
Occasional Review

The value of the Internet to anaesthetists

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Purpose: To determine which anaesthetists are using the Internet, which resources they find most valuable, and whether the Internet provides useful information which changes the way in which they practice anaesthesia.

Method: The survey was posted on the World Wide Web and publicised by e-mail messages to the major anaesthesia discussion lists on the Internet.

Results: Two hundred and five valid replies were received from 22 countries. The typical respondent was an American male specialist who worked in a university or teaching hospital in a city with a population of over one million. The most popular World Wide Web site was GASNet, and the Anesthesiology Discussion Group was the most popular discussion list. Eighty-one percent of anaesthetists had changed their practice of anaesthesia based on information obtained via the Internet. Ninety-six percent recommend that other anaesthetists join the Internet.

Conclusion: The Internet is a valuable resource for anaesthetists but, at present, it is used mainly by anaesthetists in universities and other major centres, especially in North America.

Objectif : Rechercher quels anesthésistes utilisent l'Internet, quelles sont pour eux les ressources les plus précieuses, et si l'Internet diffuse des informations susceptibles de modifier leur façon d'exercer l'anesthésie .

Méthodes : Ce sondage était affiché dans le World Wide Web (WWW) et diffusé par courrier électronique aux principaux groupes de discussion de l'anesthésie sur Internet.

Résultats : Deux cent cinq réponses valides provenant de 22 pays ont été reçues. Typiquement, celui qui répondait était un spécialiste américain de sexe masculin travaillant dans une université ou un hôpital d'enseignement dans une ville de plus d'un million d'habitants. Le site WWW le plus populaire était GASNet, avec le groupe de discussion *Anesthesiology Discussion Group*. Quatre-vingt-un pour cent des anesthésistes ont changé leur façon de pratiquer sur la base de l'information obtenue grâce à Internet. Quatre-vingt-seize pour cent des anesthésistes recommandent à leurs collègues de se brancher sur l'Internet.

Conclusion : L'Internet constitue une ressource d'information précieuse pour les anesthésistes, mais présentement, on l'utilise surtout dans les universités et les autres centres importants, spécialement en Amérique du Nord.

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THE Internet is a global network of computers which has enormous potential for disseminating information and promoting communication.¹ Anaesthetists are well-represented on the Internet, which they use for communicating among individuals, for corresponding with organizations or discussion groups and for publishing information on the World Wide Web (WWW). Little has been published about the benefit of the Internet to anaesthetists. A literature search of *Index Medicus* for the last five years revealed only one article describing the activities of the Anesthesiology Discussion Group,² and two general articles introducing the Internet to anaesthetists.^{3,4}

This survey determined the views of anaesthetists who use the Internet, on a variety of subjects related to anaesthesia resources on the Internet.

Method

A survey form was designed as a Web document and put on the Internet at the following address; <http://www.oyston.com/anaes/survey.html>. Input was accepted for seven weeks from March 12th to April 30th, 1996. The survey was open to any anaesthetist (defined as a person who puts human patients to sleep for surgery). The survey was publicized by sending e-mail messages to all the major Internet anaesthesia discussion groups.

Visitors to the survey Web site answered the questions by selecting the appropriate answer on the screen. Once they had completed the survey, they had the option of changing any answer prior to submitting the form. The form included a counter, which kept a record of the number of times that the survey was accessed. Submitted forms were converted into an e-mail message, which was forwarded to the authors.

The information was entered into an Epi-6 database (Stone Mountain, Georgia) and into a Lotus 123 spreadsheet (Lotus Development Corporation). Data analysis involved the calculation of simple descriptive statistics, and Chi-squared. A *P* value of <0.05 was taken to be statistically significant.

Results

During the seven week survey period, the site was visited 406 times. A total of 208 completed forms were received. Three replies from anaesthesia technicians, who did not meet the survey definition of anaesthetists, were eliminated from the analysis, leaving 205 valid replies for further analysis.

Demographics

Replies were received from every continent except Antarctica (Table I), from a total of 22 countries

(Australia, Belgium, Brazil, Canada, Chile, Denmark, Finland, Germany, Italy, India, Israel, Japan, Namibia, Portugal, Russia, South Africa, Sweden, Switzerland, Taiwan, the United Arab Emirates, the UK, and the USA).

Two-thirds of the respondents worked in cities with a population of over 200,000 (Table II), and 64% worked in university or teaching hospitals (Table III). Seventy-eight percent were specialists or academic anaesthetists (Table IV) and 11 classified as "other" had a variety of work types, such as intensive care, pain

TABLE I Origin of respondents

	<i>Number of responses</i>	<i>% Responses</i>
USA	88	42.9
Europe	49	23.9
Australia	21	10.2
Canada	18	8.8
Far East	8	3.9
Rest of World	21	10.2
Total	205	100.1

TABLE II Community of respondents

<i>Size</i>	<i>Number of responses</i>	<i>% Responses</i>
>1 million	80	39.0
200,001-1,000,000	57	27.8
50,001-200,000	51	24.9
20,001-50,000	16	7.8
≤20,000	1	0.5
Total	205	100.0

TABLE III Workplace of respondents

<i>Hospital</i>	<i>Number of responses</i>	<i>% Responses</i>
University/teaching	131	63.2
Private/clinic	43	21.1
State-funded	15	7.4
Government/military	10	4.9
None of above	5	2.5
Total	204	100.0

TABLE IV Professional anaesthesia activity of respondents

	<i>Number of responses</i>	<i>% Responses</i>
Specialist	97	47.3
Academic	64	31.2
In training	24	11.7
Nurse	9	4.4
GP	0	0
Other	11	5.4
Total	295	100.0

clinics, dental surgery or locums, which included giving anaesthetics. No general practitioner anaesthetists completed the survey form. Ninety-two percent were male (Table IV) and 77% were in the 30–49 yr-old age range (Table V).

TABLE V Age of respondents

Age	Number of responses	% Responses
<30 yr	14	7
30–39	84	42
40–49	69	34.5
50–59	22	11
60+	11	5.5
Total	200	100.0

TABLE VI Comments about the Internet

Comment	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Useful information	32	49	11	5	2
Useful information, hard to find	6	31	27	35	1
Poor quality information	5	26	26	36	6
Cheap & easy	16	52	15	15	3
Reject sponsorship	10	12	33	39	6
Pornography concerns	7	10	30	34	19
Viruses etc, unsafe	7	3	20	42	28
Recommend to colleague	56	40	3	1	0

TABLE VII Web Sites

Web site*	Score	% visited	Recommendations
GASNet http://gasnet.med.yale.edu/	2.40	93	119
American Society of Anesthesiologists http://dewey.anes.ucla.edu/	1.13	77	26
Anesthesia and Critical Care Resources http://www.eur.nl/FGG/ANEST/wgtl_3.html	1.04	62	40
Global Textbook of Anesthesiology http://gasnet.med.yale.edu/gta/	1.01	64	21
Australian Anaesthesia Web Pages http://www.ozemail.com.au/~asaacc/index.html	0.94	58	17
WWW Virtual Library – Anesthesiology http://gasnet.med.yale.edu/index.html	0.93	65	12
Anaesthesia Meetings http://www.oyston.com/anaes/meet.html	0.89	58	16
Educational Synopses in Anaesthesia and Intensive Care http://gasnet.med.yale.edu/esia/	0.83	51	22
E-anesthesia from Penn State http://www.anes.hmc.psu.edu/Homey.html	0.73	47	20
Erasmus University, Rotterdam http://www.eur.nl/FGG/ANEST/	0.67	46	9
Swiss Anaesthesia Server http://www.medana.unibas.ch/	0.49	34	4
Canadian Anaesthetists' Society† http://www.cas.ca	0.42	30	3
Anaesthesia Web (Singapore) http://biomed.nus.sg/ikh/saw/	0.42	29	5

* Addresses correct at time of survey. Links are available via <http://www.oyston.com/anaes/survey.html>

† CAS site closed throughout survey period. Now open at this address.

Opinions

Eighty-one percent agreed that there was lots of useful information for anaesthetists on the Internet, although 38% felt that it was too hard to find and 32% felt it was of poor quality. Eighty-four percent of respondents from the USA and Canada felt that it was cheap and easy to get Internet access, compared with 49% of respondents from the rest of the world ($P<0.0001$). Ninety-six percent of respondents would recommend the Internet to an anaesthetic colleague (Table VI).

Preferred Resources

Respondents rated 13 major anaesthesia Web sites, based on the frequency with which they visited the site, on a scale from 0 (= never) to 5 (= more than

once per day). They also recommended up to three sites. Table VII shows the average score for frequency of visitation, the percentage of respondents who had ever visited each site, and the total number of recommendations each site received.

GASNet was the most popular Web site, with 119 recommendations. It was visited daily by 19% of the respondents. The American Society of Anesthesiologists site was the next most visited site, and A J Wright's list, "Anesthesia and Critical Care Resources on the Internet," was the second most commonly recommended site. The Anesthesiology Discussion Group was by far the most popular, the most visited, and the most recommended discussion list (Table VIII).

Internet Access

Most respondents (56%) had Internet access both at home and at work, 35% had access only at home, and 9% only at work. Forty-nine percent paid for their own Internet access, 27% shared the cost with their employers, and 24% had their access paid for exclusively by their employers. The average duration that respondents had had access to Internet e-mail was 25.9 mo (SD \pm 30.5 mo, mode 24 mo) and to the WWW was 14.2 mo (\pm 11.2 mo, mode 12 mo). The respondents used the Internet for anaesthesia for an average of 3.8 hr per week (\pm 3.2 hr, mode 2 hr), and for fun an average of 3.9 hr per week (\pm 5.2 hr, mode 1 hr).

A total of 154 respondents used the "Netscape" Internet browser software, of which 93 reported using the most recent version (2.0). Twelve used "Microsoft Internet Explorer," and 16 used a variety of other browsers, including "Mosaic" (4), "Lynx" (3) and "Chameleon" (2). Some respondents used more than one browser, while others did not specify which one they used.

Most respondents had a high-speed connection to the Internet: 27% reported a connection speed of $>$ 28.8 kbps, 34% had 28.8 kbps connections, 35% had 14.4 kbps connections, and 4% had slower links. Academic anaesthetists were more likely than others to have a fast connection ($P < 0.0001$).

Value of the Internet

When asked to rate the Internet as a source of information about anaesthesia on a scale from zero (waste of time) to 5 (invaluable), the mean score was 3.3 (\pm 1.2, mode 3) (Table IX). Ninety-nine percent of respondents sometimes found useful information about anaesthesia on the Internet, and 34% did so several times each week. Thirty-seven percent of respondents gave specific examples of information they had acquired from the Internet. Eighty-one percent had changed their practice based on information received via the Internet, and 21% did so several times a month. 19% of respondents gave specific examples.

The Internet was especially useful as a source of information about new drugs (11 responses). Another use of the Internet was providing practical tricks, tips or hints (eight responses). It provided a forum for case reports (seven responses) and general discussion (five responses).

TABLE IX Value of Internet as anaesthesia information source – scale 0–5

Score	Responses	Response %
0	1	0.5
1	15	7.7
2	27	13.8
3	62	31.8
4	59	30.3
5	31	15.9
Total	195	100.0

TABLE VIII E-mail Discussion Lists

Site*	Score	% visited	Recommendations
Anesthesiology Discussion Group (Anesthesiology) (To subscribe, send "subscribe anesthesiology yourname" to listproc@gasnet.med.yale.edu)	2.73	76	88
Anesthesiology Discussion List (ANEST-L) (To subscribe, send "subscribe anest-l yourname" to listserv@ubvm.cc.buffalo.edu)	1.32	42	16
Anaesthesia and Intensive Care List (AIC-L) (To subscribe, send "subscribe AIC-L youremailaddress" to majordomo@mailbox.uq.oz.au)	1.09	37	15
Paediatric Anaesthesia Conference (PAC) (To subscribe, send "subscribe pac" to macjoromo@anaes.sickkids.on.ca)	0.95	28	18

* Links available from <http://www.oyston.com/anaes/survey.html>

es). It confirmed rather than changed practice (two responses) and raised topics for discussion (two responses) or teaching (two responses). Forty-two other miscellaneous uses of the Internet were reported, including topics related to complications, consent, regional anaesthesia, help acquiring a drug, advice about equipment, getting references, and obtaining information about conferences and employment opportunities.

Suggestions for ways in which the Internet could be made more useful to anaesthetists included: more content (49 responses): putting the full text of existing journals on-line (nine responses), publishing new electronic journals (four responses), putting databases on-line (five responses) and providing on-line medical education, reviews, e-mail address lists, lists of meetings and job opportunities, and case conferences.

Suggestions related to improved organisation (15 responses) included the need to reduce the signal to noise ratio (two responses), a request for fewer sites with more information at each site, and better links and co-ordination between sites.

There were 14 comments about e-mail discussion groups. Two respondents felt they were the best part of the Internet. Two respondents found them too complicated, and two said they received too much e-mail, with some participants offering opinions on subjects which they knew nothing about. Suggestions included more, and more specific, discussion groups, and that the "big names" in anaesthesia should be encouraged to participate.

Ten replies suggested that easier access was required, including cheaper and faster access, guides for new users, and a computer in the operating suite coffee room.

Discussion

The majority of respondents to the survey were highly enthusiastic about the Internet, and found that it was a useful source of information which changed the way they practised anaesthesia. For example:

99% had found useful information about anaesthesia on the Internet.

96% would recommend a colleague to join the Internet.

81% felt that there was lots of useful information available.

81% had changed their practice based on information acquired over the Internet.

78% rated the value of the Internet as a source of information as three out of five or better.

However, the respondents are not a random sample of all anaesthetists who use the Internet. Other less

frequent or committed users might never have heard about the survey, or not bothered to fill out the form. However, the responses should be of value to all anaesthetists, as they represent a total of almost 100,000 hours of Internet experience.

This survey is the first to attempt to determine the value of the Internet to anaesthetists. Without the Internet, it would have been much more difficult, expensive and time consuming to collect the opinions of 205 people, in 22 countries. No attempt was made to verify the identity of the respondents, so it would have been possible for one person to make multiple responses under assumed names, although this is unlikely. There is no way of knowing the distribution of anaesthetists around the world. For example, none of the 205 replies came from GP anaesthetists. Perhaps there are very few GP anaesthetists in the world, but it is more likely that anaesthetists outside the major centres have less opportunity to explore the Internet.

The authors had hoped that the Internet would be a valuable resource for isolated anaesthetists in small communities, but the reverse appears to be true. The majority of responses came from teaching centres, where Internet access is often a standard amenity. Much of the information the respondents reported acquiring from the Internet was practical information about managing everyday problems. This use of the Internet is similar to chatting with colleagues over coffee, where exchange of information occurs between equals, in an informal, and perhaps even anecdotal manner. While one must be somewhat cautious about the value of such information, we feel that this opportunity to exchange ideas and information with professional colleagues around the world would be of greatest benefit to isolated rural anaesthetists.

Many respondents made suggestions about what they would like to see available. In many cases, the resource they suggested already existed on the Internet. Either they were unaware of its existence, or perhaps it was not of sufficient quality. In theory, the Internet offers incredible opportunities for spreading timely information about anaesthesia. Instead of referring to textbooks purchased many years ago when one was a resident, or travelling to the nearest medical library, one could access up to date information on any anaesthesia topic by dialling into the Internet. Sound files, video clips, simulations and tests could be used to assist in updating one's knowledge. The two major obstacles to making this dream a reality are the difficulty and cost of Internet access, and the lack of a sufficient amount of accessible high-quality anaesthesia information on the Internet. The first problem is

being solved, as Internet software improves and the cost of computers and Internet access continues to fall. The second problem requires either the conversion of existing anaesthesia textbooks and journals into on-line formats, or the development of entirely new anaesthesia resources for the Internet. Either approach will require substantial funding, and it is not clear at present how those costs could be recouped.

It may be useful to repeat the survey later, when more anaesthetists are on-line and, perhaps, bigger and better resources are available on-line. It would have been useful to ask if anaesthetists would be prepared to pay for a high-quality Internet resource.

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