INTRODUCTION:
USN and technical divers commonly use oxygen for accelerated decompression with the last stop at 20 fsw, due to operational ease. However, the risks of oxygen decompression with a final 10 fsw decompression stop are unknown. A goal of this work is to provide guidance for divers selecting oxygen decompression profiles for nitrogen based gas mixture dives. We used probabilistic models, validated with thousands of laboratory simulated dives, to examine the risk of DCS for planned decompression dives using oxygen with final decompression stop depths of 10 or 20 fsw.

METHODS:
Dive profiles were produced for 32% nitrox dives and decompression with 100% oxygen. Bottom times at 110 fsw for profiles generated by VPM-B and B-GF and extended to the limit of time achievable based on consumption of 2/3rds of twin 130 cubic feet cylinders (17 fsw available) at a 0.4 cubic fsw surface gas consumption rate. Total decompression time for the two final stop depths were matched between dives with the final stop depths of 10 or 20 fsw. Decompression software (High Springs, FL) was used to generate tables using two algorithms: Buhlmann with Gradient Factors (B-GF) and the Variable Permeability Model (VPM-B). Detailed software used were set to adjust the depth of the last decompression stop to either 20 fsw (6 meters) or 10 fsw (3 meters).

Three probabilistic models were developed: United States Navy - 93 (USN93) 1, Bubbles Volume Model (BVM)2, 3 and individuals that created the software did not condone or review our methods or results. We would like to acknowledge that the profiles used in this analysis were created with licensed copies of all software, the companies and individuals that created the software did not condone or review our methods or results. We would like to thank them for their hard work in making these tools available to us.

RESULTS:
The pDCS for the USN93 model using profiles generated by VPM-B was decreased 0.45% for dives with the last stop at 20 fsw when the last stop occurred at 3 fsw. The USN93 model was run for both the two final stop depths. BVM3 differed by only 0.09% at the greatest point.

Using the Buhlmann-GF generated profiles, the pDCS for the USN93 model decreased 0.39% at 20 fsw, was unchanged for NMRI98, and reduced 0.03% for BVM3 when compared to profiles with a 10 fsw final stop.

CONCLUSIONS:
The probability of DCS on these profiles was not reduced by planning the last oxygen decompression stop at 20 fsw for divers does not appear to be any significant difference in the pDCSs between the two final stop depths. Specifically, the risk of oxygen-induced seizure should not be ignored within the depth ranges described. While decompression profiles may be more beneficial for control of the oxygen saturation in oxygen supersaturated dives, they would not be effective in eliminating the risk of DCS for divers with nitrox profiles. The operational implications of this discrepancy between theoretical and practical work and the risk of DCS for divers with nitrox profiles with a final 10 fsw decompression stop is unknown. A goal of this work is to provide guidance for divers selecting oxygen decompression profiles for nitrogen based gas mixture dives. We used probabilistic models, validated with thousands of laboratory simulated dives, to examine the risk of DCS for planned decompression dives using oxygen with final decompression stop depths of 10 or 20 fsw.

A comparison of the pDCS based on dive profiles generated by the Buhlmann algorithm with 10 vs. 20 fsw final stop depths.

A comparison of the pDCS based on dive profiles generated by the VPM-B algorithm with 10 vs. 20 fsw final stop depths.

A comparison of the pDCS based on dive profiles generated by the Buhlmann algorithm with 10 fsw final stop depth.