How evidence-based are CAGS surgeons really?

Chris de Gara, MB

Please don't confuse me with the fact—my mind is already made up!
–anonymous

Evidence-based medicine is now ubiquitous. Since the pioneering work of Sackett[1] in defining best evidence, there is now a plethora of meta-analyses, clinical practice guidelines (www.guideline.gov) and Cochrane Database Reviews (www.cochrance.org), as well as the Canadian Association of General Surgeons' (CAGS) own evidence-based Web page (www.cags-accg.ca). Surgeons have tended to lag behind our medical colleagues in generating level 1 evidence. There are, no doubt, many reasons for this, including the appropriateness and validity of randomizing a single surgeon or multiple surgeons to 2 procedures. Simpler and more methodologically feasible drug A versus drug B questions are of less interest to the surgical community. With improved outcomes, event rates may be so low that studies are underpowered and prone to type 2 error. Even when differences are identified, how clinically meaningful is a statistical reduction, for example, of half a day in the length of stay after appendectomy?[2] Perhaps what is more important is the reality that significant changes in clinical practice become the standard of care without ever having been tested in a randomized study; laparoscopic cholecystectomy is a good example.

However, many studies do provide level 1 and incontrovertible evidence through multiple studies and meta-analyses. These include deep vein thrombosis (DVT) prophylaxis, preoperative wound antibiotic prophylaxis, drain usage in colorectal surgery, double gloving, abdominal facial closure, hospital and surgeon outcome volume data, nasogastric tube use in elective gastrointestinal (GI) surgery and preoperative bowel preparation in colorectal surgery.

At the 2004 CAGS meeting in Ottawa, a 13-item questionnaire was pretested by 30 general surgeons, and appropriate modifications were made to the final survey. In addition to such demographic questions as sex, years of practice, place and size of community of practice, type of appointment, and trauma and general surgical call, the surgeons were asked to identify which procedures they did not perform in their practice, what personal protection they wore in the operating room, and what skin preparation, fascial wound closure and perioperative prophylactic procedures they routinely used.

Subsequently, the survey was emailed to the 925 full members of CAGS with the option to respond by email, fax or mail. The survey was resent by email on 2 occasions, December 12, 2004 and February 10, 2005.

We received 197 completed responses, for a response rate of 21.3%. Responses were received from surgeons from every province in Canada, with 77% working in communities of more than 100 000 people, 8% working in communities of 50 000–100 000 people, and 13% working in communities of less than 50 000 people. The surgeons indicated that they had been in practice for a mean of 14.7 (median 14) years. Most (89%) respondents were male with 25% indicating no appointments, 30% indicating clinical faculty, and 44% indicating full-time university appointments. The most common call frequency (18%) was 1 in 5, with almost 50% of surgeons indicating that they did either a 1 in 4, 1 in 3 or 1 in 6 call. For 52% of respondents, trauma was part of their call commitment.

The least common procedure carried out by CAGS surgeons was

Department of Surgical Oncology, Cross Cancer Institute, University of Alberta, Edmonton, Alta.

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Correspondence to: *Dr. Chris de Gara, Department of Surgical Oncology, Cross Cancer Institute, 11560 University Ave., Edmonton AB T6G 1Z2; fax 780 432-8333; chrisdeg@cancerboard.ab.ca*

bariatric surgery, with only 5% performing this procedure. Cesarean section, elective and emergent aortic aneurysm surgery and vascular surgery were all procedures that were significantly more ($p < 0.05$) likely to be carried out by surgeons working in communities of less than 50 000 people and having no university faculty appointment. Sentinel node procedures and amputation were also infrequently performed (20%–30% of surgeons). Hepatectomy was generally performed (28%) by surgeons with full-time appointments ($p = 0.007$) and in larger communities ($p = 0.007$). Whipple's procedure was carried out by 32% of surgeons, mainly by those who had been in practice longer. Faculty appointment was not significantly associated but smaller community size meant surgeons were less likely to perform this procedure. Laparoscopic inguinal hernia surgery tended to be performed by female surgeons in smaller communities ($p < 0.04$). The most likely procedure to be performed was laparoscopic appendectomy (82% of surgeons surveyed). However, 55% of surgeons did not carry out laparoscopic colectomy or colostomy. Gastroscopy was performed by 70% of surgeons (significantly more in small communities $p < 0.000$) and colonoscopy by 66%, of whom most were younger surgeons ($p = 0.015$) without a faculty appointment ($p = 0.009$) and working in a smaller community ($p = 0.002$).

Some form of eye protection is worn by 75% of surgeons. There were no significant differences between the various subgroups. Only 33% of surgeons wore double gloves, with surgeons in practice for less than 10 years being significantly ($p = 0.02$) more likely to do so.

Continuous polydioxane (PDS) closure is used by 60% of surgeons, who are most likely to have a full-time appointment ($p < 0.01$) and to have been in practice less than 10 years ($p = 0.03$). Sex and community size did not appear to affect closure technique. Vicryl continuous closure is employed by 22% of surgeons, often in smaller communities ($p = 0.02$). Continuous nylon or prolene suture, interrupted vicryl, interrupted PDS and interrupted nylon or prolene suture were all employed by less than 20% of surgeons, and there was no significant difference in use between groups.

Some form of mechanical bowel preparation is employed by 92% of surgeons, with 93% indicating the use of preoperative antibiotic prescription and 46% employing postoperative prophylactic antibiotic dosing. No significant differences existed between groups. Pre- and postoperative low-dose heparin is prescribed by 84% of surgeons, whereas 40% used pre- and postoperative TED (anti-embolism) stockings, and 40% prescribed pneumatic compression devices.

When asked whether a nasogastric tube would be used in an elective, uncomplicated, colorectal surgical procedure, 18% indicated yes, with sex, appointment type and community size not being significantly different. Surgeons in practice longer than 10 years tended to do this more often ($p < 0.01$). With regard to drain usage in elective colon surgery, only 5% of surgeons indicated that they do this. However, 26% used a drain in elective rectal surgery, irrespective of the number of years in practice and sex not being significantly different. Surgeons working in communities of fewer than 50 000 people are more likely to insert a drain ($p < 0.01$), whereas those with a full-time appointment are less likely to use a drain ($p < 0.0001$).

According to John Adams' (1735–1826) argument in defense of the soldiers in the Boston Massacre Trials in December 1770,

> facts are stubborn things, and whatever may be our wishes, our inclinations, or the dictates of our passion, they can not alter the state of facts and evidence.

Evidence-based medicine is a relatively new addition to the academic armamentarium. Surgeons have always used evidence to guide clinical practice; however, the sources of such evidence tended to combine training, anecdote and experience. The concept of best (level 1) evidence[1] has been less enthusiastically embraced by the surgical community. Conversely, when medical oncologists are presented with a well-conducted and appropriately powered randomized study, they rapidly adopt the favoured regime.

Whereas a sample of almost 200 subjects might only represent 20% of active Canadian general surgeons, the demographic data would tend to suggest an adequate sampling of the general surgical community. The higher proportion of respondents with full-time appointments may not be as representative, given the larger proportion of community surgeons within the country. However, one might reasonably expect that full-time university faculty would be more evidence-based oriented than nonfaculty surgeons. Although the response rate was poor, physician survey response rates rarely exceed 50%, at best, indicating the extent of nonrespondent bias.[3]

The data presented provide a snapshot of the attitude toward evidence from a considerable number of CAGS surgeons.

Numerous studies have outlined the relation between surgeon hospital volume and patient outcome. Hannan and colleagues[4] discussed the fact that cholecystectomy was hospital-volume-related, whereas the outcomes for coronary aortic bypass grafting, aortic aneurysm surgery, gastrectomy and colectomy were related to physician volume. Similarly, Urbach and colleagues[5] compared operating room mortality in high- versus low-volume Ontario hospitals between 1994 and 1999. Findings indicated that lives could be potentially saved if esophagectomy, pancreatectomy and aortic aneurysm surgery were carried out in high-

volume hospitals only; colon and rectal surgery did not need to be carried out in high-volume institutions. Using a negative question style, we had hoped to identify which general surgeons had consciously elected not to carry out certain operative procedures that may still be considered part of the general surgeons' armamentarium. Although bariatric surgery[6] has been shown in multiple level 1 studies to have a major impact on patient outcomes, it is not surprising that this relatively new, resource intensive and complex surgery would only be carried out by 5% of general surgeons. Similarly, it is not surprising that cesarean section, emergent and elective aortic aneurysm surgery and vascular surgery are carried out by surgeons in smaller communities with no faculty appointment. Considering the novelty of the procedure and the need for credentialing, it is not surprising that two-thirds of general surgeons do not perform sentinel node biopsy. This will, however, likely be a short-lived observation, because most current general surgical residents are being trained in these procedures. With the subspecialization of hepatobiliary pancreatic surgery, the observation that less than one-third of general surgeons perform liver surgery, and that those who do are full-time surgeons in larger communities, was anticipated. The same is true for esophageal resection and Whipple's procedure with the latter, following best evidence, in not being carried out in smaller communities. In general surgery, more than 80% of surgeons are performing laparoscopic appendectomy, but with regard to colectomy and colostomy, the laparascope is used by around 50%. The finding that most general surgeons carry out gastroscopy and colonoscopy was also anticipated.

The topic of personal protection in the operating room has been in the literature for well over 15 years. Patz and Jodrey[7] observed that the risk of a healthcare worker acquiring HIV after a single percutaneous stab was 0.3% to 0.4%; for hepatitis B, 30%; and for hepatitis C, 2.7% to 10%. In the *Australian and New Zealand Journal of Surgery* in 1990, Gani and colleagues[8] demonstrated that the risk of a single glove perforation was 21% but was only 2.5% when 2 pairs of gloves were worn. The technique of double gloving reduced blood contamination of the hands of the operator from 13% to 2%.[9] Dodds and colleagues[10] demonstrated that the average operating room glove perforation rate was 35%, which increased to 58% if the procedure lasted longer than 5 hours. Finally, the incidence of eye splashes is 3% when no eye protection is worn but is virtually nil if a shield or goggles are worn.[11,12] Over 70% of CAGS surgeons indicated that they routinely wear eye protection, and there was no difference between subgroups. Regarding double gloving, only one-third of CAGS surgeons followed this practice, whereas those who had been in practice for less than 10 years were more likely to wear double gloves.

There have been numerous studies on the ideal abdominal closure (suture and technique) for midline laparotomies. An important meta-analysis was published by Hodgson and colleagues in the *Annals of Surgery*.[13] The finding unequivocally indicated that a continuous nonabsorbable suture reduces the incisional hernia rate by 30%. Thus, the ideal suture would be a continuous prolene or nylon suture. However, Hodgson and others' data were mainly from a time before PDS was well established. This latter suture material is used by 60% of CAGS surgeons who were more likely to have a university appointment and to be in practice for less than 10 years. It was encouraging to see that the suture and technique associated with the highest hernia rate (continuous vicryl) was used by just 20% of surgeons; these tended to be in communities of less than 50 000 people. Use of all other closure methods and materials was less than 20%. Of course, the ideal result would have been to observe almost universal adoption of continuous, nonabsorbable (or near nonabsorbable) monophilament suture.

A contentious topic in evidence-based surgery is that of bowel preparation before elective colorectal surgery. The meta-analysis carried out by Bucher and colleagues published in the *Archives of Surgery* in 2004[14] of 7 randomized clinical trials involving nearly 1300 patients demonstrated that, not only was bowel preparation failing to achieve its goals, but that it might also be producing harm with increased leak rates and intra-abdominal infections. Reoperation and wound infection rates were 5.6%, 3.7%, 5.2% and 7.5%, respectively, in the patients who underwent bowel preparation patients, compared with 2.8%, 2%, 2.2% and 5.7%, respectively, in those who did not. Over 90% of CAGS surgeons continue to prescribe bowel preparation before elective colorectal surgery. With regard to antibiotic prophylaxis in elective colorectal surgery, multiple studies have demonstrated that a single dose just prior to the surgical incision reduces wound infection rates from 40% to between 11% and 22%.[15] Another 17 randomized studies have clearly demonstrated no benefit of prescribing multiple postoperative doses, and confirm the potential for harm (e.g., *Clostridium difficile* colitis) with unnecessary antibiotic dosing. Ninety-five percent of Canadian general surgeons prescribe preoperative antibiotics. Unfortunately, almost 50% of CAGS surgeons persist in prescribing postoperative antibiotic prophylaxis.

The importance of thromboprophylaxis has been documented for more than 25 years. A recent Cochrane Database Review[16] summarized that using heparin 5000 IU subcutaneously 1 hour preoperatively and twice daily until ambulatory,

reduces DVT rates from 44% to 12% and pulmonary embolism rates from 1.6% to 0.5%, with a further 25% reduction in DVT rates with compression stockings. Less than 20% of respondents claim not to prescribe pre- and postoperative heparin thromboprophylaxis for elective colorectal surgery patients. However, only 40% of respondents adopted a policy of perioperative TEDs or pneumatic compression stockings.

Nasogastric tubes have been used for over 300 years with the therapeutic intent of gastric decompression for patients with abdominal distention and vomiting from bowel obstruction or gastrointestinal bleeding, or prophylactically, in patients undergoing major abdominal surgery. Use of such tubes has been considered the standard of care traditionally used by most surgeons.[17] In a systematic review of prophylactic nasogastric decompression after abdominal operations, Nelson and colleagues[17] analyzed 28 high-quality randomized studies, incorporating over 4000 patients. Avoiding a nasogastric tube was associated with a significantly earlier return to bowel function and no difference in pulmonary complications, wound infection and ventral hernia rates or anastomotic leakage. Patient comfort, nausea, vomiting and length of stay favoured the avoidance of nasogastric tubes. That is, prophylactic nasogastric tube insertion resoundingly fails to achieve its prophylactic goals. This evidence does appear to have been adopted by over 80% of responding CAGS surgeons regarding uncomplicated colorectal surgery. The only significance between groups was that surgeons in practice for longer than 10 years were more likely to insert a nasogastric tube.

In keeping with nasogastric tube usage, prophylactic drain insertion in elective colorectal surgery has also been a time-honoured tradition. In a Cochrane Database Systematic Review,[18] 6 randomized studies involving 1140 patients found no differences in mortality, clinical or radiologic anastomotic dehiscence, wound infection, reoperation or extra-abdominal complications. The reviewers concluded that "there is insufficient evidence showing that routine drainage after colorectal anastomosis prevents anastomotic and other complications."[18]

This philosophy was adopted by 95% of surgeons with regard to colon surgery; however, 25% of CAGS surgeons continue to use a drain for rectal surgery—a practice more common among surgeons working in small communities and less likely to be adopted by university full-time surgeons.

Although it is encouraging to observe that, where incontrovertible evidence for best clinical practice does exist, many surgeons have incorporated it into their practice; of greater concern is to understand why surgeons choose to ignore best evidence. There are likely a myriad of reasons, including that surgeons may be ill-informed, studies lack generalizability to their patients, evidence contradicts community and institutional pressures or they may merely be slow to adopt practice change. Undoubtedly, personal philosophy also plays a large role (the "just in case, so I can sleep better at night" approach). Unlike medication-related complications, untoward outcomes after surgery are uniquely personal and potentially guilt-laden. Other factors that may prevent surgeons from adopting evidence-based practices may involve the low event rates (e.g., 5% anastomotic leakage after elective colorectal surgery) or separate in time (e.g., development of an incisional hernia months or years after abdominal fascial closure). An important aspect of clinical practice is that of the "sticky learning experience,"[19] whereby a single bad outcome is interpreted as the consequence of failing to adopt an intervention (e.g., drain or nasogastric tube insertion) and colours all subsequent practice. Finally, the role of the surgical teacher and mentor remains a powerful predictor of clinical practice. As this study has shown, surgeons in practice longer tend to be less willing to adopt evidence-based practice.

It remains to be seen whether there will be a time when, through legal pressures, performance evaluation and patient safety, concerns that surgeons will not enjoy the freedom to adopt practices that are not evidence-based.

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Quill on Scalpel
Plume et scalpel

Citations and wait-lists: much ado about nothing?

Michael Gross, MD

Two seemingly disparate papers published in this issue raise some interesting points and require wider discussion.

The first paper is about our favourite subject in Canadian surgical practice: wait-lists. To some degree, wait-lists have become the canary in the cage for the success or otherwise of the provision of nonurgent health care surgical and other procedures for the Canadian population. The paper from Gaudet and colleagues[1] has come to a strikingly original conclusion that should bolster the orthopedic profession: in the arena of restricted resources, patients who are waiting for a total hip replacement are prioritized according to their need, not according to their place in society, age or the other demographic factors described in the paper. Why is this seemingly mundane fact so important?

Because, unfortunately, wait-lists have spawned an industry of their own. Researchers, opinion makers, patient pressure groups and even the legal industry have made their mark. Too many policy and administrative career civil servants, researchers, social policy analysts and others now want to take the issue of wait-lists out of the surgeons' hands and organize even more complicated methods of assessing and running wait-lists. More money is being poured into studying the wait-list problem. The paper by Gaudet and colleagues[1] should be read as the needle that will puncture this unnecessary effort, as it is quite clear that, when given the resources,

Professor of Surgery, Dalhousie University; Division of Orthopedics, Queen Elizabeth II Health Sciences Centre, Halifax, NS.

Correspondence to: *Dr. Michael Gross, Dalhousie University, Division of Orthopedics, Queen Elizabeth II Health Sciences Centre, 1796 Summer St., Rm. 4879, Halifax NS B3H 3A7; fax 902 473-2042; grossm@dal.ca*

