

# COVID-19

CORONAVIRUS DISEASE 2019

## **Blood stream infections in Patients Undergoing ECMO for Severe Pneumonitis Secondary to covid-19; *The Wythenshawe experience.***

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*Manchester University NHS Foundation Trust*

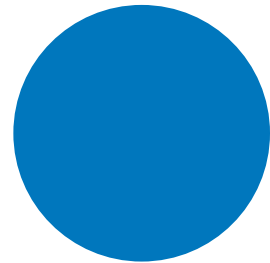
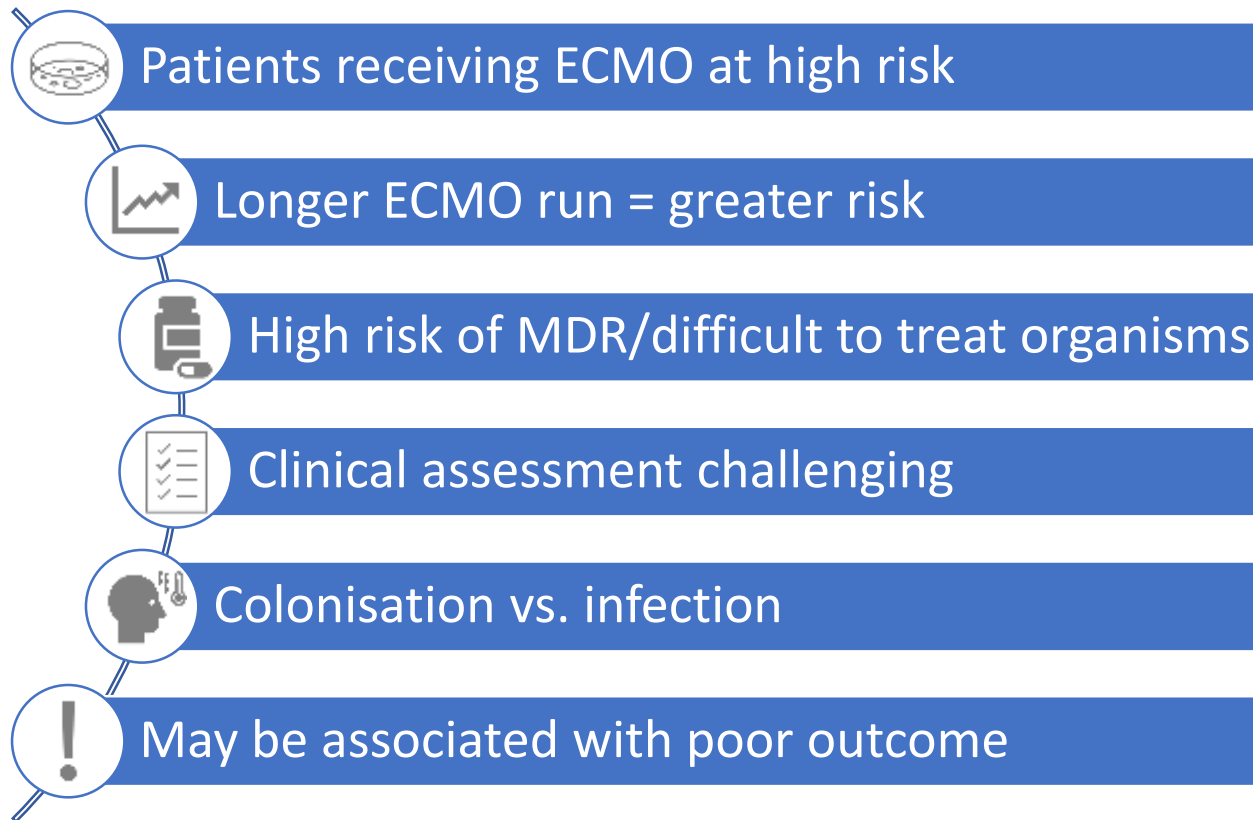
# Disclosure

I have no actual or potential conflict of interest in relation to this program/presentation

# Objectives of the presentation

- To state the secondary infections in Covid-19 subjects
- To study the blood stream infections in Patients Undergoing ECMO for Severe Pneumonitis Secondary to Covid-19
- To reiterate other issues related to Severe Pneumonitis Secondary to Covid-19

# Background: *blood stream infection (BSI)*



# Case 1

49yo lady

Past medical history: high BMI

Admitted to local hospital with resp symptoms

Bilateral consolidation on CXR

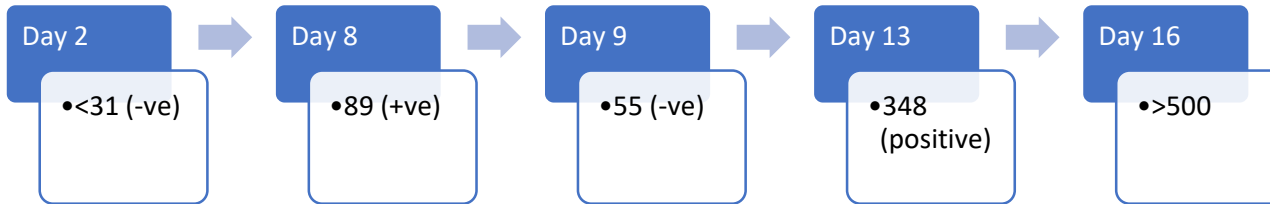
COVID PCR positive

Day 1 – I+V

Day 2 – ECMO

# Case 1

## Beta-D-Glucan



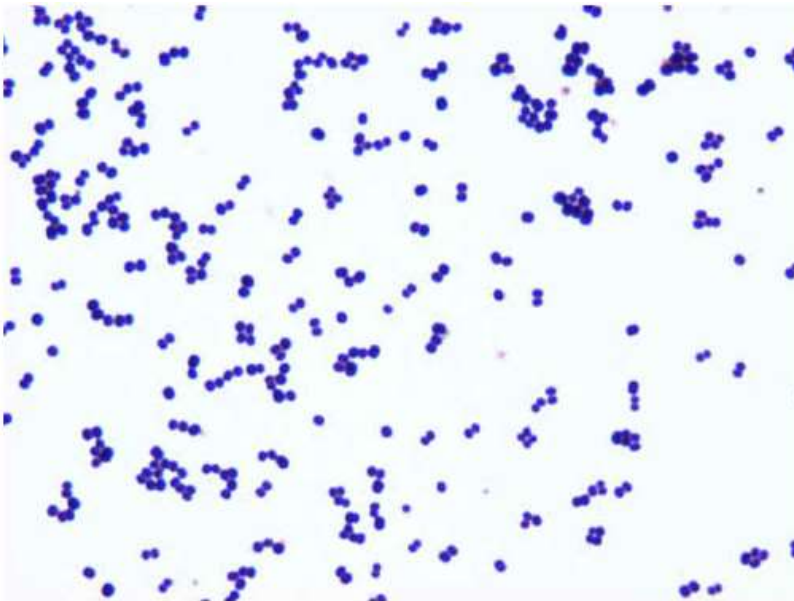
### What next?

- a) Do nothing
- b) Repeat BDG
- c) Start antifungals
- d) Other

# Case 1

## Day 10

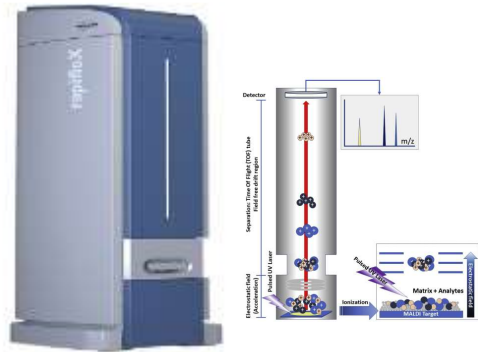
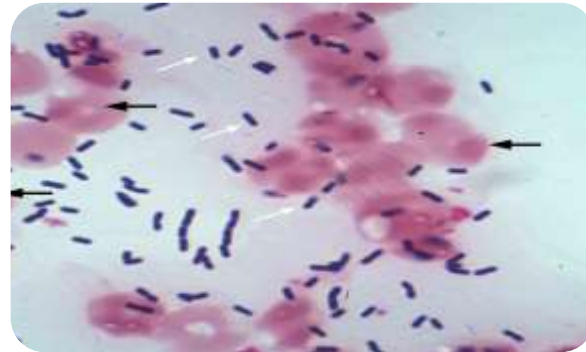
- Positive blood culture
- Left femoral line
- Anaerobic bottle
- Gram positive cocci – clusters (Staphylococci)



What next?

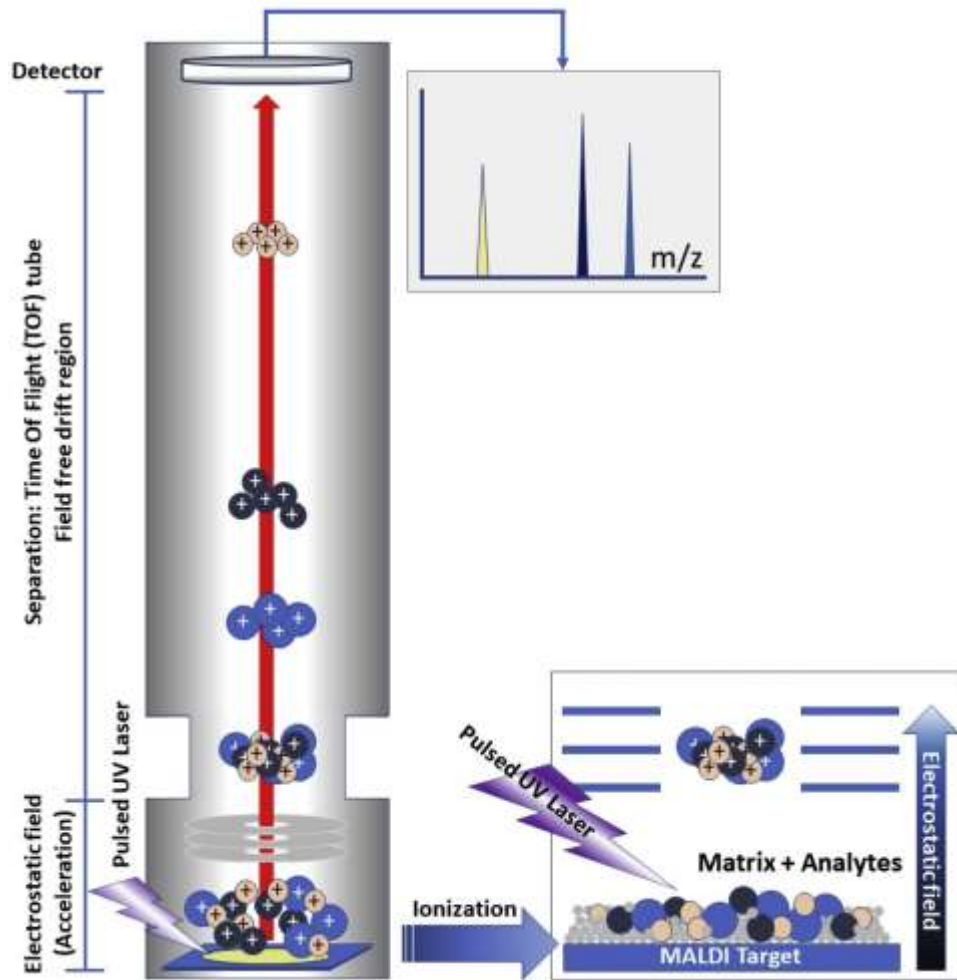
- a) Do nothing
- b) Start antibiotics (if so, what?)
- c) Repeat blood cultures
- d) Other

# Blood culture journey





# MALDI-ToF (Matrix-Assisted Laser Desorption/Ionisation – Time Of Flight)

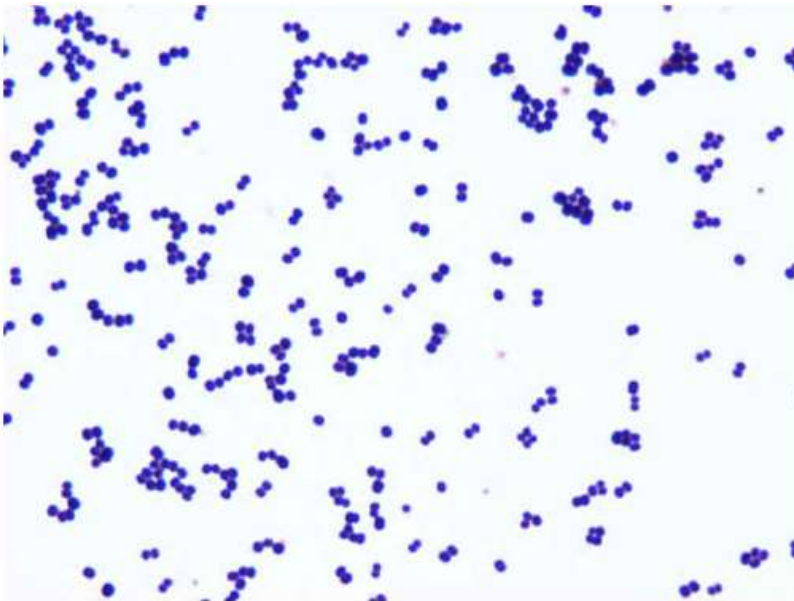


A Case Series. Open Forum Infect Dis. 2020 Nov 12;7(11):ofaa518.

# Case 1

## Day 10

- Positive blood culture
- Left femoral line
- Anaerobic bottle
- Gram positive cocci – clusters (Staphylococci)

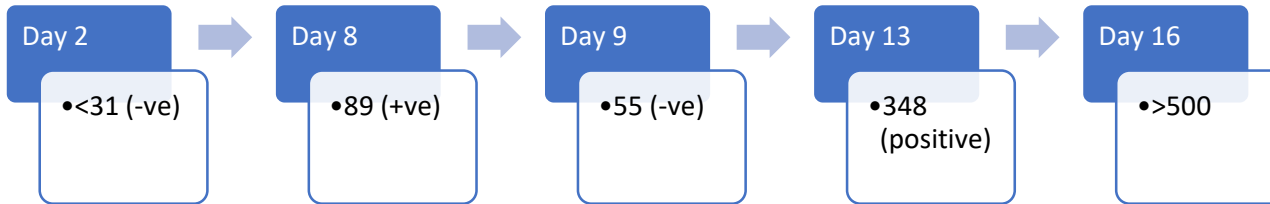


What next?

- a) Do nothing
- b) Start antibiotics (if so, what?)
- c) Repeat blood cultures
- d) Other

# Case 1

## Beta-D-Glucan



### What next?

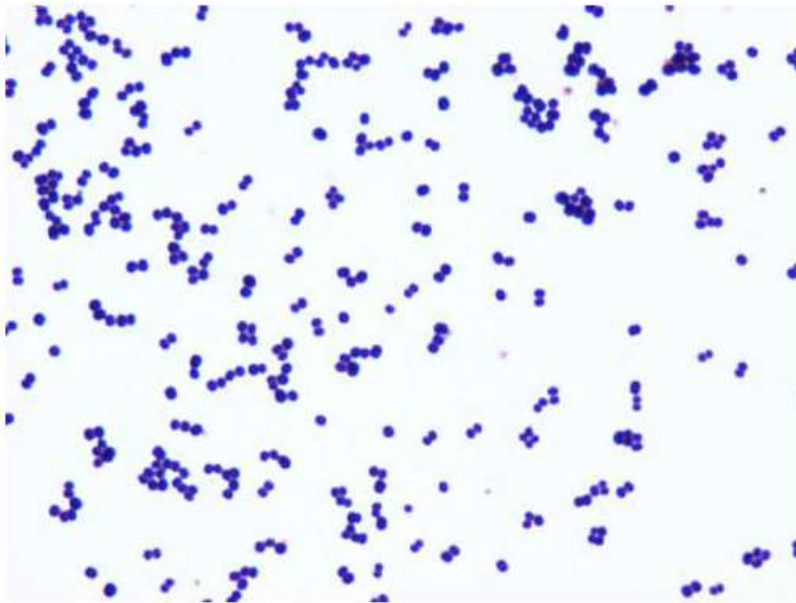
- a) Do nothing
- b) Repeat BDG
- c) Start antifungals
- d) Other

Day 15 – Blood culture positive – Yeast (*Candida parapsilosis*)

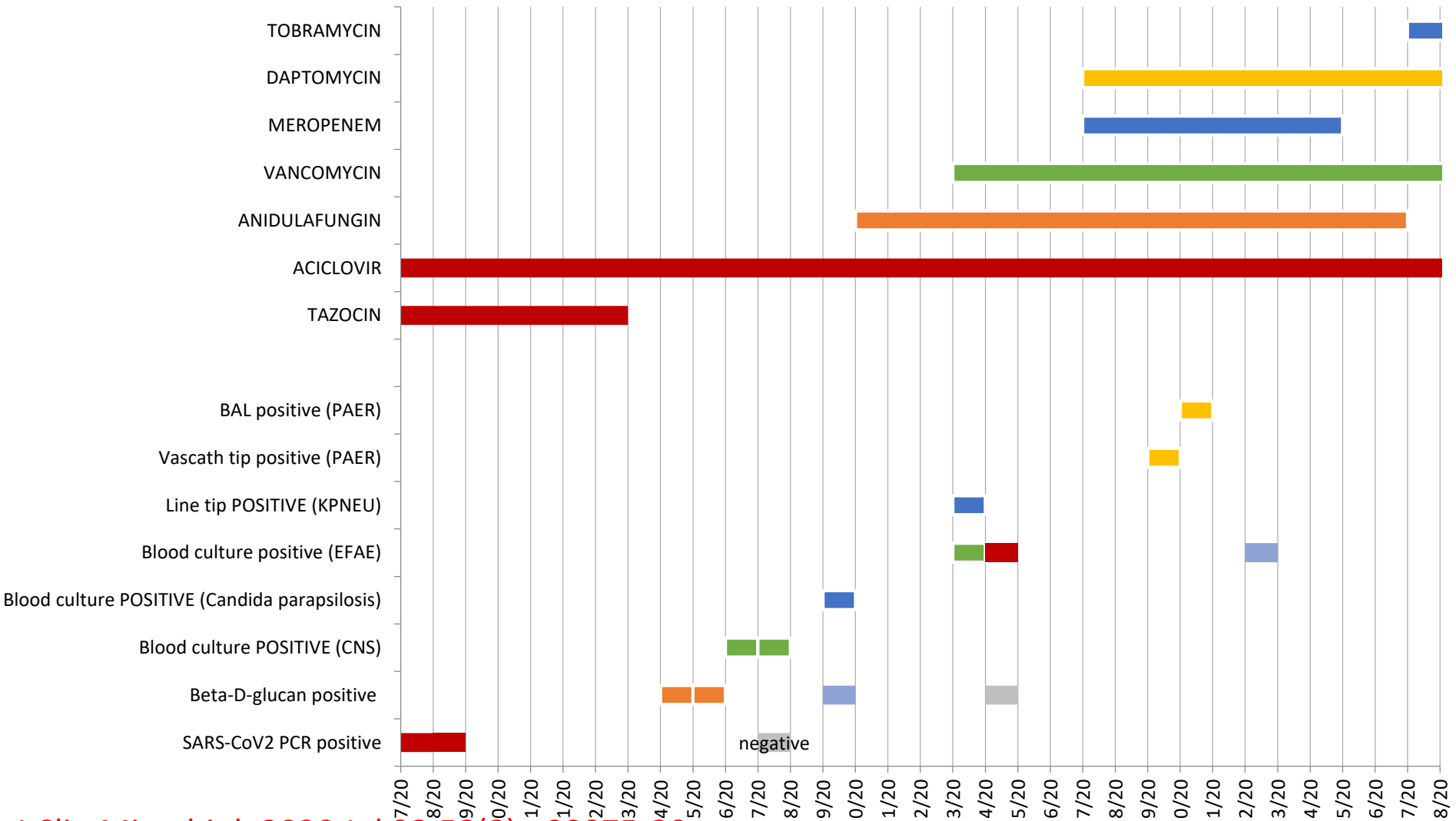
# Case 1

## Day 12

- Positive blood culture
- Left internal jugular
- Both bottles
- Gram positive cocci – clusters (Staphylococci) + chains (Streptococci)



# Case 1



# Case 1

## **Pseudomonas aeruginosa**

Ciprofloxacin	RESISTANT
Ceftazidime	RESISTANT
Cefepime	RESISTANT
Meropenem	RESISTANT
Tazocin	RESISTANT
Azstreonam	RESISTANT

What next?

Agents reserved for MDR

Ceftolozane/tazobactam	RESISTANT
Ceftazidime/avibactam	RESISTANT

THE LANCET  
Infectious Diseases

Lancet Infect Dis. 2020 Oct 12:S1473-3099(20)30796-9.

ARTICLES | [ONLINE FIRST](#)

Efficacy and safety of cefiderocol or best available therapy for the treatment of serious infections caused by carbapenem-resistant Gram-negative bacteria (CREDIBLE-CR): a randomised, open-label, multicentre, pathogen-focused, descriptive, phase 3 trial

[Prof Matteo Bassetti, MD](#) • [Roger Echols, MD](#) • [Yuko Matsunaga, MD](#) • [Mari Ariyasu, BPharm](#) • [Yohei Doi, MD](#) • [Ricard Ferrer, MD](#) • et al. [Show all authors](#)

Published: October 12, 2020 • DOI: [https://doi.org/10.1016/S1473-3099\(20\)30796-9](https://doi.org/10.1016/S1473-3099(20)30796-9) •  Check for updates

# BSI in COVID-19 ECMO

## *Patient Demographics:*

- n=37
- median age = 43 (19-58) years
- median days on ECMO = 20 (1-81)

## *Microbiology Data:*

- 32/37 (**86%**) patients had at least one positive blood culture
- median number of positive sets per patient = **3** (0-29)

# BSI in COVID-19 ECMO

40 / 83 (48%)  
(c/w 86%)

Articles

Lancet Respir Med. 2020;8(11):1121-1131.

## Extracorporeal membrane oxygenation for severe acute respiratory distress syndrome associated with COVID-19: a retrospective cohort study



Matthieu Schmidt, David Hajage, Guillaume Lebreton, Antoine Monsel, Guillaume Voiriot, David Levy, Elodie Baran, Alexandra Beurton, Juliette Chommeloux, Paris Meng, Safaa Nemlaghi, Pierre Bay, Pascal Leprince, Alexandre Demoule, Bertrand Guidet, Jean Michel Constantin, Muriel Fartoukh, Martin Dres, Alain Combes, for the Groupe de Recherche Clinique en REanimation et Soins intensifs du Patient en Insuffisance Respiratoire aiguë (GRC-RESPIRE) Sorbonne Université, and the Paris-Sorbonne ECMO-COVID investigators\*

### Summary

**Background** Patients with COVID-19 who develop severe acute respiratory distress syndrome (ARDS) can have symptoms that rapidly evolve to profound hypoxaemia and death. The efficacy of extracorporeal membrane oxygenation (ECMO) for patients with severe ARDS in the context of COVID-19 is unclear. We aimed to establish the clinical characteristics and outcomes of patients with respiratory failure and COVID-19 treated with ECMO.

**Methods** This retrospective cohort study was done in the Paris-Sorbonne University Hospital Network, comprising five intensive care units (ICUs) and included patients who received ECMO for COVID-19 associated ARDS. Patient demographics and daily pre-ECMO and on-ECMO data and outcomes were collected. Possible outcomes over time were categorised into four different states (states 1–4): on ECMO, in the ICU and weaned off ECMO, alive and out of ICU, or death. Daily probabilities of occupation in each state and of transitions between these states until day 90 post-ECMO onset were estimated with use of a multi-state Cox model stratified for each possible transition. Follow-up was right-censored on July 10, 2020.

**Findings** From March 8 to May 2, 2020, 492 patients with COVID-19 were treated in our ICUs. Complete day-60 follow-up was available for 83 patients (median age 49 [IQR 41–56] years and 61 [73%] men) who received ECMO. Pre-ECMO, 78 (94%) patients had been prone-positioned; their median driving pressure was 18 (IQR 16–21) cm H<sub>2</sub>O and PaO<sub>2</sub>/FiO<sub>2</sub> was 60 (54–68) mm Hg. At 60 days post-ECMO initiation, the estimated probabilities of occupation in each state were 6% (95% CI 3–14) for state 1, 18% (11–28) for state 2, 45% (35–56) for state 3, and 31% (22–42) for state 4. 35 (42%) patients had major bleeding and four (5%) had a haemorrhagic stroke. 30 patients died.

**Interpretation** The estimated 60-day survival of ECMO-rescued patients with COVID-19 was similar to that of studies published in the past 2 years on ECMO for severe ARDS. If another COVID-19 outbreak occurs, ECMO should be considered for patients developing refractory respiratory failure despite optimised care.

Lancet Respir Med 2020

Published Online  
August 13, 2020  
[https://doi.org/10.1016/S2213-2600\(20\)30328-3](https://doi.org/10.1016/S2213-2600(20)30328-3)

See Online/Comment  
[https://doi.org/10.1016/S2213-2600\(20\)30357-X](https://doi.org/10.1016/S2213-2600(20)30357-X)

\*Investigators are listed in the appendix

Sorbonne University, INSERM, UMR5\_1166-ICAN, Institute of Cardiometabolism and Nutrition, Paris, France (M Schmidt MD, G Lebreton MD, J Chommeloux MD, Prof P Leprince MD, Prof A Combes MD); Service de médecine intensive-réanimation, Institut de Cardiologie (M Schmidt, D Levy MD, J Chommeloux, P Bay MD, Prof A Combes), Service de chirurgie cardiaque, Institut de Cardiologie, (G Lebreton, Prof P Leprince), Multidisciplinary Intensive Care Unit, Department of Anaesthesiology and Critical Care (A Combes MD, F Demoule MD)



## BSI: *Gram Positives*

Gram positive organism	Number of patients (n=37)	Total number of isolates
<b>coagulase negative <i>Staphylococci</i></b>	<b>20 (54%)</b>	<b>47</b>
<b><i>Enterococcus faecium</i></b>	<b>12 (32%)</b>	<b>39</b>
<b>VRE</b>	<b>5 (14%)</b>	<b>30</b>
Mixed coagulase negative <i>Staphylococci</i>	<b>3 (8%)</b>	5
<i>Propionibacterium</i> species	<b>1 (3%)</b>	3
<i>Staphylococcus aureus</i>	<b>1 (3%)</b>	1
<i>Enterococcus avium</i>	<b>1 (3%)</b>	1
<i>Corynebacterium jeikeium</i>	<b>1 (3%)</b>	1
<i>Flavonifractor plautii</i>	<b>1 (3%)</b>	1
<b>Grand Total</b>	<b>24</b>	<b>128</b>

## BSI: *Gram Negatives*

Gram negative organism	Number of patients (n=37)	Total number of isolates
<b>Escherichia coli</b>	<b>4 (11%)</b>	<b>13</b>
<b>Klebsiella aerogenes</b>	<b>4 (11%)</b>	<b>5</b>
<b>Klebsiella pneumoniae</b>	<b>4 (11%)</b>	<b>11</b>
Pseudomonas aeruginosa	<b>3 (8%)</b>	9
Serratia marcescens	<b>3 (8%)</b>	8
Enterobacter species	<b>1 (3%)</b>	3
Klebsiella oxytoca	<b>1 (3%)</b>	1
Raoultella ornithinolytica	<b>1 (3%)</b>	1
Serratia liquefaciens	<b>1 (3%)</b>	1
Stenotrophomonas maltophilia	<b>1 (3%)</b>	4
Bacteroides species	<b>1 (3%)</b>	1
Enterobacter cloacae complex	<b>1 (3%)</b>	2
Morganella morganii	<b>1 (3%)</b>	2
<b>Grand Total</b>	<b>21</b>	<b>61</b>

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Escherichia coli	4 (11%)	13
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<b>Grand Total</b>	<b>21</b>	<b>61</b>

## ***BSI: Candida***

<b>Candida species</b>	<b>Number of patients (n=37)</b>	<b>Total number of isolates</b>
<b>Candida parapsilosis complex</b>	<b>4 (11%)</b>	<b>14</b>
Candida albicans	<b>2 (5%)</b>	3
Candida dubliniensis	<b>1 (3%)</b>	3
Lodderomyces elongisporus	<b>1 (3%)</b>	2
<b>Grand Total</b>	<b>7</b>	<b>22</b>

# BSI: Candida rates (ECMO pre covid-19)

de Roux et al. *Critical Care* (2019) 23:214  
<https://doi.org/10.1186/s13054-019-2593-4>

Critical Care

LETTER

Open Access

## Candida bloodstream infection under veno-arterial ECMO therapy



4/150 (2.7%)

Quentin de Roux<sup>1,2</sup>, Françoise Botterel<sup>3,4</sup>, Raphaël Lepeule<sup>5</sup>, Fabio Silvio Taccone<sup>6</sup>, Olivier Langeron<sup>1,4</sup> and Nicolas Mongardon<sup>1,2,4\*</sup>

This comment refers to the article available at <https://doi.org/10.1186/s13054-018-2023-z>.

Published in final edited form as:  
*Pediatr Crit Care Med*. 2012 September ; 13(5): e288–e293. doi:10.1097/PCC.0b013e318246aaf7.

### The Morbidity and Mortality of Patients with Fungal Infections Before and During Extracorporeal Membrane Oxygenation Support

Thomas Plum, MD<sup>1</sup>, Natasha Helasa, MD, MPH<sup>2</sup>, Sharon E. Phillips, MSPH<sup>3</sup>, and Geoffrey Fleming, MD<sup>1</sup>

106/2067 (5.1%)

Cavayas et al. *Critical Care* (2018) 22:98  
<https://doi.org/10.1186/s13054-018-2023-z>

Critical Care

RESEARCH

Open Access

## Fungal infections in adult patients on extracorporeal life support

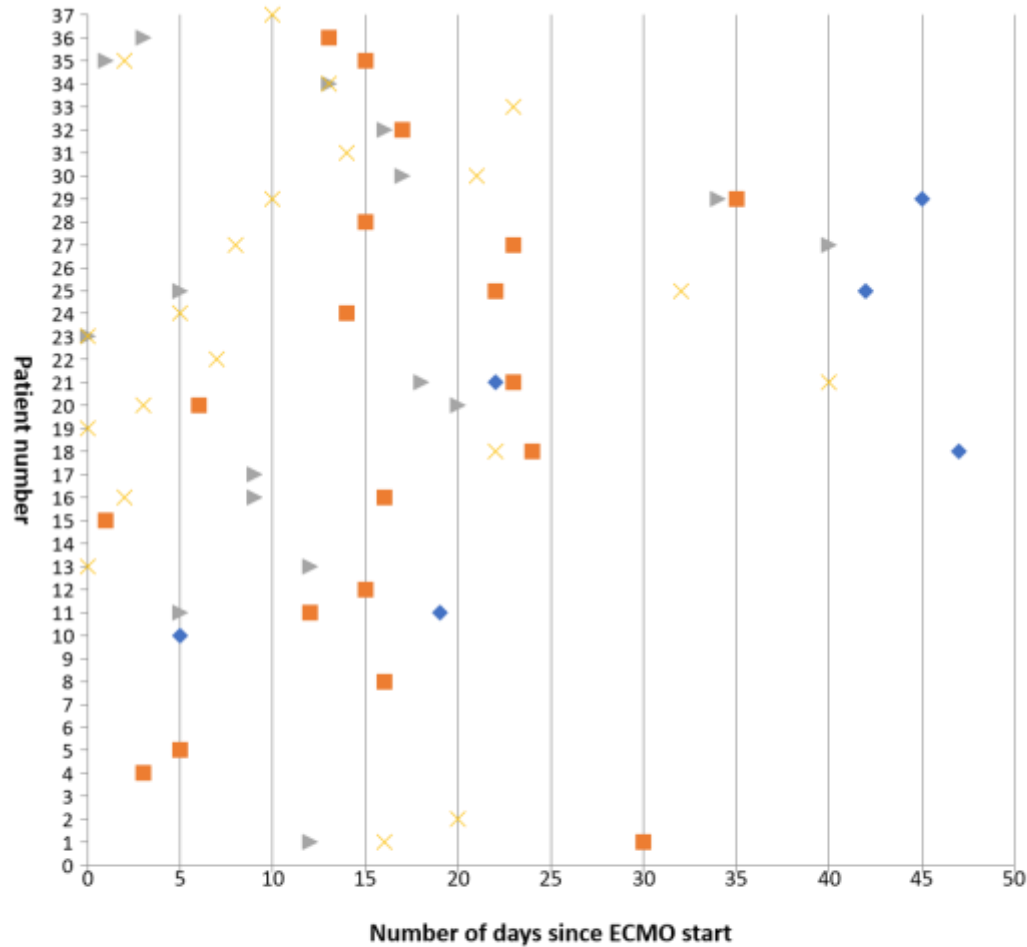


245/19697 (5.1%)

Yiorgos Alexandros Cavayas<sup>1\*</sup>, Hakeem Yusuf<sup>2</sup> and Richard Porter<sup>2</sup>

J Fungi (Basel). 2020 Oct 8;6(4):211.

# Timing of BSI in COVID-19 ECMO



Patient number	Enterococcus	CNS	Gram negative	Candida	Total days on ECMO
1					1
2					4
3					5
4					5
5					7
6					9
7					10
8					10
9					11
10					12
11					12
12					12
13					15
14					16
15					16
16					16
17					16
18					19
19					20
20					20
21					20
22					20
23					20
24					27
25					28
26					28
27					28
28					32
29					33
30					34
31					38
32					39
33					46
34					48
35					57
36					58
37					81
<b>Total</b>	<b>15</b>	<b>17</b>	<b>19</b>	<b>7</b>	

# BSI in COVID-19 ECMO

## *High numbers (86% v 48%)*

- longer ECMO runs
- immunosuppression
- critical illness
- screening (3x/week v daily)

## *Lots of gut organisms*

- translocation
- ?contamination of lines during interventions e.g. proning  
(dressings for ECMO cannula)

## *High numbers of candida BSI*

- long ECMO runs
- multiple courses of antibiotics



# Other important issues

## *Immunosuppression (n.b steroid use):*

- Hepatitis B reactivation
- Tuberculosis
- CMV reactivation

## *Moving forwards:*

- more data on infections/Case Reports
- reduce the number of BSI
- PPE and infection prevention
- ?? need for prophylaxis (for candida, what agent and timings)



# References

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- Arastehfar A, Carvalho A, Nguyen MH, et al. COVID-19-Associated Candidiasis (CAC): An Underestimated Complication in the Absence of Immunological Predispositions? *J Fungi (Basel)*. 2020 Oct 8;6(4):211. doi: 10.3390/jof6040211. PMID: 33050019; PMCID: PMC7712987.
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# References

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- Schmidt M, Hajage D, Lebreton G, et al. Extracorporeal membrane oxygenation for severe acute respiratory distress syndrome associated with COVID-19: a retrospective cohort study. *Lancet Respir Med.* 2020;8(11):1121-1131. doi:10.1016/S2213-2600(20)30328-3