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

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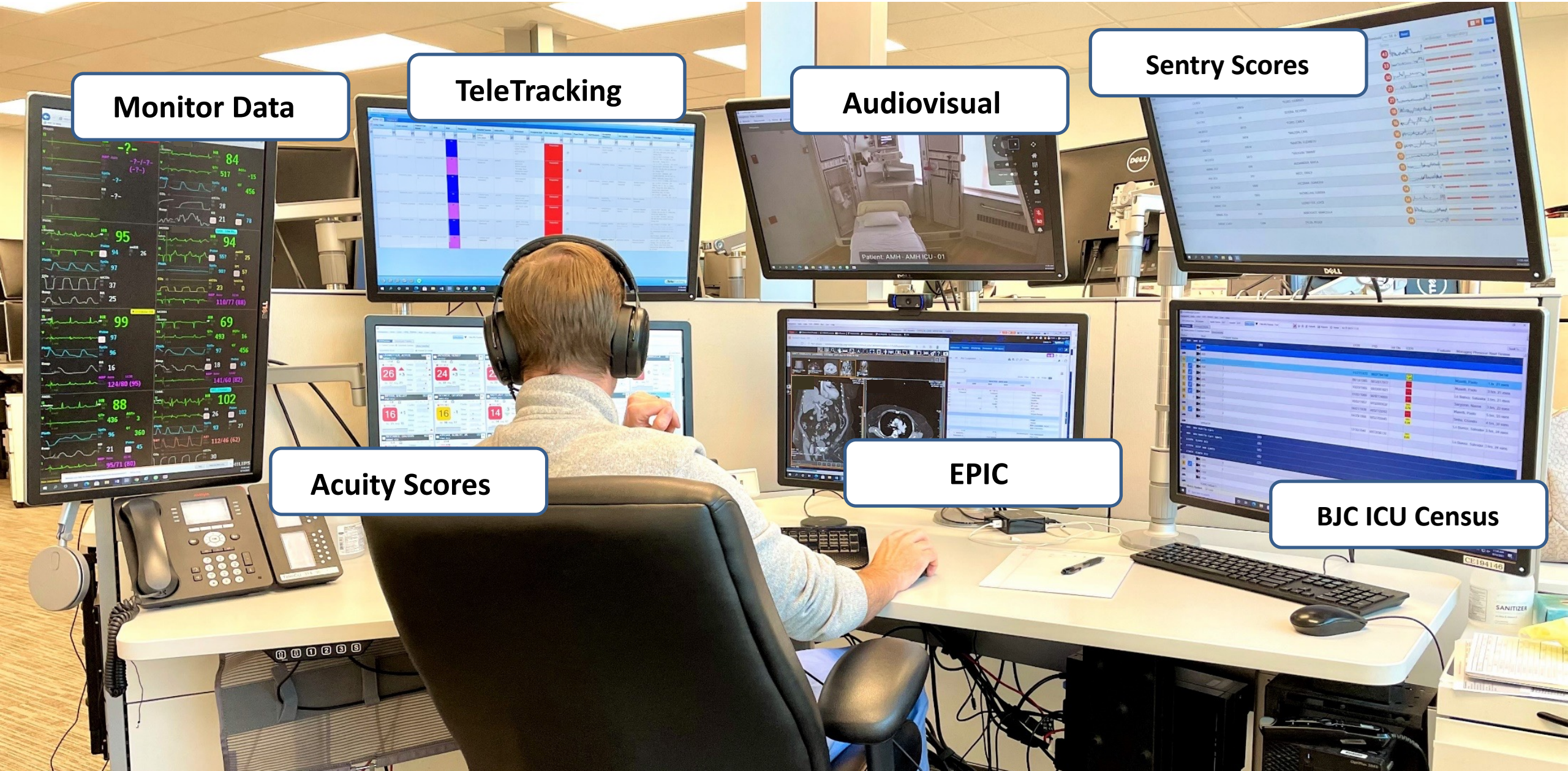
Monitor Data
TeleTracking
Audiovisual
Sentry Scores
Acuity Scores
EPIC
BJC ICU Census


St. Peters
12 Beds
Alton Memorial
12 Beds
Progress West
6 Beds
BJWC
4 Beds
Christian
26 Beds
BJH
184 Beds
MBMC
40 Beds
Memorial East
6 Beds
Memorial Belleville
24 Beds
MoBap Sullivan
6 Beds
Parkland
6 Beds
=ECMO center
BJC HealthCare Hospitals
326 ICU beds

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

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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 the Extracorporeal Life Support Organization: ASAIO Journal 2021

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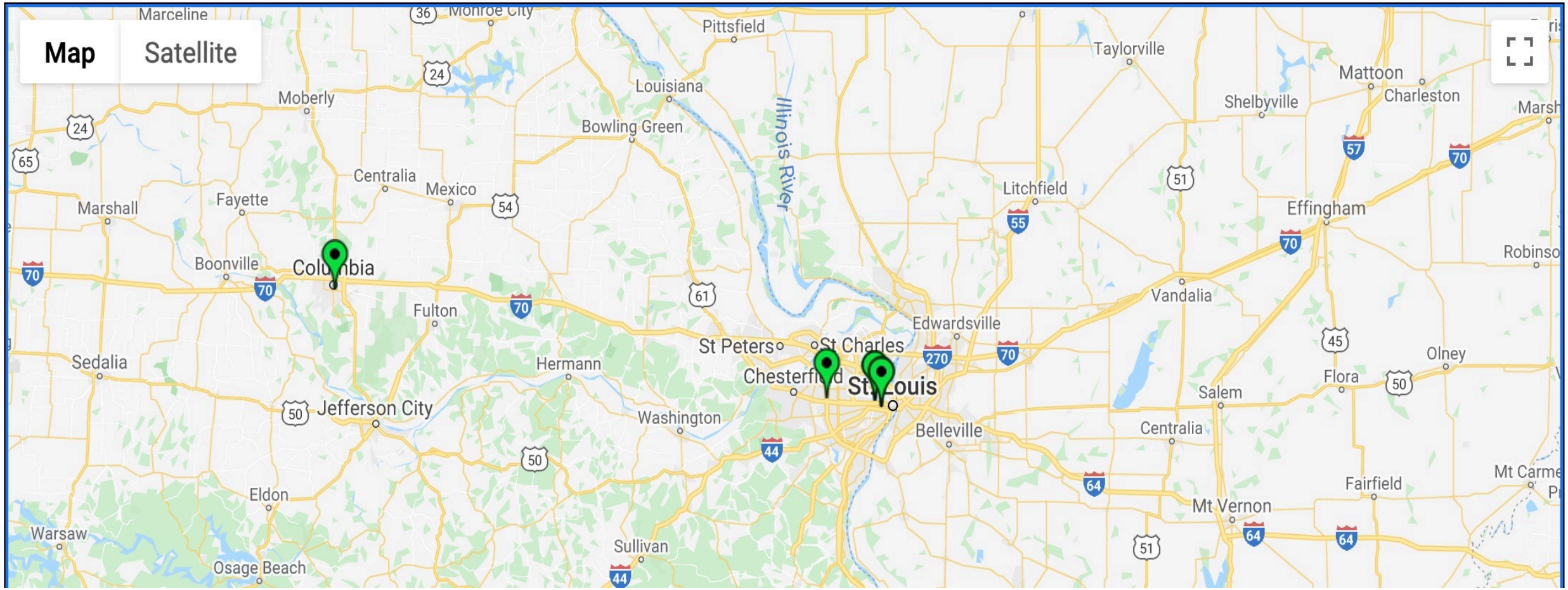
ECMO Availability Center Map



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BJC COVID-19 ICU Tracker*

		Physical Beds	Census	Beds Open	CV19+	CV19 rcvrd	CV19-	ECMO
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	AMH ICU	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

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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

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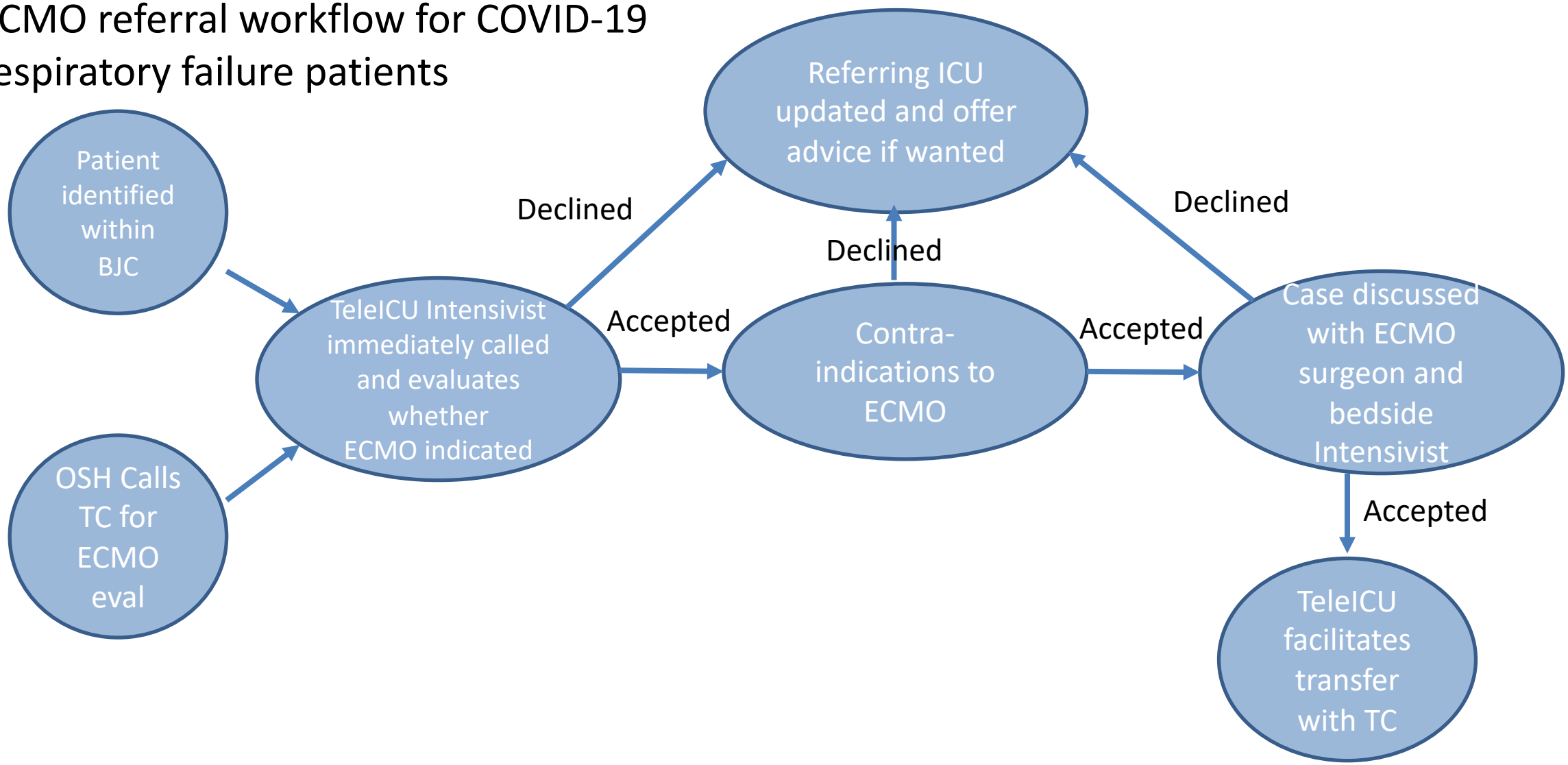
ECMO referral workflow for COVID-19 respiratory failure patients



TC= BJC Transfer Center

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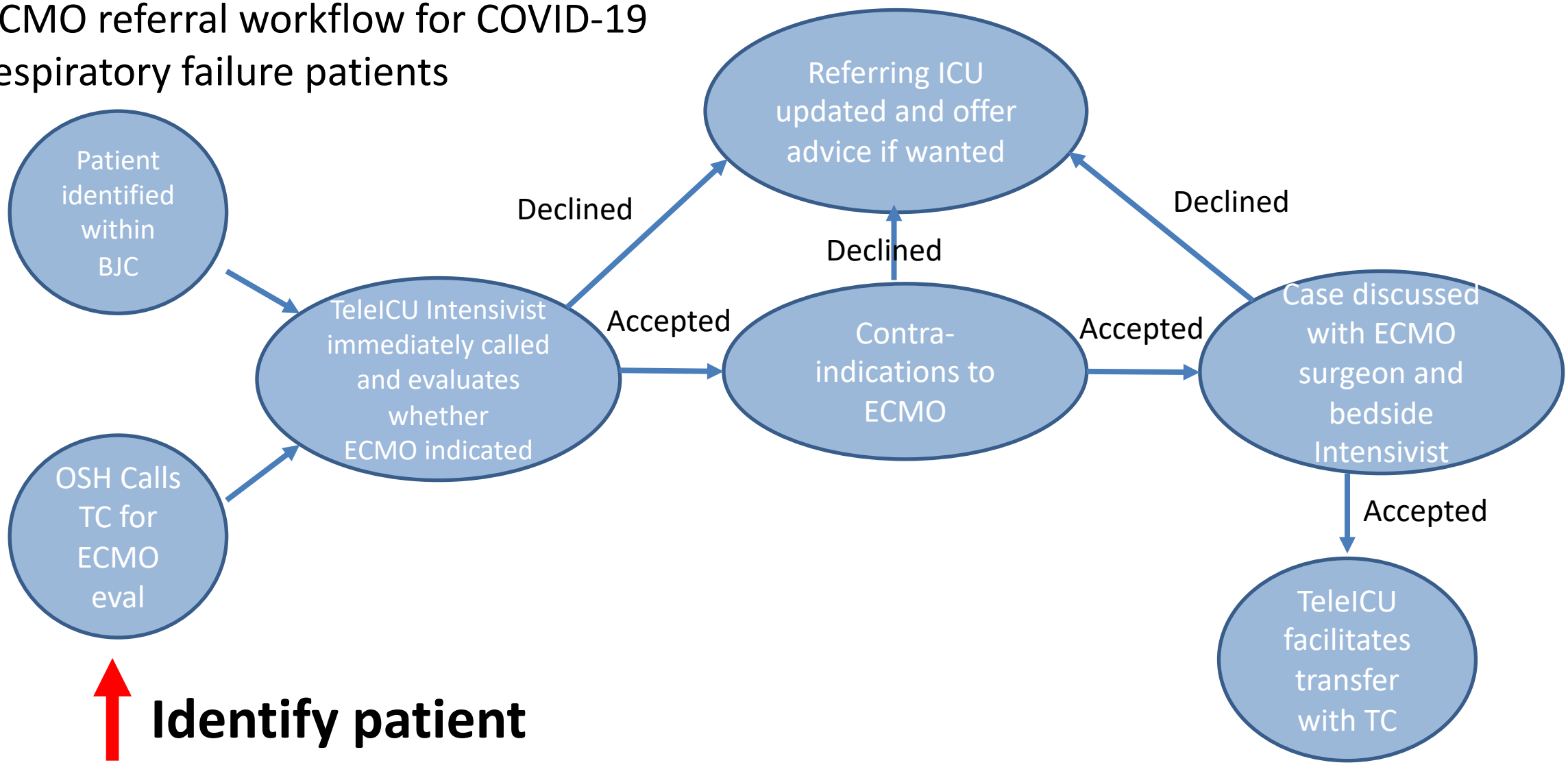

Identify patient

TC= BJC Transfer Center
OSH= Outside Hospital (non-BJC)

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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

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Unit Review with eCare

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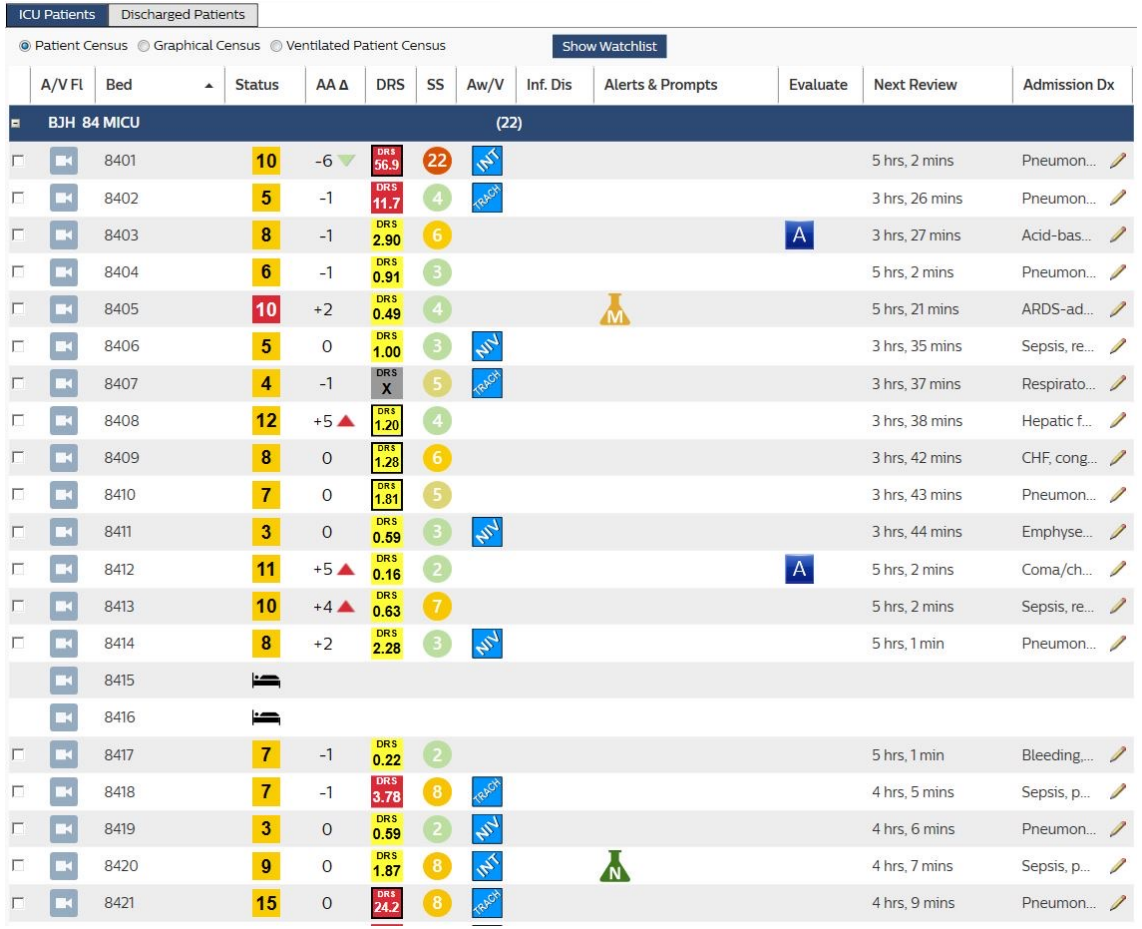
Review ICU census



A/V Fl	Bed	Status	AA Δ	DRS	SS	Aw/V	Inf. Dis	Alerts & Prompts	Evaluate	Next Review	Admission Dx
BJH 84 MICU						(22)					
	8401	10	-6	56.9	22	INT				5 hrs, 2 mins	Pneumon...
	8402	5	-1	11.7	4	TRACH				3 hrs, 26 mins	Pneumon...
	8403	8	-1	2.90	6				A	3 hrs, 27 mins	Acid-bas...
	8404	6	-1	0.91	3					5 hrs, 2 mins	Pneumon...
	8405	10	+2	0.49	4			M		5 hrs, 21 mins	ARDS-ad...
	8406	5	0	1.00	3	NIV				3 hrs, 35 mins	Sepsis, re...
	8407	4	-1	X	5	TRACH				3 hrs, 37 mins	Respirato...
	8408	12	+5	1.20	4					3 hrs, 38 mins	Hepatic f...
	8409	8	0	1.28	6					3 hrs, 42 mins	CHF, cong...
	8410	7	0	1.81	5					3 hrs, 43 mins	Pneumon...
	8411	3	0	0.59	3	NIV				3 hrs, 44 mins	Emphyse...
	8412	11	+5	0.16	2				A	5 hrs, 2 mins	Coma/ch...
	8413	10	+4	0.63	7					5 hrs, 2 mins	Sepsis, re...
	8414	8	+2	2.28	3	NIV				5 hrs, 1 min	Pneumon...
	8415										
	8416										
	8417	7	-1	0.22	2					5 hrs, 1 min	Bleeding,...
	8418	7	-1	3.78	8	TRACH				4 hrs, 5 mins	Sepsis, p...
	8419	3	0	0.59	2	NIV				4 hrs, 6 mins	Pneumon...
	8420	9	0	1.87	8	INT		N		4 hrs, 7 mins	Sepsis, p...
	8421	15	0	24.2	8	TRACH				4 hrs, 9 mins	Pneumon...

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Review ventilation data

ICU Patients | Discharged Patients

Patient Census | Graphical Census | Ventilated Patient Census | Show Watchlist

Auto Refresh | Show/Hide Ventilated Census Columns

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		No	5.9
8401	02/20/1961	26	4.7	24	87	12.5	60	75	125	7.32		No	5.9
8420	04/03/1974	31	2.7	29	100	5	40	79	198	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

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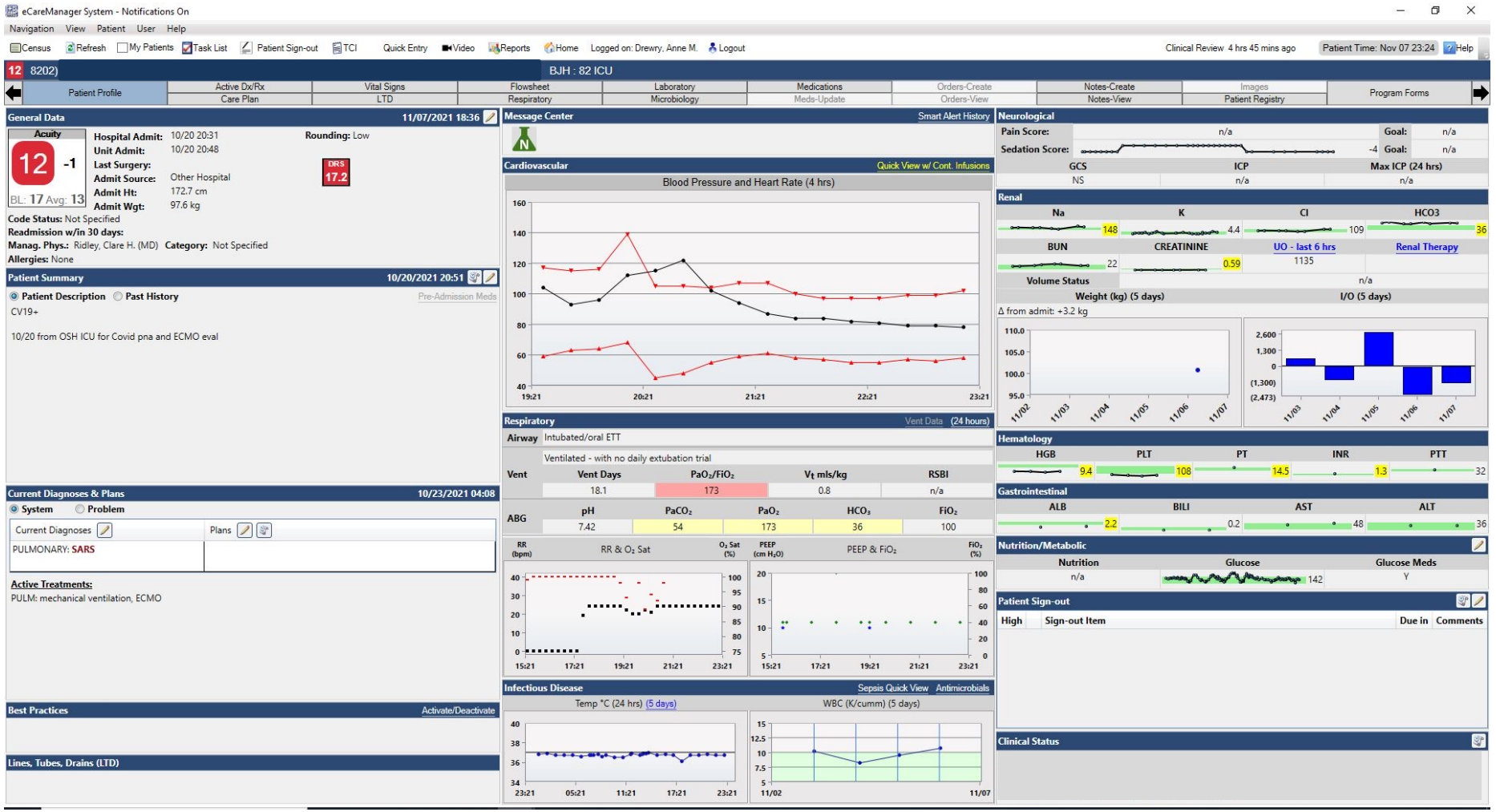
Chart Dive



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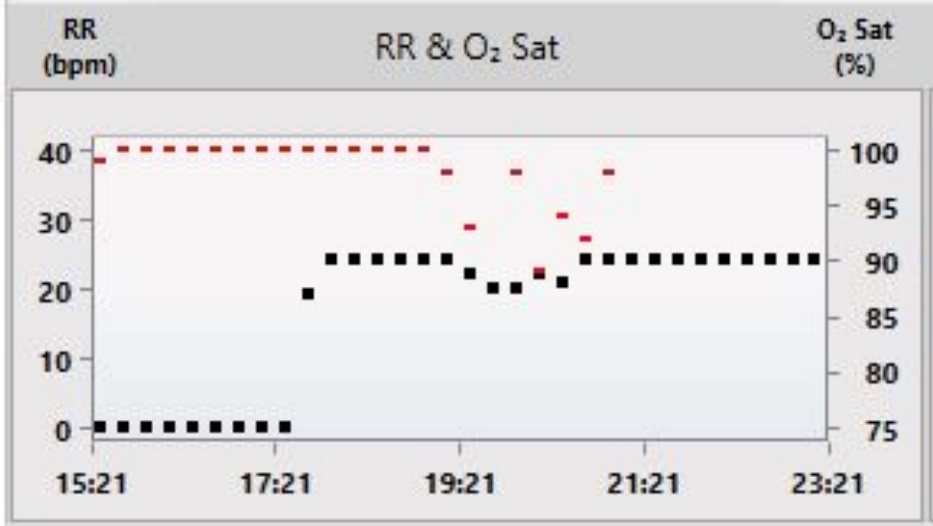
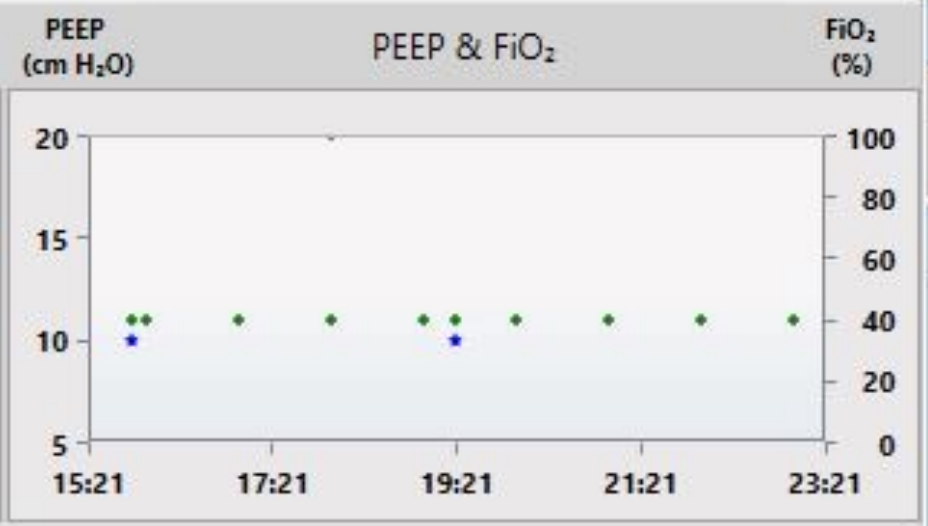
Ventilation Information

Respiratory — Vent Data (24 hours)

Airway	Intubated/oral ETT			
Vent	Ventilated - with no daily extubation trial			
	Vent Days	**PaO_2/FiO_2**	**V_t mls/kg**	**RSBI**
	18.1	173	0.8	n/a
ABG	**pH**	**$PaCO_2$**	**PaO_2**	**HCO_3**	**FiO_2**
	7.42	54	173	36	100





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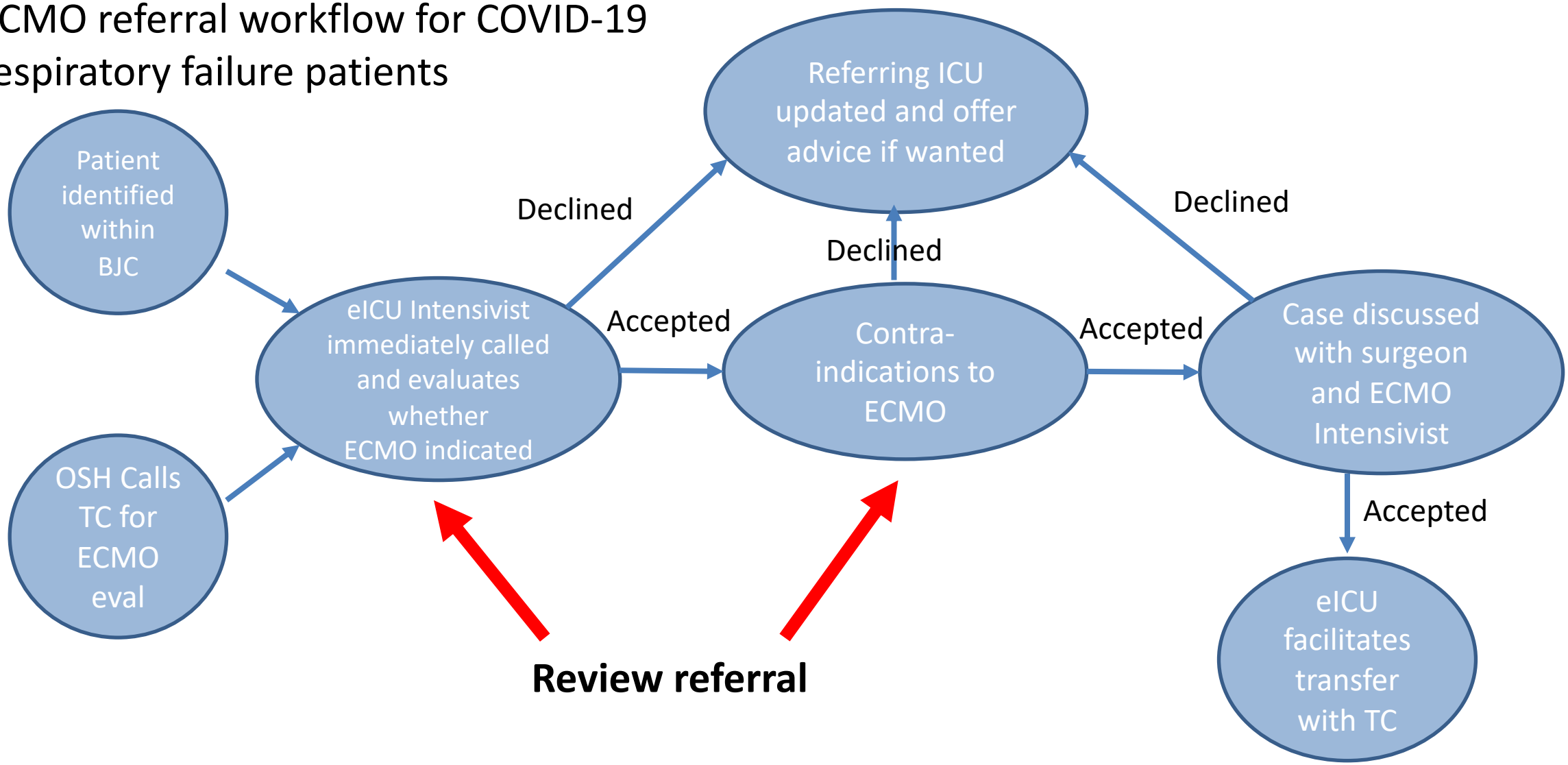

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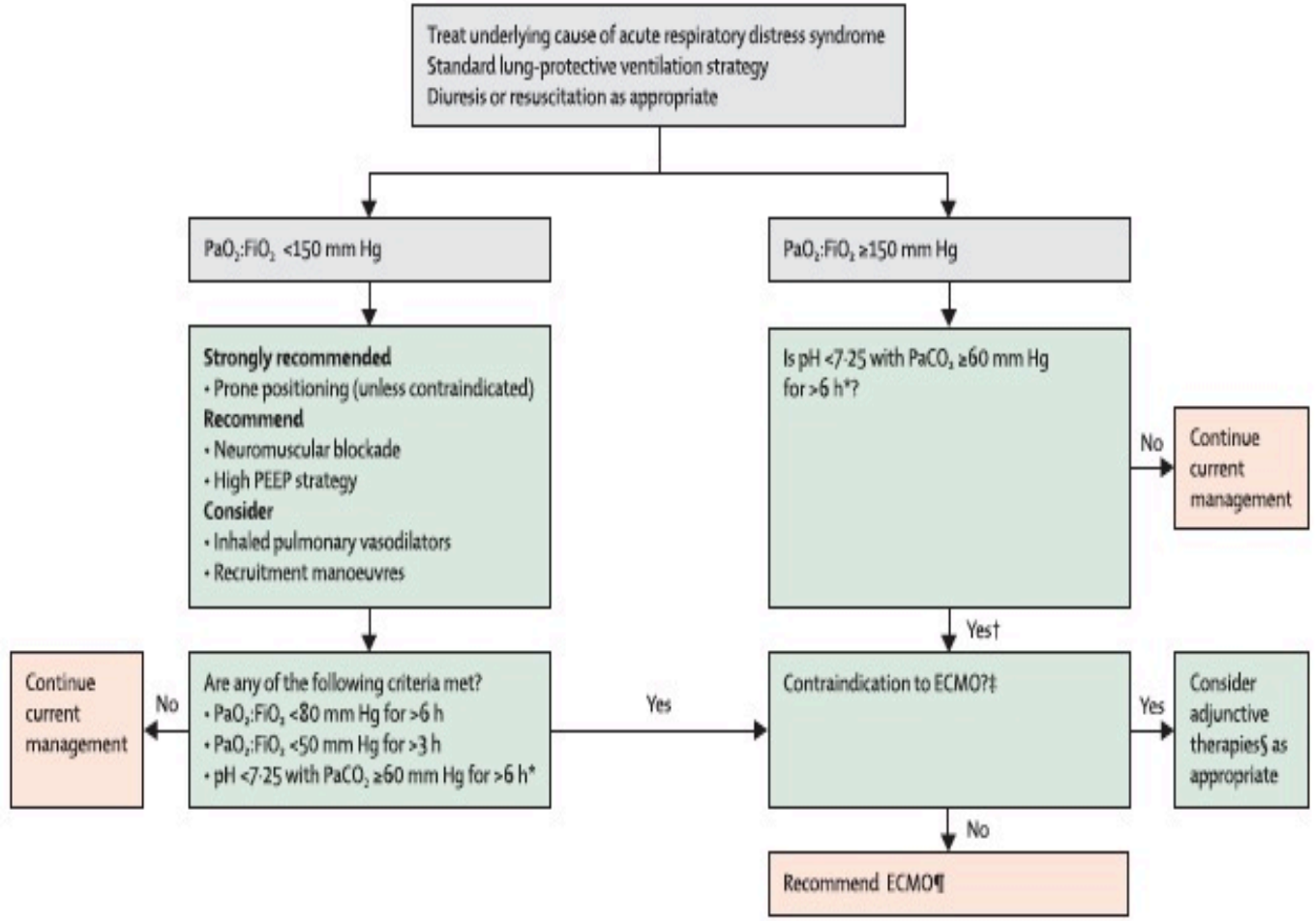
Evaluate ECMO Indicators

- 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



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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

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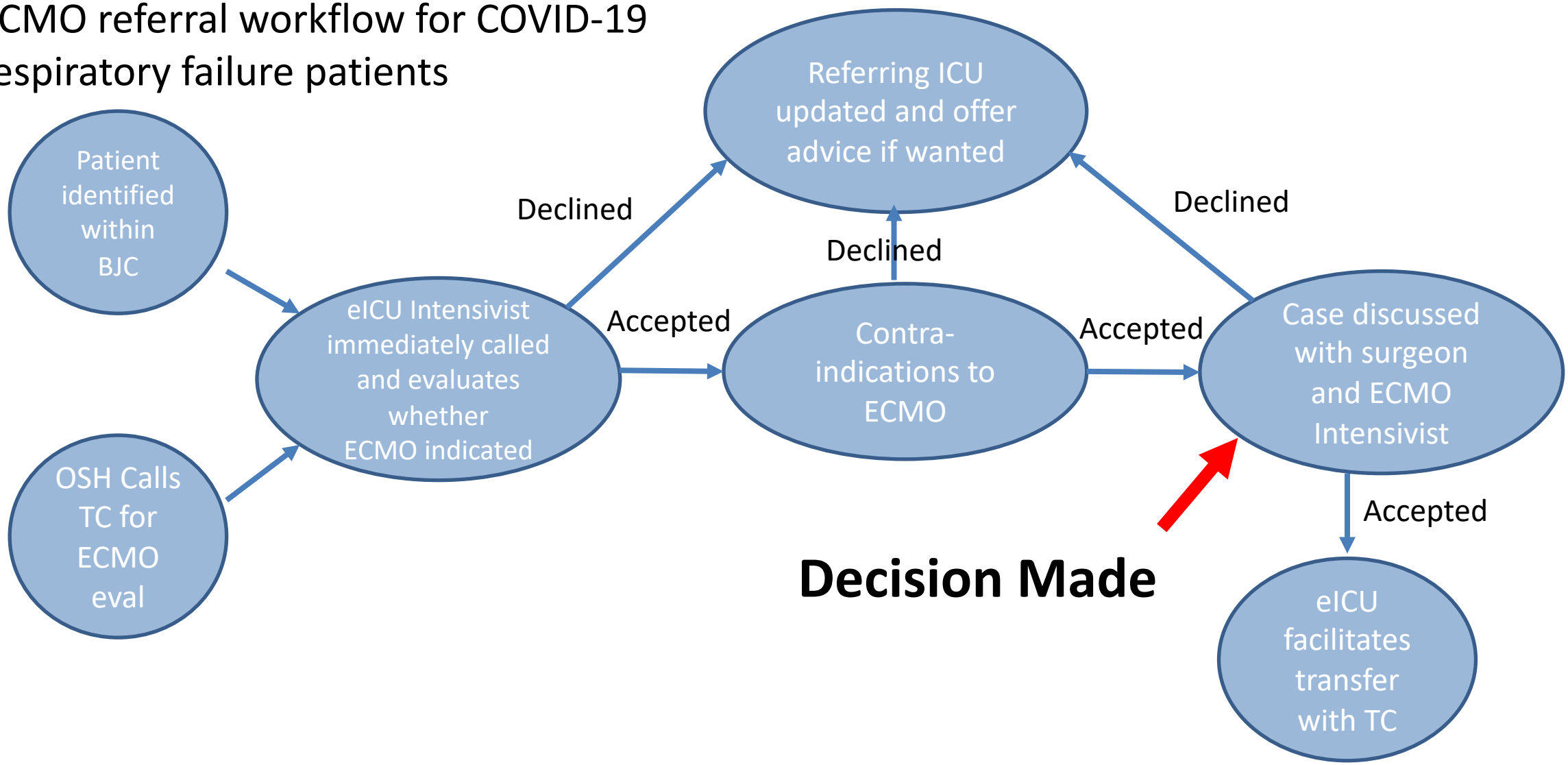

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TeleICU Intensivist Role

- 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

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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

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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

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Questions?

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