Timing and Rate of Conversion from Nitrous Oxide to Neuraxial Analgesia During Labor

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Background

Nitrous oxide was **FDA-approved in 2011** for use during labor and is a popular alternative to neuraxial analgesia and intravenous opioids.[1]

The Nitronox™ delivery system delivers 50% nitrous oxide with 50% oxygen.

The **rate of conversion** from nitrous oxide to neuraxial analgesia is reported between **40 and 63.2%**.[2,3]

Labor induction or augmentation has been the only variable associated with conversion to neuraxial analgesia.[3]

Aims

1. Quantify the **rate of conversion** from nitrous oxide to epidural analgesia.
2. Quantify the **time interval** from initiation of nitrous oxide analgesia to request for epidural analgesia.
3. Characterize **factors associated with conversion** from nitrous oxide to epidural analgesia.

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Study Design and Methods

Hypothesis:

Patients who request nitrous oxide at **larger cervical dilations** will be more likely to deliver with nitrous oxide alone than patients who request at **smaller cervical dilations.**

Design:

Retrospective chart review of all pregnant patients who **received inhaled nitrous oxide** as part of their labor course from **1/2018 – 11/2024.**

Enterprise Data Warehouse identified patients and data. Approved by **Institutional IRB.**

Outcomes:

Primary: conversion from nitrous oxide to neuraxial analgesia.

Abstracted Data: cervical dilation at time of nitrous initiation, cervical dilation at time of neuraxial initiation, duration of nitrous oxide utilization, patient demographics, medical/obstetric history, mode of delivery, fetal outcomes.

Exclusion Criteria:

Patients who utilized nitrous oxide **after** delivery (e.g. laceration repair).

Patients who requested **but did not receive** nitrous oxide.

Patients who received nitrous oxide **only during cesarean delivery.**

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Results

869
Deliveries that utilized nitrous oxide

40.7%
Rate of delivery with nitrous oxide alone

47.6%
Rate of vaginal delivery after conversion to neuraxial

11.7%
Rate of cesarean delivery after trial of nitrous oxide

		n	Mean	Stand Dev	*p* (95% CI)
Age	Nitrous	355	31.67	5.58	0.08 (-0.1, 1.5)
	Nitrous-Neuraxial	414	30.96	5.78	
BMI	Nitrous	348	30.34	4.70	**0.004** (-1.9, -0.3)
	Nitrous-Neuraxial	412	31.44	5.96	
Total Nitrous Time (min)	Nitrous	354	152	212	**<0.001** (13.5, 62.7)
	Nitrous-Neuraxial	414	114	111	
Nitrous Start to Delivery Time (min)	Nitrous	355	129	127	**<0.001** (-396, -338)
	Nitrous-Neuraxial	414	496	264	
EBL	Nitrous	350	280	247	0.54 (-41, 21)
	Nitrous-Neuraxial	411	290	183	
Birth Weight (g)	Nitrous	355	3312	537	0.18 (-122, 22)
	Nitrous-Neuraxial	414	3362	475	
Cervical Dilation at Nitrous Start (cm)	Nitrous	354	7.48	2.03	**<0.001** (2.29, 2.83)
	Nitrous-Neuraxial	414	4.92	1.75	

	Vaginal Delivery (n)	Assisted Vaginal Delivery (n)	X^2	*p*
Nitrous	351	4	**18.7**	**<0.001**
Nitrous-Neuraxial	382	32		

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Conclusion and Discussion

Take-home Points

- Requesting nitrous oxide at **greater cervical dilations** is associated with less need to convert to neuraxial analgesia.
- Conversion to neuraxial analgesia strongly **associated with operative vaginal delivery.**

Limitations

- **Retrospective** observational study design.
- Cervical dilation **not routinely checked** at the time of initiation of nitrous oxide or neuraxial.
  - Closest recorded value reported.

Future Directions

- **Scoring system** to predict successful delivery with nitrous oxide.
- Improved **patient counseling** regarding likelihood of delivery with nitrous oxide and **implications for conversion to neuraxial.**

References

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