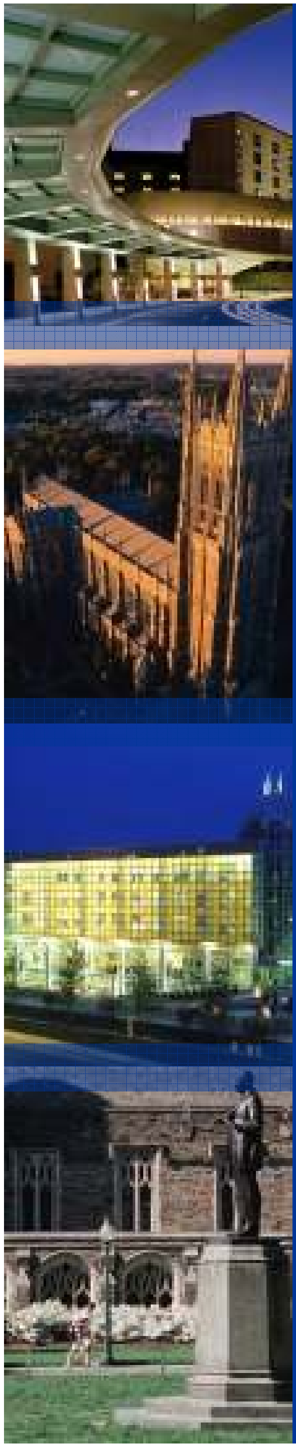

Duke Anesthesiology

THE EFFECT OF FINAL OXYGEN DECOMPRESSION STOP DEPTH ON DCS RISK: 20 FSW VS. 10 FSW

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Background:

- Oxygen commonly used for accelerated decompression by US Navy and Technical Divers
- Traditional tables last stop at 10 fsw, now common to stop at 20 fsw
  - Decreased diver stress and risk of PBT by stopping deeper to avoid wave motion
  - Theoretical increased efficiency in inert gas washout

Theoretical Advantage:

- Oxygen at 20 fsw
  - Decreased wave action
  - Increased efficiency of decompression postulated
    - ? Reduced pDCS by staying deeper…
  - pN2 of venous gas bubble at 20 fsw
    - pN2 = 1.6 atm N2
  - PN2 of venous gas bubble at 10 fsw
    - pN2 = 1.3 atm N2

Theoretical Risks:

- Acute CNS oxygen toxicity
  - Seizures rarely, if ever, seen at pO2 $\leq$ 1.3 ATM O2
  - Seizures have been recorded at 1.6 atm O2
    - More common in technical exposures measured in hours
  - 45 minute NOAA dive limit at 1.6 ATM rarely adhered to by recreational and technical divers

Methods:

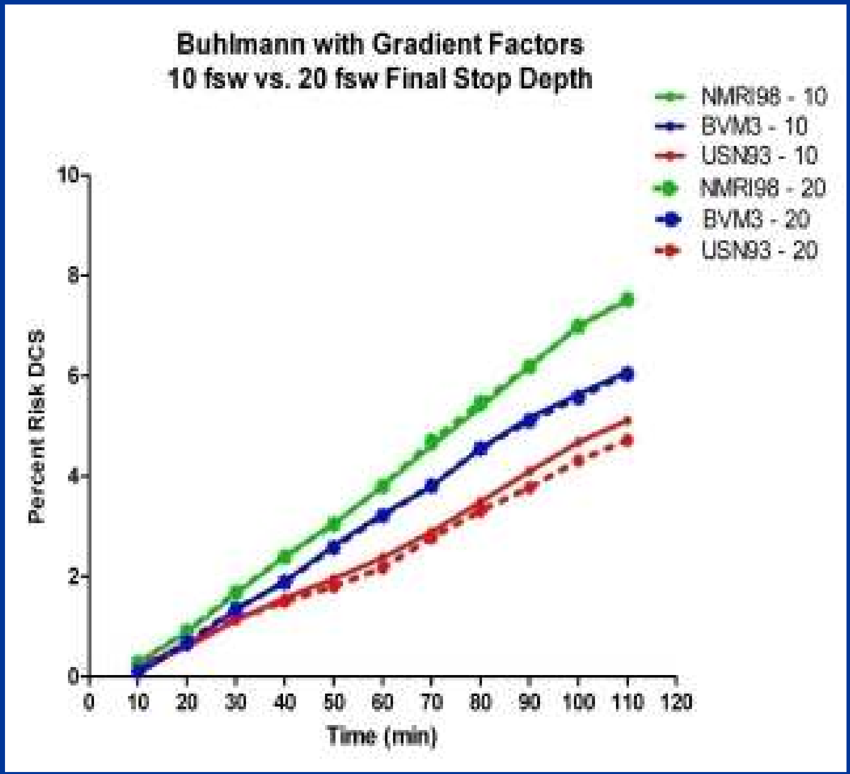
- Study decompression dive profiles that do not exceed the US Navy "extreme exposure" limits
  - Limited to feasible amount of gas in large double set
  - Common nitrox mixture (32%)
    - – Profiled at MOD of gas mixture - 110 fsw (pO_2 = 1.38 atm O_2)
  - Common commercially available deco algorithms
    - Variable permeability model-B
    - Buhlmann with gradient factors

Methods (cont.)

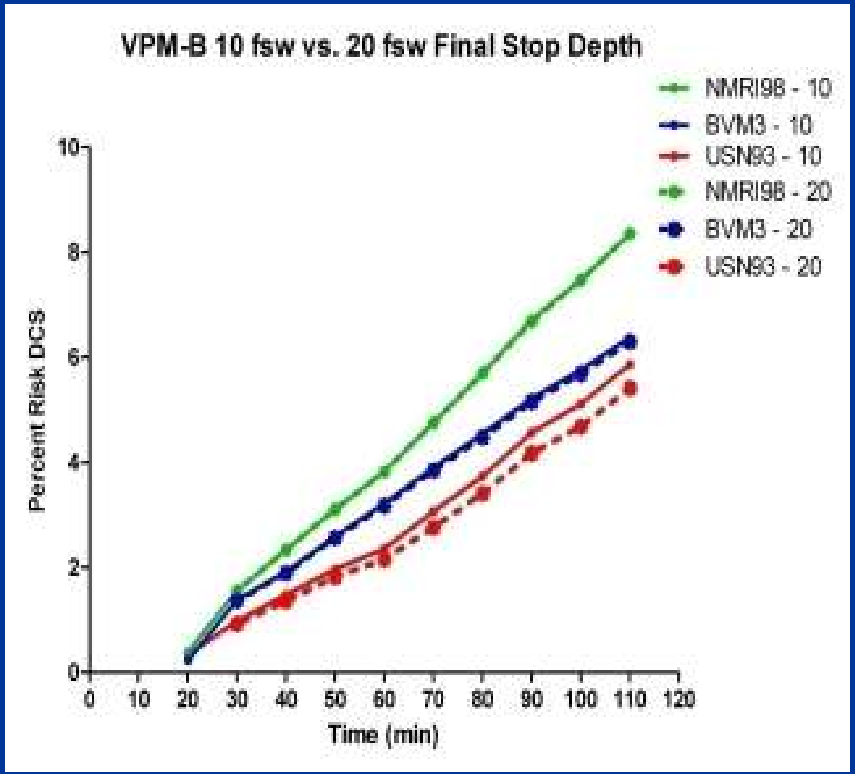
- **Navy Probabilistic Models used to produce pDCS risk for both commercial profiles**
  - **Navy Models validated with dive data including DCS outcome**
  - **Models include traditional tissue compartments, high fractions of oxygen and bubble volume**
- **Profiles differed only in final stop depth (20 fsw vs. 10 fsw)**
  - **Profiles time matched to ensure only variable is final stop depth**

Model Data Sets vs. Risk Calculation	Nominal Dive Dataset	Dive Dataset with High FiO2
Risk as a function of tissue compartment gas load	USN-93	NMRI-98
Risk as a function of bubble volume	BVM-3	

Results:



Maximum change in pDCS = 0.39%



Maximum change in pDCS = 0.45%

Limitations:

- Only a nitrogen based gas mixture was used for the profiles
- Profiles were intentionally picked that are unlikely to produce VGE in water
  - Extreme exposure dives may show a reduced pDCS
- Not applicable to surface supplied/hard-hat divers
  - Airway protected
  - Start oxygen decompression deeper than SCUBA divers

Conclusions:

The pDCS is not reduced by planning the last oxygen stop at 20 fsw, divers should consider overall risk for each planned dive:

- Operational needs
- Seizure risk/airway protection
- Environmental concerns

Different needs of the US Navy and the technical/recreational community!

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