Clinical Evaluation of Isoflurane

REGIONAL GEOGRAPHIC DEMOGRAPHY

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THE RESULTS FOR each region are summarized in Tables 7-9 inclusive. A few points are worth emphasizing here since they undoubtedly influence the overall relationships which were found for a number of variables against demographic parameters. The proportion of females was highest in the NE region (59.0 per cent) and least in the West (44.4 per cent) (Table 7). Mean age of patients varied between regions, being lowest in the West (36.1 yr) and highest in NE (41.5 yr) (Table 8) as did the proportions in each age group. The use of premedicants varied between regions, eg: narcotic use in NE was 66.1 per cent compared to 47.2 per cent in Canada. Anticholinergics were used frequently in the North Central region (68.2 per cent) but rarely in Canada (23.9 per cent). Barbiturate induction was common in all regions (69.7 to 83.7 per cent) while the use of narcotic at induction varied from 11.1 per cent in the West to 22.6 per cent in Canada. Although there were differences in the patient populations from each region, these were not large enough to account for the differences in drugs used and it seems likely that the latter reflect differences in pattern of anaesthetic practice between regions.

ISOFLURANE CONCENTRATIONS

The mean percentage of isoflurane used varied between regions from 1.62 ± 0.76 in Canada to 1.84 ± 0.78 in the West at induction and 1.19 ± 0.57 to 1.28 ± 0.62 during maintenance in these same regions (Table 7). One possible explanation for these geographic differences is evident when average isoflurane at induction is compared with the percentage of patients having narcotic at induction, expressed as means $\pm$ 1SD for each of the five regions. This suggests that with higher narcotic use at induction less isoflurane was used. The influence of narcotics and other factors on isoflurane use was examined in some detail by multiple analysis of variance and is discussed in the section on isoflurane concentrations by Dr. M.K. Cahalan.

DURATION OF ANAESTHESIA

The duration of anaesthesia was different in each region within the range of 82 minutes in Canada to 174 minutes in the Southern region (Table 7). This was reflected in the absolute values for blood loss and fluids given but when these were corrected for duration of anaesthesia, the rates of blood loss and fluids given were essentially similar in all regions. No conclusive explanation for these differences is possible from the data available, but since the spectrum of procedures performed also varied between regions (Table 9) it seems reasonable to conclude that this factor, together with different patterns of practice, could account for these differences in the duration of anaesthesia.

POSTOPERATIVE NARCOTICS

The postoperative use of narcotics varied with region from 53 per cent of patients not given narcotic in the North East to 45.7 per cent not given narcotic in the Southern region (Table 7). Generally the lower the use of narcotics was at induction or in maintenance the higher it was postoperatively. Although the same trend was found when narcotic was given as premedication, this was not the case in all regions.

DISEASE AREAS AND CURRENT DRUGS

In most instances the proportion of patients with coexisting disease was highest in the Southern region and lowest in Canada (Table 9). Although mean ages varied slightly between the regions, there were proportionately greater numbers at the extremes of age in Canada. A similar trend was found for current medications with the highest proportions for digoxin, diuretics, and bronchodilators being in the Southern region. The proportion of smokers in the South was much greater at 32.5 per cent than in any other region (range 20.1 to 24.2 per cent).

TABLE 7
REGIONAL SUMMARY

	Canada	Northeast	Northcentral	Western	Southern	Total
Number hospitals	35	52	32	22	24	165
Number cases	1829	1707	1417	877	967	6798
Female per cent	54.3	59.0	55.4	44.4	51.6	54.1
Premed						
Barb.	1.9	16.8	7.3	10.7	7.2	8.7
Narc.	47.2	66.1	65.1	49.3	54.7	57.0
Tranq.	30.2	51.8	46.5	49.3	67.3	46.8
Atrop.	23.9	56.2	68.2	31.5	49.2	45.8
Induction						
Barb.	83.7	73.8	73.7	69.7	78.2	76.5
Narc.	22.6	12.8	11.0	11.1	18.7	15.7
Tranq.	7.7	5.3	8.5	4.6	12.7	7.6
Atrop.	12.8	5.3	2.9	5.2	6.4	7.0
Isoflurane						
Induction (m $\pm$ 1SD)	1.62 $\pm$ 0.76	1.72 $\pm$ 0.84	1.73 $\pm$ 1.02	1.84 $\pm$ 0.78	1.76 $\pm$ 1.46	1.69 $\pm$ 0.98
Maintain (m $\pm$ 1SD)	1.19 $\pm$ 0.57	1.20 $\pm$ 0.59	1.23 $\pm$ 0.60	1.28 $\pm$ 0.62	1.16 $\pm$ 0.58	1.20 $\pm$ 0.59
Bl. loss ml (m $\pm$ 1SD)	237 $\pm$ 736	313 $\pm$ 662	296 $\pm$ 549	335 $\pm$ 1022	413 $\pm$ 1075	251 $\pm$ 521
Fluids ml (m $\pm$ 1SD)	920 $\pm$ 977	1372 $\pm$ 1578	1517 $\pm$ 1424	1389 $\pm$ 1597	1961 $\pm$ 1955	1273 $\pm$ 1433
Bl. loss/min. anaes.	2.89	2.62	2.27	2.31	2.37	2.52
Fl./min. anaes.	11.22	11.47	11.61	9.58	11.27	10.66
Min. anaes. (m $\pm$ 1SD)	82 $\pm$ 68	120 $\pm$ 96	131 $\pm$ 95	145 $\pm$ 107	174 $\pm$ 12	123 $\pm$ 101
Min. to 1st narc. (m $\pm$ 1SD)	112 $\pm$ 429	101 $\pm$ 159	132 $\pm$ 223	148 $\pm$ 477	154 $\pm$ 348	123 $\pm$ 342
No narc. postop (Per cent)	44.5	53.0	50.8	47.2	45.7	48.4

TABLE 8
DRUGS/DISEASE AREAS – PER CENT

	Canada	Northeast	Northcentral	Western	Southern	All regions
Respiratory	10.3	10.0	10.9	14.8	16.0	11.8
Hepatic	1.5	3.1	3.3	4.3	5.8	3.3
Circulatory	19.1	23.6	23.4	22.8	23.6	22.3
Renal	4.2	5.6	5.3	8.1	8.2	5.8
CNS	4.8	7.1	5.4	8.2	8.9	6.5
Endocrine	4.0	6.0	7.6	6.0	7.5	6.0
G.I.	7.1	10.5	11.9	12.1	13.1	10.5
Gynecology	8.6	19.7	8.6	8.7	17.0	12.6
Ortho.	9.8	12.5	10.7	16.8	11.9	11.9
Other	10.4	16.5	16.2	21.2	22.5	16.3
Digoxin	2.3	3.5	2.8	2.9	3.8	3.0
Beta-bl.	4.0	5.9	6.3	6.0	4.0	5.2
Diuretic	6.9	10.6	11.3	10.5	11.1	9.8
Nitrog.	2.2	4.0	3.7	3.4	2.3	3.1
Bronchodil.	1.7	0.9	1.5	2.3	2.7	1.7
Smoker	21.9	20.2	23.5	22.5	32.5	23.4
Age	Percentage for each region					
0–10	14.5	6.3	11.9	18.1	8.7	11.4
11–20	8.6	9.1	7.5	7.9	7.1	8.2
21–30	17.2	19.0	16.1	18.6	19.3	17.9
31–40	14.6	16.6	17.3	13.8	17.0	15.9
41–50	13.1	12.9	13.0	9.7	15.0	12.9
51–60	13.8	15.3	15.1	14.1	16.2	14.8
61–70	9.9	11.2	11.4	11.7	11.3	11.0
71–80	6.0	7.6	6.0	4.9	4.9	6.1
> 80	2.2	1.9	1.8	1.1	1.6	1.8
MEAN AGE (YR)	38.0	41.5	39.6	36.1	40.6	39.5

TABLE 9
PROCEDURE SITE – PER CENT

	Canada	Northeast	Northcentral	Western	Southern	All regions
Intracran.	1.2	1.3	1.6	2.1	2.1	1.6
Major vess.	3.2	2.0	1.6	2.9	3.6	2.6
Open heart	0.5	1.6	1.7	2.1	0.8	1.3
Cor. art.	1.0	2.2	2.0	2.2	1.0	1.7
Hd. neck	5.1	4.7	5.2	7.3	9.4	5.9
Lung	0.8	0.5	0.9	1.1	1.2	0.9
EENT	18.8	8.6	8.5	15.8	8.7	12.2
Intra-abd.	18.0	24.3	26.3	19.8	30.9	23.4
Laparosc.	4.9	5.5	6.1	2.3	4.9	5.0
Kidney	1.5	2.3	2.0	3.2	2.5	2.2
Trunk	9.3	7.3	10.7	5.8	7.3	8.4
Spine	1.5	1.3	2.6	2.9	2.5	2.0
Perineum	8.3	11.3	10.2	7.5	7.4	9.2
Extremity	19.3	18.2	17.2	20.1	16.2	18.2
Endosc.	3.6	5.7	2.8	3.5	1.4	3.6
Other-diag.	1.1	1.9	0.8	1.5	0.6	1.2
Other	6.9	12.5	10.0	7.4	8.5	9.3

PROCEDURE SITES

The proportions of the 17 listed procedure sites (Table 9) was comparable between regions except that EENT procedures were twice as common in Canada and the West (18.8 and 15.8 per cent) compared to other regions (range 8.5 to 8.7 per cent) and that intra-abdominal procedures were much more common in the South (30.9 per cent). These differences could not be explained on the basis of the incidence of disease alone, at least as recorded by system.

SUMMARY

The most significant geographic differences relate to the incidence of the drugs as premedication and for induction of anaesthesia and the concentration of isoflurane used. Thus narcotic use in premedication was much more common in institutions in the NE and NC regions, whereas narcotic use at induction was more common in the South and in Canada. The effect of these different patterns of prescribing of narcotics had the effect of influencing the isoflurane concentration used. The use of anticholinergics showed a three-fold difference between the NC region and Canada, undoubtedly reflecting different approaches to the need for vagolytic action.

The prevalence of disease and coexisting

cardiorespiratory drug therapy was higher in the South and NE in most instances. It is likely that this reflects the older mean age of patients in these regions. However, the proportion of patients over 80 years of age was highest in Canada and least in the Western region where respiratory, circulatory, and CNS disease were rather more frequent. The significant differences for some procedures, for example EENT and intra-abdominal, could not be explained on the basis of age differences alone.

Apart from different rates of disease and the influence that has on rates for the various procedures, it seems likely that an important determinant of the latter as well as of the anaesthetic drugs used before, during, and after operation relates to what might be described as "usual practice". The outcome of such differences in terms of morbidity and complications requires detailed and careful analysis which must take account of the many patient factors as well. Although there were differences for reflex activity and complications between regions, these were such that no clear explanation of their occurrence could be made on the basis of regional factors. The later sections on reflex activity by Dr. C. Buffington and complications by Dr. K. Rehder describe, in detail, the results of the analysis of patient and demographic factors related to these outcomes.