

Critical medical products: a view from the ICU

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- No financial conflicts of interest.
- The views expressed herein are those of the presenter and do not necessarily reflect the official policy or position of the Department of the Navy, the Department of Defense, or the U.S. Government.

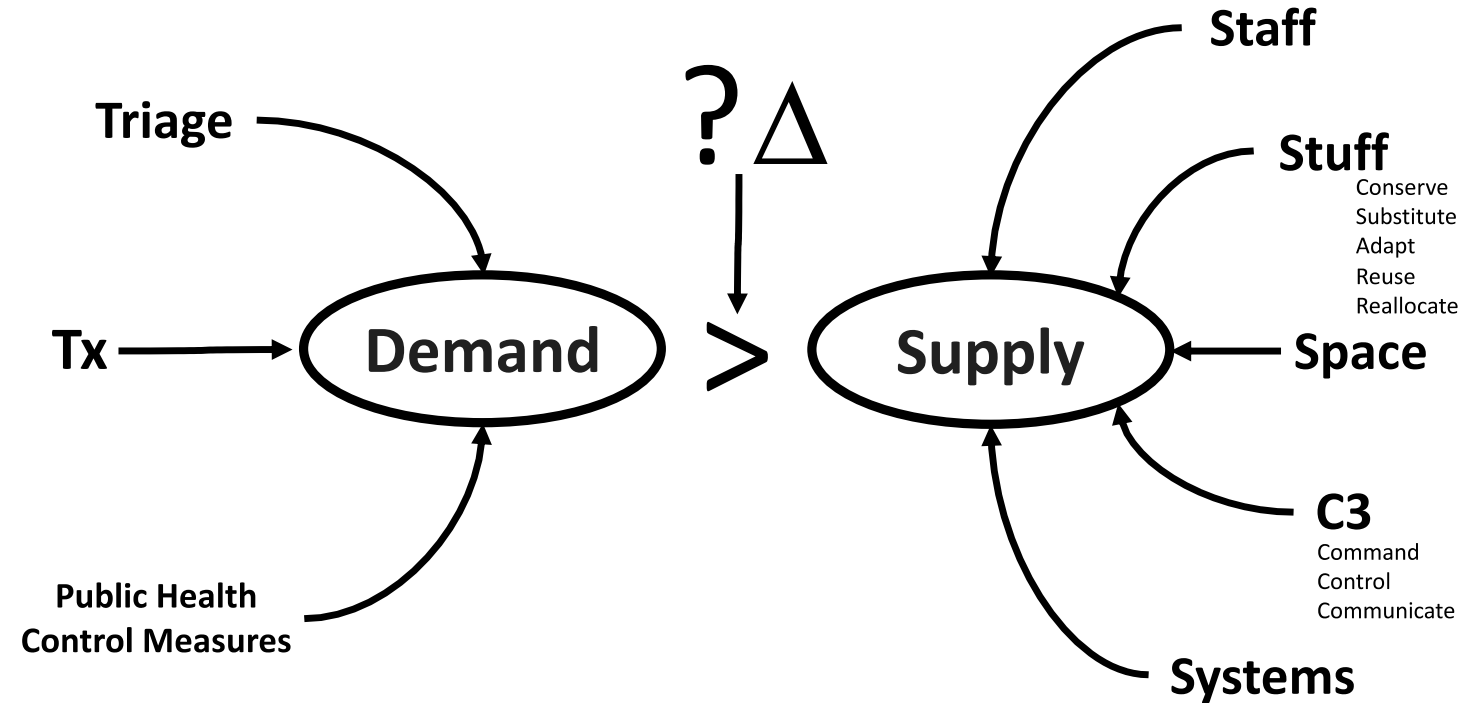
The ICU as a microcosm of the hospital

- Loss of ICU capability is rate-limiting for most major hospital functions:
 - Severe infections
 - Trauma
 - Myocardial infarction
 - Major surgical procedures

The ICU as a microcosm of the hospital

- Traditional elements of hospital surge response:

1. **Stuff**
2. **Staff**
3. **Space**



Source: Dr. Michael Christian (<https://youtu.be/xEhmeMY6zY8>)

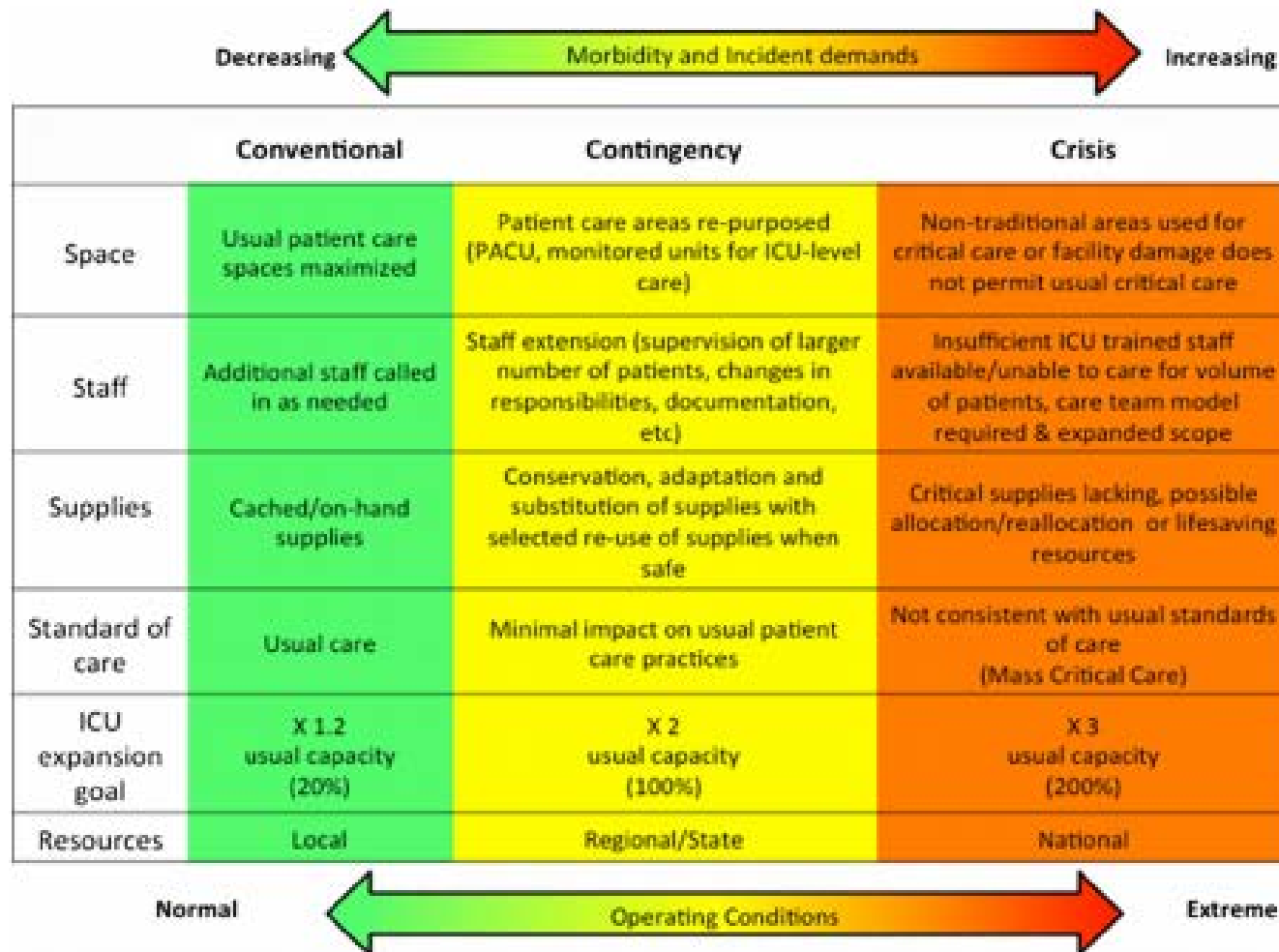


Figure 1 – A framework for critical care surge capacity planning, outlining the conventional, contingency, and crisis surge responses. PACU = postanesthesia care unit.

Hick JL, Einav S, Hanfling D, et al. Surge capacity principles: care of the critically ill and injured during pandemics and disasters: CHEST consensus statement. *Chest*. 2014;146(4 Suppl):e1S-e16S. doi:10.1378/chest.14-0733

“Stuff” shortages in surge response

- Ventilators
 - Consumables (e.g., tubing)
 - Defense Production Act ventilators – only ~60,000 of 200,000 are true full-featured ventilators
- CRRT
- PPE
- Key ICU medications:
 - Antimicrobials
 - Sedatives
 - Analgesics
 - Neuromuscular blockade

Full Function Ventilators

- Hamilton C1, C3, and T1
- GE Carescape R860
- Vyaire LTV 2 (2200)
- GM/Ventec V+ Pro
- Phillips EV300

Ventilators for less severely ill patients, **NIV**, or transport

- Medtronic 560
- Resmed Astral 150
- Zoll 731
- Phillips EVO
- Vyaire LTV 2 (2150)
- Hill Rom Life 2000
- GE/Ford/Airon pneutron
- Combat Medical Systems SAVE II

SNS Ventilators

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graph TD; A([SNS Ventilators]) --> B[Full Function Ventilators]; A --> C[Ventilators for less severely ill patients, NIV, or transport];
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Branson R et al, CHEST 2020

<https://doi.org/10.1016/j.chest.2020.09.085>

Now the U.S. Has Lots of Ventilators, but Too Few Specialists to Operate Them

A burst of production solved the dire shortage that defined the first wave of the coronavirus. But the surplus may not be enough to prevent large numbers of deaths.



A patient was placed on a ventilator in a hospital in Yonkers, N.Y., in April. John Minchillo/Associated Press

By Andrew Jacobs

Nov. 22, 2020



FDA Essential Medicines List

- Generally sound list.
- Some peculiarities:
 - Only one antiretroviral (darunavir/cobicistat)?
 - Would swap isavuconazole out instead of voriconazole
 - Four NMB agents?
 - Three fluoroquinolones?
 - Where is prednisone?
 - Inhaled zanamavir “essential”?

The bottom line

- “Things” are rarely critical.
 - Can use rocuronium instead of cisatracurium.
 - Can use hydromorphone instead of fentanyl.
- **Capabilities** are critical.
 - Ability to provide neuromuscular blockade.
 - Ability to provide analgesia.
- “Things” are necessary but insufficient in providing capabilities.
 - A transport ventilator does not replace a PB980.
 - A PB980 is useless without experts to operate it.