

Medical Challenges in the High Speed Boat World,..... And Beyond!

Healthy Personnel, Successful Missions!
The importance of Force Health Protection

HSBO Conference 2018
Surg CDR Jacob Boreel, MD, MSc

WOW!



BUT WHAT ABOUT THE PHYSICAL EFFECTS?





Topics

- Zoom in on HSBO-related Health issues
- Zoom out on Force Health Protection in general
- Some conclusions and recommendations

High Speed Boat Operations. Biggest Health Risks?



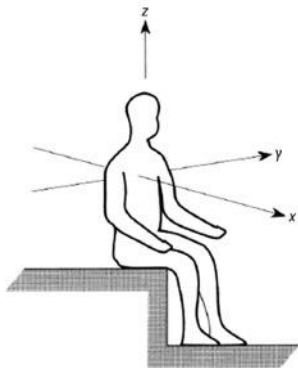
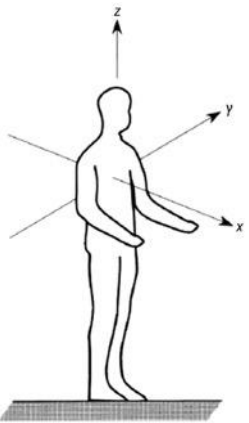
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High Speed Boat Operations. Biggest Health Risks?



PHYSICAL EFFECTS BY.....

- ❖ Whole Body Vibrations (WBV)
- ❖ Repeated shocks (RS):



- Vertical forces (upto 15 g, depending on type of boat, type of suspension-seats, sea state, speed, etc)
- Forward- and backward forces (possibly one of the most common causes of lower back problems)
- Lateral forces (most difficult to compensate by body posture)

RELEVANT FACTORS OF EFFECTS OF VIBRATIONS & SHOCKS

❖ Caused by contact between vibrating platform and it's human passengers

❖ 4 characteristics :

- Strength / intensity
- Frequency
- Direction of forces x, y, z
- Characteristics of the vibrations

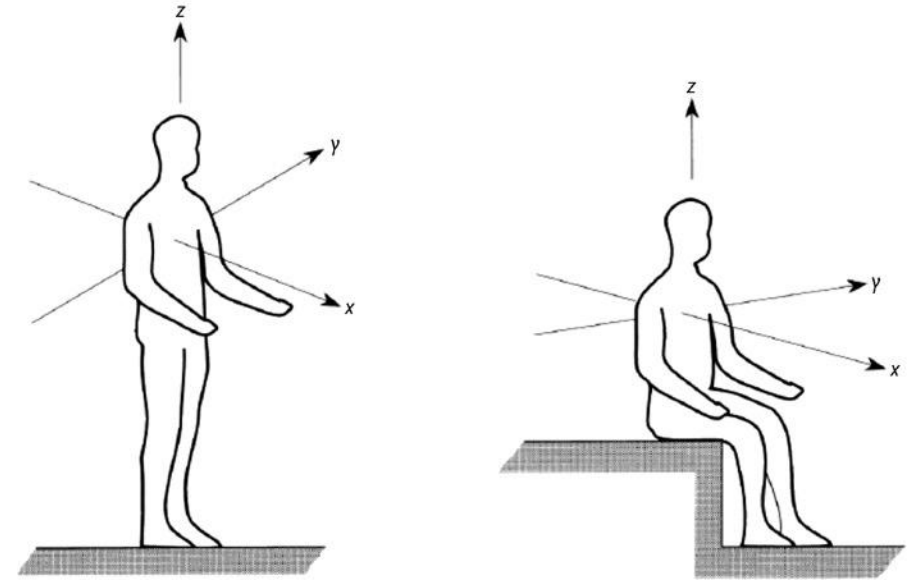
❖ Duration of Exposure

❖ Vulnerability of humans can vary

- Physical fitness and (Core) muscle strength
- Body posture

❖ Other factors:

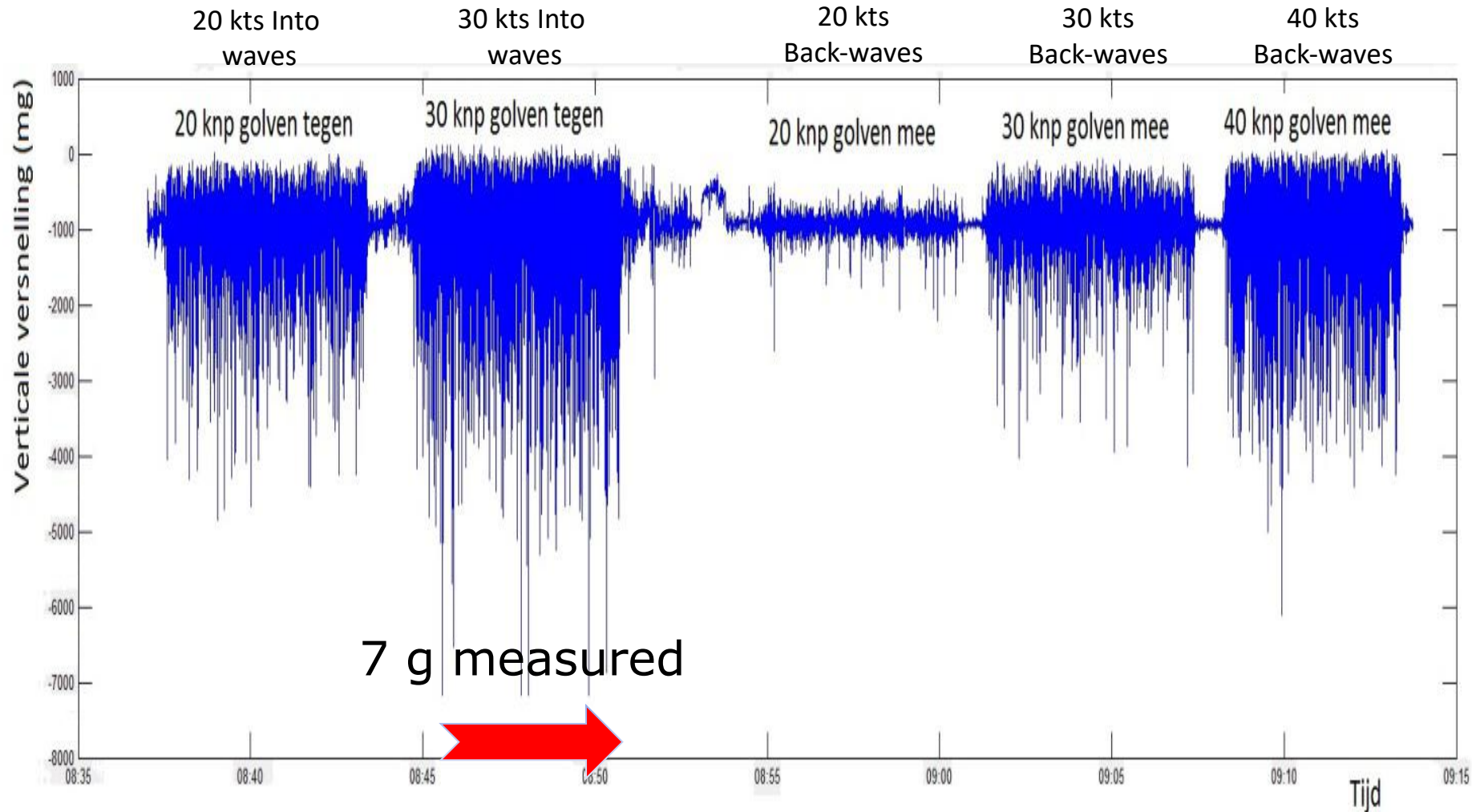
- Cold
- Pre-existing fatigue



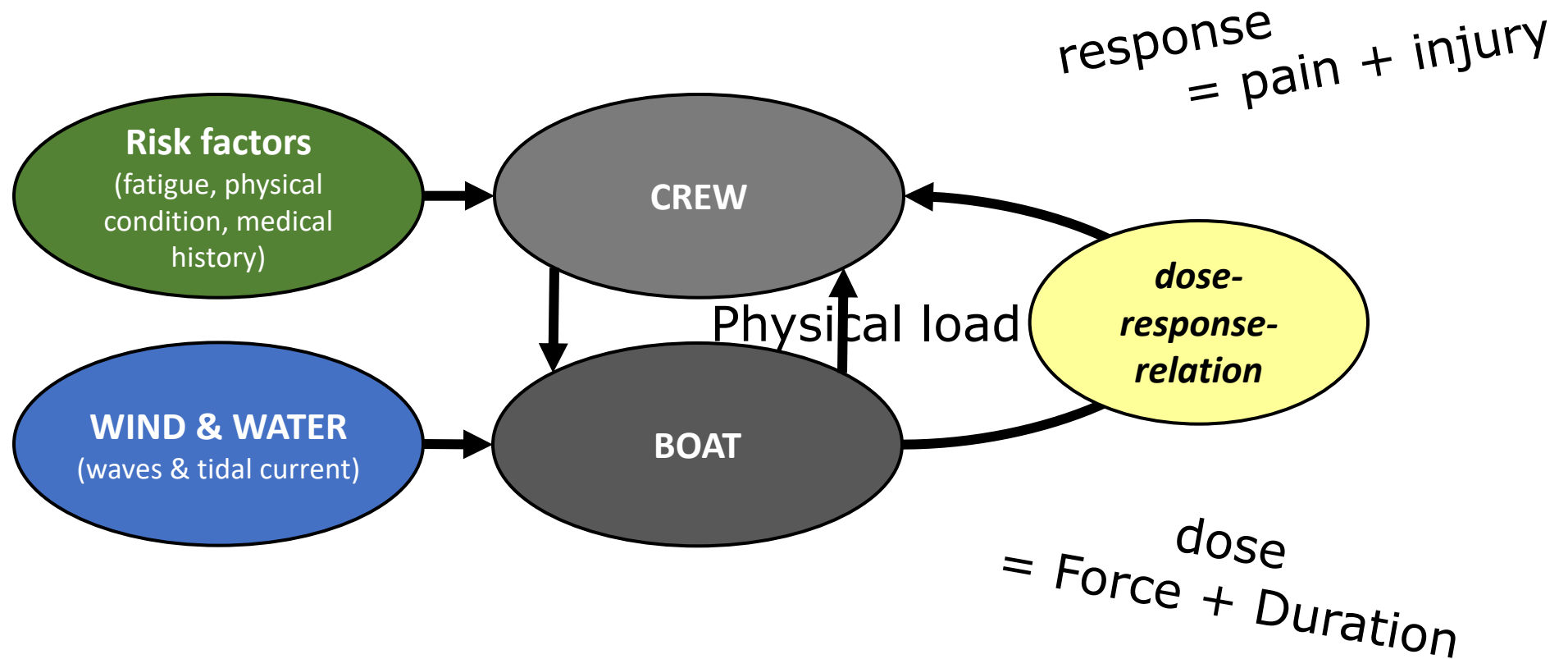
PHYSICAL EFFECTS



MEASUREMENT OF DECELERATIONS!

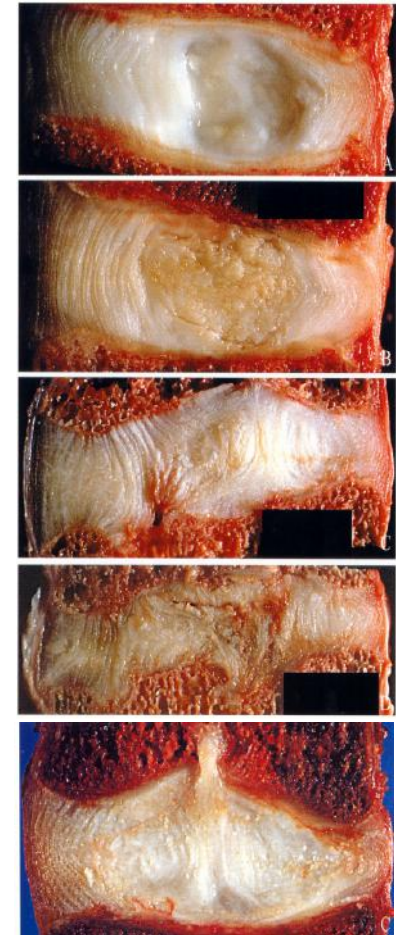
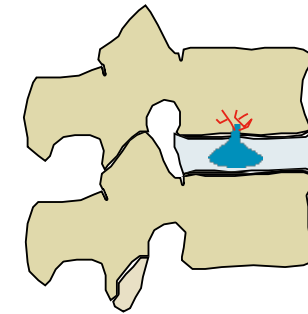
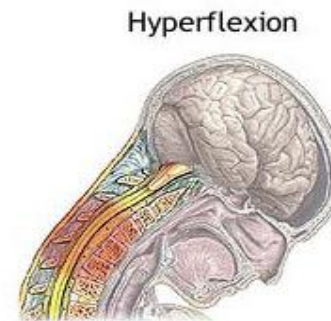
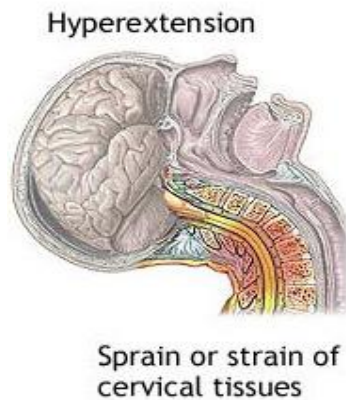
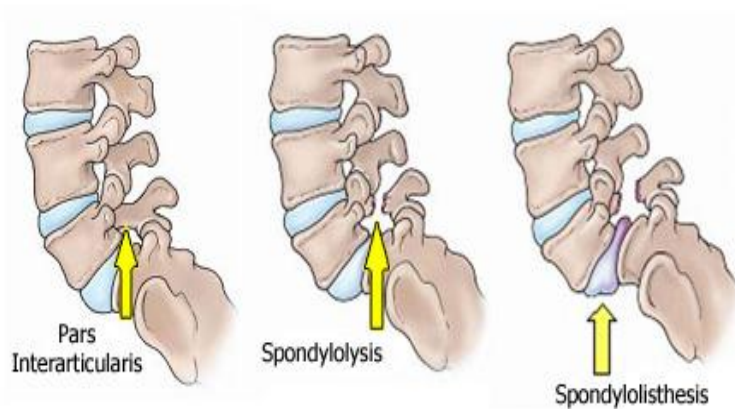


So how do various factors relate to the incidence of injury?



POTENTIAL HARMFUL EFFECTS OF VIBRATIONS AND DECELERATIONS ON HUMAN BODY

- **Nervous system, muscles, skeleton and urinary tract**
- Head/neck/shoulder, back, knees, ankle, central nervous system, bladder/kidneys/prostate/genitalia, the hearing



Intervertebral discs

DUTCH HSBs



FRISC (Fast Raiding Interception and Special-Forces Craft ;
Dutch Marines)

RHIB 2000D (Dutch Navy RHIB)



INTERVENTIONS & SOLUTIONS

(Technical)

- RS and WBV mitigating Means & Cockpit Management Systems?



Suspension Jockey Seats



- Suspension hull systems



INTERVENTIONS & SOLUTIONS

(Human Factors)

- Better knowledge on DO's and DON'Ts when operating HSBs and better training of crewmembers!
- Better, wiser and more optimal (BUT SAFE!) usage of the boat's "envelopes" (Speed regulations combined with various sea states, angles of waves, wind direction, etc)
- Better physical training for crewmembers and better usage of "work-time" versus recuperation periods
- Better information and briefing to incidental "passengers"
- **CAVEAT: MAN is the limiting factor, NOT MACHINES!**

LONGER TERM WAY AHEAD

Increasing technical and medical know-how:

- ❖ Research/ advices from National and International research initiatives (eg Dutch TNO (2014-2016), other multinational studies) and International Cooperation between universities and organisations
- ❖ Cooperation between Navies and other Civilian agencies and stakeholders
- ❖ Research into and setting (International) guidelines and norms on maximum acceptable WBV / RS
- ❖ Further develop technical improvements on HSBs
- ❖ Setting up programs to monitor the health of crews

SOME CONCLUSIONS

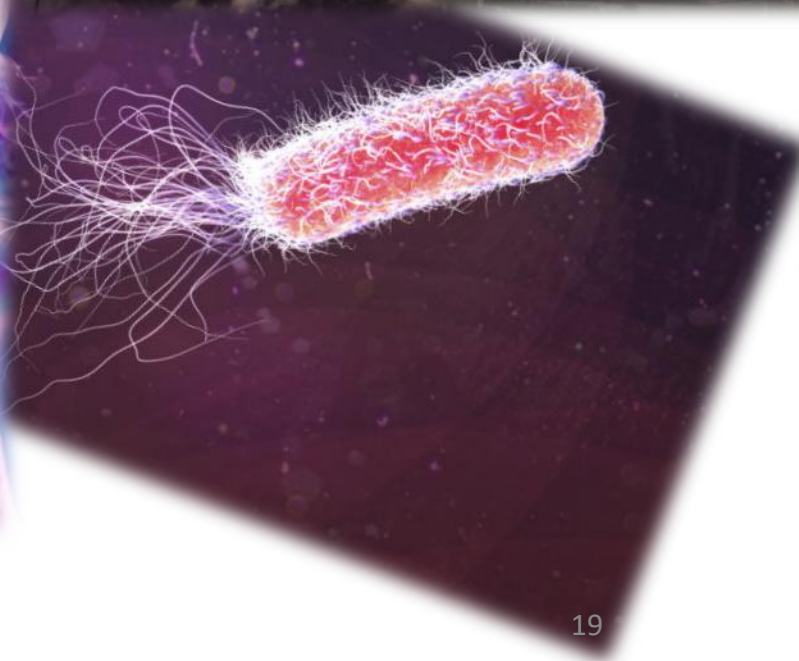
- ❖ RS/WBV is an international issue!
- ❖ Specific training and continuous health monitoring are essential elements in prevention of harmful effects of RS/WBV
- ❖ New (legislative) guidelines for the maritime world should be developed
- ❖ Coalition partners are still in a learning process
- ❖ **CAVEAT: MAN is the limiting factor, NOT MACHINES!**

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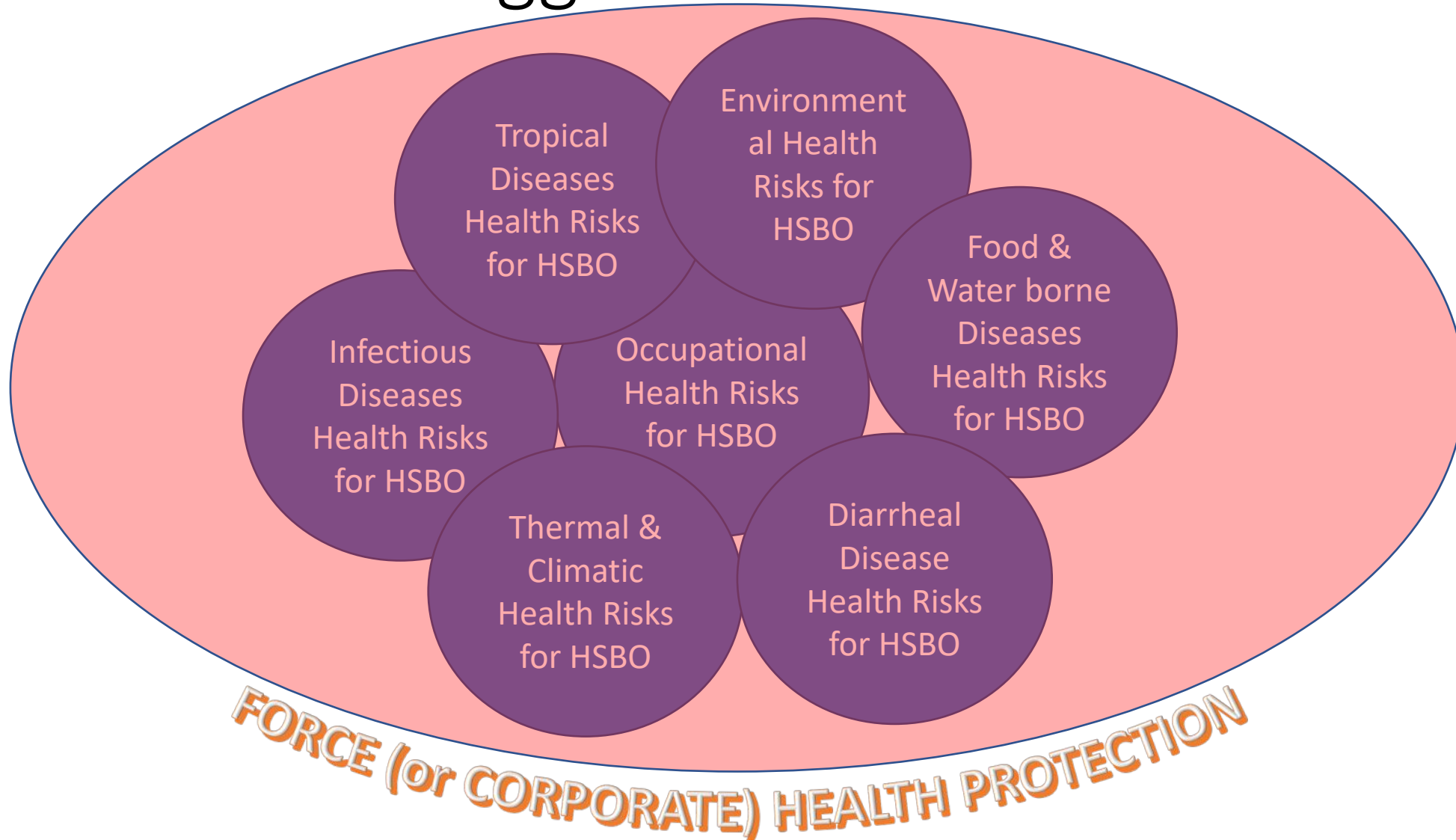
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High Speed Boat Operations. Biggest Health Risks?



DISEASE NON BATTLE INJURIES (DNBI)

ARBO-VIRUSSES



Proper Planning Prevents P... Poor Performance!



Failed military planning:

The Charge of the Light Brigade. Crimean War, 1854

Proper Planning Prevents P... Poor Performance!



Failed military planning:

The Battle of Arnhem-17/25 sep 1944 A failed attempt to take Arnhem by air assault in order to facilitate the further advance towards Germany. Due to extreme short time for a proper planning phase (several days), intelligence about German Panzer-SS troops was completely overlooked, for which reason the German troop strength in and nearby Arnhem was underestimated. The operation was a complete failure which led to hasty retreat of Allied Forces, severe losses and a significant delay of the advance towards Germany.

Proper **Medical** Planning Prevents P... Poor Performance as well!

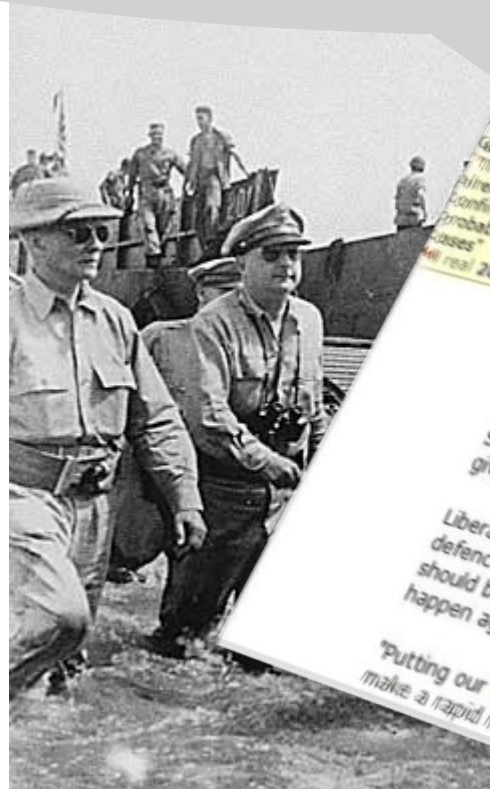


After conquering the Persians, capturing the entire coastline of the eastern Mediterranean, Syria, Phoenicia, Arabia, and Egypt, Alexander had set out to subjugate the earth. But just as he was to depart with his army in early June 323 B.C., he contracted a fever and the voyage was postponed. At first the thirty-three-year-old general regarded his illness as nothing more than a temporary setback. But Alexander continued to deteriorate until he lapsed into a deep coma and died. Malaria, by striking Alexander, had altered the course of history.

May 1943: “This will be a long war, if for every division I have facing the enemy, I must count on a second division in the hospital with malaria and a third division convalescing from this debilitating disease”



May 1943: “This will be a long war have facing the enemy, I must cov in the hospital with malaria and convaescing from this debilita



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Malaria strikes British troops

Paras did not have time to take anti-malarial drugs
 British forces in Sierra Leone have been hit by illness because they were not given malaria pills early enough.

See also:

- 05 Jun 00 | Africa Life is short in Sierra Leone
- 26 Jul 99 | Medical notes Malaria
- 31 May 00 | UK Bringing malaria home
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Internet links:

- Ministry of Defence
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The BBC's Andrew Gilligan reports
 "There are already 16 confirmed or probable malaria cases"
 real 28k

At least 16 paratroopers and RAF personnel who went to the war-torn African country appear to have contracted malaria.

Ministry of Defence guidelines recommend people travelling to high risk malaria areas start taking anti-malarial drugs up to three weeks before departure.

But an MoD spokesman said the troops sent to Sierra Leone were only given two days' notice.

“It is something we were prepared for”
 MoD spokesman

Liberal Democrat defence spokesman Paul Keetch said measures should be put in place to ensure it does not happen again.

“Putting our troops at risk of disease will not make a rapid reaction effective,” he said.

Mosquito menace
 How to control the spread of malaria
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An Outbreak of *Plasmodium falciparum* Malaria in U.S. Marines Deployed to Liberia

Timothy J. Whitman,* Philip E. Coyne, Alan J. Magill, David L. Blazes, Michael D. Green, Wilbur K. Milhous, Timothy H. Burgess, Daniel Freilich, Sybil A. Tasker, Ramzy G. Azar, Timothy P. Eady, Christopher D. Clagett, Gregory A. Deye, G. Dennis Shanks, and Gregory J. Martin[†]
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Abstract. In 2003, 44 U.S. Marines were evacuated from Liberia with either confirmed or presumed *Plasmodium falciparum* malaria. An outbreak investigation showed that only 19 (45%) used insect repellent, 5 (12%) used permethrin-treated clothing, and none used bed netting. Adherence with weekly mefloquine (MQ) was reported by 23 (55%). However, only 4 (10%) had serum MQ levels high enough to correlate with protection (>794 ng/mL), and 9 (22%) had evidence of steady-state kinetics (MQ carboxy metabolite/MQ > 3.79). Tablets collected from Marines met USP identity and dissolution specifications for MQ. Testing failed to identify *P. falciparum* isolates with MQ resistance. This outbreak resulted from under use of personal protective measures and inadequate adherence with chemoprophylaxis. It is essential that all international travelers make malaria prevention measures a priority, especially when embarking to regions of the world with high transmission intensity such as west Africa.

"Good doctors are of no use without good discipline. More than half the battle against disease is not fought by doctors, but by regimental officers. It is they who see that the daily dose of mepacrine (anti-malarial chemoprophylactic drug used in WW II) is taken...if mepacrine was not taken, I sacked the commander. I only had to sack three; by then the rest had got my meaning."

—Lieutenant General William Slim (1891–1970),
Burma Campaign, 1943

INTRODUCTION

Military personnel frequently deploy to regions of the world endemic for tropical infectious diseases. One of the most important tropical diseases, malaria, has had a significant impact on the welfare of U.S. servicemen since the Revolutionary War.^{1,2} Failure to appreciate the importance of malaria led to disastrous results in many units fighting in the South Pacific during World War II. More recently, failure to appreciate the

importance of malaria led to the evacuation of more than half were evacuated to U.S. military hospitals in Germany and Bethesda, Maryland. This report summarizes the clinical, laboratory, and epidemiologic features of an outbreak of malaria that was unique in severity of illness and attack rate after a brief exposure to a locale with high transmission intensity. It also discusses host and parasite factors that contributed to these apparent chemoprophylaxis failures.

MATERIALS AND METHODS

In August 2003, 225 Marines with the 26th Marine Expeditionary Unit aboard U.S. Navy ships were deployed to Roberts International Airport outside the coastal city of Monrovia. Liberia has a tropical climate that includes frequent rainstorms (average rain fall is 78 cm/month) and daytime high temperatures (average approximately 27°C in the summer months). Additionally, years of conflict and lack of a functioning government has led to the neglect of disease and vector control programs. As a result, Liberia is holoendemic for malaria and has an annual *Plasmodium falciparum* entomological

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Malaria strikes British troops



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Malaria areas start
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action effective," he said.

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W B V & R S



<http://ullmandynamics.com/human-impact-exposure-on-fast-boats>



Human impact exposure on fast boats

Carl Magnus Ullman presents us with a walk-through guide to human impact exposure, with questions answered and myths dispelled.

<https://magazines.marinelink.com/Magazines/MaritimeReporter/201309/content/mitigation-shock-vibration-211540>

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Mitigation of Shock & Vibration on Fast Boats

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Repeated Shock and Whole Body Vibration Awareness

For some time now, military agencies and specialist organizations around the globe have driven the evolution of high speed watercraft. As a trickle-down effect fast response craft now serve roles once typically serviced by displacement designs including pilot boats, dive boats, crew boats and offshore support. During high speed operations the repeated shocks (RS) and whole body vibrations (WBV) of this harsh environment are transmitted to the passengers, operators and crew aboard, creating avenues of owner liability if not addressed.

While economic considerations and fast transport of personnel are core commercial objectives [1] long term

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Healthy People, Healthy Companies

