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Medical Supply Chain Impacts of Pandemic Preparedness and Response

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Monterey, California: Naval Postgraduate School

<http://hdl.handle.net/10945/69848>

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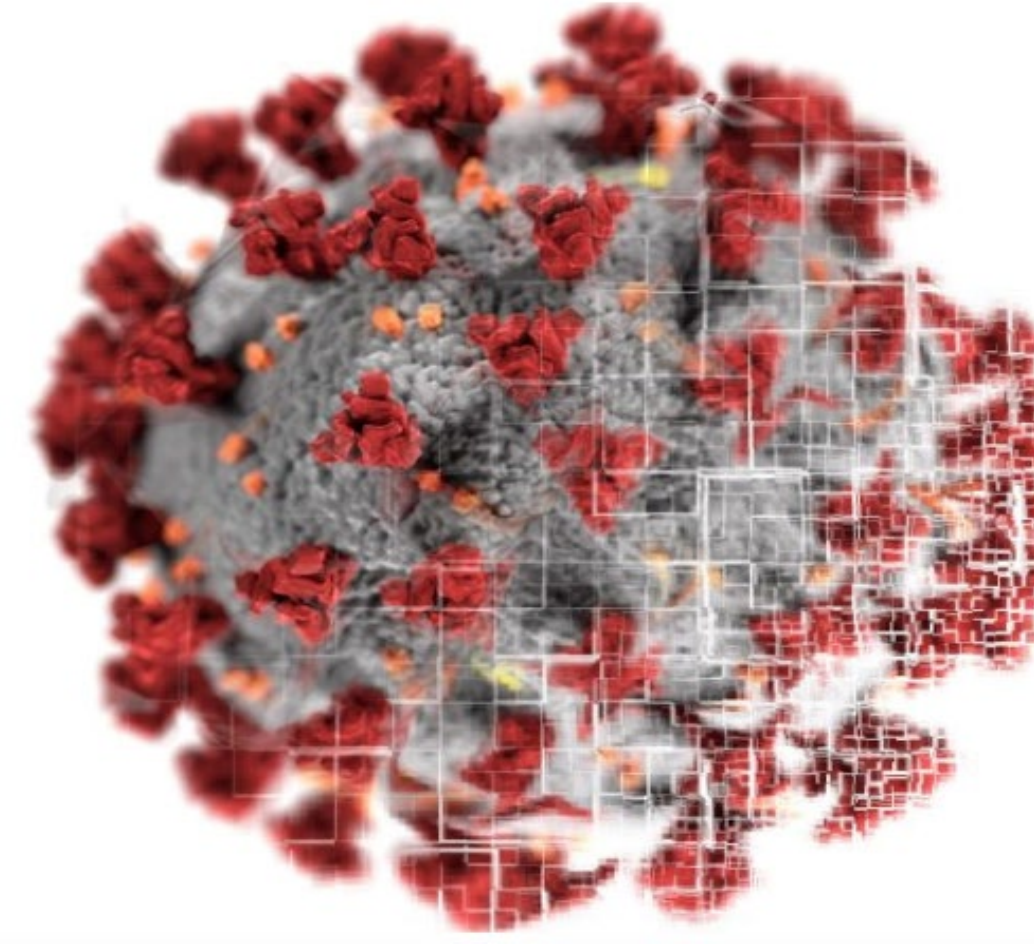
PREPARING FOR THE NEXT PANDEMIC: HOW CAN NAVY PERSONAL PROTECTIVE EQUIPMENT RESUPPLY BE IMPROVED?



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Project Summary

- Our research seeks to examine the U.S. Navy's COVID-19 response at the ship and fleet level by evaluating notional AMAL assemblages and supply chain processes aboard Arleigh Burke-class destroyers to increase resiliency in future pandemics.
- Study results identified factors that contribute to efficient supply management and determined reasonable onboard PPE inventory.

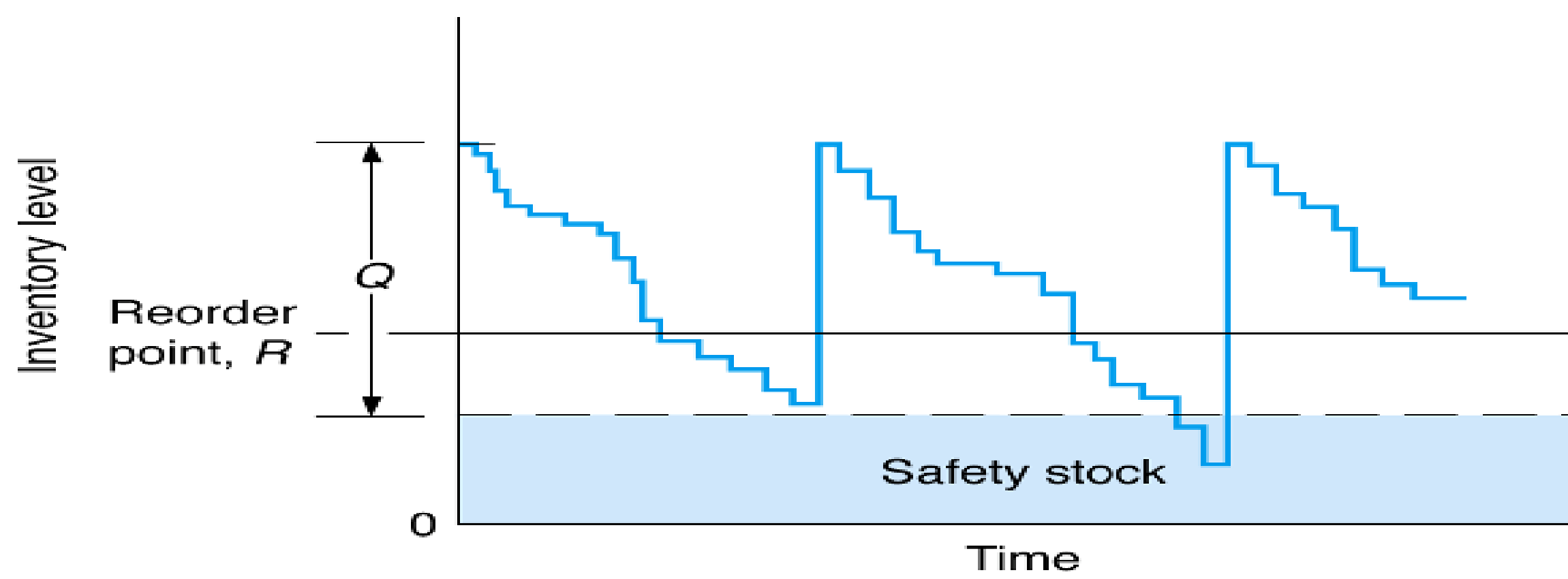


COVID 19. Source: Sci Tech Daily



Hospital Corpsman Insignia. Source: BUPERS

Methodology



Stochastic ROP Model: Source California State University, Northridge

- A mixed-method research design was used to explore the problem through a case study design and application of a stochastic reorder point (ROP) model.
- The first interview protocol phase was used to understand medical supply chain processes while informing the second phase with variables in determining PPE inventory ROP and Safety Stock (reasonable onboard allowance).

Reorder Point (ROP) Formula

- Average onboard demand based on IDC input and average lead time based on geographic and logistical assumptions.
- Stochastic ROP: a triggered replenishment action would be required once inventory levels reached 243.46 units remaining N95 masks (Safety Stock/reasonable onboard allowance: 82.46)

Prepositioned Stock ROP and SS for N95 Masks

* Stochastic formula (variable demand and lead time):

$$ROP = \bar{d}L + SS$$

$$SS = Z \sqrt{(\sigma_d)^2 L + (\sigma_L)^2 \bar{d}^2}$$

$\bar{d} = 200/\text{month or } 7/\text{day } (200 \div 30 = 6.6)$
 $L = 23 \text{ days}$
 $\sigma_d = 3.76$
 $\sigma_L = 11.03$
 $SS = \text{Safety Stock}$
 $Z = 1.04 \text{ (85\% Service Level)}$

1. $SS = 1.04 \sqrt{(3.76)^2 (23) + (11.03)^2 7^2}$
 $= 1.04 \sqrt{325.16 + 5961.38}$
 $SS = 82.46$

2. $ROP = \bar{d}L + 82.46$
 $= (7)(23) + 82.46$
 $= 161 + 82.46$
 $ROP = 243.46$

30 day burn rate.		6 period lead time average.	
TOTAL	206	1	40
Mean	6.866666667	2	17
Mode	9	3	20
Max	20	4	18
St. Dev.	3.748409624	5	10
		6	32
		L AVE ->	22.83333
		St. Dev ->	11.03479

Reorder Point and Safety Stock for N95 Masks (Prepositioned).

Findings

- Concurrence amongst the majority of respondents may indicate points of potential enhancements in didactic supply chain training.
- Indications of potential improvements of standardization of PPE data reporting requirements.

- Significant saturation levels in the interview processes may suggest strong continuity and understanding of processes and policies by the IDCs.
- Although ROP and safety stock presented do not reflect precise figures, the study provides a mechanism to employ in the management of medical supplies onboard DDGs using a stochastic ROP formula.

Future Work

- Further studies focused on other platforms such as LHA, LHD, CVN and submarines classes.
- Studies aimed at optimal stockpiling and pre-positioning models to assure rapid replenishment.
- Research on how to better utilize supply focused technological innovations in forecasting methods to optimize PPE assemblage requirements.
- Research to counter potential of price gouging and how to secure and leverage PPE inventories less impervious to stock shortages.
- Studies identifying obstacles and leveraging solutions for efficient means of vaccine distribution across the DoD.

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Topic Sponsor: COMNAVSURFPAC N01H (CDR David G. Baptista)

NRP Project ID: NPS-21-N167-A
 Thesis: <https://calhoun.nps.edu/handle/10945/67707>

