



## Shared Learning

from the Dental Patient Safety Foundation Reporting Tool

“What gets measured gets managed” is the DPSF philosophy to encourage reporting. All received information about patient safety events (unsafe conditions, near misses or adverse events) are contextually de-identified (full confidentiality is preserved), aggregated, analyzed and abstracted by selected experts from our DPSF committees. Reports are generated and disseminated as the only means to learn from our errors. The information in these peer-reviewed reports is provided for its educational value only, and does not purport to establish any legally binding standard of care. Feedback is encouraged.

### Case 2018.1A: Crossed O<sub>2</sub> and N<sub>2</sub>O Gas Lines

**Situation:** A patient presented to a recently completed dental office for extraction of four wisdom teeth under deep sedation, with midazolam, fentanyl and propofol, supplemented with a 30:70 N<sub>2</sub>O / O<sub>2</sub> mixture. During the procedure, the patient’s blood pressure and heart rate dropped and the surgeon switched the patient to 100% oxygen while she and her staff took measures to address the hypotension and bradycardia. After several minutes, the patient became apneic and EMS was called. The patient was transported to a local hospital where he was diagnosed with hypoxic encephalopathy resulting in brain injury. It was later discovered that the oxygen and nitrous oxide lines had been crossed during construction of the new building and the patient had been receiving 100% nitrous oxide during resuscitation.

**What we learned:** The DPSF Committees are aware of several similar incidents. Building codes and enforcement of those codes vary across the United States. In this particular case, the mechanical engineers of the new building mistakenly and improperly labeled the oxygen and nitrous pipelines on the blue print drawings. The plumbing contractors, who were not certified to install medical gases, then followed the blueprints without noticing the lines had been mislabeled. The dental supply company in turn installed the manifolds and other hardware to the crossed lines without confirming their correct placement. Finally, the city building inspectors failed to take steps to assure the gas lines had been installed properly by skilled and certified installers and that proper testing had been performed. This case is another example of Reason’s Swiss Cheese Modal of Accident Causation where multiple safeguards (slices of cheese) fail (holes in slices), and seemingly minor deviations from safe practice accumulate and temporally align, thereby reaching the patient and possibly causing injury.



**Recommendations and action:** Dentists contemplating new construction or a remodel of existing space should only hire qualified contractors who are licensed and certified in their specific area of the project. Municipal building codes for medical and dental offices should be standardized in all states and practitioners should insist on an independent analysis of medical gases once construction is complete. Oxygen analyzers can be purchased for less than \$100, and a simple check can be performed by anyone familiar with the equipment. This case serves a reminder that outliers can injure patients, and that low frequency, high impact events require the same vigilance and attention to remediation as do high frequency, unsafe conditions or near misses that often do not reach the patient.

The DPSF encourages frequent reporting of unsafe conditions, near misses and adverse events as the only means to close the gap between knowing how to prevent these occurrences and taking the necessary action to do so. Please visit our website.

**Additional reading:**

Reason J. The contribution of latent human failures to the breakdown of complex systems. *Phil Trans R Soc London B*, 1990;327:475-484.

[www.dentalpatientsafety.org](http://www.dentalpatientsafety.org)

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