Parents are reluctant to use technological means of communication in pediatric day care

[Les parents résistent à l'idée d'utiliser des moyens technologiques de communications dans les soins pédiatriques de jour]

Kimmo Murto FRCPC,* Gregory L Bryson FRCPC,□ Ibrahim Abushahwan MD,* Jim King FRCPC,\$ David Moher PhD,†§** Khaled El-Emam PhD,‡ William Splinter FRCPC*

Purpose: We hypothesized that advanced information and communication technology (ICT) would be acceptable to parents in a pediatric surgical, and diagnostic imaging day care setting.

Methods: After Ethics Committee approval, we distributed surveys, over a one-month period, to parents of children arriving for day care surgery or diagnostic imaging. Parents indicated their acceptance of various proposed modes of postoperative discussion of healthcare i.e.; face-to-face, videophone, or telephone. Parents were also asked to describe their receptiveness to scheduling non-emergency hospital appointments online and to receiving electronic media describing their child's surgery and postoperative management. Parental education, income, and familiarity with the Internet were also assessed.

Results: A total of 451 surveys (84% response rate) were returned. Most parents (95%) had access to the Internet and 70% did their banking online. Forty-two percent of the parents had at least a university education and 63% had an annual family income > \$50,000 Canadian. The majority of parents (98%) accepted face-to-face interaction, while only 35% and 37% of parents were receptive to videophone and telephone interviews, respectively. Computer availability ($P = 0.001$) and online banking ($P = 0.011$) were the only variables that predicted those parents who were in favour of using videophone technology. Parents were receptive to instruction electronic media (80%) and booking appointments online (61%).

Conclusions: A well-educated and technologically sophisticated parent population does not favour advanced communication technologies over simple, face-to-face interaction in an in-hospital setting. These parents are prepared to receive technology-based information about their child's surgery and to schedule non-emergency hospital appointments online.

CAN J ANESTH 2008 / 55: 4 / pp 214–222

Objectif : Nous avons émis l'hypothèse que des technologies d'information et de communication (TIC) avancées seraient considérées comme acceptables par les parents dans le contexte des soins de jour en pédiatrie chirurgie, et en imagerie diagnostique.

Méthode : Après avoir obtenu l'aval du comité d'éthique, nous avons distribué des questionnaires pendant un mois aux parents d'enfants admis pour des chirurgies ou des imageries diagnostiques aux soins de jour. Les parents ont indiqué leur acceptation de diverses méthodes proposées de discussion postopératoire des soins de santé, nommément : face à face, visiophone, ou téléphone. Nous avons également demandé aux parents de décrire leur réceptivité face à la prise de rendez-vous hospitaliers non urgents en ligne et à la réception de documents électroniques décrivant la chirurgie de leur enfant et la prise en charge postopératoire. La formation des parents, leurs revenus et leur aisance sur Internet ont aussi été évalués.

Résultats : Au total, 451 questionnaires (taux de réponse de 84 %) ont été retournés. La plupart des parents (95 %) bénéficiaient d'un accès Internet et 70 % effectuaient leurs transactions bancaires en ligne. Quarante-deux pour cent des parents avaient au moins une formation universitaire et 63 % affichaient un revenu familial annuel > 50 000 dollars canadiens. La majorité des parents (98 %) consentaient à une interaction face à face, alors que seulement 35 % et 37 % des parents considéraient, respectivement, le visiophone et les entrevues téléphoniques comme moyens de communication appropriés. L'accès à un ordinateur ($P = 0,001$) et les transactions bancaires en ligne ($P = 0,011$) constituaient les seules variables prédisant quels parents seraient réceptifs à l'utilisation d'un visiophone. Les parents jugeaient appropriés

From the Department of Anesthesiology,* Chalmers Research Group,† Research Institute‡ and Department of Pediatrics,\$ Children's Hospital of Eastern Ontario, the Department of Anesthesiology,□ The Ottawa Hospital, and the Department of Epidemiology and Community Medicine,** Faculty of Medicine, University of Ottawa, Ottawa, Ontario, Canada.

Address correspondence to: Dr. Kimmo Murto, Department of Anesthesiology Children's Hospital of Eastern Ontario, 401 Smyth Rd., Ottawa, Ontario K1H 8L1, Canada. Phone: 613-737-2431; Fax: 613-738-4815; E-mail: kmurto@cheo.on.ca

Source of funding: University of Ottawa Department of Anesthesia Chairman's Fund.

Conflict of interest: None identified by any author.

Accepted for publication October 31, 2007.

Revision accepted January 4, 2008.

l'envoi électronique de documents éducatifs (80 %) et la prise de rendez-vous en ligne (61 %).

Conclusions : *Une population de parents bien éduquée et à l'aise avec les technologies avancées ne préfère pas les moyens de communications à la fine pointe de la technologie en remplacement des interactions simples, face à face, dans un contexte hospitalier. Ces parents sont cependant prêts à recevoir des renseignements électroniques concernant la chirurgie de leur enfant et à prendre des rendez-vous hospitaliers non urgents en ligne.*

APPROXIMATELY 69% of Canadian households have access to a home computer^A and 60% have access to the Internet.^B As technology evolves, the consumer is confronted with a seemingly never-ending myriad of applications to everyday living. Information intensive sectors such as banking and government have embraced information and communication technology (ICT). Approximately 9–13% of their operating budgets are dedicated to ICT.¹ Telemedicine is the delivery of health care and the sharing of medical knowledge over a distance using ICT. It can be real time (synchronous) or prerecorded (asynchronous) and involves the transmission of various combinations of text, audio, and video signals. Typically, it is used to overcome significant geographical distances between the health care provider and the patient. Advances in wireless communications technology, the widespread availability of broadband data transfer, and the emergence of affordable, web-based, digital video systems have allowed novel medical applications to be explored and implemented.² The medical literature has numerous examples of telemedicine innovation across many specialties.^{3–7} Unfortunately, perioperative medicine specialists are not well represented.^{8–11} In the case of pediatric anesthesia, it is practically nonexistent.^{12,13}

Anesthesiologists, along with their surgical and nursing colleagues, need to evaluate the role of telemedicine in the perioperative environment to determine if it is a worthwhile pursuit. A methodical and evidence-based assessment will prevent cost overruns

and will avoid implementing unsustainable programs.

We recently completed a videophone-based, telemedicine pilot project involving the parents of 25 children undergoing day care surgery.¹² A videophone is a telephone which is capable of simultaneous audio and video signal transmission. Parents used them as a means of postoperative communication with their attending surgeon and/or recovery room nurse. Both feasibility and parent/provider satisfaction were established by means of this project; and a survey was developed to further explore the use of technology in this setting. Our objective was to describe the parents' level of acceptability of various proposed telemedicine modalities, exclusive of each other, in a postoperative day care setting. Modalities included videophones, telephones, instruction electronic media, and online appointment bookings. In addition, we wanted to establish the parents' level of comfort with, and exposure to, ICT. Our hypothesis was that the introduction of ICT in a pediatric day care hospital setting would be acceptable to parents and would be directly related to their level of comfort using ICT in their activities of daily living.

Methods

We designed a 17-question survey (Appendix) and an accompanying cover letter using the methods described by Dillman.¹⁴ To account for our francophone population, a hospital-based translator translated 25% of our surveys into French. The survey underwent face and content validation. It was reviewed by our anesthesia colleagues and by two members of the research team.¹⁵ Tests of reliability, including test-retest, intra-observer, and alternate form reliability and the associated correlation coefficients were determined for the English version of this tool.¹⁶ Fifteen individuals filled out the survey on two occasions, separated, on average, by a six-day interval. To avoid practice bias, the survey wording and the arrangement of the Likert scales were reordered on the second occasion.

The survey population was the parents of children undergoing day care procedures requiring general anesthesia in our tertiary care pediatric institution during September and October of 2005. The setting was two geographically distinct day care reception areas serving the main operating rooms and the magnetic resonance imaging/computed tomography suite, respectively. Upon arrival for the scheduled surgery or diagnostic test, the day care clerk provided each family with a personally signed cover letter, a numbered survey, and an opaque envelope for the completed survey. The consent was implied by reading the cover letter and by returning the completed survey. No sig-

A OECD Key ICT Indicators: Households with access to a home computer. Organization for Economic Development and Cooperation, 2006. Available from URL; <http://www.oecd.org/dataoecd/19/46/34083096.xls>. Archived at: <http://www.webcitation.org/5QLh1C9bv>.

B OECD Key ICT Indicators: Households with access to the Internet in selected OECD countries. Organization for Economic Development and Cooperation, 2006. Available from URL: <http://www.oecd.org/dataoecd/19/45/34083073.xls>. Archived at: <http://www.webcitation.org/5QLgvVT4D>.

nature was required and the parents were not given the opportunity to try the technology we were proposing in the survey. As an incentive, a \$3.00 parking voucher was provided on completion of the survey. The principal investigator collected completed surveys at the end of each day.

The survey results were entered into an Excel spreadsheet by a layperson not involved with the study. To assess the reliability of the keyed entered data, a secretary, not associated with the study, randomly chose 25 completed surveys and compared the responses to the data that had been entered. The data were transferred and analyzed using SPSS 13 (SPSS, Inc. Chicago IL, USA). The primary outcome evaluated was the parental acceptance of various modes of postoperative communication i.e., face-to-face, videophone, and telephone interactions. The secondary outcomes evaluated included the parental receptiveness to receive postoperative information and instruction media and to book hospital appointments online. In addition, we assessed the parents' access to a computer, hardware, and exposure to the Internet. Where appropriate, acceptability was ranked using a five-point Likert scale ranging from the number 1 "strongly favour" to number 5 "strongly oppose". A sixth point on the scale was labelled "no opinion". The definition of an individual's acceptance of, or receptiveness to, a technology was a Likert response ranging from "somewhat" to "strongly" in favour. In addition, we collected demographic data, including the age of the child, the type of surgery, previous hospital experience, and the education and income level of the parents.

We described all data as proportions or medians (interquartile range) and evaluated test-retest reliability using Cohen's Kappa and intraclass correlation coefficients. Demographic characteristics of study participants were compared with the Chi-squared statistic. Preferences between survey items were correlated using the Spearman's rho. A P value < 0.05 was considered statistically significant. We estimated our population size to be 8,000, representing the number of children who annually undergo day care surgery and diagnostic imaging procedures under general anesthesia. Based on a 60% parental approval of videophones in our previous pilot study in a similar setting, we assumed a maximum variation, that is, a 50/50 split between parents accepting the technology and those who would not. In addition, we felt that a sampling error of $\pm 5\%$ and a Z statistic, associated with a 95% confidence level, were acceptable. Using the formula outlined by Dillman and inserting the values previously described, we calculated our sample

TABLE I Acceptance of modes of postoperative interaction with health care professionals/services

<i>Mode of communication</i>	<i>Parents' acceptance of mode of communication median [interquartile range] (n = 451)</i>	<i>Parents who accept mode of communication n (% for given mode)</i>
Face-to-face	1 (1-1)	438 (98)
Videophone	3 (2-4)	150 (35)
Telephone	3 (2-4)	161 (37)
Instructional media	1 (1-2)	358 (80)
Book appointments online	2 (1-3)	274 (61)

Acceptance graded on a five-point Likert scale ranging from 1 "strongly favour" to 5 "strongly oppose". Scores of 1 "strongly favour" and 2 "somewhat favour" were pooled to identify those parents accepting the given mode of communication.

TABLE II Correlation of preference for videophone interview with other technologies

	<i>Face-to-face interview</i>	<i>Telephone interview</i>	<i>Book appointments online</i>	<i>Instructional media</i>
Videophone interview	Rho = -0.16 ($P = 0.01$)	Rho = 0.4 ($P = 0.01$)	Rho = 0.28 ($P = 0.01$)	Rho = 0.24 ($P = 0.01$)

Rho refers to the value of the Spearman's correlation for non-parametric data.

size to be 366 children.¹⁷

Results

Review of the test scores of the 15-member validation cohort revealed consistent answers on demographic characteristics (items 2-6, 9, 10, 14-17). Where degree of acceptance was expressed using Likert scales, repeat testing revealed statistically significant ($P < 0.05$) intraclass correlation coefficients that varied between 0.471 for item 1B (acceptance for videophone), and 0.832 for item 7 (comfort with Web). Review of the inputted raw data of 25 surveys did not show any discrepancies. To avoid confusion with data input, we treated the phrased responses "neither favour nor oppose" and "no opinion" as having the same meaning.

We identified a total of 572 potential day care candidates and 94 potential diagnostic radiology candidates during the trial period. A total of 451 (84%) surveys were returned out of the 538 administered. Day care accounted for 392 (87%) of the responses and diagnostic radiology had 59 (13%) replies. Francophone responses totalled 111 (25%) of all completed surveys. During the first few days it became apparent that the

day care ward clerk and the diagnostic radiology staff were having difficulty distributing the surveys to consecutive families. Compliance improved after several reminders and after transferring the responsibility from the diagnostic radiology staff to their clerk. Funding for the \$3.00 parking vouchers was limited to 400 in total, to reflect our proposed sample size (366). Many families chose not to redeem the vouchers, allowing an additional 138 survey packages to be handed out. The larger sample size did not reduce our sampling error when using the formula referenced previously. It was not possible to identify those families who chose not to respond to the questionnaire.

Of the respondents: 91% had access to a computer; 92% had access to a CD-ROM and a DVD player; 95% had access to the Internet; over 90% of parents were comfortable using the Internet and e-mail; and 70% of the respondents did their banking online. Many parents (42%) had at least a university education and 63% had a family income greater than \$50,000 per year. The median child's age bracket was two to five years of age. Only 52% of the children had previous hospital experience. Parents were receptive to receiving postoperative instruction electronic media (80%) and booking appointments online (61%).

When considered individually, postoperative face-to-face interaction with the most responsible health care workers was deemed acceptable by 98% of parents, while only 35% and 37% of parents were receptive to videophone and telephone interaction, respectively (Table I). There was no difference in receptiveness to the various modes of communication between the parents of children undergoing surgical vs diagnostic radiology procedures. Several variables were evaluated to predict which parents were accepting of videophone technology. Variables evaluated included access to a computer and associated hardware, familiarity with the Internet, use of online banking, the child's age, previous hospital experience, and parental education and income. Only computer availability ($P = 0.001$) and online banking ($P = 0.011$) predicted those parents who were in favour of using videophone technology. A weak negative correlation between interest in videophone technology and preference for face-to-face interviews was identified (Table II). In addition, a weak positive correlation was identified when interest in videophone technology was compared with preference for telephone interviews and use of other technology modalities.

Discussion

The respondents were technologically advanced, educated, and had a high standard of living. Except for

online banking, these factors were not associated with accepting advanced ICT interaction with their child's health care providers in the postoperative day care setting. The child's age and previous hospital experience had no impact as well. Only 35% of parents were receptive to using a videophone in this environment. Approval of technology in health care and non health care settings was associated with approval of videophone technology.

Our sample of parents had a less enthusiastic response to the use of videophones compared to our previous pilot study trialing them in the same environment.¹² In our pilot study, the parents and the attending surgeon and/or recovery room nurse of 25 children undergoing minor day care surgery evaluated an in-hospital videophone system as a means of postoperative communication. Other than audio clarity, parents had a more favourable impression of the technology compared to staff. In addition, 62% of staff and 60% of parents (in contrast to 35% of our survey population) recommended promoting this technology in hospital. This difference could be explained by our survey's inability to accurately portray a technology that may very well have been unfamiliar to the parents. This unfamiliarity was reflected by the relatively weak negative correlation coefficient (-0.16) between a preference for the videophone interview and face-to-face interaction. It is generally accepted that a correlation coefficient less than -0.7 represents a good negative correlation. In addition, the experience of new and innovative technology might have accounted for the increased appeal of this technology in the pilot study. It seems that the public's perception of a relatively unfamiliar technology may be significantly different compared to the actual experience. This is in keeping with the literature that conveys a general patient satisfaction with telemedicine when implemented.¹⁸

There is very limited data describing the use of telemedicine to replace real-time, face-to-face interactions in the postoperative setting. Ellison *et al.*² describe a randomized controlled trial of telerounding and its impact on adult patient satisfaction with postoperative care. A total of 85 patients undergoing elective laparoscopic or percutaneous urologic procedures were enrolled in one of three interventions of their study. The control intervention had twice daily bedside visits by the fellows and the residents, with the attending staff person only in attendance during the morning visit. The second intervention was the same, but, in addition, the staff person attended the afternoon round using a wireless laptop. The third intervention was the same as the control, but, starting on the second day, the staff person attended twice-daily, bedside

visits using a wireless laptop mounted on a remotely controlled service robot. The majority of patients thought their care was equivalent to, or better than, care they would have received with standard rounds. In contrast to our survey findings, but similar to our pilot project, 77% of patients were in favour of promoting this technology in hospital.

Videophones could facilitate the postoperative management of children in hospital. There is literature demonstrating that the assessment of patients and the provision of management instructions to remote health care workers through audio and visual media are feasible, safe, and beneficial to the patient.^{5,13} It has been shown that the electronic intensive care unit (ICU), a central station dedicated to the monitoring of multiple remote ICU patients, reduces patient mortality and hospital stay.¹⁹ In addition, more frequent contact with patients by physicians has been shown to reduce hospital length of stay.²⁰ It could be conceivable for videophone technology to assess children suffering postoperative complications in the day care area and to provide management instructions to staff. Also, ICT may facilitate the attending anesthesiologist's or surgeon's reassessment of a patient with the parents prior to discharge, without disrupting the ongoing flow of surgical patients. Finally, patients under quarantine could be managed using ICT, limiting the risk of infectious exposure to attending health care workers.

Telemedicine and instruction media may play a role in influencing care after discharge from hospital.²¹ Eighty percent of our population was receptive to receiving instruction media (CD Rom or DVD) pertaining to the postoperative care and management of their child. This media could contain Internet-links to associated sites to further enhance the parents' means to manage their child postoperatively. The psychology literature suggests that verbal instructions relayed to an individual over a video screen are better retained compared to those acquired from a face-to-face interaction.²² Perhaps many of the distracting, nonverbal cues that occur during conversation are filtered out. Also, it is impossible for two individuals to speak and to hear each other at the same time. This allows for the clear transmission of instructions, which could prevent unnecessary postoperative phone calls or visits to the emergency room. In some European centres audiotapes of consultations are provided to patients for future reference.²³ It would seem logical that physicians, knowing their conversations were going to be recorded, would be inclined to raise the standard of the information relayed to the benefit of the patient. When relaying information to families, interactive visual media may be more attractive and more inter-

esting to review than simply reading a pamphlet.

Most parents surveyed were receptive to booking their own non-emergency hospital appointments online. We are unaware of any hospitals that provide this service to their patients. Parents scheduling postoperative follow-up and preoperative assessment clinic appointments could benefit by increased flexibility around their work schedule. The booking of preoperative assessment appointments could be linked to a patient questionnaire that, upon completion, would be linked to the appointment. Screening of the questionnaires could be used as a means to determine which patients require assessment in person, by videophone, or via email.²⁴ A nominal fee, associated with the online booking of appointments and the completion of the screening questionnaire, could be implemented to allay the upfront and maintenance costs of this technology.

Videophone technology has a role in the preoperative management of children. Various pediatric specialties have found telemedicine consultation to be a cost-saving and an acceptable method of assessing patients in geographically remote locations.²⁵ Some Canadian tertiary care based anesthesiologists provide preoperative videophone assessment of children in remote communities, but literature is lacking. Licensure and hospital privilege requirements need to be fulfilled before consultation can proceed. The preoperative airway exam is facilitated by an airway camera and auscultation of the heart and lungs is made possible by a digital electronic stethoscope. Typically, an encrypted, private, provincial Internet network ensures patient confidentiality and secure data storage. In Ontario, the physician seeks reimbursement from the Ontario Telemedicine Network, an organization funded by the Ontario Ministry of Health.

The implementation of preoperative instruction media for parents of children undergoing surgery is relatively common. Most Canadian tertiary care pediatric centres, including our own, have some form of a web accessible, interactive, preoperative virtual tour that includes information regarding anesthesia. However, the impact on anxiety, retention of perioperative information, and postoperative outcomes are limited.²⁶ Parental use of the Internet to educate themselves about their child's condition is widespread.²⁷ Health care professionals can ensure that parents have access to quality and accurate information by being involved in its development and its distribution.

It is apparent that telemedicine studies, using proper economic analysis and establishing effectiveness under routine conditions, are required before more widespread adoption of this technology is pos-

sible.^{28–31} Telemedicine used in the postoperative period is no exception. Reluctance to adopt telemedicine is reflected by the status of budgetary spending on ICT in Canadian hospitals. In Canada, hospitals spend only 1.8–2.5% of their budgets on ICT, which is low compared to other nations.³² There is evidence to suggest that these expenditures are continuing to decline.^C That being said, teleradiology, home based telemedicine monitoring of patients with chronic disease, and remote monitoring of intensive care patients have been shown to be economical and clinically efficacious models.^{4,33,34}

Our survey has several limitations. Our respondents' experience with technology was not typical. They had greater exposure to computers and to the Internet, when compared to the national average. This is the result of prominent government and technology work sectors in our city. However, their preference for face-to-face interaction over ICT emphasizes that comfort with technology does not equate to its acceptance in an in-hospital based setting. At the time that the survey was designed, it was assumed that the prevalence of videophone use was very limited and it would not be a useful variable to predict acceptance in the setting we proposed. The prevalence of online banking was thought to be a better surrogate marker for videophone adoption. Our results suggest that this may be the case; but we were unable to make any firm conclusions. One could question the validity of a parent's assessment of technology (videophone) that they may not have personally experienced. However, they routinely encounter similar applications used in the media, for example, a news anchor communicating with an onsite reporter. We felt the familiarity of this technology, through television, was adequate to imagine its use in a day care setting.

Another concern was our inability to identify those individuals who chose not to respond to the survey. Also, the responses we received could have resulted from a single parent, a consensus of two parents, or, perhaps, a caregiver who may not have been related to the child. Our reliability coefficient for the survey was based on the response of one individual who was a parent of the child in question. It is difficult to determine whether these issues would have had an impact on the quality of our responses. Our high response rate and a sampling error of $\pm 5\%$, at the 95% confidence level, likely reduced the impact of these concerns. Also, in our institution, the incidence of

parents not accompanying their children is less than 1%. Another concern was whether our patient population represented the various surgical specialties in our hospital. Unfortunately, the question identifying the specialist involved with the child's care was misinterpreted and, therefore, unusable as a variable for analysis. However, the survey was distributed during the months of September and October, because all of the day care surgical specialties were adequately represented at that time. Finally, we did not document if the parents completed the survey before or after their child's procedure. The impact of a child's recovery in day care on their parent's acceptance of ICT is unknown.

We did not seek feedback from health care providers themselves. As seen in our previous pilot study, their support for videophones was similar to the parent population. However, concerns were raised about technology depersonalizing the doctor/patient interaction. Billing, liability, and ethical issues, especially those concerning the impact on doctor/patient interaction, limit widespread adoption of telemedicine by health care workers. This apprehension is not unlike concerns raised when telephone use, now a staple in health care delivery, was viewed in a similar light many years ago. It was felt that using a survey to establish the public's perception and acceptance of technology was the logical first step to identifying research questions that would eventually involve the health care provider.

Conclusions

In the postoperative day care setting, parents favour face-to-face interaction with health care workers over telemedicine based communication. The parents' degree of comfort with technology, level of education, and standard of living do not appear to influence this preference. Parents are receptive to receiving postoperative instruction media and to booking non-emergency hospital appointments online. A formal assessment of telemedicine in this setting should include the evaluation of clinical efficacy and effectiveness, cost effectiveness, patient and provider satisfaction, quality of care, and organizational issues. Also, one should assess the educational opportunities this technology can provide for training future health care workers in clinical based settings. From the providers' perspective, obstacles to address include remuneration, regulatory and medico-legal issues, depersonalization of the physician/patient encounter, and technical standards.

C Irving R. 2003 Report on IT in Canadian Hospitals: Canadian Healthcare Technology; 2003.

Acknowledgements

We would like to thank Mrs. Suzanne Schwarz for inputting the data and Dr. Uwe Schwarz for facilitating the data entry. We would like to thank our clerks, Nicole Barrette and Chantal Delasalle, for distributing the surveys.

References

- 1 Prada G, Roberts G, Vail S, et al. Understanding Health-Care Cost Drivers and Escalators: The Conference Board of Canada, Alberta; 2004. Available from URL; www.health.gov.ab.ca/resources/publications/conference_board.pdf (accessed December, 2007).
- 2 Ellison LM, Pinto PA, Kim F, et al. Telerounding and patient satisfaction after surgery. *J Am Coll Surg* 2004; 199: 523–30.
- 3 Currell R, Urquhart C, Wainwright P, Lewis R. Telemedicine versus face to face patient care: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev* 2000; (2): CD002098.
- 4 Hersb WR, Helfand M, Wallace J, et al. Clinical outcomes resulting from telemedicine interventions: a systematic review. *BMC Med Inform Decis Mak* 2001; 1: 5.
- 5 Heinzelmann PJ, Williams CM, Lugn NE, Kvedar JC. Clinical outcomes associated with telemedicine/telehealth. *Telemed J E Health* 2005; 11: 329–47.
- 6 Bensink M, Armfield N, Russell TG, Irving H, Wootton R. Paediatric palliative home care with internet-based video-phones: lessons learnt. *J Telemed Telecare* 2004; 10(Suppl. 1): 10–3.
- 7 Flewelling C, Ingram CA. Telepediatrics in Canada: an overview. *Telemed J E Health* 2004; 10: 357–68.
- 8 Wong DT, Kamming D, Salenieks ME, Go K, Kohm C, Chung F. Preadmission anesthesia consultation using telemedicine technology: a pilot study. *Anesthesiology* 2004; 100: 1605–7.
- 9 Dorman T. Telemedicine. *Anesthesiol Clin North America* 2000; 18: 663–76.
- 10 Jacques PS, France DJ, Pilla M, Lai E, Higgins MS. Evaluation of a hands-free wireless communication device in the perioperative environment. *Telemed J E Health* 2006; 12: 42–9.
- 11 Cone SW, Gebr L, Hummel R, Merrell RC. Remote anesthetic monitoring using satellite telecommunications and the internet. *Anesth Analg* 2006; 102: 1463–7.
- 12 Murto K, Chowdary K, Abushabwan I, et al. A pilot study: videophones in a pediatric day care setting. *Can J Anesth* 2005; 52: A104 (abstract).
- 13 Miyasaka K, Suzuki Y, Sakai H, Kondo Y. Interactive communication in high-technology home care: video-phones for pediatric ventilatory care. *Pediatrics* 1997; 99: 1–6.
- 14 Dillman DA. Chapters 1–4. In: Dillman DA (Ed.). *Mail and Internet Surveys. The Tailored Design Method*, 2nd Ed. NY: John Wiley & Sons Inc.; 2000: 3–193.
- 15 Litwin MS. Validity. In: Litwin MS (Ed.) *The Survey Kit TSK 7. How to Measure Survey Reliability and Validity*. CA: Sage Publications, Inc.; 1995: 33–45.
- 16 Litwin MS. Reliability. In: Litwin MS (Ed.) *The Survey Kit TSK 7. How to Measure Survey Reliability and Validity*. CA: Sage Publications, Inc.; 1995: 5–31.
- 17 Dillman DA. Reduction of coverage and sampling errors. In: Dillman DA (Ed.). *Mail and Internet Surveys. The Tailored Design Method*, 2nd Ed. NY: John Wiley & Sons Inc.; 2000: 194–213.
- 18 Mair F, Whitten P. Systematic review of studies of patient satisfaction with telemedicine. *BMJ* 2000; 320: 1517–20.
- 19 Rosenfeld BA, Dorman T, Breslow MJ, et al. Intensive care unit telemedicine: alternate paradigm for providing continuous intensivists care. *Crit Care Med* 2000; 28: 3925–31.
- 20 Diamond HS, Goldberg E, Janosky JE. The effect of full-time faculty hospitalists on the efficiency of care at a community teaching hospital. *Ann Intern Med* 1998; 129: 197–203.
- 21 Miller EA. The technical and interpersonal aspects of telemedicine: effects on doctor-patient communication. *J Telemed Telecare* 2003; 9: 1–7.
- 22 Jacobsen SE, Sprenger T, Andersson S, Krogstad JM. Neuropsychological assessment and telemedicine: a preliminary study examining the reliability of neuropsychology services performed via telecommunication. *J Int Neuropsychol Soc* 2003; 9: 472–8.
- 23 Liddell C, Rae G, Brown TR, Johnston D, Coaes V, Mallett J. Giving patients an audiotape of their GP consultation: a randomised controlled trial. *Br J Gen Pract* 2004; 54: 667–72.
- 24 Borowitz SM, Wyatt JC. The origin, content, and workload of e-mail consultations. *JAMA* 1998; 280: 1321–4.
- 25 Dick PT, Filler R, Pavan A. Participant satisfaction and comfort with multidisciplinary pediatric telemedicine consultations. *J Ped Surg* 1999; 34: 137–42.
- 26 Kain ZN, Caldwell-Andrews AA, Mayes LC, et al. Family-centered preparation for surgery improves perioperative outcomes in children: a randomized controlled trial. *Anesthesiology* 2007; 106: 65–74.
- 27 Sim NZ, Kitteringham L, Spitz L, et al. Information on the World Wide Web – how useful is it for parents? *J Pediatr Surg* 2007; 42: 305–12.
- 28 Hailey D. The need for cost-effectiveness studies in

- telemedicine. *J Telemed Telecare* 2005; 11: 379–83.
- 29 Whitten PS, Mair FS, Haycox A, May CR, Williams TL, Hellmich S. Systematic review of cost effectiveness studies of telemedicine interventions. *BMJ* 2002; 324: 1434–7.
 - 30 Reardon T. Research findings and strategies for assessing telemedicine costs. *Telemed J E Health* 2005; 11: 348–69.
 - 31 Abenstein JP. Technology assessment for the anesthesiologist. *Anesthesiol Clin* 2006; 24: 677–96.
 - 32 Prada G, Grimes K, McCleery A, *et al.* Challenging Health Care System Sustainability: Understanding Health System Performance of Leading Countries: The Conference Board of Canada; 2004. Available from URL; www.health.gov.ab.ca/resources/publications/conference_board2.pdf (accessed December, 2007).
 - 33 Hailey D, Ohinmaa A, Roine R. Study quality and evidence of benefit in recent assessments of telemedicine. *J Telemed Telecare* 2004; 10: 318–24.
 - 34 Roine R, Ohinmaa A, Hailey D. Assessing telemedicine: a systematic review of the literature. *CMAJ* 2001; 165: 765–71.

Appendix

1. Below we have listed three possible means of speaking with your doctor or nurse (while they are in the hospital) after your child's surgery or procedure. Please indicate the extent to which you would favour or oppose each of these methods?

A) Face-to-face conversation

- ☐ Strongly favour
- ☐ Somewhat favour
- ☐ Neither favour nor oppose
- ☐ Somewhat oppose
- ☐ Strongly oppose
- ☐ No opinion

B) Videophone

- ☐ Strongly favour
- ☐ Somewhat favour
- ☐ Neither favour nor oppose
- ☐ Somewhat oppose
- ☐ Strongly oppose
- ☐ No opinion

C) Telephone

- ☐ Strongly favour
- ☐ Somewhat favour
- ☐ Neither favour nor oppose
- ☐ Somewhat oppose
- ☐ Strongly oppose
- ☐ No opinion

2. Do you have access to a computer?

- ☐ No → SKIP to 10
- ☐ Yes

3. (If yes) Where do you MOST often access a computer?

- ☐ Home
- ☐ Work
- ☐ Library
- ☐ School
- ☐ Other _____ (specify)

4. Regarding the computer you use the most. Which of the following devices does it have?

- ☐ Floppy disk
- ☐ CD-ROM
- ☐ DVD player

5. Do you routinely access the Internet?

- ☐ No → SKIP to 10
- ☐ Yes

6. (If yes) Please indicate the Internet connection you have.

- ☐ Dial-up
- ☐ High-speed

7. How would you rate your level of comfort using the Internet?

- ☐ Excellent
- ☐ Good
- ☐ Fair
- ☐ Poor

8. How would you rate your level of comfort using electronic mail (e-mail)?

- ☐ Excellent
- ☐ Good
- ☐ Fair
- ☐ Poor

9. Do you perform your banking online over the Internet?

- ☐ Yes
- ☐ No

10. Do you have a DVD player that is connected to your television set?

- ☐ Yes
- ☐ No

11. Please indicate the extent to which you favour or oppose receiving an informational DVD or CD-ROM containing Internet links and general information about your child's surgery and postoperative management.

- ☐ Strongly favour
- ☐ Somewhat favour
- ☐ Neither favour nor oppose
- ☐ Somewhat oppose
- ☐ Strongly oppose
- ☐ No opinion

12. Which of the following best describes the extent to which you favour or oppose the option of booking non-emergency hospital appointments online?

- ☐ Strongly favour
- ☐ Somewhat favour
- ☐ Neither favour nor oppose
- ☐ Somewhat oppose
- ☐ Strongly oppose
- ☐ No opinion

The following questions are designed to provide background information on the parents/caregivers and their children (patients) that have completed this survey.

13. Please indicate the medical or surgical specialist that will be performing the surgery or procedure on your child (patient).

- ☐ Anesthesiology
- ☐ Cardiac Surgery
- ☐ Cardiology
- ☐ Dentistry
- ☐ Ear, Nose and Throat
- ☐ Endocrinology
- ☐ Gastroenterology
- ☐ General Surgery
- ☐ Gynecology
- ☐ Neurology
- ☐ Neurosurgery
- ☐ Ophthalmology
- ☐ Orthopedics
- ☐ Plastic Surgery
- ☐ Radiology
- ☐ Respiriology
- ☐ Rheumatology
- ☐ Urology

14. Is this the first time your child (patient) has needed to come to the hospital for surgery or a procedure?

- ☐ Yes
- ☐ No

15. What is the age of your child (patient)?

- ☐ 0-1 year
- ☐ 2-5 years
- ☐ 6-12 years
- ☐ 13-18 years
- ☐ Over 18 years

16. Please indicate your (parent/caregiver) highest level of education achieved.

- ☐ Elementary School
- ☐ High School (or equivalent)
- ☐ College (or equivalent)
- ☐ University
- ☐ Postgraduate

17. Which of the following categories describes your household income?

- ☐ \$10,000 or less
- ☐ \$10,001-\$20,000
- ☐ \$20,001-\$35,000
- ☐ \$35,000-\$50,000
- ☐ \$50,001-\$100,000
- ☐ \$100,001 or more