

Laparoscopy and the Internet: Surgeon Survey

by

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Abstract:

Background: The Internet has become a new paradigm in the delivery and utilization of medical information. **Methods:** A thirteen-item questionnaire was posted on the World Wide Web and also sent over e-mail to collect information on the attitudes and practices of surgeons regarding the use of the Internet as a medical resource. **Results:** Over a two-month period, 459 surgeons were enrolled in this study. Most of the surgeons who responded to the survey were identified as male (96%) between the ages of 31-50 (79.25%), accessing the Internet mainly from their homes (67.10%) and offices (17%) using 56 Kbps (34.86%) and 33.6 Kbps (21.79%) modems. Participants indicated that they use the Internet to increase their knowledge of general surgery (78.87%), to learn more about technologies related to the practice of surgery (74.51%), to access Medline™ medical database (73.20%) and to locate other resources for academic purposes (68%). Approximately half of the surgeons surveyed responded positively about having access to or working with robotic assist devices in the operating room (53%) and most of them supported the use of technology for telementoring purposes (78%). Almost 80% professed an interest in video streaming technology applied to surgical education. **Conclusions:** The Internet has been proven to be a useful real time and powerful survey tool to understand the impact of the Internet and related technologies in surgical education and practice.

Key Words: Internet, survey, surgery, video streaming, laparoscopy

Introduction:

The health care industry has not let the revolution of the Internet and on-line multimedia products go unnoticed. From the creation of websites rich with medical information to the introduction of websites as potential platforms for telemedical use, the Internet has become a new paradigm in the delivery and utilization of medical information.

In order to better understand the impact of the Internet on the surgical community, a thirteen-item questionnaire was designed as a study. The aim of the survey was to gather information on the attitudes and practices of surgeons working with medical web applications, focusing on laparoscopic surgery and the related use of the web as a medical information resource.

Material and Methods:

A questionnaire consisting of 13 items was designed with the aim of surveying surgeons to obtain information regarding the use of the Internet as a medical resource, with an emphasis on laparoscopic surgery. The survey was distributed via e-mail and was also available on-line through Laparoscopy.com (www.laparoscopy.com), a high traffic multimedia Internet web site dedicated to laparoscopic surgery. Respondents were surveyed in several areas: demographics (gender, age, location, specialty, faculty rank/position), connectivity (connection speed, access location, site identification), Internet preference, use and attitudes. Opinions on the emerging technologies of robotic assist devices, telementoring, and live streaming video were also collected.

Three surgical audiences were targeted: members of SAGES (Society of American Gastrointestinal Endoscopic Surgeons numbering approximately 4,100), participants on Surginet (13) (a general surgery list server which serves approximately 500 members), and physicians who logged on to Laparoscopy.com (www.laparoscopy.com). The questionnaire was designed for completion within three minutes. Participants were asked a variety of demographic, technical and attitudinal questions related to their practice, their current use of Internet technologies and their opinions on the potential of the Internet to play a significant role in surgical education. The survey was interactive in design and all participants were able to see real time results upon submitting the completed form.

All questions were formatted into a Hypertext Mark-up language (HTML) interface using SurveySolution For the Web™ software and distributed via: e-mail to SAGES mailing list and to Surginet listserver. Also, this same format, was posted in a visible place on Laparoscopy.com website.

All answers were transmitted into the SurveySolution™ server that had the capability to display instant “live” results. This was accomplished by running a Common Gateway Interface (CGI) script program written in Perl language. This particular software imports the submitted data and after displaying the current computation on a HTML format, sends an additional notification copy of each result form via e-mail to a designated workstation. These files were then stored in American Standard Code for Information Interchange - tab separated values (ASCII TSV) files to be added into a customized database (Microsoft Access) for more accurate analysis, charting, and results reporting.

Responses obtained during a 60-day period (February and March 2000) were included for the study.

Duplicate respondents were identified and deleted based on e-mail addresses and Internet Protocol numbers (IP) assuring data integrity.

Results:

The survey elicited 459 unique responses. Of these, 378 (82.35%) were obtained directly from the World Wide Web via the Laparoscopy.com website, 61 responses (13.29%) were originated from Surginet while Sages members contributed to the survey with 20 (4.35%) responses. Most of the surgeons who responded to the survey were identified as male (96%) between the ages of 31-50 (79.25%) accessing the Internet mainly from their homes (67.10%) and from offices (17%) (Tables 1 & 6). Most respondents were general surgeons (61.44%) performing in the private sector as a “group” (28.76%) or as a “solo” (21.57%) practitioner, performing mostly a combination of general surgery and advanced laparoscopy cases (52.07%) (Tables 3, 4 & 7). The geographical distribution of the respondents is shown in Table 2.

The most frequently cited connection speeds available to link up to the Internet were 56 Kbps (Kilo-bits-per-second) (34.86%) and 33.6 Kbps (21.79%) (Table 5). Participants indicated that they use the Internet to increase their knowledge of general surgery (78.87%), to learn more about technologies related to the surgery practice (74.51%), to access Medline™ (73.20%) and to locate resources for academic purposes (prepare lectures, slides, articles) (68%). Few surgeons used the web for legal advice and/or liability issues (11.76%) (Table 8).

The majority of the surveyed professionals agreed that patients are using the Internet to seek more information about the disease and relative diagnosis (87%) and to clarify his/her physician's explanation (41%). Ninety one percent of all physicians were aware that patients seek information from the Internet regarding his/her disease (Table 9).

Approximately half of the surgeons surveyed responded positively about having access to or experience working with robotic assist devices in the operating room (53%) and most surgeons supported the use of technology for telementoring purposes (78%) (Tables 11-12). In addition, surgeons were asked about their interest in laparoscopic content, such as live surgery, grand rounds, lectures, continue medical education credits etc., offered as live streaming audio/video broadcast. Almost 80% professed an interest in this potential on-line feature and other on-line productions that might incorporate live stream video (Table 13)

Finally when asked regarding the credibility of information obtained on the Internet, most surgeons trusted the material retrieved based mainly on physicians' credentials and cited studies (71.68%).

Discussion

Less than a decade ago, few members of the general public were familiar with the Internet. While the Internet existed, access was limited primarily to academic communities. Over the years, the Internet has become available to all through commercial access. With this increased exposure, more sophisticated interfaces have been created and the medium has become a means of information broadcast as well as a tool for data collection and communication. The

proliferation of Internet Service Providers (ISPs) has enabled those outside of the academic community to work with personal computers to access this resource. Computer ownership and Internet access are growing trends. A June 1999 study found that 53% of households own a personal Computer (PC) (1). Seventy one per cent of PC users consider the Internet the most critical medium of communication following the telephone (1). Furthermore, 20% of individuals between the ages of 11 and 18 spend more time on-line than watching television. (1).

While some segments of the population are more likely to gain Internet access, the percentage of physicians with access to the Internet is growing. According to a recent study by the American Medical Association, 20% of physicians used the web in 1997. By 1999, this figure had grown to 37%. Additionally, 58% of those physicians who don't have access to the Internet plan on gaining access within the next year. (17). The Canadian Medical Association has reported that 66% of Canadian physicians had access to the Internet in 1999, up 10% from 1998. 42% of Canadian physicians indicated intent to obtain Internet connectivity within the next year. (8). Clearly, the Internet is being accessed by an increasing number of physicians who may be able to incorporate the use of this tool in their research and practice.

Historically, one of the tools used by physicians to collect data for information analysis has been the survey. Physicians have used surveys to gather information to identify trends, particularly within their specialties. Obtaining responses to surveys has long been a challenge within the medical community.

Among the diversity of formats and methodologies currently available, the Internet is being used with increasing frequency to achieve this purpose. There are many advantages to using a web-based survey: ease in formatting, breadth of distribution, response convenience for participants, automated data analysis and overall cost effectiveness in the absence of printing, postage and data entry fees. Web surveys are fast, and can be tabulated automatically as soon the respondent submits the form allowing a real time check while the study is in progress. However, this method of data collection is not free of flaws, as there is no available method of verifying the identity of those respondents who completed the survey using the website while surfing the Internet.

In this study, the figures shown in table 1 demonstrate that young male surgeons between the ages of 31 to 50 are the most frequent on-line end users. This is a useful base figure, particularly considering that the number of total "seniors" (age 50 and higher) online has nearly tripled over the last three years, from 5 million in 1997 to 14.2 million in 1999(21).

Approximately half of these respondents are in private practice and access the web from their homes. These practitioners represent a mixture of surgeons who perform general surgery and surgeons who perform advanced laparoscopic procedures (table 7). The survey did not attempt to segregate this group by specific surgical procedure performed.

Table 5 shows the different types of connectivity speed. It is clear that currently access to the Internet is mainly achieved using 33.6 and 56 Kbps modem. This data should be taken into consideration if multimedia content is to be delivered to the average user. A bandwidth capable of handling approximately 300 Kbps is

necessary to obtain an acceptable display of motion during the broadcast of high action video, as it is the case with laparoscopic surgical content.

As of today, systems capable of delivering such speed are achieved by:

1. Multiplexing (adding) 8 Integrated Services Digital Network (ISDN) channels (512 Kbps).
2. Satellites offer download and upload speeds of 400 Kbps and 56 Kbps respectively.
3. Asymmetrical Digital Subscriber Line (ADSL) that provides a maximum bandwidth of 6.144 Mbps downstream and 640 Kbps upstream,
4. Cable modems with download speeds between 3 – 30 Mbps and upload speeds that range between 128 Kbps to 10 Mbps.
5. T1-T3 are currently available lines as part of an institutional network or local access network (LAN) infrastructure.

When surgeons were asked about their views and use of the Internet, almost all of them agreed that the Internet might enhance surgical knowledge and academic work, particularly in the preparation and distribution of lectures or scientific manuscripts (Table 8). Only a small percentage (11.76%) of respondents use the Internet to seek legal information or examine liability issues. This is quite surprising, as the Internet is an overwhelming resource on topics related to these matters.

With the Internet growing exponentially, health care websites have been a very useful resource for patients. Medical information can be browsed and retrieved instantly. Furthermore, physicians from many specialties are available on-line ready to communicate with patients or colleagues regarding medical topics (15).

Most surgeons conveyed that patients use the Internet to obtain more information about his/her disease (86.71%) and to clarify their own physician's explanation of the disease treatment (40.96%).

Although there is adequate evidence regarding the beneficial use of robotic devices in the operating room (18), only 53.38% of the polled surgeons were in favor of incorporating such an apparatus into their practices. A significant group, almost 20%, did not agree with the use of robotics and the remaining 26% showed no bias for or against the use of robotics in surgery.

The feasibility of telementoring as a tool for those training in basic or advanced laparoscopy has already been successfully assessed. (20)(2). Unlike robotics, telementoring hardware proved to be much easier to set up and more cost effective (19). It is not surprising that telementoring was widely accepted by 78% of the polled surgeons in this study. No attempt, however, was made to identify if these physicians are interested in being telementors or telementees in the instruction of surgical procedures.

The quality of the content offered by health oriented web sites has been previously evaluated concluding that the searcher, particularly those without medical knowledge, should exercise caution when retrieving medical information as many of these resources provide incomplete content (6). However, in this survey 71.68% of surgeons trusted medical web-content based on the credentials of physicians and cited studies.

The final question queried surgeons regarding the use of streaming video to view on-going grand rounds, lectures and even surgical procedures in real time. Streaming technology allows end users to view multimedia content over a network overcoming the limiting factor of bandwidth. By using a buffer on the recipient side, the software (player) stores a few seconds of media content before starting to display video or sound on the recipient's computer screen. The end result is a smooth streaming multimedia content that automatically adjusts the way it is being delivered to the end user according to the bandwidth availability. This technology has been evolving since 1995 and has the potential to play a major role in surgical education (3), training (7), telementoring (9) and patient education (14). In our survey almost 80% of the respondents look favorably upon an interface capable of providing live broadcast of laparoscopic content over the Internet (table 13). Almost 20% of this group was not familiar with streaming video technology. The Internet has already proved to be a powerful resource for the physician, from presenting live conferences (16) and live surgical procedures, (5, 10, 12) to real time broadcast of patients' vital signs from a commercial aircraft (11)

The results of this study help to illustrate the powerful potential of a web based survey. Although on line surveys can be used as an efficient tool to base a decision making process, particularly for focused populations, it is important to point out that all respondents in this study belong to a biased group that is very familiar with the Internet and computer technologies and may not represent the surgical community as a whole. Other investigators have noted marginal

computer literacy among surgical residents and a great need for training among young surgeons in information technology (4).

Survey research has been an essential tool for evaluation within the medical community. However, achieving a significant response rate has always been a challenge. With the use of the Internet, the electronic survey demonstrates many features that help to overcome these challenges. With turnkey software packages, surveys are easy to design and post on the web. Through the web, the survey can be made available to specific target audiences without the cost of printing or postage. Web access to surveys provides respondents with convenient, private return methods. In turn, this data can be automatically analyzed, potentially minimizing the time, cost, and error rate of data entry. Additionally, the software provides the researcher with a convenient way to monitor responses through real time interactive reporting. Clearly, when aimed at target groups, online survey research can be very helpful in diagnosing and identifying trends, particularly within the surgical community.

Table 1.

Distribution of surgeon population by age
(Percentage of respondents, n = 459)

Age Group	
20 - 30	10.24%
31 - 40	39.65%
41 - 50	36.60%
50 - 60	11.33%
61 - 70	1.96%

Table 2.
Distribution of surgeon population by Country
Total number of respondents, n =459

Country	No. Responding
USA	101
BRAZIL	38
MEXICO	37
ITALY	33
INDIA	32
COLOMBIA	17
ARGENTINA	16
SPAIN	16
PORTUGAL	13
VENEZUELA	11
TURKEY	10
CANADA	9
EGYPT	9
UNITED KINGDOM	7
RUSSIA	7
POLAND	5
GREECE	5
CHILE	4
THAILAND	4
SAUDI ARABIA	4
Other	73

Table 3.**Surgical Specialty**

Total number of respondents, n = 459

Specialty	frequency
Surgery/Laparoscopy	61.44%
Surgery/Gynecology	11.76%
Surgery/Residency	6.54%
Surgery/Colo-Rectal	3.92%
Surgery/Oncology	3.49%
Surgery/Pediatric	2.83%
Surgery/Urology	1.96%
Surgery/Thoracic	1.96%
Surgery/Trauma	1.96%
Surgery/Breast	1.53%
Surgery/Vascular	1.09%
Surgery/Transplantation	0.87%
Surgery/Hand	0.44%
Surgery/Plastic	0.22%

Table 4.**Position**

Total number of respondents, n =459

Type of position	frequency
Staff - Surgeon (private - group)	28.76%
Staff - Surgeon (private - solo)	21.57%
Staff - Assistant Professor	15.47%
Resident	11.76%
Staff - Associate Professor	6.32%
Staff - Chairman	6.10%
Staff - Professor	5.01%
Fellow	5.01%

Table 5.
Connection Speed

Total number of respondents, n =459

Bandwidth	frequency
56.2 Kbps	34.86%
33.6 Kbps	21.79%
28.8 Kbps	13.29%
I don't know	11.11%
ISDN	7.41%
T1 - Intranet or greater	5.01%
ADSL	3.49%
14.4 Kbps	2.40%
9.6 kbps or less	0.65%

Table 6.**Accessing from:**

Total number of respondents, n =459

Location	frequency
Home	67.10%
Office	16.99%
Hospital	13.51%
Friend's computer	1.53%
Other	0.87%

Table 7.**Type of Practice**

Total number of respondents, n =459

Response	frequency
Mixture between GS and advanced laparoscopy	52.07%
Advanced laparoscopy	18.52%
Open general surgery	16.34%
Basic laparoscopy	13.07%

Table 8.**Use of Internet for:**

Total number of respondents, n = 459

Response	frequency
Increase Knowledge of GS	78.87%
Learn about technologies	74.51%
Access Medline	73.20%
Academic purposes	67.97%
Meet other physicians	28.32%
Post electronic brochure	25.27%
Legal advice and liability issues	11.76%

Table 9.**Surgeon believes patients surf the Internet because:**

Total number of respondents, n =459

Response	frequency
Patients wants more information about his/her disease	86.71%
Physician's explanation needed clarification	40.96%
Convenience of time and access of Internet information	34.42%
Privacy Issues	15.47%
I was not aware that patients search the Internet	8.93%

Table 10.**Do you trust medical information you retrieve on the Internet?**

Total number of respondents, n = 459

Response	frequency
yes, due to credentials of physicians and cited studies	71.68%
yes, due to presence of links for further information	30.94%
yes, due to the clarity and presentation	21.79%
yes, because existence of site sponsors	14.38%
No, I don't trust medical information on the Internet	8.50%
I don't have anywhere else to turn for medical information	3.05%
I have never used the Internet prior to this time	2.18%

Table 11.**Are you in favor of using robotic assist devices in the OR?**

Total number of respondents, n = 459

Response	frequency
yes	53.38%
No	20.70%
I don't know	25.93%

Table 12.**Are you in favor of telementoring**

Total number of respondents, n = 459

Response	frequency
yes	78.00%
No	10.46%
I don't know	11.55%

Table 13.**Would you be interested in laparoscopy content offered in "live" streaming video?**

Total number of respondents, n = 459

Response	frequency
Live Surgery	74.07%
Conferences	51.63%
Grand Rounds	38.34%
Morbidity and Mortality rounds	37.69%
CME	34.86%
patient education	26.80%
I don't know what streaming video is	20.26%
I am not interested	3.49%

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