



Challenges in Operational Naval Medical Support: The RSN Experience

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SCOPE OF PRESENTATION

1. Introduction to Navy Medical Service (NMS)
2. Spectrum of RSN Peacetime Naval Medical Operations
3. Medical Challenges in Naval Operational Medical Support
 - Operational
 - Manpower
 - Medical Logistics / Technical
4. Conclusion
5. Questions



History of Navy Medical Service

1960's - 1970's

- Naval Medical Inspectorate Room
- Provided basic healthcare and medical support to a fledgling Navy
- Treated fishermen who had decompression illness

1980's - 1990's

- Established Naval Medicine Research Centre (NMRC) and then Naval Medicine Hyperbaric Centre (NMHC)
- Opening of Tuas Medical Centre (1994)
- Provided hyperbaric medical consultancy and on-site support to Singapore Mass Rapid Transit (SMRT) project



2000 - 2013

- Opening of Changi Naval Medical Centre
- Developed Submarine Medical Capability
- Provided medical support for Operation Flying Eagle (Boxing Day tsunami) in 2004
- Re-organisation of RSN Medical Service to form Navy Medical Service (NMS) in 2006
- Established collaboration with Singapore General Hospital (SGH) Hyperbaric & Diving Medicine Centre in 2008
- Operationalised MV Swift Rescue (RSN Submarine Rescue suite)



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2013 and beyond

- Medical support for Archer Class Submarines
- Shipboard Surgical capability on board RSN Frigates
- Naval Aviation Medical Support
- Establishing RSN as the Regional Submarine Rescue Hub



Navy Medical Service aims to provide comprehensive and responsive medical support for RSN combatants by identifying various challenges posed by the naval maritime environment.

the **Third** generation

An aerial photograph showing a fleet of several Navy ships, including a large amphibious transport dock ship (LST) in the foreground and several smaller destroyers and frigates, moving in a formation across the open ocean. The ships are leaving white wakes behind them.

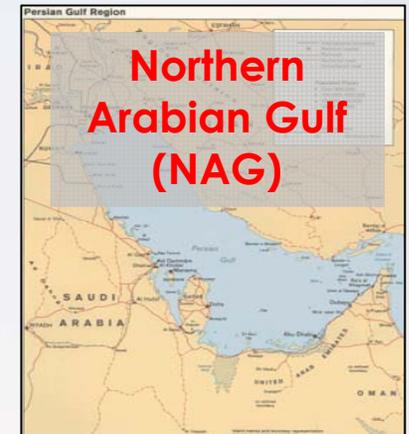
We overcome the limitations posed by these challenges through adaptation and innovation in order to achieve mission success for the 3rd Generation RSN's full spectrum of operations

SPECTRUM OF PEACETIME NAVAL MEDICAL OPERATIONS



Naval Exercises & Deployments

SPECTRUM OF PEACETIME NAVAL MEDICAL OPERATIONS



Peace Support Operations (PSO)

SPECTRUM OF PEACETIME NAVAL MEDICAL OPERATIONS



Socio-civic Missions

SPECTRUM OF PEACETIME NAVAL MEDICAL OPERATIONS

Asian Tsunami
26 Dec 2004



HADR Operations

MEDICAL CHALLENGES



Area of Singapore: 714.3 km² (275.79 sq miles)
Population size: 5.3124 million (3.8182 million residents)*

*Department of Statistics Singapore - Time Series on Population Mid-year estimates
<http://www.singstat.gov.sg/stats/themes/people/hist/popn.html> (accessed on 16 Dec 12)

Current situation: RSN Fleet participates in multiple exercises, operations and missions annually

- local / regional / international
- internal / bi-lateral / multi-lateral
- different platforms, different exercises / deployment profiles
- varying distances from Singapore
- various ports-of-call (old and new)



Operational Challenges (1)

- Medical evacuation of no-duff casualties esp. for new missions profiles / ports-of-call; need to know updated information of nearest evacuation routes / medical facilities



	A	B	C
1	MEROX – MEDICAL REPORT ON OVERSEAS EXERCISE		
2			
3	UNITED ARAB EMIRATES		
4	Back to contents		
5	Port of call	Dubai	
6	Main ethnic groups	Indian, Arab	
7	Main language spoken	English, Arabic	
8	Temp range	14.3-40.8	
9	Currency	UAE DIRHAM	
10	Credit cards in use	Visa, Mastercard	
11	Use of personal check (Yes/No)	Some Places	
12	Use of travellers check (Yes/No)	Some Places	
13	Endemic diseases	-	
14	Potable water sources	Desalination	
15	Method of disinfection of water source		
16	Remarks on water		
17			
18	1 st Hospital	American Hospital	
19	Address	Al Quta Eyat Road, near Al Nasr Leisureland, Dubai	
20	Telephone number	-	
21	Fax number	-	
22	Website / Email	-	
23	Ownership of hospital (Public/Private/Military)	Private	
24	Number of beds	?100	
25	Distance from wharf (km)	?50	
26	Land evacuation time from wharf to hospital	?45	
27	Aeromedical evacuation remarks	No	
28	Accident & emergency operating hours	24 hrs	
29		Specialty	Yes/No
30		Orthopaedics	Yes
31		General Surgery	Yes
32		Neurosurgery	Yes
33		Internal Medicine	Yes
34		CVM	Yes
35		Eye	Yes
36		ENT	Yes
37		Obs & Gynae	Yes
38		X rays	Yes
39		Ultrasound	Yes
40		CT scan	Yes
41		MRI	Yes
42		ICU	Yes
43		Hyperbaric facilities	No
44		Others	-
45		Diseases screened	Yes/No
46		HIV	Yes
47		Hepatitis B	Yes
48		Hepatitis C	Yes
49		VDRL	Yes
50		CMV	Yes
51		Toxoplasma	Yes
52	Remarks		
53			

Operational Solutions (1)

- Medical Support Plan (MSP) for each exercise / deployment; KM of lessons learned from previous similar missions
 - MEROX (Medical Report on Overseas Exercises)
 - medical system to capture updated information on the medical facilities (Level 3) at regular and new ports-of-call
- Sources of information: websites, S.O.S, hospital visits to garner 'medical intel' on available resources during port-of-call



Operational Challenges (2)

- Understanding operational requirements in order to tailor the appropriate medical support
- Incomplete understanding and proper communication between Ops Community e.g. Line Officers and Medical Community e.g. Medical Officers & Medical Planners



<http://neoblogic.blogspot.sg/2011/06/communicating-with-your-sound-engineer.html>

(Accessed on 19 Dec 12)



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Operational Solutions (2)

- Conscious effort to understand the full-spectrum of all operations
- Engage the Ops community e.g. attending Ops-related meetings
- Establish good relationships with staff officers / middle management from Manpower, Ops, Intel, Logistics, Plans offices
- Capitalize on opportunities e.g. meetings, briefing sessions etc. to 'educate' Ops Community on Medical Support concepts and common nomenclature



Operational Challenges (3)

- New platforms and operational concepts
 - Formidable class Frigates (2007 onwards)
 - Sikorsky Naval Helicopters (2011)
- New Medical Cap Dev to meet medical support requirements in support of 3rd Generation RSN full-spectrum of operations



Operational Challenges (3)

- Paradigm shift in forward-deployed medical and surgical support concepts e.g. from Level 1 medical support to Level 2 Damage Control Surgery (DCS) for forward-deployed Frigates without dedicated surgical capability
 - Need for HD/ICU beds; not factored in during initial design
 - Space constraints need to be addressed



Operational Solutions (3)

- Leveraging on design **innovation** to mitigate space constraints through retrofit of existing spaces

Ship Medical Centre



Major Operating Theatre



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Ship Dining Room



HD / ICU Beds



Operational Solutions (3)

- RSN Frigate Medical Capabilities
 - Medical Support requirements built into design of Frigate during development phase e.g. dedicated medical centre



- Naval Helicopter MEDEVAC Capability
 - CONOPs & SOPs developed in collaboration with RSAF e.g. air-certification of medical equipment
 - **Adapting** configuration and equipment to address limitations



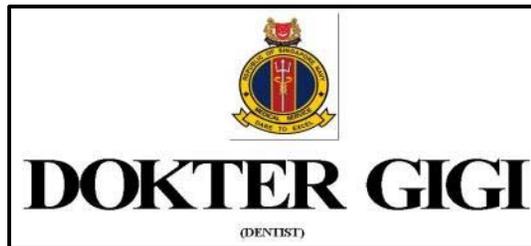
Operational Solutions (4)

- Learning the language, understanding the culture / religion
- Leveraging on interpreters and local health care workers
- Working with local partners (side-by-side) → helps to build patient confidence and trust



Operational Solutions (4)

- Using **innovation** to **adapt** and simplify medical terms / instructions
- Translation of signs, information sheets, consent forms, prescription instructions



Operational Challenges (5)

- RSN platforms deployed for PSO have changed over the years e.g.
- need to ensure that medical support capability is maintained or improved in support of RSN (and coalition) operations



Ops Blue Sapphire (Maritime)

RSN Mission

To conduct counter-piracy operations under the ambit of CTF 151 in the GoA

Medical Mission

To ensure optimal force health protection and provision of primary healthcare and frontline trauma life support services



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2004 – 2010: Ops Blue Orchid (OBO)

- Afloat Platform: Landing Ship Tank (LST)



2011: Ops Blue Sapphire (OBS(M))

- Afloat Platform: Landing Ship Tank (LST)
- Air Assets: 2 x Super Puma Helicopters



2012: Ops Blue Sapphire (OBS(M))

- Afloat Platform: Formidable Class Frigate (FFS) – inaugural deployment of this platform for PSO
- Air Assets: 1 x Sikorsky -70B Naval Helicopter



Operational Challenges (5)

Medical Principal Considerations for PSO over the years

- Long deployment: Need for comprehensive pre-deployment preparations
- Change in operational platforms for (LST → Frigate)
- Large area of operation; >300NM (>6hrs) from land
- Need for expedient access to Level II and III medical facilities
- Need for Heli-Medevac capability
- Risk of operational injuries: low



Operational Solutions (5)

- Established echelons of medical support; adaptation to Frigate platform limitations e.g. no well dock for ship-to-ship transfer of patients

Echelons of Care	Level of Care	Casualty transfer to next Echelon of Care	
		LST / SP	Frigate / S-70B
• Self-aid / Buddy Aid	• Basic First Aid	• Well-dock • Heli-winch	• Ship Crane
• Sea Security Team • Medic • First Aid Party	• Level 1 (CPR + AED) • Level 1 (BCLS) • Level 1 (CPR + AED)		
• Medical Officer • Senior Medic / Paramedic	• Level 1 (ACLS, ATLS)	• Ship-to-ship • Heli-Medevac	• Ship-to-ship • Heli-Medevac
• Medical Facilities ashore / afloat (coalition ships)	• Level 2 (including Damage Control Surgery)	• Land / Air assets	• Land / Air assets
• Medical Facilities ashore	• Level 3 (Definitive Surgery; Sub-specialty care)	• RSAF assets / Commercial resource e.g. International S.O.S	• RSAF assets / Commercial resource e.g. International S.O.S



Operational Solutions (5)

- Use of paraguard stretchers and Frigate crane in absence of well-dock



RaCE (Rapid Casualty Evacuation) system

- RSN pulley system for ship-to-ship transfer and recovery of in-water casualties
- Pros: cost effective, easy to use and deploy, low maintenance and transfer time is shortened
- Cons: May be unstable for usage in high sea state



Operational Solutions (5)

- Inclusion of haemostatic bandages and packed red cells for transfusion
 - Development of S70-B Medevac Capability
 - Leverage on coalition's medical/ medevac capabilities
 - Database on coalition ships with medevac capable helicopters/ afloat
- Level II medical capabilities to enhance MEROX



Manpower Challenges (1)

- small Regular Naval force; even smaller Regular Naval Medical Force



Manpower Challenges (1)

- NMS comprises predominantly National Service Full-time (NSF) (conscripts) medics / medical officers and NSmen (reserves)
- High-turnover of NSF medics and MOs; 2 year liability
- NSmen do not hold medically-related jobs in their civilian life
- Medical training and medical competency need to be addressed



Manpower Solutions (1)

- Regular NSF medic proficiency assessments and scenario-based training
- NSF MOs maintain BCLS, ACLS and ATLS certification; regular CMEs; introduction of compulsory 6-month posting in Emergency Department in public tertiary hospitals prior to enlistment
- Annual In-camp Training (ICT) for Medical NSmen



Manpower Challenges (2)

- Small resource of NMS regulars i.e. MOs and Medical Military Experts (MMEs) to support wide-spectrum of RSN operations
- Impact on shipboard medical team for each platform



Manpower Solutions (2)

- Centrally-managed pool of NSF and NSmen medics / medical officers
- Train selected shipboard crew to provide Level 1 medical care / augment embarked medical team e.g. First Aid Party (FAP)
- Ensures provision of responsive and comprehensive medical support for RSN





Medical Logistics / Technical Challenges (1)

- Always a challenge, never fails to baffle
- Need to balance the requirement for adequate amount of medical stores with limited space; tailored for each platform / type of exercises & deployment
- Constant challenge in the packing of surgical equipment scales compounded by limited space on surgical platforms

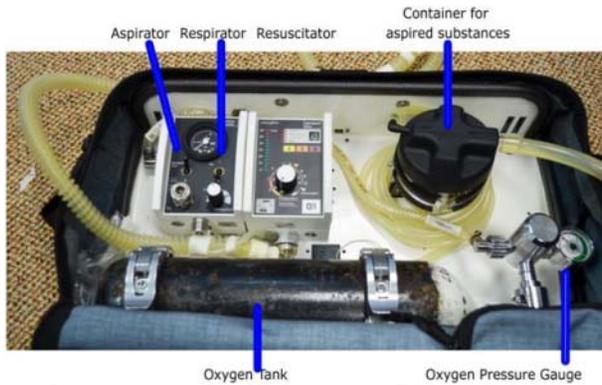


Medical Logistics / Technical Solutions (1)

- Besides having a good medical logistics team, key to medical logistics management is **MODULARISATION**
- Medical Modules are centrally-managed and deployed with the embarked medical / surgical teams
- Good record-keeping e.g. electronic dispensing of drugs on mobile electronic medical record system embarked on ships i.e. mobile PACES module
- Surgical Modules currently undergoing review and modularisation
- Meticulous planning of each surgical scale; consultation with surgeons, anaesthetists and physicians in the reserves



RSN Shipboard Medical Equipment



Automatic Oxygen Resuscitator



Air Viva



Medical Orderly Pouch (MOP)



Medical Chest



**Automated
External
Defibrillator
(AED)**



Paraguard Stretcher



Additional Medical Equipment

- Operations Stores
- Overseas Stores
- Modules deployed with embarked medical team depending on profile of exercise / deployment (number of ship crew, duration, distance, risks assessment etc.)



Operations Stores



Overseas Stores



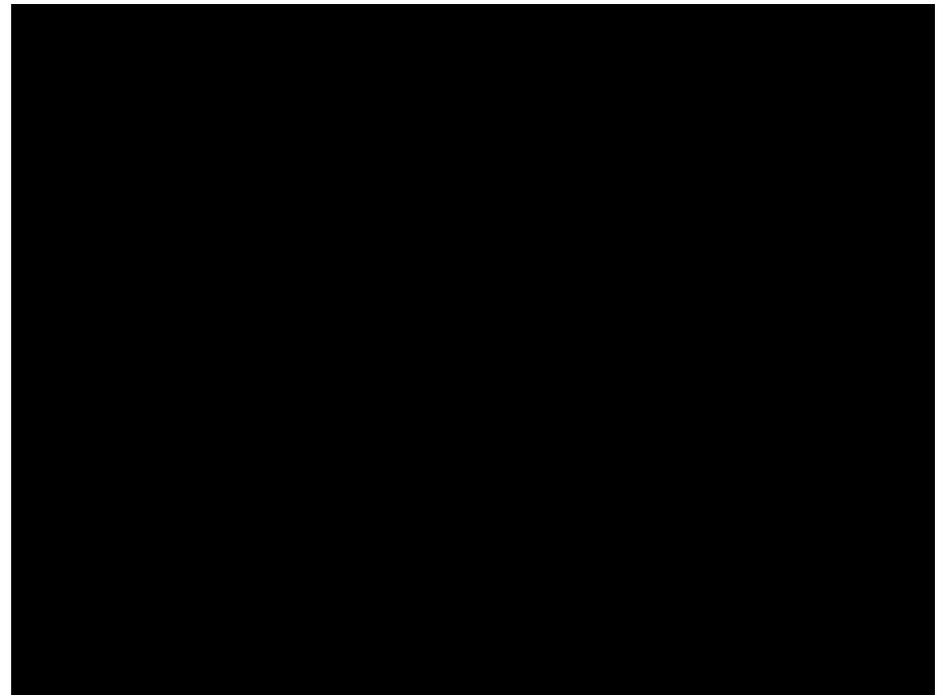
Medical Logistics / Technical Challenges (2)

- Ship does not always come alongside during missions; anchored off the coast
- Requirement for shore-to-ship and ship-to-shore patient transfer e.g. Socio-civic Missions, HADR etc.



Medical Logistics / Technical Solutions (2)

- Use of LST FCUs as water taxi for transfer of medical personnel and patients;
adapting to the situation if not alongside and leveraging on ship assets



Medical Logistics / Technical Challenges (3)

- RSN platforms e.g. LST not designed with Major OT capability, only Minor OT in medical centre
- LSTs have been deployed for HADR e.g. Ops Flying Eagle (Asian Tsunami 2004 in Aceh) and Socio-civic Missions e.g. Ops Surya Bhaskara Jaya
- Requirement for Major OT and HD/ICU. Triage and General Ward capabilities





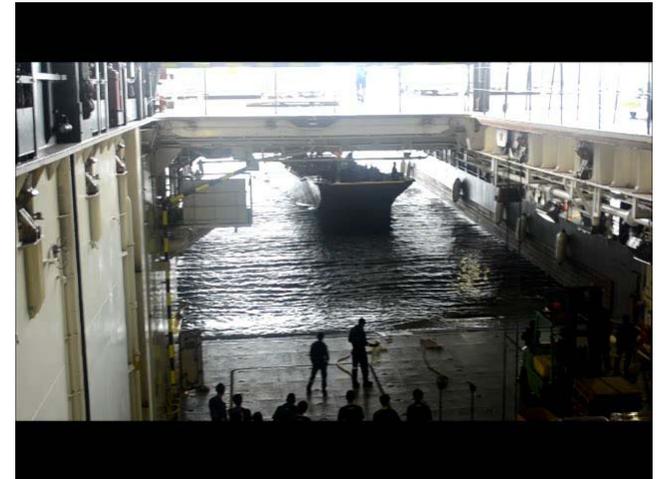
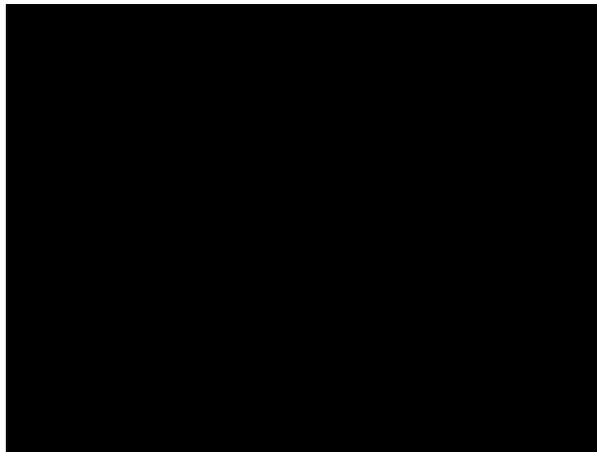
Medical Logistics / Technical Solutions (3)

- Collaboration with Army; Army surgical containers embarked on LST flight deck for HADR / Socio-civic Missions
- Surgical containers converted into Major OT, Pre-op / Post-op HD Modules



Medical Logistics / Technical Solutions (3)

- Leveraging on **innovation** to facilitate work processes:
 - Utilising tank deck lift as patient lift and registration/triage area





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Medical Logistics / Technical Solutions (3)

- Leveraging on **innovation** to facilitate work processes:

- Retrofitting gym and training rooms as General Ward
- Converting Army surgical containers to pre-op assessment rooms / post-op HD beds



Medical Logistics / Technical Challenges (4)

- Standard ISO containers with height restrictions
 - Impact on equipment e.g. OT lights, bottle height of phacoemulsification machine for cataract surgery (Socio-civic Missions)
- Army surgical containers not marinised
 - Water-resistant but not water-proof
 - Reliance on stand-alone generators



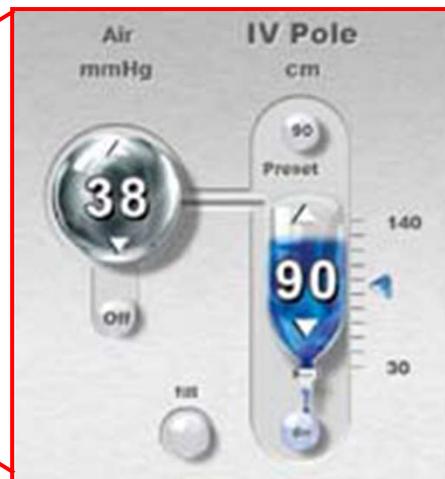
Medical Logistics / Technical Solutions (4)

- Use of portable, free-standing OT lights to mitigate and **adapt** to height restrictions of ceiling-mounted OT lights



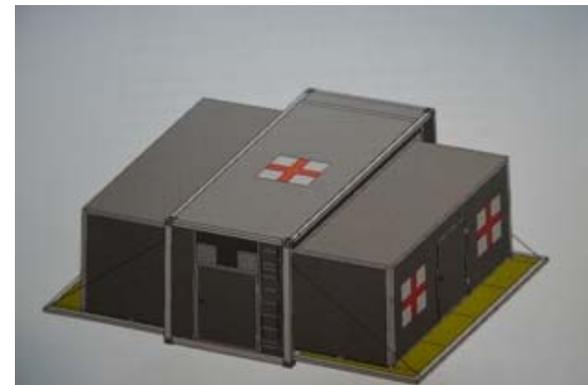
Medical Logistics / Technical Solutions (4)

- Leveraging on technological advances in phacoemulsification machines (Stellaris B&L) to utilise air pressure (DigiFlow – digitally controlled air pump) instead of pure hydrostatic pressure
- bottle height requirements reduced (surgical containers able to accommodate and **adapt** to height constraints)



Medical Logistics / Technical Solutions (4)

- Future Cap Dev: **Rapidly Deployable Maritime Containers (RDMC)**
- Manually-deployed Army Surgical Containers to automatically-deployed RDMCs
- ISO containers for OT and HD/ICU configurations; inclusion of **innovative** design features to “Marinise” the surgical containers
 - High-cube ISO to increase internal height
 - Improved water-proofing / protection from marine environment
 - Tap on ship's water, electrical supplies and blackwater drainage systems



Medical Logistics / Technical Challenges (5)

- Pitch and roll of ship; inclement weather
- Vibration from ship's engines and generators; other ship operations e.g. lifts



Medical Logistics / Technical Solutions (5)

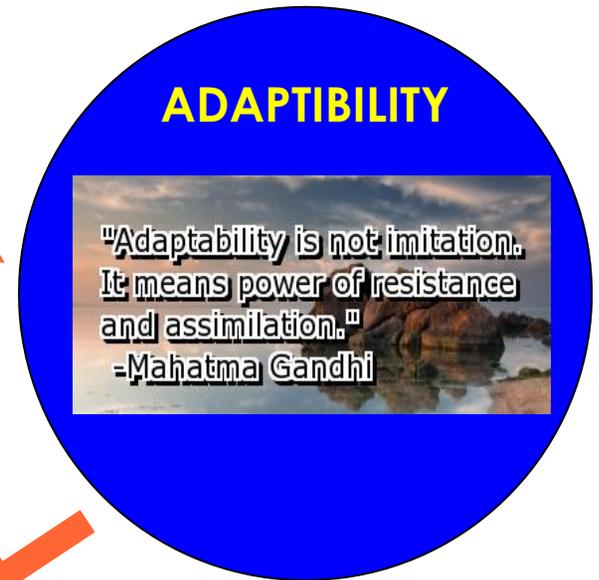
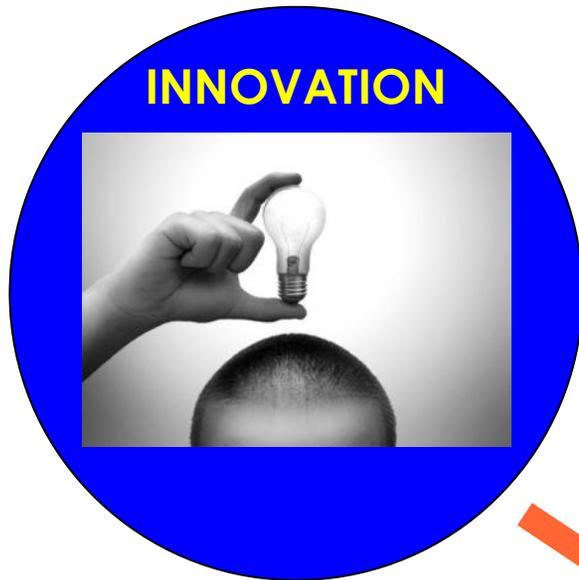
- All equipment secured to floorboard; containers closed and equipment secured when not in use / during transit; deliberate decision not to operate beyond certain sea state and weather
- Close communication with ship crew to coordinate surgeries esp. eye surgery, with shipboard operations
- **Adapting** to the constantly-changing environment to calibrate operations



CONCLUSION

- Wide spectrum of peacetime operations in Modern Naval Operational Concepts compared to Conventional Naval Warfare.
- Medical Planners need to be cognizant of the operational considerations and limitations / challenges in order to develop a comprehensive and holistic medical support plan.







Accept **challenges**,
so that you may feel
the exhilaration of
victory.

- General George Smith Patton, US Army (1885 - 1945)



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Thank you!
Any questions?

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