Canadian Journal of Surgery

Journal canadien de chirurgie

Vol. 54, Suppl., August / août 2011
cma.ca/cjs

Canadian Surgery Forum

Abstracts of presentations to the Annual Meetings of the

Canadian Association of Bariatric Physicians and Surgeons

Canadian Association of General Surgeons

Canadian Association of Thoracic Surgeons

Canadian Hepato-Pancreato-Biliary Society

Canadian Society of Surgical Oncology

Canadian Society of Colon and Rectal Surgeons

London, Ont.
Sept. 15–18, 2011

Forum canadien de chirurgie

Résumés des communications présentées aux congrès annuels de

l'Association canadienne des médecins et chirurgiens spécialistes de l'obésité

l'Association canadienne des chirurgiens généraux

l'Association canadienne des chirurgiens thoraciques

la *Canadian Hepato-Pancreato-Biliary Society*

la Société canadienne d'oncologie chirurgicale

la Société canadienne des chirurgiens du côlon et du rectum

London, Ont.
du 15 au 18 sept. 2011

Abstracts • Résumés

Canadian Association of Bariatric Physicians and Surgeons

Association canadienne des médecins et chirurgiens spécialistes de l'obésité

1

Outcomes of the adjustable gastric band in a publicly funded obesity program. ***J.C. Chiu, X. Shi, S. Karmali, D.W. Birch.*** **From the University of Alberta, Royal Alexandra Hospital, Edmonton, Alta.**

Laparoscopic adjustable gastric banding (LAGB) is considered to be a safe and effective method of weight loss and reduction of comorbidities. Our publicly funded program recognizes obesity as a chronic disease, providing extensive preoperative multidisciplinary assessment and long-term follow-up after selecting the most appropriate patients for LAGB. It is not known whether the current literature is representative of the outcomes that may be achieved in a Canadian, publicly funded system.

Patients who attended the Weight Wise Clinic and were selected for LAGB are identified, and a retrospective analysis over a 6-year period (2005–2010) was performed. Issues captured include weight loss at 1, 2 and 3 years, complications and operational costs of ongoing care for LAGB.

A total of 178 patients underwent LAGB over this period. The average preoperative body mass index is 44.2. Mean percentage total body weight loss at 1, 2 and 3 years respectively is 9.95%, 15.1% and 16.8%. The most common short-term complication is postoperative nausea (19%) followed by nonsurgical site infections (1%). The medium-term complications include obstructive symptoms owing to band migration (5.6%), port site complications (1%), band leakage (1%) and incisional hernia (1%). The reoperation rate is 4.5%. The mean operative time is 56 minutes with a length of stay of 1.4 days. Clinic visits occur most frequently in the first year with an average of 7 visits and drop to 4 visits at the next 2 years. The average number of band fillings required is 3 fills at year 1, and 1 fill only for the other 2 years. The most commonly used investigation for complication is fluoroscopy studies (86%) followed by computer tomography (9%).

The weight loss with LAGB through the publicly funded program over the short term out-performs the average quoted in the literature (13.2%). The degree of weight loss reaches a plateau between the second and third year. The complication rates are within the acceptable standards. Our patients could represent a distinct population that is different from the private system. This could translate into improved performance. However, this has to be balanced with the operational cost and maintenance of this extensive program to truly determine its cost-effectiveness.

2

Simultaneous cholecystectomy and bariatric procedure is feasible and safe: systematic review and meta-analysis. ***I. Apriasz, N.A. Alkhamesi, A. Lal, C.M. Schlachta.*** **From the Schulich School of Medicine and Dentistry and the London Health Sciences Centre, London, Ont.**

The objective of this meta-analysis was to establish the indication and correct timing for cholecystectomy in patients undergoing bariatric surgery.

Following a literature review, articles describing open or laparoscopic bariatric procedures with combined cholecystectomy or bariatric procedures followed by cholecystectomy or bariatric procedures with no subsequent cholecystectomy were analyzed. Statistical analysis was performed on patients' demographics, operative time, length of hospital stay, diagnostic use of ultrasound for cholelithiasis, prophylactic medications, postoperative billiary disease, postoperative morbidity and mortality. Articles were independently reviewed by 2 reviewers to confirm their suitability for analysis.

Of 75 articles identified, 16 were included in the review. There were no published randomized clinical trials. Retrospective data from 8454 patients were included in the analysis. There was no significant difference in the operative time between combined operations or a bariatric procedures alone; $p = 0.38$. Postoperative complications were similar in both combined procedures and stand-alone bariatric surgery; $p = 0.59$. However, patients who underwent delayed cholecystectomy had more complications compared with those who underwent a combined procedure; $p < 0.00001$. Mortality was lower in the combined procedures compared with the stand-alone bariatric operations; $p < 0.00001$. Length of stay was similar in both groups, but the total hospitalization was longer in the patients who underwent bariatric surgery followed by cholecystectomy; $p = 0.4$. Prophylactic ursodiol was effective in preventing postoperative cholelithiasis following bariatric surgery in patients who had no previous cholelithiasis, but it did not change the incidence of biliary symptoms in those with known gallstones; $p = 0.001$. The use of diagnostic ultrasound did not change the decision whether to perform simultaneous cholecystectomy or not.

These findings suggest that simultaneous cholecystectomy should be recommended for patients with a proven diagnosis of cholelithiasis undergoing bariatric procedures. Prophylactic ursodiol is indicated in those patients without gallstones.

3

Laparoscopic gastric bypass can be performed safely in secondary health care centres with a dedicated service corridor to an affiliated tertiary health care centre. ***N.V. Christou.*** **From McGill University, Montréal, Que.**

Canada needs to increase capacity for bariatric surgery to reduce

the extremely long wait for this cost-effective, life-saving surgery. We tested the hypothesis that laparoscopic gastric bypass (LGBP) can be delivered safely in a secondary health care centre (SHCC) given certain conditions.

We performed a prospective cohort study of 643 patients (see Table). The same surgeon performed all LGBP surgeries with the same dedicated team at the SHCC, with all patients monitored with a saturometer till discharge and a patient-to-nurse ratio of 2:1. The SHCC has no intensive care unit (ICU). Patients with complications were transferred for treatment to the affiliated tertiary health care centre (THCC) via a dedicated "service corridor" arrangement. The surgeon was the only constant at the THCC, with patients treated on the ward or ICU as deemed appropriate. Patients with ASA class 4 or an Obesity Surgery-Mortality Risk Score (OS-MRS) of ≥ 4 were excluded from the SHCC. Patients weighing > 205 kg were also excluded owing to ambulance transfer regulations.

Length of stay was 2 versus 2.8 days and operating time (in/out of OR) 89 ± 12 versus 145 ± 23 minutes at the SHCC versus LHCC ($p < 0.05$).

The 12 patients with major (life-threatening) complications were transferred to the THCC, and all were treated successfully. The 2 deaths at the THCC occurred in a woman with a BMI of 75.5, ASA of 3 and an OS-MRS of 3 (massive pulmonary embolism) and in a woman with a BMI of 59, an ASA of 4 and an OS-MRS of 4, who was on home oxygen (nosocomial pneumonia in the ICU). No deaths occurred in the SHCC.

With proper patient selection, a dedicated healthcare team and a service corridor to an affiliated THCC, laparoscopic gastric bypass can be performed safely in a SHCC. This service model deserves more study to determine whether it can be widely applied across Canada.

Table, abstract 3

Loc.	No.	Age, yr	Sex, % F:M	BMI*	OS-MRS*	ASA class*	Previous surgery, %	No. deaths	Major comp., %†
SHCC	464	44±11	72:28	48.1±7.2	1.5±1	2.8±0.8	67.4	0	2.6
THCC	179	42±10	58:42	53.3±9.7	2.3±0.9	3.2±0.8	73.3	2	1.7

ASA= American Society of Anesthesiologists; BMI = body mass index; comp. = complications; F = female; Loc. Location; M = male; OS-MRS = Obesity Surgery–Mortality Risk Score; SHCC = secondary health care centre; THCC = tertiary health care centre.
*$p < 0.005$, t test.
†$\chi^2 = 3.9$, NS.

4

Impact of surgeon experience on perioperative outcomes after bariatric procedures at a designated centre of excellence in Ontario. ***S. Elkassem, D. Lindsay, L. Smith, P. Sullivan.*** **From the University of Toronto, Toronto, Ont.**

Five centres of excellence in the province of Ontario have been designated to perform obesity surgery, including laparoscopic Roux-en-Y gastric bypass (LRGB) and sleeve gastrectomy (LSG). We wanted to assess the impact of surgeon experience on perioperative outcomes after bariatric surgery.

A retrospective review of bariatric procedures performed from 2006 until the end of 2010 identified 145 patients. Each surgeon was mentored by an experienced bariatric surgeon for their first 10 cases. The first half of patients (1H) underwent surgery over a period of 4 years, whereas the second half (2H) underwent surgery within the span of a year owing to enhanced provincial funding for cases. We compared preoperative outcomes of the 1H of patients to the 2H of patients, including length of stay (LOS), perioperative complications and stricture rate.

The 2 groups were similar in age (41.9 v. 44 yr), sex distribution (91.6% v. 87.6% female) and preoperative BMI (47.4 v. 49). The average LOS was similar between the groups (3.5 d). The length of operative procedure was significantly shorter in the 2H patients for LRGB than in the 1H patients (148 v. 173 min, $p < 0.05$), whereas there was no difference in time for LSG between 1H and 2H patients (94.4 v. 113 min, $p > 0.05$). There were no differences in postoperative complications, including bleeding (7% v. 11%), leak (3% v. 2%) and return to the OR (7% v. 10%). The rate of postoperative endoscopy was significantly higher in the 1H patients (25% v. 4%, $p < 0.05$); however, there was no difference in stricture rate (8.3% v. 1.3%, $p = 0.056$).

These findings suggest that centres starting a bariatric program can expect a learning curve, especially with operative time and management of postoperative dysphagia. Furthermore, the presence of a multidisciplinary team with multiple bariatric surgeons familiar with bariatric procedures may help to recognize and minimize complications in these complex patients.

5

Supporting bariatric surgeons: the rationale for an integrated psychosocial model in a bariatric surgery program. ***S. Sockalingam, R. Hawa, S. Wnuk, T. Jackson, A. Okrainec.*** **From the University Health Network, Toronto Western Hospital, University of Toronto, Toronto, Ont.**

The emergence of bariatric surgery programs across Canada has resulted in a need to develop standardized assessment models to improve surgical outcomes. Psychosocial assessment before bariatric surgery is recommended, although the degree of psychopathology in Canadian bariatric programs has not been well studied. The purpose of this study was to identify the rates of psychosocial comorbidity in bariatric surgery candidates in a Canadian bariatric surgery assessment centre.

We assessed 134 consecutive patients presenting for bariatric surgery. Baseline psychosocial data using self-report measures for depression (PHQ-9 or Beck Depression Inventory), Impact of Weight on Quality of Life (IWQOL), Alcohol Use Disorders Identification Test and Eating Disorder Examination Questionnaire, body mass index (BMI), age and sex are reported.

The average age of bariatric surgery candidates was 45.1 years, 87% were female, and the mean BMI of patients was 46.9. At baseline, 57% of patients had a positive screen for depression as per validated depression screening measures in this population. Approximately 13% met criteria for night eating syndrome and 47% endorsed loss of control over eating, a core feature of binge-eating disorder and predictor of postoperative outcomes. Health-related of quality of life as measured by the IWQOL scale showed lower scores on all 5 domains compared with a reference patient population. Rates of self-reported past sexual abuse were 47%, which is higher than previously reported in US samples.

The psychosocial findings from our bariatric surgery centre

suggest higher rates of psychiatric comorbidity and sexual abuse, which may reflect wider accessibility and cultural factors in our Canadian sample. These data reinforce the need for integrated psychosocial resources within bariatric surgery programs across Canada. A model for mitigating psychiatric comorbidity during the perioperative phase of bariatric surgery will be discussed.

6

Laparoscopic sleeve gastrectomy: outcomes in a super morbidly obese patient population. ***R. Fayez, N.V. Christou, O. Court.*** **From the McGill University Health Centre, Montréal, Que.**

In this study, we describe our centre's experience with laparoscopic sleeve gastrectomy (LSG) as a definitive bariatric surgery procedure in super morbidly obese patients.

This is a retrospective analysis of prospectively collected data from our bariatric surgery registry at the McGill University Health Centre. Data were collected from September 2005 to December 2010. Patient demographics, percentage of excessive weight loss and complications were evaluated.

A total of 113 patients underwent LSG at our centre (65% female), a mean body mass index (BMI) of 62 kg/m^2. Mean excess weight loss after 3 months, 6 months, 1 year and 2 years was 31%, 41%, 48% and 57%, respectively. Complications were seen in 13 patients (11.5%); there was no mortality or conversion to open surgery.

In our selected population of mostly super morbidly obese patients (average BMI 62 kg/m^2), we see weight loss rates (> 50% EWL) comparable to multiple studies encompassing a morbidly obese patient cohort of lower BMI with up to 2 years follow-up along with low complication rates. Further studies will need to examine long-term outcomes.

7

Bariatric surgical care delivery within a multidisciplinary psychosocial model may improve patient adherence and follow-up. ***C. Mueller, A. Okrainec, S. Sockalingham, T. Jackson.*** **From the Division of General Surgery and Division of Psychiatry, University Health Network, Department of Surgery, University of Toronto, Toronto, Ont.**

Reported follow-up rates after obesity surgery range from only 30% to 50%. However, successful maintenance of initial weight loss after bariatric surgery has been linked to adherence to dietary recommendations and support through regular follow-up in a multidisciplinary bariatric program.

Our goal was to determine whether greater preoperative emphasis on psychosocial support for bariatric patients will result in improved follow-up adherence.

Charts of all consecutive patients undergoing bariatric surgery during the first 18 months (2009–2011) of our multidisciplinary bariatric surgery program at a tertiary care centre in Toronto, Ontario, were retrospectively reviewed. Demographic data, psychiatric diagnoses and presentation for follow-up at routine 3- and 6-month appointments were tabulated.

A total of 151 patients were indentified (141 laparoscopic Roux-en-Y gastric bypass, 15 sleeve gastrectomy; median age 43 [21–66] yr and BMI 48.1 [36.6–80]; 82% female). All patients underwent a rigorous multidisciplinary assessment and education process prior to surgery, and those with psychiatric issues received the support of a dedicated bariatric psychiatrist and social worker. A total of 54% had a positive screen for depression and 47% endorsed loss of control over eating, a core predictor of postoperative outcomes. A further 47% endorsed a history of physical and/or sexual abuse. Follow-up adherence at 3 and 6 months was 92% and 84%, respectively. There was no significant difference in follow-up adherence rates between patients with a psychiatric diagnosis and those without.

Excellent short-term follow-up can be achieved in a multidisciplinary program with a rigorous preoperative emphasis on patient education, psychosocial assessment and support. We predict that a psychosocial model will result in greater follow-up adherence, and ultimately improved patient satisfaction and weight loss outcomes after bariatric procedures.

8

The safe implementation of a multidisciplinary bariatric surgery program in the absence of a formal accreditation system at a tertiary care centre in Canada. ***C. Mueller, T. Swanson, C. Daigle, A. Okrainec, K. Pitzul, T. Penner, D.R. Urbach, T. Jackson.*** **From the Division of General Surgery, University Health Network, Department of Surgery, University of Toronto, Toronto, Ont.**

To improve safety and quality, accreditation programs have recently been mandated in the United States for all centres providing bariatric surgical care. Currently, no similar accreditation requirements exist in Canada.

We describe the safe introduction of a multidisciplinary bariatric surgery program at our academic tertiary care institution in Toronto, Ontario, in accordance with current guidelines for standards of care but outside of a formal accreditation program.

Charts of all consecutive patients undergoing bariatric surgery during the first 18 months of the program (2009–2011) were retrospectively reviewed. Primary safety and bariatric-specific end points were evaluated.

A total of 151 patients were indentified (141 laparoscopic Roux-en-Y gastric bypass, 15 sleeve gastrectomy; median age 43 [21–66] yr, BMI 48.1 [36.6–80]; 82% female). Obesity-related comorbidities included diabetes (32%), hypertension (57%), osteoarthritis (33%), obstructive sleep apnea (56%), dyslipidemia (38%) and reflux (32%). Median length of stay was 2 days. Analysis of safety outcomes revealed no mortalities, gastrojejunostomy (GJ) leaks or jejunojejunostomy (JJ) strictures.

Surgical complications included 1 JJ leak and 1 port-site bleed. Readmission for surgery-related complications occurred in 9%, primarily owing to GJ strictures (11%). Twenty-three dilatations were performed in 17 patients, and 1 patient required surgical revision of GJ stricture. No patients developed cardiac, respiratory, renal or venous thromboembolic adverse events.

Safety outcomes within our new centre were comparable to currently published standards. Bariatric procedures can be performed safely in a well-organized, multidisciplinary program adhering to current guidelines despite being outside of a formal credentialing system.

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9 (CAGS Clinical Research Award)

Sources of bias in nonrandomized comparative studies of surgical procedures. ***L. Sandhu.*** **From the University of Toronto, Toronto, Ont.**

Although nonrandomized studies (NRS) provide weak evidence for the effectiveness of health interventions, the surgical literature is dominated by these studies. Nonrandomized studies are prone to selection and measurement biases that exaggerate estimates of the effectiveness of surgical procedures. We sought to quantify the extent of bias associated with characteristics of NRS of surgical procedures.

We identified nonrandomized English-language studies comparing laparoscopic-assisted and conventional surgery for colon cancer that estimated surgical complications as an outcome measure. Subgroup meta-analyses for 4 study characteristics were performed. Summary odds ratios (ORs) were estimated using random-effects models.

In total, 155 comparative studies were identified from 6261 abstracts. Sixty-two studies (41 NRSs and 21 RCTs) involving 857 132 patients provided an estimate of total morbidity. The summary OR for surgical complications associated with laparoscopic resection in all 62 studies was 0.72 (95% CI 0.67–0.79). Twenty-one RCTs favoured laparoscopy (OR 0.76, 95% CI 0.62–0.94), and a similar benefit was seen in 41 NRSs (OR 0.70, 95% CI 0.64–0.76). Prospective NRSs and retrospective NRSs yielded almost identical estimates for total morbidity (Table). Studies with matched controls estimated a larger benefit of laparoscopic-assisted surgery than studies without this characteristic. Studies with concurrent controls and systematic assessment of outcomes estimated smaller benefits of laparoscopic-assisted surgery — estimates that were closer to the pooled estimate from the RCTs. Of note, NRSs with historical controls failed to find a statistically significant difference between laparoscopy and conventional surgery (type 2 error).

Among NRSs comparing surgical complications after laparoscopic-assisted and conventional surgery for colon cancer, the use of matched or historical controls, or nonsystematic outcome assessment is associated with biased estimates of safety.

Table, abstract 9

Characteristics of nonrandomized studies, $n = 41$	Characteristic status; no. studies (OR)* [95% CI]	
	Present	Absent
Prospective data collection	25 (0.67) [0.60–0.76]	16 (0.68) [0.52–0.89]
Concurrent (v. historical) controls	39 (0.70) [0.64–0.76]	2 (0.61) [0.22–1.63]
Matching of groups	12 (0.52) [0.35–0.78]	29 (0.71) [0.66–0.78]
Systematic outcome assessment	9 (0.76) [0.72–0.80]	32 (0.60) [0.49–0.74]

CI = confidence interval; OR = odds ratio.
*Odds ratio for experiencing a complication following laparoscopic-assisted surgery, compared with conventional surgery.

10 (CAGS Basic Science Award)

Sirolimus-eluting, hydrogel-impregnated mesh reduces intra-abdominal adhesion formation in a mouse model. ***A. Maciver, M. McCall, R. Edgar, A. Thiesen, D. Bigam, T. Churchill, A.M.J. Shapiro.*** **From the University of Alberta, Edmonton, Alta.**

The use of prosthetic mesh is common for abdominal wall reconstruction. Complications from postoperative adhesion formation represent a considerable clinical and cost burden. A hydrogel interface and drug-eluting prosthetic mesh offers the potential to reduce adhesions; herein we investigate the antiproliferative agent sirolimus (SRL) for its capacity to reduce adhesion formation to mesh.

Our objective is to investigate the antiadhesiogenic properties of hydrogel and local delivery of SRL on intraabdominal adhesion formation in an in vivo hernia mesh model in mice. We expect local delivery of SRL will reduce the incidence, severity and tenacity of postoperative adhesions in this model.

A 1 × 1 cm^2 polypropylene mesh from 1 of 3 groups (plain control, hydrogel [2% agarose] or hydrogel + 10 μg SRL) was surgically implanted into the peritoneal cavity of BALB/c mice, and followed for up to 4 weeks, with adhesions scored by percent surface area of mesh (0%–100%), severity (0–3) and tenacity (0–4). Representative samples were assessed by scanning electron microscopy.

Hydrogel + SRL-treated mesh is less adhesiogenic than either hydrogel mesh or plain mesh. There was a significant reduction in percent surface area covered by adhesions comparing plain mesh and hydrogel mesh (100 ± 0% v. 47.2 ± 10.6%, $p < 0.05$) and between plain mesh and mesh treated with hydrogel + SRL (100 ± 0% v. 17.5 ± 8.4%, $p < 0.001$). Plain mesh incited the most severe reaction, and severity scores improved compared with hydrogel mesh (2.9 ± 0.1 v. 1.8 ± 0.2, $p < 0.01$) and with mesh treated with hydrogel + SRL (2.9 ± 0.1 v. 1.4 ± 0.1, $p < 0.001$). Similar findings were noted on tenacity scores, between plain mesh and hydrogel mesh (3.5 ± 0.2 v. 1.8 ± 0.2, $p < 0.001$) and between plain mesh and mesh treated with hydrogel + SRL (3.5 ± 0.2 v. 1.5 ± 0.1, $p < 0.001$).

Treatment of polypropylene mesh with hydrogel significantly decreased adhesions. The combination of SRL with hydrogel provided significant additive protection.

11

Surgeons' reactions to adverse events in the operating room. ***S. Luu, G. Regehr, M.L. Murnaghan, S. Gallinger, C.-A. Moulton.*** **From the Wilson Centre, University Health Network, Department of Surgery, University of Toronto, Hospital for Sick Children, Toronto, Ont., and the Centre for Health Education Scholarship, University of British Columbia, Vancouver, BC**

Adverse patient events are an inherent component of surgical practice, but most surgeons are unprepared for the profound

psychological reactions that these events evoke. This study explored surgeons' reactions to these events in order to develop a framework for understanding the cognitive and emotive responses involved with these experiences.

Semistructured, 60-minute interviews were conducted with 18 surgeons across specialties, with different levels of experience and of different sexes to explore recollections of their reactions to adverse events using a reflexive and constructivist grounded theory approach. Twenty-eight brief interviews were conducted exploring immediate experiences following adverse events. Saturation of major themes was achieved after purposive and theoretical sampling.

Participant surgeons consistently described feeling unique and alone in the depth of their reactions to an adverse event. However, most experienced an equally profound reaction and a consistent set of phases that included both cognitive and emotive components. The initial phase involved a feeling of failure and self-doubt ("Am I good enough?"). In the second phase, the extent of the surgeon's contribution toward the event was assessed ("Was it my fault?"). During the third phase, surgeons invoked coping strategies for dealing with the event while continuing with daily activities ("moving on"). Over time, surgeons also described a process whereby they incorporated their reactions into their sense of self, reconstructing in a positive (or negative) way their long-term identity as a surgeon.

Surgeons are more consistent in the depth and pattern of their reactions than they realize. Adverse events are experienced by the surgeon as a personal affront and might be considered best as a form of immediate performance feedback. Our framework also offers a language for surgeons to discuss and reflect on their role in adverse events, providing better teaching and learning opportunities.

12

Individualized deliberate practice on a virtual reality simulator improves technical performance of surgical novices in the operating room. *V. Palter, T. Grantcharov*. From St. Michael's Hospital, University of Toronto, Toronto, Ont.

Training on virtual reality (VR) simulators has been shown to improve technical performance in the operating room (OR). Currently described VR curricula consist of trainees practising the same tasks until expert proficiency is reached. It has yet to be investigated whether individualized deliberate practice, where curricula tasks vary depending on prior levels of technical proficiency, would translate to the OR.

This single-blinded prospective trial randomized 16 novice surgical residents to a deliberate practice (DP) group and a control group. Both groups performed a laparoscopic cholecystectomy in the OR that was video-recorded. Technical performance of DP group residents in the OR was assessed using 2 validated assessment tools. A score of < 60% on any component of the assessment tool resulted in the trainee practising a specific task on the VR simulator. The DP group practised on the simulator as per their individualized schedule. Both groups then performed another laparoscopic cholecystectomy. A blinded expert assessed the OR recordings using a validated global rating scale.

Although preintervention, both groups had similar technical abilities (median score DP 13.5, control 14.5, $p = 0.45$); postintervention, the DP residents had a superior technical performance (median score DP 17, control 12.5, $p = 0.034$). Six of 8 DP residents practised 5 basic VR tasks (median 1 trial to pass), and 7 of 8 practised 2 advanced tasks (median 4 trials to pass).

Deliberate individualized practice on a VR simulator improves OR performance of a basic laparoscopic procedure. Individualizing ex vivo training schedules can potentially reduce the resources and time required to implement a VR curriculum.

13

Motivate your learners: an exploration of motivation as an intraoperative teaching technique. *D. Dath, J. Hoogenes, E. Matsumoto, D. Szalay*. From McMaster University, Hamilton, Ont.

This study describes behaviours and techniques that surgeons use to motivate surgical residents as they teach in the operating room (OR).

A large, qualitative study on intraoperative teaching identified motivation a priori as a theme for exploration. Fifty-three surgeons from a tertiary care centre were recruited using purposive sampling to conduct 10, audio-taped, surgeon-facilitated focus groups. Qualitative content analysis included generating a thematic coding scheme that identified emerging concepts and linkages in the data. Study rigor (integrity and validity) was achieved through maintaining an audit trail, investigator and data triangulation, and reaching conceptual saturation of the data. Three surgeon investigators independently and then collaboratively reviewed all the data. They developed an operational codebook with group consensus, paying attention to motivation as a teaching technique.

Surgeons repeatedly held residents responsible for arriving in the OR motivated to learn. However, they often found themselves using teaching techniques to improve motivation. Eight motivational techniques and behaviours emerged from 34 factors in the codebook. These techniques and behaviours were grouped into those requiring the resident to show or develop intrinsic motivation (facilitating autonomy, expecting resident self-motivation, fostering a responsible attitude, modelling relational behaviour) and those which offered the resident extrinsic motivation (providing expectations, instructions and directions; being personally involved; providing safe teaching; providing reward).

Surgical residents and surgeons share the responsibility of developing motivation to learn in the OR. Surgeons use a variety of techniques and behaviours to foster residents' intrinsic motivation and to provide extrinsic motivation to resident learners when teaching in the OR. Explicit attention to these techniques may improve intraoperative teaching.

14

Outcomes and costs of laparoscopic distal pancreatectomy. Comparison to open resection in a single centre. *A. Fox, K. Pitzul, F. Bhojani, M. Kaplan, A. Wei, I. McGilvray, S.P. Cleary, A. Okrainec*. From University of Toronto, Toronto Western Hospital, Toronto, Ont.

The cost implications of laparoscopic distal pancreatectomy (LDP) and a detailed breakdown of hospital expenditures has yet to be presented in the literature. The purpose of this study is to compare hospital costs and short-term clinical outcomes between LDP and open distal pancreatectomy (ODP).

We evaluated all distal pancreatic resections performed at our centre between January 2004 and March 2010. Parametric and nonparametric statistical analysis was used to compare hospital departmental and total hospital costs as well as oncologic and surgical outcomes.

A total of 118 cases, 42 laparoscopic (including 5 conversions) and 76 open resections were analyzed. Demographic characteristics were similar between groups, other than a predominance of female patients in the laparoscopic group ($p = 0.036$). Indication for operation differed by a paucity of malignant tumours being approached laparoscopically ($p < 0.001$). Intraoperatively, there were no differences in estimated blood loss, OR time or transfusion requirement. There were no significant differences in pathological outcomes. Median length of stay (LOS) for the LDP cohort was 5 days (range 3–31 d), and that for the ODP cohort was 7 days (range 4–19 d, $p < 0.001$). Postoperative pancreatic fistulae occurred in 22 patients, with a higher proportion observed in the LDP group at 28.57% ($n = 12$) compared with the open group 13.16% ($n = 10$, $p = 0.05$). However, the rate of grade B and higher fistulae was higher in the ODP group (4 ODP and 0 LDP). There were no significant differences in median preadmission or operative costs. The ODP cohort had significantly higher costs in all other hospital departments, including total cost.

Laparoscopic distal pancreatectomy is both a cost-effective and safe approach for distal pancreatic lesions. This series has shown shorter LOS and lower total hospital costs for the LDP cohort, accompanied by equivalent postoperative outcomes.

15

Parathyroid hormone levels 1 hour after surgery as an early predictor of postthyroidectomy hypocalcemia.

A. Alqahtani, A. Parsyan, R. Payne, R. Tabah. **From McGill University, Montréal, Que.**

Parathyroid dysfunction following a total or completion thyroidectomy is not uncommon, and it may be associated with significant patient morbidity. If there is a simple test with proven high predictability for identifying which patients will develop hypocalcemia, it would be very useful to determine the necessities of careful monitoring and calcium replacement.

Our goal was to evaluate the use of using a parathyroid hormone (PTH) assay 1 hour following surgery as a predictor of post-thyroidectomy hypocalcaemia and therefore of safe early discharge.

A prospective series of 150 consecutive patients undergoing total thyroidectomy (2009–2010) was enrolled for this study. Ionized calcium was measured before and 1 hour, 6 hours and 24 hours after surgery, and PTH was measured before and immediately after surgery at 1 hour, 6 hours and 24 hours. The specificity, sensitivity and overall accuracy of 1h-iPTH in predicting post-thyroidectomy hypocalcemia and symptoms were determined.

Sixty of 150 patients (40%) who underwent total thyroidectomy developed hypocalcemia. Fifty patients of the 60 patients who became hypocalcemic had a 1-hour postoperative PTH drop of 60% or more when compared with the preoperative value. The sensitivity, specificity, positive and negative predictive values of PTH were 83%, 100%, 100% and 90%, respectively.

A PTH assay, when checked 1 hour after thyroidectomy, is a highly accurate and effective tool for predicting symptomatic hypocalcemia immediately after thyroidectomy. Routine use of this assay should be considered because it will allow safe and timely discharge of normocalcemic patients.

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Impact of an acute surgical care team on the management of general surgical emergencies: an institutional experience.

R. Anantha, K. Vogt, S. Crawford, N. Parry, K. Leslie. **From the Division of General Surgery, Victoria Hospital, London Health Sciences Centre, University of Western Ontario, London, Ont.**

Acute care surgical services are emerging in many centres to provide comprehensive emergency general surgical care and are hypothesized to lead to more efficient use of resources. This study was undertaken to assess the volume and distribution of emergent operative cases after the introduction of an acute care surgical service (ACCESS) at a Canadian tertiary care hospital.

This single-centre retrospective case–control study compared all adult patients identified from the LHSC operative database who underwent emergency surgical procedures between July and December 2009 (pre-ACCESS), with those between July and December 2010 (post-ACCESS). The distribution of cases was considered between 0700 and 1500 hours (day), between 1500 and 2300 hours (evening) and between 2300 and 0700 hours (night). Frequencies were compared using the χ^2 test.

A total of 2672 emergent cases were identified (1327 pre-ACCESS and 1345 post-ACCESS). The Table demonstrates the time distribution of cases in the pre- and post-ACCESS cohorts. The proportion of general surgical cases (elective and emergent) remained the same after the introduction of ACCESS (22% v. 22%, $p = 0.14$). The proportion of nongeneral surgical cases also remained unchanged (78% v. 77%, $p = 0.14$). The proportion of emergent general surgeries performed in the daytime, however, increased significantly post-ACCESS (24% v. 54%, $p < 0.01$), with a concomitant 48% decrease in night-time emergent general surgeries (20% v. 11%, $p < 0.01$). There was no difference in night-time operating for nongeneral surgery cases post-ACCESS (7% v. 6%, $p = 0.27$).

The implementation of the ACCESS service has resulted in a shift in emergency general surgery operating from night-time to

Table, abstract 16. Distribution of general surgery and nongeneral surgery cases (emergency and elective) by time frame before and after the implementation of ACCESS

	Surgery, timing, no. (%)*			
	General		Nongeneral	
Surgery	Pre-ACCESS	Post-ACCESS	Pre-ACCESS	Post-ACCESS
Emergency				
Day	106 (24)	279 (54)	318 (24)	291 (22)
Evening	253 (56)	185 (36)	478 (36)	439 (33)
Night	91 (20)	55 (11)	81 (6)	96 (7)
Total	450	519	877	826
Elective				
Number	1061	996	4595	4333
Total cases	1511	1515	5472	5159

ACCESS = acute care emergency surgical service.
*Percentages of cases are based on the total number of cases in each cohort.

daytime, without impacting the overall number of general surgery cases, and without affecting other surgical services. The shift of emergency general surgery operating to the daytime may lead to greater efficiency, lower cost, decreased strain on hospital resources and improved patient outcomes.

17

A potential therapy for ischemic gut: establishing clinical relevance. *A. Ochs, K. Matthew, R. Khadaroo, T. Churchill*. From the University of Alberta, Edmonton, Alta.

An intraluminal nutrient-rich preservation solution has been shown to increase survival of small intestine grafts in transplantation. Our objective is to determine if this solution can ameliorate the negative effects of ischemia reperfusion injury in a small animal model of intestinal ischemia.

Anesthetized rats (n = 6 per group) were subjected to 60 minutes of intestinal ischemia by clamping the superior mesenteric artery. Experimental animals received the intraluminal solution 10 minutes before 60 minutes of reperfusion. Control animals were untreated. Tissue samples were taken at 15-minute intervals throughout reperfusion. Tissue was analyzed for energetics, oxidative stress, amino acid metabolism and histology. Statistical analysis involved ANOVA for parametric data and Kruskal–Wallis for histology grades; $p < 0.05$ is reported.

Energy levels in the intestines treated with the intraluminal solution were consistently higher than controls and resumed levels of healthy tissues. Untreated tissues never regained preischemic levels. Aerobic energy production involves amino acid metabolism; a primary end point is the level of alanine. After 60 minutes of reperfusion, treated tissues maintained significantly higher levels of alanine (compared with controls). The index of oxidative stress used was malondialdehyde (MDA). In treated tissues, MDA values were significantly lower than controls over the first 30-minute reperfusion. After 45 minutes, levels increased, reflecting the impact of oxidative stress during reperfusion. Histology of the intestinal villi revealed extensive deterioration of the villi tips with marked hemorrhage within the lumen in all untreated specimens (6/6 specimens); the villi of intestines treated with the intraluminal solution were intact with minimal hemorrhage (2/6 specimens); $p = 0.03$.

These data support the use of a nutrient-rich solution to protect ischemic intestine upon reperfusion. This is a potential therapy for intestinal ischemia in the clinical setting. A large animal model will be examined in future studies.

18

The use of gentamicin collagen implant in stoma closure reduces local infection rates. *J.-M. Lavoie, C. Zalai, C.-A. Vasilevsky*. From McGill University, Montréal, Que.

Stoma closures are contaminated procedures that carry an inherent risk for surgical site infection (SSI) of 20%–40%, despite appropriate surgical techniques and antibiotic prophylaxis. The use of a gentamicin-impregnated collagen implant (GCI) has been proposed as a method for reducing SSIs.

Thirty-seven sequential cases were selected for GCI use during elective stoma closures from January 2009 to June 2010, when GCI became available. The control group was composed of all patients who underwent elective stoma closure in 2008, before GCI availability. Records were reviewed for evidence of risk factors for SSI (age > 70 yr, obesity, diabetes, smoking status, nutritional status, elevated American Society of Anesthesia [ASA] scores and recent or current steroid-use). All patients were followed postoperatively for at least 60 days, with no loss to follow-up. Superficial SSI, organ/space SSI and mortality rates were analyzed using GraphPad Prism 5 (Student t test for continuous variables, Fisher exact test for discrete data).

Superficial SSIs occurred in 2 patients with a GCI and in 7 patients in the control group (5% v. 24%, $p = 0.03$). One patient in the GCI group developed an abscess; he had undergone a laparotomy for technical reasons during his ileostomy closure. There was 1 early mortality in the control group (Table).

In this single-centre case–control study, implantation of a GCI during stoma closure led to a significant decrease in superficial SSIs. Study limitations include small sample size, potential selection bias and patient heterogeneity. Despite this, the results suggest a potential role for a GCI in stoma closure where local factors may play a more important role than systemic ones. A larger study is potentially warranted.

Table, abstract 18. Stoma closure

Characteristic	Group; no. (%)*		p value
	GCI	Control	
No.	37	29	
Age, mean (SD) yr	52 (3.3)	57 (3.1)	0.29
Albumin, mean (SD)	43 (0.73)	43 (1)	0.91
ASA grade	2	2	0.92
No. of patients (%)			
Women	15 (40)	10 (34)	0.79
Obese	10 (27)	5 (17)	0.39
Diabetic	3 (8)	2 (7)	1
Smokers	7 (19)	8 (28)	0.56
Immunocompromised	7 (19)	5 (17)	1
Initial diagnoses			
Inflammatory bowel disease	12 (33)	4 (15)	0.14
Familial adenomatous polyposis	7 (19)	0 (0)	NA
Colorectal cancer	13 (36)	18 (67)	0.02
Diverticular disease	2 (6)	3 (11)	0.64
Bowel perforation	2 (6)	2 (7)	1
Stoma type			
Ileostomy	32 (89)	24 (89)	1
Colostomy	4 (11)	3 (11)	1
Superficial SSI	2 (5)	7 (24)	0.03
Organ/space SSI	1	0	1
Mortality	0	2	0.19

ASA = American Society of Anesthesiologists; GCI = gentamicin-impregnated collagen; SD = standard deviation; SSI = surgical site infection.
*Unless otherwise indicated

19

The prevalence of autoimmune disease in patients with esophageal achalasia. *J. Booy, J. Takata, G. Tomlinson, D.R. Urbach*. From the University Health Network, Toronto, Ont.

Achalasia is a rare disease of the esophagus that has an unknown etiology. Genetic, infectious and autoimmune mechanisms have each been proposed. Autoimmune diseases often occur in association with one another, either within a single individual or in a

family. There have been separate case reports of patients with both achalasia and 1 or more autoimmune disease, but no study has yet determined the prevalence of autoimmune diseases in the achalasia population.

We retrospectively reviewed the charts of 193 achalasia patients who received treatment at Toronto's University Health Network between January 2000 and May 2010 to identify other autoimmune diseases and a number of control conditions. We determined the general population prevalence of autoimmune diseases from published epidemiological studies.

The achalasia sample was, on average, 10–15 years older and had slightly more male patients than the control population. Compared with the general population, patients with achalasia were 5.4 times more likely to have type I diabetes mellitus (95% CI 1.5–19), 8.5 times as likely to have hypothyroidism (95% CI 5–14), 37 times as likely to have Sjögren syndrome (95% CI 1.9–205), 43 times as likely to have systemic lupus erythematosus (95% CI 12–154) and 259 times as likely to have uveitis (95% CI 13–1438). Overall, patients with achalasia were 3.6 times more likely to have any autoimmune condition (95% CI 2.5–5.3).

Our findings are consistent with the impression that achalasia's etiology has an autoimmune component. Further research is needed to more conclusively define achalasia as an autoimmune disease.

20

The impact of an acute care surgery service on the outcomes and quality of delivery of care in patients with biliary tract disease. *D. Lim*. From the University of Alberta, Edmonton, Alta.

To determine the effect that an acute care surgery service has had on outcomes of biliary tract disease.

An acute care surgery (ACS) service at the University of Alberta Hospital was implemented in October 2006 to address various concerns: the disjointed care of acutely ill general surgical patients, the decline in operative cases for trauma surgeons and to improve resource utilization. With the ACS model, the on-call surgeon dedicates protected time to emergency on-call work, thereby eliminating conflicting demands with scheduled surgery and outpatient clinics. Theoretically, this should lead to more efficient delivery of care as well as an improved satisfaction for the care received. To date, there remains limited study on the impact that an ACS model has had on patient care and surgical outcomes.

A retrospective review of a prospective database of all inpatient operative biliary tract disease at the University of Alberta Hospital 1 year before and 2 years post-ACS implementation. Data collected included diagnosis, comorbidities, procedure(s), key time intervals (time from admission to operating room arrival, procedure length) and outcomes (complication rate and length of hospital stay).

There were 72 patients in the pre-ACS group and 184 patients in the post-ACS group. Both groups were similar in terms of demographics and comorbidities. There was wide variability in patient diagnosis between the 2 groups. The post-ACS group had a shorter time from admission to OR for all biliary tract disease (34.15 h pre-ACS v. 27.73 h post-ACS) and in the subgroups of biliary colic (31.81 h pre-ACS v. 26.12 h post-ACS), choledocholithiasis (43.19 h pre-ACS v. 28.27 h post-ACS), gallstone pancreatitis (39.73 h pre-ACS v. 34.09 h post-ACS) and cholangitis (34.81 h pre-ACS v. 27.73 h post-ACS). There was no difference in the acute cholecystitis subgroup (22.86 h pre-ACS v. 24.80 h post-ACS). There was no difference in the actual length of operative time and length of hospital stay between both groups. There was a trend toward decreased complication rates in the ACS model (34.72% pre-ACS v. 23.91% post-ACS).

The implementation of an ACS service at the University of Alberta Hospital appears to have improved the management of emergent biliary tract disease in a timely and safe manner.

21

The Canadian general surgery resident: defining current challenges for surgical leadership. *C. Tomlinson, J. LaBossiere, K. Rommens, D.W. Birch*. From the University of Alberta, Royal Alexandra Hospital, Edmonton, Alta.

Surgery training programs in Canada and the United States have recognized the need to modify current models of training and education. In order to guide these important educational initiatives, a profile of the Canadian general surgery (CGS) resident and their impressions of training is required.

A survey was developed and revised through several focus groups. The survey was further refined for clarity, content and design through the Centre for Research in Applied Management and Evaluation at the University of Alberta. A total of 300 surveys were distributed to CGS trainees, and 186 were returned for analysis (62%).

The average age of CGS residents is 30 years, 38% are female, 41% are married and 43% plan to add to or start a family during residency. A majority (85%) of residents plan to pursue postgraduate education. On completion of training, 74% of graduates plan to work in Canada and 49% wish to practice in an academic setting. Acceptable access to mentorship is acknowledged by 47% of respondents, whereas 37% describe suitable access to career guidance. Only 40% of residents identify current social supports as being adequate. Just over half (54%) of respondents believe the level of stress during residency is manageable, whereas 43% report an inadequate balance between work and personal life.

With respect to the quality of education, 49% of residents rated their overall level of satisfaction as good or excellent and 46% believe current teaching is effective. Intimidation appears to present a barrier to learning. Additionally, residents describe an inadequate amount of time training in problem-based learning sessions, simulation, skills laboratories and working with cadaveric models.

This survey provides a profile of the contemporary CGS resident. Important challenges within the residency system are identified. Program directors and chairs of surgery are encouraged to recognize these challenges and consider urgent means to address these critical deficiencies.

22

One stage abdominal wall reconstruction for complex ventral hernias. *F. Brenneman, S. MacLellan, J. Simpson, K. Asai, K. Elgadi, S. Ali, J. Sawyer*. From Sunnybrook Health Sciences Centre, University of Toronto, Toronto, Ont.

The management of ventral hernias complicated by concomitant bowel surgery or infected mesh removal has often required a

2-stage operative approach. We describe a 1-stage abdominal wall reconstruction (AWR) using components separation techniques and a biologic mesh in these complex hernia patients.

Study patients presented with a ventral/incisional hernia and a concomitant high risk for postoperative wound infection. All underwent laparotomy, any necessary bowel surgery and/or mesh explant and abdominal wall reconstruction using bilateral components separation (posterior rectus sheath and/or external oblique muscle releases) followed by implantation of a human acellular dermal matrix biologic mesh (AlloDerm Regenerative Tissue Matrix) in the intraperitoneal (underlay) position. Outcome measures included surgical site infection rate, need for biologic mesh removal and early hernia recurrence rate.

Thirty-five patients underwent AWR over a 16-month period. Their mean age was 58 years old. Seventeen (49%) had mesh explant, 4 (11%) had an associated enterocutaneous fistula and a total of 13 (37%) required some form of concomitant bowel surgery. All patients were graded 3 or 4 as classified by the Ventral Hernia Working Group grading scale. The mean fascial defect area was 235 cm^2, with a mean defect diameter of 12.7 cm wide. We achieved midline primary fascial closure with bilateral components separation in all patients. The mean length of hospital stay was 7 days. The wound complication rate was high, with 16 (46%) wound infections and/or skin flap necrosis. However, all wounds went on to complete healing, and no biologic mesh required removal. Although still early in follow-up (mean 4.5 mo), there were no early hernia recurrences.

We believe that abdominal wall reconstruction with component separation techniques reinforced with human acellular dermal matrix is a safe and promising strategy in the management of complex ventral hernias.

23

Local recurrence of rectal cancer in Manitoba. ***R. Helewa, D. Turner, D. Wirtzfeld, J. Park, P. Czaykowski, G. Mak, D. Hochman, A. McKay*. From the University of Manitoba, CancerCare Manitoba, Winnipeg, Man.**

Local recurrence rates following surgery for rectal cancer in Manitoba were 17.4% for cases diagnosed between 1994 and 1997. Efforts to improve these rates have been made. The objective of this study was to evaluate more recent rates and predictors of local recurrence.

Stage I–III rectal cancer patients who underwent surgery with curative intent between 2004 and 2006 were included. Administrative data from the Manitoba Cancer Registry were used to identify patients and extract data. Charts at CancerCare Manitoba were reviewed to document local recurrences. Univariate analysis and multivariate proportional hazards regressions were used to investigate the role of various tumour, demographic and treatment variables on outcome.

In total, 370 patients with a mean age of 66.6 years were identified. The 5-year local recurrence rate was 14.9%. Local recurrence rates did not increase with stage. In univariate analysis, lower local recurrence rates were associated with use of neoadjuvant therapy of any kind (odds ratio [OR] 0.17, 95% CI 0.04–0.70), adjuvant radiation (OR 0.55, 95% CI 0.30–1) and adjuvant chemotherapy (OR 0.37, 95% CI 0.20–0.67). In multivariate analysis, relative to Winnipeg residents, non-Winnipeg residents, regardless of where they underwent surgery, had an increased risk of local recurrence (hazard ratio [HR] 2.85, 95% CI 1.46–5.57 for surgery in Winnipeg; HR 2.51, 95% CI 1.35–4.67 for surgery outside of Winnipeg). This analysis also found that local recurrence was associated with the absence of either neoadjuvant radiation or adjuvant chemotherapy.

Local recurrence rates of rectal cancer in Manitoba appear lower than previously documented rates in our population. However, these rates remain high relative to current benchmark rates. Rural residents may present a particularly important opportunity for quality improvement initiatives, although the project is ongoing and may yield additional improvement targets.

24

Image inversion and digital mirror image technology aid laparoscopic surgery task performance in the paradoxical view: a randomized controlled trial. ***R. Gill, D. Al-Adra, X. Shi, C. Sample*. From the University of Alberta, Edmonton, Alta.**

As laparoscopic surgical procedures increase in complexity, surgeons may find themselves with the laparoscope opposite to their laparoscopic instruments, thus creating the paradoxical viewpoint. We assessed whether surgical task performance in the paradoxical viewpoint would be improved by digitally altering the image or by changing the camera orientation.

Sixty-one laparoscopically naive operators preformed a peg transfer task using a trainer box. In the first "round," naive operators were block-randomized to perform the peg transfer task either in the standard view or the paradoxical view. In the second "round," naive operators were positioned in the paradoxical view and block-randomized to having the monitor image as paradoxical (n = 19) or altered by being digitally flipped (mirror; n = 22) or inverted (n = 20). The task consisted of transferring 6 plastic objects in 5 minutes (300 s). Scoring was based on total time = time to completion (maximum 300 s) + penalty time (50 s/peg not completed).

In the first "round," average total time to perform the peg transfer task using the standard view was 215 ± 20 seconds, which was significantly less ($p < 0.001$) than that for the paradoxical view at 563 ± 13 seconds.

In the second "round" (with all naive operators in the paradoxical viewpoint), the total time for the paradoxical image, digitally flipped (mirror) and inverted image were 561 ± 12, 449 ± 25 and 259 ± 37 seconds, respectively. The total time for the inverted image was significantly less than both the paradoxical image and digitally flipped image ($p < 0.001$). The total time for the digitally flipped image was also less than paradoxical image ($p < 0.05$). The group with the paradoxical image completed 0.8 ± 0.2 peg transfers, which was less than both the digitally flipped (mirror) and inverted view groups ($p < 0.05$).

This is the first study to demonstrate that when in the paradoxical viewpoint, altering the image on the video monitor, either by digitally flipping or inverting the image, can improve surgical task performance.

25

Frequency and reasoning for repeated CT scans in trauma patients transferred from other hospitals. ***J. Armstrong, L. Lester, K. Vogt, M. Brackstone*. From the University of Western Ontario, London, Ont.**

In the era of heightened awareness of the radiation associated with computed tomography (CT), concern has been raised about scans being repeated following patient transfer. This study was done to identify the frequency with which CT scans are repeated in adult trauma patients transferred to a single trauma centre, and to investigate the reasons for repeating these scans. This prospective cohort study evaluated all severely injured trauma patients transferred from the referral base to a single tertiary care trauma centre in Southwestern Ontario over a 4-month period. Data collected included demographics, injury details, number and type of CT scans performed at the referring hospitals and at the trauma centre, and reason for repeating CT scans.

In total, 100 consecutive patients were transferred from 30 hospitals. Thirty-five patients had CT imaging prior to transfer, of whom 19 (54.3%) had at least 1 CT repeated on arrival to the trauma centre. In total, CT abdomen/pelvis was repeated in 9 of 17 patients (52.9%), CT head in 11 of 28 (39.3%), CT face in 2 of 5 (40%), CT thorax in 4 of 11 (36.4%) and CT cervical spine in 6 of 24 (25%). Reasons given for repeating CT scans included the following: clinical indication including deterioration in clinical status (9 patients, 47.3%), images unavailable to the trauma team leader online or on compact discs (5 patients, 26.3%) and inadequate scans including poor image quality or incorrect contrast usage (5 patients, 26.3%).

Computed tomograph scans were often repeated in patients transferred to the trauma centre from other hospitals. A significant number of these repeat CT scans were because images were unavailable, or inadequate CT scans were performed at the referring institution. Potential improvements to the trauma system include improved access to online imaging and implementation of a consistent CT protocol across the catchment area. These changes will reduce unnecessary delays, expenditure and radiation exposure in the trauma setting.

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WITHDRAWN

27

Risk factors for incisional hernia after laparoscopic colon resection: midline versus transverse extraction site. ***L. Lee, P. Kaneva, S. Liberman, P. Charlebois, B. Stein, G. Fried, L. Feldman*. From the McGill University Health Centre, Montréal, Que.**

Incisional hernia (IH) remains a source of considerable morbidity after laparoscopic colon surgery. A midline specimen extraction site may increase the risk of hernia. This study compares the incidence of incisional hernia after midline or transverse incisions for specimen extraction in laparoscopic colon resection.

Laparoscopic colon resections performed at a single university centre before 2010 were retrospectively reviewed. Cases involving a Pfannenstiel incision, stoma creation or reversal or a hand-assist port were excluded. Incisional hernias were identified from review of clinic notes and postoperative imaging. Univariate analysis was performed using the χ^2 and Student t tests ($^*p < 0.05$). Logistic regression was performed to identify risk factors associated with a diagnosis of incisional hernia.

In total, 155 patients were included (134 midline, 21 transverse). The 2 groups were comparable in terms of age, sex, diabetes, malignancy and length of follow-up (11.4 mo). The BMI was higher in the transverse group (29 v. 26 kg/m^2, $p = 0.04$). Surgical site infections occurred in 13.4% in the midline group versus 19% in the transverse group (p = NS). Overall, 9.8% (15/155) of patients were diagnosed with an IH; 10.4% (13/134) of patients in the midline group developed an IH compared with 4.8% (1/21) in the transverse group ($p = 0.41$). Patients with IH (IH$^+$) had a higher BMI (30 v. 26 kg/m^2, $p = 0.03$) and had more wound infections (40% v. 11%, $p = 0.003$) compared with those without (IH–). There were no differences in age, sex or diabetes. Follow-up was significantly longer in IH$^+$ patients compared with the IH– (22.6 v. 10.3 mo, $p = 0.005$). Logistic regression identified higher BMI, longer follow-up and surgical site infections as significant predictors of incisional hernia; extraction site was not significant.

After laparoscopic colon resection, surgical site infection and body habitus may be more important risk factors than extraction site for the development of an incisional hernia.

28

Should atypical spitz tumour be treated as malignant melanoma? A single institution experience of 26 patients. ***A. Kanji, E. Sharon, K. Asai, L. Jacks, D. McCready, D. Ghazarian, W.-L. Leong*. From the University of Toronto, University Health Network, Toronto, Ont.**

Atypical Spitz tumours (ASTs) are rare skin lesions with histological features of both benign Spitz nevi and malignant melanomas. The current surgical managements of ASTs are similar to melanomas, but we hypothesize that ASTs can be treated less aggressively.

The objective of this study is to compare the clinicopathological features and clinical outcomes of age- and thickness-matched AST and melanoma patients treated with wide local excision and sentinel lymph node biopsy (SLNB).

Between July 1996 and December 2005, 26 ASTs (median patient age 34 yr, mean Breslow thickness 2.1 mm) were found in a prospective melanoma database (n = 855). The clinicopathologic variables of the AST group were compared with a matched melanoma group (n = 310, matched by age and Breslow thickness) using the χ^2 or Fisher exact test and the Wilcoxon rank-sum test. The overall and recurrence-free survival curves were compared using the log-rank test. The median follow-up was 6.15 years and 5.15 years for AST and melanoma groups, respectively.

Although AST patients more often presented with SNB-positive disease (31% v. 20%, $p = 0.21$), none had additional nodal involvement at completion nodal dissection. Patients with an AST showed a trend toward better recurrence-free ($p = 0.09$) and overall survival ($p = 0.11$).

Compared with melanoma, ASTs have a more favourable biology and can be treated less aggressively, especially when it comes to the decision for completion nodal dissection.

29

Laparoscopic peritoneal dialysis catheter insertion using nitrous oxide under conscious sedation is an effective alternative of implantation. ***R. Wu, A. Okrainec, T. Penner*. From The Ottawa Hospital, Ottawa and Toronto Western Hospital, Toronto, Ont.**

Laparoscopic peritoneal dialysis catheter (LPDC) implantation

using nitrous oxide (N_2O) under conscious sedation is a procedure that has many advantages over conventional insertion methods. The purpose of this study was to review the LPDC insertion results at our centre.

Data from 86 consecutive patients were retrospectively reviewed. After patients received local anesthesia, a nitrous oxide (N_2O) pneumoperitoneum was established. Peritoneal dialysis (PD) catheters were advanced using rectus sheath tunneling. Position of the catheter was confirmed by laparoscope, and adjunct procedures such as omentopexy and adhesiolysis were performed on selective patients to prevent catheter flow problems.

Nitrous oxide was well tolerated intraoperatively without complications. After a mean follow-up of 18.2 months, mechanical complications included pericatheter/incision leakage (2.4%), incision/exit site (3.5%), flow obstruction (4.6%), hemoperitoneum (2.3%), pleuroperitoneul fistula (1.2%), hydrothorax (1.2%), scrotal leak (1.2%) and migration (1.2%). Infective complications include exit site infection (4.6%) and peritonitis (32.5%). Revision-free catheter survival is 97.6% after 1 year.

Laparoscopic implantation of a PD catheter with N_2O insufflation and local anesthesia is thought to be hemodynamically safer than carbon dioxide (CO_2) for patients with severe renal failure. In addition, N_2O is an inert gas and is better tolerated as an insufflation agent, enabling awake procedures. Insertion of an LPDC using N_2O is simple and safe. Functionally, our accumulated experience has also shown no disadvantage using awake sedation for laparoscopic implantation. Functional outcomes are comparable to the existing literature and should be recommended as a good option of catheter implantation in patients needing dialysis.

30

New frontiers for the trauma surgeon: using the "resuscitation with angiography, percutaneous techniques and operative repair (RAPTOR) suite" for severely injured patients. *C. Ball, A. Kirkpatrick*. From the University of Calgary, Calgary, Alta.

Exsanguination and death are rapid consequences of untreated hemorrhage. Percutaneous approaches use minimally invasive endovascular techniques to arrest ongoing bleeding. This systematic review analyses the role of and evidence for percutaneous techniques in injured patients.

A PRISMA-based systematic review was completed using all relevant English literature identified in multiple databases (PubMed, MEDLINE, EMBASE, Cochrane Central Register for Controlled Trials).

Percutaneous techniques for trauma have evolved from primarily diagnostic/noninvasive aortic arch angiograms and extremity peripheral vascular angiography to therapeutic procedures for hemorrhage control (embolization, balloon occlusion, stenting). Hemodynamic instability has become only a relative contraindication. Published targets include spleen, liver, kidney, pelvis, pulmonary and virtually all major abdominal vessels (aorta, iliac, renal, lumbar, inferior vena cava). Balloon occlusion of the distal aorta for bleeding pelvic fractures and proximal aorta for cross-clamping are well established. Appropriate routes for training and maintenance of skills are not currently standardized. Because 70% of emergency angiography occurs "out-of-hours," with less than 15% being performed within 90 minutes of arrival, trauma surgeons trained in percutaneous endovascular techniques to arrest exsanguinating hemorrhage would be ideal. A single location capable of allowing operative and percutaneous procedures as well as critical care (RAPTOR) could benefit severely injured patients.

Trauma surgeons should play a role in the emergent arrest of hemorrhaging trauma patients via balloon occlusion, angiography and potentially angioembolization. The role of a single location for resuscitation, angiography, percutaneous techniques and operative repair (RAPTOR) is substantial.

31

Outcomes following subcutaneous endoscopically assisted ligation (SEAL) in children: a retrospective cohort study. *A Vasquez, L. Balakrishnan, G. Miller, S. Awan*. From the University of Saskatchewan, Saskatoon, Sask.

Subcutaneous endoscopically assisted ligation (SEAL) is a new method for inguinal hernia repair in children that has been introduced to the pediatric surgeons' armamentarium. The objective was to retrospectively evaluate a series of pediatric inguinal hernia repairs performed by open herniotomy (open) or the SEAL technique and compare outcomes for measures of quality assurance.

A retrospective cohort study of inguinal hernia repairs performed in children less than 16 years old, using either the SEAL or open technique between January 2008 and December 2009 at the Royal University Hospital was performed. The end points included intraoperative time, complications, postoperative outcomes such as recurrence, postoperative hydrocele, testicular atrophy and wound complications.

In total, 127 clinical charts were reviewed retrospectively (SEAL 42, open 85). Our population included 97 male patients (SEAL 33, open 64) and 30 female patients (SEAL 9, open 21). Mean age was 3.1 years and 5.2 years in male and female patients, respectively, including 57 patients less than 1 year old (open 33, SEAL 24) and 70 older than 1 year (open 52, SEAL 18). Median times in the operating room for SEAL and open repair were 25 minutes and 30 minutes, respectively. Mean follow-up time was 6 weeks. Complications in open procedures included 1 postoperative hydrocele, 1 recurrence perioperatively and groin pain requiring clinical follow-up. Complications in SEAL procedures included 2 recurrences and 1 wound granuloma. There were no mortalities.

The SEAL technique for inguinal hernia repair is a safe and effective procedure. Surgical outcomes in our institution for operative time are similar to those quoted in the literature. The recurrences associated with SEAL procedure were seen in patients older than 1 year of age. This is a technically challenging surgical technique. A learning curve to become proficient with this technique would be expected. This may have influenced our surgical outcomes and should be taken into account.

32

Positive factors that influence general surgery specialty choice are robust through residency. *N. Rajaee Azadeh, J. Hoogenes, D. Dath*. From McMaster University, Hamilton, Ont.

This study explored the factors that influenced current residents to choose general surgery (GS) and whether those factors remained important during residency.

A prospective, cross-sectional survey design was employed with a convenience sample of McMaster University GS residents during grand rounds. Survey items were adapted from the literature and pilot tested for feasibility. Residents rated 23 factors on a 5-point Likert scale, first rating how factors influenced their choice to pursue GS and then indicating each factor's importance as a resident. Open-ended questions elicited residents' reasons for choosing GS, certain features about lifestyle and whether they thought about switching out of GS. Results were analyzed in SPSS v.18.

Twenty-two GS residents completed the survey (55% female, mean age 29 yr). Resident year was almost equally distributed (PGY1–5). No statistically significant differences were found between any factor's influence on choice as a medical student and its importance during residency. Highest rated factors were the challenge and variety of GS, influence of role models, types of procedures and ability to see immediate results. Variety was the most frequently quoted reason for choosing GS. Lowest rated factors were job, fellowship and research opportunities, financial prospects and being highly regarded by colleagues. Fifty-percent of residents indicated that they had thought about switching out of GS at times, citing call frequency, poor lifestyle, time constraints and stress as reasons.

The factors that residents used to choose a GS career remained important measures of satisfaction through residency. This consistency suggests that medical students critically contemplate their specialty choice and are not deterred during their residencies by some negative aspects of lifestyle. Future research will involve a larger sample and include staff surgeons.

33

The implementation of an acute care emergency surgical service: What does it cost surgeons? *V. Jain*. From the University of Western Ontario, London, Ont.

Acute care surgical services have been theorized to not only improve patient care, but also to reduce costs to the health care system. We undertook this study to identify the costs associated with the implementation of our Acute Care Emergency Surgical Service (ACCESS) from the perspective of surgeon billings.

This retrospective cohort study assessed all emergent general surgery cases at a single centre tertiary care hospital in Ontario. The operative database was used to identify all emergent cases from July 1 to December 31, 2009 (pre-ACCESS), and July 1 to December 31, 2010 (post-ACCESS). Billing costs for all identified procedures were obtained from the published OHIP Schedule of Benefits. Our model was based on the actual volume of daytime (7 am – 3 pm), evening (3 pm – 11 pm) and nighttime (11 pm – 7 am) emergent cases.

A total of 366 procedures were performed in the pre-ACCESS period and 463 in the post-ACCESS period. The absolute cost billed for these cases differed by $6008 ($281 066 pre-ACCESS v. $287 075 post-ACCESS). The proportion of cases performed in the daytime increased with the introduction of ACCESS (11.3% v. 62.5%), while the evening and nighttime cases decreased (63.2% v. 30.7% and 25.5% and 6.8%, respectively). Modelling was based on proportions if all emergent general surgery cases were appendectomies, segmental colon resections, laparotomies or cholecystectomies.

Despite a significant increase in the number of emergency general surgery cases performed after the introduction of our ACCESS service, the total billings increased by only $6000. Further, theoretical modelling demonstrates a significant potential cost savings to the health care system achieved by shifting emergency general surgical operating to daytime hours.

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WITHDRAWN

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CSTAR Interprofessional Surgery and Anesthesia School: a novel program for preclinical medical and nursing students at the University of Western Ontario. *G.-M. Busato, O. Cristea, J. Landau, R. Moreland, M. Johnson, D. Ramage, D. Browning*. From the Schulich School of Medicine and Dentistry, and Canadian Surgical Technologies and Advanced Robotics, London, Ont.

Many preclinical medical and nursing students report significant stress and uncertainty associated with impending career choices. The practical aspects of surgical and anesthesia specialties are often under-represented in preclinical curricula, leading many students to express a desire for earlier hands-on exposure to these disciplines.

We developed a 5-day training program that allows students in both medicine and nursing to experience a dynamic simulated operating room (OR) environment. The principal goals of our program are to facilitate informed decision-making around career and specialty choice, as well as to enhance student appreciation for the interprofessional nature of the OR environment. The curriculum is structured around interactive sessions where students acquire early exposure to fundamental perioperative knowledge, skills and techniques. These sessions include suturing, sterile field preparation, airway management, laparoscopic simulation and induction and maintenance of anesthesia, to name a few. The week culminates in the interdisciplinary team-based management of a patient using various forms of simulation.

Thirty students completed the first iteration of this program. The results of a course evaluation survey revealed an overwhelmingly positive response, with many students highlighting the significant practical benefits of the experience. Nursing and medical students also noted an enhanced appreciation for each other's roles in the OR, as well as the program's positive influence on their consideration of an OR career.

Students with an interest in hands-on specialties benefit from an early interactive exposure to these fields. Mentor-guided simulated experiences can offer students a better opportunity to define their potential career interests in surgery, anesthesia and perioperative nursing and may result in far-off benefits for the retention of recruits in these fields.

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SOAP (Surgically Orientated Anatomy Program): a student-initiated, extracurricular response to the role of anatomy teaching in the modern medical curriculum. *S. Ullah, O. Cristea, A. Bodrogi, M. Johnson, V. McAlister*. From the Canadian Forces Medical Service and University of Western Ontario, London, Ont.

The role of anatomy in medical education has diminished in

recent times. There is a general expectation from patients that physicians have a sound knowledge of anatomy. Students express a desire to understand anatomy in its clinical context before undertaking clerkship rotations. Given the limited availability of cadaveric anatomy instruction and the demands for space in a busy curriculum, how can students achieve the desired level of anatomic knowledge?

Our surgical anatomy club, "SOAP," created an informal extracurricular environment where surgeons and anatomists demonstrate surgical procedures on cadavers to allow students an appreciation of how anatomy is applied everyday in the operating room. Procedures (anatomic issues) demonstrated so far include: Whipple's procedure (abdominal wall, liver, pancreas, gallbladder, gastrointestinal tract, portal venous system, aorta and vena cava); shoulder replacement (rotator cuff muscles, axilla, pectoral girdle, brachial plexus and artery); kidney transplantation (pelvis, iliac vessels, bladder, kidney); laryngectomy and lateral rhinotomy (nasal cavity, oral cavity, larynx, trachea, cranial nerves, carotid arteries, jugular veins); and abdominal aortic aneurysm repair (abdominal cavity including arterial and venous anatomy, retroperitoneal structures). The sessions were completed with refreshment in the postgraduate bar.

Each session was limited to 40 students. Places were sold out within 30 minutes of the start of booking. A class survey showed 26% to be satisfied with current anatomy instruction time; 9.8% did not agree that anatomy instruction was essential; 86% felt SOAP enhanced their clinical understanding of anatomy and preparations for clerkship.

Medical students have sought to remedy a perceived inadequacy of time spent teaching anatomy through an extracurricular partnership with surgeons and anatomists.

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The feasibility of telesimulation for teaching operative nursing skills in remote regions. *J. Palisoc, J. Anderson, R. Kiladze, J. Ciar, I. Bancel, K. Pitzul, P.-A. Leake, A. Okrainec*. From the Division of General Surgery, University Health Network, University of Toronto, Toronto, Ont.

Telesimulation is an educational tool that uses the Internet and webcams to connect a teacher with trainees in remote locations. The objective of this pilot study was to adapt our current telesimulation surgical skills platform for operating room nursing education and to determine if telesimulation was a feasible approach for nursing training.

A curriculum for teaching minimally invasive surgery nursing (MISN) skills was developed by content experts. The curriculum consists of 5 modules, each of which contains both a didactic lecture and a hands-on skills component. Webcams were placed so the instructor and trainees could see both each other and the surgical equipment that was placed throughout the room. Skype software was used to establish a video connection between instructors and trainees. Skype software's screen sharing feature was used so trainees could view the didactic lecture presented by instructors.

The first telesimulation session was conducted between the University of Toronto and Korle Bu Teaching Hospital in Accra, Ghana. Two MISN expert nurses in Toronto remotely connected with 9 nurses in Ghana to teach Module III: Equipment and Supplies. Instructors were able to teach, demonstrate and provide feedback on all aspects of minimally invasive surgery equipment, identification of instruments, how to assemble and disassemble instruments and proper sterile handling of all equipment. Feedback from Ghanaian nurses suggests that telesimulation is an effective tool for teaching MISN skills and that nurses in remote locations would eagerly participate in our program.

Our current telesimulation platform is a feasible tool for teaching MISN skills in remote locations and resource-poor countries. Future studies are needed to determine the effectiveness of telesimulation for teaching MISN skills.

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Surgical site infection prevention: long-term results of a quality improvement initiative. *A. Dalvi, R. McLean, W. Stephen, M. Loeb, R. Smith, E. Christoffersen, S. Forbes*. From the Department of Surgery, Department of Pathology and Molecular Medicine, McMaster University and Hamilton Health Sciences Hamilton, Ont.

The long-term sustainability of quality improvement initiatives in the literature is unknown. A practice audit was carried out following the successful implementation of a surgical site infection (SSI) prevention care pathway to determine its long-term performance.

A retrospective chart review was performed on elective abdominal surgery patients 2 years after the implementation of a standardized care pathway for SSI prevention. This included improving timing of preoperative antibiotic administration using a discrete change in nursing practice, and perioperative normothermia rates via incremental changes in patient warming methods. Patients were reviewed for timing of preoperative antibiotic administration and perioperative normothermia rates as well as overall SSI rate. Groups were compared with the χ^2 statistic; relative risks (RR) and 95% confidence intervals (CI) were calculated.

In total, 100 consecutive patients were reviewed. There was no significant difference between the current practice audit and the postintervention cohort from the original study in receiving antibiotics within 60 minutes of surgical incision (95.1% v. 92.6%; RR 0.97, 95% CI 0.92–1.05, $p = 0.494$). Normothermia rates declined significantly compared with the postintervention cohort (82.4% v. 97.6%; RR 1.18, 95% CI 1.08–1.23, $p = 0.001$). There was no statistically significant difference in SSI rates between the 2 groups (6% v. 8.7%; RR 1.03, 95% CI 0.96–1.10, $p = 0.594$).

Sustained improvement in care was demonstrated for timing of antibiotic administration but not normothermia rates; SSI rates remained the same. Simple practice changes implemented for antibiotic administration may be more sustainable over time compared with more complex models as used for maintenance of normothermia. Further research into mechanisms for sustaining change is required.

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The hospital standardized mortality ratio: Is it missing the boat? *B. Kidane, K. Vogt, C. Vinden*. From the University of Western Ontario, London, Ont.

The hospital standardized mortality ratio (HSMR) is a ratio of observed to expected in-hospital mortality based on demographic and illness variables. It is often used as a performance indicator to compare institutions. By focusing on in-hospital mortality, we

hypothesize that the HSMR is limited and fails to account for important variability in end-of-life beliefs/practices. Extant literature suggests there are cultural differences along the collectivism–individualism spectrum and that these impact on end-of-life care beliefs. As there are no standard measures of where populations sit on the collectivism–individualism spectrum, we chose the following as proxies: proportion of population comprised of first- and second-generation immigrants, proportion of population that immigrated between 2001 and 2006 and proportion of population mainly speaking nonofficial languages at home. We therefore undertook this study to address the relation between HSMR and cultural variation in end-of-life care within various regions.

Published HSMRs for hospitals in Ontario were averaged for each Local Health Integration Network (LHIN) to determine a regional HSMR. These values were then correlated with the aforementioned proxies identified from the most recent national census.

Data for 154 hospitals were included. All proxies were similarly negatively correlated with HSMR ($r^2 = 0.69$, $r^2 = 0.70$, $r^2 = 0.63$; $p < 0.01$) such that LHINs with a higher proportion of immigrants had lower regional HSMRs.

Despite the use of logistic regression adjusting for variables impacting on expected in-hospital mortality, the HSMR appears to underestimate the importance of certain characteristics. Cultural differences in end-of-life beliefs/practices along the collectivism–individualism spectrum may impact on HSMRs by decreasing in-hospital mortality in regions with larger immigrant populations. Our data suggest that failing to account for such regional differences may lead to a misrepresentation of the HSMR.

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Teaching critical appraisal skills to general surgery residents: Is evidence-based reviews in surgery the answer? ***N. Ahmadi, L. Dubois, M. McKenzie, N. Baxter, C. Brown, P. Chaudhury, E. Dixon, W. Fitzgerald, H. Henteleff, A. Kirkpatrick, S. Latosinsky, A. MacLean, R. McLeod*. From the University of Toronto, Toronto, the University of Western Ontario, London, Ont., the Department of Surgery, St. Paul's Hospital, University of British Columbia, Vancouver, BC, McGill University, Montréal, Que., the University of Calgary, Calgary, Alta., Charles S. Curtis Memorial Hospital, St. Anthony, NL, and Dalhousie University, Halifax, NS**

Teaching critical appraisal (CA) is a mandatory part of resident curricula in Canada. The purpose of this study was to determine the proportion of general surgery (GS) residents in Canada who receive CA training, whether evidence-based reviews in surgery (EBRS) is used to teach CA and, finally, to assess resident opinions regarding EBRS and journal club.

Residents (PGY2–5) from 15 GS programs were invited to complete a survey that was distributed by GS program directors. Data are presented as percentages and means.

Of 232 residents (58%: mean 56%/program, range 0%–100%) who responded, 86 (39%) receive CA training and 198 (85%) participate in journal club. In total, 125 (54%) knew about EBRS, of whom 46 (37%) use EBRS in a journal club format and 33 (27%) participate in EBRS online or on their own. Over 75% of residents who use EBRS agreed or strongly agreed that the EBRS clinical and methodological articles and reviews are relevant. Only 40% of those who use EBRS online felt the listserv discussion was worthwhile and 43% felt a listserv group exclusively for residents would be of value. Only 16 (13%) residents use the EBRS archives section, but those who do find it very useful. Eighteen (16%) access EBRS journals to download other articles. The most common journal club format is a mandatory meeting held at a special time (e.g., evenings) every month with faculty members with epidemiological and clinical expertise. The EBRS articles are used exclusively (14%) or with other articles (62%). In total, 176 (91%) stated that journal clubs are very or somewhat valuable to their education.

In summary, most GS residents in Canada do not receive formal CA training. Although most residents who use EBRS rate it highly, a large proportion is unaware of EBRS and its features. Thus, future efforts to increase awareness of EBRS, communicate directly with GS residents and increase its accessibility are required.

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Enablers and barriers to implementation of an enhanced recovery after surgery protocol: viewpoints of members of a perioperative multidisciplinary team. ***E. Pearsall, M.-A. Aarts, Z. Meghji, R. McLeod, A. Okrainec*. From the University of Toronto, Toronto, Ont.**

Enhanced recovery after surgery protocols (ERASp) are often difficult to implement owing to the necessity of engagement of a perioperative multidisciplinary team (PMT). The aim of this study was to understand current beliefs, enablers and barriers of an ERASp and its implementation.

A medical student using a pilot-tested standardized script interviewed general surgeons (GS), anesthetists and ward nurses at 7 university-affiliated hospitals to identify potential barriers and enablers to adoption of 18 ERAS interventions. Grounded theory was used to thematically analyze the transcribed interviews.

Nineteen GS, 18 anesthetists and 18 nurses participated. The mean time of the interviews was 18 minutes. Two hospitals had an ERASp in place. Overall, interviewees were supportive of implementation of a standardized ERASp and agreed that hospital and discipline champions, a standardized ERASp based on best evidence, preprinted pre- and postoperative order sets and education of the PMT, patients and families are essential. Lack of manpower, hospital resources and buy-in, poor communication within the PMT, physician preferences and patient factors were cited by most as barriers. Discipline-specific issues were identified: most nurses felt that early feeding was not important and that manpower issues are barriers to early ambulation. Conversely, most GS felt both were important and easily implementable. Many GS were against shortened preoperative fasting because cases might be cancelled. Most anesthetists and surgeons felt a change in nursing culture would be required. Sites with ERASp felt ongoing re-education and audit and feedback were essential.

In summary, whereas there was agreement that a standardized ERASp should be adopted, identified barriers to adoption included lack of understanding of other disciplines' challenges and lack of communication among the PMT. Identification of respected champions to encourage education, communication and collaboration among the PMT may increase the likelihood of adoption of an ERASp.

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A novel measure of recovery after abdominal surgery. ***T. Tran, P. Kaneva, G. Fried, N. Mayo, L. Feldman*. From McGill University, Montréal, Que.**

Innovations in surgery are advocated on the basis of "enhanced recovery." Individual aspects of recovery are currently measured using narrowly focused administrative indicators (length of stay) or patient-reported questionnaires (quality of life). The objective of our study was to integrate multiple instruments into a single quantitative measure that would be sensitive to expected differences in recovery after abdominal surgery.

The measure was developed and validated using data from patients undergoing scheduled abdominal surgery. Patients were interviewed preoperatively, 3 weeks and 2 months postoperatively with 5 indices currently used to assess recovery: health-related quality of life (SF-36), Quality of Recovery score, symptoms (visual analog scale), physical activity (CHAMPS questionnaire) and general health perception (EQ-5D). Rasch analysis combined items across domains of the various instruments to develop the new measure on a logit scale which was transformed to a score from 0 to 100. Longitudinal, known-groups and construct validity were assessed to demonstrate its psychometric properties (*$p < 0.01$, †$p < 0.05$).

Data from 177 patients were collected. Using Rasch analysis, a 24-item measure was developed. The mean score returned to baseline from 69 (13) preoperatively to 67 (14) at 3 weeks and increased above baseline to 76 (14) at 2 months.* Ambulatory patients had faster recovery, returning to preoperative scores at 3 weeks (72 v. 70†) and increasing above baseline at 2 months (81 v. 70*). Scores for inpatients were decreased at 3 weeks (58 v. 67†) but returned to baseline at 2 months (69 v. 67). Ambulatory patients had higher scores postoperatively at 3 weeks (72 v. 58*) and 2 months (81 v. 68*). Patients with complications had lower scores preoperatively (64 v. 70†), at 3 weeks (60 v. 71*) and 2 months (66 v. 78*). The measure had moderate correlations with all instruments ($r = 0.3$–0.8*).

A novel measure of recovery after abdominal surgery was developed encompassing a broad range of domains. This method illustrates that recovery can be quantified with mathematical units.

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Preoperative cognitive impairment and its impact on postoperative delirium — a pilot study. ***D. Newman, S. Bergman, B.-A. Cummings, M. Delisle, V. Whitehead, H. Chertkow*. From McGill University and the Jewish General Hospital, Montréal, Que.**

The primary purpose of this pilot study was to determine the relation between mild cognitive impairment and postoperative delirium in elderly surgical patients. The secondary purpose was to determine the clinical impact of delirium.

This is a prospective study of 35 consecutive patients, 70 years and over, not known to have any degree of cognitive impairment, undergoing elective general, vascular or otolarygologic surgery. Preoperatively, patients were assessed for the presence of a mild cognitive impairment (MCI) using the Montréal Cognitive Assessment (MoCA). Comorbid disease burden was evaluated using the Charlson Comorbidity Index (CCI). Following surgery, patients were assessed daily for delirium using the Confusion Assessment Method (CAM) for 1 week or until discharge. Secondary outcomes were length of stay and the occurrence of complications. Logistic regression using delirium as the independent variable and MCI, age, sex and CCI as independent variables was performed.

Twenty-nine of the 35 patients (82.8%) had MCI. Postoperative delirium occurred in 6 of 35 patients (17.1%). When controlled for age, sex and comorbidity, MCI was not significantly associated with the development of postoperative delirium. Patients who developed delirium, compared with those who did not, had a significantly longer length of stay (22.7 ± 17.4 v. 12.7 ± 10.8, $p = 0.01$) but did not have higher complication rates (16.7% v. 11.4%, $p = 0.7$).

The presence of mild cognitive impairment was not associated with postoperative delirium. The significance of the strikingly high prevalence of mild cognitive impairment in our surgical population is unclear and should be further investigated.

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SxCx: an evidence-based index of surgical complication rates for your smartphone. ***T. Chan, M. Cicero, K. Perampaladas, T. Bandukwala*. From McMaster University, Hamilton, Ont.**

With the growing popularity of hand-held devices, there is emphasis on applications that allow quick access to information. Our goal is to provide surgeons with the first comprehensive database of surgical complication rates. A group of medical students, with endorsement from staff surgeons, created SxCx, an index of over 400 surgical procedures and their complication rates across 17 surgical specialties based on the most current evidence available. This application is designed to be open-sourced and can be updated by many contributors to keep pace with the mobile and changing body of evidence in surgery, with biannual peer reviews to maintain content integrity. The application will be available free for download across smartphone platforms by May 2011. Applications like SxCx will be one of many quick-reference applications that can be used as tools to aid learning while enhancing patient care by providing evidence-based information about surgical procedures. This poster will highlight the development process and utility of this application, as well as comment on user feedback of surgeons and residents using this application in clinical practice.

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When are bowel sounds most reliable in the diagnosis of small bowel obstruction? ***J. Struble, M. Moser.* From the Department of Surgery, University of Saskatchewan, Saskatoon, Sask.**

A recent study by our group found that only 42% of recorded small bowel obstruction (SBO) bowel sounds were correctly identified by test physicians. Sound analysis revealed that some of the bowel sounds were very typical, whereas others were atypical, and hence were rarely identified as SBO. The purpose of our study was to determine if "typical" sounds are more commonly found in certain settings such as early versus late, or proximal versus distal SBO.

Healthy volunteers ($n = 10$) or patients with radiologically- or laparotomy-confirmed small bowel obstruction ($n = 19$) were

enrolled as study participants. Unselected recordings of bowel sounds from each participant were obtained using an electronic stethoscope. Twenty study physicians were then individually presented with 36 consecutive sound recordings and were asked whether each sound clip represented small bowel obstruction or healthy participants.

Test physicians scored an average of 45% (16.2/36) correct answers. Intraobserver agreement, however, was excellent (85%, $\kappa = 0.696$), suggesting that the recordings were of good quality, and the test physicians were consistent. Intrapatient agreement was poor (59.29%, $\kappa = 0.117$), suggesting that a patients' bowel sounds vary considerably even between recordings taken just minutes apart. Listening for a full minute, as opposed to 30 seconds, made no difference, and no difference was seen in correct answers whether the obstruction was proximal or distal, or early or late.

In conclusion, the auscultation of bowel sounds does not appear to be reliable in diagnosing SBO. Nor does it appear that "typical" sounds are more common in certain settings such as early versus late, or proximal versus distal SBO. Our study suggests that the reason may be that sounds made by the obstructed bowels vary greatly from one moment to the next.

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Risk factors for surgical site infections following colon surgery: a retrospective chart review. ***P. Young, A. Groeneveld, P. Chan, S. Smith, R. Khadaroo.*** **From the University of Alberta, Edmonton, Alta.**

Surgical site infections (SSIs) are one of the most common complications following surgery. They can result in delayed wound healing, increased hospital stay, decreased quality of life and significant morbidity and mortality. Colon surgery in particular has significant risk of SSI, with previous studies reporting rates as high as 26%. It is important to understand the risk factors that contribute to increased rates of SSIs in an effort to identify high-risk groups and develop strategies to reduce these risk factors.

A single institution retrospective review of 93 consecutive patients undergoing elective and emergent colon surgery between January 2010 and December 2010 was undertaken. Outcomes measured were rates of SSIs as defined by the Centre for Disease Control–National Healthcare Safety Network (CDC-NHSN) 2008 guidelines.

Rates of superficial incisional, deep incisional and deep organ space SSIs were 12.1%, 0% and 1.1%, respectively. Overall rates of SSIs were 13.2%. Patient demographics and operative and perioperative characteristics were analyzed to identify significant risk factors. Only steroid use was identified as a statistically significant risk factor for SSIs overall (odds ratio 6.8, 95% CI 1.6–30.2).

This study suggests that identification of risk factors in SSIs during colon surgery is feasible through the use of statistical analysis. The inclusion of a larger patient population would allow for greater statistical power in identifying these risk factors contributing to SSIs. Further data collection and analysis of a full 3-year retrospective review is underway.

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The use of biomaterials for closure of the open abdomen after abdominal sepsis: a pilot study. ***A. Buczkowski, M. Hameed, C. Tan-Tam, A. Meneghetti, R. Simons, N. Panton.*** **From the University of British Columbia, Vancouver, BC**

The increasing use of open abdomen management strategies in abdominal sepsis, while improving the chances of survival for many patients, has created complex challenges for abdominal closure. The utilization of biomaterials for abdominal wall reconstruction has been a promising development in the multimodal management of abdominal sepsis. However, the economic impact of these materials has not yet been extensively tested in the Canadian health care system. This pilot study evaluated the performance, clinical impact and costs of 2 well-known biomaterial meshes for abdominal wall reconstruction in abdominal wall sepsis.

We conducted a pilot prospective cohort study. Type of prosthetic mesh was considered the exposure of interest, whereas resource utilization was the outcome of interest. Operative strategies, outcomes and costs were compared between abdominal sepsis patients managed with 2 types of bioprosthestic meshes: Surgisis and Alloderm.

Three patients were managed with Surgisis and 6 with Alloderm. Per-patient mesh costs for abdominal wall reconstruction were: Surgisis $3673 and Alloderm $12 000. However, resource use was higher among Surgisis patients than Alloderm patients, including total time in the OR (1967 v. 1338 min), VAC dressing changes (22 v. 6.6), days of VAC therapy (102 v. 26), LOS after last OR (61 v. 24 d) and institutional costs per patient ($289 773 v. $202 308).

Use of Alloderm was associated with decreased need for intervention and decreased overall resource use compared with Surgisis in this pilot study. This study highlights the importance of global assessments of costs and benefits in operative resource allocation. Formal cost effective analyses are planned.

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WITHDRAWN

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Bone marrow transplant patients with gallstone disease: Is there a role for early cholecystectomy? ***A. Elnahas.*** **From McMaster University, Hamilton, Ont.**

Management of gallstone disease in the adult transplant population has consisted of a spectrum of options ranging from pre- and post-transplantation prophylactic cholecystectomy to expectant management. Currently, there is a paucity of literature specifically addressing the management of gallstone disease in the adult bone marrow transplant (BMT) population. The objective of this study is to evaluate the management of adult BMT patients with symptomatic gallstone disease requiring cholecystectomy.

The adult BMT patient database at a single institution was cross-referenced with hospital records to identify patients who had undergone a cholecystectomy for symptomatic gallstone disease. Clinical presentation, operative management and clinical outcomes were evaluated.

There were 9 patients status post-BMT who had a cholecystectomy between 2006 and 2010. Six patients (67%) developed complications of gallstone disease, including 4 cases of acute cholecystitis, 1 case of gallstone pancreatitis and another with ascending cholangitis. These patients required hospital admission and proceeded to urgent surgery. Conversion to an open procedure was

required in 2 cases (22%). Surgical pathology characteristically revealed chronic cholecystitis, with the exception of 1 case where no inflammation was evident. Although there was no operative mortality, 2 cases were complicated by wound infections and another by laparoscopic port–site hematoma.

Gallstone disease in adult BMT patients was associated with a higher rate of acute inflammatory complications compared with the general population. Operative management of symptomatic gallstone disease in these patients also appears to be more challenging. Future studies could be directed toward screening and surveillance for gallstones as well as determining the optimal timing for cholecystectomy. This will provide a more systematic approach and hopefully optimize care in this select population.

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Canadian general surgeons: opinion about clinical practice audit. ***I. Ghaderi, A. Madani, C. de Gara, C.M. Schlachta.*** **From the University of Western Ontario, London, Ont., and the University of Alberta, Edmonton, Alta.**

The objective of this survey was to explore Canadian Association of General Surgeons (CAGS) members' opinions about the role and utility of clinical practice audit (CPA).

A 2-question electronic survey was sent to CAGS members that addressed demographics, knowledge about CPA, awareness of available audit tools, experiences with CPA and opinions about value, implementation and barriers to CPA.

In total, 108 surveys were completed (mean age of respondents was 44 ± 12 yr). Seventy-five percent of respondents practice in the public and 25% in the private sector. Residents, fellows and retired surgeons comprised of 17.6%, 3.7% and 3.7%, respectively. Of practising surgeons, 63.9% had subspecialty training and 60% were in an academic centre as opposed to 32% and 7% in community or rural hospitals. Familiarity with common auditing tools ranged from 3.7% to 27.8%, with 40.7% familiar with none. Forty-four percent have previously performed CPA. Most respondents believe that CPA should be mandatory (48.1%). Many stated that CPA is best done by self (34.3%) and that the Ministry of Health should pay for it (35.2%). Using a Likert scale, a majority of respondents felt that CPA is effective at changing both patient outcomes (57.4%) and clinical practice (73.1%), and that barriers included time constraints (90.7%), resources (90.7%), cost (62%) and inadequate documentation (56.5%). A majority of respondents believed that the results of CPA should be reviewed by themselves (92.5%), their department (81.5%), provincial organizations (48.1%) or the Royal College (50.9%) as opposed to the public, ministry of health or hospital administration.

Canadian surgeons perceive usefulness in clinical audit but have limited knowledge about available audit tools and resources. An appropriate auditing infrastructure needs to be implemented to increase awareness, address barriers and ensure adequate regulation over the distribution and use of such information.

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Telesimulation and the fundamentals of laparoscopic surgery: The Northern Ontario experience. ***S. Kalechstein, K. Pitzul, O. Henao, A. Okrainec.*** **From McMaster University, Hamilton University Health Network, Hamilton, University of Toronto, Toronto, Ont., and the Hospital Universitario San Vicente Fundacion, Medellin, Colombia**

The Fundamentals of Laparoscopic Surgery (FLS) program is considered to be the gold standard for laparoscopic technical skills training. The purpose of this project was to determine if telesimulation, connecting a teacher with trainees using the Internet and webcams, is a feasible and effective tool for teaching FLS skills in Northern Ontario.

Eighteen surgical residents and surgeons from 4 Northern Ontario communities were enrolled in the study. Baseline FLS testing was performed for all 5 technical skills before telesimulation training. Sessions allowed for 20 minutes of individualized telementoring once per week for a total of 4 weeks, after which an official FLS proctor administered FLS testing at each site. Pre- and post-telesimulation FLS test scores were compared using a paired *t* test.

Six surgical residents and 12 staff surgeons were enrolled. Participants were primarily male (66%), most (56%) had been practising surgery for less than 10 years and half (50%) had completed more than 100 laparoscopic cases. There was a significant difference in mean pre- and post-telesimulation total (pre 61 ± 20 v. post 87 ± 8) and task-specific FLS scores (peg 70 ± 14 v. 96 ± 8; pattern 46 ± 26 v. 76 ± 10; loop 58 ± 21 v. 79 ± 18; extracorp 72 ± 21 v. 99 ± 11; intracorp 58 ± 30 v. 86 ± 12) Using a 5-point Likert scale, participants ranked simulation as having an important role in their region (mean score 4), and deemed both the FLS simulator and telesimulation course useful (mean score 4). Fourteen individuals were FLS certified, with results for the remaining 4 individuals still pending.

Our telesimulation program resulted in significant improvement in participants' laparoscopic FLS technical skills. Participant feedback indicates the utility of our telesimulation program in these remote regions. Telesimulation should continue to be used for FLS skills training in remote locations, and could be applied to technical skills training of other laparoscopic procedures.

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Obturator hernias: a Canadian centre's experience. ***D. Paskar, K. Croome, R. Hernandez.*** **From the Department of General Surgery, University of Western Ontario, London, Ont.**

Obturator hernia (OH) is a rare intra-abdominal hernia where bowel incarcerates in the obturator canal, resulting in small bowel obstruction (SBO). Overall, OH represents less than 1% of abdominal hernias. Risk factors include female sex, weight loss and multiparity. Owing to its rarity, OH is often omitted from initial differential diagnoses for SBO, leading to delay in diagnosis and treatment.

We sought to identify our institution's recent (2001–2010) OH cases, describe this unique population, as well as determine how we diagnose and manage OH. A retrospective cohort of OH patients was established via a database search. Data regarding demographics, history, physical exam, laboratory and imaging, operative reports and postoperative course were recorded.

All the patients were female with a mean age of 84.8 ± 3.7 years. The mean body weight was 40 ± 7.6 kg. This was below this age group's fifth percentile.

Each patient presented to the emergency department (ED) with complaints of nausea, vomiting and cramping abdominal pain. All patients received preoperative CT scans in the ED, each demonstrating mechanical SBO with pelvic transition points; 83% demonstrated radiographic OH. Seventeen percent of cases were diagnosed at laparotomy. Two-thirds were right-sided, one-third left-sided.

One patient refused surgery, whereas the remainder underwent midline laparotomy. Half of the patients required bowel resection with primary anastomosis. The average time from first medical assessment to CT scan in resected patients was 64.7 ± 53 hours versus 8.9 ± 5.6 hours for those nonresected. Two resected patients were transferred from peripheral centres, whereas the nonresected patients were not.

Our data suggest that early access to CT may prevent bowel compromise and subsequent need for resection. Patients presenting with SBO to centres without CT and/or surgical capacity should be expeditiously transferred to a tertiary centre.

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Output of essential surgical services at a district hospital in rural Angola by nonphysician surgical providers. ***G. Knapp, N. Howatt, S. Foster, B. Cameron*. From McMaster University, Hamilton, Ont., and Centro Evangelico de Medicina (CEML) Hospital, Lubango, Angola**

There exists a paucity of information on access, delivery and output of surgical services done by nonsurgeons in developing countries. We analyzed the surgical outputs from a unique training program for nonphysician surgical providers at a district hospital in Southern Angola.

The nonphysician surgical providers at Kalukembe District Hospital in Angola were trained by a Canadian general surgeon in an informal, nongovernmental training program including mentoring and graded responsibility. Providers were graduate nurses working in the operating room and selected for their capacity for further training. The surgeon was based at a hospital 300 km distant, visited Kalukembe for 4 days a month, and was available by cell phone to discuss cases. We retrospectively reviewed the Kalukembe Hospital surgical logbook from January to July 2010 and summarized the types of surgical cases done by the nonphysician surgical providers.

Over the 7-month period, 987 surgical procedures were performed at the hospital by nonphysician surgical providers, including 17 different types of operations. The most common operations were fracture management (32%), wound débridement (15%), Caesarian section (11%), incision and drainage of abscess (6%) and acute abdominal emergencies requiring a laparotomy (4%). Surgical outcomes were reviewed monthly by the visiting surgeon.

Nonphysician surgical providers are a significant component of the surgical delivery system in Sub-Saharan Africa. There is a critical unmet surgical need in Angola associated with excessive morbidity and mortality. In the Kalekembe region, nurses have been successfully trained as surgical providers and are delivering emergency surgical services. Essential to the continued development of this program is formalization of the training process, expansion of mentored learning opportunities and monitoring of quality of care. Future research will include evaluation of the cost-effectiveness of task-shifting surgical care to nonphysician providers in Angola.

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Retrospective analysis of outcomes in patients with superficial soft tissue sarcoma treated with surgical management. ***J. Austin, L. Mack, W. Temple, S. Puloski, N. Schachar*. From the Foothills Medical Centre and Tom Baker Cancer Centre, Calgary, Alta.**

The current standard of care for the treatment of soft tissue sarcoma (STS) of the extremity is limb-sparing wide local excision and adjuvant radiation. However, we hypothesize that STS superficial to muscular fascia represents a less aggressive subtype and may be treated with surgery alone regardless of size or grade. The primary objective is to assess local recurrence rates in patients treated with surgical management alone for STS.

A retrospective cancer registry review was performed to assess outcomes in patients treated with superficial STS at the Tom Baker Cancer Centre.

The primary outcome recorded was local recurrence rates among patients with superficial STS treated by surgery alone. Patient and tumour characteristics including size, grade and histology are described.

Descriptive statistics with standard deviations and confidence intervals were used to describe patient and tumour characteristics. Univariate analyses were performed to assess predictors of local recurrence.

Sixty-four of 137 charts reviewed met study criteria. Local and overall recurrence rates were 14.1% ± 4.3% (9/64) and 20.3% ± 9.9% (13/64). For patients with and without recurrence, the mean age was 59 versus 56 years, and 61.5% versus 56.9% of patients were male. The proportion with a T2 tumour was 23.1% versus 41.2% ($p = 0.21$), and the proportion with intermediate- or high-grade tumours was 69.3% versus 58.8% ($p = 0.49$) for patients with and without recurrence. Resection margins < 1 cm were present in 69.2% versus 31.4% ($p = 0.013$) of patients with and without recurrence. The mean follow-up for patients in the study was 4 years. Mean time to recurrence was 2 years.

The local recurrence rate is consistent with others reported in literature, which range from 11% to 23%. However, the majority of studies do not distinguish those treated with surgery alone versus those treated with surgery and chemotherapy/radiation.

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Update of the National Surgical Quality Improvement Program at our hospital: continued success in promoting data driven initiatives to improve quality of care. ***T. Gill, P. Doris, A. Tecson*. From the Surrey Memorial Hospital, New Westminster and Surrey, BC**

At the 2008 CAGS conference, we presented on the implementation of the National Surgical Quality Improvement Program (NSQIP) in our hospital, discussed initial results and data-driven initiatives that drove stakeholders toward quality improvement and patient safety. This presentation will demonstrate improved surgical outcomes, reduced length of stay and costs and increased patient satisfaction. NSQIP is an internationally recognized program designed to identify strengths, weaknesses and gaps in surgical practices through data collection. NSQIP releases risk-adjusted semiannual reports and real-time data available online, which gives independent and comparative reports to see where improvements can be made. The activities have generated positive

outcomes: reduction in postoperative mortality, surgical site infection, pneumonia and urinary tract infection. Care paths and order sets were created by procedure groups to streamline surgical processes and reduce variations in care, thereby increasing capacity and reducing length of stay. A study on a deep vein thrombosis/pulmonary embolism risk scoring tool is currently being conducted and aims to determine venous thromboembolism risks prior to surgery. Identifying a reasonable cut-off risk score will guide our team in implementing appropriate prophylaxis to targeted populations. Reporting of statistically valid data has resulted in creation of action teams. There is increased commitment to welcome continuous process, practice enhancement and development of innovative strategies that are safety- and outcome-oriented. Input from staff has provided an opportunity for collaboration. Patients' overall satisfaction indicates marked improvements. By having access to shared, accurate data that surgeons trust, we can elicit vital changes in our perioperative system. The success and recognition of NSQIP at our hospital, formation of Canadian Collaboratives and increased Canadian hospital enrollment are testaments to efficacy of NSQIP in generating positive outcomes and improving quality of surgical care.

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Sex isn't everything: the role of gender in early performance of a fundamental laparoscopic skill. ***N. Kolozsvari, A. Andalib, P. Kaneva, J. Cao, M. Vassiliou, G. Fried, L. Feldman*. From the Steinberg-Bernstein Centre for Minimally Invasive Surgery and Innovation, McGill University, Montréal, Que., and Simon Fraser University, Burnaby, BC**

Existing literature on the acquisition of surgical skills suggests that women generally perform worse than men. This literature is limited by looking at an arbitrary number of trials and not adjusting for potential confounders. The objective of this study was to evaluate the impact of gender on the learning curve for a fundamental laparoscopic task.

Thirty-two medical students performed the FLS peg transfer task, and their scores were plotted to generate a learning curve. Nonlinear regression was used to estimate learning plateau and learning rate. Variables that may affect performance were assessed using a questionnaire. Innate visual-spatial abilities were evaluated using tests for spatial orientation, spatial scanning and perceptual abilities. Score on first peg transfer attempt, learning plateau and rate were compared for men and women using the Student *t* test. Innate abilities were correlated to simulator performance using the Pearson coefficient. Multivariate linear regression was used to investigate the effect of gender on early laparoscopic performance after adjusting for factors found significant on univariate analysis. Statistical significance was defined as $p < 0.05$.

Nineteen men and 13 women participated, of whom 30 were right-handed, 12 reported high interest in surgery and 26 had video game experience. There were no differences between men and women in initial peg transfer score, learning plateau or rate. Initial peg transfer score and learning rate were higher in participants reporting high interest in surgery ($p = 0.02$, $p = 0.03$). Initial score also correlated with perceptual ability score ($p = 0.03$). In multivariate analysis, only surgical interest remained a significant predictor of score on first peg transfer ($p = 0.03$) and learning rate ($p = 0.02$) whereas gender had no significant relation to early performance.

Gender did not affect the learning curve for a fundamental laparoscopic task, whereas interest in surgery and perceptual abilities did influence early performance.

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New dog, new tricks: trends in FLS laparoscopic simulator performance for incoming surgery residents. ***N. Kolozsvari, P. Kaneva, M. Vassiliou, G. Fried, L. Feldman*. From the Steinberg-Bernstein Centre for Minimally Invasive Surgery and Innovation, McGill University, Montréal, Que.**

Exposure to laparoscopic surgery during medical school has increased over recent years. The Fundamentals of Laparoscopic Surgery (FLS) simulator allows for objective assessment of laparoscopic skill. The goal of this study was to determine whether the fundamental laparoscopic skills of incoming surgery residents have improved.

The initial FLS performance of first-year residents between 2003 and 2008 was identified from a prospective database. Linear regression was used to determine the effect of incoming year on performance of the 5 FLS tasks (peg transfer, pattern cut, endoloop placement, suture with extracorporeal knot [EC], suture with intracorporeal knot [IC]) and total score. Data are presented as mean ± SD. Statistical significance is defined as $p < 0.05$.

There were 65 first-year residents identified from the database. Scores for each task and total score are presented in the Table. Total FLS score improved over time ($r = 0.39$, $p = 0.001$). Scores for peg transfer did not significantly change, but scores for pattern cutting ($r = 0.37$, $p = 0.002$), endoloop placement ($r = 0.36$, $p = 0.004$), suture with EC ($r = 0.32$, $p = 0.02$) and suture with IC ($r = 0.26$, $p = 0.03$) all significantly improved over the 5 years.

Baseline fundamental laparoscopic skills for incoming surgery residents appear to have improved over time. This may be owing to increased clinical laparoscopic exposure and availability of laparoscopic simulation in medical school.

Table, abstract 57

	Year; FLS score						
Task	2003	2004	2005	2006	2007	2008	*p* value
Peg transfer	47.9 ± 22.0	39.7 ± 19.4	42.2 ± 26.5	56.6 ± 24.2	40.4 ± 23.1	58.5 ± 31.1	0.34
Pattern cut	11.1 ± 16.3	17.1 ± 18.0	6.05 ± 12.0	15.0 ± 18.3	16.6 ± 18.0	43.8 ± 16.7	0.002
Endoloop	28.2 ± 25.5	27.3 ± 25.0	15.6 ± 16.9	35.2 ± 20.1	44.9 ± 29.5	54.0 ± 11.3	0.004
EC	26.9 ± 27.5	29.6 ± 24.6	26.0 ± 21.5	28.7 ± 33.8	45.5 ± 26.6	54.7 ± 26.5	0.01
IC	20.0 ± 26.8	25.7 ± 28.8	28.3 ± 26.8	41.3 ± 37.9	22.6 ± 19.5	53.2 ± 26.6	0.03
Total score	26.8 ± 19.5	27.9 ± 14.9	23.6 ± 12.6	35.4 ± 20.5	34.0 ± 17.2	52.8 ± 13.4	0.001

FLS = Fundamentals of Laparoscopic Surgery.

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Mastery versus standard proficiency targets for basic laparoscopic skill training: effect on skill transfer and retention. ***N. Kolozsvari, P. Kaneva, C. Brace, G. Chartrand, M. Vaillancourt, J. Cao, D. Banaszek, M. Vassiliou,***

***G. Fried, L. Feldman*. From the Steinberg-Bernstein Centre for Minimally Invasive Surgery and Innovation, McGill University, Montréal, Que., and Simon Fraser University, Burnaby, BC**

Although there is little evidence guiding educators on how to best implement simulation within surgical skills training, the Fundamentals of Laparoscopic Surgery (FLS) curriculum emphasizes part-task training and overtraining. We investigated, first, whether part-task training by practising a basic FLS simulator task (peg transfer [PT]) facilitates learning a more complex skill (intracorporeal suture [ICS]) and, second, compared the effect of PT overtraining with training to the passing level on PT retention and on learning ICS.

Ninety-eight surgically naive participants were randomized to 1 of 3 PT training groups: control, standard training and overtraining. All participants then trained in ICS. The learning curves for ICS were analyzed by estimating the learning plateau and rate using nonlinear regression. Skill retention was assessed by retesting participants 1 month after training. The groups were compared using ANOVA. Effectiveness of skill transfer was calculated using the transfer effectiveness ratio (TER). Data are presented as mean (SD). $^*p < 0.05$.

Seventy-seven participants completed the study: 28 controls, 26 standard and 23 overtrained. The ICS learning plateau rose with increasing PT training (452 [10] v. 459 [10] v. 467 [10], $p < 0.01$). There was a trend toward higher initial ICS scores (128 [107] v. 127 [110] v. 183 [106], $p = 0.13$) and faster learning rates (15 [4] v. 14 [4] v. 13 [4] trials, $p = 0.10$) with increasing PT training. At retention, there were no differences in PT scores ($p = 0.5$). Peg transfer training took 20 (10) minutes for standard training and 39 (20) minutes for overtraining ($p < 0.01$). Overtrained participants saved 11 (5) minutes in ICS training compared with controls ($p = 0.04$). However, the TER was 0.165 for the overtraining group and 0.160 for the standard training group, suggesting that PT overtraining took longer than the time saved on ICS training.

In surgically naive participants, part-task training with peg transfer alone was associated with slight improvements in the learning curve for intracorporeal suturing. However, overtraining with peg transfer did not improve skill retention, and peg training alone was not an efficient strategy for learning intracorporeal suturing.

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Surgical Safety Checklist alone is not enough to improve appropriate antibiotic prophylaxis adherence. *S. Fraser, S. Bergman*. From the Jewish General Hospital, Montréal, Que.

The Surgical Safety Checklist (SSC) is a quality improvement tool designed to maximize adherence to standards of care for perioperative processes. The objective of this study was to measure rates of appropriate use of antibiotic and venous thromboembolism (VTE) prophylaxis after the implementation of the SSC.

This retrospective study compares adherence rates of antibiotic and VTE prophylaxis use in general surgery patients in the 3 months prior to implementation to those in the 3 months following the implementation period. The following data were collected: demographic and procedural data and use of perioperative prophylaxis (antibiotics and heparin). Data are presented as proportions (%) and compared using χ^2. Antibiotics were appropriately administered and withheld less frequently following SSC implementation, whereas appropriate heparin administration rates were improved (see Table).

The SSC implementation was not sufficient to improve appropriate antibiotic prophylaxis use at our institution. We believe evidence-based surgical education initiatives must be used in conjunction with the SSC to modify safety culture and behaviour.

Table, abstract 59

Variable	Period; no. (%)		*p* value
	Pre-SSC	Post-SSC	
Antibiotic prophylaxis			
Overall	125/169 (74)	72/143 (50.3)	< 0.0001
Appropriately given	61/83 (73.5)	39/78 (50)	0.003
Appropriately withheld	64/86 (74.4)	36/65 (55.4)	0.02
VTE prophylaxis			
Overall	145/169 (85.8)	128/143 (89.5)	0.4
Appropriately given	2/22 (9.1)	12/23 (52.2)	0.003
Appropriately withheld	143/147 (97.3)	116/120 (96.7)	1

SSC = Surgical Safety Checklist; VTE = venous thromboembolism.

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Colorectal cancer screening practices in Saskatchewan: a survey of Saskatchewan family physicians. *R. Deobald, J. Chad, C. Di Gregorio, J. Johnstone, C. Kenyon, M. Lees*. From the Department of General Surgery and West Winds Primary Health Centre, University of Saskatchewan, Saskatoon, Sask.

Despite the high incidence and mortality associated with colorectal cancer (CRC) and the proven effectiveness of screening, studies continue to show low screening rates across Canada. As there is no standard province-wide screening program in Saskatchewan, the responsibility for initiating screening belongs to family physicians. We administered a survey to all family physicians in Saskatchewan to ascertain their current screening practices and their view of the barriers to current screening options.

A total of 773 eligible family physicians were surveyed, of whom 344 responded, yielding a response rate of 44.5%. When asked what method they use for fecal occult blood (FOB) testing, almost 40% of responding physicians were either unsure or did not answer the question. Of those who did respond, 35.8% employ a Hemoccult test following digital rectal exam, which is not a recommended test for CRC screening. Screening guidelines for average-risk patients were generally well adhered to, with 79.9% of respondents recommending screening beginning at 50 years of age. For screening patients at increased risk of CRC owing to a family history of CRC, only 64.2% of respondents chose to begin screening 10 years prior to the age of the index patient. Physicians who were significantly more likely to follow guidelines included female physicians, physicians practising in urban areas, physicians in practice fewer than 10 years and physicians trained in Canada. More than 90% of family physicians agreed a standard province-wide screening program would be beneficial.

We have identified significant knowledge gaps with regards to CRC screening. There seems to be confusion regarding which

FOB tests are recommended for the purposes of screening. Also, screening guidelines for patients with a family history of CRC are poorly understood. These findings suggest that better physician education is required in regards to CRC screening.

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Selective use of mesh in laparoscopic paraesophageal hernia repair: an attractive option. ***E. Auger-Dufour, G. Fried, L. Feldman, L. Ferri, M. Vassiliou.*** **From the McGill University Health Centre, McGill University, Montréal, Que.**

Use of mesh in laparoscopic paraesophageal hernia repair has been associated with an improved short-term recurrence rate in randomized controlled trials. However, numerous case reports of mesh-related complications can be found in the literature, creating some reluctance to routine mesh use. The objective of this study is to determine our short-term recurrence rate with selective use of mesh.

We reviewed a prospective database of patients undergoing a laparoscopic paraesophageal hernia repair between 1997 and 2009 in our centre. Mesh was placed selectively when anatomic factors that might increase the risk of recurrence were present (tension on the crural repair, peritoneal stripping, attenuated crural muscles). Upper gastrointestinal series were done routinely 3–6 months postoperatively to evaluate for recurrence. Patient characteristics, mesh use and recurrence rates were evaluated.

Laparoscopic repair of a primary paraesophageal hernia was performed in 104 consecutive patients (mean age 69 yr, mean BMI 27). The female-to-male ratio was 2:1. The mean operative time was 144 minutes. Primary crural repair was done in 80% of patients (83/104); mesh repair in 20% (21/104) (3 PTFE, 18 Surgisis). The median length of stay was 2 days. Radiological follow-up was achieved at a mean of 6.4 months in 92% of patients. The overall recurrence rate is 13.4% (14/104). Four recurrences occurred in the first 15 cases. After this learning curve, the recurrence rate was 11.2% (10/89). The recurrence rates were 14% (3/21) in the mesh group and 13% (11/83) in the primary repair group; 57% (8/14) of recurrences were sliding or migration of the wrap in the chest; 43% (6/14) were true paraesophageal recurrences.

Considering the potential risks associated with mesh placed at the hiatus, we feel a selective approach is attractive. We were able to achieve an acceptable short-term anatomic recurrence rate while avoiding the use of mesh in 80% of our patients.

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Clinical variables in intestinal obstruction. ***A. Alqahtani, R. Perlman, C. Holcroft, P.H. Gordon, A. Szilagyi.*** **From the Division of Colorectal Surgery, Department of Epidemiology, Division of Gastroenterology of the Jewish General Hospital, McGill University School of Medicine, Montréal, Que.**

Small bowel obstruction is a frequent complication of Crohn disease. Determining need for an operation over medical therapy is a demanding task. The aim of this study was to quantitatively support clinical judgment regarding therapeutic decisions in small bowel obstruction of any cause.

Consecutive patients with Crohn disease and small bowel obstruction were compared with a selected sample group of non-Crohn patients with obstruction over a 9-year period. Twenty-two clinical, laboratory and radiological variables were assessed for outcomes, operative or nonoperative treatment in Crohn disease, operative or nonoperative treatment without Crohn disease and preoperative judgement that cause obstructions among Crohn patients. Multivariable models were developed for each outcome using logistic regression.

Age less than 50, history of smoking and mean platelet volume < 9.9 fL supported the diagnosis of Crohn disease preoperatively. Operation in Crohn disease was associated with a history of smoking, temperature > 38°, high pulse > 100 and obstruction on abdominal scan (91% correctly classified), whereas surgery in patients without Crohn disease was associated with temperature > 38°, tachycardia, leukocytosis ($> 11 \times 10^9$), previous operation (98% correctly classified). Preoperative etiology in Crohn disease could not be determined

In patients presenting with small bowel obstruction and Crohn disease in addition to intuitive markers of clinical severity such as tachycardia, fever and elevated white blood count a history of smoking increases the likelihood for need to operate instead of medical therapy. These markers need to be prospectively verified.

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Is the use of total parenteral nutrition in patients over 80 years worth it? ***D. Iradukunda, M.A.J. Moser, N. Rodych, J.M. Shaw.*** **From the University of Saskatchewan, Saskatoon, Sask.**

Age is becoming less of a consideration to aggressive medical and surgical interventions. The aim of this study was to evaluate whether patients older than 80 years showed similar gains from total parenteral nutrition (TPN) compared with patients 35–50 years old.

A database of patients aged 80 years old (group 1) and patients between 35 and 50 (group 2), on TPN for greater than 1 week, was compiled from the Nutrition Support Service (NSS) database. Patients had C-reactive protein (CRP), prealbumin, albumin and electrolytes drawn at least twice weekly. Patients were matched 1:1 according to their diagnosis, year of admission and Subjective Global Assessment.

Group 1 patients had lower prealbumin and albumin levels compared with group 2 patients, nonetheless they benefitted from the TPN in terms of a rise in prealbumin. The C-reactive protein and CRP:prealbumin ratio improved in both groups. Both groups had similar complication rates (line related thrombosis, catheter related bloodstream infections, intra-abdominal sepsis), days on TPN and length of hospitalization.

Patients older than 80 years may benefit from aggressive nutritional support by administration of TPN. Age should not be used as an exclusion criterion for patients requiring TPN.

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Crisis in the general surgery work force: a qualitative exploration of career satisfiers and dissatisfiers among general surgeons. ***N. Ahmed, M. Chiu, B. Kurabi, A. Qureshi, A. Nathens, L. Gotlieb Conn, A. Pandya, S. Kitto.*** **From the University of Toronto, Toronto, Ont.**

General surgeons (GS) are an essential component of the health care system as they provide a large proportion of emergency and

elective surgical care. We explored career satisfaction/dissatisfaction among practising GS to understand why this crucial workforce is declining.

Members of the Canadian Association of General Surgeons were contacted to participate in a telephone interview. The transcripts were analyzed using iterative coding. They were asked to describe the factors that contributed to career satisfaction and dissatisfaction and to offer suggestions for prevention, screening and management of career distress.

Thirty-two GS from diverse practice environments participated in this study. Participants identified the influence of role models, the broad scope of practice and passion for the profession as central reasons for choosing GS. Gratification from work and professional relationships were reported as major contributors to career satisfaction. Ideas related to career dissatisfaction cleaved into system issues (inadequate OR resources, demanding call schedules) and personal issues (imbalance between time and energy spent at and outside of work).

General surgeons love their work and feel greatly rewarded; however, alongside these themes was the indelible idea that system factors that seem beyond the influence of a practising surgeon conspire to negatively impact their work/life balance. Many GS felt that some of these challenges could be overcome. These results may help to develop effective solutions for fostering this essential workforce at the level of medical education, training and practice.

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Quality of inguinal hernia operative reports: room for improvement. ***G Ma, A. Pooni, S. Forbes, C. Eskicioglu, E. Pearsall, F. Brenneman, R. McLeod*****. From the University of Toronto, Toronto, Ont.**

Operative reports (ORs) are dictated narratives that serve as the official documentation of an operation and are important for patient care, research, quality improvement and medico-legal proceedings. The quality of narrative reports is often poor and lacking in detail. The purpose of this study was to audit the completeness of inguinal hernia ORs.

A standardized checklist for inguinal hernia repair (IHR) consisting of 33 perioperative variables was developed by consensus by 4 surgeons. Five high-volume IHR surgeons categorized items as essential, preferable or not essential. Operating rooms for open IHR at 6 academic hospitals were audited.

In total, 213 ORs (3–45 ORs per hospital) were audited. Tension-free repairs were the most common repair (79.8%), with the plug-and-patch method the most frequent technique (51.2%). Fifty-eight percent of ORs were dictated by residents. Of the 15 items considered essential, on average 9.2 were included. Individual items were reported in 9.4%–100% of ORs. Poorly reported elements included first occurrence versus recurrent repair (9.4%), small bowel viability in incarcerated hernias (35.3%) exploration of the spermatic cord (58.8%). Of nonessential elements, thromboprophylaxis, preoperative antibiotics and urgency of the repair (elective v. emergent) were reported in 1.9%, 11.7% and 24.9% of ORs, respectively. Repair-specific details were reported in 0%–97.1% including patch sutured to tubercle (55.1%), internal ring recreated (36.7%) and location of the plug (67%). In McVay repairs, the transition stitch was reported in 0%, whereas 97.1% of Prolene Hernia System repairs reported overlay mesh. Operating rooms dictated by senior residents were more complete (66.7%) than those dictated by staff (58.6%) or junior residents (59.8%).

The completeness of IHR ORs varied with regards to both essential and nonessential items but were generally incomplete, suggesting there is an opportunity for improvement, including implementation of standardized synoptic ORs.

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Decision-tree analysis of dialysis initiation for acute kidney injury in the intensive care unit. ***M.A. Rockx, V. McAlister.*** **From the Alberta Medical Association Locum Services and the University of Western Ontario, London, Ont.**

Many surgeons are involved with the management of patients with complex comorbidities who are admitted to ICUs. Access to renal replacement therapy (RRT) for acute kidney injury (AKI) has dramatically increased recently with the development of continuous veno-venous hemodiafiltration (CVVHDF). The purpose of this paper is to determine by decision-tree analysis an appropriate protocol for initiation of various intermittent and continuous types of RRT and to identify points of care that should receive priority for research.

We surveyed currently available protocols, cohort studies and randomized controlled trials (RCTs) to arrange factors determining decisions into 3 categories: decision nodes (binary outcomes), chance nodes (continuous outcomes arranged into categories) and end nodes (categorical outcomes).

Two factors are effective in developing appropriate tracks of care: poisoning and symptoms/signs. Chance nodes include degree of acidemia, hyperkalemia, hypervolemia and uremia. Degree of hemodynamic stability and anticipation of a procedure such as surgery or intravenous contrast-enhanced imaging are decision nodes that can be placed at the commencement of the tree or within it as modifiers. No RRT, CVVHDF and intermittent HD are 3 end nodes identified. Resource availability modifies the end nodes for individual ICUs. Expert opinion (level D evidence) appears to be the basis for most decision-making with respect to RRT. The only RCTs (level A evidence) available concern the type of RRT, and none are available regarding the initiation or duration of treatment.

The variety of options implies the difficulty in consistency in the care of patients with AKI. A decision tree helps simplify the process and identifies opportunities for development. The best target for further research would be large trials of RRT conducted in clinical settings, using a database including survival, duration of stay, etc., where patients are randomized regarding the initiation and duration of therapy.

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Severe adult street cycling and mountain biking injuries: a comparison of the incidence, injury patterns and risk factors over 14 years. ***D. Roberts, J. Ouellet, A. Kirkpatrick, R. Lall, F. Sutherland, C. Ball.*** **From the University of Calgary, Calgary, Alta.**

Street cycling and mountain biking are popular recreational activities and prevalent modes of transportation with the potential for severe injury. The purpose of this study was to evaluate the over-

all incidence and injury patterns associated with cycling, as well as to compare street and mountain bicycling.

A retrospective audit of all adults severely injured (ISS > 12) during street or mountain bicycling between 1995 and 2009 was completed. Standard statistical methodology was employed ($p < 0.05$ = significance).

Among 11 772 severely injured patients, 258 (2.2%) were injured (mean ISS 21, mean hospital stay 11 d, mortality rate 7%) during street cycling ($n = 209$) or mountain biking ($n = 49$). Injury patterns were similar across both groups ($p > 0.05$), with trauma to the head (67.4%), extremities (38.4%), spine (37.2%), chest (34.1%), face (26%) and abdomen (10.1%) being most common. Surgical intervention was required in 33.3% of patients (9.7% open reduction internal fixation, 7.8% spinal fixation, 7% craniotomy, 5.8% facial repair, 2.7% laparotomy). Mountain bikers were admitted to hospital more commonly on weekends compared with street cyclists (61.2% v. 45%, $p = 0.03$). Street cyclists were more often injured after being hit by a motor vehicle, whereas mountain bikers were more frequently injured after faulty jump attempts, bike tricks and falls (cliffs, roadsides, embankments).

Despite differing technique (street v. mountain), severely injured bicyclists displayed similar injury patterns with comparable outcomes. While more mountain bikers are injured on weekends, they require surgical interventions at the same rate as street cyclists. Helmet and thoracic protection should be advocated as injury prevention.

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Assesment of surgical and anesthesia capacity in post-conflict Liberia. ***S. Chackungal, L.M Knowlton, B. Dahn, K. McQueen*. From the University of Western Ontario, London, Ont., the University of British Columbia, Vancouver, BC, the Ministry of Health Liberia, Monrovia, Liberia, and Harvard Humanitarian Initiative, Cambridge, Mass.**

The objective of this study was to assess the capacity of the national health system of Liberia to provide surgical services and track surgical outcomes at the county hospital level.

A comprehensive survey tool was developed to assess physical infrastructure of operative facilities, education and training for surgical and anesthesia providers, equipment and medications, as well as the capacity of the surgical system to collect and evaluate surgical outcomes at district-level hospitals in Africa. This tool was implemented in a sampling of county hospitals in Liberia (January 2011). Data were obtained from the Ministry of Health and by direct government-affiliated hospital site visits.

The catchment area of the 10 hospitals surveyed was 2 288 429 — equivalent to roughly 75% of the population of Liberia (3 475 600). There were a total of 12 operating rooms and 31 physicians delivering surgical, obstetric or anesthesia care, only 2 of whom had matriculated in formal postgraduate training programs in these specialty areas (0.08 per 100000 population). The total number of surgical cases for 2010 was 7600, with approximately 47% of those being elective procedures. Among the facilities that tracked outcomes in 2010, the intraoperative death rate was 140 per 100 000 cases, and the 30-day postoperative death rate was 579 per 100 000 cases.

A significant volume of surgical care is being delivered at county hospitals throughout Liberia. The density of physicians with formalized surgical or anesthesia training remains critically low. Postoperative maternal mortality was almost uniformly tracked and serves as a model for monitoring all operative deaths in order to accurately assess performance. Almost half of all operative procedures performed in the surveyed hospitals were elective in nature, pointing to a possible unrecognized burden of surgical disease in the population.

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Inguinal hernia repair without mesh fixation. ***J.A. Morrison*. From the Chatham Kent Health Alliance, Chatham, Ont.**

Our aim was to establish whether the use of prosthetic mesh in open repair of inguinal hernias without the use of suture or fibrin fixation would lead to less patient chronic groin pain or change in the expected hernia recurrence rate.

A consecutive series of 78 patients presenting with a symptomatic unilateral inguinal hernia were entered in the series. Their mean age was 59 years and mean BMI 26, with a mean follow-up of 13.3 months (range 4–29 mo). All patients underwent standard open inguinal hernia repair using Covidien Parietex ProGrip mesh suitably measured and trimmed to fit each patient's inguinal canal. No fixation of the mesh in the inguinal canal was carried out. No intentional neurectomies were performed. Each patient was assessed using standard Carolinas Comfort Scale measurements at 6 and 12 months postoperatively.

All patients were contacted by telephone, and the Carolinas Comfort Scale questionnaire was completed by an independent surveyor. There was a single incidence of a femoral hernia occurring following ipsilateral indirect hernia repair. This was subsequently repaired laparoscopically. One patient complained of some groin discomfort lasting longer than 6 months postoperatively. All patients returned to their previous lifestyle. There were no mesh infections.

In a series of this size, it would have been expected that between 2 and 11 patients would have chronic groin discomfort of varying intensity lasting longer than 6 months. Similarly, 2–3 patients would have been expected to return with a recurrent hernia. However, in this series, only 1 patient experienced continuing symptoms of discomfort following the immediate postoperative period. There was a single recurrent hernia in the series. Because of the low incidence of postoperative discomfort and recurrences, it is felt that the absence of suture fixation of the mesh did lead to a better patient outcome.

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Seeking balance: the complexity of choice-making among academic surgeons. ***B. Lent, J. Brown, M. Fluit, C. Herbert*. From the University of Western Ontario, London, Ont.**

This study, conducted in 2009–2010, at the University of Western Ontario, describes the experiences of academic surgeons in seeking a balance between their personal and professional lives.

This phenomenological study used in-depth individual semi-structured interviews to explore 17 recently recruited academic surgeons' (9 women/8 men) ideas, perceptions and experiences of seeking a balance between their personal and professional lives. All the interviews were audio-taped and transcribed verbatim.

The data analysis was both iterative and interpretative.

All the participants expressed a passion and commitment to academic surgery, but their stories revealed the complexity of making choices in seeking a balance between their personal and professional lives. This process of making choices was filtered through influential values in their lives, which in turn determined how they set boundaries to protect their personal and family time from the demands of their professional obligations. Intertwined in this process were the trade-offs they had to make in order to seek balance. Some choices, boundary setting strategies and trade-offs were dictated by sex. Finally, the process of making choices was not static; instead, the data revealed how it was both dynamic and cyclical, requiring re-examination over the life cycle, as well as their career trajectory. Thus seeking a balance was an ever-changing process.

An understanding of how individuals, who are members of an academic department of surgery, navigate the balance between their personal and professional worlds may provide new insights and understandings for other disciplines seeking to enhance the development of the next generation of academics.

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Cricotracheal and tracheal resection for subglottic stenosis: our institutional experience. ***S. Deen, M. Deutschmann, S. McFadden, G. Gelfand, D. Bosch.*** **From the University of Calgary, Calgary, Alta**

Subglottic stenosis, whether idiopathic or traumatic, is uncommon. Treatment can be conservative, including dilatations and laser therapy, or surgical resection. The purpose of this study was to review our centre's experience with cricotracheal (CTR) and tracheal resection (TR) for subglottic stenosis.

A retrospective chart review was performed on 22 patients who had CTR or TR for subglottic stenosis from 1995 to 2010. Clinic and hospital charts were reviewed. Patient data were entered onto an Excel spreadsheet and then coded into SPSS software (version 15).

Twenty-two patients were identified with a mean follow-up of 19 months. The average ICU and overall hospital stay were 2.6 and 10.3 days, respectively. There were no intraoperative complications. Postoperative complications included 1 unplanned, temporary tracheostomy, 1 urinary tract infection, 1 bronchoscopy to clear excess airway secretions and 1 transient, unilateral recurrent nerve palsy. Restenosis requiring further medical treatment occurred in 5 patients (22.7%), and 2 patients (9.1%) had obstructing granulation tissue requiring further medical treatment. At follow-up, 16 patients (72.7%) retained normal voice function, and 5 patients (22.7%) maintained a low pitched voice. One patient (4.5%) developed a whispering voice. Breathing status was rated as "excellent" in 14 patients (63.6%) and "good" in 6 patients (27.3%). Two patients (9%) had minimal shortness of breath on exertion. Swallowing was normal in 18 patients (81.8%), and 4 patients (18.2%) experienced a sticking sensation or tightness in their throat when swallowing.

Patients who had CTR and TR performed at our centre have experienced good overall functional outcomes. These data show that it is safe to perform these more complex operations at lower volume centres with the necessary expertise and resources. Furthermore, CTR or TR can be an effective long-term treatment modality for patients with subglottic stenosis.

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Can preoperative methicillin-resistant *Staphylococcus aureus* screening and chlorhexidine chest scrub decrease the incidence of post-resection empyema? ***L. Grimmer, S. Milman, T. Ng.*** **From the Brown University School of Medicine, Providence, RI**

We evaluated the efficacy of preoperative methicillin-resistant *Staphylococcus aureus* (MRSA) screening and chlorhexidine chest scrub in decreasing the incidence of empyema after major pulmonary resections.

For 2 years, a strategy aimed at decreasing post-resection empyema was instituted (group A, n = 192). This entailed preoperative screening for nasal MRSA and chlorhexidine chest scrub the night before surgery. Patients screened positive for MRSA received 5 days of nasal mupirocin. Group A was compared with patients 2 years earlier who did not receive this preoperative strategy (group B, n = 173). The extent of resection considered was lobectomy or greater. All patients received cefazolin (or clindamycin if allergic) before incision and 24 hours postoperatively, except for patients in group A screening positive for MRSA, who received vancomycin. All patients had povidone-iodine skin preparation.

In group A, the prevalence of MRSA was 1% (2/192) and methicillin-sensitive *Staphylococcus aureus* (MSSA) was 7.8% (15/192). There was no difference in patient demographics and operative characteristics between groups A and B. There was also no difference in prolonged airleak, empyema, wound infection, pneumonia and mortality rates between the 2 groups. When stratifying for the extent of procedure, the incidence of empyema after pneumonectomy was lower in group A than group B; however, this did not reach statistical significance (group A, 6.7% [1/15] v. group B, 13.6% [3/22], p = 0.633). In both univariate and multivariate analysis, prolonged airleak and pneumonectomy were significant risk factors for empyema.

Preoperative screening for MRSA and chlorhexidine chest scrub does not seem to decrease empyema rates after major pulmonary resection. However, owing to the small number of patients undergoing pneumonectomy, the study was underpowered for this patient population, and further studies are needed. Prolonged airleak and pneumonectomy continue to be significant risk factors for developing empyema.

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The significance of incidental intra-abdominal findings on FDG positron emission tomography performed to investigate pulmonary nodules. ***R. Gill, T. Perry, J. Abele, E. Bedard, D. Schiller.*** **From the University of Alberta, the Cross Cancer Institute, Edmonton, Alta.**

In North America, lung cancer is the most common cause of cancer-related death. Staging of lung cancer includes positron emission tomography (PET) scanning, in which 18F-fluoro-2-dexoy-D-glucose (FDG) is taken up by cells proportional to metabolic activity. FDG also plays a role in differentiating benign and malignant pulmonary nodules. Uptake of FDG can also occur in other cells within the body, including the abdomen. The clinical significance of incidental abdominal FDG uptake in the setting of lung cancer is not well established. Our objective is to clarify the clinical significance of incidental intra-abdominal FDG activity in the setting of lung cancer.

Fifteen hundred FDG-PET or PET/CT scan reports for studies performed for lung cancer (staging or pulmonary nodule work-up) were retrospectively reviewed for the presence of incidental FDG-positive intra-abdominal findings. Patient charts with positive findings were then reviewed. Information on investigations of incidental abdominal findings, diagnosis and treatment were extracted.

Twenty-five patients (25/1500) demonstrated incidental intra-abdominal FDG uptake thought to be significant (1.7%). The mean age of patients was 71 years, with 52% being female. The most common location within the abdomen for focal FDG uptake was the colon (n = 17). Of the 17 cases with incidental colonic findings, 9 (52%) were investigated further with either contrast-enhanced CT abdominal scan or colonoscopy. Of these 9 cases, a diagnosis of malignancy was made in 3 patients, pre-malignant adenomas in 2 patients, a benign lipoma in 1 patient and no abnormal findings in the remaining patients.

Incidental abdominal findings in the colon on FDG-PET scan for work-up of pulmonary nodules need to be further investigated by colonoscopy.

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Operative fixation improves survival in ventilated patients with flail chest. ***S. Coughlin, T. Charyk Stewart, N. Parry, D. Gray, J. Williamson, R. Malthaner.*** **From the University of Western Ontario, London Health Sciences Centre, London, Ont.**

A retrospective cohort study was performed to determine if operative fixation reduced mortality and time to extubation in ventilated patients with traumatic flail chest compared with conservative management.

All severely injured (ISS > 12) adult (age 18 yr), ventilated patients with flail chest admitted between 1991and 2010 were identified in our trauma database. A Cox proportional hazard model was used to compare time to extubation, and a multivariate logistic regression was used to compare mortality between the 2 treatment groups. Age, ISS, head maximum anatomic injury score (MAIS), Charlson comorbidity index, number of rib fractures and systolic blood pressure < 90 on presentation were a priori hypothesized potential confounders and were included in the regression analyses to determine adjusted outcome measures.

A total of 414 patients with flail chest were identified. Of these, 203 (49%) required ventilation. Twenty-four (12%) ventilated patients with flail chest underwent operative fixation. Adjusted mortality was significantly decreased in the operative group (OR 0.135, 95% CI 0.027–0.678, p = 0.015). Increasing age (OR 1.063, p < 0.001), ISS (OR 1.041, p = 0.034) and head MAIS (OR 1.432, p = 0.004) were also associated with an increase in mortality. For time to extubation, a Cox proportional hazard model did not identify any difference between operative fixation and conservative management (HR 0.89 [favours conservative], p = 0.614). Increasing age (HR 0.979, p < 0.001) and ISS (HR 0.974, p < 0.001) were associated with increased time to extubation.

Operative fixation of flail chest in ventilated patients was associated with a significant 7-fold improvement in mortality. Given the improved survival, operative fixation should be considered more frequently in the management of flail chest in ventilated patients.

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New VATS palpator sensing system safely locates occult tumours in vivo. ***D. Bottoni, M. Perri, A.L. Trejos, M. Naish, R. Patel, R. Malthaner.*** **From the London Health Sciences Centre and CSTAR, London, Ont.**

A hand-held minimally invasive probe was developed to help locate occult tumours during video-assisted thoracoscopic surgery (VATS). This palpator includes a probe in combination with newly developed software that presents a real-time colour-contour pressure map of the contact surface.

The device was tested on anesthetized in vivo porcine models. The animals were maintained on single lung ventilation and were monitored throughout the study. Two spherical agar phantom "tumours" (10 mm diameter) were surgically implanted into the underside of the nonventilated lung. The device was evaluated via a left open thoracotomy and during VATS. In the open procedure, 5 blinded participants palpated the nonventilated lung to localize the occult tumours. Suspected tumours were marked with a radio-opaque instrument, and localization was verified fluoroscopically.

There were 10 "suspected" localization events. Among these, 8 tumours were correctly identified, and there were 2 false-positive results.

For the VATS model, 2 participants localized 2 phantom tumours, 1 in the left upper lobe and 1 in the left lower lobe. In this case, all 4 suspected localization events correctly identified an underlying tumour. There were no false-positive results. The maximum amount of force applied was 4.8 N (mean 2.5 N) and 3.8 N (mean 1.1 N) for the first and second participants, respectively. The amount of applied force recorded at the instant of tumour localization was 3.2 N and 4 N, and 1.5 N and 3.7 N for the first and second participants, respectively. No significant changes in the monitored physiologic variables or clinical signs of instability during either the open or VATS tumour localization experiments were observed.

The VATS palpator facilitates the localization of occult lung tumours during in vivo VATS procedures. It is safe, accurate and intuitive, and has the potential to avoid thoracotomies during VATS tumour resections.

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A retrospective analysis of division versus nondivision of short gastric vessels in laparoscopic giant paraesophageal hernia repair. ***A. Ashrafi, J. Bond, S. Ong, M. Yamashita, S. Ahmadi.*** **From the Surrey Memorial Hospital, Surrey, BC**

A total of 96 patients underwent laparoscopic giant paraesophageal hernia repair (LGPHR) between October 2005 and February 2011. Short gastric vessels in those patients were either routinely divided (group 1) or not (group 2). There were 58 (60.4%) female patients, and the mean body mass index (BMI) was 27.6 ± 4.5 kg/m^2. Eighty-seven (90.6%) cases were elective surgeries. Three (3.1%) patients underwent a Collis gastroplasty. Mesh was used in 21 (21.9%) patients and gastropexy in 1 (1%).

There were 37 (38.5%) patients in group 1. The mean operative length for group 1 was 187 ± 71 minutes versus 140 ± 55 minutes for group 2 (p = 0.0006). In 6 (16.2%) of group 1 patients mesh was used, compared with 15 (25.4%) of group 2 (p = 0.32). Only 1 (2.7%) patient required surgical intervention owing to

severe epigastric pain in group 1 versus 2 patients in group 2 ($p = 1$). Seven (18.9%) patients of group 1 had early (in-hospital/30-day) postoperative complications and 5 (8.5%) of group 2 ($p = 0.20$). By contrast, 16 (43.2%) patients of group 1 had late (> 30-day) postoperative complications, relative to 33 (55.9%) of the group 2 patients ($p = 0.30$).

Standard SF-36 and GERD-HRQOL (health-related quality of life) questionnaires were used to determine overall patient outcome. Nineteen (73.1%) of the group 1 patients were satisfied with the outcome versus 20 (58.8%) of the group 2 patients. The 30-day and in-hospital mortality for the entire cohort was zero. Although there is a trend toward better functional outcome with routine division of short gastric arteries in laparoscopic giant paraesophageal hernia repair, this does not reach statistical significance.

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Limited resection of early staged lung cancer: a retrospective review of our database comparing lobar resection and segmental and wedge resection. Pilot. ***M. Abdulmosen, J. Miller, C. Finley, K. Ostrander, Y. Shargall.*** **From McMaster University, Hamilton, Ont.**

The Canadian Lung Cancer Study Group published findings comparing lobectomy and segmental resection for early lung cancer in 1997. Despite little or no clear survival advantage being demonstrated by lobectomy, the thoracic community has not embraced limited resection. Lobectomy remains the basic standard operation even for early disease. The National Cancer Institute of Canada has joined a new RCT to evaluate segmental and lobar resections for lung tumours of 2 cm or less. This is a retrospective review of our recent experience with limited resection.

Using the Division of Thoracic Surgery Database and office and hospital charts, consecutive patients who have undergone either a lobectomy or lesser resection for early staged lung cancer were reviewed. A Kaplein–Meier survival analysis (Collett 2003) was performed comparing postoperative survival between the 2 treatment groups.

In total, 200 patients were included (156 lobectomy and 44 limited resections, either wedge or segmentectomy). Patients in the lobectomy group had on average larger tumours (3.2 v. 2.4 cm, $p = 0.010$). Node sampling occurred more often at the time of lobectomy (95% v. 46.5%, $p < 0.001$), and the mean length of stay was significantly longer (7 v. 6 d, $p = 0.012$) in the lobectomy group.

Of 196 patients, 58 (29.6%) patients had recurrence during follow-up time: 43 (28%) in lobectomy group and 15 (35%) in the limited resection group. Patients were free of local recurrence 97.5% (95% CI 95.5%–100%) for lobectomy and 84% (95% CI 66%–100%) for limited resection surgery (log rank, $p = 0.051$) over the 7-year study. The distant recurrence rate was 60% (95% CI 48%–71%) for lobectomy and 69.5% (95% CI 55%–84%) for limited resection surgery (log rank, $p = 0.639$).

The disease-free survival rate at 7 years was 58% (95 CI 48%–71%) for lobectomy and 58% (95% CI 40–876) for limited resection, with no statistically significant differences (log-rank, $p = 0.207$; see Figure).

These results show a trend toward increased survival in the lobectomy group. The results of this study encourage us to more fully study the possible advantage of a sublobar resection and the long-term outcomes.

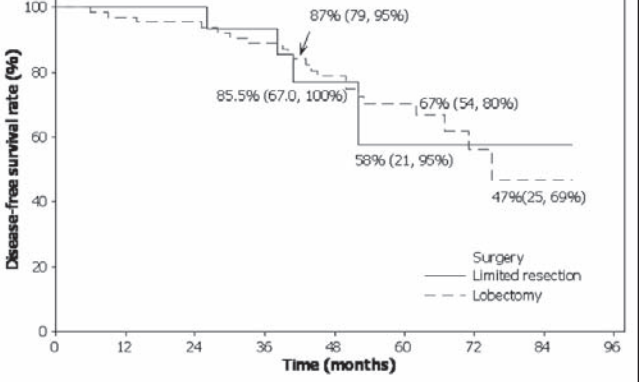

Fig., abstract 75. Seven-year recurrence-free rates by type of surgery.

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Estimating the risk of prolonged air leak after pulmonary resection using a simple scoring system. ***L. Lee, S. Hanley, C. Robineau, C. Sirois, D. Mulder, L. Ferri.*** **From the McGill University Health Centre, Montréal, Que.**

The high rate of prolonged air leak (PAL) after pulmonary resection has prompted interest in surgical adjuncts designed to prevent this complication. However, these adjuncts are costly and may not be beneficial if routinely used. Identification of patients at highest risk may allow for more effective use of these adjuncts. Therefore we sought to develop a simple scoring system to predict PAL.

A derivation set of 580 patients was identified from a prospectively entered database of consecutive pulmonary resections at a single institution from 2002 to 2007. Patient and operative characteristics were compared using the Student t and χ^2 tests. Significant variables on univariate analysis were entered into a stepwise logistic regression to establish a simple predictive model to estimate the risk of PAL. This scoring system was then validated in a consecutive set of 381 patients operated at the same institution from 2007 to 2009.

The rate of PAL was 14% in the derivation set and 18% in the validation set. Poor pulmonary function (forced expiratory volume in 1 second [FEV1] % predicted and carbon monoxide diffusing capacity [DLCO] % predicted) and pleural adhesions were significantly associated with PAL in the derivation set. A weighted scoring system was devised using pleural adhesions (+2 points), FEV1 (+ 1 per 10% below 100%) and DLCO (+1 per 20% below 100%). Total number of points estimated the probability of PAL. The Hosmer Lemeshow goodness-of-fit test confirmed the validity of this scoring system ($p > 0.2$).

We have a devised and validated a simple scoring system to predict the probability of PAL after pulmonary resection.

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A prospective randomized double blind controlled trial to determine if an autologous plasma derived sealant reduces postlobectomy air leaks and length of hospital stay. ***R. Humphrey, R. Inculet, D. Fortin, A. Arab, R. Malthaner.*** **From the University of Western Ontario, Woodstock, and London, Ont.**

Postoperative air leaks (PAL) are a common complication of pulmonary resection, resulting in prolonged hospital stay. The objective was to determine whether duration of PAL after pulmonary lobectomy could be reduced through via the autologous derived fibrin sealants platelet-rich and concentrated platelet poor plasma (PRP/PPP).

A prospective, randomized, double-blinded controlled trail was performed. Adult patients undergoing lobectomy for lung cancer were randomized with concealed allocation to intervention (I) or control (C) groups. The control group underwent standard lobectomy, and the intervention group had PRP/PPP applied to sites of parenchymal dissection. Two chest tubes (underwater seal at –20 cm H_20) were inserted into each patient. The primary outcome, duration of PAL, was calculated by blinded observers. Secondary outcomes included prolonged air leak (> 7 d), 48 hours drainage, time to chest tube removal, complications, length of stay (d) and 30-day mortality. The calculated sample size was 204 participants to detect a 24-hour difference in duration of PAL, assuming 10% loss to follow-up.

In total, 206 patients were randomized; 8 were excluded for protocol violations before intervention; 198 were included, 102 in group I and 96 in group C. There were no significant differences in baseline characteristics. There was no significant difference in median duration of PAL between group I (86 h) and C (84 h). There were no significant differences in secondary outcomes for group I and C: prolonged PAL incidence (20.6% v. 23.2%), 48-hour drainage (1173 v. 1198 mL), time to chest tube removal (117 v. 120 h), median length of stay (5.4 v. 6.2 d), complication rate (36.3% v. 36.5%) and 30-day mortality (4 [3.9%] v. 4 [4.2%]).

The intraoperative application of the autologous biological sealant PRP/PPP was not associated with any adverse effects and did not reduce PAL or length of hospital stay.

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A novel approach to reduce large bore chest tube days and hospital length of stay post–VATS lobectomy: a prospective comparative study. ***A. Ashrafi, J. Bond, S. Ong, M. Yamashita, S. Ahmadi.*** **From the Surrey Memorial Hospital, Surrey, BC**

Most patients undergoing VATS lobectomy are managed with 1 large bore chest tube postoperatively. The tube remains in situ until cessation of air leak and reduction of chest tube output. We have modified this approach by using a combination of 1 small bore and 1 large bore chest tube. This has allowed us to routinely remove the larger bore chest tube on postoperative day 1 or 2, thus decreasing patient discomfort and shortening length of stay.

A total of 129 patients underwent VATS lobectomy at our centre between December 2008 and March 2011. They included 79 (61.2%) female patients. The mean age of the group was 67 ± 11 years. Twenty-seven of the patients (group 1) were managed by the approach described above. It included 14 female patients (51.9%). The remaining subgroup (group 2), including 65 (63.7%) female patients, was managed using a large bore chest tube only.

In group 1 we were able to remove the large bore chest tube on postoperative day 1 in 24 (88.9%) patients. In 2 patients, the tube was removed on postoperative day 2 owing to sanguineous drainage and in 1 patient on day 3 because of air leak. One patient in each group died postoperatively of acute myocardial infarction.

The use of both a large and small bore chest tube in VATS lobectomy enabled us to routinely remove the large bore chest tube in the majority of patients on postoperative day 1. We did not need to reinsert a chest tube in any of the patients. Insertion of a large and small bore chest tube leads to a statistically significant reduction in hospital length of stay ($p = 0.031$) and number of postoperative large bore chest tube days ($p < 0.0001$).

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Survival outcomes for never-smokers versus smokers with non–small cell lung cancer at the Cancer Centre of Southeastern Ontario, 1998–2009. ***A. McGuire, K. Reid, D. Petsikas, W. Hopman.*** **From Queen's University, Ottawa and Kingston, Ont.**

Evidence is emerging that lung cancer in never-smokers is a distinct entity from that occurring in smokers. The primary etiological factor associated with lung cancer is exposure to tobacco smoke. The causative factors for lung cancer in never-smokers are poorly understood. The differences in epidemiology and biological characteristics of lung cancer in never-smokers may have implications for optimal treatment to improve survival and prevent recurrence. A long-term analysis of the characteristics and outcomes of never-smokers compared with smokers was carried out in a Canadian tertiary referral university hospital.

The outcomes of all non–small cell lung cancer patients undergoing resection from 1998 to 2009 were analyzed ($n = 467$). Predictors of recurrence and survival were assessed. Appropriate statistical analyses involved the χ^2 test, the t test and Kaplan–Meier estimates of survival.

In total, 449 patients were smokers and 18 patients were never-smokers. Mean follow-up was 49 months for never-smokers and 39 months for smokers. Mean months to recurrence was 24.3 months for never-smokers and 21 months for smokers. Mean months follow-up after recurrence was 24.3 months for never-smokers and 21 months for smokers. Never-smokers tended to be slightly younger than smokers ($p = 0.143$), female ($p = 0.074$) and have higher rates of adenocarcinoma histology ($p = 0.131$). Never-smokers had significantly higher rates of lymphovascular invasion ($p = 0.021$) and tended to h wave tumours that were larger in diameter ($p = 0.142$). Never-smokers had significantly higher rates of tumour recurrence ($p = 0.017$) and overall mortality ($p = 0.024$) compared with smokers, despite having fewer medical comorbidities ($p = 0.001$). There is a trend for worse disease-free survival with never-smokers compared with smokers ($p = 0.129$).

Lung cancer in never-smokers appears to be a distinct epidemiological entity from that occurring in smokers. Never-smokers tend to have larger adenocarinomas with aggressive histological features and shorter disease-free survival. There were significant differences in rates of tumour recurrence and overall mortality for never-smokers compared with smokers.

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WITHDRAWN

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Endoscopic R4–R5 sympathecotomy for the treatment of focal axillary hyperhidrosis. ***A. Basi, S. Basi, K. Irshad.*** **From the University of Western Ontario, London, and the William Osler Health Centre, Brampton, Ont.**

Endoscopic thoracic sympathecotomy (ETS) has yielded excellent results for the treatment of focal palmar hyperhidrosis. However, many surgeons are reluctant to offer surgery for focal axillary hyperhidrosis because of the high failure rate. The aim of this study was to prospectively evaluate the benefits of endoscopic R4–R5 sympathecotomy for the treatment of focal axillary hyperhidrosis.

Seventeen patients with isolated axillary hyperhidrosis underwent endoscopic R4–R5 sympathecotomy between April and November 2010. All patients were required to fill out a quality of life questionnaire before surgery. Symptoms were quantified on an increasing severity scale of 1 to 10. Bilateral transection of the sympathetic chain at the level of the fourth and fifth rib was performed as an outpatient. A follow-up questionnaire was completed by the patient.

Mean follow-up was 216 days. Severity score of their axillary hyperhidrosis decreased from 9.1 to 1.6 following ETS ($p < 0.001$). All patients remained satisfied on follow-up. Prior to surgery, all patients had to modify the types of shirts they wore, and on average would have to change 2.9 times per day. Following surgery, only 1 patient had to still modify their clothing, and patients would have to change their shirt 0.1 times per day ($p < 0.01$). Compensatory hyperhidrosis occurred in 88% of patients; however, none of the patients regretted having the operation. All patients would recommend the surgery to others with similar symptoms.

Bilateral sympathecotomy at the level of the fourth and fifth rib significantly reduces the severity of focal axillary hyperhidrosis. Compensatory hyperhidrosis is very likely; however, it is mild and well tolerated.

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Reconstruction after major chest wall resection: Can rigid fixation be avoided? ***W. Hanna.*** **From the Toronto General Hospital, Toronto, Ont.**

Rigid fixation is advocated as the best method to achieve good respiratory outcomes after chest wall resection at the expense of a high complication rate. The following study highlights the positive outcomes of our experience with reconstruction of the chest wall without rigid fixation.

All patients undergoing resection of chest wall tumours between 2003 and 2010 were identified from a prospectively entered database. Operative and postoperative outcomes were documented. Patients were stratified into 2 separate groups based on the size of the residual chest wall defect; the small defect (SD) group (< 60 cm^2) and the large defect (LD) group (> 60 cm^2).

Thirty-seven patients were identified over a 5-year period: 9 in the SD group and 28 in the LD group. Primary sarcoma was the most common indication for resection (57%). The mean size of the chest wall defect was 50.8 cm^2 in the SD group and 149.4 cm^2 in the LD group ($p = 0.001$). All patients underwent reconstruction with autologous tissue, nonrigid prosthesis or a combination of the two. Prosthesis was used in 11% of patients in the SD group and 61% of patients in the LD group ($p = 0.018$). The rate of immediate postoperative extubation was 100% in the SD group and 89% in the LD group (p = NS). The rate of postoperative pneumonia was 7% in the LD group and 0% in the SD group. The rate of surgical site infection was 7% in the LD group and 0% in the SD group. A subgroup analysis of the LD group demonstrated no significant differences in any of the measured outcomes between patients in whom a prosthesis was used and patients in whom a myocutaneous flap alone was used.

Large chest wall defects can be reconstructed with pedicled myocutaneous flaps alone without compromising respiratory outcomes. Even if a prosthetic mesh is required, avoidance of rigid fixation after major chest wall resection yields excellent results.

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Model for end-stage liver disease (MELD) and donor risk index as predictors of early allograft dysfunction. ***K.P. Croome, P. Marotta, V. McAlister, D. Quan, W. Wall, R. Hernandez-Alejandro.*** **From the University of Western Ontario, London, Ont.**

There is a global tendency to transplant extended criteria organs (ECD; Donor Risk Index [DRI] ≥ 1.7) ideally into recipients with a lower MELD score and to transplant standard criteria organs (DRI < 1.7) into recipients with a high MELD score. This allocation strategy assumes that an increasing MELD score increases the probability of graft loss inherent to higher DRI allografts. There is a lack of evidence in the current literature for this assumption.

A review of our prospectively entered database for donation after brain death liver transplantation (n = 310) between January 2007 and September 2010 was performed. Donor Risk Index scores dichotomized standard livers (DRI < 1.7) and ECD livers (DRI ≥ 1.7). Recipients were divided into 3 strata: those with high MELD (≥ 27), medium MELD (15–26) and low MELD (< 15) scores. An updated definition of early allograft dysfunction (EAD) was recently validated as a predictor of graft failure and death in the first 6 months. We analyzed EAD as it relates to both DRI and MELD scores.

The overall incidence of EAD was 24.5%. Mortality in the first 6 months in recipients with EAD was 20% compared with 3.4% for those without EAD (RR 5.56, CI 1.96–15.73; $p < 0.001$). Graft failure rate in the first 6 months in those with EAD was 27% compared with 5.8% for those without EAD (RR 4.63, CI 2.02–10.6; $p < 0.001$). In multivariate adjusted logistic regression, an interaction term was created for MELD score and DRI, and this was significantly associated with the odds of EAD ($p < 0.001$).

In patients with low MELD scores, a significantly increased rate of EAD was seen in patients transplanted with a high DRI liver (25%) compared with those transplanted with a low DRI liver (6.25%; $p = 0.012$). In medium MELD and high MELD patients, there was no significant difference in the rate of EAD in patients transplanted with a high DRI liver compared with those transplanted with a low DRI liver.

The use of high DRI livers (DRI ≥ 1.7) in low MELD patients results in higher levels of EAD, whereas the use of high or low DRI livers for recipients with medium or high MELD does not result in a significantly different rate of EAD. These results suggest that it is not appropriate to preferentially allocate organs with higher DRI to recipients with lower MELD scores.

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Early cholecystectomy for acute cholecystitis: a population-based analysis of practice patterns in Ontario. ***C. de Mestral, B. Zagorski, O. Rotstein, D. Gomez, B. Haas, A. Laupacis, S. Sharma, J. Bridge, A. Nathens.*** **From the Keenan Research Centre in the Li Ka Shing Knowledge Institute of St. Michael's Hospital, University of Toronto and Institute for Clinical Evaluative Sciences, Toronto, Ont.**

Evidence suggests that the optimal management for most patients with acute cholecystitis (AC) is cholecystectomy at the time of first presenting admission. Our objective was to evaluate temporal trends in the rates and timing of operative intervention among patients with AC and to explore variability in achieving best practices.

We used a population-based retrospective cohort design. The cohort was limited to adults with a first episode of AC identified using an administrative discharge database comprising all hospital admissions in Ontario from 2004 to 2009. We included patients with a primary diagnosis of AC and whose admission type was classified as urgent. We excluded patients with an ER visit or admission for gallstone disease within the prior 2 years. Rates and timing of cholecystectomy were evaluated across years and by hospital characteristics (teaching status, volume of elective cholecystectomies).

We identified 16 899 patients with AC. Over half (56%, n = 9529) underwent cholecystectomy during their index admission, of whom 78% underwent surgery within 48 hours of admission. Most (89%) cases began with a laparoscopic approach, with a conversion rate of 7%. While the rate of cholecystectomy on index admission remained stable from 2004 to 2009, the proportion of patients who underwent surgery within 48 hours of admission increased significantly ($p < 0.01$). Rates of cholecystectomy on index admission for AC varied significantly among hospitals (IQR 0%–62%). Furthermore, the cholecystectomy rate was lower in patients admitted to a teaching hospital (RR 0.76, 0.73–0.80) and higher in patients admitted to a centre in the top volume quartile of elective cholecystectomies (RR 1.27, 1.24–1.31).

The management of AC varies across Ontario. While over half of patients undergo early operative management, there may be fewer barriers to this approach in nonteaching hospitals and in centres with a high volume of elective cholecystectomy.

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Comparison of laparoscopic and open liver resections in cirrhotic patients using a matched pair analysis. ***F. Bhojani, A. Fox, K. Pitzul, C.-A. Moulton, A. Wei, A. Okrainec, S. Cleary.*** **From the University of Toronto, Toronto, Ont.**

Surgical resection for hepatocellular carcinoma (HCC) in patients with cirrhosis is associated with increased perioperative morbidity and mortality. Laparoscopic liver resection (LLR) is gaining acceptance as a safe method of resection and may have such benefits as less morbidity, shorter OR time and shorter length of stay (LOS). Our objective was to assess our initial experience with LLR for hepatoma in cirrhotic patients.

We evaluated resections performed for HCC in patients with cirrhosis. Each was matched to 3 open cases for number of segments removed, demographics and background liver histology. Nonparametric statistical analysis was used to compare perioperative outcomes. Analyses were performed including and excluding converted cases.

From 2007 to 2010, 11 cirrhotic patients underwent LLR for HCC. This included 2 right hemihepatectomies, 1 left hemihepatectomy, 7 left lateral sectionectomies and 1 trisegmentectomy (segments 5, 6, 7). Intraoperatively, there were no differences in estimated blood loss, OR time or transfusion requirements. There

were no positive margins in either cohort, and the median margin distance was similar between LLR and open groups at 15 mm and 8 mm, respectively. Median tumour size in the LLR group was larger at 5.5 cm versus 4.1 cm ($p = 0.02$). The average LOS in the LLR and open groups were 6.6 (range 4–12) and 11.1 (range 8–57) days, respectively. There was no difference in frequency of ICU admission, postoperative transfusion requirement or number of complications. When converted cases (3) were excluded, total OR time was shorter in the LLR group at 195 versus 266 minutes ($p = 0.01$).

Laparoscopic liver resection appears to be a feasible approach for HCC in a cirrhotic liver. Our series has shown shorter OR time without compromising perioperative outcomes in a cohort of tumours larger than generally reported for a laparoscopic series. Although limited in power, our data suggest a clinically significant trend toward shorter LOS and OR times with LLR.

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The effect of portal vein embolization on tumour growth rate in primary liver tumours and liver metastases. ***K. Bertens, K.P. Croome, A. Mujoomdar, D. Peck, R. Rankin, D. Quan, N. Kakani, R. Hernandez-Alejandro*. From the University of Western Ontario, London, Ont.**

Portal vein embolization (PVE) is an effective method for increasing the future liver remnant (FLR) in patients with primary liver tumours and liver metastases who would otherwise not be candidates for major hepatic resection. Whereas it has been hypothesized that the tumour growth rate in both embolized and nonembolized segments increases following embolization, the current literature consists of only small studies with less than ideal control groups and almost entirely focuses on metastatic disease.

Charts of patients with primary liver tumours or liver metastases who underwent PVE before a planned hepatic resection at our institution between January 2005 and February 2011 were reviewed. Computed tomography volumetric analysis was used to calculate tumour volume pre-PVE and post-PVE. The tumour growth rate (TGR) was calculated as % increase in tumour volume/day. Data were analyzed by subgroup analysis comparing TGR in colorectal metastases (CRM) and non-CRM (including other liver metastases and primary hepatic carcinomas).

Twenty-one patients were identified, all having had right PVE (12 CRM, 9 non-CRM). The average age of patients undergoing PVE was 59.6 ± 8.3 years (61.7 ± 6.6 yr CRM, 56.9 ± 9.9 yr non-CRM). The average amount of time between PVE and imaging to assess for FLR hypertrophy was 33.4 ± 7.8 days. In patients who went on to hepatic resection, the average time between PVE and resection in these patients was 49.9 ± 15.5 days. The mean TGR of CRM was 2.1 ± 0.6%/day post-PVE. The non-CRM lesions were seen to decrease in volume by 0.1 ± 0.3%/day subsequent to PVE.

Following PVE, the growth of CRM within the embolized lobe increases. It is not uncommon for a CRM to double in volume in the time between PVE and planned hepatic resection, which in some cases can make the disease unresectable. In contrast, non-CRM neoplasms do not exhibit this increase in growth post-PVE and, in fact, may actually reduce in size.

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The role of preoperative biopsy in patients with potentially resectable periampullary malignancy. ***R. Suri, M. Marcaccio, L. Ruo*. From McMaster University, Hamilton, Ont.**

Diagnosis of malignant periampullary neoplasms amenable to operative management by pancreaticoduodenectomy is often based on clinical presentation and standard diagnostic imaging modalities alone. We sought to determine the accuracy of such diagnoses and whether there was any additional benefit with preoperative biopsy.

A retrospective review of all patients undergoing surgical resection by pancreaticoduodenectomy for a suspected periampullary malignancy between 2005 and 2009 at a single tertiary referral centre was performed. All cases were discussed preoperatively at a multidisciplinary case conference consisting of hepatobiliary surgeons and at least 1 specialist radiologist to determine the likelihood of malignancy. The accuracy of a clinical diagnosis of malignant periampullary neoplasm was compared with the accuracy of this diagnosis when preoperative biopsy was used.

A total of 158 patients had pancreaticoduodenectomy for a presumed periampullary malignancy. There were 61 patients who had no preoperative biopsy and proceeded to surgery based on clinical suspicion of malignancy determined by patient presentation and radiographic findings. The accuracy of a preoperative diagnosis of malignancy in these patients was 93%. Of 97 patients who had a preoperative biopsy, the overall accuracy for diagnosis of a malignant periampullary neoplasm was 73%. Types of biopsies included endoscopic biopsy ($n = 58$, accuracy 74%), endoscopic retrograde cholangiopancreatography brush cytology ($n = 22$, accuracy 59%), percutaneous core biopsy ($n = 4$, accuracy 100%) and fine needle aspiration ($n = 3$, accuracy 67%).

In patients with suspected periampullary malignancy, a multidisciplinary review of cases using clinical and radiologic correlation is highly accurate and sufficient to proceed with potentially curative operative management. Preoperative biopsy in such patients can often be misleading.

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The McGill–Brisbane scoring system preoperative clinical score is an excellent predictor of survival in patients after a pancreatico-duodenectomy for pancreatic adenocarci-noma. ***M. Jamal, J. Abou Khalil, E. Simoneau-Beaudry, S. Dumitra, M. Edwards, Y. Yousef, M. Al Jiffry, P. Metrakos, J. Tchervenkov, S. Doi, J. Barkun*. From McGill University, Montréal, Que., and University of Queensland, School of Public Health, Brisbane, Queensland, Australia**

We have previously described and validated the McGill–Brisbane scoring system (MBSS), which predicts survival in palliative (unresectable) pancreatic adenocarcinoma patients based on 4 clinical variables recorded at the time of first clinical encounter. The purpose of this study is to determine the impact of the MBSS on the survival of patients who underwent a pancreaticoduodenectomy (PD) for resectable pancreatic adenocarcinoma (rPA).

We conducted a retrospective study of 83 consecutive patients diagnosed with rPA who had a PD at our institution from January 2001 to January 2010. Multivariable analyses were performed to determine predictors of survival. We obtained complete follow-up until February 2011 in all patients using a populational database.

Overall median survival was 21 months. The median survival for patients with a low symptom score (LS) group was 45 months and 17 months in patients with a high symptoms score (HS) groups. Twenty-four percent of LS group patients survived beyond 5 years, compared with only 12% of HS patients. The

overall 5-year survival was 19%. Although in univariate analysis age, MBSS group and margin status were significantly associated with survival, in a multivariable model (Cox regression), only age (odds ratio [OR] 1.03, 95% CI 1–1.06) and MBSS group (OR 2.46, 95% CI 1.41–4.3) predicted overall survival. Chemotherapy and tumour size were not associated with overall survival.

The MBSS is a better predictor of survival than all known conventional predictors of survival in patients with rPA.

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Pancreatic cancer and diabetes any association? ***A. Obayan, S. Meiers, R. Keith.*** **From the Department of Surgery, University of Saskatchewan, Saskatoon, Sask., and the Regina General Hospital, Regina, Sask.**

There is a suggestion of an association between pancreatic cancer and diabetes in the literature. About 4000 Canadians are diagnosed with pancreatic cancer annually, and the estimated mortality is high at 3900. Diabetes affects a growing number of Canadians, and approximately 3200 people are newly diagnosed with diabetes each year in Saskatchewan. Prevention and early diagnosis of pancreatic cancer through screening of at-risk individuals would likely improve outcome if an association is established. The aim of the study is to evaluate the association between pancreatic cancer and diabetes.

A retrospective study through chart reviews of 120 patients with pancreatic cancer in the province of Saskatchewan between 2002 and 2010 was conducted. These patients underwent an intention-to-treat surgery at Saskatoon and Regina, the 2 provin-cial centres. The study took into account age, sex, history of diabetes and where possible the type of diabetes.

Most patients were above 60 years (78%); 63 (58%) were diabetic, 47 (42%) were nondiabetic and 10 had unknown diabetic history. Of the diabetic patients, 5 had type 1 diabetes, 22 had type 2 and the rest were not specified. Whipple's surgery was performed on 32 patients, 58 (52%) had nonresectable cancer and the remaining had a distal and subtotal pancreatectomy. Of those with a history of diabetes, 16 received the diagnosis 2 years before and 22 received the diagnosis 5 years before their diagnosis of pancreatic cancer. There was a significant interaction between diabetes and pancreatic cancer, with diabetics having a worse stage-matched survival outcomes compared with nondiabetics ($p = 0.04$). Diabeties appeared to be an independent determinant factor for survival outcome ($p = 0.001$).

It appears that the diagnosis of diabetes may delay the diagnosis of pancreatic cancer and therefore worsen survival outcome.

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Management of common bile duct stones: single stage versus 2-stage approach. ***S. Elkassem, N. Church, P. Mitchell, C. Turbide, E. Dixon, E. Debru.*** **From the University of Toronto, Toronto, Ont., and the University of Calgary, Calgary, Alta.**

Patients presenting with suspected common bile duct (CBD) stones are typically managed in 2 stages (2S), consisting of preoperative endoscopic retrograde cholangiopancreatography (ERCP) followed by laparoscopic cholecystectomy (ERCP + LC). This problem can also be managed with a 1-stage (1S) laparoscopic cholecystectomy and common bile duct exploration (LCBDE + LC).

The purpose of this study was to compare perioperative outcomes of a 1-staged and 2-staged approach for patients presenting emergently with CBD stones.

A retrospective review was conducted for patients treated with a 1S approach as well as for a matched cohort of patients treated with a 2S approach.

Fifty-two patients treated with a 1S approach were identified. A matched cohort of 52 patients treated with a 2S approach was included. The 2 groups were similar in age, sex and preoperative presenting symptoms. The 1S group had significantly longer operative times compared with the 2S group (137 v. 79 min, $p < 0.05$). More drains were placed in the 1S group (60% v. 17%, $p < 0.05$). Successful overall ductal clearance was similar in the 2 groups (78.8% v. 90.3%, $p > 0.05$). The success of ERCP in clearing ducts on the first attempt was 86%, and multiple ERCPs were needed in 13.5% of patients in the 2S cohort to clear bile ducts. No stones were found on ERCP in 46.1% of patients in the 2S cohort. Complications were similar between groups (10% v. 7%). The mean length of hospital stay was significantly shorter in the 1S group compared with the 2S group (4.7 v. 7 days, $p < 0.05$).

Nearly half the patients managed by the 2S approach passed their stones and therefore derived no benefit from an ERCP with associated risks of sphincterotomy. The clearance of the CBD with the 1S approach is safe, effective and results in a significantly shorter length of hospital stay than a 2S approach. The 1S approach is an effective alternative to a 2S procedure and might spare patients the risks of an unnecessary ERCP.

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Major iatrogenic biliary injuries treated with liver transplantation. ***J. Shum, W.J. Wall.*** **From the University of Western Ontario, London, Ont.**

Major biliary injuries during cholecystectomy can usually be managed successfully by reconstructive procedures. However, some cases are devastating and result in complications that can only be salvaged by liver transplantation. We report a series of 5 individuals, 2 male and 3 female, who sustained injury to the biliary tree during cholecystectomy and who required transplantation. Three patients received a transplant and 2 succumbed before a donor liver became available. The average age of transplanted patients was 65.6 years, with a mean preoperative model for end-stage liver disease (MELD) score of 25.

The time from injury to liver transplantation ranged from 7 to 31 years (mean 15 yr). The 5 patients assessed and accepted for transplantation had undergone at least 3 major laparotomies including Roux-en-Y hepaticojejunostomy, hepatic resections and biliary revisions to manage their biliary injury. In addition, all had endoscopic attempts to treat recurrent bouts of cholangitis. Indications for transplant were for recurrent, refractory cholangitis, septicemia from hepatolithiasis and secondary biliary cirrhosis. One patient also had a small focus of hepatocellular carcinoma discovered incidentally in the explanted liver.

Currently, all transplanted patients are alive after a follow-up ranging from 4 to 38 months post-transplantation. Endoscopic procedures, biliary revisions and hepatic resections are treatment options to treat complications related to iatrogenic major bile duct injuries. When these methods fail, liver transplantation is successful management.

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Documentation of quality of care data for colon cancer surgery: comparison of synoptic and dictated operative reports. ***R. Maniar, D. Hochman, D. Wirtzfeld, C. Yaffe, B. Yip, A. McKay, R. Silverman, J. Park.*** **From the University of Manitoba, Winnipeg, Man.**

Operative (OR) reports are a form of communication and a source of clinical data that can, for quality assurance purposes, be used to document the performance of processes that involve and affect the care of surgical patients. We recently implemented web-based synoptic OR reports to replace dictated reports for colorectal cancer procedures at our institution. This study assessed the degree to which synoptic reports document pre- and intraoperative quality of care indicators for colon cancer resections.

Two surgeons independently reviewed, first, 36 synoptic reports from colon cancer cases, which we prospectively collected over a 5-month period (November 2010 to March 2011) and, second, a case (surgeon and resection)-matched historical cohort of 36 dictated reports. They rated the degree to which the reports documented the performance of quality care indicators based on a 38-item checklist of previously validated, colon cancer–specific quality measures.

Synoptic reports had significantly higher overall scores on the colon cancer resection quality of care indicators checklist in comparison to dictated reports (mean 46.4 ± 2.6 v. 22.2 ± 10.6; maximum possible score = 100; $p < 0.01$). On individual checklist sections, synoptic reports had significantly higher scores in the preoperative evaluation and intraoperative care sections, but not in the patient–provider discussion and laparoscopic sections (data not shown). Reviewers also extracted data significantly more quickly from synoptic reports than dictated reports (mean 2.5 ± 0.8 v. 4 ± 1.4 min/report, $p < 0.05$).

Whereas synoptic reports may improve the documentation of quality of care data for complex oncologic procedures, these results also reveal some limitations to our current colon cancer templates. Further refinement may help surgeons better document the performance of quality measures and improve reporting standards.

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A standardized mouse model of hyperthermic intraperitoneal chemotherapy (HIPEC). ***V. Francescutti, L. Rivera, J.M. Kane, J.J. Skitzki.*** **From the Roswell Park Cancer Institute, Buffalo, New York, NY**

In colorectal cancer carcinomatosis, the contributions of hyperthermia, specific chemotherapy agent and immune-mediated effects of hyperthermic intraperitoneal chemotherapy (HIPEC) after surgical cytoreduction are unknown. A mouse model was established to address the contributions of these variables.

Viable mouse colorectal cancer CT26 tumour cells (1 × 105) were injected intraperitoneally into BALB/c mice to reliably generate diffuse colonization of the peritoneal surfaces, simulating the postcytoreduction state. Allowing 2 days for tumour establishment, mice (n = 4 per group) underwent inhaled anesthesia, laparotomy on a Lego platform and intraperitoneal wash with mitomycin C (MMC; 0.1 mg/mouse) with shaker agitation (160 rpm) for variable time periods. Control groups were treated with intraperitoneal saline. Hyperthermia was delivered by whole body hyperthermia and monitored with implantable thermotransponders. Immunostimulatory contributions of HIPEC were investigated using CT26 expressing the neoantigen hemagglutinin (CT26-HA). Endogenous antigen-specific T cell expansion and expansion of transferred clonogenic antigen-specific T cells were determined.

No differences in procedure-related mortality were observed between groups receiving MMC or saline, standard versus higher doses of MMC, hyperthermia versus normothermia, or 15- versus 90-minute exposure times. Small animal MRI and tumour volume calculations were compared between groups. Preliminary results demonstrate a statistically significant improvement in tumour burden and survival between the MMC treatment group and saline controls at 14 days postoperatively. HIPEC treatments in this model did not appear to induce the adaptive arm of the immune system.

This mouse model may be useful to determine, dissect and optimize the factors that contribute to clinically successful HIPEC. The reproducibility and short time to treatment effect make this model practical for the study of HIPEC and associated changes to the immune system. This model can be used to test novel pharmacologic agents, for future application to HIPEC in humans.

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The feasibility and implementation of a surgeon-directed quality improvement strategy in breast cancer surgery. ***P. Lovrics, N. Hodgson, M.A. O'Brien, L. Thabane, S. Cornacchi, B. Heller, S. Reid, K. Sanders, T. Kittmer, M. Simunovic.*** **From McMaster University, Hamilton, Ont.**

Quality improvement activities in clinical care attempt to close quality gaps and optimize patient care. We designed a surgeon-directed, iterative project to improve the quality of breast cancer surgery in Southern Ontario. Forty-four surgeons performing breast surgery across 12 hospitals are involved in the project.

Our strategy includes multiple interventions to encourage surgeon awareness, participation and practice change. Interventions include audit and feedback of surgeon-selected quality markers, surgeon workshops and tailored interviews. Workshops are held to discuss quality improvement strategies, select quality markers, review audited results and select interventions for subsequent implementation. Examples of important quality markers include rate of preoperative core biopsy, rate of specimen orientation

labelling and rate of positive margins. Semistructured tailoring interviews were conducted to identify facilitators and barriers to improved quality. All presentations and results were disseminated to all surgeons doing breast surgery.

Four workshops have been held since 2006. Surgeon enthusiasm and involvement in the project has been positive. Eleven quality indicators are followed. Over 4 iterations including 1376 cases (2006–2010), preoperative core biopsy rate has increased (74% to 92%), specimen orientation labelling has increased (79% to 93%) and the positive margin rate has decreased (21% to 14%). Mastectomy rates for T1/T2 cancers remained relatively stable, but there was considerable variation across hospitals. Tailored interviews were conducted with 21 surgeons. Interview results have informed the design of new interventions.

This project highlights the feasibility of a surgeon-directed quality improvement initiative in breast cancer surgery. Initial results demonstrate consistent improvements.

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Is MRI telling the truth? A head-to-head comparison of the accuracy of preoperative magnetic resonance imaging for invasive ductal versus lobular carcinoma of the breast. ***S. Duhaime, B. Fong, M. Deria, C. Acton, M. El-Maadawy, S. Lad, A. Arnaout.*** **From the University of Ottawa, Ottawa, Ont., and The Ottawa Hospital, Ottawa, Ont.**

The major challenge in breast cancer imaging remains accurate preoperative assessment of extent of disease. Traditionally, MRI had been suggested for patients with invasive lobular cancer (ILC) owing to its multicentricity and the difficulty correlating disease extent with traditional imaging modalities (ultrasound and mammography). Recently, however, MRI is increasingly being used preoperatively for assessment of all subgroups of breast cancer with the goal of providing the best surgical intervention to achieve clear margins. We performed a retrospective multicentred chart review to establish if MRI evaluation differs by breast cancer subtype.

All patients with biopsy-proven invasive ductal cancer (IDC) or ILC treated within our institution, consisting of an academic and a community hospital, between 2008 and 2011, were included in this study. Patients were excluded if they did not undergo preoperative MRI evaluation and/or did not undertake surgical resection immediately after MRI. Clinical, demographic, imaging and pathological data were obtained retrospectively through chart review. Disease extent reported on MRI was correlated with histopathological findings. Statistical analysis was performed using paired *t*/Fisher exact tests, and Pearson correlation coefficients (r) were calculated.

A total of 201 patients were analyzed, 100 within the IDC group and 101 within the ILC group. Patients within the ILC group were older ($p = 0.029$) and had larger tumours ($p = 0.027$). MRI-based tumour size was concordant within 1 cm of pathologic tumour size in 73% of the IDC compared with 69% of the ILC group ($p = 0.64$). MRI correlated equally well to histopathological disease extent for both subtypes ($r = 0.74$ v. $r = 0.72$, $p < 0.00001$). Subgroup analysis demonstrated that the highest rate of correlation between MRI and pathology was seen in the 80- to 90-year-old group for both IDC ($r = 0.99$, $p = 0.0002$) and ILC ($r = 0.94$, $p = 0.00006$).

Preoperative evaluation by MRI can accurately predict the histopathological extent of disease regardless of breast cancer subtype. Histological subtypes should not be a factor for the use of preoperative MRI. This is also the first study that has identified a variation in the diagnostic accuracy of MRI based on age.

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Strategies for developing breast cancer screening guidelines in a low-resource setting (Ile-Ife and Ilesha), Osun State, Nigeria. ***M. Omole, J. Pemberton, P. Lovrics.*** **From McMaster University, Hamilton, Ont.**

Breast cancer is the most prevalent cancer among women worldwide. It is estimated that by the year 2020, 70% of patients with cancer will live in countries that have less than 5% of the resources available for care of patients with cancer. One of the key strategies in Nigeria for the development of a population-based screening program is early detection to downstage symptomatic disease. However, there are no previous studies delineating the most effective methods of communication with women in low-resource settings such as Nigeria. The primary objective of the current study is to survey the effectiveness of different strategies for educating women about breast cancer in an urban setting in southwest Nigeria.

Ethics approval was obtained from the local teaching hospital, Obafemi Awolowo Teaching Hospital Complex (Ile-Ife) and Hamilton Health Sciences. Women aged 25–70 ($n = 91$) residing in a semiurban region (Ile-Ife and Ilesa) participated in this qualitative study. Participants were asked to score on a 4-point Likert scale their preference for different forms of contact, (home visits, media, etc.) and which contact strategy would be effective in promoting breast cancer screening.

Seventy-seven percent (77%) of participants were 40 years or older. Women with low education (secondary school and below) preferred educational material about breast cancer and screening options in the form of mass media ($p < 0.0001$). Furthermore, women with low education preferred nonprint forms of educational material ($p < 0.0001$). Of women surveyed, 100% indicated gatherings and home visits as a better method of contact. Finally, women with high education were willing to travel further distance for a mammogram if it was available at a reasonable cost ($p = 0.0019$).

Interactive strategies and nonprint educational resources were perceived as more effective in educating and promoting the participation of women in breast screening by Nigerian women.

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Technical and early postoperative outcomes of laparoscopic gastrectomy for gastric cancer in a community-based setting. ***D. Bischof, P. Stotland, J. Hagen, C. Swallow, L. Klein.*** **From North York General Hospital, Mount Sinai Hospital, Humber River Regional Hospital and the University of Toronto, Toronto, Ont.**

A recent meta-analysis suggests that lymph node (LN) retrieval may be inferior when gastrectomy for gastric cancer (GC) is performed as a laparoscopic rather than an open procedure. The purpose of the present study was to examine the safety and technical outcomes of laparoscopic gastrectomy with D2 lymphadenectomy in a community setting.

All cases of curative intent laparoscopic gastrectomy performed

for GC at 2 community hospitals from July 2008 to February 2011 were identified and charts reviewed retrospectively. Patient demographics, operative time, LOS, LN retrieval, margin status, morbidity and mortality (in-hospital and 30-day) were examined.

Twenty-nine patients were identified; 69% were male and the median age was 69 (28–84) years. Sixty-five percent of patients underwent subtotal and 35% total gastrectomy. The median operative time was 230 (132–313) minutes. The median LOS was 4 (2–49) days. All patients underwent modified D2 lymphadenectomy. The median number of LNs retrieved was 32 (15–62), and all patients had adequate lymph node assessment according to AJCC staging criteria. Sixty-nine percent of patients had nodal metastases. Twenty-eight patients (97%) had an R0 resection; 1 had an R1. There were 8 major complications in 7 patients including 2 postoperative deaths. Major complications included pulmonary embolus (PE; 2), anastamotic leak (2), evisceration (1), infected hematoma (1), intra-abdominal abscess (1) and anastamotic stricture (1). One death at 47 days after surgery resulted from a leak at the esophago-jejunal anastomosis; the other death was from massive PE 3 days after hospital discharge. Six of 8 complications were in total gastrectomy patients.

Laparoscopic gastrectomy with D2 lymphadenectomy can be performed in a community setting with operative times, LN retrieval, margin status and complication rates comparable to the published open and laparoscopic literature. Morbidity was predominantly related to total gastrectomy, and a learning curve was seen associated with method of anastamosis.

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The use of immunohistochemistry to test endometrial cancer specimens for HNPCC-associated genetic markers: identifying patients at risk of hereditary nonpolyposis colorectal cancer. ***J.A. Van Koughnett, T. Ahmad, P. Ainsworth, M. Brackstone.*** **From the Division of General Surgery, University of Western Ontario, and the London Regional Cancer Program, London, Ont.**

Women with hereditary non-polyposis colorectal cancer (HNPCC) genetic mutations often develop endometrial cancer as their first presentation. The use of immunohistochemistry (IHC) may be useful to identify these patients and better screen for colorectal cancer, as many are not screened for HNPCC-associated cancers. The objective of this study was to use IHC as a screening tool to test endometrial cancer specimens for HNPCC genetic markers. Immunohistochemistry results were compared with microsatellite instability (MSI) testing and family history.

Patients treated for endometrial cancer with a total hysterectomy between 2007 and 2010 at London Health Sciences Centre and St. Joseph's Health Care were eligible to participate. Recruitment occurred by phone and mailings. A detailed family history of HNPCC-related tumours was collected from participants on enrollment. Paraffin-embedded tissue from hysterectomy specimens was tested for MLH1, MSH2, MSH6 and PMS2 using IHC. The MSI of the BAT25 and BAT26 markers was determined by a separate blinded assessor. Immunohistochemistry, MSI and family history results were compared.

Sixty-two patients participated in the study. Twelve of 62 participants (19%) showed loss of protein expression on IHC testing. The correlation between positive IHC and MSI results was 100%. Of those who tested IHC- and MSI-positive, only 2 patients (17%) met the Amsterdam criteria for HNPCC on family history. All but 1 patient who tested IHC- and MSI-positive have consented to undergo definitive genetic testing by polymerase chain reaction.

This study demonstrates that IHC is a useful method of identifying women at risk of hereditary colorectal cancer who have already been diagnosed with an HNPCC-associated cancer. Immunohistochemistry is an accurate and cheaper alternative to MSI testing for endometrial cancer specimens and may better target colorectal cancer screening for high-risk patients and their families.

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Results of axillary dissection in a community setting: a qualitative review. ***S. Kanagaratnam, G. Groot.*** **From the University of Saskatchewan, Saskatoon, Sask.**

In 2010, an adequate axillary dissection is considered as harvesting of 10 or more level I and II axillary lymph nodes. This standard of care was established in 1998 with *The Steering Committee Report of Clinical Practice Guidelines for the Care and Treatment of Breast Cancer*.

In this project, we review the efficacy of axillary node dissection by community surgeons in the province of Saskatchewan between 1991 and 2001. In reviewing the data, we focused on 3 areas, including axillary node harvest before and after publication of the guideline, and surgeon and or pathologist factors affecting the adequacy of node dissection.

Retrospective review of 778 charts was done of early-stage breast cancer with a diagnosis of intraductal carcinoma and treated with lumpectomy and axillary dissection between 1991 and 2001. A Poisson regression model analysis was used to analyze the data.

No statistically significant differences were noted when comparing the number of axillary nodes harvested before and after the publication of practice guidelines in 1998. The surgeon's level of experience in doing axillary node dissection did not influence harvest count. A more experienced pathologist had significantly lower node harvest rate.

The publication of the axillary node harvest practice guideline in 1998 did not significantly influence the node harvest rate in the province of Saskatchewan between 1991 and 2001. The level of experience of the surgeon didn't significantly affect harvest rate, but that of the pathologist negatively affected harvest number.

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Primary breast cancer tumour and patient characteristics as predictors of adjuvant radiation therapy. ***L. VanderBeek, V. Francescutti, F. Farrokhyar, B. Strang, K. Kahnamoui.*** **From McMaster University, Hamilton, Ont.**

The purpose of the current study was to identify patient and tumour characteristics that guide adjuvant radiation therapy (RT) as well as our centre's adherence to recommended guidelines.

A retrospective review was undertaken of 1667 stage I–III breast cancer patients treated at a regional cancer centre from 2004 to 2007. Univariate analysis was used to select factors for entry into multivariate stepwise logistic regression model.

The primary indicators for any field of RT (n = 935) were lumpectomy (OR 79.5, 95% CI 47.6–132.9), N2 status (OR 71.9,

95% CI 17–304.7) and N3 status (OR 60.5, 95% CI 7.9–460.8). In patients who underwent a lumpectomy (n = 1081), the indicators for any field of RT were receipt of chemotherapy (OR 3, 95% CI 1.4–6.4), absence of connective tissue disease (OR 16.3, 95% CI 2.8–95.30), absence of coronary artery disease (OR 2.3, 95% CI 0.8–6.3) and N1 status (OR 0.3, 95% CI 0.1–0.7). In mastectomy patients (n = 408), the indicators for postmastectomy RT (PMRT) were N2 (OR 29.4, 95% CI 12.9–67.4) and N3 status (OR 108.3, 95% CI 14.5–807.5). Finally, we examined the predictors of the type of RT received, either breast/chest wall or locoregional RT, in those who received RT (n = 575). Those receiving locoregional RT were more likely to have N1 (OR 4.3, 95% CI 2.1–8.9), N2 (OR 26.1, 95% CI 11.1–61) or N3 involvement (OR 91, 95% CI 17.7–468), have had a mastectomy (OR 4.3, 95% CI 2.2–8.4) and had larger tumours (OR 1.6, 95% CI 1.3–2).

Patients who had a lumpectomy or had 4 or more positive lymph nodes (LNs) were more likely to receive any field of RT. In patients who received RT, those with any positive LNs, larger tumours, or those who had a mastectomy were more likely to receive locoregional RT. Our institution had a high adherence to the recommended guidelines of locoregional RT to patients with 4 or more positive LNs (83.1%) and RT for postlumpectomy patients (96.1%).

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Laparoscopic gastrectomy for patients with advanced gastric cancer produces similar oncologic outcomes to open resection. ***S. MacLellan, H. MacKay, J. Ringash, L. Jacks, Z. Kassam, I. Khalili, T. Conrad, A. Okrainec.*** **From the Department of Radiology, Department of Surgery, Princess Margaret Hospital, University Health Network, University of Toronto, Cancer Care Ontario, Toronto, Ont.**

Use of laparoscopic gastrectomy has gained acceptance as a treatment option for early gastric cancer. Its role in advanced gastric cancer remains unclear. The purpose of this study was to compare the oncologic outcomes for laparoscopic versus open gastrectomy in the management of advanced gastric cancer in patients receiving adjuvant chemoradiotherapy.

We reviewed consecutive patients with gastric cancer, treated with resection and adjuvant chemoradiation (45 Gy/25 with 5FU-based chemotherapy), at a quaternary care comprehensive cancer centre between January 2000 and November 2009. Of 203 patients, 21 were treated with laparoscopic gastrectomy. These patients were compared with those who underwent open surgery, and were evaluated for overall survival (OS), relapse-free survival (RFS) and site of first disease recurrence.

Among 21 patients in the laparoscopic group, median age was 61.3 (28.2–76.6) years and median follow-up was 21.3 (6.7–50.4) months; 71% were male. Most had AJCC/UICC TNM v6 stage II (33%) or III (52%) disease. These demographic characteristics were similar in both the laparoscopic and open groups. The incidence of recurrence was 38.1% (8/21) in the laparoscopic group and 36.8% (67/182) in the open group. In the laparoscopic group, the site of first recurrence was distant in 3 patients, peritoneal in 4 and mixed in 1 (locoregional [LR] and distant). There was no significant difference in recurrence patterns compared with patients undergoing open resection. In the open group, recurrence was distant in 26, peritoneal in 12, LR in 15, and 14 presented with a mixed pattern. The 3-year RFS was 58% (50%–66%) and was not significant between the 2 groups (Gray's test, p = 0.32). The 3-year OS was 65.9% (58%–73%) and was not significantly different between the groups on univariate (p = 0.92) or multivariate (p = 0.54) analyses.

Our study suggests laparoscopic assisted gastrectomy is an oncologically safe procedure for advanced gastric cancer with comparable outcomes to open resection.

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A nationwide assessment of adherence to stage-specific treatment guidelines for adenocarcinoma of the colon. ***R. Chagpar, Y. Xing, N. You, C. Yi-Ju, B. Feig, G. Chang, J. Cormie.*** **From the University of Western Ontario, London, Ont., and the MD Anderson Cancer Center, Houston, Tex.**

Guideline adherence has been proposed as a measure of cancer care quality. The purpose of this study was to determine hospital-based adherence rates and factors associated with adherence to the National Comprehensive Cancer Network (NCCN) treatment guidelines for adenocarcinoma of the colon.

All patients within the National Cancer Database diagnosed with colonic adenocarcinoma (2003–2007) formed the study cohort. Adherence with stage-specific NCCN guidelines was based on pathologic assessment. Multivariate analyses were performed to determine clinicopathologic and socio-economic factors that were predictive of adherence. Nonadherence was based on whether chemotherapy was not recommended for stage I and low-risk stage II, or recommended for high-risk stage II and stages III and IV, as indicated by the guidelines.

A total of 220 406 patients were identified, 148 016 (67.1%) of whom were treated in accordance with NCCN guidelines. Patients with stage I disease were most likely to receive guideline-based treatment (96.1%), relative to those with stage II (low risk 75.5%, high risk 24.7%), stage III (62.6%) and stage IV (66.8%) disease, respectively (p < 0.001). Lack of recommended chemotherapy was largely responsible for nonadherence in high-risk stage II (91.9%) and stage III (82.1%). Using stage-specific multivariate models, factors associated with adherence across all stages included age, Charlson–Deyo comorbidity index score, later year of diagnosis and insurance status.

Although adherence to consensus-based guidelines has increased in recent years, older patients with pre-existing comorbidities and those with lower socio-economic status are less likely to be offered systemic therapy for high-risk stage II and stage III colon cancer. Young, healthy patients with early stage disease were more likely to have been recommended chemotherapy, which is not in accordance with NCCN guidelines. The impact of nonadherence on patient outcomes needs to be further elucidated.

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Cytoreductive surgery plus hyperthermic intraperitoneal chemotherapy with oxaliplatin for peritoneal carcinomatosis arising from colorectal cancer. ***M.-K. Gervais, L. Sideris, P. Drolet, A. Mitchell, G. Leblanc, P. Dubé.*** **From Hôpital Maisonneuve-Rosemont, Montréal, Que.**

Peritoneal carcinomatosis from colorectal cancer is an aggressive

disease associated with poor prognosis. The advent of cytoreduction surgery (CRS) followed by hyperthermic intraperitoneal chemotherapy (HIPEC) has greatly improved survival. The objective of the study was to evaluate the results of this therapeutic approach in our institution over the past 6 years.

Treatment consisted of complete cytoreductive surgery followed by oxaliplatin HIPEC (460 mg/m^2) in 2 L/m^2 of D5W at 42°C for 30 minutes. Survival was calculated by Cox regression model.

From 2004 to 2010, 40 patients presenting with peritoneal carcinomatosis arising from colorectal cancer were included in the study. Of the 40 patients, 25 HIPEC procedures were performed. Six patients had a negative second-look surgery, and 9 patients had extensive unresectable disease found at laparotomy and thus were not treated with HIPEC. Mean follow-up was 32.7 months. Overall 3- and 5-year survival for the entire series was 56% and 33%, respectively. The 3- and 5-year overall survival rates were 61% and 36% for the HIPEC group, 67% and 67% for patients with negative second-look surgery, and 22% and 0% for patients with unresectable disease (p = 0.0087). Disease-free survival for the HIPEC group was 22% at 3 years. One postoperative mortality occurred in the HIPEC group. The major complication rate was 20% and included intra-abdominal abcesses (10%), anastomotic leaks (7.5%), intra-abdominal bleeding (5%) and enterocutaneous fistulas (5%). Peritoneal carcinomatosis index (p = 0.0374) and lymph node status (p = 0.027) were significant prognostic indicators.

Oxaliplatin HIPEC for peritoneal carcinomatosis of colorectal origin is an effective treatment with encouraging survival results.

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Practice referral patterns and outcomes for primary retroperitoneal sarcoma in British Columbia. ***S. Merchant, M. Knowling, R. Cheifetz.*** **From the University of British Columbia, General Surgery, and the BC Cancer Agency, Vancouver, BC**

Our objectives were, first, to understand practice referral patterns for primary retroperitoneal sarcoma (PRS) in British Columbia (BC) and, second, to determine if there is an association between timing of referral to tertiary care (BC Cancer Agency and/or a surgical oncologist) and patient outcomes.

This was a retrospective database review study. Using ICD-10 coding, the Cancer Agency Information System was used to identify patients with PRS from 2000 to 2009. We excluded patients who were < 18 years of age, did not undergo surgery, had all surgeries outside of BC and those who were never referred to tertiary care.

In total, 228 patients were identified; ultimately, 86 patients were included in the study. All patients underwent surgical resection; 43 patients were referred before surgery (group 1) and 43 after surgery (group 2). Average age at diagnosis, sex, tumour size, grade, stage and histologic subtype were not significantly different between the groups. Patients in group 1 were significantly more likely to have their surgery performed by a surgical oncologist (36/43 v. 0/43, $p < 0.05$), to receive a complete gross resection (42/43 v. 27/43, $p < 0.05$), to receive adjuvant radiation (22/43 v. 2/43, $p < 0.05$) and to be alive (34/43 v. 18/43, $p < 0.05$) compared with patients in group 2. Patients in group 2 underwent significantly more incomplete resections (6/43 v. 1/43, $p < 0.05$) and transperitoneal biopsies (10/43 v. 0/43, $p < 0.05$) compared with patients in group 1.

Our data show that 50% of patients with PRS who are eligible for surgical resection are referred to tertiary care before initial surgery and that this is associated with higher rates of complete gross resection, utilization of adjuvant radiation and improved survival. This is in keeping with existing evidence that suggests better patient outcomes when an aggressive tertiary care approach is used.

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Transanal endoscopic microsurgery: outcomes in patients with rectal carcinoma. ***M. Raval, B. Heidary, S. Kalikias, D. Raval, T. Phang, C. Brown.*** **From the Department of Surgery, St. Paul's Hospital, University of British Columbia, Vancouver, BC**

Our objective was to quantify local recurrence in patients with rectal adenocarcinoma managed by transanal endoscopic microsurgery (TEM) from 2007 to 2011. We retrospectively reviewed these patients' charts. Transanal endoscopic microsurgery was performed by 3 surgeons, and patients were followed clinically and endoscopically.

Forty-seven patients with rectal adenocarcinoma (mean 73, range 42–95 yr) underwent TEM during the study period, with a mean follow-up of 13 (1–42) months. Mean tumour size was 3.4 (1–8) cm and mean tumour height was 7 (0–15) cm from the dentate line. T1, T2, T3 and T4 stages were 40.4%, 42.6%, 14.9% and 2.1%, respectively. Five major (10.5%) and 3 minor (6%) complications occurred postoperatively. Mean hospital stay was 1.3 (0–5) days. Sixteen patients (34%) received adjuvant radiation. There were no procedure-related mortalities. Three patients died during follow-up (2 cancer-specific [uT3N0M0 and uT3N1M0], 1 cerebral aneurysm, unrelated).

Four patients (8.5%) had local recurrence of adenocarcinoma at a mean 5 months after TEM. The final pathologic stage was T1 in 2 patients and T2 in 2. Microscopic margins were positive in 1 patient. No patients received immediate adjuvant radiation after TEM. All 4 patients underwent curative salvage surgery with neoadjuvant radiotherapy after recurrence (2 abdominoperineal resection, 2 low anterior resection). Recurrence was not associated with age, tumour size, closure of TEM defect or preoperative or final pathologic stage ($p > 0.05$). Three patients were alive without disease at last follow-up and 1 died of unrelated causes 6 months after salvage resection, but free of disease.

In 47 patients undergoing TEM for rectal cancer, we observed an early local recurrence rate of 8.5% after a mean follow-up of 13 months. Extended follow-up is necessary to better elucidate the appropriateness of TEM for rectal adenocarcinoma, as a higher rate may be seen with longer follow-up. The role of adjuvant radiation is yet to be determined. In our series, salvage surgery following recurrence was successful.

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The myth of informed consent in rectal cancer surgery: What do patients retain? ***A. Scheer, A. O'Connor, B. Chan, H. Moloo, E. Poulin, J. Mamazza, R. Auer, R. Boushey*****. From The Ottawa Hospital, University of Ottawa, Ottawa, Ont.**

To determine what information rectal cancer patients retain and what information they desire during informed consent.

Thirty postoperative rectal cancer patients were interviewed at a university-based teaching hospital, using a questionnaire based on the validated Ottawa Decision Support Framework Needs Assessment template. Prior to surgery, patients were seen at a cancer assessment centre where a comprehensive clinical pathway is used to standardize perioperative management and improve patient education. Patients have 2 preoperative visits with the surgeon and also attend educational discussions with enterostomal therapy, oncology nurses and social work. All patients receive standardized information packages.

Thirty patients were interviewed between December 2009 and June 2010. Eighty percent were male, with a median age of 65. Two-thirds of patients had a primary anastomosis and one-third received an end colostomy (9 abdominoperineal resection, 1 anterior resection with end colostomy). None of the patients perceived having a choice of surgical options. When questioned about preoperative discussions of functional risks, 47% could not recall a discussion of risks to bowel function, 47% for sexual function and 57% for urinary function. The majority of patients would like information regarding functional outcomes (67%), body image (53%) and other information such as images of stomas, scars and the immediate postoperative period in hospital (67%). The minority of patients requested information regarding cure rate (40%), need for a second surgery (30%) or the ability of surgery to treat their symptoms (10%). Patients find reading material (87%) discussions with the health care team (77%) and the Internet (73%) most useful. Patients did not find discussion groups with previous patients helpful. Patients would like information that is portable and trusted by their health care team that they can review in their own time.

Despite a comprehensive educational oncology pathway, patients retain little of the informed consent discussion. This study highlights the dichotomy between the outcomes that surgeons and patients value most. The results of this study will guide future efforts to improve informed consent in rectal cancer surgery.

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Short-term outcomes of laparoscopic right hemicolectomy with intracorporal v. extracorporal anastamosis. ***K. Hardy, A. Vergis, P. Sullivan.*** **From the University of Manitoba, Winnipeg, Man., and the University of Toronto, Toronto, Ont.**

The objective of this study was to compare the short-term outcomes of laparoscopic (lap) right hemicolectomy with intracorporal versus extracorporal anastamosis.

A retrospective review of all elective lap right hemicolectomies

at St. Joseph's Hospital, Ontario, from January 2008 to September 2009 was undertaken. Patient demographic, pathologic, operative and outcome data were recorded. Data were analyzed using the Student *t* test for continuous variables and the Pearson χ^2 test for categorical variables. Median length of stay was compared using the Mann–Whitney *U* test.

Fifty elective lap right hemicolectomies were completed during the study period (21 intracorporal/29 extracorporal). The groups were similar in terms of age, sex, body mass index, ASA score, previous laparotomy and preoperative invasive pathology. There was no difference in mean operative time (217 v. 196 min, p = NS), estimated blood loss (14 v. 42 mL, p = NS), perioperative blood transfusions (5% v. 14%, p = NS), in-hospital morbidity (33% v. 41%, p = NS), out-of-hospital morbidity (19% v. 31% p = NS), emergency department visits (10% v. 17%, p = NS) or 30-day readmissions (5% v. 7%, p = NS) for intracorporal versus extracorporal anastamoses, respectively. There was 1 anastamotic leak in each group, and there were no perioperative deaths. Median length of stay was significantly shorter for intracorporal anastamoses (4 v. 5 d, p = 0.05). Two ventral hernias occurred in midline extraction sites with extracorporal anastamoses.

Lap right hemicolectomy can be performed safely with either an intracorporal or extracorporal anastamosis. Whereas an intracorporal anastamosis requires advanced lap suturing skills, it has the advantage of a less hernia-prone Pfannenstiel extraction site, with faster recovery and reduced length of stay. A larger study would be required to determine a statistical difference in ventral hernia rates.

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Changing trends in laparoscopic surgery for rectal cancer in the province of Ontario. ***R. Musselman, T. Gomes, B. Chan, R. Auer, H. Moloo, E. Poulin, J. Mamazza, K. Al-Khayal, M. Al-Omran, M. Mamdani, O. AlObeed, R. Boushey.*** **From The Ottawa Hospital, University of Ottawa, Ottawa, Institute for Clinical Evaluative Sciences, Li Ka Shing Knowledge Institute of St. Michael's, Toronto, Ont., and King Khalid University Hospital, King Saud University, Riyadh, Saudi Arabia**

The safety and efficacy of laparoscopic surgery for colon cancer has been demonstrated in large, multicentre clinical trials. Similar studies for rectal cancer are ongoing. The purpose of this study is to explore the trends and outcomes of laparoscopic surgery for rectal cancer in Ontario.

We conducted a retrospective cross-sectional time series examining rates of elective rectal cancer surgery among 10.5 million adults in Ontario, Canada, from April 2002 to March 2009. We linked the Canadian Institute for Health Information Discharge Abstract Database, Registered Persons Database and the Ontario Cancer Registry to assess procedure rates over time. Data on demographics and 30-day outcomes were collected. Outcomes were identified using the modified Clavien–Dindo classification system. Trends were assessed using time series analysis.

Over the 7-year period, 8189 open and 1079 laparoscopic elective surgeries for rectal cancer were identified. The annual rate of laparoscopic rectal cancer surgeries increased from 0.60/100 000 population in 2003 to 2.24 in 2008 (p < 0.01), driven mainly by an increase in anterior resections. Patients who underwent laparoscopic and open procedures were similar with respect to age (66.5 ± 11.8 yr v. 66.2 ± 12.1 yr; SD 0.02) and sex (63.2% v. 59.4%; SD 0.08). Preoperative Charlson comorbidity index scores did not differ between groups (SD < 0.10). Laparoscopic patients had a shorter mean LOS (6.7 ± 6.8 d v. 9.9 ± 7.1 d, SD 0.45), received fewer stomas (23.4% v. 44.9%, SD 0.44) and were less likely to be admitted to the ICU postoperatively (12% v. 25.9%, SD 0.32). Thirty-day mortality and hospital readmission rates did not differ between groups.

Laparoscopic rectal cancer surgery rates are increasing in Ontario, with short-term outcomes remaining favourable. Ongoing research regarding the long-term safety and effectiveness of the laparoscopic approach for rectal cancer surgeries may lead to greater increases in its utilization.

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Oncologic outcomes of laparoscopic and open colorectal cancer surgery: meta-analysis and correlation with expert opinion. ***G. Martel, A. Crawford, J. Barkun, C. Ramsay, D. Fergusson, R. Boushey.*** **From the University of Ottawa, Ottawa, Ont., McGill University, Montréal, Que., and the University of Aberdeen, Aberdeen, Great Britain**

This study sought to synthesize the oncologic outcomes associated with trials of laparoscopic and open surgery for colorectal cancer, and to determine whether expert acceptance of this technology has paralleled the accumulation of survival evidence.

A comprehensive systematic review of the literature was conducted. Randomized controlled trials (RCTs) were retrieved and abstracted. The primary outcome was survival. A meta-analysis of survival time-to-event data was conducted using described techniques. Hazard ratio estimates were generated from Kaplan–Meier curves. Reviews, guidelines and textbook chapters were also included and used to grade expert opinion on a 7-point Likert scale. Pooled survival data were correlated in time with accumulating expert opinion scores.

A total of 5799 citations were screened. Of these, 42 publications pertaining to 25 individual RCTs were retained. As well, 413 reviews were included (28 guidelines, 30 textbook chapters, 19 systematic reviews, 336 narrative reviews). In total, 6488 patients were randomized to laparoscopic (n = 3412) and open (n = 3076) colorectal surgery. Methodological quality was highly variable. Survival data were presented in 20 publications. The pooled hazard ratio for overall survival comparing laparoscopy to open surgery was 0.92 (95% CI 0.79–1.06; p = 0.25). The mean reported follow-up time ranged from 12 to 91 months. Expert opinion in the literature pertaining to the oncologic acceptability of laparoscopic surgery for colon cancer correlated most closely with the publication of large RCTs in 2002–2004. Laparoscopic rectal cancer surgery was widely perceived by experts as experimental.

Laparoscopic surgery for colon cancer appears to be equivalent to open surgery in terms of oncologic outcomes. Expert opinion in the literature has been increasingly supportive of this finding since 2003. Laparoscopic surgery for rectal cancer remains controversial and is widely considered experimental, likely owing to the lack of large-scale RCTs.

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Implementation of a regional colorectal cancer communities of practice (CoP) leads to improved quality of care for rectal cancer patients. ***L. Williams, A. Crawford,***

K. McLaughlin, M. Mackey, H. Moloo, J. Mamazza, E. Poulin, M. Friedlich, R. Boushey, R. Auer. **From the University of Ottawa, Ottawa, Ont.**

A colorectal cancer community of practice (CoP) was implemented in the Champlain region, Canada (population 1.2 million), engaging key stakeholders from 9 hospitals. Several initiatives were undertaken, resulting in centralization of rectal cancer treatment and creation of standardized care pathways. This study was undertaken to determine if implementation of a regional CoP model improves the quality of care for rectal cancer patients.

A retrospective study of rectal cancer patients who underwent surgery between Jan. 1, 2006, and Dec. 31, 2009, was performed. Patients were divided into 2 groups: those who underwent surgery before the CoP initiatives (pre-CoP, before January 2008) and those who underwent surgery after (post-CoP, after January 2008). Differences in terms of preoperative pelvic imaging (MRI or TRUS) and neoadjuvant therapy for stage II/III disease were evaluated.

Of the 262 patients included, preoperative staging by pelvic imaging was performed in 206 (79%), and neoadjuvant therapy was administered to 153 (58%). Compared with pre-CoP, a significant increase in the number of patients receiving neoadjuvant therapy was seen in the post-CoP group (69% v. 48%, $p < 0.001$), and the number of patients receiving pelvic imaging was significantly improved (94% v. 63%, $p < 0.001$). Patients who underwent pelvic imaging were more likely to receive neoadjuvant therapy, regardless of time period (66% v. 32%, $p < 0.001$). A subset analysis was performed in patients with stage II/III disease based on surgical pathology but who were not staged by preoperative pelvic imaging and not offered neoadjuvant therapy. These patients would have potentially benefited from a preoperative treatment approach. The proportion of these patients was markedly reduced in the post-CoP group (3% v. 11%, $p = 0.013$). Both subspecialty-trained and general surgeons were more likely to perform pelvic imaging in the post-CoP era (97% v. 73%, $p < 0.001$; 85% v. 35%, $p < 0.001$).

The implementation of a regional colorectal cancer CoP results in increased utilization of preoperative pelvic imaging and neoadjuvant therapy for stage II/III disease, leading to regional improvements in the quality of rectal cancer care.

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Strictureplasty in selected Crohn disease patients results in acceptable long-term outcome. *F. Bellolio, Z. Cohen, H. MacRae, B. O'Connor, H. Huang, J.C. Victor, R. McLeod.* From the University of Toronto, Toronto, Ont.

Strictureplasty (STXP) is an alternative to surgical resection of Crohn disease (CD). The objective of this study was to evaluate the long-term results of patients who have undergone STXP.

All patients who had a STXP of the small bowel between 1985 and 2010 were identified from an inflammatory bowel disease (IBD) database. Additional information was obtained through review of hospital records and by contacting patients. The need for further surgery was defined as the need for another surgical resection or STXP because of CD after the first STXP. The surgery-free survival was defined as the absence of need for further surgery and was calculated using the Kaplan–Meier method. Multivariate analysis was performed to determine factors affecting the need for further surgery. Quality of life was measured using the Short IBD Questionnaire (SIBDQ), with possible scores ranging from 1 (poorest) to 7 (best).

Ninety-four patients (44.7% women, mean age at first STXP 33.4 ± 9.7 yr) underwent 119 procedures (1.24 procedures per patient, range 1–4). The number of STXPs was 278 (2.34 STXP per procedure, range 1–11), including 9 duodenal and 269 jejunal/ileal STXPs. The most common type was Heineke–Mickulicz (92.8%) STXP. At a mean follow-up of 84.2 months, the need for further surgery was 44%. In multivariate analysis, only age at first STXP was associated with need for further surgery. The surgery-free survival at 5 and 10 years was 70.7% (95% CI 59.8%–81.7%) and 26.6% (95% CI 13.6%–39.6%), respectively. Fifty-three patients returned the questionnaire. The average SIBDQ score was 5.2 ± 1.2 (range 2.2–7). Previous surgery ($p = 0.07$), need for simultaneous resection ($p = 0.8$) and need for further surgery ($p = 0.18$) had no effect on scores.

STXP is a safe procedure with acceptable long-term outcomes. The need for further surgery is high, reflecting the complexity of this disease. However, overall quality of life is good and similar to patients with inactive CD.

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A cost comparison of laparoscopic and open colorectal surgery in a Canadian hospital. *K. Hardy, K. Pitzul, J. Kwong, A. Vergis, D. Urbach, A. Okrainec.* From the University of Manitoba, Winnipeg, Man., the University of Toronto, Toronto, and Queen's University, Kingston, Ont.

The objective of this study was to compare the total hospital cost of laparoscopic (lap) and open colorectal surgery in a Canadian academic institution.

Patients undergoing elective laparoscopic or open colorectal surgery for all indications at the University Health Network, Toronto, from April 2004 to March 2009 were included. Patient demographic, operative (OR) and outcome data were reviewed retrospectively. Hospital costs were determined from the Ontario Case Costing Initiative, adjusted for inflation and compared using the Mann–Whitney *U* test. Linear regression was used to analyze the relation between length of stay and total hospital cost.

There were 658 elective colon resections (295 lap/363 open, 18% conversion). There was no difference in sex, median age or Charlson Index score. There were more laparoscopic segmental resections and more open rectal procedures (22.2% v. 54.2%/77.1% v. 42.7%, lap v. open, $p < 0.05$). There was no difference in median OR time (229/230 min, lap v. open, $p = 0.377$), in-hospital complications (21.5%/22.3%, lap v. open, $p = 0.847$), 30-day readmissions or emergency room visits (9.8%/11.8%, lap v. open, $p = 0.452$ and 15.6%/18.2%, lap v. open, $p = 0.405$). Estimated blood loss, median length of stay and need for home care were less for laparoscopic surgery (100/300 mL, 5/7 days, 8.8%/17.2%, respectively, $p < 0.05$). Median total hospital cost was lower for laparoscopic surgery ($10 068.40/$12 751.80, lap v. open, $p < 0.05$) whereas OR costs were similar ($4311.60/$4042.80, lap v. open, $p = 0.071$). Laparoscopic segmental resection and laparoscopic rectal surgery were less costly ($9551.35/$12587.02 and $11 629.11/$12 519.10, lap v. open, $p < 0.05$).

Laparoscopic colon surgery is associated with similar OR costs and lower total hospital costs compared with open surgery.

Median length of stay correlates with total cost and is less for laparoscopic surgery. These results should be interpreted carefully, since patients selected for laparoscopic surgery may differ from those having open surgery with respect to expected hospital costs.

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Specialty bias may help explain variable results of CT colonography in the literature. ***K. Vogt, L. Dubois, C. Vinden*. From the London Health Sciences Centre, London, Ont.**

Studies assessing computed tomography colonography (CTC) for colorectal cancer screening have produced variable results with unexplained heterogeneity. We hypothesize that the involvement of 2 different specialties (endoscopists and radiologists) in the assessment of CTC creates potential bias. This study was undertaken to determine the effect of the medical subspecialty of the primary author on summary estimates of the diagnostic accuracy of CTC for the identification of colorectal polyps.

A systematic review of 3 bibliographic databases was conducted. Studies were included if they presented per-patient sensitivity and specificity of CTC in reference to a gold standard test for the detection of colorectal polyps. The affiliation of the primary study author was identified as either endoscopist (surgeon or gastroenterologist) or radiologist. Results reported from primary studies were pooled using the bivariate method and adjusted for the baseline risk of the included population and the gold standard used.

Of the 52 published studies reporting on diagnostic accuracy of CTC, 29 met our inclusion criteria. Eight studies were authored by endoscopists and 21 by radiologists. The overall summary estimate for sensitivity was 0.74 (95% CI 0.66–0.81) and specificity was 0.84 (95% CI 0.78–0.89). The specialty of the primary author was found to have a significant effect in the overall model ($p = 0.008$). The pooled sensitivity and specificity in studies authored by an endoscopist was 0.53 (95% CI 0.46–0.59) and 0.81 (95% CI 0.76–0.85), versus 0.78 (95% CI 0.75–0.81) and 0.82 (95% CI 0.79–0.84) in studies authored by a radiologist.

This study demonstrates that the medical subspecialty of the primary author may be an important indicator of bias in estimates of the diagnostic accuracy of CTC. To our knowledge, bias associated with the subspecialty of the primary author has not been reported in the medical literature, and assessment for this bias may be warranted in other areas

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Does perioperative nonsteroidal anti-inflammatory drug (NSAID) use increase the risk of anastomotic leak in elective colorectal surgery? ***B. Chan, A. Scheer, A. Menezes, H. Moloo, E. Poulin, R. Boushey, J. Mamazza*. From the University of Ottawa, Ottawa, Ont.**

The aim was to determine whether perioperative nonsteroidal anti-inflammatory drug (NSAID) use increased the risk for anastomotic leaks in elective colorectal surgery.

A case–control study evaluated colorectal surgery patients at a tertiary hospital from July 2006 to June 2009. Cases were defined as patients over 18 years with an anastomotic leak within 30 days postoperatively, excluding diverting stomas, pelvic exenterations and emergency resections. Controls were defined as patients without an anastomotic leak and were matched 3:1 to cases. NSAID exposure was defined as any NSAID use in the perioperative period. Analysis was done with odds ratios (OR) and 95% confidence intervals (CI).

Forty-eight cases and 132 controls were identified. Cases were 65% male and had a mean age of 66 (SD 16) years. Sixty-three percent had open surgery, 31% had rectal surgery and 79% were for malignancy. Cases had a median length of stay (LOS) of 22.5 days (IQR 13.5–33.5) with 10% in-hospital mortality. Controls had a median LOS of 6 days (IQR 4–8) and had 0% in-hospital mortality. There was no significant increased risk of anastomotic leak with NSAID use in the perioperative period, OR 1 (95% CI 0.44–2.26); however, there was a dose response trend with increasing NSAID dose. Compared with no NSAID use, low dose NSAID use had an OR of 0.71 (95% CI 0.25–2.02), medium dose had an OR of 1 (95% CI 0.41–2.44) and high dose had an OR of 1.71 (95% CI 0.56–5.28). In a subgroup analysis, celecoxib use had an adjusted OR of 1.37 (95% CI 0.64–2.97), and ketorolac use had an adjusted OR of 1.66 (95% CI 0.76–3.61).

This study failed to identify a significant relation between perioperative NSAID exposure and anastomotic leaks in elective colorectal surgery. There was, however, a nonsignificant dose response curve identified raising the possibility of an association given adequate power. Further larger studies are required to clarify this relation.

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Ileocolic resection for Crohn disease: Is there a difference according to the complexity of the disease? ***F. Bellolio, H. MacRae, Z. Cohen, B. O'Connor, H. Huang, R. McLeod*. From the University of Toronto, Toronto, Ont.**

The most common indications for surgery for patients with ileocolic Crohn disease (CD) are fibrostenotic or perforating (fistulas or abscesses) disease. The objective of this study was to compare surgical outcomes of patients with perforating (PER) versus nonperforating (NPER) disease following ileocolic resection (ICR).

Patients who had their first ICR at Mount Sinai Hospital between 1990 and 2010 were identified from an IBD database. Demographic, preoperative medication, intraoperative and postoperative outcome data were collected. Outcomes in patients with previous abscess drainage or fistula or abscess at surgery (PER) were compared with patients with NPER.

A total of 436 patients were included: PER group ($n = 233$) and NPER group ($n = 203$). Mean age (31.5 yr/o v. 32.5 year/o, $p = 0.4$), tobacco use (33.9% v. 39.4%, $p = 0.23$) and preoperative steroid and immunosuppressive use (31.3% v. 28.6%, $p = 0.53$ and 21.5% v. 25%, $p = 0.37$, respectively) were similar. Thirty-nine patients (16.7%) in the PER group had preoperative abscess drainage, 81 (34.8%) had an abscess and 197 (84.6%) had a fistula at surgery, mostly to the sigmoid colon (47.2%). Patients in the PER group were more likely to require preoperative total parenteral nutrition (18.5% v. 6.4%, $p < 0.001$), a second resection (28.8% v. 0.5%, $p < 0.001$) and an ileostomy (15% v. 2.5%, $p < 0.001$) and less likely to have a laparoscopic procedure (49.4% v. 68.5%, $p < 0.001$). Patients in the PER group had a longer mean postoperative stay (8.8 d v. 7.1 d, $p < 0.001$), had more septic complications (anastomotic leaks and/or intra-abdominal

abscesses, 5.6% v. 1%, $p = 0.009$), but the reoperation rate was similar (3.4% v. 1%, $p = 0.08$).

Patients with ICR for penetrating Crohn disease require a more complex procedure, have a longer postoperative stay and have a greater likelihood of an ileostomy but with optimal pre- and intraoperative care have acceptable surgical outcomes.

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The incidence of surgical site infection in colorectal surgery. ***C. Godbout-Simard, J. Azar, F. Psaradellis, J. Sampalis, N. Morin.*** **From the McGill Medical School, JSS Medical Research, Jewish General Hospital, Montréal, Que.**

Colorectal surgery is a well-known high outlier in regards to its rates of surgical site infections (SSI) owing to the nature of the operation, and this has significant impact on patient care and treatment. The main focus of this research was to determine the effect of the implementation of best practice measures on the rate of SSI.

Data were gathered by reviewing patients' hospital records, clinic charts, laboratory results and operative records. Patients' baseline characteristics, demographic and specific surgical variables were also collected to determine which were the most likely risk factors for the development of SSI. A total of 168 colorectal surgery patients, 84 in both the pre- and postmeasure groups, met the inclusion criteria. Thirteen patients (15.5%) in the premeasure group and 19 patients (22.6%) in the postmeasure group developed an SSI, thus showing a 7.1% increase in the rate of SSI after implementation. However, the mean risk index category (RIC) for the premeasure cohort was 0.58, whereas the postmeasure cohort had a mean RIC of 0.74. Preliminary results using NSQIP risk-adjusted rates are following the same trend. None of the variables pertaining to patient characteristics yielded any statistical significance, but surgical variables including patient RIC, the creation of a stoma, a dirty infected wound, the duration of surgery, intraoperative transfusion and rectal surgery were all statistically associated with the development of SSI in the univariate analysis. The dirty infected wound class was the only significant variable in the multivariate analysis.

The measures implemented were not successful in showing a significant decrease in SSI incidence. Our results are in accordance with studies from hospitals that enrolled into quality improvement programs to decrease their SSI rates and failed to do so with process measure implementation indicating that the measures proposed by these programs do not target the significant risk factors for SSI development.

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Retrospective comparison of early complications in open versus suture closure rectal lesions excised using transanal endoscopic microsurgery. ***C. Brown, S. Kalikias, B. Heidary, D. Raval, P.T. Phang, M. Raval.*** **From the Department of Surgery, St. Paul's Hospital, University of British Columbia, Vancouver, BC**

Our objective is to compare the rate of early complications in patients undergoing transanal endoscopic microsurgery (TEM) whose rectal defect is sutured closed with those whose defect is left unsutured.

Transanal endoscopic microsurgery is used to treat patients with rectal adenoma and select patients with rectal cancer. There are no data comparing defect closure with the unsutured approach in patients undergoing TEM.

Between 2007 and 2010, all patients treated with TEM have been maintained in the St. Paul's Hospital TEM registry. We identified all patients treated with a full-thickness TEM procedure. Two cohorts were established: patients with the defect sutured and patients with the defect left open. Demographic, operative and pathologic data were compared. The main outcome analyzed was early (< 30 day postoperative) complications, including bleeding that required investigation and readmission, infection and reoperation.

Overall, 52 patients had the TEM defect sutured (TEM-S) and 55 patients had the defect left open (TEM-O). There were no differences between the groups in patient age, sex, tumour height or underlying diagnosis (adenoma 29 v. 24, $p = 0.21$). The surgeon performing the procedure was a significant predictor of defect closure (61% v. 54% v. 41%, $p = 0.01$). The TEM-S group had longer operative time (mean 73 v. 59 min, $p = 0.01$).

There were 12 complications: 8 postoperative bleeds and 4 patients with postoperative peritonitis. There was no difference between TEM-S and TEM-O in overall complications (5 v. 7, $p = 0.47$). However, in the TEM-O group, 86% (6/7) of the complications were bleeds and in the TEM-S group, 60% (3/5) of the complications were peritonitis. All patients with peritonitis were treated nonoperatively.

The St. Paul's Hospital TEM Centre experience suggests that it is safe to leave rectal defects open when a robust mesorectal fat layer is present. However, a randomized clinical trial is necessary to confirm these findings.

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Can mouse colonoscopy reliably evaluate colonic inflammation in mouse models of colitis? ***A. Archibald, D. Hurlbut, S. Vanner.*** **From the Department of Pathology and the Gastrointestinal Diseases Research Unit, Queen's University, Kingston, Ont.**

Small video colonoscopes have been developed that can visualize and biopsy the colonic mucosa of live anesthetized mice with colitis; however, mouse colonoscopy has never been systematically evaluated against the existing gold standard of full histopathological tissue scoring. A comparison of colonoscopic visual colitis scores and colonoscopic biopsies to the gold standard of full histopathological tissue scoring was needed.

A dextran sulfate sodium (DSS) model of experimental murine colitis was induced in several mice per week to yield mice at various stages of colitis inflammation (mild, moderate, severe). Each mouse underwent colonoscopy by a blinded endoscopist. Biopsies were collected, and the severity of colitis was scored visually using the murine endoscopic index of colitis severity (MEICS). The mice were then sacrificed and their colons collected. The severity of colitis from the biopsies and necropsy samples were graded by a pathologist blinded to the treatments. The Bowker test of symmetry was then used to compare the data.

A total of 26 mice with acute or resolving colitis underwent colonoscopy and had their colitis scored visually. The colonoscopic visual colitis scores and the gold standard of full histopathological tissue scoring were significantly different ($B = 11$, $p = 0.012$). A total of 9 mice underwent colonoscopic biopsies. Colitis severity scores from the colonoscopic biopsies were not

significantly different from the gold standard of full histopathological colitis scores ($B = 2$, $p = 0.368$).

In this study, colonoscopic biopsies were shown to be a reliable method to evaluate colonic inflammation in a mouse model of colitis. However, the colonoscopic visual colitis scores differed significantly from the gold standard. The existing visual scoring system for mouse models of colitis does not reliably reflect histological changes and a new scoring system can be designed using the video records and histopathologic findings from this study.

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Gentamicin-collagen implant in colorectal surgery and surgical site infections. ***C. Zalai, C.-A. Vasilevsky*. From McGill University, Montréal, Que.**

Colorectal surgery is associated with a significant rate of wound infections, contributing to increased costs and length of stay. Rates as high as 40% are reported in some series.

Case–control series of 96 patients undergoing colorectal surgery were selected for a gentamycin-collagen implant (GCI) use during midline laparotomy closure at our institution. Gentamycin-collagen implant use was determined by the operating surgeon based on the presence of risk factors for surgical site infections (SSIs). Age over 70 and/or presence of obesity, diabetes, smoking, redo surgery, poor nutritional status, elevated American Society of Anesthesia (ASA) scores and immunodeficiency warranted the use of a GCI. The control group was composed of 118 consecutive colorectal patients who underwent midline laparotomy in the period immediately preceding the introduction of GCI, with the above inclusion criteria. All patients were followed postoperatively for at least 60 days, with no loss to follow-up. The rates of superficial/deep, organ space SSIs, length of stay (LOS) and mortality were collected.

Results were analyzed using GraphPad Prism 5; variables were compared via Student t test (continuous data) or Fisher exact test (discrete data).

Superficial SSIs were noted in 20 patients who received a GCI (21%) and in 21 patients from the control group (18%; $p = 0.6$). Organ/space SSI rates were also similar (26% and 21%), as were mortality (1% and 2%) and LOS (23 v. 16 d). There was a significant difference in age, with the GCI group being 6 years younger and having twice the number of patients with IBD (subgroup analysis, however, did not demonstrate a difference in infection rates).

In this single-centre, case–control study of patients at high risk for wound infections, implantation of a GCI during midline laparotomy closure did not impact the rate of SSIs, mortality or LOS. Limitations of this study include possible selection bias, small sample size, patient heterogeneity and the preponderance of younger patients with IBD in the GCI group. The results nevertheless suggest that local wound factors may be less important compared with systemic, patient factors in the development of SSIs.

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WITHDRAWN

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The Juravinski Cancer Centre (JCC) Two-step Multidisciplinary Clinic (2-Step MDC) in Local Health Integration Network 4 (LHIN4): a pilot study for patients with rectal cancer. ***M. Simunovic, M. Cadeddu, S. Forbes, S. Kelly, W. Stephen, V. Grubac, M. Marcinow, A. Coates*. From the Juravinski Cancer Centre, McMaster University, Hamilton, Ont.**

Multidisciplinary clinics (MDCs) with assessment by relevant specialists, including surgeons with colorectal cancer expertise, are encouraged for patients with colorectal cancer. At the JCC colorectal MDC, oncologists and surgeons assess a maximum of 3 patients per week. There are annually 850 colorectal surgery patients in LHIN4. Thus a true colorectal MDC in LHIN4 is logistically problematic and may undermine local surgeon autonomy and expertise. In response, we describe the rectal cancer 2-Step MDC at the JCC.

For step 1 of the 2-Step MDC, through email, a referring surgeon completes an intake form outlining patient and tumour features and the initial treatment plan — straight to surgery or preoperative radiation. This form and all cross-sectional imaging are reviewed concurrently by the referring surgeon and a JCC surgeon through an Internet-based platform, which provides audio and video linkage. The main concern is with the status of the mesorectal margin and tumour staging. For step 2, a decision is made by the surgeons — local surgery, radiation referral or referral to the JCC colorectal MDC. We report findings from the pilot phase of the 2-Step MDC.

Seven surgeons from 4 hospitals referred and reviewed 20 cases from November 2010 to March 2011. Initial treatment plans were changed for 6 of 20 patients — 2 patients went straight to surgery, and 4 patients were referred to the JCC MDC. A satisfactory review (time, video and audio links), which occurred for all cases, was dependent on strong information technology support.

For patients with complex colorectal cancer, the 2-Step MDC may allow for optimal care, the efficient use of resources and constructive support for referring surgeons. The 2-Step MDC has been integrated into the disease assessment pathway of Hamilton Health Sciences and will be expanded across LHIN4.

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Influence of surgeon and hospital factors on implementation of laparoscopic colon cancer surgery in British Columbia. ***N. Aslani, P.T. Phang, M. Raval, C. Brown.* From the University of British Columbia, Department of Surgery, St. Paul's Hospital, Vancouver, BC**

Multiple RCTs have shown laparoscopic-assisted colon cancer resection (LAC) to be a safe alternative to open colectomy (OC) with less perioperative morbidity. However, several population-based studies have demonstrated that the majority of colon cancer surgery is performed open.

Our objective was to determine factors associated with surgeon utilization of LAC in colon cancer patients in British Columbia.

The Gastrointestinal Cancer Outcomes Unit (GICOU) database prospectively collects data on all patients with colon cancer referred to the BC Cancer Agency in the province of British Columbia. In 2013 patients treated with surgery for colon cancer between 2003 and 2008, we analyzed surgeon and hospital factors that were associated with LAC.

Overall, 15% of patients were treated by LAC. There was increasing uptake of LAC across the 6 years ($p < 0.001$). Recent year of graduation ($p < 0.001$) and fellowship training ($p < 0.001$) were the

only factors associated with performing LAC. There was no relation between foreign training or sex. Hospital volume of colon surgery, size of hospital and presence of other surgeons performing laparoscopic surgery were not factors associated with LAC.

Whereas LAC has proven short-term advantages in colon cancer surgery, less than half of patients eligible are treated with this technique. Strategies that include recent graduates with fellowship training should be considered.

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Extended perioperative low molecular weight heparin to improve disease-free survival following surgical resection of colon cancer: a pilot randomized controlled trial. ***A. Scheer, M. Carrier, R. Boushey, T. Asmis, P. Wells, D. Jonker, R. Auer.*** **From The Ottawa Hospital, Ottawa, Ont.**

To evaluate the feasibility of a randomized controlled trial (RCT) assessing the effect of extended perioperative low molecular weight heparin (LMWH) thromboprophylaxis on disease-free survival in patients with resectable colon cancer.

An open-label pilot RCT involving consecutive patients diagnosed with localized and resectable colon cancer is ongoing at The Ottawa Hospital in Canada. Patients are randomized to extended perioperative or standard thromboprophylaxis. Standard thromboprophylaxis received tinzaparin (4500 U) daily beginning on the first postoperative day until discharge. Extended thromboprophylaxis received tinzaparin (4500 U) daily beginning within 2 days of the decision to operate (within 6 weeks of surgery) and continued for 4 weeks postoperatively.

Forty-one patients were approached between July 2009 and June 2010. Nine patients were ineligible, 23 refused consent. Eighteen patients (44%) were included. Ten (56%) were male, with a median age of 66. Median length of follow-up from enrollment was 9 months. Thirty-nine percent had stage II disease and 33% had stage III disease. Tinzaparin thromboprophylaxis was well tolerated in all patients. Compliance was excellent, with 2 missed doses and 2 delayed doses. No thrombotic or severe adverse events have been reported to date. Adverse events included a decrease in hemoglobin of 20 g/L that did not require transfusion in an intervention patient and a postoperative transfusion of 2 units in a control patient. One patient has recurred with distant disease, 1 patient had an adrenal metastasis at the time of surgery, and 1 patient has subsequently been diagnosed with a stomach gastrointestinal stromal tumour.

An RCT investigating the effect of extended perioperative thromboprophylaxis using tinzaparin on disease-free survival in patients with resectable colon cancer is feasible. The slow recruitment is attributed partially to patients feeling overwhelmed at their first surgical visit and partially to patient disinterest in self-injection. However, once enrolled, patient compliance was excellent. If LMWH can decrease metastatic spread, this would improve the health and quality of life for patients with otherwise limited disease.

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The impact of obesity on colorectal surgery: a survey of Canadian surgeons. ***N. Azer, R. Gill, C. de Gara, D.W. Birch, S. Karmali.*** **From the University of Alberta, Royal Alexandra Hospital, Edmonton, Alta.**

Over 1.7 billion adults worldwide are considered overweight or obese, with the prevalence of obesity in Canada increasing rapidly. Obesity has been shown to affect surgical outcomes such as local recurrence of cancer and wound infections following colorectal procedures. The objective of this study was to determine the perception of Canadian surgeons toward obesity's impact on colorectal surgery.

A 20-question survey was administered to Canadian surgeons through mail and email from the Canadian Association of General Surgeons over 2010–2011. The questions focused on surgeon demographics, experience with laparoscopic colon resections and their perception of obesity toward surgical proficiency and complications.

In total, 177 Canadian surgeons completed the survey. There was wide range of experience among the surgeons in terms of years of practice and number of colon resections performed per year. The majority (72.88%) reported having primary general surgical training. A majority of surgeons (57.71%) identified obesity as a risk factor for colorectal surgery. Furthermore, a large majority agreed that obesity is a risk factor for wound infection (97.17%), stomal retraction (90.39%) and stomal herniation (82.48%). Whereas obesity was not considered a contraindication to laparoscopic colon resection, it was considered to increase operative time (98.3%), cardiovascular (80.23%) and respiratory (95.4%) complications.

The majority of surgeons across Canada identify obesity as a risk factor for postoperative complications following colon resection. However, the majority did not consider obesity a contraindication for laparoscopic colon resection.

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Transanal excision of rectal adenomas: close follow-up is warranted. ***G. Roxin, S. Drolet, A. MacLean, W.D. Buie, J. Heine.*** **From the University of Calgary, Calgary, Alta.**

Large adenomas of the lower rectum not amenable to snare polypectomy are typically treated by transanal excision. The aim of this study was to evaluate the recurrence rate following transanal excision of these lesions.

All patients undergoing transanal excision of rectal adenomas between 1999 and 2009 were identified using the regional health record database. Recurrence was confirmed histologically. Statistical analysis included Wilcoxon-rank sum and Fisher exact tests for medians and proportions and Kaplan–Meier and Cox proportional regression models to identify predictors of recurrence.

Sixty-three (43 female) patients underwent a total of 77 transanal excisions. Median age was 63 years (range 42–93 yr), with a median tumour size of 4 cm (1–7 cm). Histologic evaluation revealed 11 tubular, 28 tubulovillous, 19 villous and 4 serrated adenomas. Thirty-one adenomas (49.2%) contained foci of high grade dysplasia. Twenty patients (32%) had positive or fragmented margins. Median follow-up was 14 months (interquartile range [IQR] 7–36 mo). Fifteen patients (23.8%) developed at least 1 recurrence at a median of 10 months (IQR 6–32 mo), with 7 patients (11.1%) having multiple recurrences. Progression to adenocarcinoma occurred in 4 patients (6.3%), at a median time from first resection of 44.5 months (40–46 mo). Multivariate analysis of patient and tumour characteristics demonstrated positive margin to be the only significant risk factor for recurrence (adjusted hazard ratio 3.08, 95% CI-1.01–9.38).

Transanal excision of rectal adenomas is associated with a high rate of local recurrence and in some cases progression to invasive cancer. Close follow-up of these patients is therefore warranted.

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Prognostic indicators in the management of anastomotic leaks following colorectal surgery. ***J. Agzarian, S. Forbes, W. Stephen, S. Kelly*. From McMaster University Hamilton, Ont., and the Harvard School of Public Health, Boston, Mass.**

The purpose of this study is to identify clinical variables that predict the need for and success of operative versus nonoperative management of colorectal anastomotic leaks (AL). A multicentre retrospective cohort study was conducted, identifying 1177 patients undergoing colorectal surgery between 2002 and 2007, in which there were 46 ALs.

The 2 intervention groups (24 operative v. 22 nonoperative) were compared with respect to patient characteristics, surgical factors (location and type of anastomosis) and clinical parameters (vital signs, physical exam findings and type of AL). Primary outcome measures were in-hospital mortality and length of stay (LOS). Univariate analysis was conducted using the Fisher exact test for binomial proportions and Student t test for continuous data. Multiple logistic regression using propensity scores was used to determine the adjusted effect of treatment on mortality. Length of stay was analyzed using Kaplan–Meier estimates and compared using the log-rank test.

On univariate analysis, there was a statistically significant difference between the 2 groups with regards to both the presence of sepsis and peritonitis — the operative group having higher proportions of both (p = 0.02). Nonoperative cases had lower mean heart rate (93 v. 108 beats/min, p = 0.02), higher mean systolic blood pressure (SBP; 130 v. 118 mm Hg, p = 0.03) and a higher proportion of contained leaks (77% v. 17%, p < 0.01). Propensity scores for treatment determination were based on age, SBP, peritonitis and type of AL. The adjusted OR of operative intervention on mortality was not significant at 0.64 (0.05, 7.67; p = 0.73). Median LOS was nonsignificantly shorter in the nonoperative group (18.5 v. 24 d, p = 0.12).

This study demonstrates that nonoperative management of AL is a viable option in well-selected hemodynamically stable patients with contained AL. Nonoperative management was not significantly associated with greater mortality or decreased LOS.

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Impact of a diagnostic assessment pathway on wait times for colorectal cancer surgery. ***P. Churchill, T. Corner, S. Kelly, S. Forbes, L. Lindsay, W. Stephen*. From McMaster University, Hamilton Health Sciences Hamilton, Ont.**

As cancer care becomes increasingly complex, timely management of patients has become a growing issue. A diagnostic assessment pathway (DAP) was launched to coordinate the care of colorectal cancer (CRC) patients referred for surgery in a tertiary care centre. This pilot study aims to outline the long-term feasibility of this program.

Wait times from diagnosis (colonoscopy) to imaging, surgical consult and surgery (OR) were collected prospectively for DAP patients. A random sample of patients treated for CRC in the 2 years before the DAP's implementation were used as controls. Neoadjuvant and nonoperative patients were excluded. Median wait times were compared using the Wilcoxon rank-sum test. The relative risk of wait times longer than Cancer Care Ontario recommendations was also calculated.

Seventy CRC patients were included in the analysis (pre-DAP 37, post-DAP 33). Median time from diagnosis to OR was not significantly reduced (pre-DAP 38, range 11–236 d; post-DAP 28, range 11–79 d; p = 0.89). The proportion of patients treated within 6 weeks of diagnosis also did not significantly differ (RR 1.51, 95% CI 0.83–2.76). Imaging wait times were improved (median 13 v. 5 d, p < 0.001), with more DAP patients imaged within 10 days after diagnosis (RR 3.01, 95% CI 1.40–6.51). Wait time reductions were also seen for consultation to OR (median 29 v. 17 d, p = 0.01) with more DAP patients having surgery within 28 days (RR 2.26, 95% CI 1.15–4.42). Median wait time from diagnosis to consultation did not differ (median 8 v. 9 d, p = 0.290).

Wait times for consultation to OR and for the completion of imaging have decreased significantly post-DAP. Wait times from diagnosis to OR showed a downward trend, but this was not statistically significant. This data support extending the DAP program for further analysis. Important areas for future investigation include the coordination of adjuvant/neoadjuvant treatment and morbidity/mortality data.

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Shared decision-making in rectal cancer surgery: a view from expert colorectal practitioners across North America. ***A. Scheer, A. O'Connor, B. Chan, H. Moloo, E. Poulin, J. Mamazza, R. Auer, R. Boushey*. From The University of Ottawa, The Ottawa Hospital, Ottawa, Ont.**

To clarify the surgical decision-making process between rectal cancer patients and practitioners and to determine the practitioners' understanding of and role in addressing the decisional needs and support of patients.

Colorectal fellowship trained surgeons, considered leaders in the field and advanced practice nurses in colorectal surgery were interviewed using a semistructured questionnaire based on the validated Ottawa Decision Support Framework. The interviews were recorded to ensure accurate data capture. Two reviewers independently analyzed the transcribed interviews and consensus was obtained for areas of discrepancy.

Ten practitioners agreed to participate (7 surgeons, 3 advanced practice nurses). The majority of practitioners had more than 10 years of experience and 50% had more than 21 years of experience. All surgeons preferentially perform sphincter-preserving procedures for rectal cancer. The main risks/benefits of the 2 most common procedures (anterior resection or abdominoperineal resection) highlighted by the practitioners were function, body/sexual image, patient preference, stigma of a stoma and impact on quality of life. Eight of 10 practitioners felt their role was to share the decision with the patient, whereas 2 of 10 (2/7 surgeons) felt they should make the decision for the patient. Six of 10 practitioners recognized patient decisional conflict as a challenge in involving patients in decision-making. Identified major barriers to decision-making include patient lack of knowledge, information overload and the stigma of a stoma. Perceived facilitators of decision-making include intelligent, motivated patients, access to standardized trusted information, and staged meetings with the health care team, including advanced practice nurses and enterostomal therapy nurses.

The majority of practitioners aspire to participate in shared decision-making with their patients, although there are a number of barriers that need to be addressed in order to better facilitate the decision-making process. This information will be used to create a decision support tool to improve the quality of the informed consent process for rectal cancer surgery.

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Transanal endoscopic microsurgery: the results of 35 patients. ***J. Denis, D. Hochman*. From the Winnipeg Regional Health Authority, University of Manitoba, Winnipeg, Man.**

Transanal endoscopic microsurgery (TEM) has emerged as a revolutionary technique for surgical resection of rectal lesions via the rectum itself, achieving complete resection of lesions with clear margins, even within the proximal rectum. Compared with conventional transanal excision, TEM has been shown to have fewer positive margins within resected specimens, significantly reduced recurrence rates and is capable of resection of even large lesions.

Transanal endoscopic microsurgery has been performed in Manitoba at the Victoria General Hospital since May 2009 but has been available routinely since January 2010 and remains the second of only 3 sites in Canada where this procedure is performed. Between May 2009 and March 2011, a series of 35 patients having undergone TEM resection at our institution has been retrospectively reviewed, demonstrating excellent results, in keeping with TEM outcomes previously published in the literature.

Median age was 70 (41–86) years. Twenty-one of the patients were female. Median BMI was 27.5 (18–39). The average area of tissue resected was 16.2 cm^2 (2.8–58.5 cm^2). Negative margins were achieved in 86%. Blood loss was minimal (median 1 mL). Operative time averaged 90 minutes per case (40–165 min). Recurrence rate within this short period has been 5.7%. Hospital stay was typically overnight (12–96 h). Complications were rare: a single patient had postoperative bleeding, 2 procedures were converted to endoscopic management owing to polyp position and 1 to biopsy only owing to overt cancer seen on rectal insufflation.

Transanal endoscopic microsurgery has proven to be a remarkable tool for the management of large and complex rectal lesions. Within our first series of 35 patients, results have exceeded expectations, achieving results well within the accepted literature values early in its implementation.

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Canadian guidelines for the follow-up of postoperative stage II and stage III colorectal cancer patients. ***M. Recsky, P.T. Phang, M. Raval, W. Cheung, C. Brown*. From the Department of Surgery, St. Paul's Hospital, University of British Columbia, and the BC Cancer Agency, Vancouver, BC**

There is ample evidence that intensive follow-up for stage II and stage III colorectal cancer (CRC) patients improves mortality after surgical resection, and guidelines worldwide are changing to adapt to this evidence. In Canada, there is no national cancer guideline strategy for cancer follow-up as this responsibility is provincial. Our objective was to survey the current colon cancer follow-up guidelines in Canada in order to, first, determine whether each province had its own set of official guidelines and, second, investigate whether the current guidelines across Canada are uniformly intensive in nature.

Provincial cancer websites were searched, in addition to contacting local representatives of provincial cancer care centres in order to obtain the most recent version of follow-up guidelines. In cases where no guidelines were identified, further attempts at contacting local representatives were made to ensure adequate acquisition of data.

The majority of provinces (6/10) in Canada do indeed have quite intensive follow-up schedules for postoperative stage II and stage III CRC patients. The details of these guidelines vary in the frequency of visits, the need for chest imaging during follow-up and the duration of high-frequency clinical evaluation. Of the provinces that do not have published guidelines, 1 province is currently working on finalizing the surveillance process for CRC, and the remaining 3 provinces did not have individualized provincial follow-up guidelines.

The majority of provinces in Canada does have formal follow-up guidelines for postoperative stage II and stage III colorectal cancer. The provinces that do have defined follow-up guidelines have similarly intensive follow-up. The variability in the specific investigation schedule is consistent with the variability of these schedules in the current level 1 evidence.

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Laparoscopic versus open colon surgery in a tertiary hospital: a cost-minimization study. ***N. Alkhamesi, C.M. Schlachta*. From Canadian Surgical Technologies and Advanced Robotics, London, Ont.**

The clinical advantages of laparoscopic surgery are well established, but questions remain regarding cost to the health care system. Real world cost analysis of elective laparoscopic versus open colon resection in a tertiary Canadian teaching hospital was performed to evaluate the financial impact of minimally invasive colon surgery.

A retrospective review of elective same-day admission laparoscopic and open segmental colectomies between 2005 and 2010 for both benign and malignant disease was performed. Combined cases, rectal surgery and procedures carried out on inpatients were excluded to minimize cost variation. The hospital global case costing system was used to calculate hourly cost of operating room time and daily hospital ward stay. The cost of disposable equipment was calculated manually. A cost-minimization analysis was performed from the hospital perspective. Converted cases were analyzed on an intention-to-treat basis.

In total, 470 right side (RC) colectomies (322 open and 148 laparoscopic) and 266 left side (LC) colectomies (181 open and 85 laparoscopic) met the inclusion criteria. There were no differences in patient demographics, indications for surgery or comorbidities. Conversion to open surgery was 18.9% RC and 23.5% LC. Operating room time for laparoscopic procedures was longer than open for both RC (203.4 min v. 173.4 min, $p = 0.1$) and LC (287.4 min v. 173.4 min, $p = 0.009$), resulting in greater OR costs of $4094.10 versus $3312.11 and $5784.88 versus $4582.55, respectively. Median stay for index admission was shorter for laparoscopy for RC (5 d v. 8 d, $p = 0.01$) and LC (4 d v. 6 d, $p = 0.04$), resulting in lower ward cost of $4556.07 versus $6632.82 and $3297.24 versus $5949.09, respectively. The cost of care per index admission following laparoscopic versus open resection was $10 097.93 versus $10 444.69 for RC and

$11 067.72 versus $11 146.56 for LC. The introduction of laparoscopic surgery had saved our institution $58 021.43 over 5 years.

Acknowledging the retrospective nature of this analysis, the results demonstrate that adopting laparoscopic approach to elective colon surgery has realized progressive financial benefit.

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Quality of life (QOL) for operative and nonoperative management of diverticulitis. ***T. Tiwari, C. Brown, M.J. Raval, P.T. Phang.*** **From the Department of Surgery, St. Paul's Hospital, Vancouver, BC**

Colonic resection is the standard practice for management of complicated diverticulitis; however, nonoperative management is increasingly recommended for uncomplicated diverticulitis. Quality of life (QOL) is not well studied in patients managed with watchful waiting. We compare QOL in patients managed by resection to those managed without surgery.

Quality of life data were requested from 113 patients hospitalized with CT scan–confirmed diverticulitis between 2006 and 2009. Twenty-six patients responded, of whom 14 had surgery and 12 were managed nonoperatively. Quality of life was assessed using the Irritable Bowel Syndrome (IBS) questionnaire consisting of 34 questions in 8 subscales with normalized scores (mean ± SD).

Quality of life was not different between surgical and nonoperative patients overall or for any subsclae. The IBS QOL subscale scores have wide variation. Quality of life in diverticulitis patients managed nonoperatively is similar to patients managed by surgery in our small sample and supports the recommendation of nonoperative management in uncomplicated diverticulitis. The IBS QOL may be used in further study to confirm this finding.

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