



THE ROLE OF MARGINAL OUTCOMES IN THE FITTING OF PROBABILISTIC DCS MODELS

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INTRODUCTION

- ❖ Marginal DCS is defined as single joint pain lasting < 60 min or multiple joint pain lasting < 30 min [1].
- ❖ Marginal DCS does not require recompression therapy [2].
- ❖ Marginal DCS events have been included in the fitting of probabilistic DCS models by assigning a fractional weight to the events so they contributed, but less so, than full DCS events to the model fit [3].
- ❖ Typical fractional weights for marginal DCS were $\delta=0.5$ [3] or $\delta=0.1$ [4].

METHODS

- ❖ We fitted the three null models for marginal DCS to the BIG292 dive data base [1] after deleting the full DCS events.
- ❖ Null model 1 assumed all dives had an equal probability of DCS.
- ❖ Null model 2 assumed the probability of DCS per unit time was constant among dives.
- ❖ Null model 3 used 30 trials of randomized sham marginal events fitted with the LE1 model [5]. This null model was designed to test the hypotheses that marginal events were randomly occurring.
- ❖ Actual marginal DCS events were fitted to the BIG292 dive data base [1] using the LE1 model [5].
- ❖ Occurrence density functions (ODF) and cumulative density functions (CDF) for marginal and full DCS events were compared using the Mann-Whitney rank sum test.
- ❖ We derived a closed-form solution for the optimal fractional weight that was valid for any DCS model.

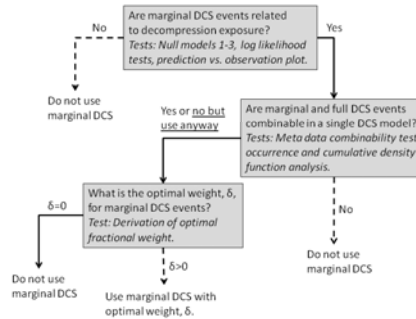


Figure 1. Study decision tree. Solid lines indicate the conclusions of this study.

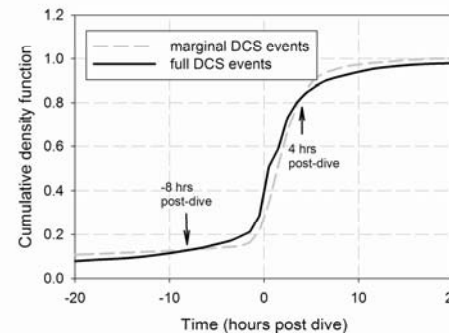


Figure 2. Significantly different ($p<0.02$) CDF for marginal and full DCS in BIG292 data base.

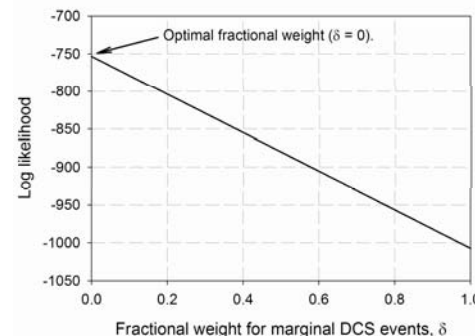


Figure 3. Optimal fractional weight for marginal DCS events.

RESULTS

- ❖ The log likelihood difference comparison of the three null models to the LE1 model revealed that marginal DCS was related to decompression exposure ($p<0.001$) (Fig. 1, top box, right decision branch).
- ❖ The log likelihood test of separately fitted marginal and full DCS revealed that marginal and full events are not combinable under the LE1 model ($p<0.001$) although many researchers have ignored this point [5] (Fig. 1, middle box, left decision branch).
- ❖ The ODF and CDF for marginal and full DCS events are significantly different ($p < 0.005$) (Fig. 2).
- ❖ The optimal fractional weight for marginal DCS is $\delta=0.0$. (analytical result – not a statistical fit) (Fig. 3 and Fig. 1, bottom box, left decision branch to study conclusion).

DISCUSSION

- ❖ Including fractional weighting of marginal DCS events degrades the accuracy of DCS model predictions. *Therefore, we recommend using $\delta=0.0$ for marginal events when fitting probabilistic DCS models to dive data. That is, marginal events should be graded as no-DCS events.*

REFERENCES

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