COVID-19 & Healthcare Workers

Khachornsakdi Silpapojakul MD

Prince of Songkla University

Hat yai, Songkla, Thailand

Scope of presentations

Part 1: Probability of getting infected, hospitalized or dying from COVID 19 infection among healthcare workers.

Probability of spreading the disease to their families and the outcomes.

Part 2: Infection control to prevent COVID-19 infection .

Part 1:

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus–Infected Pneumonia

Qun Li, M.Med., Xuhua Guan, Ph.D., Peng Wu, Ph.D., Xiaoye Wang, M.P.H., Lei Zhou, M.Med., Yeqing Tong, Ph.D., Ruiqi Ren, M.Med., Kathy S.M. Leung, Ph.D., Eric H.Y. Lau, Ph.D., Jessica Y. Wong, Ph.D., Xuesen Xing, Ph.D., Nijuan Xiang, M.Med., Yang Wu, M.Sc., Chao Li, M.P.H., Qi Chen, M.Sc., Dan Li, M.P.H., Tian Liu, B.Med., Jing Zhao, M.Sc., Man Liu, M.Sc., Wenxiao Tu, M.Med., Chuding Chen, M.Sc., Lianmei Jin, M.Med., Rui Yang, M.Med., Qi Wang, M.P.H., Suhua Zhou, M.Med., Rui Wang, M.D., Hui Liu, M.Med., Yingbo Luo, M.Sc., Yuan Liu, M.Med., Ge Shao, B.Med., Huan Li, M.P.H., Zhongfa Tao, M.P.H., Yang Yang, M.Med., Zhiqiang Deng, M.Med., Boxi Liu, M.P.H., Zhitao Ma, M.Med., Yanping Zhang, M.Med., Guoqing Shi, M.P.H., Tommy T.Y. Lam, Ph.D., Joseph T. Wu, Ph.D., George F. Gao, D.Phil., Benjamin J. Cowling, Ph.D., Bo Yang, M.Sc., Gabriel M. Leung, M.D., and Zijian Feng, M.Med. et al.

January 29, 2020
DOI: 10.1056/NEJMoa2001316

425 cases

Table 1. Characteristics of Patients with Novel Coronavirus–Infected Pneumonia in Wuhan as of January 22, 2020.*

Characteristic	Before January 1 (N=47)	January 1 –January 11 (N=248)	January 12 –January 22 (N=130)
Median age (range) — yr	56 (26–82)	60 (21–89)	61 (15–89)
Health care worker — no./total no. (%)	0/47	7/248 (3)	8/122 (7)

Take home message:

The chance of getting COVID 19 in worst case scenario among Chinese healthcare workers (HCWs) was about 5%.

The NEW ENGLAND JOURNAL of MEDICINE

CORRESPONDENCE

Death from Covid-19 of 23 Health Care Workers in China

TO THE EDITOR: The National Health Commission of the People's Republic of China has reported that as of February 24, 2020, a total of 3387 of 77,262 patients with Covid-19 (4.4%) in China were health care workers or others who worked in medical facilities.[1,2] According to the Chinese Red Cross

their condition then deteriorated quickly; all but 3 of these persons were 50 years of age or older. After their condition deteriorated, 12 of the 23 health care workers were transferred from the hospitals where they were first admitted to specialized intensive care units in other hospitals or

“ As of March 31, none of the 42,600 health care workers who went to Hubei Province to care for patients with Covid-19 were known to have been infected with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).”

Take home message:

The chance of getting COVID 19 in worst case scenario among Chinese HCWs was about 5%.

This risk probably was diminished following better infection control practices among 42600 Chinese HCWs mobilized to rescue Wuhan.

How severe is COVID-19 infection in HCWs???

JAMA | Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus–Infected Pneumonia in Wuhan, China

Dawei Wang, MD; Bo Hu, MD; Chang Hu, MD; Fangfang Zhu, MD; Xing Liu, MD; Jing Zhang, MD; Binbin Wang, MD; Hui Xiang, MD; Zhenshun Cheng, MD; Yong Xiong, MD; Yan Zhao, MD; Yirong Li, MD; Xinghuan Wang, MD; Zhiyong Peng, MD

Wuhan University Hospital
138 nCoV- pneumonia cases
57 (41%) = hospital-acquired
17(12.3%)= nosocomial in-patients
40 (29%) = healthcare workers

	No. (%)	
	Total (N = 138)	ICU (n = 36)
Infected		
Hospitalized patients	17 (12.3)	9 (25.0)

Take home message:

If HCWs develop nCoV 2019 pneumonia, the chance of being severe (needs ICU care) is 1 in 40.

Thus, the probability of a young doctor getting COVID 19 and has to be admitted into ICU was only 1/20 x 1/40 = 1 in 800.

How about the mortality ???

Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19)

16-24 February 2020

NHCPRC reported that ,up until February 24th, 2055 Chinese healthcare workers had been confirmed infected with COVID-19, with 22 (1.1%) deaths.

The NEW ENGLAND JOURNAL of MEDICINE

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their condition then deteriorated quickly; all but 3 of these persons were 50 years of age or older. After their condition deteriorated, 12 of the 23 health care workers were transferred from the hospitals where they were first admitted to specialized intensive care units in other hospitals or

As of April 3, a total of 23 of the health care professionals among these 3387 persons had died from Covid-19. CFR= 0.7%

Take home message:

Eventhough many of the Chinese healthcare workers were infected with COVID 19, the case fatality rate was low.

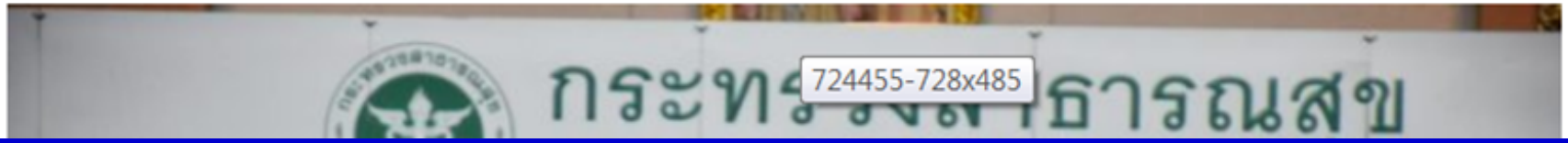
How about Thailand ???

ประชาชาติธุรกิจ
WWW.PRACHACHAT.NET ออนไลน์

ในประเทศ

"โควิด -19" ติดเชื้อบุคลากรการแพทย์ในไทย คนแรก

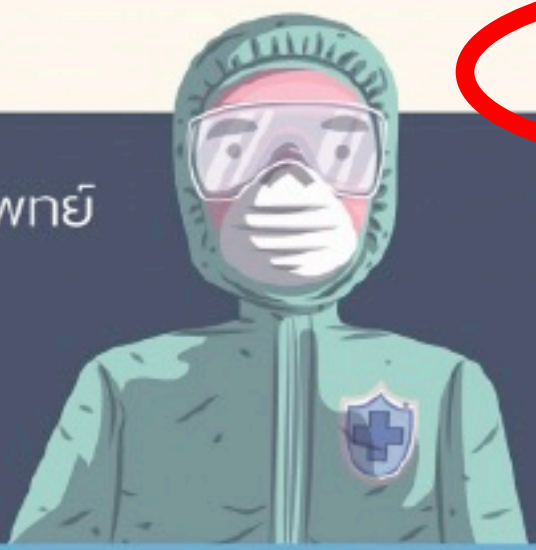
วันที่ 15 กุมภาพันธ์ 2563 - 13:01 น.



บุคลากรทางการแพทย์
ติดเชื้อโควิด-19 เพิ่มรายวัน!!

สถานการณ์

ข้อมูล ณ วันที่ 13 เม.ย. 63



จำนวนบุคลากรทางการแพทย์ติดเชื้อโควิด-19

102 ราย

%ของการติดเชื้อทั้งหมด

4%

ติดเชื้อจากการปฏิบัติหน้าที่

65%

ติดเชื้อจากในชุมชน

20%

ไม่สามารถระบุได้

15%

พยาบาล

40%

แพทย์

10%

ผู้ช่วยแพทย์และพยาบาล

10%

20

None of the 102 infected Thai healthcare workers had died of COVID 19 infection.

Take home message:

The situation of COVID infections in Thai healthcare workers is pretty much the same as in China in that the case fatality rate is likely to be very low.

We agree that the case fatality rates in HCWs with COVID 19 were low. But what did they die from ???

The NEW ENGLAND JOURNAL of MEDICINE

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As of April 3, a total of 23 of the health care professionals among these 3387 persons had died from Covid-19. CFR= 0.7%

All but three were =/> 50 year old

11/23 persons had been rehired after retirement,

5 Had known underlying chronic conditions.

13 were physicians.

Take home message:

Most of HCWs who died from COVID 19 disease were either old or had underlying diseases.

Journal Pre-proof

Characteristics of health worker fatality in China during the outbreak of COVID-19 infection

Wei Li , Jie Zhang , Shifu Xiao , Lin Sun

PII: S0163-4453(20)30158-4
DOI: https://doi.org/10.1016/j.jinf.2020.03.030
Reference: YJINF 4504

To appear in: *Journal of Infection*

Accepted date: 18 March 2020

Table 1. Demographics of deceased medical workers in China by Mar 16, 2020.

Characteristic	Total (n=24)	COVID-19 infection (n=13, 54.2%)	Sudden death (n=8, 33.3%)	Traffic accident (n=3, 12.5%)
Age, Median (IQR) -yrs	50.5(36.25-56.5)	51(38.0-58.0)	50(36.25-56.5)	/
Male, No. (%)	20(83.3)	11(84.6)	7(87.5)	2(66.7)

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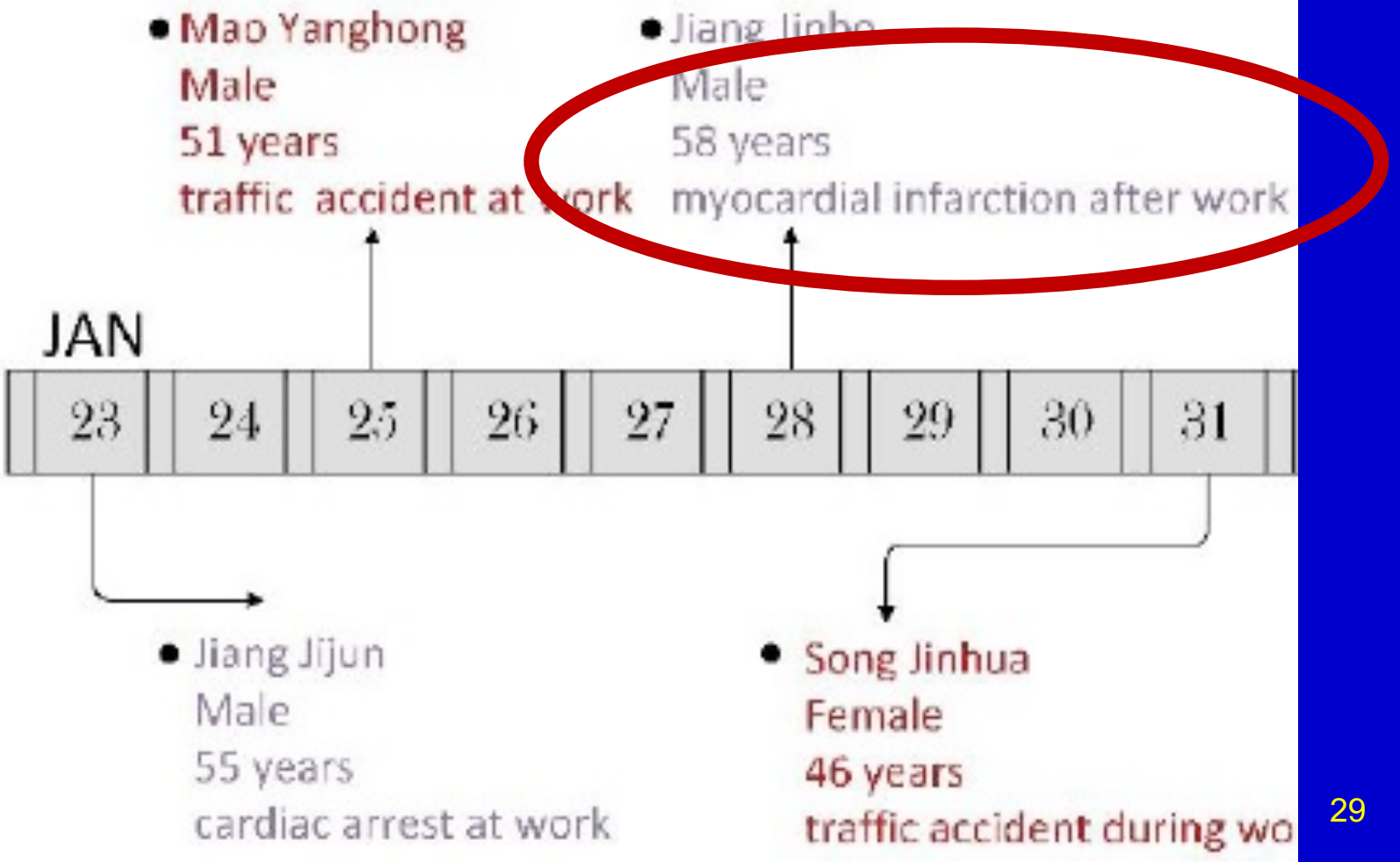
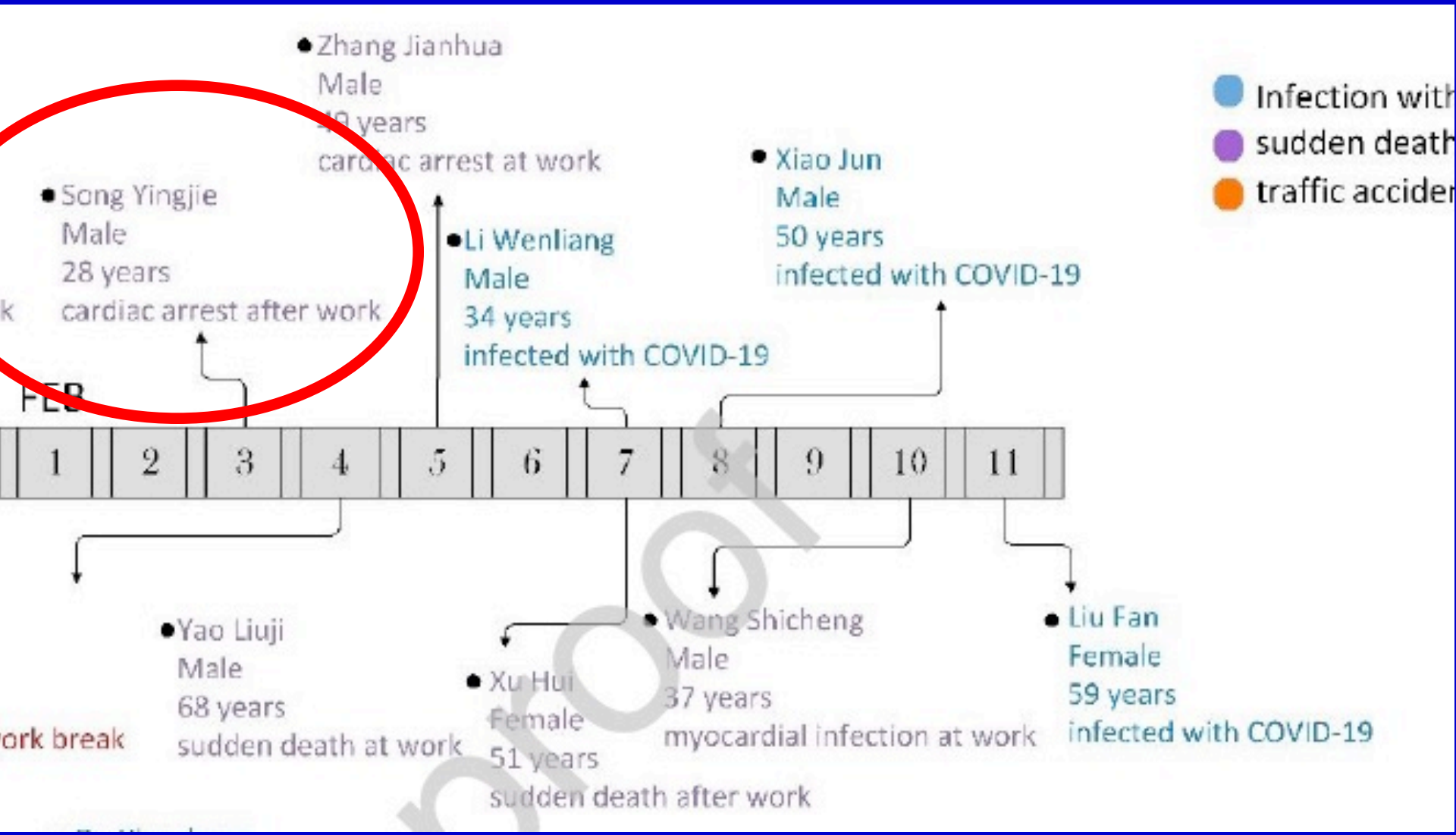

• Mao Yanghong
Male
51 years
traffic accident at work
• Jiang Jinbo
Male
58 years
myocardial infarction after work
JAN
23
24
25
26
27
28
29
30
31
• Jiang Jijun
Male
55 years
cardiac arrest at work
• Song Jinhua
Female
46 years
traffic accident during wo


Zhang Jianhua
Male
cardiac arrest at work
Song Yingjie
Male
28 years
cardiac arrest after work
Li Wenliang
Male
34 years
infected with COVID-19
Xiao Jun
Male
50 years
infected with COVID-19
Infection with
sudden death
traffic accide
FEB
1
2
3
4
5
6
7
8
9
10
11
Yao Liuji
Male
68 years
sudden death at work
Xu Hui
Female
51 years
sudden death after work
Wang Shicheng
Male
37 years
myocardial infection at work
Liu Fan
Female
59 years
infected with COVID-19

Take home message:

Only half of the fatalities in Chinese healthcare workers infected with coronavirus were caused directly by the infections. Some died from traffic accidents and ? underlying heart diseases precipitated by ? work exaustion.


敬老岗

From whom did HCWs get COVID-19 ???

? Their families ?

?Their co-workers ?

?Their patients?

Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19)

16-24 February 2020

"Investigations among HCWs suggest that many may have been infected within the household rather than in a health care setting."

Discovery!

Coronavirus Disease 2019 (COVID-19): Emerging and Future Challenges for Dental and Oral Medicine

Journal of Dental Research
1–7

DOI: 10.1177/0022034520914246
journals.sagepub.com/home/jdr

L. Meng[1], F. Hua[2], and Z. Bian[1]

This paper mentions about COVID 19 in Chinese dental healthcare personnels.

Patient No.[a]	Occupation	Are There Any Close Contacts Infected?
1	Doctor	No
2	Nurse	No
3	Nurse	Family members[b]
4	Administrator	1 family member
5	Nurse	Family members
6	Administrator	Family members[b]
7	MD student	1 family member
8	Doctor	1 family member
9	Doctor	1 family member

Only 2 of 9 dental healthcare workers had COVID 19 from unknown origin. The rest contracted the disease from their families.

Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19)

16-24 February 2020

In China, human-to-human transmission of the COVID-19 virus is largely occurring in families. Among 344 clusters involving 1308 cases in Guangdong and Sichuan Provinces, 78%-85% have occurred in families.

Take home message:

You may get COVID 19 from your family members rather than from your patients.

Beware of your wife !

From whom did HCWs get COVID-19 ???

? Their families ?

If I contract COVID 19, what is the probability that I may pass the infection to my family ???

The secondary attack rates in households ranged from 3-10% in Guangdong.

Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19) 16-24 February 2020, page 8.

中华预防医学杂志

Like 0 Share 0 Favorite 1 Error correction log in registere

• New coronavirus pneumonia prevention and control •

Expressway

Analysis on epidemiological characteristics of new-type coronavirus pneumonia family aggregation epidemic in Zhejiang Province

Sun Wanwan Ling Feng Pan Jinren Cai Jian Miao Ziping Liu Shelan Cheng Wei Chen Enfu

Chinese Journal of Preventive Medicine, 2020,54: Online pre-publishing . DOI: 10.3760 / cma.j.cn112150-20200227-00199

Family secondary attack rate for subsequent cases = 31.6%

Take home message:

The probability that you might further propagate the disease to your family was 3-32%.

148 index cases with family clustering

↓

Mean serial interval of 3 days

↓

189 subsequent cases and 54 asymptomatic infected cases.

Who, in your family, will get COVID virus from you?

relationship	No. Symptomatic	Total no.	Attack rate(%)

Are they going to die ???

China CDC Weekly

Vital Surveillances

The Epidemiological Characteristics of an Outbreak of 2019 Novel Coronavirus Diseases (COVID-19) — China, 2020

The Novel Coronavirus Pneumonia Emergency Response Epidemiology Team

Zhonghua Liu Xing Bing Xue Za Zhi. 2020;41(2):145–151.
DOI:10.3760/cma.j.issn.0254-6450.2020.02.003.

Baseline Characteristics	Confirmed Cases, N (%)	Deaths, N (%)	Case Fatality Rate, %
Age, years			
0–9	416 (0.9)		–
10–19	549 (1.2)		1 (0.1)
20–29	3,619 (8.1)		7 (0.7)
30–39	7,600 (17.0)		18 (1.8)
40–49	8,571 (19.2)		38 (3.7)

Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study

Nanshan Chen, Min Zhou*, Xuan Dong*, Jieming Qu*, Fengyun Gong, Yang Han, Yang Qiu, Jingli Wang, Ying Liu, Yuan Wei, Jia'an Xia, Ting Yu, Xinxin Zhang, Li Zhang*

Jinyintan Hospital
99 Pneumonia cases

	Patients (n=99)
Age, years	
Mean (SD)	55·5 (13·1)
≤39	10 (10%)
40–49	22 (22%)
50–59	30 (30%)
60–69	22 (22%)
≥70	15 (15%)
Chronic medical illness	50 (51%)
Cardiovascular and cerebrovascular diseases	40 (40%)
Digestive system disease	11 (11%)
Endocrine system disease†	13 (13%)

Take home message:

No COVID pneumonia case in this series was younger than 20 year old..

Take home message:

The chance of death from COVID 19 among children is almost nil. If you get COVID -19 and pass the virus to your child, he (or she) is unlikely to get sick or die from this disease.

From whom did HCWs get COVID-19 ???

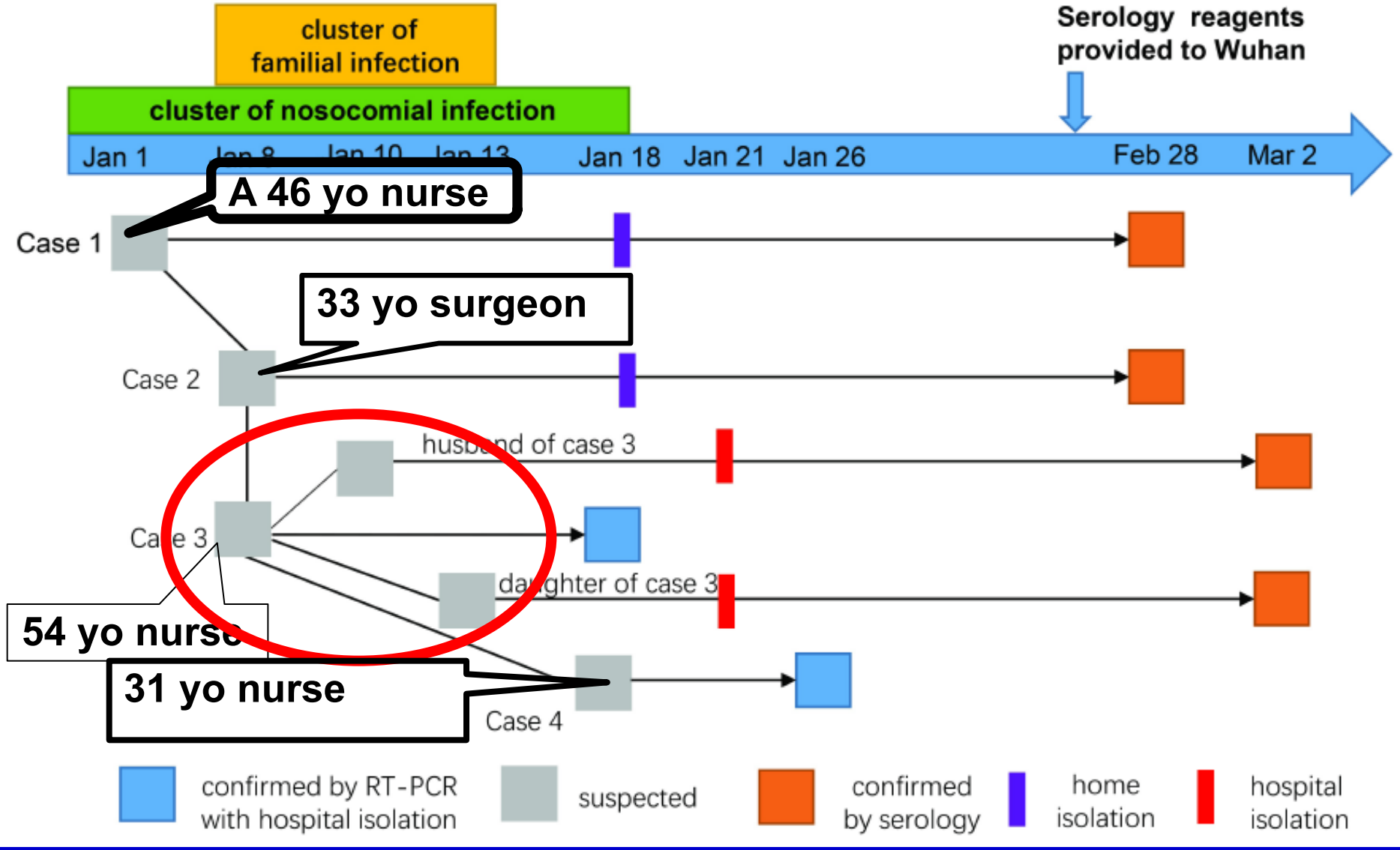
? Their families ?

?Their co-workers ?

One nosocomial cluster following with a familial cluster of COVID-19 cases: the potential transmission risk in patients with negative swab tests

CURRENT STATUS: POSTED

Guoqing Cao
Wuhan Union Hospital


cluster of familial infection
cluster of nosocomial infection
Serology reagents provided to Wuhan
Jan 1
Jan 18
Jan 21
Jan 26
Feb 28
Mar 2
A 46 yo nurse
Case 1
33 yo surgeon
Case 2
husband of case 3
Case 3
daughter of case 3
54 yo nurse
31 yo nurse
Case 4
confirmed by RT-PCR with hospital isolation
suspected
confirmed by serology
home isolation
hospital isolation

All these HCWs had to be excluded from duty and received either self-quarantined at home or were admitted to hospital for isolation and treatment.

An occurrence of COVID 19 among hospital staffs might lead to considerable loss of manpower because many exposed HCWs needed to be excluded from duty for at least 2 weeks.

What should you do to mitigate this potential mishap ??
Masks, ?Fixed team assignment

From whom did HCWs get COVID-19 ???

? Their families ?

?Their co-workers ?

?Their patients?

How HCWs got COVID-19 from the patients ???

Journal Pre-proof

Reply to “Coronavirus 2019-nCoV: A brief perspective from the front line”: Nosocomial SARS-CoV-2 infection among nurses in Wuhan from a single center

Huimin Sun , Mengxin Lu , Song Chen , Zhenshun Cheng , Yong Xiong , Xinghuan Wang

PII: S0163-4453(20)30163-8
DOI: https://doi.org/10.1016/j.jinf.2020.03.036
Reference: YJINF 4510

To appear in: *Journal of Infection*

Accepted date: 22 March 2020

A review of 32 nurses infected by SARS-CoV-2 at Wuhan University Hospital.

65.6% (21/32) was from nosocomial infection,

18 Without isolation measures.

3 With isolation measures

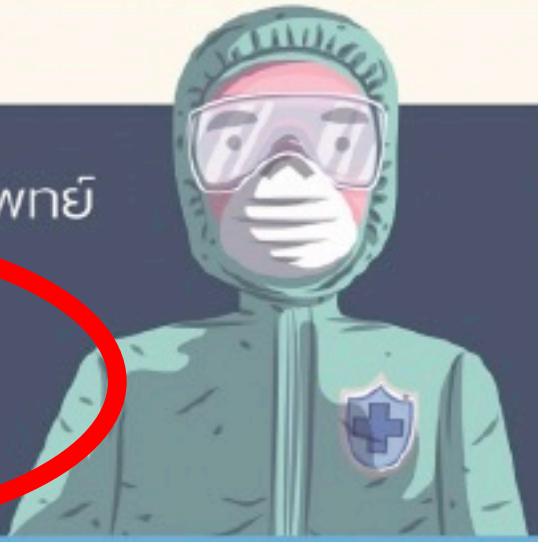
15.6% (5/32) was community acquired.

18.8% (6/32) from unknown sources.

บุคลากรทางการแพทย์
ติดเชื้อโควิด-19 เพิ่มรายวัน!!

สถานการณ์

ข้อมูล ณ วันที่ 13 เม.ย. 63



จำนวนบุคลากรทางการแพทย์ติดเชื้อโควิด-19

102 ราย

%ของการติดเชื้อทั้งหมด

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20%

ไม่สามารถระบุได้

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พยาบาล

40%

แพทย์

10%

ผู้ช่วยแพทย์และพยาบาล

10%

สาเหตุการติดเชื้อ

ผู้ป่วยปกปิดประวัติ
เสี่ยงต่อการสัมผัส
เชื้อโควิด-19

Hfocus

Take home message:

Half of the nosocomial COVID 19 infection acquired by HCWs occurred in the settings of unrecognized or delayed diagnosis of the disease together with unprepared infection control practices.

Delayed or misdiagnosis of COVID-19

Fresh voices from today's China

Rising Tones

Coronavirus' Assault on Wuhan Mental Hospital Alarms Experts

Despite the compounded challenge of having to treat patients for COVID-19 as well as mental illness, Wuhan's psychiatric facilities have largely been left to fend for themselves.

การติดเชื้อในโรงพยาบาลในศูนย์สุขภาพจิตหวู่ฮั่นผู้ป่วยประมาณ 80 รายได้รับการวินิจฉัยว่าเป็นโรคปอดบวมใหม่

ต้นฉบับ ลิอยาก Minamata **จีนข่าวรายสัปดาห์** 8 กุมภาพันธ์

周刊君说★

ผู้ป่วยประมาณ 50 คนและเจ้าหน้าที่ทางการแพทย์ 30 คน
วินิจฉัยด้วยโรคปอดบวมแบบใหม่

เมื่อวันที่ 8 กุมภาพันธ์ "China News Weekly" ได้เรียนรู้โดยเฉพาะว่ามีการติดเชื้อในโรงพยาบาลในศูนย์สุขภาพจิตหวู่ฮั่น แหล่งอ้างอิงภายในโรงพยาบาลมีผู้ป่วยอย่างน้อยประมาณ **50** คนและเจ้าหน้าที่ทางการแพทย์ **30** คนได้รับการวินิจฉัยว่าเป็นโรคปอดบวมแบบใหม่

An outbreak of COVID -19 diseases involving 50 patients and 30 HCWs occurred in a Wuhan mental hospital.

Take home message:

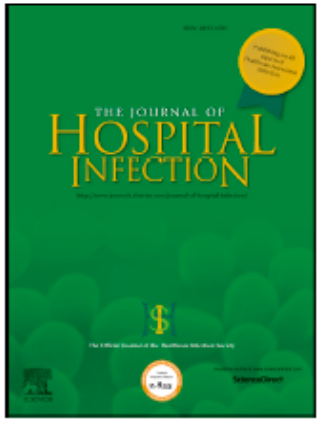
Not just the OPDs, unsuspected exposure to COVID-19 might also occur in any IPDs.

Every patient must be screened for COVID-19.

How to prevent COVID-19 infection from a delayed or unrecognized cases?

Example 1

Journal Pre-proof



Risk of nosocomial transmission of coronavirus disease 2019: an experience in a general ward setting in Hong Kong

S.C.-Y. Wong, R.T.-S. Kwong, T.C. Wu, J.W.M. Chan, M.Y. Chu, S.Y. Lee, H.Y. Wong, D.C. Lung

PII: S0195-6701(20)30174-2

DOI: https://doi.org/10.1016/j.jhin.2020.03.036

An 64 yo.unrecognized COVID-19 patient had stayed in an open cubicle (bed 2) ward A with 10 other patients for 35 hours before being transferred to airborne infection isolation room.AIIR for intubation.


(a)
L
SITTING

Ward A is a 53-bedded female medical ward for renal patients. (6 ACH, normal pressure setting)


Nurses' station
33
34
48
32
35
31
36
44
43
42
41
16
9
8
1
15
10
7
Index case
14
11
6
3
52
51
13
12
5
4

A total of 71 staff and 49 patients were identified as contacts.

Close Contacts

7 staffs = had contact within two metres of the index case for >15 minutes.
were subjected to a 14-day work exclusion and quarantine.

10 patients = shared the same cubicle with the index case.
were quarantined into an AIIR (or quarantine camp if patient was deemed clinically stable) for 14 days

Other staff and patient contacts ('casual contacts') were subjected to medical surveillance for 28 days with no restriction to work or discharge from hospital.

Results:

Thirty staff and 22 patients developed fever and/or reported respiratory symptoms during the surveillance period.

All specimens from the 52 contacts were negative for SARS-CoV-2, including all patient close contacts and six of the seven staff close contacts.

Why not infected ????

All seven close contact staffs reported wearing a mask (Five,N95s and two, surgical masks, respetively) during patient contacts.

Six close contact patients who were in the same cubicle as the index case also wore surgical masks (although not consistently in some.). Four did not wear a mask at all.

Simple facemask (Hudson mask) used for high-flow oxygen therapy on the index patient during her stay in ward A.

Take home message:

All the 10 patients in the same cubicle as the index case did not get COVID 19.

In this scenario, COVID -19 probably is not air-borne.

Take home message:

Contrary to the belief that high flow oxygen mask might aerosolize the infection, this oxygen mask did not spread the disease in this incidence. However, we still don't know whether it prevented the infection or not.

Example 2

Annals of Internal Medicine

Observation: Brief Research Report

COVID-19 and the Risk to Health Care Workers: A Case Report

Ng K, et al. Ann Intern Med. 2020 Mar 16:L20-0175. doi: 10.7326/L20-0175.

February 2020

↓

A middle-aged man with DM

↓

Hospitalized for community-acquired pneumonia.

↓

The following day…..

↓

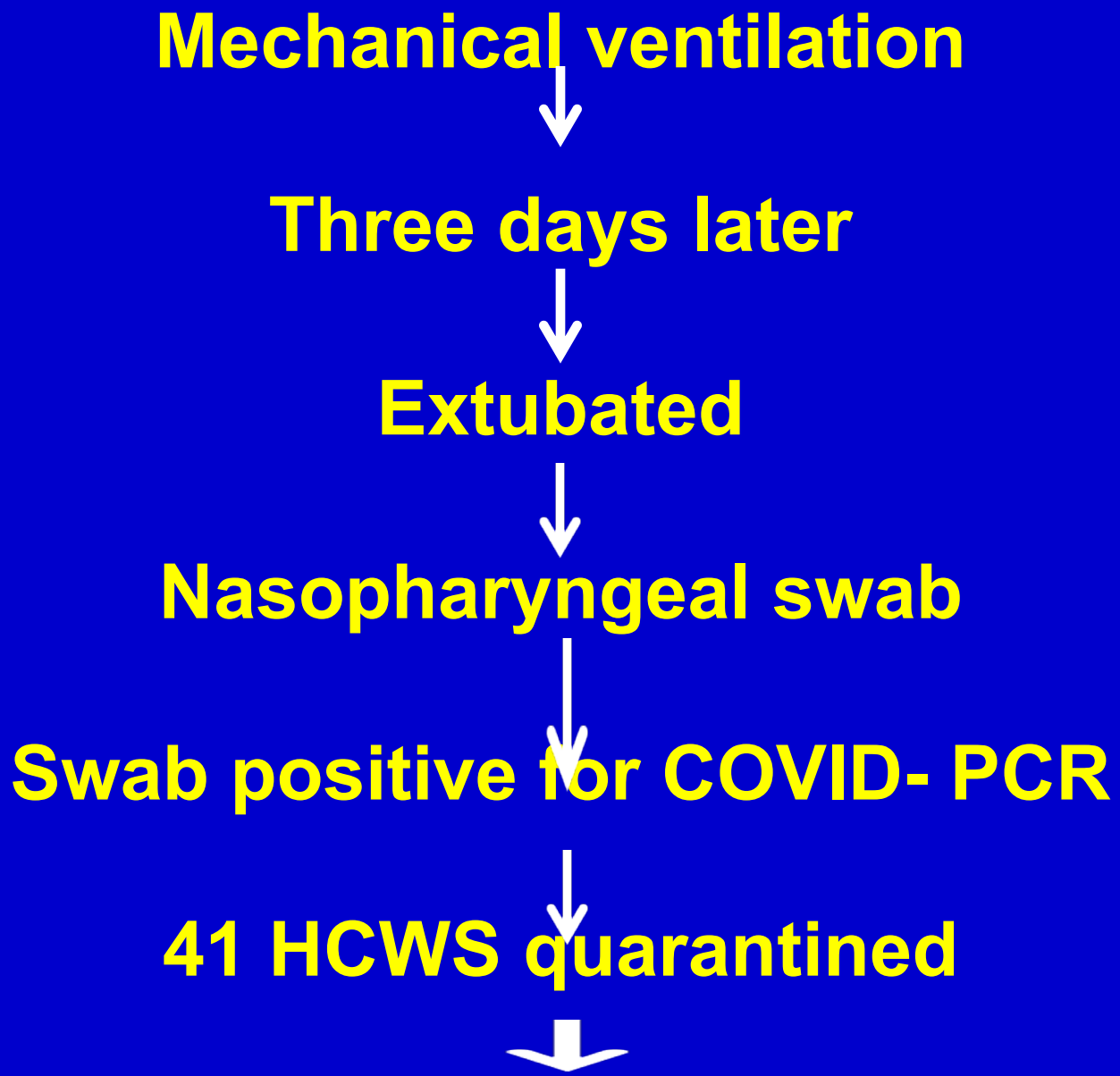
Endotracheal intubation in ICU

↓

Difficult intubation

↓

Video laryngoscope with airway bougie


Mechanical ventilation
Three days later
Extubated
Nasopharyngeal swab
Swab positive for COVID- PCR
41 HCWS quarantined

Procedures	No. of HCWs	PPE	
		Surgical mask	N95
Endotracheal Intubation	10	4	6
Extubation	2	2	0
Oral suction	4	4	0
Non invasive Ventilation	25	25	0
Total	41	35 (85.4%)	6 (14.6%)

None of these 41 healthcare workers developed fever or cough. All had multiple PCR-negative swabs.

Take home message:

Masks (either surgical or N95) were protective in this close contact with COVID19 patient incidence.

Part 2:

A nurse with a baby with the coronavirus at an isolation ward of Wuhan Children's Hospital on March 16, 2020. *China Daily via Reuters*

COVID 2019 & IC


Education
Infection Control
Resources
System-thinking
Critical Care Crisis Team
Lobby Group
Research
Communication
Clinical
Data Collection

Personnels Preparedness:Keywords

Education &Training

Maximize Their Safety

EMERGENCE OF SARS

SARS Transmission among Hospital Workers in Hong Kong

Joseph T.F. Lau,* Kitty S. Fung,* Tze Wai Wong,* Jean H. Kim,* Eric Wong,* Sydney Chung,* Deborah Ho,* Louis Y. Chan,* S.F. Lui,† and Augustine Cheng*

EID 2004;10:280-6

Infection control training <2 hours was a significant independent risk factors for SARS infection.

How to prevent getting 2019 nCoV ???

Screening:

เมื่อผู้ป่วยมาถึง
ให้พบกับพยาบาลตรวจคัดกรองก่อน
เพื่อซักประวัติการไอ และความเกี่ยวข้อง
กับประเทศที่มีการแพร่เชื้อโรค SARS

Finding a suspected case of nCoV infection: What to do next ???

Respiratory Viruses Transmission: How?

Possible Modes of Spread

3 possible mechanisms

1. Contacts (Direct or Indirect (Fomites)
   - self-inoculation after touching contaminated surfaces

2. Droplets or large particles
   - >5 microns particles
   - close person-to-person contact
   - at a distance of ≤ 0.9 m (3 feet)

3 Possible Modes of Spread

3. small-particle aerosols (airborne)

- < 3-5 microns
- generated by coughing or sneezing
- traverse distances > 1.8 m
- such as occur with measles, varicella, and sometimes influenza

Modes of transmission of respiratory syncytial virus

Caroline Breese Hall, M.D.,* and R. Gordon Douglas, Jr., M.D., *Rochester, N.Y.*

J Pediatr. 1981 Jul;99(1):100-3.

Three groups of volunteers were exposed to infants with RSV.

Gr 1 (*Cuddlers*): Wore gowns, but no masks or gloves. Caring for the infants for 2-3 hrs. (feeding,changing the diaper, and playing with the infant).

Gr.2 (*Touchers*): Touched surfaces (eg. countertops, cribs. pacifiers, toys, oxygen tent.) with ungloved hand when the infant was out of the room. They then gently rubbed the mucous membranes of their nose or eye.

Gr 3 (*Sitters*): Sit at a distance of > 6 ft. from the bed, wore gowns and gloves, but not masks.

Volunteers
No. exposed
No infected
Afebrile URI§
Febrile URI
Asymptomatic
Incubation

Take home message:

You can easily get RSV while taking care of RSV baby (5 out of 7) or touching the contaminated surfaces (4 0f 10)

Now let us examine the COVID -19 room:

A-Z Index

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EMERGING INFECTIOUS DISEASES®

ISSN: 1080-6059

EID Journal > Volume 26 > Early Release > Main Article

Volume 26, Number 7—July 2020

Dispatch

Aerosol and Surface Distribution of Severe Acute Respiratory Syndrome Coronavirus 2 in Hospital Wards, Wuhan, China, 2020

Zhen-Dong Guo[1], Zhong-Yi Wang[1], Shou-Feng Zhang[1], Xiao Li, Lin Li, Chao Li, Yan Cui, Rui-Bin Fu, Yun-Zhu Dong, Xiang-Yang Chi, Meng-Yao Zhang, Kun Liu, Cheng Cao, Bin Liu, Ke Zhang, Yu-Wei Gao✉, Bing Lu✉, and Wei Chen✉

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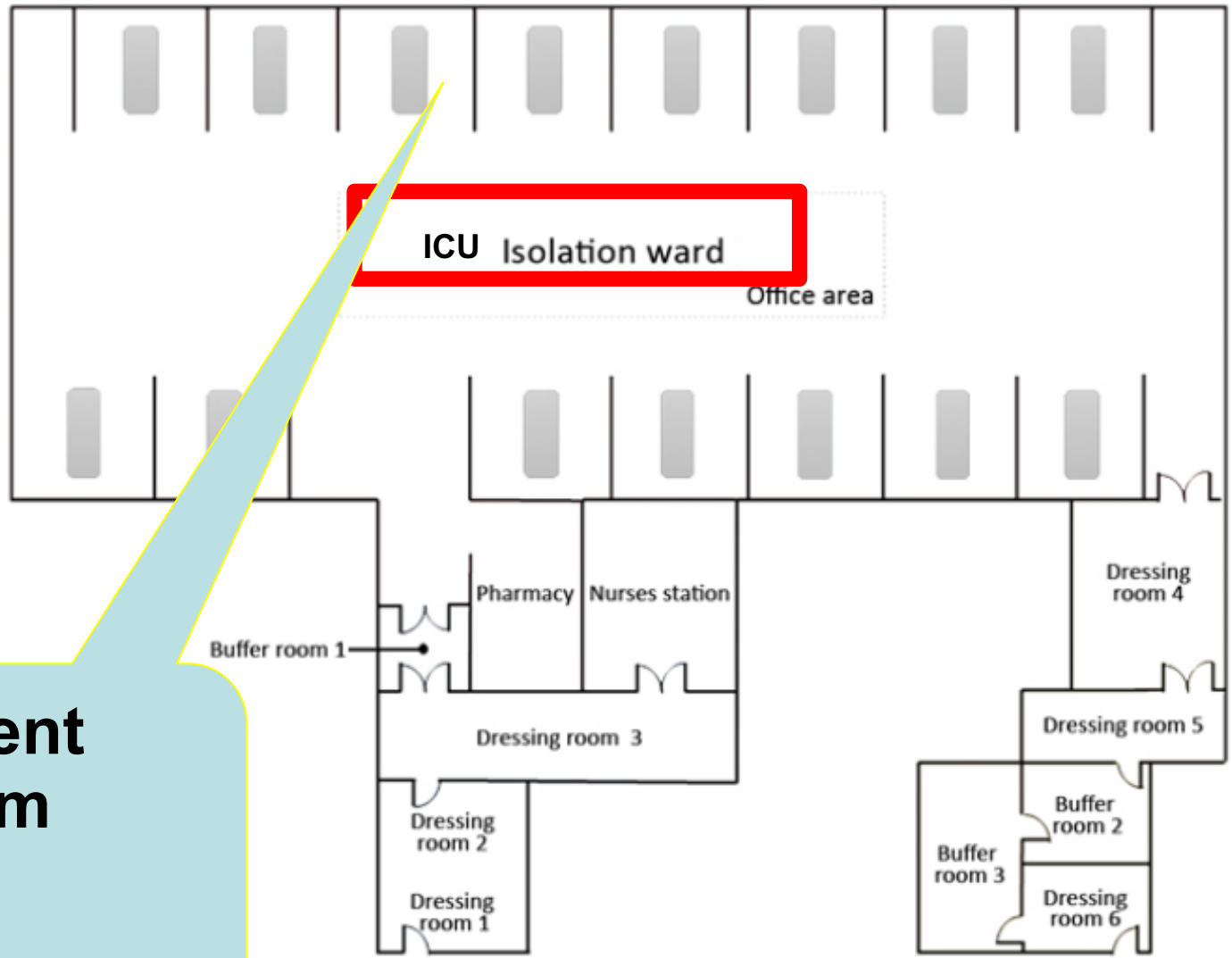
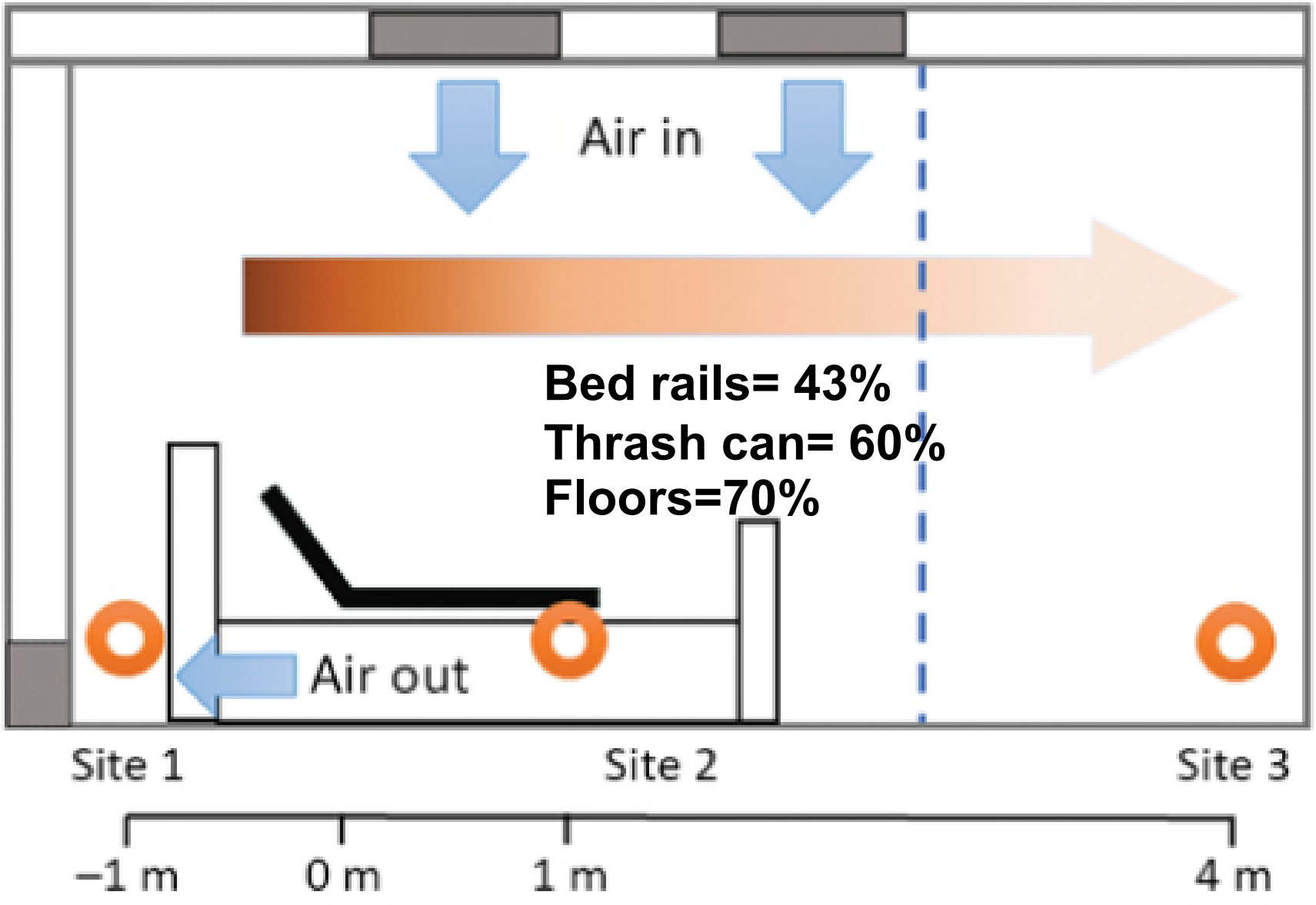


Patient Room

A


Air in
Bed rails= 43%
Thrash can= 60%
Floors=70%
Air out
Site 1
Site 2
Site 3
−1 m
0 m
1 m
4 m

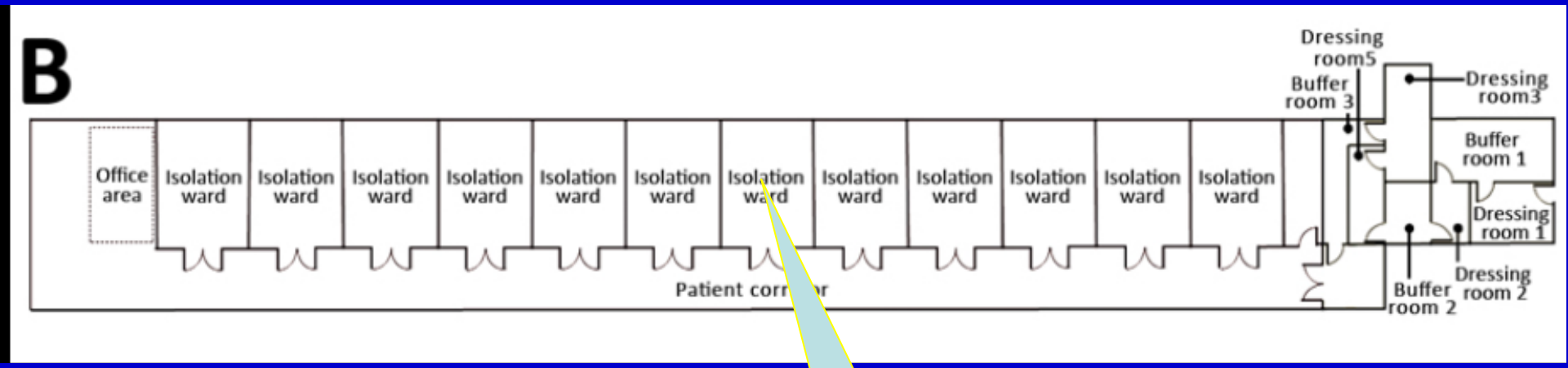
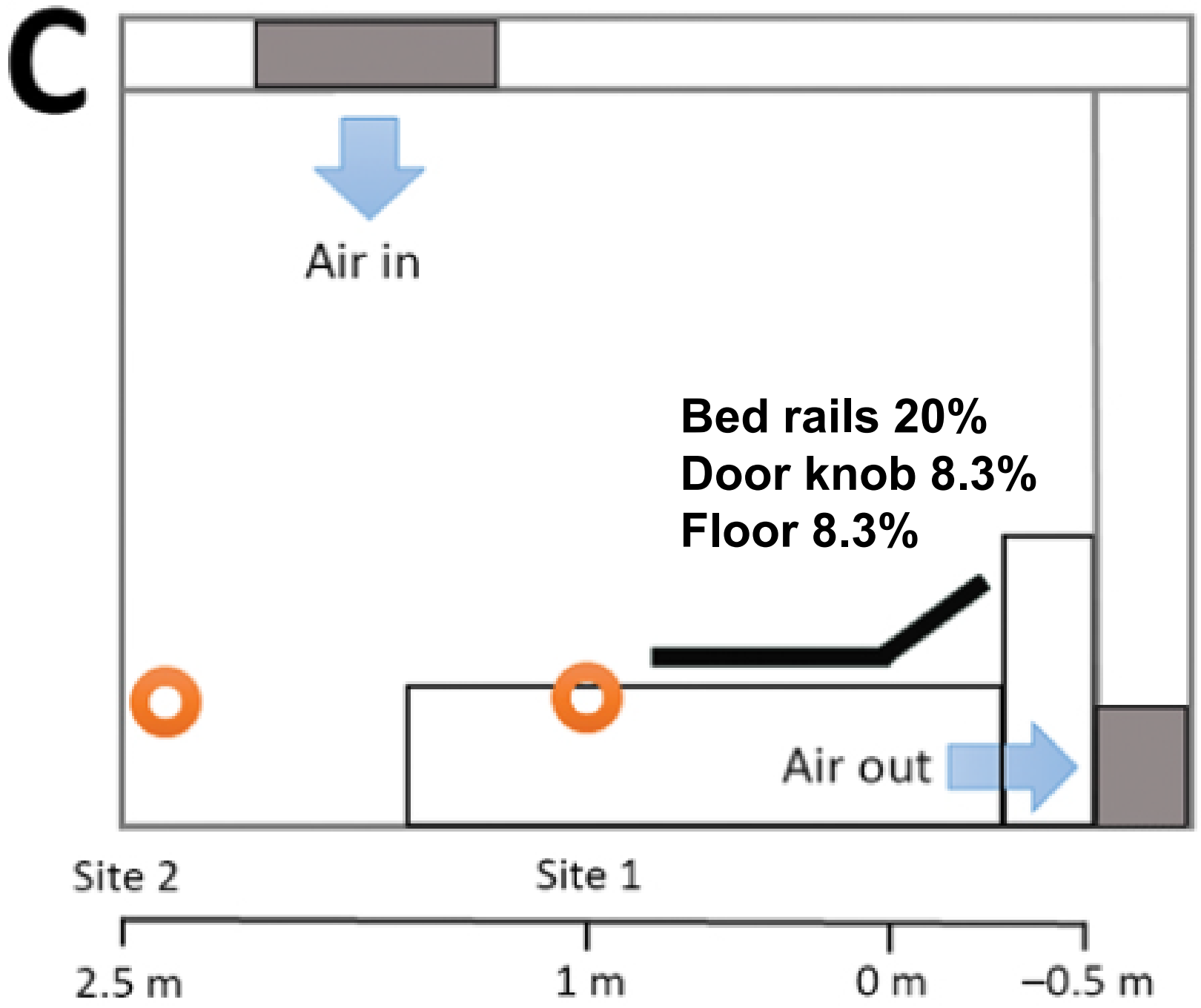


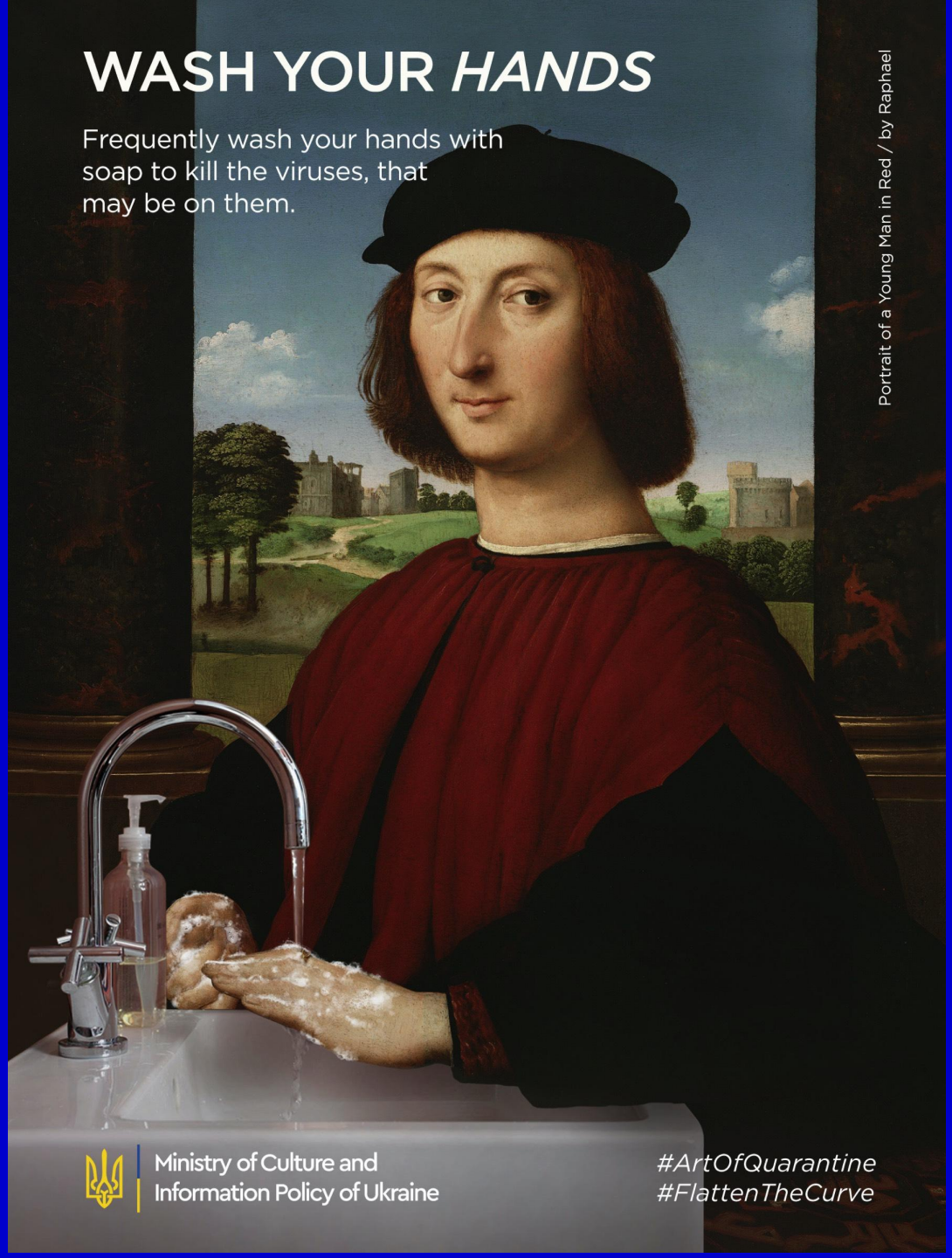
Figure B: General ward hous 24 COVID patients with milder diseases.

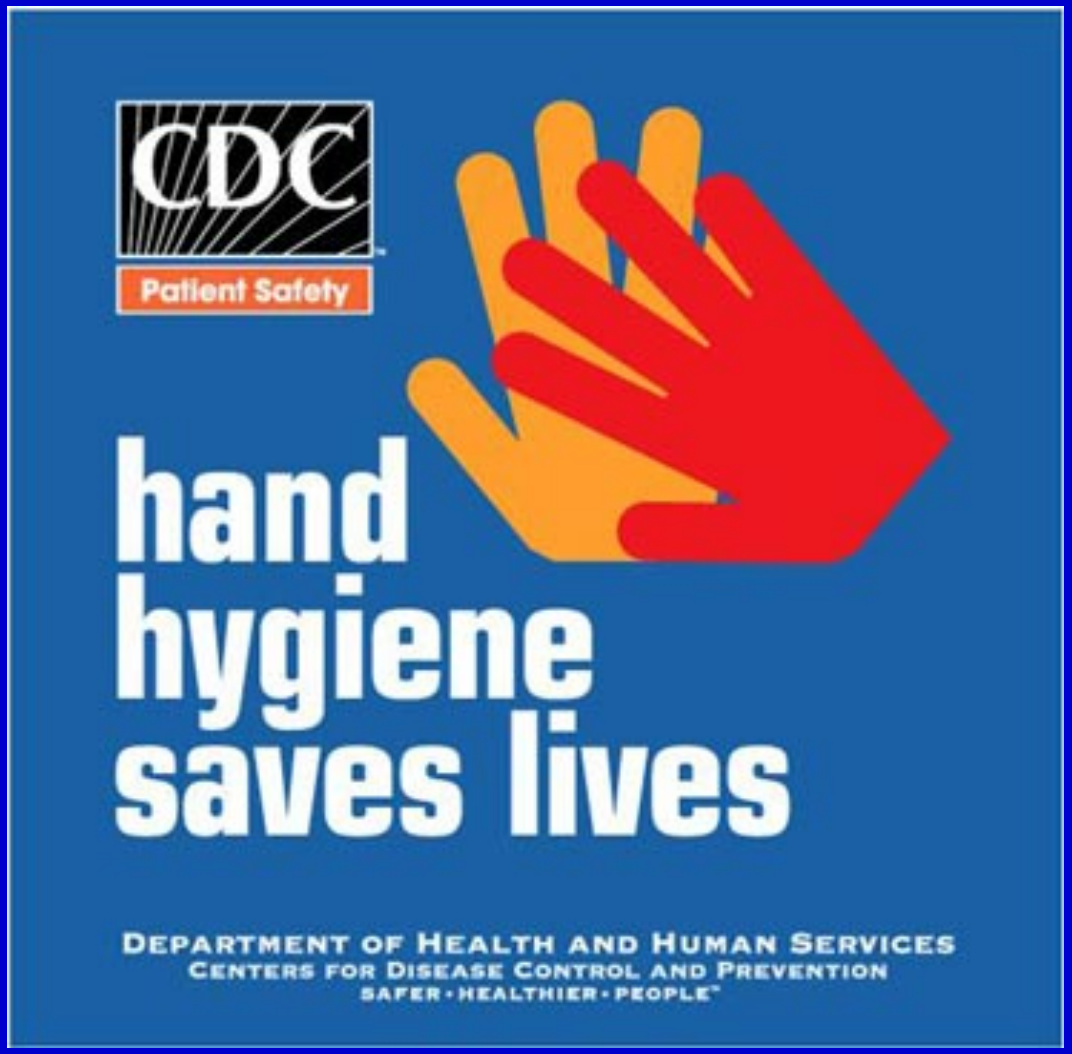
Patient room

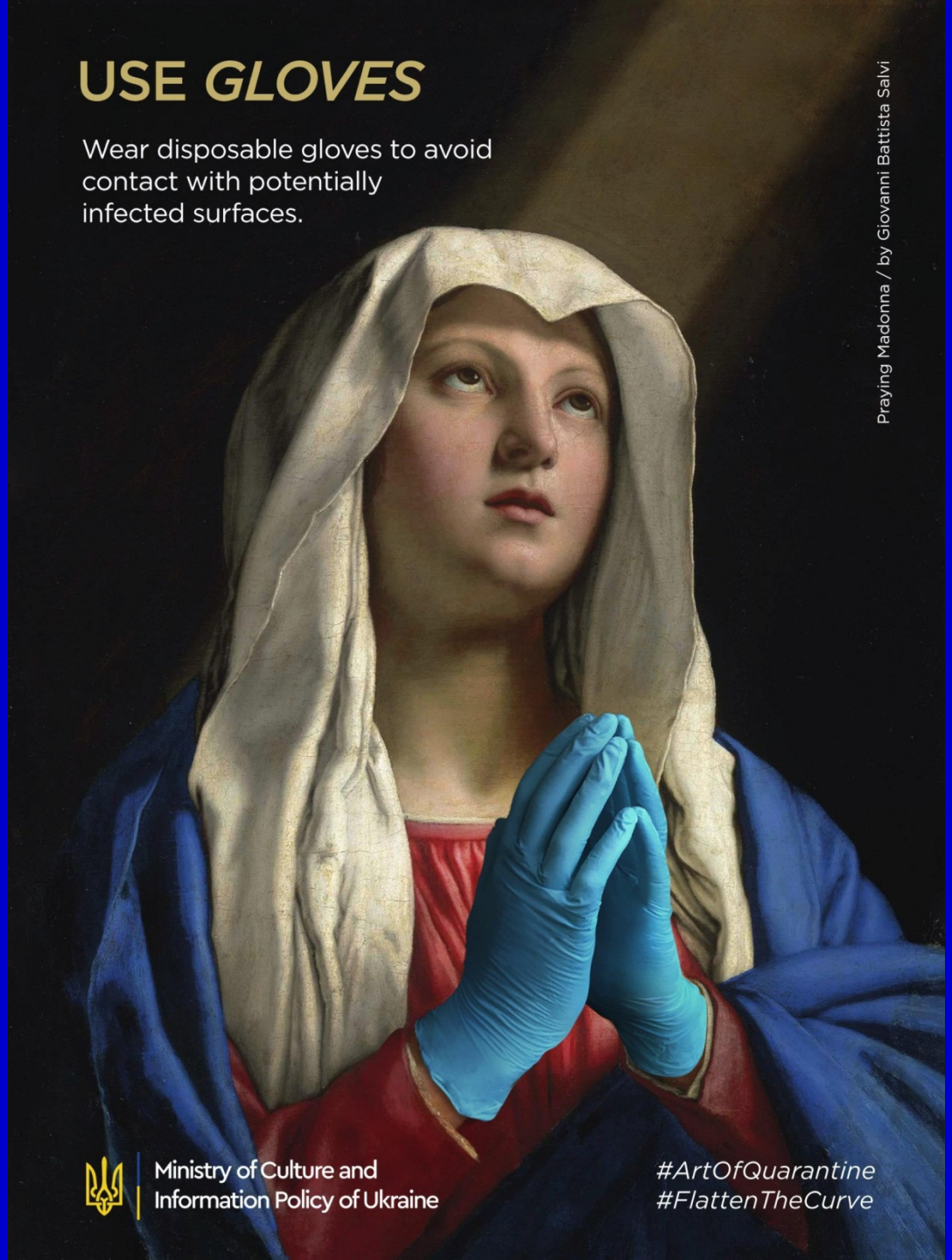

C
Air in
Bed rails 20%
Door knob 8.3%
Floor 8.3%
Air out
Site 2
Site 1
2.5 m
1 m
0 m
−0.5 m

Area, sample	Intense positive/weak positive/negative†	Rate of positivity, %
PPE	**in ICU with severe COVID patients**	
Sleeve cuff of medical staff	0/1/5	16.7
Glove of medical staff	0/1/3	25


USE HAND *SANITIZER*
Use sanitizers to keep your hands and personal accessories clean.
The Creation of Adam / by Michelangelo
Ministry of Culture and Information Policy of Ukraine
#ArtOfQuarantine
#FlattenTheCurve


WASH YOUR *HANDS*
Frequently wash your hands with soap to kill the viruses, that may be on them.
Portrait of a Young Man in Red / by Raphael
Ministry of Culture and Information Policy of Ukraine
#ArtOfQuarantine
#FlattenTheCurve


CDC
Patient Safety
hand
hygiene
saves lives
DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION
SAFER • HEALTHIER • PEOPLE™


USE GLOVES
Wear disposable gloves to avoid contact with potentially infected surfaces.
Praying Madonna / by Giovanni Battista Salvi
Ministry of Culture and Information Policy of Ukraine
#ArtOfQuarantine
#FlattenTheCurve

Yes,you can prevent the H1N1 Flu!

Do NOT touch the T zone!

mucous membranes of your eyes, nose or mouth are where germs enter your body!

Visit www.henrythehand.com

ระวังไม่ให้ผู้ป่วยสัมผัสกับแฟ้มประวัติ
การจัดส่งแฟ้มต้องทำโดยเจ้าหน้าที่ของโรงพยาบาล

How far can RSV go?

Volunteers
No. exposed
No infected
Afebrile URI§
Febrile URI
Asymptomatic
Incubation

Modes of transmission of respiratory syncytial virus. *Hall C:J. Pediatr 1981;99:100-103*

The third group, called *"sitters,"* was exposed to an infected baby by sitting at a distance of >1.8 m from the bed. They wore gowns and gloves, but no masks. *Only the cuddlers and touchers became infected, which suggests that routes that require close or direct contact with infectious secretions and self-inoculation were the major or most effective means of transmission.*

Now let us examine how far can coronaviruses go.

Cluster of SARS among Medical Students Exposed to Single Patient, Hong Kong

Tze-wai Wong,* Chin-kei Lee,† Wilson Tam,* Joseph Tak-fai Lau,* Tak-sun Yu,* Siu-fai Lui,‡ Paul K.S. Chan,* Yuguo Li,§ Joseph S. Bresee,¶ Joseph J.Y. Sung,* and Umesh D. Parashar,¶ for the Outbreak Study Group*[1]

Emerging Infectious Diseases 2004;10:269-275

Feb 24,2003: the index SARS case became ill.

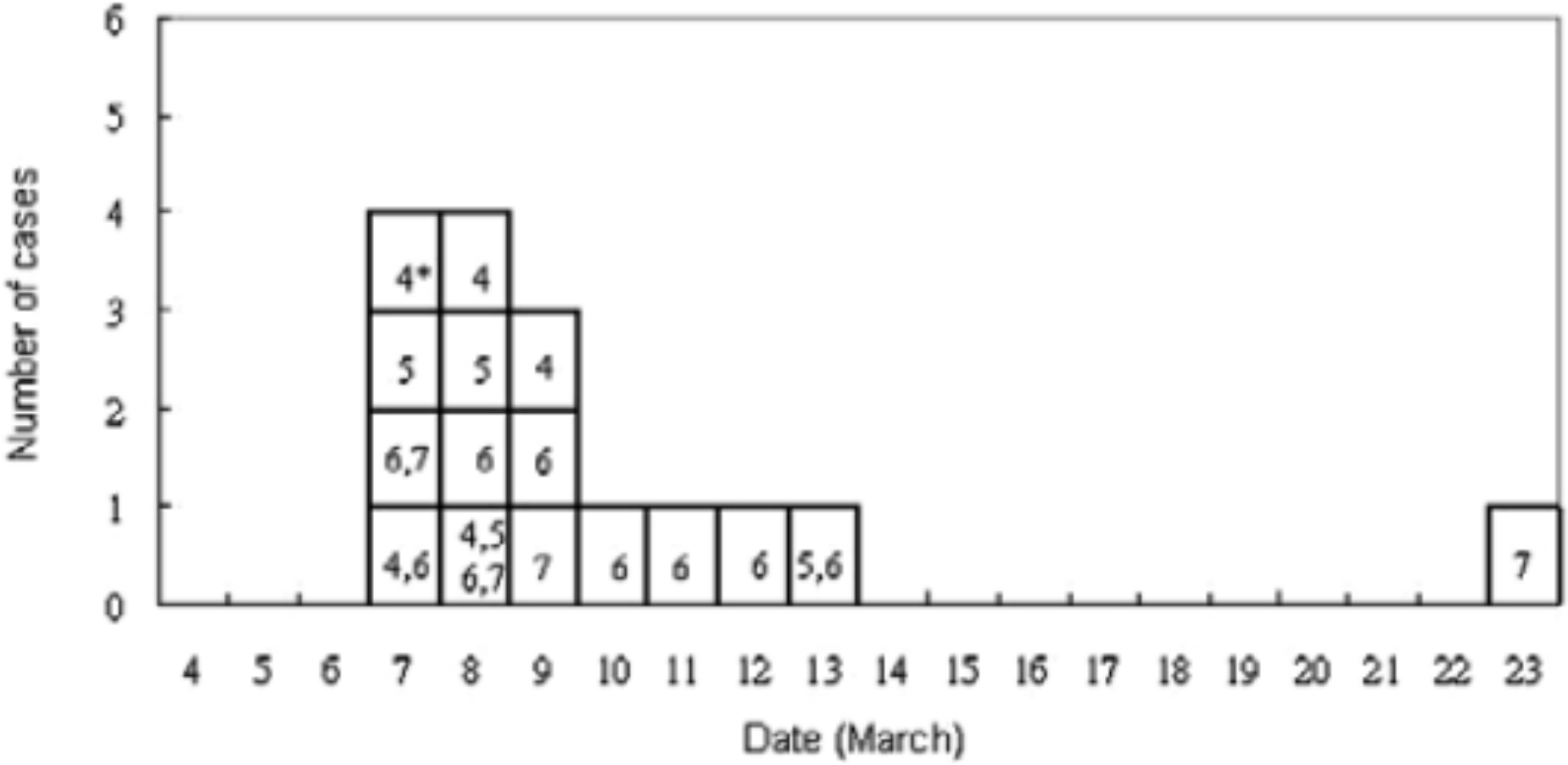
Mar 4: Visited ER & was admitted into a general ward

Had pneumonia on his rt. Lung.

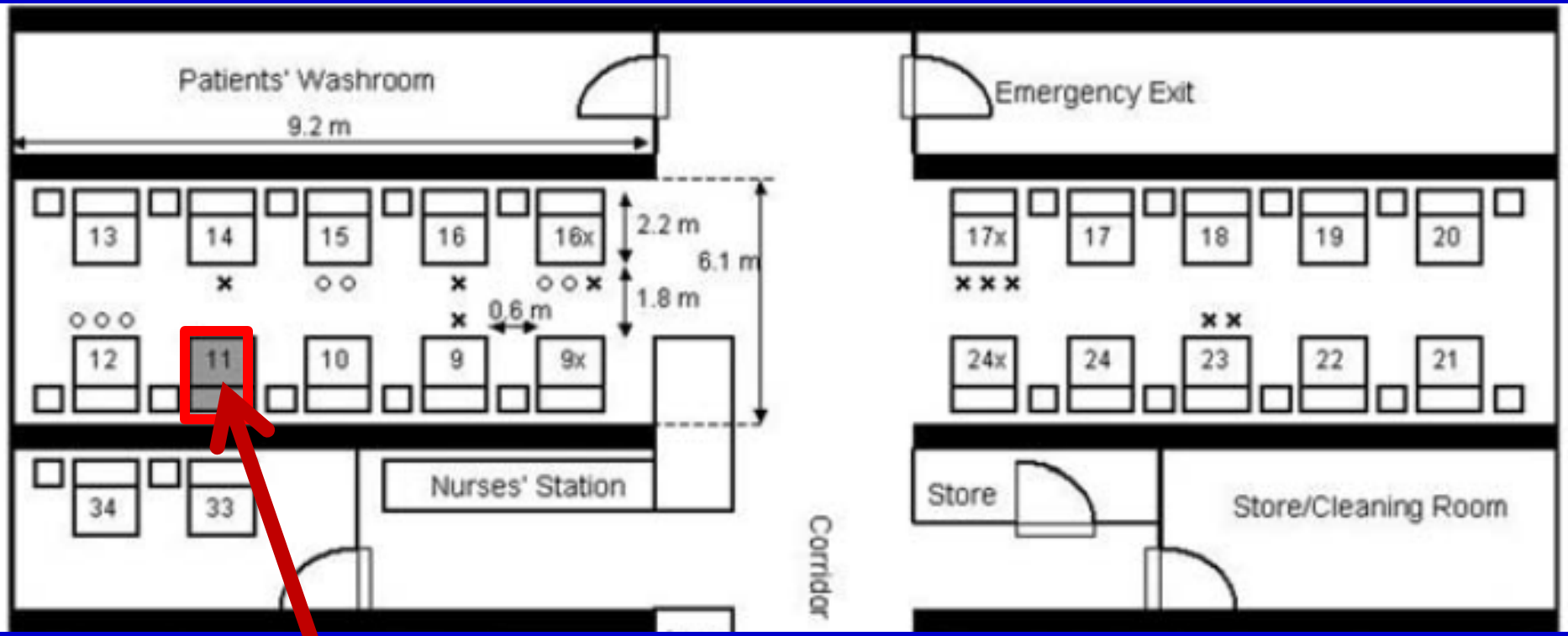
Mar 6-Mar 12: Rx with nebulized bronchodilator

Mar 4-10: 66 med. students visited this ward.

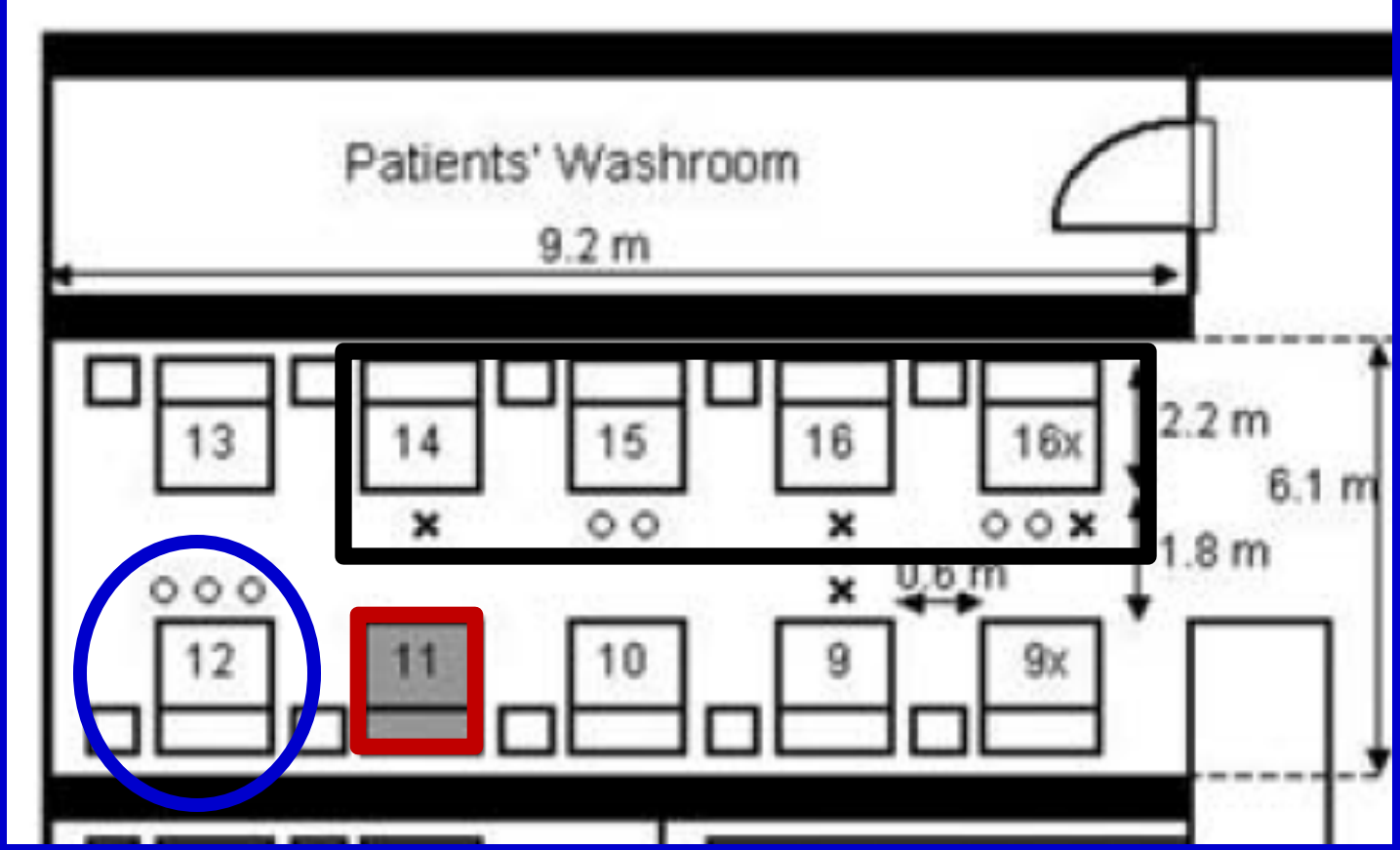
Mar 6-7: 20 (3rd yr). med students were in the ward for a 40 min. bedside clinical assessment session



Mar7-23: 16(24%) of med. students and 5 of 11 evaluators became ill.


Patients' Washroom
9.2 m
Emergency Exit
13
14
15
16
16x
2.2 m
6.1 m
1.8 m
0.6 m
17x
17
18
19
20
12
11
10
9
9x
24x
24
23
22
21
34
33
Nurses' Station
Corridor
Store
Store/Cleaning Room

Index Case



None of the students examined the index patient (Bed 11)

Examined patient in bed no.	Attack rate
Bed 12 (< 1 m. of index case bed)	3/3
Bed14,15,9,16X (>1m,same cubicle)	4/8
Beds outside this cubicle	0/8

Take home message:

SARS coronavirus usually did not spread beyond cubicle limit.

A-Z Index

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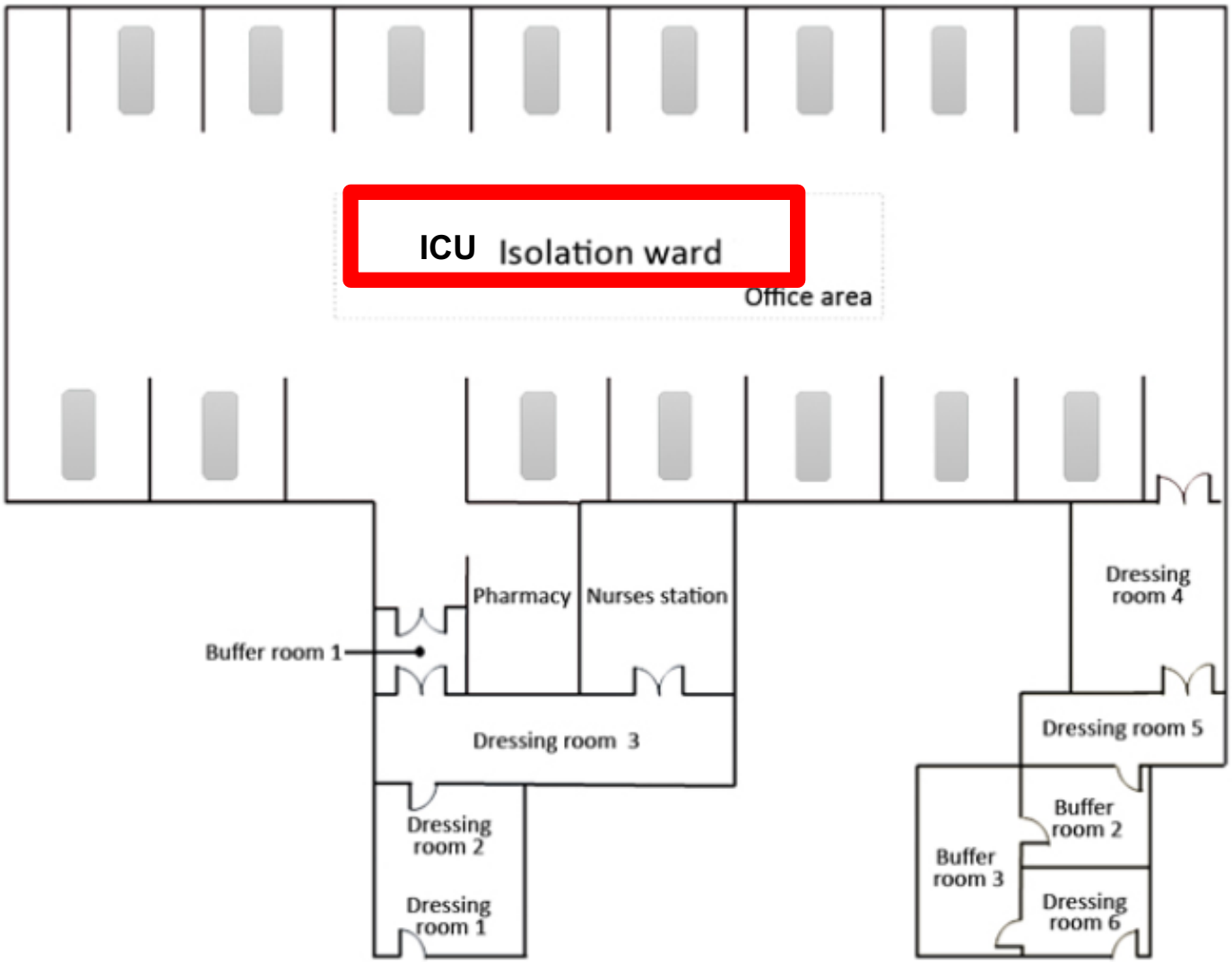
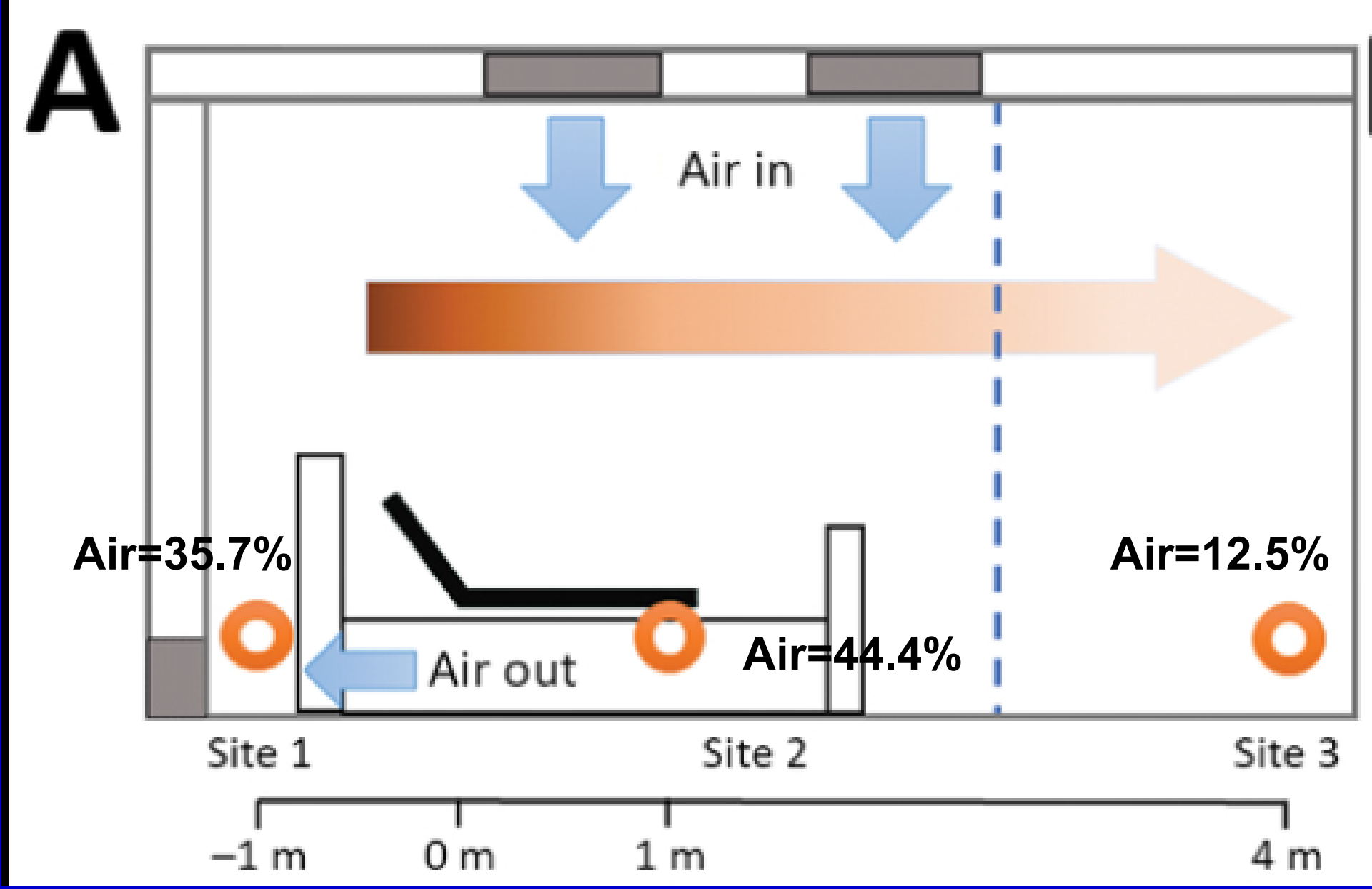
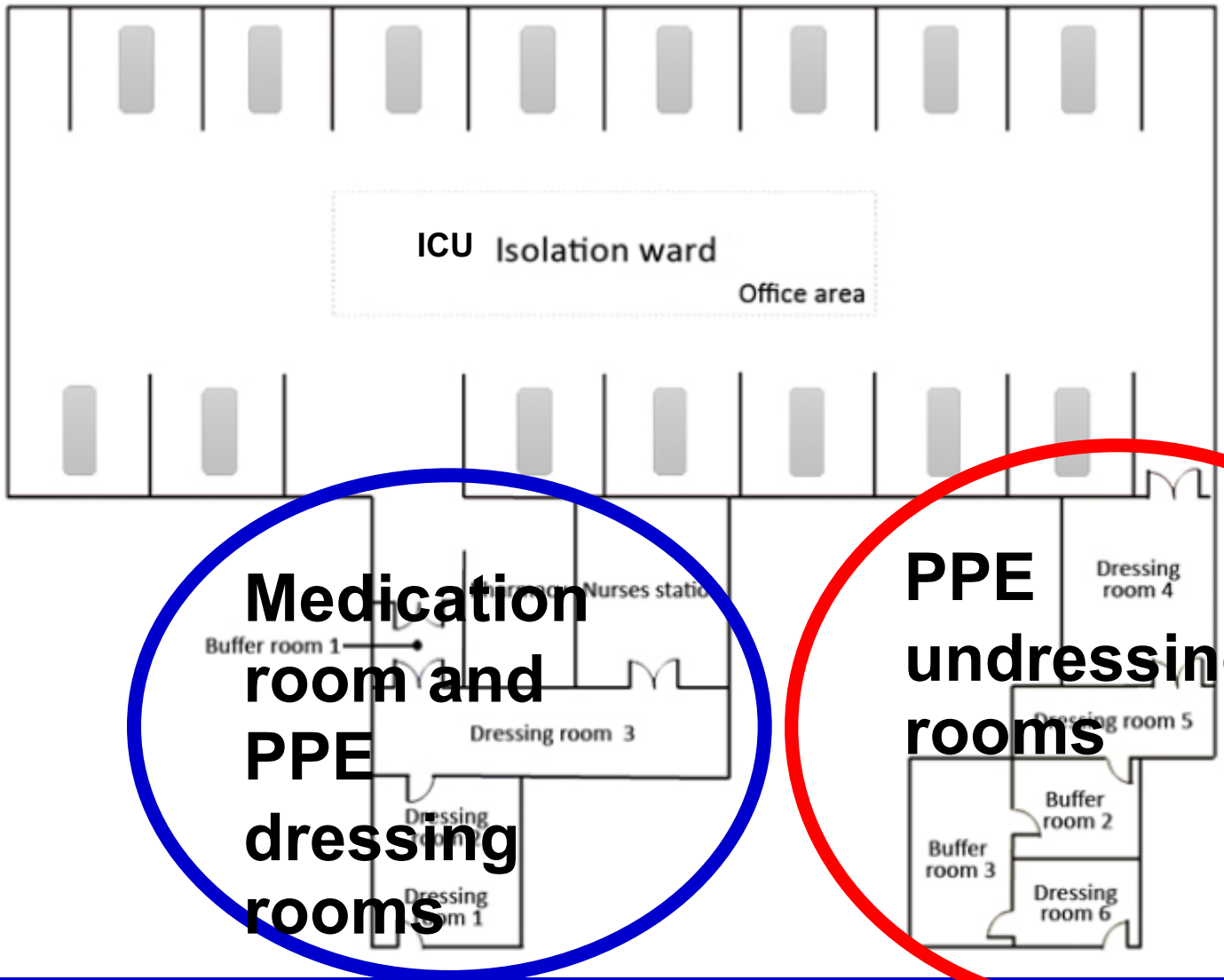

ICU Isolation ward
Office area
Pharmacy
Nurses station
Buffer room 1
Dressing room 3
Dressing room 2
Dressing room 1
Dressing room 4
Dressing room 5
Buffer room 2
Buffer room 3
Dressing room 6


A
Air in
Air=35.7%
Air=12.5%
Air out
Air=44.4%
Site 1
Site 2
Site 3
−1 m
0 m
1 m
4 m

A



All 184 sampling sites were negative except computer mouse (4 of 8) and 3 samples each from floor of Medication Room and PPE Removal Room 4

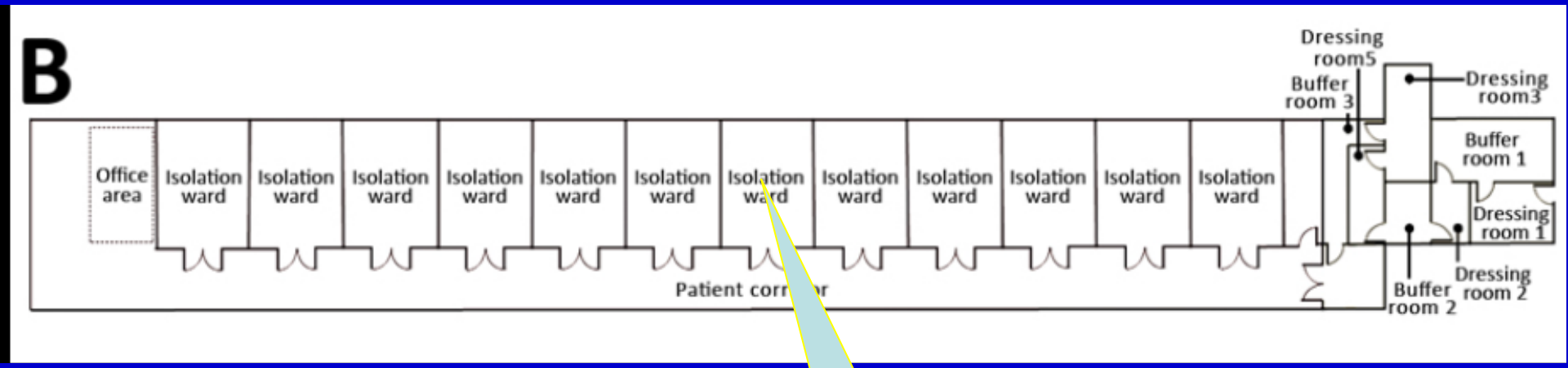
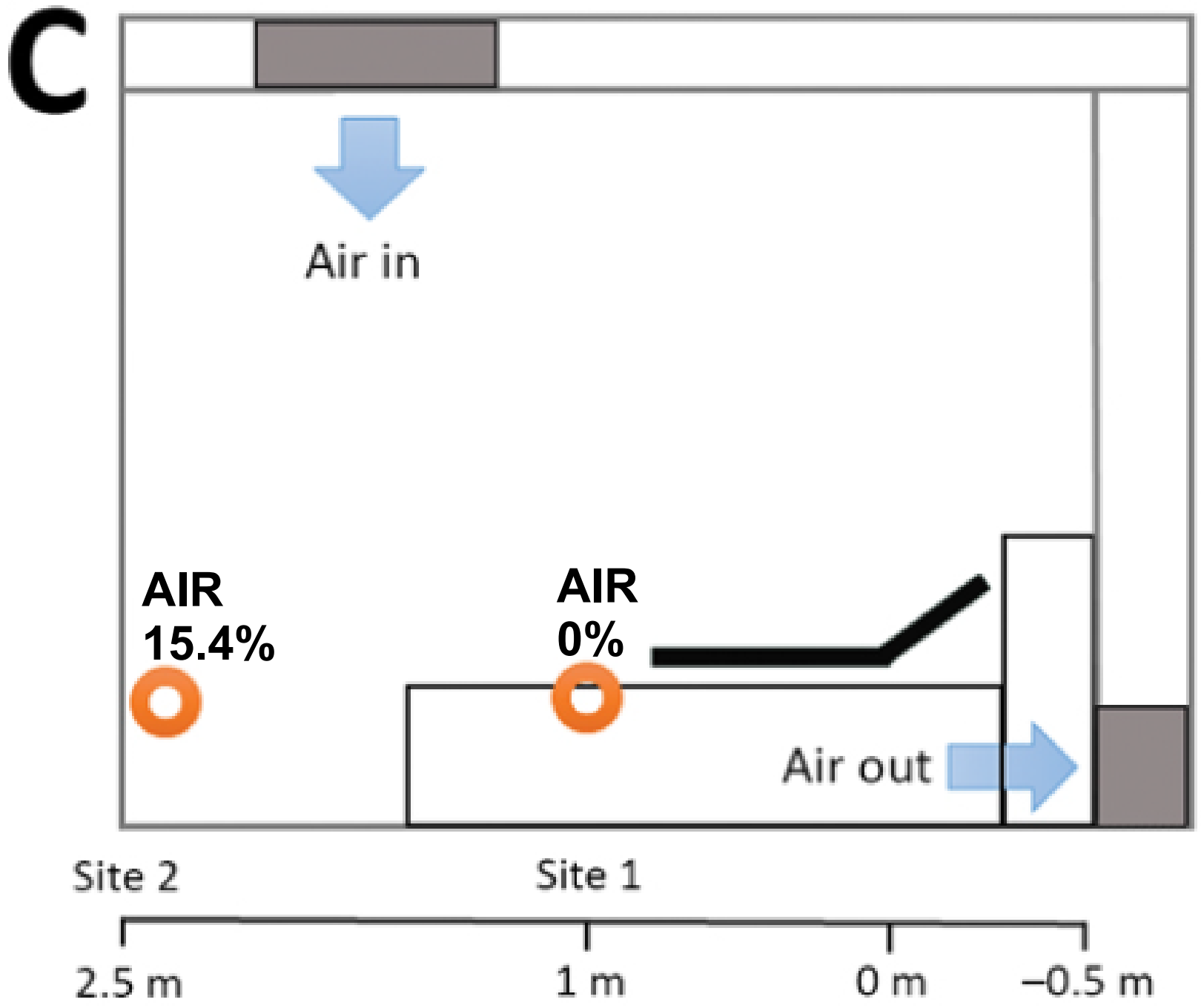
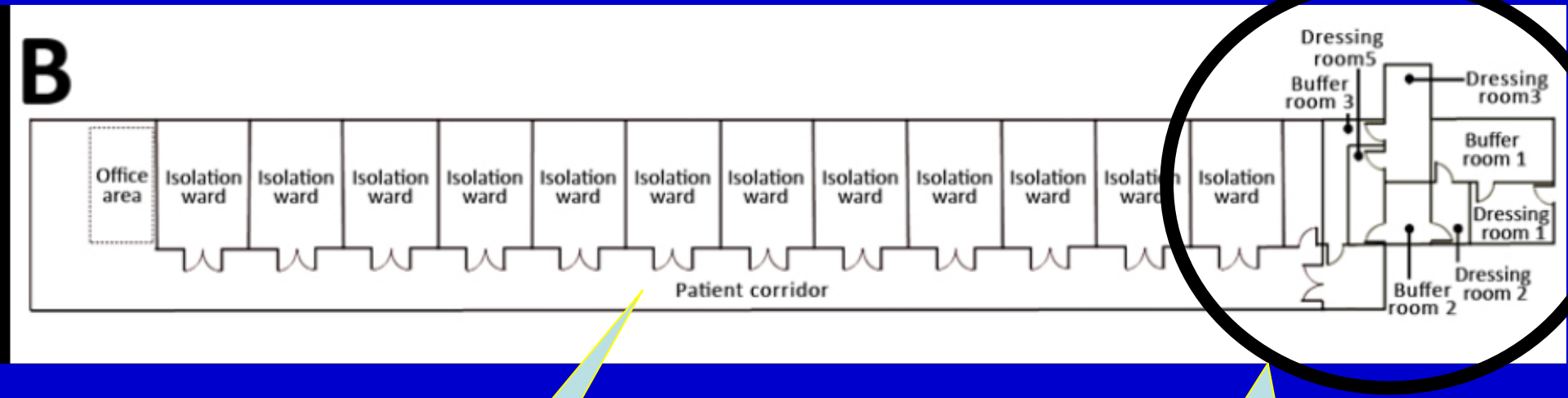


Figure B: General ward hous 24 COVID patients with milder diseases.

Patient room


C
Air in
AIR
15.4%
AIR
0%
Air out
Site 2
Site 1
2.5 m
1 m
0 m
−0.5 m



Patient corridor (26samples): Floor=0% Air =0%

All 70 sampling specimens from dressing/undressing rooms (Floor,indoor air, door knobs) =negative

Take home message:

COVID-19 usually also did not spread beyond isolation room or ward.

Finding a suspected case of nCoV infection: What to do next ???

Screening

Mask for the patient

OPEN ACCESS Freely available online

PLOS | PATHOGENS

Influenza Virus Aerosols in Human Exhaled Breath: Particle Size, Culturability, and Effect of Surgical Masks

Donald K. Milton[1,2]*, M. Patricia Fabian[2,3]☯, Benjamin J. Cowling[4], Michael L. Grantham[1], James J. McDevitt[2]☯

Milton D et al., PLoS Pathog 2013; 9(3): e1003205. doi:10.1371/journal.ppat.1003205

Surgical masks produced a 3.4 (95% CI 1.8 to 6.3) fold reduction in viral copies in exhaled breath.

A Quantitative Assessment of the Efficacy of Surgical and N95 Masks to Filter Influenza Virus in Patients with Acute Influenza Infection

D. F. Johnson,[1] J. D. Druce,[2] C. Birch,[2] and M. L. Grayson[1,3,4]

Clinical Infectious Diseases 2009; 49:275–7

The experiment compared the effectiveness of masks vs no mask in blocking influenza spread from the patient' s mouth durong coughing.(Each patient coughed 5 times onto influenza sampling plate.)

Patient or variable	Influenza type	Nasal swab	No mask, before control (step 1)	N95 mask (step 2)	Surgical mask (step 3)
Patient					
1	A	31	38	Negative	Negative
2	A	26	40	Negative	Negative
3	A	22	Negative	Negative	Negative
4	A	26	34	Negative	Negative
5	A	23	32	Negative	Negative
6	A	25	27	Negative	Negative
7	B	22	38	Negative	Negative
8	A	29	34	Negative	Negative
9	B	27	Negative	Negative	Negative

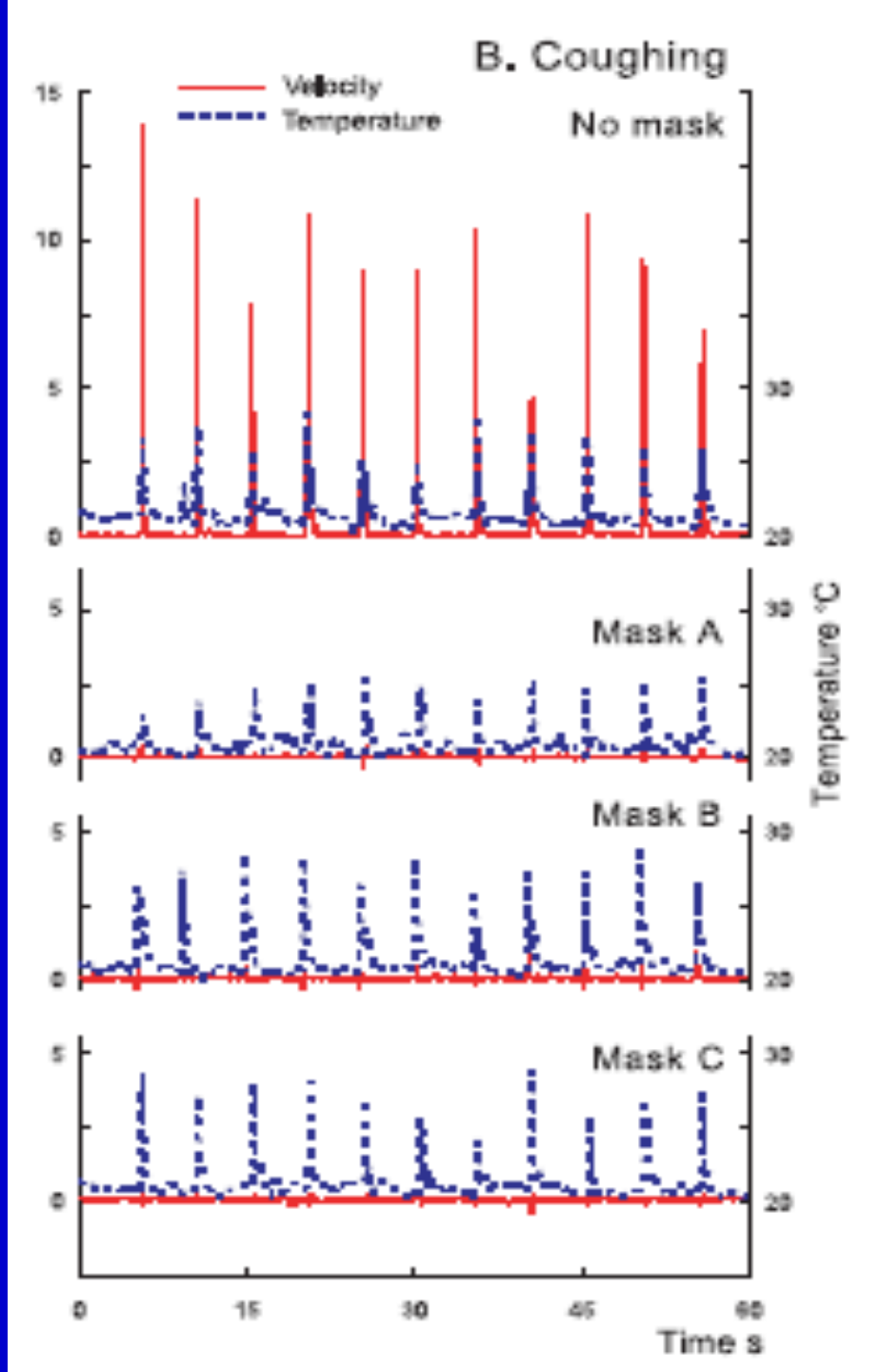
Jpn. J. Infect. Dis., 59, 179-181, 2006

Short Communication

Masks for Influenza Patients: Measurement of Airflow from the Mouth

Sakae Inouye*, Yasuaki Matsudaira[1] and Yoshibumi Sugihara[2]

Measuring the speed of the wind from the mouth with an ultrasonic anemometer.



Compared with the airspeed without masks, all three masks reduced the speed to less than 1/10.

Take home message:

Simple surgical (synthetic fibers) masks filtered more than 90% of particles in coughing experiments and reduced the speed of particle emission(and ? the distance that infected particle could go.)

แนะนำผู้ป่วยให้ใส่ mask อยู่เสมอ
ระหว่างอยู่ในโรงพยาบาล
หรือในสถานที่มีคนอื่นอยู่รวมกัน

Screening

Mask for the patient

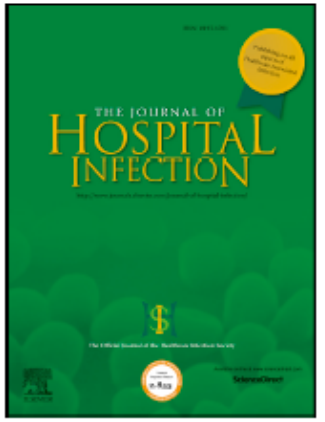
Mask for personnel

Example 1

Journal Pre-proof

Risk of nosocomial transmission of coronavirus disease 2019: an experience in a general ward setting in Hong Kong

S.C.-Y. Wong, R.T.-S. Kwong, T.C. Wu, J.W.M. Chan, M.Y. Chu, S.Y. Lee, H.Y. Wong, D.C. Lung



PII: S0195-6701(20)30174-2

DOI: https://doi.org/10.1016/j.jhin.2020.03.036

An 64 yo.unrecognized COVID-19 patient had stayed in an open cubicle (bed 2) ward A with 10 other patients for 35 hours before being transferred to airborne infection isolation room.AIIR for intubation.


(a)
L
SITTING

Ward A is a 53-bedded female medical ward for renal patients. (6 ACH, normal pressure setting)


Nurses' station
33
34
48
32
35
31
36
44
43
42
41
16
9
8
1
15
10
7
Index case
14
11
6
3
52
51
13
12
5
4

A total of 71 staff and 49 patients were identified as contacts.

Close Contacts

7 staffs = had contact within two metres of the index case for >15 minutes.

were subjected to a 14-day work exclusion and quarantine.

10 patients = shared the same cubicle with the index case.

were quarantined into an AIIR (or quarantine camp if patient was deemed clinically stable) for 14 days

Results:

All specimens from the 52 contacts were negative for SARS-CoV-2, including all patient close contacts and six of the seven staff close contacts.

Why not infected ????

All seven close contact staffs reported wearing a mask (Five,N95s and two, surgical masks, respetively) during patient contacts.


WEAR A FACE *MASK*
Cover mouth and nose, avoid touching mask once it's on.
The Son of a Man / by Rene Magritte
Ministry of Culture and Information Policy of Ukraine
#ArtOfQuarantine
#FlattenTheCurve

Mask for HCWs: ??? N95

Surgical Mask vs N95 Respirat for Preventing Influenza Among Health Care Workers

A Randomized Trial

JAMA. 2009;302(17):1865-1871

Mark Loeb, MD, MSc
Nancy Dafoe, RN
James Mahony, PhD
Michael John, MD
Alicia Sarabia, MD
Verne Glavin, MD
Richard Webby, PhD
Marek Smieja, MD
David J. D. Earn, PhD
Sylvia Chong, BSc
Ashley Webb, BS
Stephen D. Walter, PhD

Context Data about the effectiveness o respirator for protecting health care work likelihood that N95 respirators will be in sh able in many countries, knowing the effe health importance.

Objective To compare the surgical mask care workers against influenza.

Design, Setting, and Participants N 446 nurses in emergency departments, m care Ontario hospitals.

Intervention Assignment to either a fit-t providing care to patients with febrile res enza season.

Main Outcome Measures The primar

Table 2. Comparison of Laboratory-Confirmed Influenza Between the Surgical Mask and N95 Respirator Groups

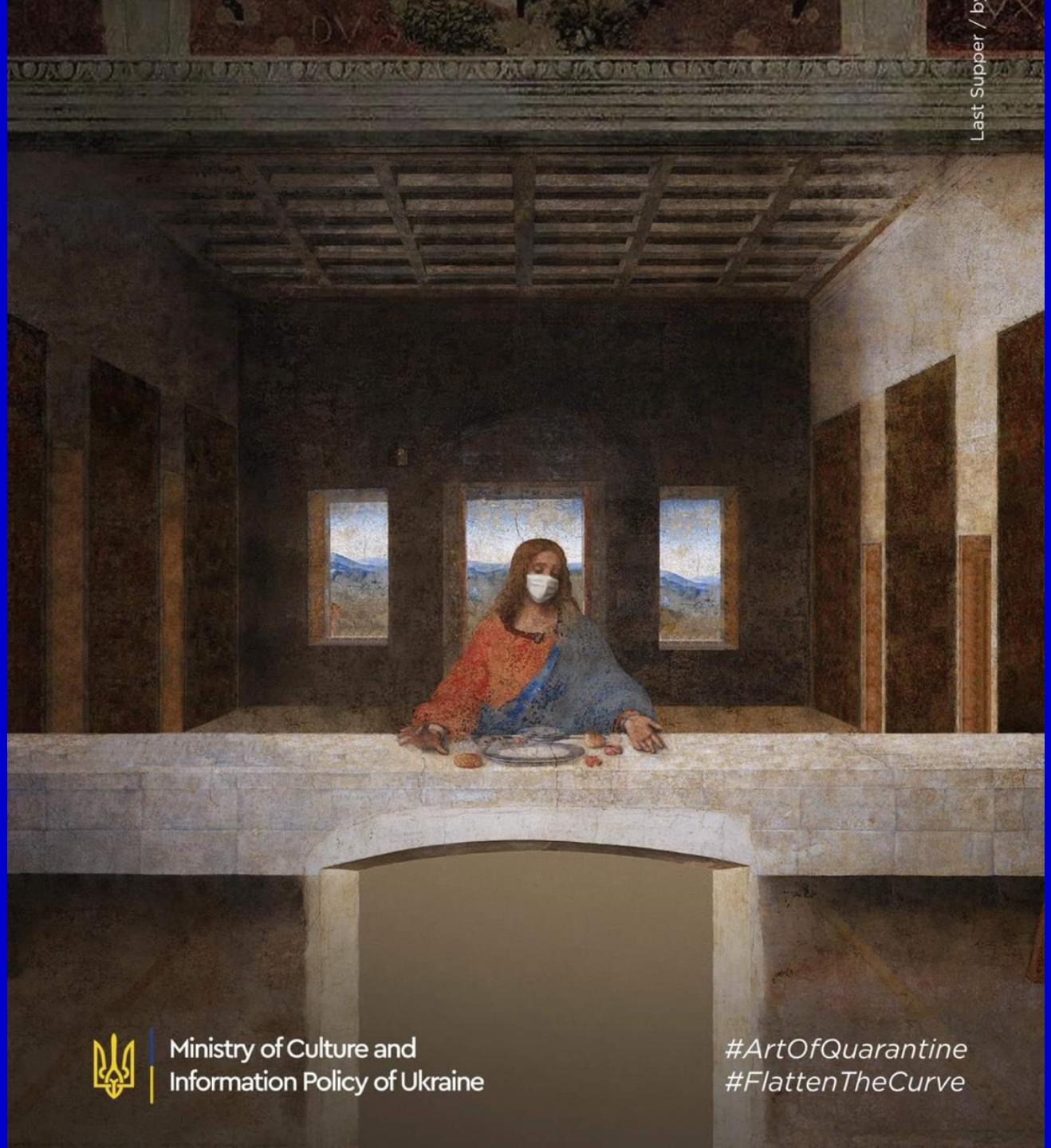
	No. (%)		Absolute Risk Difference, % (95% CI)	*P* Value
	Surgical Mask (n = 212)	N95 Respirator (n = 210)		
Laboratory-confirmed influenza[a]	50 (23.6)	48 (22.9)	–0.73 (–8.8 to 7.3)	.86
RT-PCR influenza A	5 (2.4)	1 (0.5)	–1.88 (–4.13 to 0.36)	.22
RT-PCR influenza B	1 (0.5)	3 (1.4)	0.96 (–0.89 to 2.81)	.37
≥4-Fold rise in serum titers A/Brisbane/59/2007 (H1N1)[b]	25 (11.8)	21 (10)	–1.79 (–7.73 to 4.15)	.55

Table 3. Comparison of RT-PCR Results for Other Respiratory Viruses Between the Surgical Mask and N95 Respirator Groups

	No. (%)		Absolute Risk Difference, % (95% CI)	*P* Value
	Surgical Mask (n = 212)	N95 Respirator (n = 210)		
Respiratory syncytial virus[a]	2 (0.9)	1 (0.5)	–0.47 (–2.07 to 1.13)	>.99
Metapneumovirus	4 (1.9)	3 (1.4)	–0.46 (–1.98 to 2.89)	>.99
Parainfluenza virus[b]	1 (0.5)	2 (1.0)	0.48 (–1.12 to 2.09)	.62
Rhinovirus-enterovirus	8 (3.8)	10 (4.8)	0.99 (–2.87 to 4.85)	.62
Coronavirus[c]	9 (4.3)	12 (5.7)	1.47 (–2.68 to 5.62)	.49
Total[d]	20 (9.4)	22 (10.5)	1.04 (–4.67 to 6.76)	.72

Take home message:

In routine patient care, use of a surgical mask compared with an N95 respirator resulted in noninferior rates of laboratory-confirmed influenza.


Last Supper / by
Ministry of Culture and
Information Policy of Ukraine
#ArtOfQuarantine
#FlattenTheCurve

Screening

Mask for the patient

Mask for personnel

Faceshield

2019-nCoV transmission through the ocular surface must not be ignored

We declare no competing interests.

*Cheng-wei Lu, Xiu-fen Liu, Zhi-fang Jia
lcwchina800@sina.com

Department of Opthalmology (CL, XL) and Division

www.thelancet.com Published online February 6, 2020 https://doi.org/10.1016/S0140-6736(20)30313-5

Screening

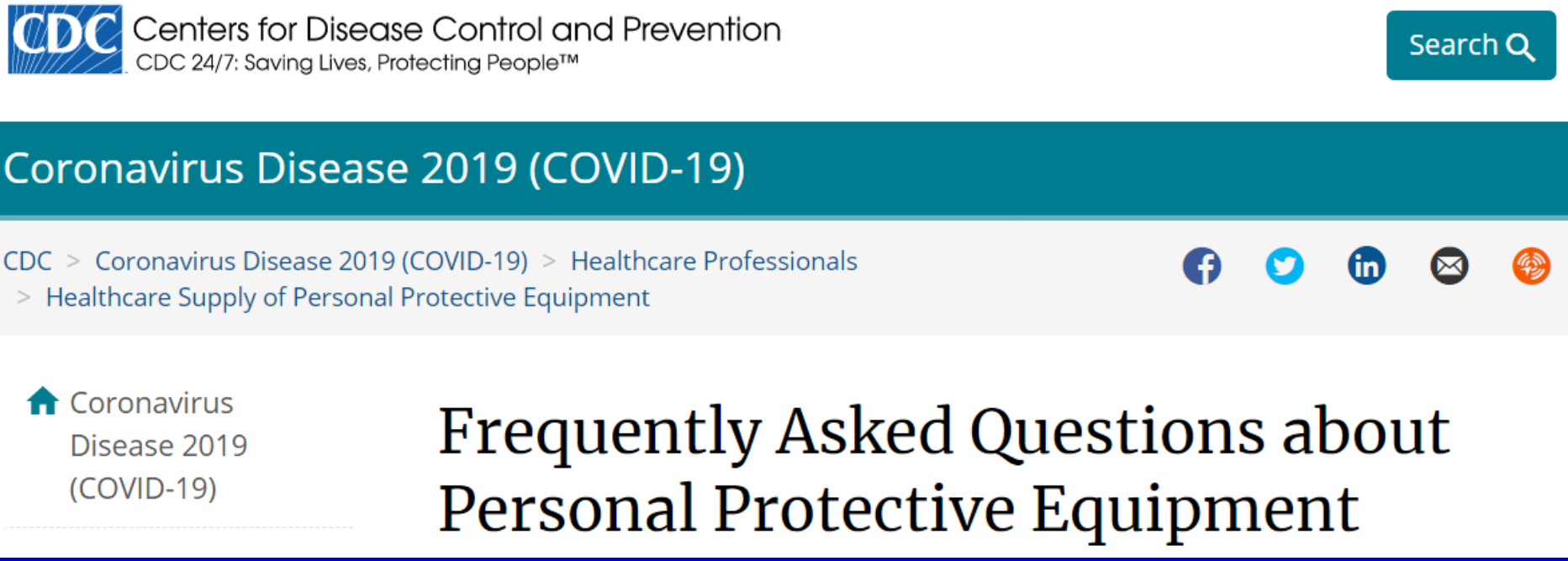
Mask for the patient

Mask for personnel

Faceshield

? Gown

Gown



For healthcare activities with low, medium, or high risk of contamination, surgical gowns (ANSI/AAMI PB70 Levels 1-4) can be used. These gowns are intended to be worn by healthcare personnel during surgical procedures.

RESEARCH LETTER JAMA Published online March 4, 2020

Air, Surface Environmental, and Personal Protective Equipment Contamination by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) From a Symptomatic Patient

Sean Wei Xiang Ong, MBBS
Yian Kim Tan, PhD
Po Ying Chia, MBBS
Tau Hong Lee, MBBS
Oon Tek Ng, MBBS, MPH
Michelle Su Yen Wong, PhD
Kalisvar Marimuthu, MBBS

Patient	Days of illness when samples were collected	Presence of symptoms during sampling	Symptoms	Disease severity[a]	Before/after routine cleaning
A	4, 10	Yes, both days	Cough, fever, shortness of breath	Moderate	After
B	8, 11	Yes on day 8; asymptomati on day 11	Cough, fever, sputum production	Moderate	After
C	5	Yes	Cough	Mild	Before

Table 2. Environmental and PPE Sites Sampled and Corresponding RT-PCR Results

Sites[a]	Positive samples (patient C; before routine cleaning)[b]	Cycle threshold value[c]
Staff PPE sites		
Upper front part of gown	0/2	
Lower front part of gown	0/2	
Front surface of face visor mask	0/2	
Front surface of N95 mask	0/2	

A-Z Index

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EMERGING INFECTIOUS DISEASES®

ISSN: 1080-6059

EID Journal > Volume 26 > Early Release > Main Article

Volume 26, Number 7—July 2020

Dispatch

Aerosol and Surface Distribution of Severe Acute Respiratory Syndrome Coronavirus 2 in Hospital Wards, Wuhan, China, 2020

Zhen-Dong Guo[1], Zhong-Yi Wang[1], Shou-Feng Zhang[1], Xiao Li, Lin Li, Chao Li, Yan Cui, Rui-Bin Fu, Yun-Zhu Dong, Xiang-Yang Chi, Meng-Yao Zhang, Kun Liu, Cheng Cao, Bin Liu, Ke Zhang, Yu-Wei Gao✉, Bing Lu✉, and Wei Chen✉

On This Page

Area, sample	Intense positive/weak positive/negative†	Rate of positivity, %
PPE **in ICU with severe COVID patients**		
Face shield of medical staff	0/0/6	0
Sleeve cuff of medical staff	0/1/5	16.7
Glove of medical staff	0/1/3	25
PPE **in ward with milder COVID cases**		
Face shield of medical staff	0/0/3	0
Sleeve cuff of medical staff	0/0/3	0
Glove of medical staff	0/0/3	0

Total positive = 2/25 (glove & sleeve cuff)

Take home message:

Gowns worn by nurses caring for a COVID patients usually were not contaminated except at the sleeve cuff where inoculation of viruses might occur during donning or removal of the gloves.

Take home message:

We may not need a water impermeable gown except when massive bleeding or fecal soiling are anticipated. A cloth gown is enough.

Hospital personnels

“First nCoV Care Teams”

ER & ICU


มีพัดลมอยู่หลังแพทย์ พัดออกทางหน้าต่าง


แพทย์ผู้ที่จะมาตรวจผู้ป่วยจะต้องสวม
หมวก, mask, ถุงมือ, และเสื้อ gown


หลังการตรวจผู้ป่วยเสร็จแล้วให้ decontaminate มือ

decontaminate พื้นโต๊ะ
และเครื่องมือที่ใช้ตรวจ

ถ้าจะต้องรับผู้ป่วยเข้ารักษาในโรงพยาบาล
ให้จัดผู้ป่วยไว้ในห้องที่เตรียมไว้เฉพาะ

Use the new non-suction oxygen mask with highly efficient Virus Filters attached

Intubation: ?When?

if an oxygen flow over 15Liter/min or a frequency of over 30 breaths/min is still not able to maintain oxygen saturation.

Intubation:

Centers for Disease Control and Prevention

Coronavirus Disease 2019 (COVID-19)

Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus Disease 2019 (COVID-19) in Healthcare Settings

Update April 13, 2020

“ N95 respirators or respirators that offer a higher level of protection should be used instead of a facemask when performing or present for an aerosol generating procedure.”

Intubation: N 95 ???

SARS among protected healthcare workers (*MMWR 2003;52:433)*

54 year old Canadian doctor

↓

Apr.1-2,2003: Examined 3 SARS patients

↓

Apr. 4: Fever, cough, normal CXR

↓

Apr. 8: LUL infiltrate

↓

Apr. 12: Received oxygen & nebulized bronchodilator

SARS among protected healthcare workers (*MMWR 2003;52:433)*

April 13,2003: Admitted into ICU

↓

Rx with BiPAP for 2 hrs,"he removed the mask repeatedly"

intubated, "had copious sputum"

↓

April 15-21,2003: 9 HCWs had SARS, all had worn the recommended protective eqipments including gowns,gloves PCM2000 duckbill masks and goggles.

6 of these 11 HCWs had been present during the intubation period.

PCM 2000 Duckbill Mask

= N95 -equivalent mask

Take home message:

For a very intimate contact with heavy load of infectious particles such as during endotracheal intubation, simple surgical mask and N95 mask are likely to be inadequate.

Why ???

Oral Maxillofac Surg
45:319–323, 1987

Efficacy of Face Masks in Preventing Inhalation of Airborne Contaminants

DAVID J. PIPPIN, DDS, MS,* RICHARD A. VERDERAME, DDS,† AND KURT K. WEBER, DDS‡

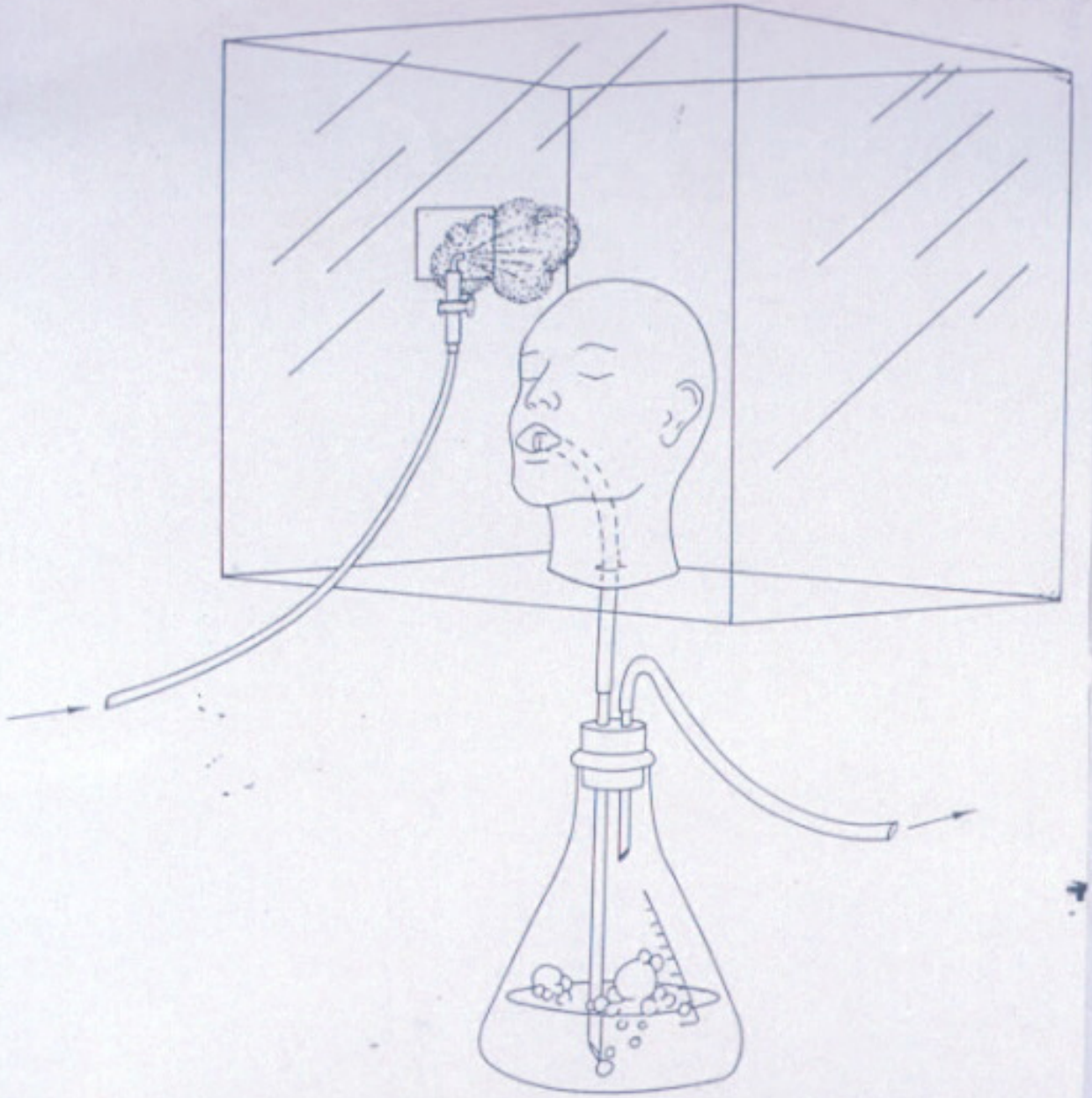


FIGURE 1. Inhalation chamber and recovery system. Capitis moulage is shown without mask.

	% spore recovered
No mask (n=8)	24.6%
American Hospital masks (n=8)	
-conventionally worn	24.2%
-taped masks	0.00%
3M masks (n=8)	
-conventionally worn	30.9%
-taped masks	0.00%

Ref.:*Pippin DJ et al. J Oral Maxillofac Surg 1987;45:319*

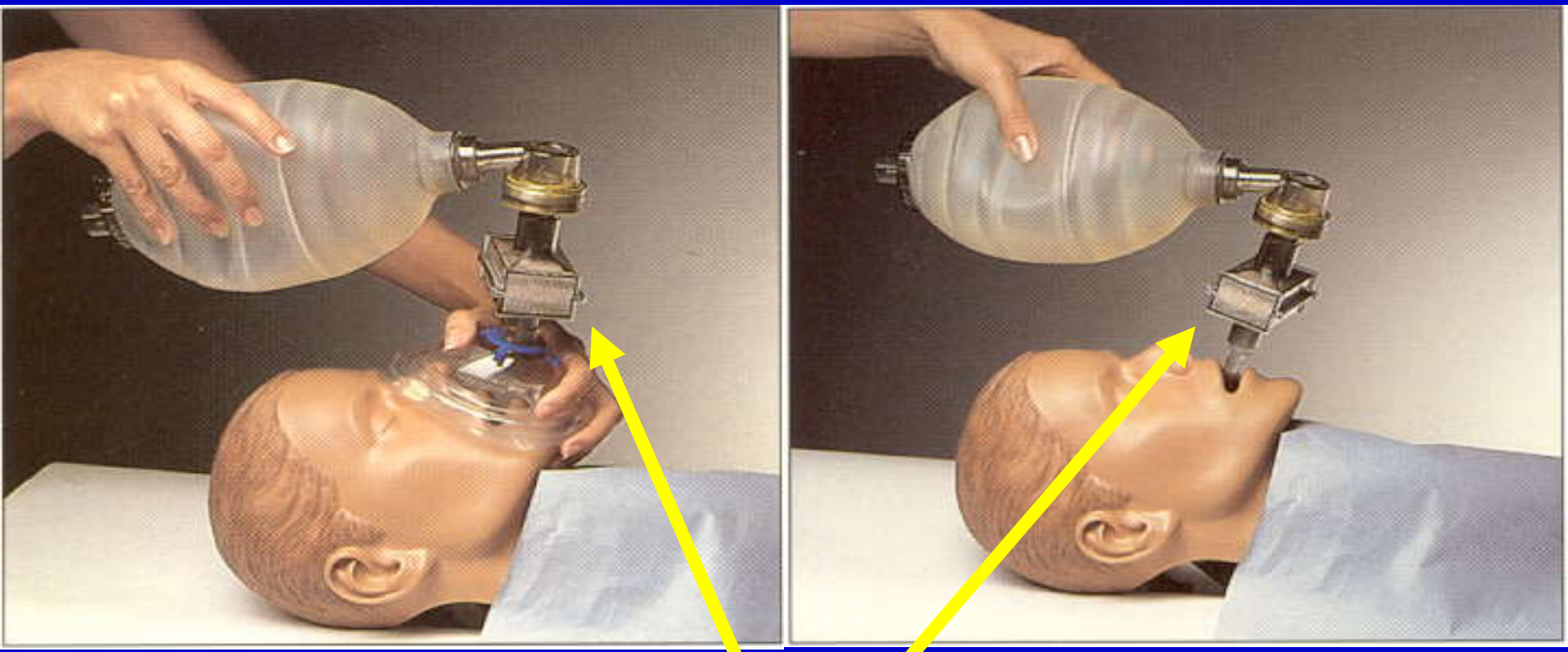
Take home message:

Ordinary- wearing masks perform poorly in protecting you against COVID 19 from a close range coughing due to leakage through the edges of the mask. However , you may get much more protection by tapeing the mask tightly to your face.

What should we do, then???

Powered Air Purifying Respirators (PAPRs)

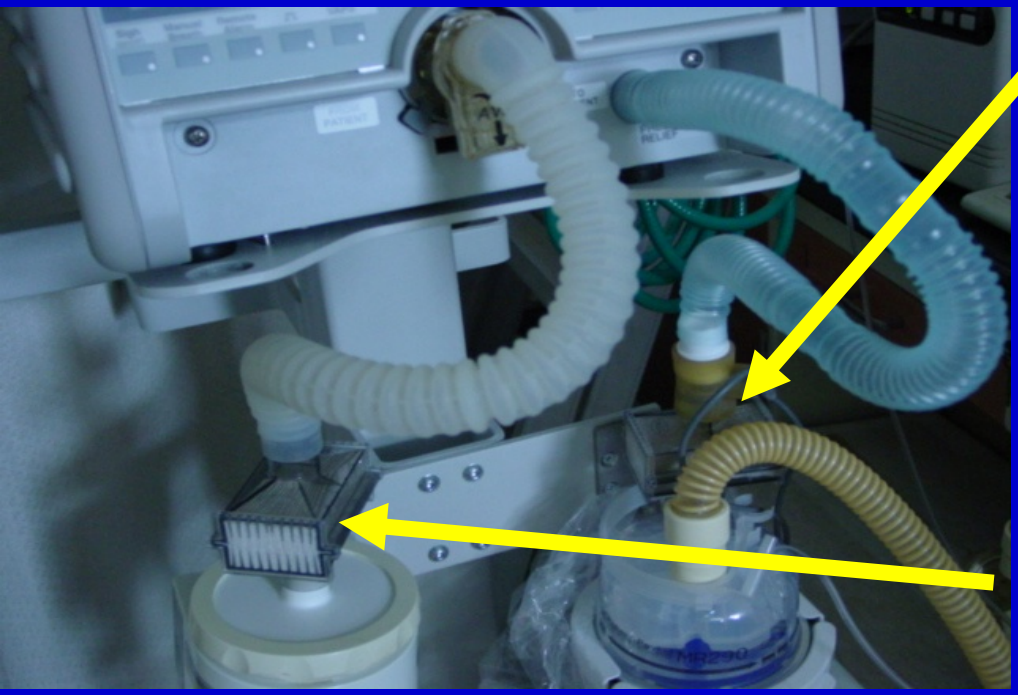
Powered Air Purifying Respirators (PAPRs)



Filter

Beware! :The filter on the expiratory end should be changed if its flow resistance has increased > 3cmH2O.

Caution!: Pay attention to filters which may have an influence on the function of some ventilators.



In the inspiratory limb of the circuit the Virus filter is placed on the entrance of Humidifier.

In the expiratory limb of the circuit the Virus filter is placed on the exit of the isolation system.

No PAPR in developing countries : What should we do ?

SPECIAL ARTICLE

Multidrug-Resistant Tuberculosis

Recommendations for Reducing Risk during Travel for Healthcare and Humanitarian Work

Barbara J. Seaworth[1], Lisa Y. Armitige[1], Naomi E. Aronson[2], Daniel F. Hoft[3], Michael E. Fleenor[4], Adrian F. Gardner[5], Drew A. Harris[6], Rachel L. Stricof[7], Edward A. Nardell[8]; for the Advisory Council for the Elimination of Tuberculosis

Ann Am Thorac Soc Vol 11, No 3, pp 286–295, Mar 2014

"Approximately 10% of inhaled air does not pass through the filter in well-fitted disposable N95 models.Well-fitted reusable elastomeric respirators have approximately 2% face-seal leakage."

Table 4. Recommendations for respiratory protection

Respirators that are suitable for work with patients with TB are either disposable filtering facepiece respirators (N95 or higher) or reusable elastomeric respirators.

Elastomeric Respirators

- The current Elastomeric Respirator TCID institutes:

North 7700 - S, M, L	Moldex – S, M, L	Powered Air Purifying Respirators
134 Employees	**2 Employees**	**2 Employees**

TEXAS
Health and Human Services
Texas Department of State Health Services

TEXAS
Health and Human Services

Texas Department of State Health Services

Use of Elastomeric Masks at a TB Hospital

Annie Kizilbash, MD, MPH
Cynthia Guenther, RCP
Richard Reed, RT, BSHED
Debbie Mata, RN

Infection Control

- 40-50% of the staff converted to TST positive after employment
- A total of 7 nurses converted their TST in 1992
- 1-2% of the staff had TB disease

TEXAS
Health and Human Services
Texas Department of State Health Services

Institution of RPP

- From surgical masks we migrated to elastomeric respirators
- TCID selected the elastomeric respirator over the N-95 respirator based on the following factors:
  - Reliability and Comfort
  - Better Respiratory Protection
  - Cost Effectiveness
  - Less Time Consuming for Fit Testing

TEXAS
Health and Human Services
Texas Department of State Health Services

Results

TCID has not had an employee TST conversion since 1994.

TEXAS
Health and Human Services

Texas Department of State Health Services

What is the cost of an elastomeric mask ???

150-1000 Bahts !!!

แนะนำการใช้ Elastomeric Respirator (N95 or P100) สำหรับบุคลากรที่ทำงานใกล้ชิดผู้ป่วยโควิดเป็นเวลานาน

- ในยุคที่ N95 อาจหาได้ยาก → จึงมองหา Elastomeric Respirator แทน
- สามารถใช้ซ้ำ เป็นของคนคนนั้น
- ประสิทธิภาพการกรองดีไม่ต่ำกว่า 95% (N95) และไม่ต่ำกว่า 99.97% (P100)
- เปลี่ยนแค่ไส้กรองเมื่อครบกำหนด
- หน้ากากทำจากซิลิโคน เบา ยืดตัว กระชับกับหน้า แต่ต้อง FIT test เสมอ
- แนะนำ แพทย์ วิสัญญีแพทย์ แพทย์EP แพทย์ผ่าตัดผู้ป่วยโควิด แลบที่เก็บสิ่งส่งตรวจ พยาบาลICU พยาบาลที่ต้องใกล้ชิดผู้ป่วยเป็นเวลานาน
- หัตถการ: bronchoscope, ใส่ ET tube, ดูดเสมหะ, พ่นยา หรือ กิจกรรม CPR

ย้ำ!! อันนี้เป็นหน้ากากของใครของคนนั้น ต้องฝึกใช้ ดูในVDOที่จัดให้ → สำคัญที่การใส่ กา[illegible]ถอด และการเช็ด ทำความสะอาดหลังใช้ทุกครั้ง พร้อมหาที่แขวนเก็บไว้ที่หอผู้ป่วยของแต่ละคน

Centers for Disease Control and Prevention

Coronavirus Disease 2019 (COVID-19)

Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus Disease 2019 (COVID-19) in Healthcare Settings

Update April 13, 2020

4. Take Precautions When Performing Aerosol Generating Procedures (AGPs)

- Some procedures performed on patients with known or suspected COVID-19 could generate infectious aerosols. Procedures that pose such risk should be performed cautiously and avoided if possible.
- If performed, the following should occur:
  - HCP in the room should wear an N95 or higher-level respirator such as disposable filtering facepiece respirators, PAPRs, and elastomeric respirators, eye protection, gloves, and a gown.

Any other choice for poor countries ???

Centers for Disease Control and Prevention

Coronavirus Disease 2019 (COVID-19)

Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus Disease 2019 (COVID-19) in Healthcare Settings

Update April 13, 2020

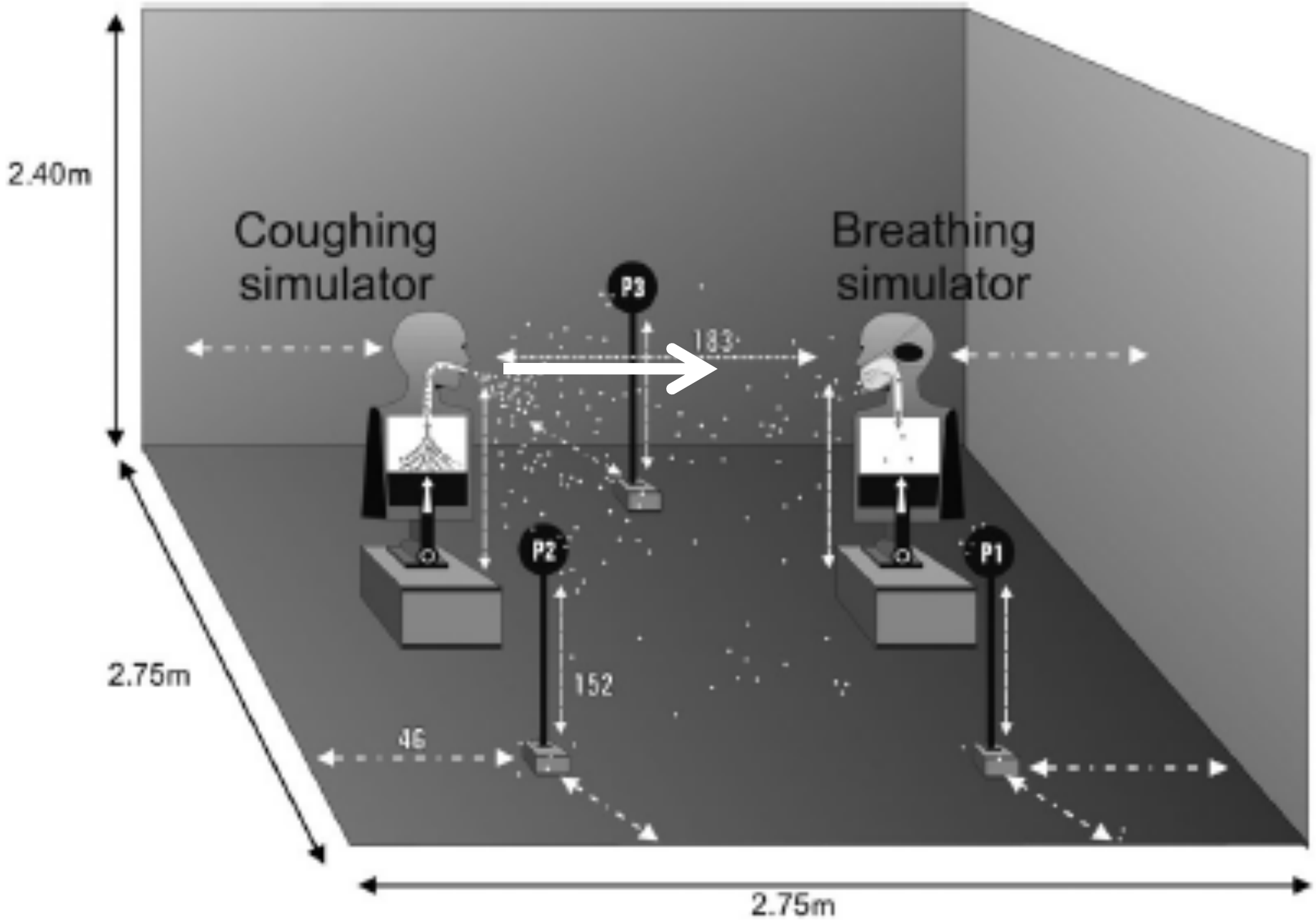
“ N95 respirators or respirators that offer a higher level of protection should be used instead of a facemask when performing or present for an aerosol generating procedure.”

MAJOR ARTICLE

Detection of Infectious Influenza Virus in Cough Aerosols Generated in a Simulated Patient Examination Room

John D. Noti,[1] William G. Lindsley,[1] Francoise M. Blachere,[1] Gang Cao,[4] Michael L. Kashon,[1] Robert E. Thewlis,[1] Cynthia M. McMillen,[1,2] William P. King,[3] Jonathan V. Szalajda,[3] and Donald H. Beezhold[1]

Clinical Infectious Diseases 2012;54:1569–77


2.40m
Coughing simulator
Breathing simulator
P3
183
P2
P1
152
46
2.75m
2.75m

Unsealed mask = “attached using the tie straps or elastic headbands of the masks.”

An unsealed surgical mask blocked entry of 56.6% of infectious virus.

An unsealed N95 blocked 66.5% of infectious virus.

Tightly- sealed Mask = “sealed over the mouth of the breathing simulator using silicone sealant.”

Tightly sealed N95 blocked entry of 99.6% of infectious virus compared with 94.8% by a surgical mask.

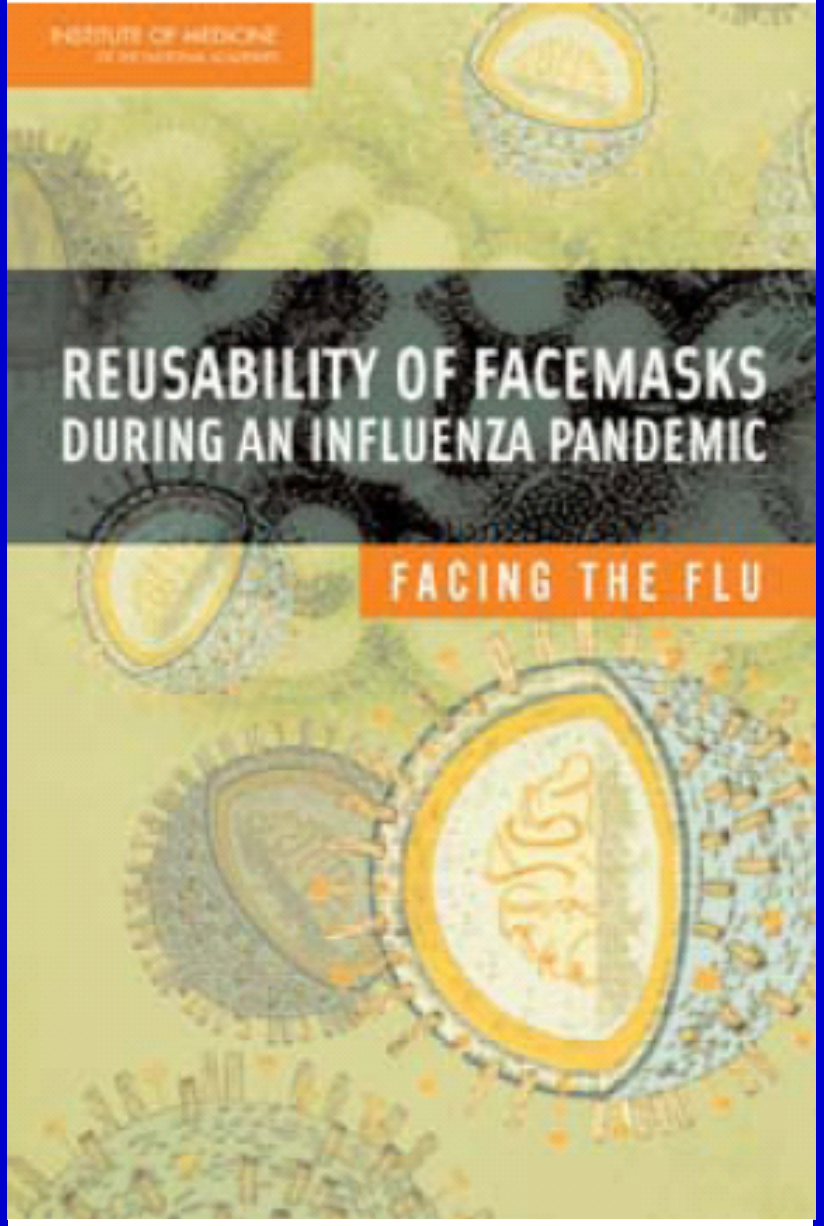
Take home message:

Ordinary- wearing masks perform poorly in protecting you against COVID 19 from a close range coughing due to leakage through the edges of the mask. However , you may get much more protection by tapeing the mask tightly to your face.

Makarak Hospital

Apply an adhesive tape around the mask rim.

N95 masks: ? Reuse ?



INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES

“if an individual user needs to reuse his or her own disposable N95 respirator, it should be done in the following manner:

1. Place a medical mask or cleanable faceshield over the respirator so as to prevent surface contamination. ……

RESEARCH LETTER JAMA Published online March 4, 2020

Air, Surface Environmental, and Personal Protective Equipment Contamination by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) From a Symptomatic Patient

Sean Wei Xiang Ong, MBBS
Yian Kim Tan, PhD
Po Ying Chia, MBBS
Tau Hong Lee, MBBS
Oon Tek Ng, MBBS, MPH
Michelle Su Yen Wong, PhD
Kalisvar Marimuthu, MBBS

Table 2. Environmental and PPE Sites Sampled and Corresponding RT-PCR Results

Sites[a]	Positive samples (patient C; before routine cleaning)[b]	Cycle threshold value[c]
Staff PPE sites		
Front surface of face visor mask	0/2	
Front surface of N95 mask	0/2	

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EID Journal > Volume 26 > Early Release > Main Article

Volume 26, Number 7—July 2020

Dispatch

Aerosol and Surface Distribution of Severe Acute Respiratory Syndrome Coronavirus 2 in Hospital Wards, Wuhan, China, 2020

Zhen-Dong Guo[1], Zhong-Yi Wang[1], Shou-Feng Zhang[1], Xiao Li, Lin Li, Chao Li, Yan Cui, Rui-Bin Fu, Yun-Zhu Dong, Xiang-Yang Chi, Meng-Yao Zhang, Kun Liu, Cheng Cao, Bin Liu, Ke Zhang, Yu-Wei Gao✉, Bing Lu✉, and Wei Chen✉

On This Page

Area, sample	Intense positive/weak positive/negative†	Rate of positivity, %
PPE **in ICU with severe COVID patients**		
Face shield of medical staff	0/0/6	0
PPE **in ward with milder COVID cases**		
Face shield of medical staff	0/0/3	0

N95 mask for health personnels: ??? For how long can I use it???

“Even in Singapore, N95 masks were of limited supply therefore HCWs wore them throughout the hospital and re-used them for about a week. Thus far, this behaviour did not result in further SARS infection”. ***James L et al. Publ Health 2006;120:20-26***

Moving the patient:

Don’t forget to put the mask on the patient. Patient ‘s mask alone can reduce more than 90% of viral dispersion from his/her mouth.

มีคนไปกดลิฟท์ไว้รอ
ลิฟท์ที่ใช้เป็นลิฟท์สำหรับผู้ป่วย
ซึ่งแยกจากลิฟท์ที่ใช้ทั่วไป


กดปุ่มให้ประตูเปิดค้างไว้
แล้วออกจากบริเวณ


มีการกำหนด เส้นทางการขนย้ายผู้ป่วย
ไว้ก่อนล่วงหน้า โดยกำหนดเส้นทางที่
ปกติไม่ค่อยมีคนผ่าน


ช่วงที่อยู่ในลิฟท์กับผู้ป่วยเป็นช่วงที่
เสี่ยงต่อการติดเชื้อ เพราะเป็นที่แคบ
และมีการถ่ายเททางอากาศน้อย

ผู้ที่ดูแล ขนย้ายผู้ป่วยถือว่าถูก contaminated
ห้ามจับต้องสิ่งใด นอกเหนือจากเตียงผู้ป่วย


กรุณาใช้เท้าปิดประตู
ประตูนี้ออกแบบมาไม่ดี
มือจับประตูเป็นแหล่งของการแพร่เชื้อ


เจ้าหน้าที่ในหอผู้ป่วยจะเป็นคนเปิด
และปิดประตูให้

ระหว่างรอห้อง respiratory isolation room
จัดวางผู้ป่วยไว้ใกล้หน้าต่าง เปิดหน้าต่างทั้งหมด
เปิดพัดลมให้ลมพัดออกนอกอาคาร

หอผู้ป่วยจัดแยกเป็นสองส่วน
ไม่ให้มีการสัมผัสถึงกันทั้งคนและสิ่งของ

- ส่วนการรักษาพยาบาลซึ่งถือว่าเป็นบริเวณที่มีการ contaminated
- ส่วนสนับสนุน เป็นส่วนทำงานด้านเอกสาร จัดเตรียมยา อุปกรณ์เครื่องมือ ที่จะใช้

ผู้อยู่ในส่วนการรักษาต้องไม่สัมผัสส่วนอื่น นอกเหนือจากผู้ป่วย เช่นรับโทรศัพท์ ขยับ mask หรือ face shield แต่ให้ผู้อื่นทำแทน และต้องไม่ผ่านเข้าไปในส่วนบริการ

ผู้อยู่ในส่วนการรักษาจะถูก observed โดยผู้ที่อยู่ในส่วนบริการ ว่ามีการ contaminate เกิดขึ้นในช่วงใดบ้างระหว่างการดูแลผู้ป่วยและจะบอกให้ทราบเพื่อทำการ decontaminate ทันที

Effectiveness of measures to prevent SARS

- A case-control study in 5 Hong Kong hospitals
  - 241 non-infected and 13 infected staffs
  - about use of mask, gloves, gowns, and hand-washing

Ref. : Seto WH *et al.*Lancet*2003;361:1519-20*

Effectiveness of measures to prevent SARS

Results:

69 staffs who reported use of all four measures were not infected. **Fewer staff who wore masks (p=0·0001), gowns (p=0·006), and washed their hands (p=0·047) became infected compared with those who didn't, but *stepwise logistic regression was significant only for masks(p=0·011).***

—

Ref. : Seto WH *et al.*Lancet*2003;361:1519-20*

nCoV & Labs

Which specimen ???

a nasopharyngeal swab

sputum,

bronchoalveolar lavage,

or tracheal aspirate

if possible. lower respiratory tract specimens should be a priority for collection

Nasopharyngeal swab: Which mask ???

A nasopharyngeal swab is also considered an aerosol-generating procedure (AGP), because, for example, it can induce coughing.

WHO. Infection prevention and control of epidemic-and pandemic prone acute respiratory infections in health care. WHO guidelines 2014 [17 January 2020].

Healthcare workers performing swabbing , should wear (gloves, goggles, gown and FFP2/FFP3 respirator)

European Centre for Disease Prevention and Control. Infection prevention and control for COVID-19 in healthcare settings – March 2020. ECDC: Stockholm; 202

Note: According to European EN149 standard, FFP2 ≈ N95 (in US. NIOSH standard)

Nasopharyngeal swab: Which mask ???

My suggestion:

First Choice = PAPR

Second choice = Elastomeric mask

Third choice = Taped N95 mask

Forth choice = Taped surgical mask

COVID 19 vs. Toilet room

Aerodynamic Characteristics and RNA Concentration of SARS-CoV-2 Aerosol in Wuhan Hospitals during COVID-19 Outbreak

Yuan Liu, Ph.D.,[1, †], Zhi Ning, Ph.D.,[2, †, *], Yu Chen, Ph.D.,[1, †, *], Ming Guo, Ph.D.,[1, †], Yingle Liu, Ph.D.,[1], Nirmal Kumar Gali, Ph.D.,[2], Li Sun, M.Sc.,[2], Yusen Duan, M.Sc.,[3], Jing Cai, Ph.D.,[4], Dane Westerdahl[2], D.Env.,[2], Xinjin Liu, M.Sc.,[1], Kin-fai Ho, Ph.D.,[5, *], Haidong Kan, Ph.D.,[4, *], Qingyan Fu, Ph.D.,[3, *], Ke Lan, MD, PhD, [1, *]

Table 1. Concentration of airborne SARS-CoV-2 at different locations in Wuhan

Category	Sites	Sample Type	Concentration (copies m^{-3})
Patient Areas (PAA)			
Fangcang Hospital	1. Zone A Workstation#	TSP[a]	1
		TSP[b]	9
	2. Zone B Workstation	TSP	1
	3. Zone C Workstation#	TSP[a]	5
		TSP[b]	0
	4. Patient Mobile Toilet Room	TSP	19

jingcheng zhang ORCID iD: 0000-0002-7555-8848

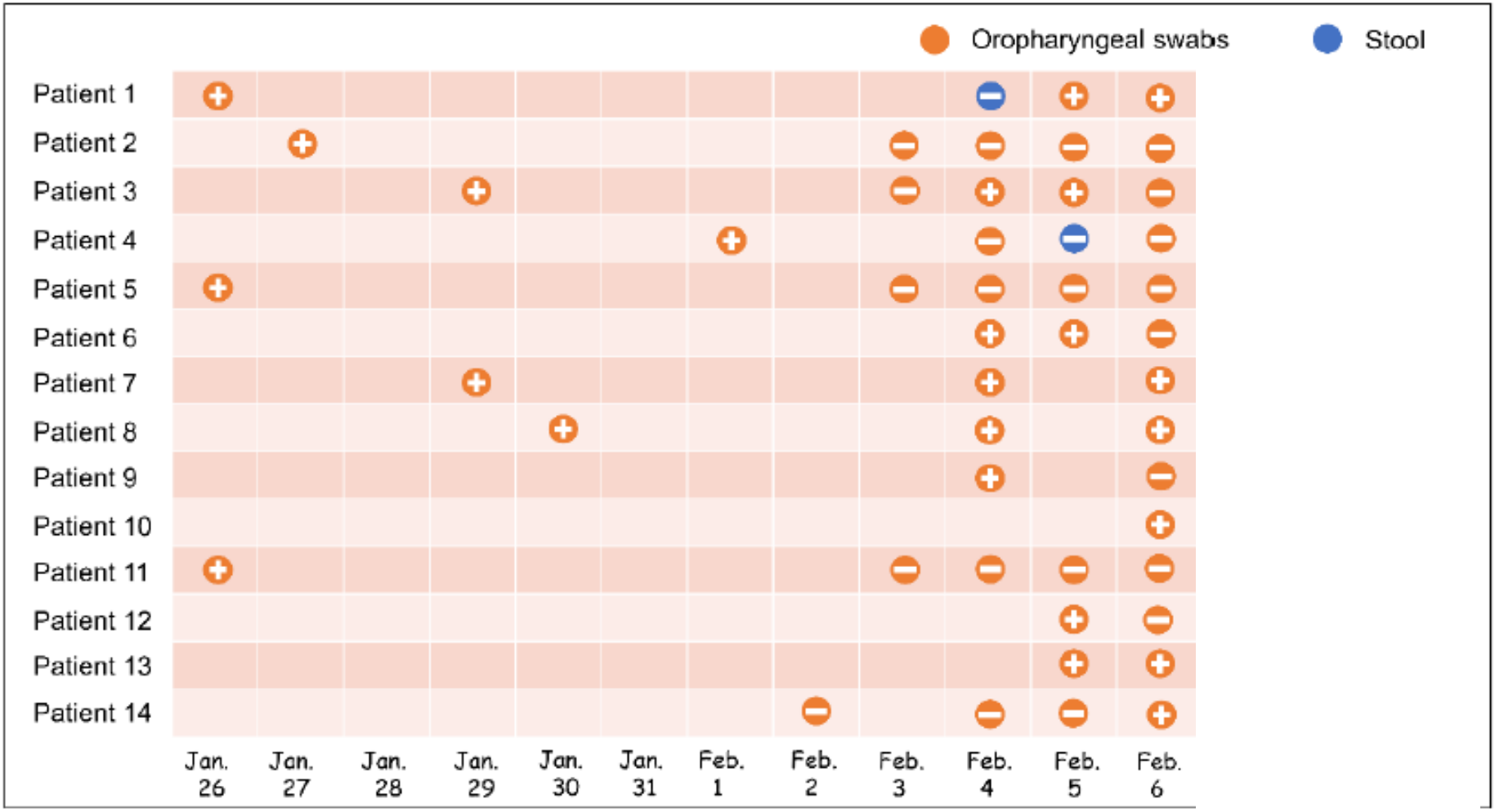
Fecal specimen diagnosis 2019 Novel Coronavirus–Infected Pneumonia

JingCheng Zhang, SaiBin Wang, YaDong Xue

Department of respiration, Jinhua Hospital of Zhejiang University(Jinhua Municipal Central Hospital), Jinhua, China 321000

Journal of Medical Virology , March 03, 2020

Figure 1. Viral nucleic acid test results in 14 patients with COVID-19.



COVID 19 vs. Toilet room

Stool RT- PCRs might become positive late in the course of COVID 19 infection. We don't know yet whether they were viable or not but it is prudent to close the toilet lid before flushing the toilet bowl.

COVID 19 vs.Tears

Received: 19 February 2020 | Accepted: 24 February 2020

DOI: 10.1002/jmv.25725

RESEARCH ARTICLE

JOURNAL OF MEDICAL VIROLOGY WILEY

Evaluation of coronavirus in tears and conjunctival secretions of patients with SARS-CoV-2 infection

Jianhua Xia MM | Jianping Tong MD | Mengyun Liu MM | Ye Shen MD | Dongyu Guo MD

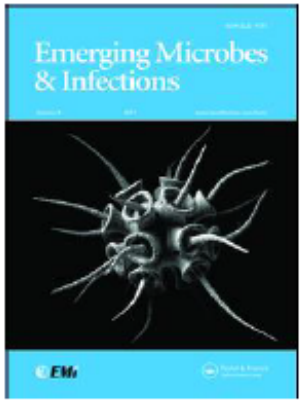
Only one patient with conjunctivitis yielded positive RT-PCR results. Fifty-eight samples from other patents were all negative.

Opinion:

Ophthalmologists are likely to get COVID 19 from the patients' cough rather than from the patients' tear.

However, wash your hand before and after touching each patient.

COVID-19 vs. Blood



Taylor & Francis
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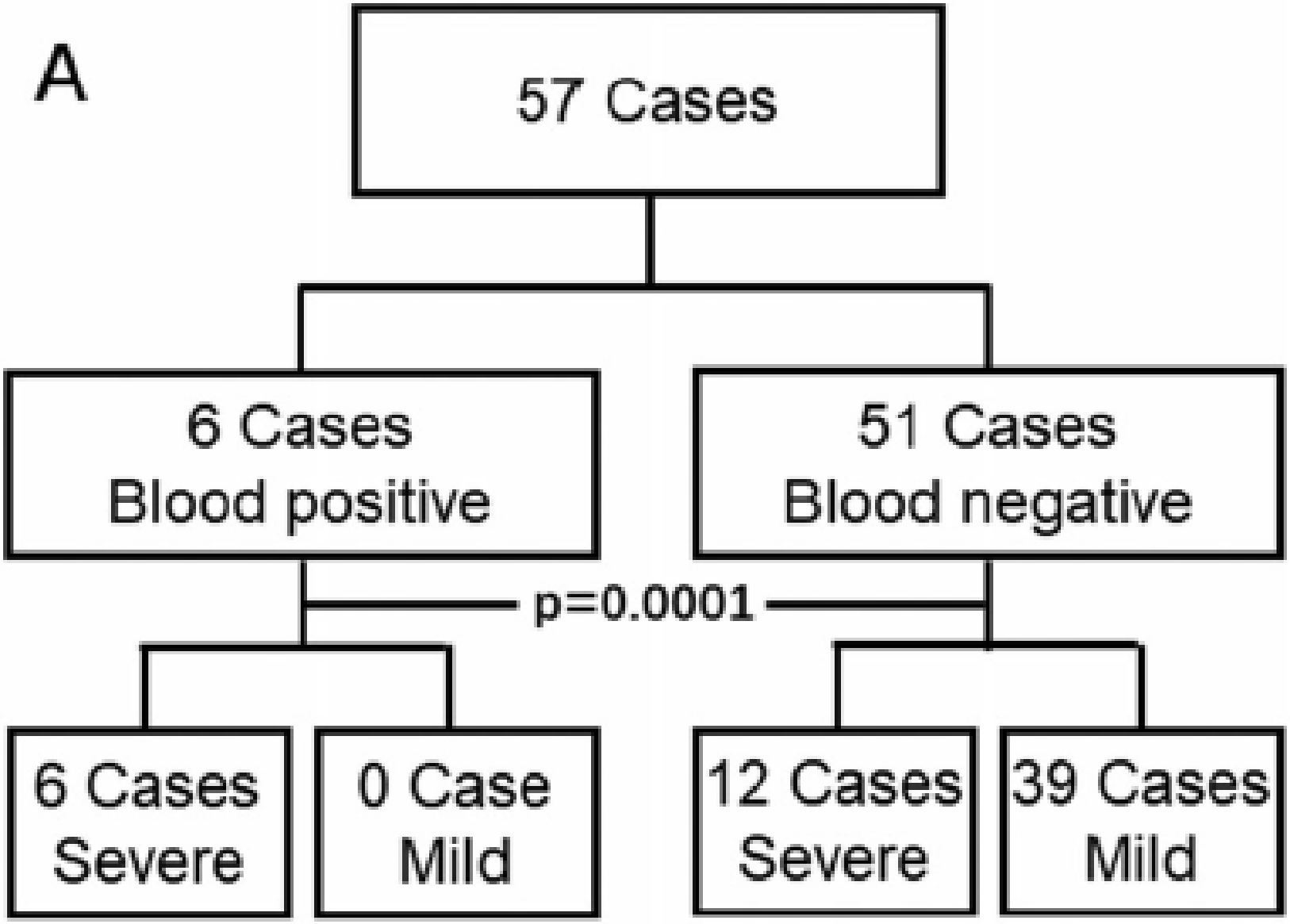
Emerging Microbes & Infections

ISSN: (Print) 2222-1751 (Online) Journal homepage: https://www.tandfonline.com/loi/temi20

Detectable 2019-nCoV viral RNA in blood is a strong indicator for the further clinical severity

Weilie Chen, Yun Lan, Xiaozhen Yuan, Xilong Deng, Yueping Li, Xiaoli Cai, Liya Li, Ruiying He, Yizhou Tan, Xizi Deng, Ming Gao, Guofang Tang, Lingzhai Zhao, Jinlin Wang, Qinghong Fan, Chunyan Wen, Yuwei Tong, Yangbo Tang, Fengyu Hu, Feng Li & Xiaoping Tang


A
57 Cases
6 Cases
Blood positive
51 Cases
Blood negative
p=0.0001
6 Cases
Severe
0 Case
Mild
12 Cases
Severe
39 Cases
Mild

Opinion:

COVID 19 viremia are well documented, exclusively among severe cases. However, nosocomial COVID 19 infection from needle stick or blood transfusion have not been reported yet.

However, beware of needle stick or sharp injuries. Never recap a needle.

Discontinue Isolation: When???

nature

https://doi.org/10.1038/s41586-020-2196-x

Accelerated Article Preview

Virological assessment of hospitalized patients with COVID-2019

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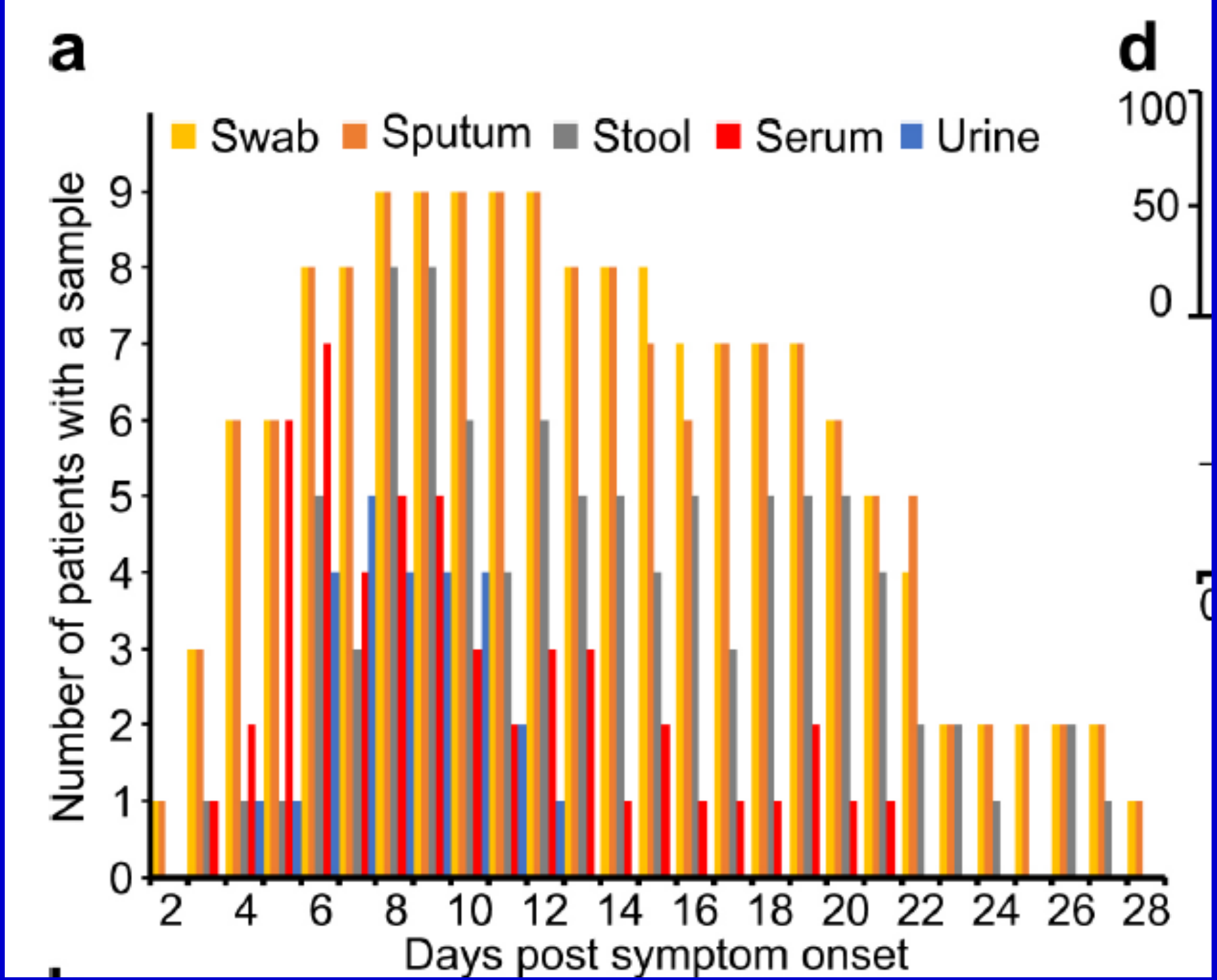
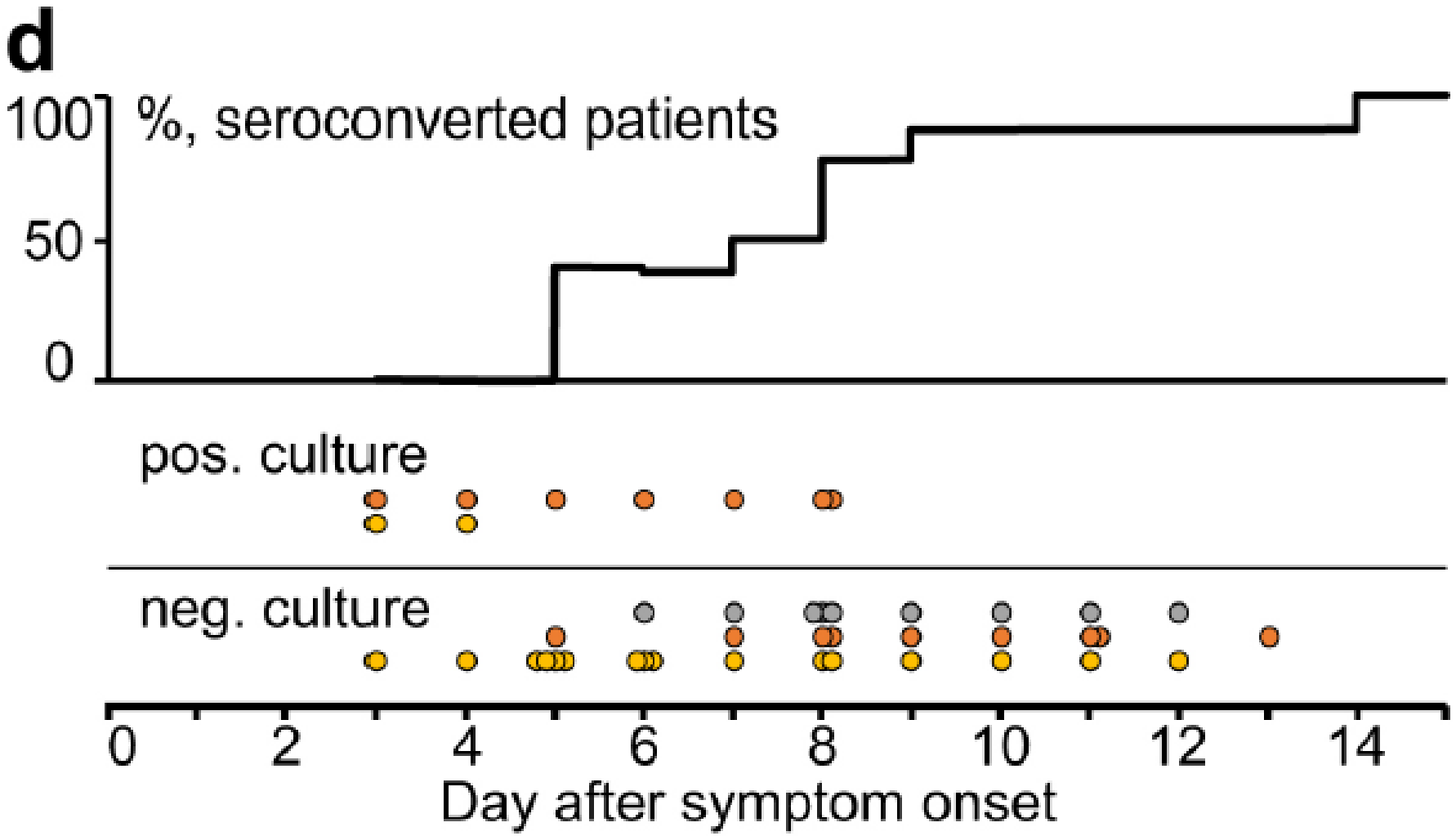
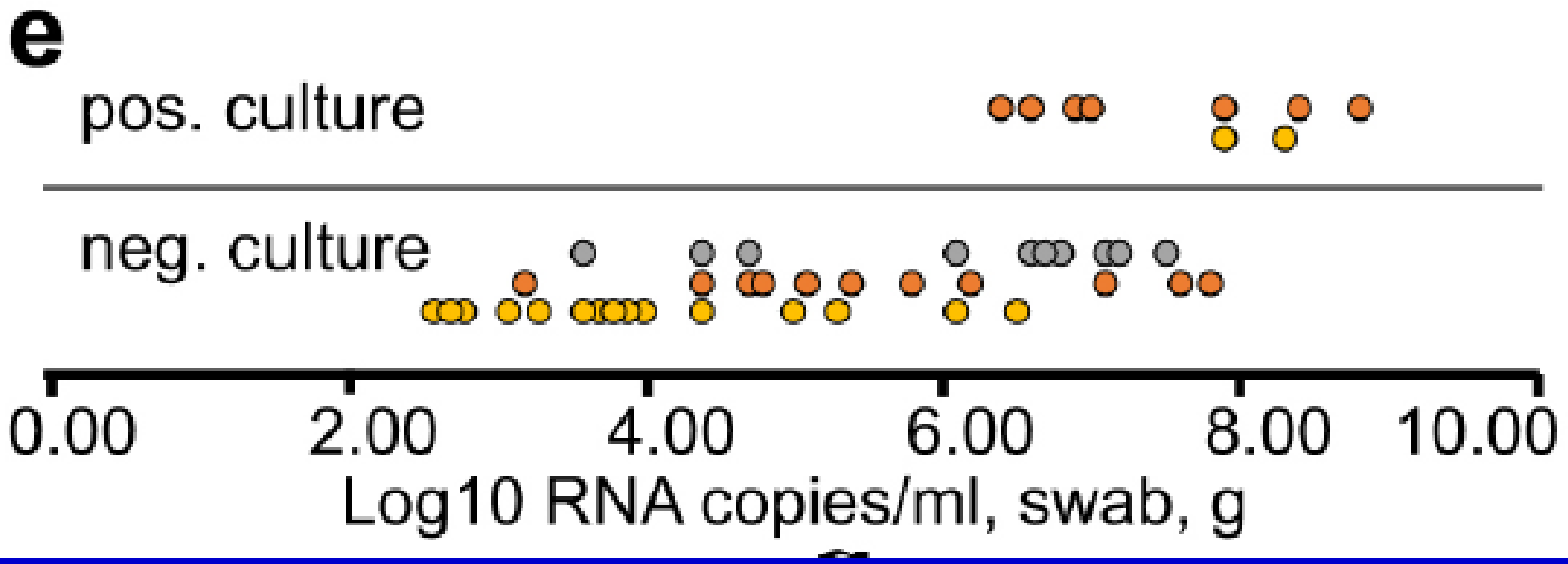
Roman Wölfel, Victor M. Corman, Wolfgang Guggemos, Michael Seilmaier, Sabine Zange, Marcel A. Müller, Daniela Niemeyer, Terry C. Jones, Patrick Vollmar, Camilla Rothe, Michael Hoelscher, Tobias Bleicker, Sebastian Brünink, Julia Schneider, Rosina Ehmann, Katrin Zwirglmaier, Christian Drosten & Clemens Wendtner


a
d
Swab
Sputum
Stool
Serum
Urine
Number of patients with a sample
0
1
2
3
4
5
6
7
8
9
2
4
6
8
10
12
14
16
18
20
22
24
26
28
Days post symptom onset
100
50
0


d
100
%, seroconverted patients
50
0
pos. culture
neg. culture
0
2
4
6
8
10
12
14
Day after symptom onset


e
pos. culture
neg. culture
0.00
2.00
4.00
6.00
8.00
10.00
Log10 RNA copies/ml, swab, g

Terminal disinfection of COVID room

Which Organisms?

Prions

↑

Cryptospoidium cysts

↑

Spores

↑

TB.

↑

Nonlipid viruses (eg. Polio virus)

↑

Fungi

↑

Bacteria

Lipid viruses (eg. HIV, HBV)

MAJOR ARTICLE

Survival of Severe Acute Respiratory Syndrome Coronavirus

Mary Y. Y. Lai, Peter K. C. Cheng, and Wilina W. L. Lim

Virology Division, Public Health Laboratory Services Branch, Centre for Health Protection, Department of Health, Hong Kong, China

Clinical Infectious Diseases 2005; 41:e67–71

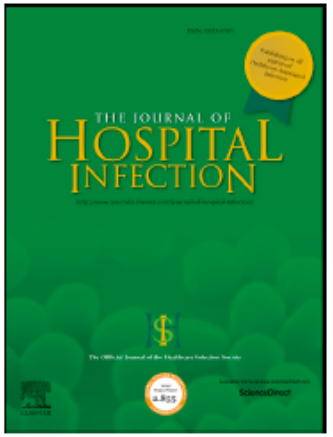
Table 2. Effect of disinfectants on severe acute respiratory syndrome coronavirus.

Duration of exposure, min	Disinfectant (dilution), residual $TCID_{50}$/mL					
	Hypochlorite (1:50)	Hypochlorite (1:100)	Detergent (1:50)	Detergent (1:100)	1% Virkon S[a]	VTM
5	$<10^2$	$<10^2$	$<10^2$	$<10^2$	$<10^2$	10^5
10	$<10^2$	$<10^2$	$<10^2$	$<10^2$	$<10^2$	$10^{5.5}$
20	$<10^2$	$<10^2$	$<10^2$	$<10^2$	$<10^2$	$10^{5.5}$
30	$<10^2$	$<10^2$	$<10^2$	$<10^2$	$<10^2$	$10^{5.75}$

NOTE. VTM, viral transport medium.

[a] Manufactured by Antec International.

Journal Pre-proof



Persistence of coronaviruses on inanimate surfaces and its inactivation with biocidal agents

Günter Kampf, Daniel Todt, Stephanie Pfaender, Eike Steinmann

PII: S0195-6701(20)30046-3

DOI: https://doi.org/10.1016/j.jhin.2020.01.022

nCoV can be efficiently inactivated by surface disinfection procedures with 62-71% ethanol, 0.5% hydrogen peroxide or 0.1% sodium hypochlorite within 1 minute.

0.05-0.2% benzalkonium chloride or 0.02% chlorhexidine digluconate are less effective/

RESEARCH LETTER JAMA Published online March 4, 2020

Air, Surface Environmental, and Personal Protective Equipment Contamination by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) From a Symptomatic Patient

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Yian Kim Tan, PhD
Po Ying Chia, MBBS
Tau Hong Lee, MBBS
Oon Tek Ng, MBBS, MPH
Michelle Su Yen Wong, PhD
Kalisvar Marimuthu, MBBS

Patient	Days of illness when samples were collected	Presence of symptoms during sampling	Symptoms	Disease severity[a]	Before/after routine cleaning
A	4, 10	Yes, both days	Cough, fever, shortness of breath	Moderate	After
B	8, 11	Yes on day 8; asymptomatic on day 11	Cough, fever, sputum production	Moderate	After
C	5	Yes	Cough	Mild	Before

Twice-daily cleaning ofhigh-touch areas was done using 5000 ppmof sodium dichloroisocyanurate.

All postcleaning samples were negative, suggesting that current decontamination measures are sufficient.

Aerodynamic Characteristics and RNA Concentration of SARS-CoV-2 Aerosol in Wuhan Hospitals during COVID-19 Outbreak

Yuan Liu, Ph.D.,[1, †], Zhi Ning, Ph.D.,[2, †, *], Yu Chen, Ph.D.,[1, †, *], Ming Guo, Ph.D.,[1, †], Yingle Liu, Ph.D.,[1], Nirmal Kumar Gali, Ph.D.,[2], Li Sun, M.Sc.,[2], Yusen Duan, M.Sc.,[3], Jing Cai, Ph.D.,[4], Dane Westerdahl[2], D.Env.,[2], Xinjin Liu, M.Sc.,[1], Kin-fai Ho, Ph.D.,[5, *], Haidong Kan, Ph.D.,[4, *], Qingyan Fu, Ph.D.,[3, *], Ke Lan, MD, PhD, [1, *]

Category	Sites	Sample Type	Concentration (copies m^{-3})
Public Areas (PUA)			
	20. Fangcang Hospital Pharmacy	TSP	3
	21. Renmin Hospital Doctor Office	TSP	0
	22. Renmin Hospital Outpatient Hall	TSP	0
	23. Renmin Hospital Outdoor	TSP	7
	24. University Office Doorside	TSP	0
	25. University Hospital Outpatient Hall	TSP	0
	26. Community Check Point	TSP	0
	27. Residential Building	TSP	0
	28. Supermarket	TSP	0
	29. Department Store 1	TSP	11
	30. Department Store 2	TSP	3
	31. Blank Control #	Field Blank[a]	0
		Field Blank[b]	0

“In public areas outside the hospitals, we found the majority of the sites have undetectable or very low concentrations of SARS-CoV-2 aerosol, except for one crowd gathering site about 1 meter to the entrance of a department store with customers frequently passing through.”