Anesthesiology
V 73, No 3A, Sep 1990

TITLE: GAS MAN SIMULATION OF OVERPRESSURE IS VERIFIED BY CORRECT ALVEOLAR PLATEAUS

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Gas Man® is a computer simulation which pictorially and graphically depicts anesthetic partial pressure (anesthetic tension) in various locations (compartments) in the anesthesia gas machine, breathing circuit, and patient. The simulation uses Euler's method to solve the simultaneous differential equations that govern the behavior of the five-compartment model. The model structure knows nothing of exponential behavior, but calculates exponentials in response to step changes in vaporizer or inspired settings.

The Macintosh version of Gas Man adds numerical display of predicted tensions to the original (Apple 2) Gas Man Picture. The only other changes from the original are addition of Sevoflurane, Desflurane, and nitrogen, adjustable simulation speed, adjustable time window with scrolling, and control buttons and pull-down menues consistant with Macintosh programs, achieved by total re-programming in the language C.

This paper tests the ability of Gas Man to calculate and display (predict) the correct alveolar tension plateau in response to constant inspired anesthetic tension. Correct plateau height prediction is required for quantitative overpressure to accellerate changes in alveolar tension and anesthetic depth.

METHODS

The relationship between predicted alveolar plateau height and inspired anesthetic tension used was:

$$P_A = P_I \cdot \frac{VA/(CO \cdot L)}{1 + VA/(CO \cdot L)}$$

where L = blood/gas solubility ratio and VA = CO = 5.The **Special** pull-down menu was used to **Disable Return** of venous anesthetic to the lungs.

The Table sumarizes the Methods, Results, and Discussion sections, line-by-line. Several anesthetics are simulated(#1). Blood/gas Solubility, L(#2), is used to predict Alv/Insp ratio(#3) and Alveolar plateau height(#5) resulting from full-scale Inspired setting(#4) for each drug.

RESULTS

Plateau heights observed on Macintosh(#6) and Apple 2(#7) Gas Man screens were identical to those predicted(#5).

DISCUSSION

I/A(#8) is the Relative OverPressure required for each agent. When combined with MAC(#9), the appropriate Inspired tension to achieve 1 MAC is computed for each drug(#10). Insp-for-1-MAC guides initial inspired tension adjustment to achieve quantitative overpressure.

#		Parameters of the model, from literature						
1	Gas Name	N2O	Iso	Enf	Hal	Des	Sevo	N2(Atm)
2	Solubility, L	0.47	1.30	1.90	2.47	0.42	0.67	0.014
		Predicted Levels, analytic solution						
3	Alv/Insp	0.68	0.43	0.34	0.29	0.70	0.60	0.99
4	Inspired %	100	5	5	5	25	5	7
5	Alv plateau %	68.03	2.17	1.72	1.44	17.61	2.99	6.92
	Gas Man®	Plateau height observed on Gas Man (%Atm)						
6	Macintosh	67.3	2.2	1.7	1.4	17.5	3.0	6.9
7	Apple 2	68	2.1	1.7	1.5	na	na	na
		I/A (Rel OverPressure), MAC, and I for 1 MAC						
8	I/A=Rel OverP	1.47	2.3	2.9	3.47	1.42	1.67	1.014
9	MAC	105	1.1	1.7	0.76	6	2	
10	Insp for 1 MAC	154	2.5	4.9	2.6	8.5	3.3	

A1026

TITLE: SHOULD PREOPERATIVE EKG'S BE OFFICIALLY INTERPRETED BY CARDIOLOGISTS PRIOR TO ANESTHESIA?

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Introduction: Many patients present for anesthesia with EKG's lacking the official interpretation by the cardiologists, leaving this responsibility to the anesthesiologist. This study compared the anesthesiologist's preoperative interpretation to the cardiologist's official reading.

Methods: All patients presenting for elective surgery over two weeks were included. Noted were the presence of a preoperative EKG, an official interpretation, and the anesthesiologist's evaluation of the EKG at the time of surgery. EKG's were evaluated as to: rate; rhythm; axis deviation; conduction defects; ischemia or myocardial infarction; and hypertrophy. The anesthesiologist's interpretation was compared to the cardiologist's official reading by an independent cardiologist who scored the individual variables and the entire EKG as no difference (0), different but not clinically important (1), or different and clinically important (2). Statistical analysis was by chi-square test.

Results: 123 of the 227 patients had EKG's on the chart at the time of surgery. 49 had an official reading (Group I) and 74 lacked an official reading (Group II). The independent cardiologist scored the anesthesiologists' interpretations of Group I EKG's as 63.3% without errors (0) and 36.7% with errors (1 +/or 2) and Group II EKG's as 44.6% without errors (0) while 55.4% contained errors (1 +/or 2) ($p<0.05$). 18 of the Group I EKG's had 38 errors of interpretation by the anesthesiologists (73.7% (1) and 26.3% (2) errors) while 41 of the Group II EKG's had 72 errors of interpretation (65.3% (1) and 34.7% (2) errors) ($p=0.368$). The distribution of clinically important (2) errors was:

	n	rate	rhythm	axis	conduction	ischemia	hypertrophy
Gr I	10	0%	0%	0%	20%	50%	30%
Gr II	25	16%	12%	0%	4%	64%	4%

Discussion: The data shows statistically fewer ($p<0.05$) EKG's read incorrectly by the anesthesiologists when there was an official reading. Although the percentage of clinically important (2) errors was not statistically different between the two groups, the fact that Group I had errors at all is discouraging and suggests that the official readings were, at times, ignored by the anesthesiologist. Finally, 34.7% of the errors in Group II EKG's were thought to be of clinical importance. In conclusion, EKG's, if obtained prior to anesthesia, should be interpreted by a cardiologist and this interpretation should be reviewed by the anesthesiologist prior to anesthesia.