COVID-19 CLINICAL ROUNDS

MASS CRITICAL CARE SERIES

"Ramping Up and Ramping Down" Surge Capacity

University of Colorado Division of Hospital Medicine

Kasey Bowden, MSN, FNP, AGACNP
Assistant Professor, Division of Hospital Medicine
Associate Clinical Director, Division of Hospital Medicine
CARE Clinic Medical Director, Division of Oncology

Jason Persoff, MD
Associate Professor of Medicine, Division of Hospital Medicine
Assistant Director of Emergency Preparedness University of Colorado Hospital
Co-Medical Director Nights Service Line

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Triggers Are Essential and Bidirectional

- Triggers should be
  - Objective
  - Quantifiable
  - Deterministic (What is the outcome the trigger is trying to accomplish?)
  - Achievable
  - Bidirectional
  - Mutually Beneficial

State of Colorado Combined Hospital Transfer

Table 1. Combined Hospital Transfer Center Tier System

	Capacity Scenario	CHTC Transfer Center	Activation Thresholds
Tier 1	Usual capacity, typical patient transfer needs	Usual interhospital transfer process	N/A
Tier 2	1 hospital/system capacity exceeded OR regional* outbreak/disaster	**Regional CHTC** Transfer leads of hospitals in a region + Regional HCC Coordinators +/- State EOC transfer lead +/- EMS MAC *Twice daily calls for the duration of activation*	# of available ICU beds** falls below 15% of active COVID-19 case counts in 1-2 HCC regions **OR** # of available inpatient beds falls below 15% of active COVID-19 case counts in the 1-2 regions **OR** Department of Corrections facility or LTC/SNF outbreak across > 1 HCC **OR** More than 20% variance between hospitals in region with ≥ 2 hospitals exceeding total ICU or inpatient capacity
Tier 3	3 or > hospital/system capacity exceeded OR statewide outbreak/disaster	**Statewide CHTC** Transfer leads of ALL Colorado hospitals + All HCC Coordinators + State EOC transfer lead + EMS MAC *Communication lines open among incident command centers of all participants for the duration of activation.*	# of available ICU beds falls below 10% of active COVID-19 case counts in ≥3 regions **OR** # of available inpatient beds falls below 15% of active COVID-19 case counts in the ≥3 regions **OR** # of available ICU or inpatient beds falls below 10% of active COVID-19 case counts in the North Central Region

*Regions are the 9 health care coalition regions, Appendix A. HCC = health care coalition, EMS MAC=emergency medical services multi-agency collaborative

University of Colorado Hospital

- 679 Beds
- Academic Medical Center
- Level 1 Trauma Center

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- 67 Physicians, 32 Advanced Practice Providers
- Average Daily Census ~200

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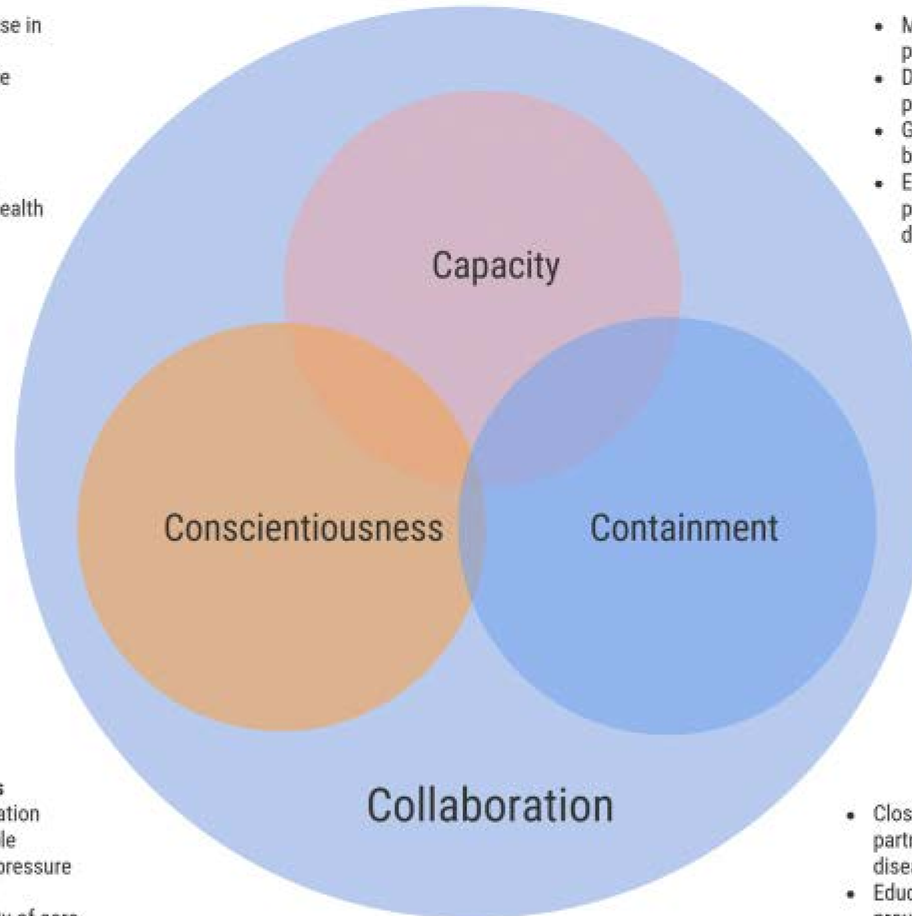
COVID Conceptual Framework



Bowden, K, Burnham, E, Keniston, A, Levin, D, Limes, J, Persoff, J, Thurman, L, Burden, M. "Harnessing the Power of Hospitalists in Operational Disaster Planning: COVID-19." *Journal of General Internal Medicine.* 2020; 35(9): 2732-2737.

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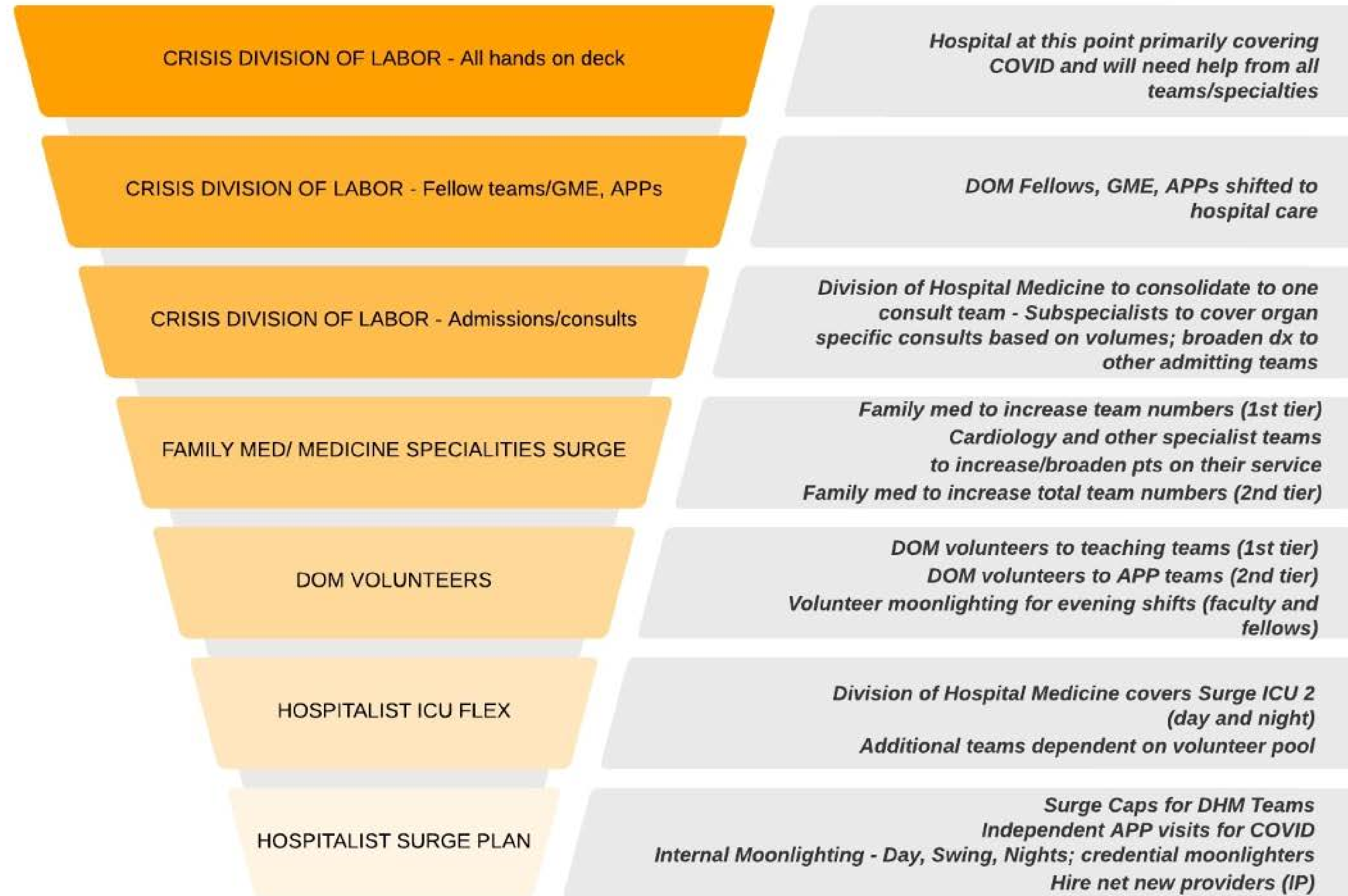
DOM/DHM Capacity Plan - Updated November 16th, 2020

Prepared by the DHM Clinical Operations Team: Alex Sun, MD, Kasey Bowden, NP, Adam Meyer, MD, Dimitriy Levin, MD, Julia Limes, MD, Timothee Schlumberger, Leah Lleras, Marisha Burden, MD



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Decreased general medicine volumes

Reduced surgical/procedural operations

COVID SURGE PLAN - DRAFT CONCEPTUAL MODEL

Developed by Division of Hospital Medicine in partnership with SOM and UCH | March 8, 2021 |

Levels of Implementation

TIER	Teams
Tier 1 - DHM increases	DHM baseline capacity 2020
	Winter surge
	Independent APP visits
	Increased team caps
Tier 2 - DOM/Family Med assistance	2 DOM Volunteers
	HF and CCU Overflow
	Onc volunteer(s)
	Addiction med + helper
	Family Med overflow
	Subspecialty Overflow
	Onc Volunteer #2
Tier 3 - DOM Crisis of Labor	2 Fellows as attendings
	Residents/ 2 DOMVolunteers
Tier 4 - SOM Crisis of Labor	Ortho overflow
	Gen surge overflow
	UCHealth pool, community

*Evening and nights flex not shown; Hospitalist to ICU teams, not shown

**Capacity is dependent upon addiction med volumes

*Will prioritize residents/fellows who have experienced a change/reduction in their current educational experience (i.e. we are ideally not pulling residents from highly educational experiences that are intact). Will aim to pair residents with DOM volunteers.

Percent baseline capacity: 100% 125% 150% 175% 200% 225% 250%

*This modeling includes maximum capacity and should not be taken to mean that there will be a stepwise approach as some of these initiatives will be started concurrently and in preparation for expected volumes.

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DOM COVID Surge Plan 2020

			Tier 1 - DHM Increases					Tier 2 - DOM Assistance										Tier 3 - DOM Crisis of Labor				Tier 4 - SOM Crisis of labor				Tier 5 - Crisis of Labor				
Team	Patients	Team Composition	Baseline 2020	Added HMS11, APP5, 6 and 10	Independent APP visits	Consolidate consults	Gen Med flex caps	2 DOM Volunteers	HF Covid overflow	1 DOM Volunteer	Oncology staff MO1	Addiction to HMS15	Family med add'l team	Gen Cards Overflow	GI Overflow	Pulm HTN Overflow	Oncology staff MO2	Residents DOM Volunteer #4	Residents DOM Volunteer #5	Fellows as attendings DOM #1	Fellows as attendings DOM #2	Ortho overflow	Gen Surgery	Neuro/NSGY	Subspecialty other	TBD Add'l Volunteers with resident staffing or fellows as attendings vs community assistance				
Med 1	Gen Med	Res/Intern	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Med 2	Gen Med	Res/Intern	12	12	12	12	14 ↑	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Med 3	Gen Med	Res/Intern	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Med 4	Gen Med	Res/Intern	12	12	12	12	14 ↑	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
ACE 1	Gen Med	Res/Intern	10	10	10	10	12 ↑	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
ACE 2	Gen Med	Res/Intern	10	10	10	10	12 ↑	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
MO 1	Oncology	Res/APP	14	14	14	14	16 ↑	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
MO2	Oncology	APP/APF	14	14	14	14	16 ↑	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
HTT	Gen Med	Resident	12	12	12	12	14 ↑	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
HMS Complex Care		APP	12	12	12	12	16 ↑	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
HMS 1	COVID	APP	16	16	18 ↑	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
HMS 2	COVID	APP	16	16	18 ↑	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
HMS 3	COVID	Phys Only	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
HMS 4	COVID	APP	16	16	18 ↑	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
HMS 5	COVID	APP	12	16 ↑	18 ↑	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
HMS 6	COVID	APP	8	16 ↑	18 ↑	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
HMS 8	COVID	Phys Only				12 ↑	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
MO3/HMS 9	Future COVID	APP	15	15	15	15	18 ↑	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
HMS 11	Future COVID	Phys Only		12 ↑	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
HMS 12	Future COVID	Phys Only						12 ↑	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
DHM Surge ICU	COVID	Phys Only						10 ↑	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
HF overflow	COVID								12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
HMS 13	COVID	Phys Only								12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
HMS 14	COVID	Phys Only									12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
HMS 15	COVID	Phys Only										6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Family Med 2	COVID												20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Cards1-4 overflow	COVID	Res/intern												10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
GI Overflow	COVID	APP													10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
pHtn Overflow	COVID	APP														6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
HMS16	COVID	TBD															12	12	12	12	12	12	12	12	12	12	12	12	12	12
HMS17	COVID	TBD																12	12	12	12	12	12	12	12	12	12	12	12	12
HMS18	COVID	TBD																	12	12	12	12	12	12	12	12	12	12	12	12
HMS19	COVID	TBD																		12	12	12	12	12	12	12	12	12	12	12
HMS20	COVID	TBD																			12	12	12	12	12	12	12	12	12	12
																						12	12	12	12	12	12	12	12	12
																							20	20	20	20	20	20	20	20
																								12	12	12	12	12	12	12
																									6	6	6	6	6	6
HMS21	COVID	TBD																												
Patient Total		0	215	239	249	261	282	304	316	328	340	346	366	376	386	392	404	416	428	440	452	464	484	496	502	502	502	502	502	502
% 2020 Capacity			100%	111%	116%	121%	131%	141%	147%	153%	158%	161%	170%	175%	180%	182%	188%	193%	199%	205%	210%	216%	225%	231%	233%	233%	233%	233%	233%	233%
Volunteer Attendings			0	0	0	0	0	2	0	1	1	0	0	0	0	0	1	1	1	1	1	1	1							
Total Volunteer Attendings			0	0	0	0	0	2	2	3	4	4	4	4	4	4	5	6	7	8	9	10	11	11	11					
COVID patients estimated total			75	109	129	141	167	194	211	228	240	246	266	276	286	292	304	316	328	340	352	364	384	396	402	402	402	402	402	402
Gen Med patients estimated given spring surge			140	130	120	120	115	110	105	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Estimated ICU patients given current ratios November																														
Estimated ICU patients		0.3	23	33	39	42	50	58	63	68	72	74	80	83	86	88	91	95	98	102	106	109	115	119	121	121	121	121	121	121
Estimated ICU patients		0.5	38	55	65	71	84	97	106	114	120	123	133	138	143	146	152	158	164	170	176	182	192	198	201	201	201	201	201	201
Weekend APP moonlighters cFTE			0	0	2.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Add'l cFTE admitter and weekend HMS15			0	0	0	0	2	0	0	2	0	0	0.5	2	0	2	0	0	0.5	2	0	0	0	0	0	0	0	0	0	0
Add'l cFTE swing			0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Add'l cFTE nights			0	0	0	0	3	0	0	3	0	0	3	0	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0
Cumulative cFTE			0	0	2.3	2.3	7.3	8.3	8.3	13.3	13.3	13.3	16.8	19.8	19.8	24.8	24.8	24.8	28.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3
Physician Jeopardy Providers			2	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
APP Jeopardy Providers			1	1	1	1	1	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Sample Email Communication:

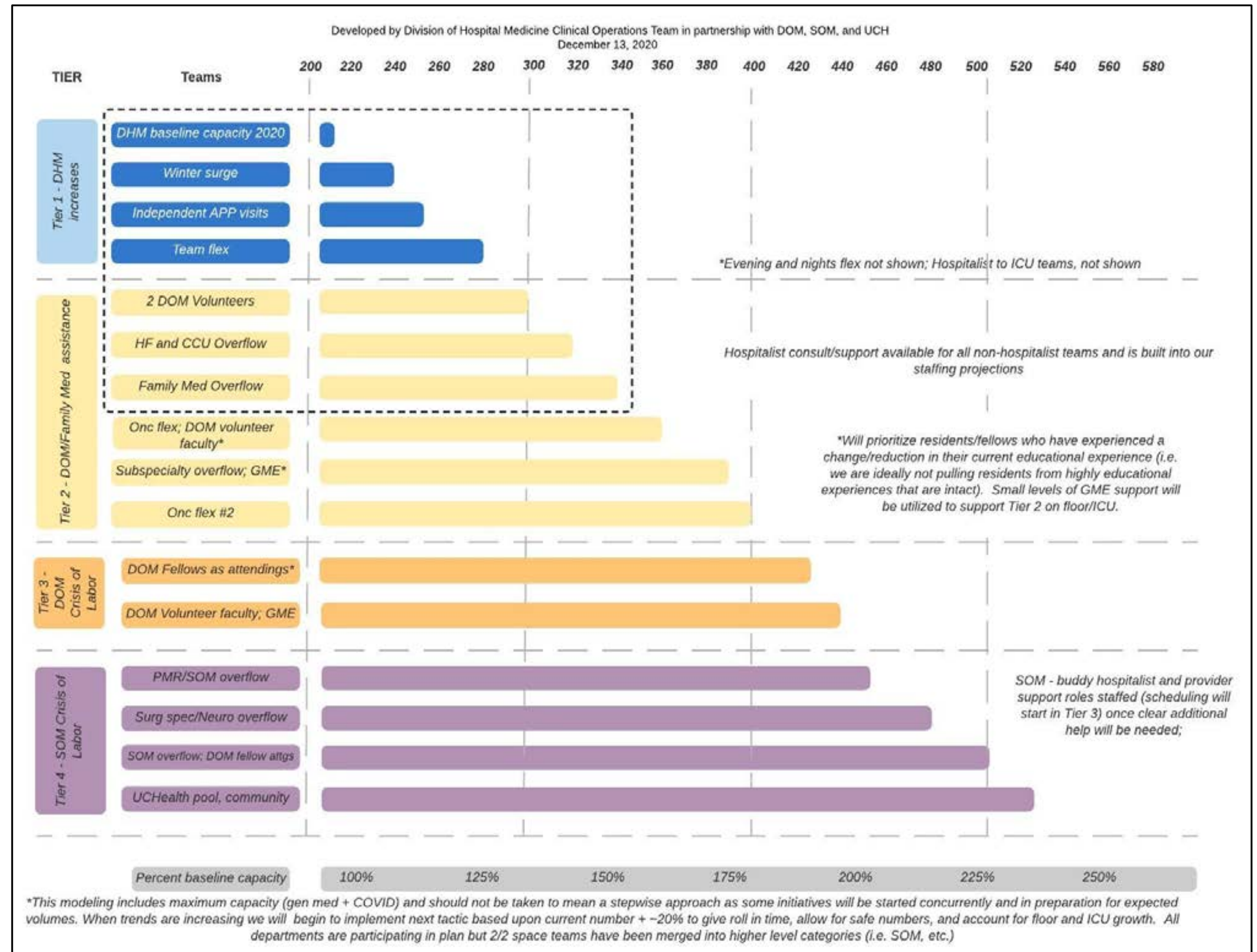
Greetings, please see below for your weekly capacity planning update for December 13th, 2020.

COVID trends at UCH. Please note that the downtrend seen in the beginning of December is likely related in part to a recent change in COVID isolation clearance guidelines.

Tier of surge implemented:
Tier 1 DHM – flex numbers, additional service, flexing to ICU/step down
Tier 2 DOM/Family Medicine support – including DOM volunteer teams, cardiology taking COVID patients as primary, subspecialty teams helping with consults, family med taking increased COVID #'s

ICU:
A total of three ICU surge teams managed by Pulmonary Critical Care Medicine, Anesthesiology Critical Care, and Surgical Critical Care. One MSPCU (stepdown) surge team managed by hospital medicine. Census has been largely stable for past three weeks. Increase in patients undergoing tracheostomy, some COVID clearance of longer-term patients. Three patients on ECMO.

While COVID numbers are stable, we have seen an increase in gen med patients. Additional levels of activation **possible** for floor census for the next week but anticipate that we would **remain in Tier 2** if additional measures needed. Additional teams for ICU are **unlikely** for the next few days.



Next activation (when/if needed): Continue to maximize DOM inpatient services to offload both COVID and gen med to other services as able. Oncology as primary. Anticipate total medicine volume would need to increase by 10-15% with clearly rising rates. Following ICU census to determine if additional surge team activation would be necessary; next ICU surge team led by anesthesia critical care.

Thank you for the amazing support! This email will be distributed each Sunday night and will be sent out as a weekly email unless a new trend change occurs and/or we are anticipating additional surge activation.

If questions, concerns, or ideas, please reach out to our team:
Kasey Bowden, NP (Associate Clinical Director, Div Hospital Medicine), Marisha Burden, MD (Division Head of Hospital Medicine), David Schwartz, MD (Chair of Medicine), Jason Brainard, MD (Co-Medical Director of UCH STICU) Frank Wright, MD (Co-Medical Director of UCH STICU), Ellen Burnham, MD (Medical Director of UCH Medical Intensive Care Unit), Marc Moss, MD (Division Head of Pulmonary/Critical Care), Anne Fuhlbrigge, MD (Sr Associate Dean of Clinical Affairs), and Jean Kutner, MD (Chief Medical Officer, UCH).

CU Division of Hospital Medicine Surge Planning

Key Lessons Learned:

- Ensure secured funding for internal surge staffing
- Adopt a tiered approach with identifiable triggers
- Direct negative correlation between COVID volumes and subspecialty/surgical volumes allows for increased collaboration
- Enhanced and optimized communication imperative to surge operations

References

*Persoff J, Ornoff D, Little C. The Role of Hospital Medicine in Emergency Preparedness: A Framework for Hospitalist Leadership in Disaster Preparedness, Response, and Recovery. J Hosp Med 2018; 13:713-718. DOI: 10.12788/jhm.3073.

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*Merkel, Matthias Johannes MD, PhD; Edwards, Renee MD, MBA; Ness, Joe MHA, BSPharm3; Eriksson, Carl MD, MPH; Yoder, Susan RN; Gilliam, Stephanie MN, RN, NE-BC; Ellero, Katie MHSA; Barreto-Costa, Coral BA; Graven, Peter PhD; Terry, Jeffrey R. MBA; Heilman, James MD, MBA. Statewide Real-Time Tracking of Beds and Ventilators During Coronavirus Disease 2019 and Beyond, Critical Care Explorations: June 2020 - Volume 2 - Issue 6 - p e0142 doi: 10.1097/CCE.0000000000000142