An Affordable Miniature Machine for Pediatric Sedation Outside of the Operating Room

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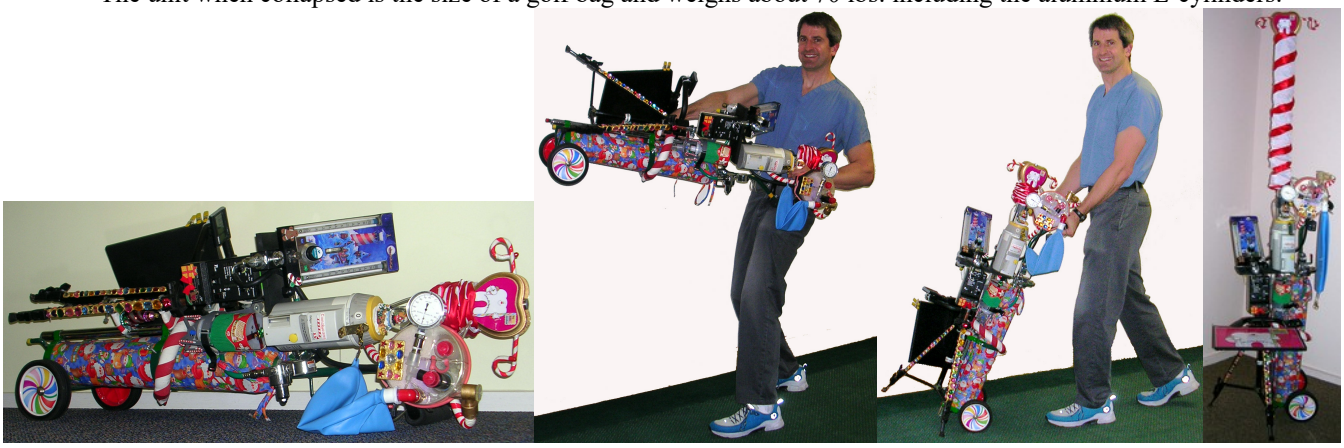
Introduction: Providing pediatric sedation in dental facilities poses many challenges for the anesthesiologist. One of the biggest hurdles is efficiently transporting, rapidly assembling, and putting away everything needed to create a surgery center setting in as many as three different facilities in one day. In 2002, I designed and built a sedation machine because there was none commercially available that transported on wheels in a fully assembled, ready-to-use state, integrated two E-cylinders, a table, an I.V. pole, as well as all required safety monitors, and could be laid flat for transport.

Methods:

- The machine is made of FDA approved parts, DISS O2 and N2O standard fittings, and various medical-grade one way valves and hoses. It was welded together at a custom fabrication shop, inspected, and certified.
- It is designed for maximum safety and portability. The core structure is a steel, two E-cylinder transport cart welded to a collapsible steel I.V. pole which supports an aluminum shelf with a back on it.
- The vaporizer manifold is screwed onto the vertical back of the shelf. The N2O/O2 mixer/flow meter assembly is bolted to the horizontal part of the shelf right next to the vaporizer. The machine is kept upright by a collapsible tripod attached to the base of the aluminum shelf.
- I installed a pneumatic low pressure alarm, an electronic high pressure alarm, negative pressure alarm, sustained pressure alarm, and dual negative pressure release valves that entrain room air in a negative pressure condition.
- There is a N2O/O2 interlock which eliminates the possibility of selecting a hypoxic fresh gas flow.
- O2 is via hose or tanks and (with closed circuit anesthesia) tanks provide 30 hours of anesthesia.
- There is a 12" x 12" steel table which collapses and is held down by a powerful magnetic latch.
- The table swivels 270 degrees to different sides of the machine for different dental setups.
- There is a refillable calcium hydroxide CO2 absorber with popoff, two one way valves, and analog manometer.
- There is a scavenging system for N2O and a charcoal scavenger for the sevoflurane.
- It lies flat for car transport. The Drager Vapor 2000 uniquely does not leak any sevoflurane even when inverted.
- The unit when collapsed is the size of a golf bag and weighs about 70 lbs. including the aluminum E-cylinders.



Results: Since 2002, the machine above has provided sedation for 3,500 patients at more than 1,000 locations.

Discussion: The total cost of the parts for this machine was less than $2,200. The other portable machines marketed in the United States for mobile sedation (OBA-1, Magmedix/Magellan 2200, Anmedic MIE Hawk, D.R.E. Integra VSO2) all are much more expensive, cannot be tilted, need padded boxes, and require extra trips to bring in the oxygen, table, and I.V. pole.

Refs: The list below names identifies the supplier and price for all major components of the machine.

COMPONENT	SUPPLIER	PRICE	COMPONENT	SUPPLIER	PRICE
Vaporizer	Drager Vapor 2000 Fixed	Loaner	N2O/O2 Mixer	Fraser	$400 (Used)
(Bracket)	Drager ¼" Barb	$200	O2 Regulator	Mada CGA-870	$100
CO2 Absorber	King KAB-02 (Refillable)	$200	O2 Reg./DISSx2	LSP Rhino	$250
(Bracket)	King/D.R.E.	$150	Manometer	Anesth. Assoc.	$100
Pressure Monitor	Ohmeda 5500	$150 (Used)	Welding	All Fab	$200
O2 Tank Cart	Hull Anesthesia	$40	I.V. Pole	Alimed	$50
Table & Handle	I.V. League Medical	$150	Low O2 Alarm	VeriFlo	$100
Tripod	Camera Type	$30	(-) Press. Valve	Porter	$100