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1 Policy on Minimizing Occupational Health Hazards Associated with Nitrous 2 Oxide

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4 Review Council

5 Council on Clinical Affairs

6 Latest Revision

7 ~~2013~~ 2018

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9 Purpose

10 The American Academy of Pediatric Dentistry (AAPD) ~~recommends~~ recognizes that exposure to ambient
11 nitrous oxide (N₂O) ~~be minimized to reduce occupational~~ may be an occupational health hazards-hazard
12 for dental personnel and encourages practitioners to take all precautions to minimize associated risks.

13

14 Methods

15 This policy was originally developed by the Clinical Affairs Committee and adopted in 1987. This
16 document is a revision of the previous version, revised in ~~2008~~ 2013. ~~The policy is based on a systematic~~
17 ~~literature search of the PubMed[®] electronic data base using the terms: nitrous oxide, occupational~~
18 ~~exposure, AND dentistry; fields: all; limits: within the last 10 years, English. Sixteen articles met these~~
19 ~~criteria; three additional papers from the previous policy statement were reviewed and added to the~~
20 ~~references. Guidelines and recommendations from the National Institute for Occupational Safety and~~
21 ~~Health (NIOSH) also were reviewed^{1,2}. The update used electronic database and hand searches of the~~
22 articles in the medical and the dental literature using the following parameters: Terms: nitrous oxide,
23 occupational exposure, AND dentistry. Fields: all; Limits: within the last 10 years, English. Additionally,
24 guidelines and recommendations from the National Institute for Occupational Safety and Health
25 (NIOSH) were reviewed^{1,2}. Expert opinions and best current practices were relied upon when sufficient
26 scientific data were not available.

27

28 Background

29 Effects of occupational exposure to ambient N₂O are uncertain, especially since the introduction of
30 methods to scavenge N₂O and ventilate operatories³. ~~Studies that linked increased general health~~
31 ~~problems and reproductive difficulties among dental personnel to chronic exposure to significant levels of~~
32 ~~ambient N₂O have been challenged³. As of 2008, there were no definitive studies linking general health~~

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33 problems and reproductive difficulties among dental personnel to chronic exposure to scavenged ambient
34 N₂O³. A maximum safe level of ambient N₂O in the dental environment has not been determined^{4,5,6}.

35
36 Reduction of ambient N₂O through system maintenance, scavenging, ventilation, use of the minimal
37 effective dose, and patient management is important to maintaining the lowest practical levels in the
38 dental environment^{1,2,7}. Frequent and regular inspection and maintenance of the N₂O delivery system,
39 together with the use of a scavenging system, can reduce ambient N₂O significantly⁸. Using a well-fitted
40 mask and an appropriate amount of suction via the scavenging system will minimize leakage, reducing
41 ambient N₂O levels^{8,9}. The use of a double-mask patient delivery system has also been shown to be more
42 effective than a single-mask system in the removal of waste nitrous oxide^{10,11}. The combined use of the
43 double mask system and scavenging systems with a high evacuation rate have been demonstrated to
44 decrease occupational exposure to nitrous¹². NIOSH has recommended that the exhaust ventilation of
45 N₂O from the patient's mask be maintained at an air flow rate of 45 L/min and vented outside the building
46 away from fresh air intakes¹⁻⁵. However, scavenging at this rate has been shown to reduce the level of
47 psychosedation achieved with N₂O inhalation¹³. Where possible, outdoor air should be used for dental
48 operator ventilation^{11,14}. Supply and exhaust vents should be well separated to allow good mixing and
49 prevent short-circuiting¹. Female dental staff frequently exposed to nitrous oxide (3 or more days a week)
50 have been found to have no elevated risk of spontaneous abortion in offices using appropriate scavenging
51 systems^{15,16}.

52
53 Patient selection is an important consideration in reducing ambient N₂O levels⁷. Patients who are
54 unwilling or unable to tolerate the nasal hood and those with medical conditions (e.g., obstructive
55 respiratory diseases, emotional disturbances, drug dependencies) that contraindicate the use of N₂O
56 should be managed by other behavior guidance techniques⁷. In the dental environment, patient behaviors
57 such as talking, crying, and moving have been shown to result in significant increases in baseline ambient
58 N₂O levels despite the use of the mask-type scavenging systems^{17,18}. Utilization of appropriate nitrous
59 concentration levels should also be considered in relation to procedure difficulty. Nitrous can be
60 discontinued once adequate anesthesia is achieved¹⁹, or decreased levels can be maintained during easier
61 procedures and increased for stimulating procedures⁵. Furthermore, the use of scavenging systems alone
62 cannot lower the ambient N₂O levels to the recommended standards^{8,17,20}. Use of supplemental measures,
63 such as a high-volume dental aspirator suction placed in proximity to the dental operative site, has been
64 shown to reduce ambient N₂O levels significantly^{17,21}. During the first three to five minutes after
65 terminating N₂O administration, a significant amount of the gas is exhaled by the patient. Once N₂O

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66 administration is discontinued, administering 100 percent oxygen to the patient for at least five minutes
67 allows oxygen to replace the N₂O in the gas delivery system²⁻³. This post-procedural oxygenation also
68 decreases the risk of diffusion hypoxia to the patient. Diligent use of the above practices in the pediatric
69 dental environment has allowed for the reduction of ambient N₂O to the levels recommended by
70 NIOSH^{21,22}. Measurement of N₂O levels in the dental operatory can be helpful in determining the type and
71 extent of remediation necessary to decrease occupational exposure.

72

73 Policy statement

74 The AAPD encourages dentists and dental auxiliaries to maintain the lowest practical levels of N₂O in the
75 dental environment while using N₂O. Adherence to the recommendations below can help minimize
76 occupational exposure to N₂O.

- 77 • Educate dental personnel on minimizing occupational exposure to and potential abuse of nitrous
78 oxide.
- 79 • Use scavenging systems that remove N₂O during patient's exhalation.
- 80 • Ensure that exhaust systems adequately vent scavenged air and gases to the outside of the
81 building and away from fresh air intake vents.
- 82 • Use, where possible, outdoor air for dental operatory ventilation.
- 83 • Implement careful, regular inspection, and maintenance of the nitrous oxide/oxygen delivery
84 equipment.
- 85 • Carefully consider patient selection criteria (i.e., indications and contraindications) prior to
86 administering N₂O.
- 87 • Select a properly-fitted mask size for each patient.
- 88 • During administration, visually monitor the patient and titrate the flow/percentage to the minimal
89 effective dose of N₂O.
- 90 • Encourage patients to minimize talking and mouth breathing during N₂O administration.
- 91 • Use ~~rubber dam and~~ high volume dental ~~evacuator~~ suction when possible during N₂O
92 administration.
- 93 • ~~Administer 100 percent oxygen to the patient for at least five minutes after terminating nitrous-~~
94 ~~oxide use to replace the N₂O in the gas delivery system.~~

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