
Ventilation Design Requirements of Operating Theatres/Rooms (II)





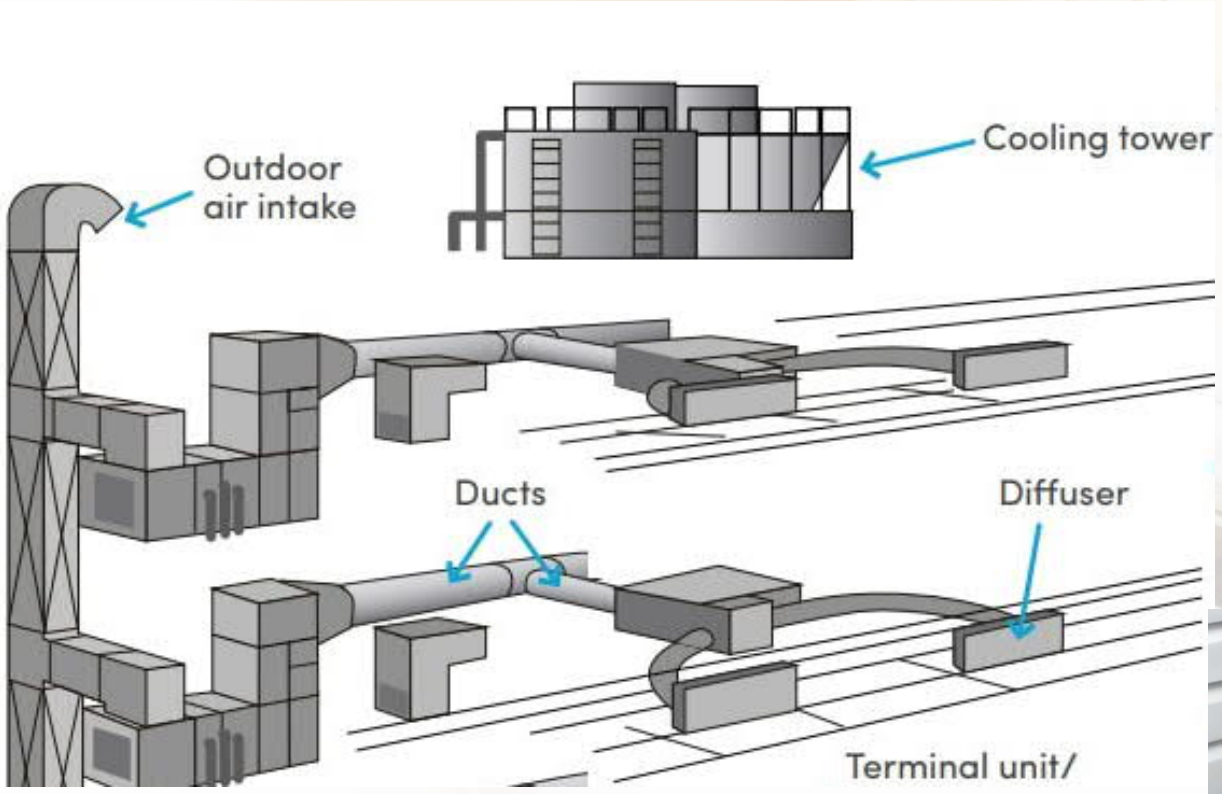
Source: https://www.atdiopl.com/laminar-air-flow/

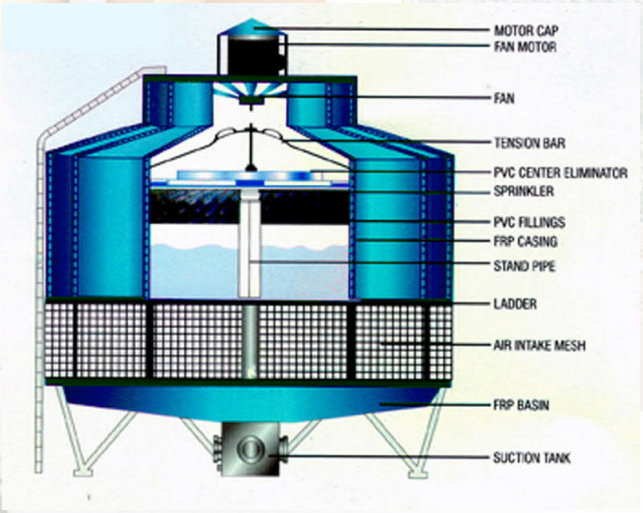
Ventilation Design Requirements of Operating Theatres/Rooms (III)

Where outdoor air intake are installed as part of the installations of DPC, the outdoor air intakes are situated away from cooling towers, boiler flues, exhaust and vent discharges, and places where vehicle exhaust gases may be drawn in.

Where exhaust discharge outlets are installed as part of the installations of DPC, the exhaust discharge outlets are placed at a suitable location to minimise the recirculation of discharged air back into the building.

Ventilation Design Requirements of Operating Theatres/Rooms (III)





Source: https://www.criticalair.com.au/in-the-news/hvac-data-analysis

PART 3

Operation and Maintenance

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Operation and Maintenance (I)

The specialized ventilation systems are properly operated and maintained, complying with all applicable statutory requirements and taking into consideration of the guidance given in internationally acceptable healthcare standards such as *ANSI/ASHRAE/ASHE Standard 170*, *HTM 03-01* or equivalent, manufacturers' recommendations and good trade practices.

An ongoing routine maintenance of the specialized ventilation systems is in place to ensure proper functioning and adequate supply and exhaust of air in the designated areas of the DPC. Documentation of repair and maintenance of the systems is kept.

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Operation and Maintenance (II)

Where fresh water cooling towers are installed as part of the installations of DPC, they are –

(a) maintained in a good and uncontaminated condition;

(b) monitored and controlled of their cooling water quality, including the presence of legionella and heterotrophic bacteria; and

(c) audited independently on their operation and maintenance annually.

Subject to infection control considerations, the ventilation systems of the operating theatres/rooms may be set back or turned off during periods of non-use, provided that full ventilation is reinstated well in advance of the commencement of operating.

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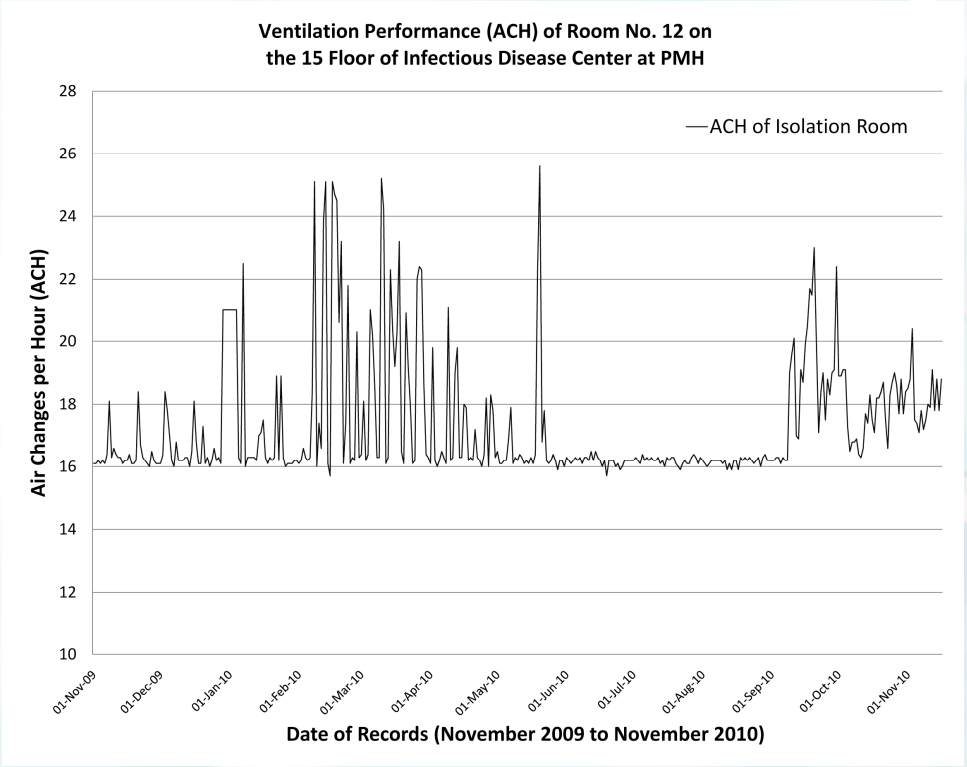
Operation and Maintenance (II)



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PART 4

Resuscitation of Patients

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Resuscitation of Patients

There are adequate and appropriate resuscitation equipment including but not limited to:

(a) device that can ventilate the lungs;
(b) oxygen supply;
(c) suction;
(d) basic intravenous setup; and
(e) defibrillator.

In a facility where procedural sedation is conducted, resuscitation equipment and emergency medications as required in the *Guidelines on Procedural Sedation* (2019), promulgated by the Hong Kong Academy of Medicine, are in place. Regular checks on their viability are conducted and documented.

Resuscitation of Patients

Full set of Resuscitator used in the experiment, including a mask cover, patient valve, silicone bag and an O2 reservoir bag.

Bacterial Viral Filter

ASHRAE Hong Kong Chapter

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Resuscitation of Patients

The CME ensures that there are written policies and procedures for resuscitation of patients and resuscitation facilities for emergencies. Resuscitation equipment are easily accessible and checked at regular interval. The CME ensures that there are sufficient staff who are trained for cardiopulmonary resuscitation on duty at all times. The facility carries out resuscitation drills regularly.

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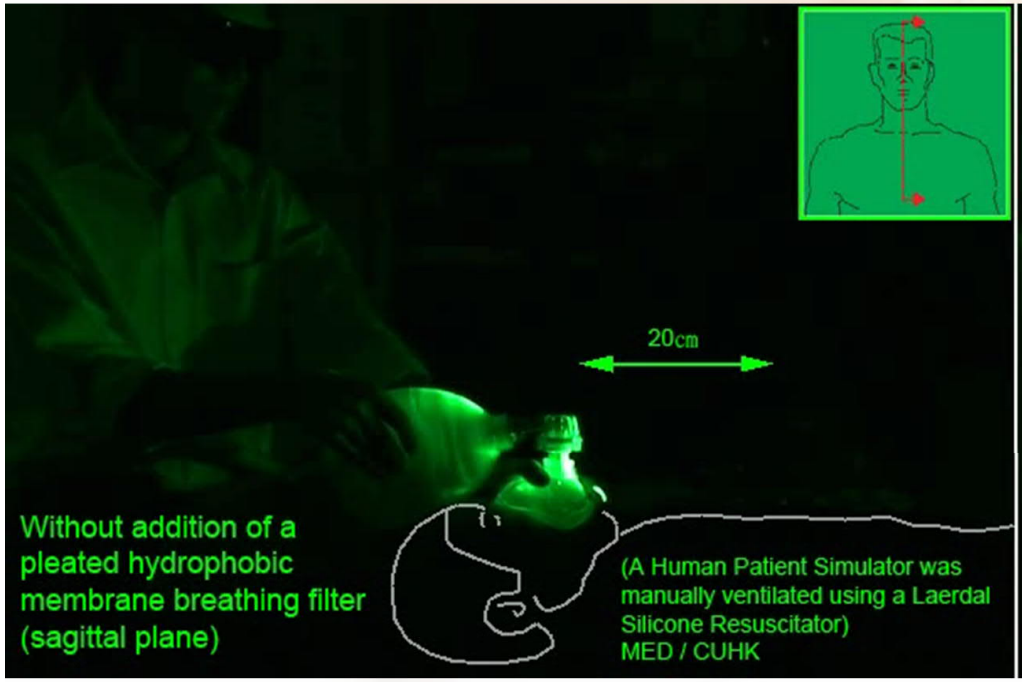
Resuscitation of Patients



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SCIENTIFIC REPORTS

OPEN

Exhaled air dispersion during bag-mask ventilation and sputum suctioning - Implications for infection control

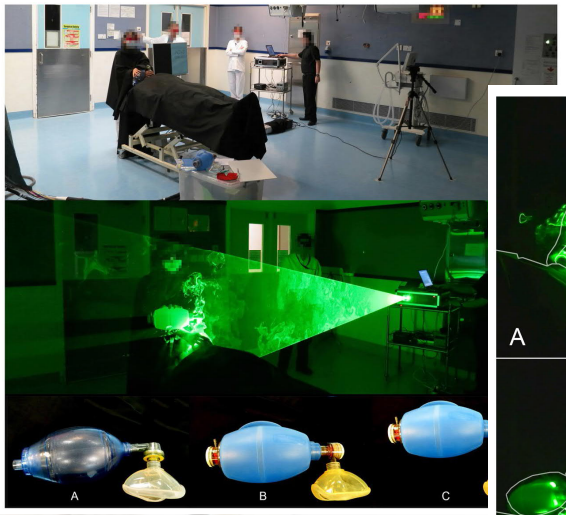
Received: 26 July 2017
Accepted: 14 December 2017
Published online: 09 January 2018

Matthew T. V. Chan[1,4], Benny K. Chow[2], Thomas Lo[1], Fanny W. Ko[3], Susanna S. Ng[3], Tony Gin[1] & David S. Hui[2,3]

Mask ventilation and coughing during oro-tracheal suctioning produce aerosols that enhance nosocomial transmission of respiratory infections. We examined the extent of exhaled air dispersion from a human-patient-simulator during mask ventilation by different groups of healthcare workers and coughing bouts. The simulator was programmed to mimic varying severity of lung injury. Exhaled airflow was marked with tiny smoke particles, and highlighted by laser light-sheet. We determined the normalized exhaled air concentration in the leakage jet plume from the light scattered by smoke particles. Smoke concentration ≥20% was considered as significant exposure. Exhaled air leaked from mask-face interface in the transverse plane was most severe (267 ± 44 mm) with Ambu silicone resuscitator performed by nurses. Dispersion was however similar among anesthesiologists/intensivists, respiratory physicians and medical students using Ambu or Laerdal silicone resuscitator, $p = 0.974$. The largest dispersion was 860 ± 93 mm during normal coughing effort without tracheal intubation and decreased with worsening coughing efforts. Oro-tracheal suctioning reduced dispersion significantly, $p < 0.001$, and was more effective when applied continuously. Skills to ensure good fit during mask ventilation are important in preventing air leakage through the mask-face interface. Continuous oro-tracheal suctioning minimized exhaled air dispersion during coughing bouts when performing aerosol-generating procedures.

Respiratory failure is a serious complication of emerging infectious respiratory diseases such as severe acute respiratory syndrome (SARS)[1,2], avian influenza[3], influenza A(H1N1)2009 infection[4] and the Middle East Respiratory Syndrome[5]. Supplemental oxygen, non-invasive ventilation (NIV) and occasionally invasive mechanical ventilation are required for managing these patients[1–5]. During the major outbreak of SARS, it was found that procedures related to tracheal intubation[6], oxygen administration ≥6 L/min, and NIV were independent risk factors for super-spreading nosocomial outbreaks affecting many healthcare workers in Hong Kong and Guangzhou, China[7]. In a systematic review of aerosol generating procedures that might increase the risk of nosocomial transmission of SARS to healthcare workers, mask ventilation and oro-tracheal suctioning increased the odds ratios (95% confidence intervals, CI) to 2.8 (1.3–6.4) and 6.2 (2.2–18.1), respectively[8]. In this respect, we have previously shown that the dispersion distances of exhaled plume along the sagittal and transverse planes were 200 and 220 mm, respectively, when bag-mask ventilation was attempted in a human-patient-simulator (HPS)[9]. Although the addition of a viral-bacterial filter eliminated forward leakage of exhaled air from the expiration diverter, leakage at the interface between the mask and the patient's face was increased to 340 mm along the transverse plane. It is unclear if the increased leakage along the transverse plane was due to the higher resistance with the filter or related to inefficient mask seal[9]. In addition, oro-tracheal suctioning may trigger coughing bouts that could further increase the spread of potentially infectious droplets. However, effective suction may limit the dispersion. Further studies are therefore required to examine if there are technical or human factors involved that

[1]Department of Anaesthesia and Intensive Care, The Chinese University of Hong Kong, Hong Kong, China. [2]Stanley Ho Center for Emerging Infectious Diseases, The Chinese University of Hong Kong, Hong Kong, China. [3]Department of Medicine and Therapeutics, The Chinese University of Hong Kong, Hong Kong, China. [4]Li Ka Shing Institute of Health Sciences, The Chinese University of Hong Kong, Hong Kong, China. Correspondence and requests for materials should be addressed to D.S.H. (email: dschui@cuhk.edu.hk)



Chan, Matthew T. V., Benny K. Chow, et el. "Exhaled Air Dispersion during Bag-Mask Ventilation and Sputum Suctioning - Implications for Infection Control." ***Nature Scientific Reports*** 8, no. 1 (December 2018)

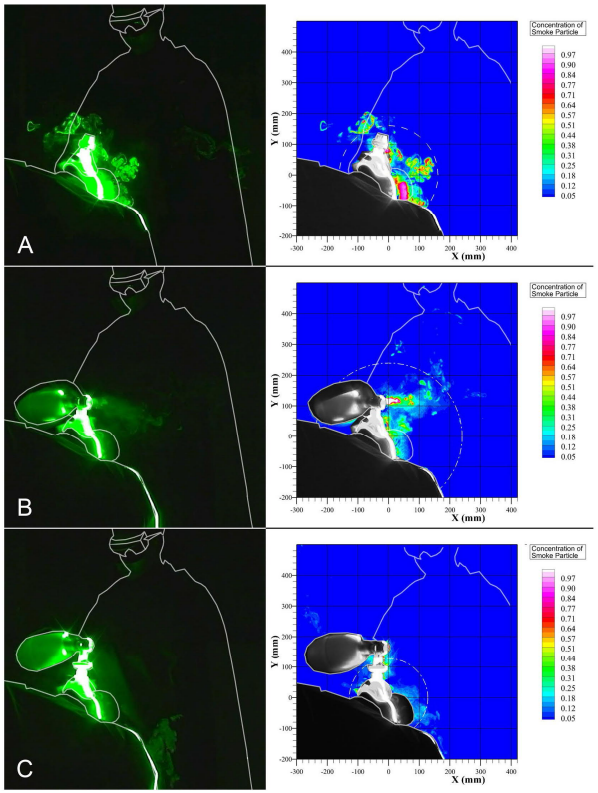


Figure 1. Bag-mask ventilation performed by an anaesthesiologist using (**A**) Laerdal silicone resuscitator (left panel) and the calculated normalized concentration of the smoke particle in the transverse plane of the expiration port (right panel); (**B**) Ambu silicone resuscitator and (**C**) Ambu silicone resuscitator with addition of a breathing filter, respectively.

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第[redacted]章 《私營醫療機構條例》
Cap. 633 Private Healthcare Facilities Ordinance

Timeline

TOC

本條例旨在就規管私營醫療機構，訂定條文；廢除《醫院、護養院及留產院註冊條例》，以及就將長者護養院轉為受《安老院條例》規管，訂定條文；廢除《診療所條例》及其附屬法例；並就附帶及相關事宜，訂定條文。

[2019年7月2日] *2019年第85號法律公告*

由立法會制定。

第1部

導言

1. 簡稱及生效日期

(1) 本條例可引稱為《私營醫療機構條例》。

(2) 本條例自食物及衞生局局長以憲報公告指定的日期起實施。

An Ordinance to provide for the regulation of private healthcare facilities; to repeal the Hospitals, Nursing Homes and Maternity Homes Registration Ordinance and provide for the transfer of nursing homes for elderly persons to be regulated under the Residential Care Homes (Elderly Persons) Ordinance; to repeal the Medical Clinics Ordinance and its subsidiary legislation; and to provide for incidental and related matters.

[2 July 2019] *L.N. 85 of 2019*

Enacted by the Legislative Council.

Part 1

Preliminary

1. Short title and commencement

(1) This Ordinance may be cited as the Private Healthcare Facilities Ordinance.

(2) This Ordinance comes into operation on a day to be appointed by the Secretary for Food and Health by notice published in the Gazette.


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Enquiries

List of Private Hospitals

List of Registered Nursing Homes

List of Clinics

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Photo: Selfie taken in Prince of Wales Hospital SARS Isolation Ward in 2003
Courtesy: Dr. Benny Chow