Effective Use of TeleICU in Identifying and Triaging Patients for ECMO During COVID

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Disclosures:

I have no relevant financial relationships

Why involve the TeleICU?

- TeleICU is a central location that is staffed 24 hours a day by intensivists
 - Rapid evaluation
 - Escalation in urgency of transfer
- Continuous monitoring
 - Physician and nursing
 - TeleICU Alert systems
- Established relationship with our healthcare system's (BJC) Transfer Center (TC)
- Overview of institutions resources allowing efficient bed utilization
 - ICU beds available, including ECMO
 - Lateral transfers
- Able to immediately discuss cases with surgical or medical teams for ECMO evaluation and management
- Timely referral to an experienced center is important







Centralized ECMO service

- Impossible for many centers to provide ECMO
- Best outcomes occur at center with appropriate support, equipment and staff
- Crucial patients identified at an early stage
 - Safe transport
 - Improved outcomes
- BJC has 2 centers Barnes Jewish Hospital and Missouri Baptist



ELSO Guidelines on ECMO for COVID patients: Where can the TeleICU help?

- Regional
 - Efficient system to refer patients directly to ECMO center
 - Unified patient exclusion criteria to help with capacity management
 - Pooling resources to optimize capacity
 - ELSO ECMO availability map
- Institutional
 - Using telemedicine to help support new ECMO centers to meet demand
 - Tracking of ECMO capacity
 - Adjusting bedside staffing ratios for increased patient numbers

Taken from : Extracorporeal Membrane Oxygenation for COVID-19: Updated 2021 Guidelines from theExtracorporeal Life Support Organization: ASAIO Journal 2021•7•





ECMO Availability Center Map



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BJC COVID-19 ICU Tracker*

		Physical Beds	Census	Beds Open	CV19+	CV19 rcvrd	CV19-	ЕСМО
BJH	44 SICU	36	29	7	0	2	19	0
	56 CTICU	21	19	2	0	1	8	3
	78 MICU	12	10	2	0	0	9	0
	78 SICU	13	11	2	0	1	7	0
	82 ICU	15	14	1	8	3	1	9
	83 MICU	19	14	5	5	2	7	0
	84 MICU	24	22	2	4	3	9	0
	94 NEURO	24	18	6	1	1	8	0
	104 CCU	15	13	2	1	0	4	0
	104 NEURO	5	5	0	0	0	4	0
AMH	AMHICU	12	8	4	0	1	6	0
MBMC	MBMC 4 ICU	10	7	3	2	0	4	0
	MBMC 5 ICU	10	9	1	2	0	5	0
	MBMC 6 ICU	10	8	2	4	0	2	1
	MBMC CVRU	10	8	2	0	0	3	0
							NATIONA	L LEAVERS ME

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Establishing ECMO workflow

- Increased requests for ECMO at the institutional, regional and national level
- Capacity concerns for ECMO
- Streamlining referral process
 - Physician immediately available 24 hours a day
 - Assistance on medical management
 - Quicker decision making
- Improved consistency of the process
- Improved patient triage
 - Transportation
 - Bed availability
 - Patient acuity







Using TeleICU to identify ECMO candidates

- EMR for the TeleICU monitors all patients admitted in the system
- Able to monitor vital signs in real time
- Physician and Critical Care Nurses continually monitoring patients allowing:
 - Individual patient review: Real time alerts to changes in hemodynamics and respiratory status
 - Unit review: Able to quickly review units for patients with possible indicators for ECMO evaluation



Unit Review with eCare

IC	U Patients	Discharg	ed Patie	nts									
۲	Patient Ce	ensus 🔘 Gra	phical Ce	ensus 🔘 Ve	ntilated Pa	atient Ce	nsus		Show	v Watchlist			
	A/V Fl	Bed	•	Status	ΑΑΔ	DRS	SS	Aw/V	Inf. Dis	Alerts & Prompts	Evaluate	Next Review	Admission Dx
•	AMH A	AMH ICU						(6)				
Ħ	BJH 44	4 SICU						(29)				
Ħ	BJH 56	5 СТІСИ						(15)				
·	BJH 78	3 SICU						(9)				
Ħ	BJH 78	3 MICU						(10)				
H	BJH 82	2 ICU						(12)				
Ħ	BJH 83	3 MICU						(17)				
•	BJH 84	4 MICU						(23)				
•	BJH 94	4 NEURO						(22)				
•	BJH 10	4 NEURO						(4)				
۰	BJH 10	A CCU						(14)				
•	BJSPH	BJSPH ICU						(9)				
•	BJWCH	I BJWCH IC	U					(2)				
•	сн сн	CVU						(4)				
•	сн сн	ICU						(15)				
•	MBMC	MBMC ICU						(27)				
•	МВМС	MBMC CVR	NU .					(5)				
	MBSH	MBSH ICU						(6)				
•	PHC P	HC ICU						(2)				
•	PWH F	PWH ICU						(5)				
•	мнв м	MHB ICU						(13)				
	MHE N	IHE ICU						(3)			, , , , , , , , , , , , , , , , , , ,	
									•16				



Review ICU census

	uents Discharg											-
Patie	ent Census 🔘 Gra	iphical Census 🔘 V	entilated P	atient G	ensus		Sho	w Watchlist	1	L mar anaz a	L and an even of	
A/\	V Fl Bed	▲ Status	AA A	DRS	SS	Aw/V	Inf. Dis	Alerts & Prompts	Evaluate	Next Review	Admission	Dx
BJ	JH 84 MICU					(22	2)					
	8401	10	-6 🔻	DRS 56.9	22	17XX				5 hrs, 2 mins	Pneumon	
	8402	5	-1	DRS 11.7	4	TRACH				3 hrs, 26 mins	Pneumon	
	8403	8	-1	DRS 2.90	6				A	3 hrs, 27 mins	Acid-bas	
	8404	6	-1	DRS 0.91	3					5 hrs, 2 mins	Pneumon	
	8405	10	+2	DRS 0.49	4					5 hrs, 21 mins	ARDS-ad	
	8406	5	0	DRS 1.00	3	FILM				3 hrs, 35 mins	Sepsis, re	
	8407	4	-1	DRS X	6	TRACH				3 hrs, 37 mins	Respirato	5
	8408	12	+5 🔺	DRS 1.20	4					3 hrs, 38 mins	Hepatic f	
	8409	8	0	DRS 1.28	6					3 hrs, 42 mins	CHF, cong	-
	8410	7	0	DRS 1.81	6					3 hrs, 43 mins	Pneumon	
	8411	3	0	DRS 0.59	3	FILM				3 hrs, 44 mins	Emphyse	4
	8412	11	+5 🔺	DRS 0.16	2				А	5 hrs, 2 mins	Coma/ch	
	8413	<mark>10</mark>	+4 📥	DRS 0.63	0					5 hrs, 2 mins	Sepsis, re	-
	8414	8	+2	DRS 2.28	3	MIN				5 hrs, 1 min	Pneumon	J
E	8415	:										
	8416	i										
	8417	7	-1	DRS 0.22	2					5 hrs, 1 min	Bleeding,	
	8418	7	-1	DRS 3.78	8	TRACH				4 hrs, 5 mins	Sepsis, p	2
	8419	3	0	DRS 0.59	2	MIN				4 hrs, 6 mins	Pneumon	
	8420	9	0	DRS 1.87	8	INT		¥		4 hrs, 7 mins	Sepsis, p	
	8421	15	0	DRS 24.2	8	and				4 hrs, 9 mins	Pneumon	



Review ventilation data

ICU Patients Discharg	ged Patients													
Patient Census Gra	aphical Census 💿 Ventilate	d Patient Census	Show Wat	chlist										
											🗹 Auto	Refresh Show/Hide Ve	entilated Census	s Column
Bed ¢	DOB \$	BMI ≑	Vent Days \$	RR \$	O2 Sat \$	PEEP \$	FiO2 ≑	PaO2 ≑	P/F \$	ABG (pH) ≑	SBT Candidate \$	SBT Done ≑	V _T ≑	
✓ BJH - 84 MICU			(6)											
8418	09/13/1961	27.1	9.2	29	100		60				x	No		:
8402	02/22/1956	27.9	40.3	25	100	5	40	49	98	7.32	۲	No	5.9	:
8401	02/20/1961	26	4.7	24	87	12.5	60	75	125	7.32	•	No	<mark>5</mark> .9	:
8420	04/03/1974	31	2.7	29	100	5	40	79	<u>1</u> 98	7.39		No	5.7	:
8422	12/25/1950	23.4	4.6	20	95	5	40	102	204	7.51	•	No	5.8	:
8421	05/20/1977	32	53.2	21	100	5	40	104	260	7.24	•	No	5.8	:



Chart Dive

📓 eCareManager System - Notificat	tions On												o ×
Navigation View Patient User	Help												
Census 😰 Refresh 🗌 My Pat	ients 🛃 Task List 🛛 🕍 Patient :	Sign-out 📓 TCI Quick Entry 🖿 Video	Reports	Home Logged on: D	rewry, Anne M. 🛛 👌 Lo	igout				Clin	ical Review 4 hrs <mark>45 mins ago</mark>	Patient Time: Nov 07	23:24 7Help
12 8202)				BJH : 82 ICU									
Patient Profile	Active Dx/Rx	Vital Signs	Flowsh	eet	Laboratory		Medications	Orders-Create	e	Notes-Create	Images	Program F	orms
	Care Plan	LID	Respira	tory	Microbiology		Meds-Update	Orders-View		Notes-View	Patient Registry		
General Data	40/00 00 04	11/0//2021 18:36	Messag	e Center				Smart Alert History	Pain Score:		n/a	Goal	n/a
Hospital Admi	10/20 20:31 10/20 20:48	Rounding: Low	N						Sedation Score:			-4 Goal:	n/a
12 -1 Last Surgery:		DRS	Cardiov	ascular			Q	uick View w/ Cont. Infusions	GC	s	ICP	Max ICP	(24 hrs)
Admit Source:	Other Hospital	17.2			Blood Pressur	e and Heart Ra	ate (4 hrs)		NS	5	n/a	n/a	a
BL: 17 Avg: 13 Admit Ht:	97.6 kg		160					1	Renal				
Code Status: Not Specified									Na		ĸ	CI	НСОЗ
Readmission w/in 30 days:	Catagony Not Specified		140	<u> </u>					DUNI	مىرەمرەسى 148 **	4.4	109	30
Allergies: None	Category. Not specified		120	/ \	-				BUN	22 CREAT	00-12 050 11	35 Ker	lai Therapy
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Patient Description O Past Hi	istory	Pre-Admission Me	ds 100-	$\sim -$	****		*		Volume State	/eight (kg) (5 days)		I/O (5 days)	
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			60			-			105.0 -		1,300 -	14	
				-			****		100.0 -		• 0-		
			40						10010		(1,300)		
			19:2	1 20	:21	21:21	22:21	23:21	95.0	an 105 1	a6 .01 (2.473)	AN	ab
			Respira	tory				Vent Data (24 hours)	AND AND	the the th	1 111 111	1110 1110 111	111
			Airway	Intubated/oral ETT					Hematology				
				Ventilated - with no dail	y extubation trial				HGB	PLT	PT	INR	PTT
			Vent	Vent Days	PaO ₂ /FiC) ₂	Vt mls/kg	RSBI		9.4 ~~~~ 1	14.5	• 13	• 32
Current Diagnoses & Plans		10/23/2021 04:	8	18.1	173		0.8	n/a	Gastrointestinal	P		CT.	ALT
System O Problem			ABG	pH	PaCO ₂	PaOz	HCO₃	FiOz	ALB	22	02		ALI 26
Current Diagnoses 🥖	Plans 🥖 💇		-	7.42	54	1/3	36	100	•	• • •	. 0.2	40	
PULMONARY: SARS			(bpm)	RR & O2 S	at 02	Sat PEEP %) (cm H ₂ O)	PEEP & F	iO ₂ (%)	Nutrition/Metaboli	c	CL	C	<u> </u>
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Poem. mechanical ventilation, com	0		20 -		•••••••••••	90 15 -		- 60	Patient Sign-out				
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Dest Fractices		Activate/Deactiva	40			15	1						
			38 -			12.5			Clinical Status				S
Lines, Tubes, Drains (LTD)			36 -	*****	****	10	-						
			34			1.5							
			23:21	05:21 11:21	17:21 23	21 11/02		11/07	7				



Ventilation Information

Respirat	ory						Vent Data	(24 hours)						
Airway	Intubated/oral ETT													
	Ventilated - with no daily extubation trial													
Vent	Vent Days	Pa	D ₂ /FiO ₂		Vt mls/kg	3	RSB	I I						
	18.1		173		0.8		n/a							
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RR (bpm)	RR & O2	Sat	02 Sat (%)	PEEP (cm H ₂ O)		PEEP & FiOz	E.	FiO2 (%)						
40	- - - - - - - - - - - - - - - - - - -	21:21	- 100 - 95 - 90 - 85 - 80 - 75 23:21	20 15 - 10 - * 5 - 15:21	• • 17:21	• • • •	• •	100 - 80 - 60 • 40 - 20 - 0 23:21						

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Evaluate ECMO Indicators

- No changes in indications for ECMO
- These indicators can be quickly evaluated within the EMR of TeleICU and EPIC
- If patient outside of BJC system TeleICU intensivist available for immediate review
- If criteria not met then guidance on further medical management given



Patient Exclusion

- Exclusion criteria created
- Potential to adapt with capacity and increased ECMO demand
- TeleICU able to immediately evaluate referrals for patient exclusion criteria
- Decision made quickly allowing for efficient triage and resource allocation

- Factors used in criteria:
 - Age
 - Obesity
 - CKD
 - Chronic liver disease
 - Severe COPD
 - Prolonged mechanical ventilation
 - NIPPV and intubation considered
 - Active malignancy
 - Frailty
 - Cardiomyopathy





TeleICU Intensivist Role

- Identify patients under TeleICU care who may benefit from ECMO
- Evaluate ECMO referral from within and outside the system
- Up to date on current indicators and bed capacity
- Screen for current exclusion criteria
- Immediate discussion with ECMO surgeon and intensivist
- Work with Transfer Center, receiving ICU and sending ICU to optimize patient for safe and timely transfer
- If declined
 - offer medical management support to referring ICU if wanted
 - Discuss admission to medical ICU bed for higher level care



Challenges

- Every patient is unique and has a story
- Currently patient vitals will alert but not automatically screened for ECMO indicators
- Unable to verify OSH patient data
- Criteria based on outcomes is still uncertain
- Capacity can fluctuate



Future Goals

- Dashboard displaying patients who meet ECMO review criteria with listed contra-indications
- Currently only utilized during capacity concerns and COVID respiratory failure patients, possible role in all ECMO requests
- Assist with higher staffing ratios if needed (nurses, perfusionist, intensivist)
 - Specialist in the TeleICU able to reach multiple sites
- Reviewing objective data for ECMO referrals before and after TeleICU involved
 - Time from referral to decision of accept/decline
 - Time from referral to transfer
 - Time from referral to cannulation
 - Percentage that proceeded to cannulation
 - Patient outcomes



Questions?

