When it comes to your health, more medical tests, treatments and procedures are not always better. In fact, sometimes they're unnecessary. Find out when you need medical tests, treatments and procedures — and when you don't. Talk with your doctor or visit ChoosingWiselyCanada.org @ChooseWiselyCA

Choosing Wisely Canada.
A healthy conversation.

Understanding the barriers among orthopedic surgery residents to screening female patients for intimate partner violence

Management and outcomes of small bowel obstruction in older adult patients: a prospective cohort study

The location of surgical care for rural patients with rectal cancer: patterns of treatment and patient perspectives

Anastomotic salvage after rectal cancer resection using the Turnbull–Cutait delayed anastomosis

Sponsors
Canadian Association of General Surgeons
Canadian Society for Vascular Surgery
Canadian Society of Surgical Oncology
Canadian Association of Thoracic Surgeons
Department of Surgery, Western University
Department of Surgery, Dalhousie University

Department of Surgery, University of Alberta
Department of Surgery, University of Calgary
Département de chirurgie, Université de Sherbrooke
Department of Surgery, McMaster University
Département de chirurgie, Université de Montréal
"I look forward to receiving my POEMs research summaries every morning. They are often directly applicable to my practice, and I appreciate that the CME credits are automatically transferred to the College on my behalf."

— Dr. Ewan Affleck
Family physician
Yellowknife, NWT

POEMs by Essential Evidence Plus — **STAY CURRENT** with the latest clinical research

- Receive concise daily clinical summaries by email
- Accredited by the CFPC and RCPSC (Mainpro-M1 and MainCert Section 2)
- CME credits are automatically transferred to the college on your behalf
- Summaries pulled from over 1,200 clinical studies and 100 medical journals
- Included with CMA membership

Subscribe today

cma.ca/poems
Can the Blaylock Risk Assessment Screening Score (BRASS) predict length of hospital stay and need for comprehensive discharge planning for patients following hip and knee replacement surgery? Predicting arthroplasty planning and stay using the BRASS
D. Cunic, S. Lacombe, K. Mohajer, H. Grant, G. Wood

The location of surgical care for rural patients with rectal cancer: patterns of treatment and patient perspectives
M.C. Nostedt, A.M. McKay, D.J. Hochman, D.A. Wirtzfeld, C.S. Yaffe, B. Yip, R. Silverman, J. Park

Anastomotic salvage after rectal cancer resection using the Turnbull–Cutait delayed anastomosis
J. Hallet, A. Bouchard, S. Drolet, H. Milot, E. Desrosiers, A. Lebrun, R.C. Grégoire

Getting by with less — the “frugal tie”
J. Rizkallah, J.M. Rothschild, D.V. Exner

What is the diagnostic value of C-reactive protein for the prediction and the exclusion of postoperative infectious complication after colorectal surgery?
P.K. Chaudhury, M.G. Jeschke, J.R. Monson; Evidence Based Reviews in Surgery Group

canjsurg.ca

EDITORIAL • ÉDITORIAL

364 Surgery in patients with Ebola virus disease
V. McAlister

366 La chirurgie chez le patient atteint de la maladie à virus Ebola
V. McAlister

COMMENTARY • COMMENTAIRE

368 Classifying outcomes of care for injured patients
N. Bell, B. Sobolev, A. Townson, D.C. Evans, H. Anton, R.K. Simons

RESEARCH • RECHERCHE

371 “I’ve never asked one question.” Understanding the barriers among orthopedic surgery residents to screening female patients for intimate partner violence
L. Gotlib Conn, A. Young, O.D. Rotstein, E. Schemitsch

379 Management and outcomes of small bowel obstruction in older adult patients: a prospective cohort study
J.E. Springer, J.G. Bailey, P.J.B. Davis, P.M. Johnson

385 Self-reported practice patterns and knowledge of rectal cancer care among Canadian general surgeons
D.P. Richardson, G.A. Porter, P.M. Johnson

DISCUSSIONS IN SURGERY

412 Getting by with less — the “frugal tie”
J. Rizkallah, J.M. Rothschild, D.V. Exner

EVIDENCE-BASED SURGERY

417 What is the diagnostic value of C-reactive protein for the prediction and the exclusion of postoperative infectious complication after colorectal surgery?
P.K. Chaudhury, M.G. Jeschke, J.R. Monson; Evidence Based Reviews in Surgery Group
PRACTICAL TIPS FOR SURGICAL RESEARCH

420 How to optimize participant retention and complete follow-up in surgical research
M. Kaur, S. Sprague, T. Ignacy, A. Thoma, M. Bhandari, F. Farrokhyar

428 SERVICE INFORMATION
RENSEIGNEMENTS AUX LECTEURS

429 CAREER/CLASSIFIED ADVERTISING
ANNONCES SUR LES CARIÈRES ET ANNONCES CLASSÉES

© 2014 Canadian Medical Association. ISSN 0008-428X. For information on permission to reproduce material from the Canadian Journal of Surgery (CJS) see canjurg.ca.

All editorial matter in CJS represents the opinions of the authors and not necessarily those of the Canadian Medical Association (CMA). The CMA does not assume any responsibility or liability for damages arising from any error or omission or from the use of any information or advice contained in CJS, including articles, editorials, reviews, letters and advertisements. All reproduction rights are reserved.

Printed by Dolico Integrated Print Solutions, Ottawa. Appears in February, April, June, August, October and December.

Return undeliverable Canadian copies to the CMA Member Service Centre, 1870 Alta Vista Dr, Ottawa ON K1G 6R7 (email cmamsc@cma.ca).

© 2014 Association médicale canadienne. ISSN 0008-428X. Pour obtenir des renseignements au sujet des permissions à obtenir afin de reproduire des extraits du Journal canadien de chirurgie (JCC), consulter canjurg.ca.

Tous les articles à caractère éditorial dans le JCC représentent les opinions de leurs auteurs, qui ne sont pas nécessairement celles de l’Association médicale canadienne (AMC). L’AMC n’assume aucune responsabilité pour les dommages résultant de toute erreur ou omission, ou de l’utilisation de renseignements ou de conseils contenus dans le JCC, y compris les articles, éditoriaux, revues, lettres et annonces. Tous droits de reproduction réservés.

La revue est imprimée par Dolico Integrated Print Solutions, Ottawa. Elle paraît en février, avril, juin, août, octobre et décembre.

Retournez toutes copies canadiennes non livrées au Centre des services aux membres, Association médicale canadienne, 1870, prom. Alta Vista, Ottawa (Ontario) K1G 6R7 (courriel : cmamsc@cma.ca).

Online manuscript submission and peer review
AVAILABLE at
http://mc.manuscriptcentral.com/cjs
The Canadian Journal of Surgery aims to contribute to the effective continuing medical education of Canadian surgical specialists, and to provide surgeons with an effective vehicle for the dissemination of observations in the areas of clinical, basic science and education research. Readers can find CJS online at canj Surg.ca.

Submission of new manuscripts can be made at http://mc.manuscriptcentral.com/cjs.

Le Journal canadien de chirurgie vise à dispenser une éducation médicale continue efficace aux spécialistes en chirurgie au Canada, et fournir aux chirurgiens un mécanisme efficace pour diffuser les constatations de la recherche cliniques, fondamentale et éducative. Les lecteurs trouveront en direct le JCC à l’adresse canj Surg.ca.

Surgery in patients with Ebola virus disease

Thirty years ago, surgical trainees like me were asked to undertake diagnostic lymph node excisional biopsies in patients with AIDS. Our teachers believed the procedures to be futile and risky. We thought we were invincible. We arranged the set-up so that we could operate alone in double masks, gowns and gloves. The purpose of the inner layer was to permit safer removal of the outer barrier. Similarly we double-bagged laundry and waste.

Yet again, we are faced with a fluid-borne virus whose potential to harm is unknown. A large experience is making clear the steps that should be taken to fight Ebola virus disease (EVD) in West Africa. We have only a tiny experience upon which to base care of patients with EVD in developed countries, such as Canada. Initial hopes that life-supporting procedures, such as mechanical ventilation and hemodialysis, would permit recovery from the advanced stages of EVD are now less certain. Our faith in conventional barrier protocols has been shaken. In this article, I try to address the role of surgery in the care of patients with EVD.

Protocols for the initial care of patients with suspected or confirmed EVD have been developed and practised by Canadian hospitals with the help of the provinces and the Public Health Agency of Canada.1 Dr. Robert Fowler has described EVD as a febrile gastrointestinal disease whose lethal effect on fluid and electrolyte homeostasis can be ameliorated through modern critical care.2 At the time of writing, 4 patients are believed to have received mechanical ventilation and dialysis for advanced EVD. Two have survived to clear the virus. This success will inspire us to continue to support patients with EVD-induced renal and respiratory failure. Surgeons are commonly asked to consult on other critically ill patients with similar problems. Therefore, we have to face the dilemma of considering surgery in patients with EVD. Information in this area is rapidly accumulating, and clinical care teams will make their own valid decisions on a case-by-case basis. The American College of Surgeons has adapted the Centers for Disease Control and Prevention guidelines for the conduct of surgery in patients with suspected EVD.3 Surgeons should consult these guidelines frequently because new information is to be expected. The guidelines are currently silent on who should receive surgery.

When considering any invasive procedure or operation in a patient with EVD, the caregiving team needs to undertake a documented utility–risk analysis, which includes not only the perspective of the patient, but also the 360° environment. Other modalities of care and the possibility of procedure postponement must be considered, for now, preferable options. The well-accepted preference for methods of rehydration should rigidly favour oral over enteral tube and peripheral over central venous routes of administration. Blood work will have to be minimized and possibly restricted to point-of-care testing. The use of imaging in patients with EVD will also be considerably restricted in comparison to patients without the disease. It will be very difficult to justify the use of arterial lines. Automated noninvasive blood pressure and oxygen saturation monitoring will reduce direct patient contact.

The biggest dilemma for surgeons will be trying to determine futility in a disease with which we have almost no direct experience. The development of organ failure renders the prognosis bleak for patients in health care systems with limited resources, such as those in areas where the outbreaks have occurred. In the developed world, the prognosis is grave with the onset of organ failure, particularly if this occurs after restoration of the fluid, electrolyte and acid–base balance. Liver failure and necrosis have been observed with EVD; failure of supportive measures renders the prognosis hopeless, and neither transplantation nor liver assist devices should be considered. Surgery for peritonitis, gastrointestinal hemorrhage, intestinal perforation or intestinal ischemia is likely to fail. Ebola virus disease may result in anasarca with abdominal compartment syndrome for which mechanical ventilation, complete muscle relaxation and dialysis is preferable to laparotomy. Cardiopulmonary resuscitation is not appropriate for end-stage EVD. Unfortunately experience in Africa has shown that pregnant women with EVD appear to be at an increased risk for spontaneous abortion and pregnancy-associated hemorrhage. Neonates born to mothers with EVD have not survived.4

Endoscopy (bronchial or gastrointestinal) is a very high-risk procedure in patients with EVD because of forceful aerosol generation and operator proximity. Diagnostic endoscopy will probably fail a utility–risk analysis, as will most procedures with a therapeutic intent. The added risks related to aerosol generation have to be considered if the laparoscopic route is used for chest or abdominal surgery. Likewise, the use of external drains should be limited because of the risks related to extracorporeal body fluids.

Mechanical ventilation may result in requirements for surgery: tracheostomy should be postponed until the...
patient has cleared the virus; extracorporeal membrane oxygenation would probably not pass a utility–risk analysis; and tube thoracostomy should be considered an aerosol-generating procedure just like endotracheal intubation. The risk of aerosol generation should be mitigated by using properly fitted N95 masks and by removing all nonessential individuals from the room. The surrounding area will require decontamination following the procedure.

Conventional barrier protocols are being strengthened to combat the transmission of Ebola virus. Elements of military protocols for chemical, biological, radiological and nuclear defense may be useful. Gowns should include a hood and boot covers in a one-piece suit. Buddy checks and assistance will reduce failures during the donning and doffing of personal protective equipment. Decontamination with wipes before removal of barriers prevents inadvertent spread. In Africa, reusable gowns with final showers using diluted bleach are preferred by the heroic teams working to contain the outbreak. In the developed world, it is essential that we do not confuse barrier precautions used for diarrhea-causing bacteria, such as *Clostridium difficile*, with protocols required for EVD. Sterile surgical gowns and gloves may have to be added to EVD barrier suits, which are not sterile.

Unlike in the early days of AIDS, trainees and young surgeons with children should not be asked to operate on patients with EVD. This is a task for experienced surgeons using the smallest possible team in the room. Surgeons asked to consult on patients with EVD should not hesitate to seek advice from surgeons in experienced centres. Following the initial fear regarding AIDS, we quickly came to understand and treat HIV. Like many surgeons, I went on to perform the full range of operations, including liver transplantation, on patients infected with HIV. There are good reasons to hope that EVD will likewise be attenuated so that the full range of modern critical care and surgical procedures become possible in patients infected with Ebola virus.

Vivian McAlister, MD
Coeditor, Canadian Journal of Surgery

Competing interests: None declared.

DOI: 10.1503/cjs.015514

References:


La chirurgie chez le patient atteint de la maladie à virus Ebola

Il y a 30 ans, à l’époque où j’étais stagiaire en chirurgie, on nous demandait de pratiquer une biopsie-exérèse des ganglions lymphatiques aux fins de diagnostic chez tous les patients atteints du sida. Nos professeurs jugeaient cette intervention futile et risquée. Mais nous nous pensions invincibles. On s’arrangeait pour pratiquer l’intervention tout seul, en portant un masque double, une blouse double et une double paire de gants. La couche de vêtements internes était censée permettre le retrait en toute sécurité de la couche de vêtements externes. Le linge à envoyer à la buanderie et les déchets étaient déposés dans des sacs doubles.

Encore une fois, nous sommes confrontés à un virus transmissible par contact avec un liquide organique et dont on ne connaît pas entièrement les risques. Seule une vaste expérience pourrait montrer clairement les mesures à prendre pour combattre la maladie à virus Ebola (MVE) en Afrique de l’Ouest. Nous avons très peu d’expérience pour décider des soins à administrer aux patients atteints de la MVE dans les pays industrialisés comme le Canada. Au début, on croyait que certaines mesures servant à maintenir artificiellement les fonctions vitales, comme la ventilation mécanique et l’hémodialyse, permettraient au patient atteint de la maladie à un stade avancé de se rétablir. Nous en sommes moins certains aujourd’hui. Notre confiance dans les protocoles de protection classiques est ébranlée. Dans le présent article, je tenterai d’examiner le rôle du chirurgien dans la prise en charge du patient atteint de la MVE.

Les protocoles des premiers soins à administrer dans les cas soupçonnés ou confirmés de MVE ont été élaborés et mis en pratique par des hôpitaux canadiens avec l’aide des provinces et de l’Agence de santé publique du Canada1. Le plus cruel dilemme pour le chirurgien, c’est de juger si une chirurgie est futile lorsqu’on ne possède presque aucune expérience directe d’une maladie donnée. Une défaillance organique assombrit le pronostic chez les patients atteints de la MVE. L’échec de la réanimation par voie orale généralement acceptée plutôt que la réhydratation parentérale, et l’administration par voie péritonale plutôt que l’administration par voie veineuse centrale. Il faut réduire le plus possible le nombre d’examens de sang et se limiter à celles qui s’effectuent au point d’intervention. Le nombre d’examens par imagerie doit être considérablement moins élevé chez les patients atteints de la MVE que chez les patients non atteints. L’implantation de cathéters artériels serait très difficilement justifiable. Pour réduire les risques de contact direct avec le patient, il faut utiliser une méthode automatisée et non effractive de surveillance de la tension artérielle et de saturation en oxygène.

Le plus cruel dilemme pour le chirurgien, c’est de juger si une chirurgie est futile lorsqu’on ne possède presque aucune expérience directe d’une maladie donnée. Une défaillance organique assombrirait le pronostic chez les patients vivant dans des régions où les ressources du système de santé sont limitées, comme dans les pays où des flambées de la maladie sont observées actuellement. Dans les pays industrialisés, le pronostic est sombre à la défaillance d’un organe, notamment si celle-ci survient après le rétablissement de l’équilibre hydroélectrolytique et acido-basique. Une insuffisance hépatique et la nécrose ont été observées chez des patients atteints de la MVE. Nous avons très peu d’expérience pour décider des soins à administrer aux patients atteints de la MVE dans les pays industrialisés comme le Canada. Au début, on croyait que certaines mesures servant à maintenir artificiellement les fonctions vitales, comme la ventilation mécanique et l’hémodialyse, permettraient au patient atteint de la maladie à un stade avancé de se rétablir. Nous en sommes moins certains aujourd’hui. Notre confiance dans les protocoles de protection classiques est ébranlée. Dans le présent article, je tenterai d’examiner le rôle du chirurgien dans la prise en charge du patient atteint de la MVE.

En Afrique de l’Ouest. Nous avons très peu d’expérience pour décider des soins à administrer aux patients atteints de la MVE dans les pays industrialisés comme le Canada. Au début, on croyait que certaines mesures servant à maintenir artificiellement les fonctions vitales, comme la ventilation mécanique et l’hémodialyse, permettraient au patient atteint de la maladie à un stade avancé de se rétablir. Nous en sommes moins certains aujourd’hui. Notre confiance dans les protocoles de protection classiques est ébranlée. Dans le présent article, je tenterai d’examiner le rôle du chirurgien dans la prise en charge du patient atteint de la MVE. Les protocoles des premiers soins à administrer dans les cas soupçonnés ou confirmés de MVE ont été élaborés et mis en pratique par des hôpitaux canadiens avec l’aide des provinces et de l’Agence de santé publique du Canada1. Le Dr Robert Fowler a décrit cette maladie comme étant une affection gastro-intestinale accompagnée de fièvre, dont l’effet mortel sur l’équilibre hydroélectrolytique peut s’atténuer grâce à des soins intensifs modernes2. Au moment où j’écris cet article, on pense que 4 patients atteints de la MVE à un stade avancé ont été placés sous ventilateur mécanique et sous hémodialyse. On a réussi à éradiquer le virus chez 2 d’entre eux. Cette réussite nous incite à poursuivre nos efforts pour soutenir les patients présentant une insuffisance rénale et une insuffisance respiratoire causées par la MVE. Les chirurgiens sont souvent consultés dans le cas de patients gravement atteints d’une maladie similaire. Ils sont alors devant un dilemme: envisager une chirurgie chez un patient atteint de la MVE. Les connaissances s’accumulent rapidement dans ce domaine. Les équipes de soins cliniques valident leurs décisions au cas par cas. L’American College of Surgeons a adapté les lignes directrices des Centers for Disease Control and Prevention des États-Unis pour les interventions chirurgicales pratiquées chez des patients que l’on soupçonne atteints de la MVE3. Les chirurgiens devraient consulter à nouveau ces lignes directrices fréquemment pour prendre connaissance des mises à jour. À l’heure actuelle, les lignes directrices ne fournissent aucun renseignement en ce qui concerne les patients qui devraient subir une intervention chirurgicale.

Lorsqu’une intervention ou une chirurgie efficace est envisagée chez un patient atteint de la MVE, l’équipe de soins doit faire une analyse utilité-risque, qui doit non seulement tenir compte du point de vue du patient mais aussi de l’ensemble du milieu. D’autres modalités thérapeutiques et le report de l’intervention à plus tard doivent constituer pour l’instant les choix préférables. Il faut favoriser rigoureusement les méthodes de réhydratation par voie orale généralement acceptées plutôt que la réhydratation parentérale, et l’administration par voie périphérique plutôt que l’administration par voie veineuse centrale. Il faut réduire le plus possible le nombre d’analyses de sang et se limiter à celles qui s’effectuent au point d’intervention. Le nombre d’examens par imagerie devrait aussi être considérablement moins élevé chez les patients atteints de la MVE que chez les patients non atteints. L’implantation de cathéters artériels serait très difficilement justifiable. Pour réduire les risques de contact direct avec le patient, il faut utiliser une méthode automatisée et non effractive de surveillance de la tension artérielle et de saturation en oxygène.

Le plus cruel dilemme pour le chirurgien, c’est de juger si une chirurgie est futile lorsqu’on ne possède presque aucune expérience directe d’une maladie donnée. Une défaillance organique assombrirait le pronostic chez les patients vivant dans des régions où les ressources du système de santé sont limitées, comme dans les pays où des flambées de la maladie sont observées actuellement. Dans les pays industrialisés, le pronostic est sombre à la défaillance d’un organe, notamment si celle-ci survient après le rétablissement de l’équilibre hydroélectrolytique et acido-basique. Une insuffisance hépatique et la nécrose ont été observées chez des patients atteints de la MVE. L’échec des mesures de maintien des fonctions vitales fait perdre tout espoir de survie; ni une greffe de foie ni l’implantation d’un dispositif d’assistance hépatique ne devraient être envisagées. La chirurgie en cas de péritonite, d’hémorragie gastro-intestinale, de perforation intestinale ou d’ischémie...
La maladie de la maladie. Dans les pays industrialisés, il est essentiel de ne pas confondre les mesures de protection contre les bactéries causant la diarrhée, comme *Clostridium difficile*, avec les protocoles de protection contre la MVE. On peut devoir ajouter des blouses et des gants de chirurgien stériles aux combinaisons de protection contre la MVE qui, elles, ne sont pas stériles.

Pour éviter de répéter ce qui s’est fait dans les débuts du sida, les stagiaires en chirurgie et les jeunes chirurgiens ayant des enfants ne devraient pratiquer aucune intervention chez des patients atteints de la MVE. La tâche doit revenir aux chirurgiens d’expérience et l’équipe du bloc opératoire devrait être aussi réduite que possible. Le chirurgien appelé en consultation pour des patients atteints de la MVE ne devrait pas hésiter à demander conseil à un chirurgien d’un centre qui a de l’expérience. Après avoir surmonté la crainte suscitée par le sida, on a rapidement compris ce qu’était le VIH et comment le traiter. Comme bon nombre de chirurgiens, j’ai continué à pratiquer un vaste éventail de chirurgies, y compris des transplantations de foie, sur des patients infectés par le VIH. On a de bonnes raisons d’espérer que la crainte suscitée par la MVE finira par s’atténuer de la même façon. Ainsi, on sera en mesure d’administrer tout l’éventail des soins intensifs et chirurgicaux aux patients infectés par le virus Ebola.

Vivian McAlister, MD
Co-rédacteur, *Journal canadien de chirurgie*

Intérêts concurrents : Aucuns déclarés.

DOI: 10.1503/cjs.016014

**Références**


Classifying outcomes of care for injured patients

Many trauma survivors face challenges of impaired functioning, limited activities and reduced participation. Recovery from injury after acute care, therefore, becomes an important public health issue. This commentary discusses a framework for evaluating outcomes of acute care.

Advances in trauma care have increased the number of trauma survivors. In the United States, about 1.5 million injured patients are discharged from hospitals alive each year. The largest trauma survivorship populations include patients treated for injuries to the extremities (survival rate 99%), the spine (96%), torso (95%), system-wide injuries (92%) and the head (89%). Many of these patients face challenges of impaired functioning, limited activities and reduced participation. Recovery from injury after acute care, therefore, becomes an important public health issue.

Multiple interventions determine the overall outcome of care for trauma survivors. These include occupational and cognitive therapy, physiotherapy and other specialist care. Injured patients may need these interventions for long periods after the acute care phase. However, most evaluations of trauma care rely on data on the outcomes of acute care, such as deaths or complications. This approach provides limited information about the ultimate results of care for injured patients.

Some studies have made recommendations for the evaluation of trauma care using outcomes relevant to disability, including psychological adjustment, attainable functions, return to activities and participation (see the Appendix, available at canjsurg.ca). However, the complexity of care delivery has led to variation in how and when outcomes have been assessed. As a result, information obtained through these assessments reveals differing concepts of the recovery process, making studies noncomparable. At the same time, trauma care interventions are rarely studied in connection with the progress through different recovery states. Furthermore, no recommendation has been based on the outcomes of combinations of interventions. In our view, understanding the utility of disability outcomes for evaluating the quality of trauma care necessitates relating outcomes to progress toward recovery after injury.

Recently, Michael Porter proposed a framework relating outcomes of multiple interventions for treating a medical condition with the intended results of care. He argued that no single outcome captures the results of care. Rather, multiple outcomes reflect progress toward the intended result. In his view, outcomes of care form 3 domains of recovery: health status achieved, process of recovery and sustainability of health. These domains capture the entire process of care, rather than an individual intervention or a single care episode. Within each domain, condition-specific outcomes are arranged along the dimensions of recovery.
Using recent examples of Porter’s framework, the disability outcomes recommended for evaluating trauma care based on group are shown in Table 1. Our guiding principle was relating outcomes of interventions to their intended results. Applying this principle, we arrayed the outcomes along Porter’s dimensions of achieved health and sustained health, 2 ultimate goals of care for the injured patient. Groups of outcomes in the achieved health dimension measure the success in restoring health and returning to pretrauma activities and participation after acute care interventions. Groups of outcomes in the sustained health dimension measure emotional health, functions, activities and participation resulting from long-term services and support. We also stress a longitudinal aspect

<table>
<thead>
<tr>
<th>Domain</th>
<th>Dimension</th>
<th>Group</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Health status achieved or retained</strong></td>
<td>Survival</td>
<td>Survival*</td>
<td>Emotional indicators of survival</td>
</tr>
<tr>
<td>Degree of health or recovery</td>
<td>Achieved mental health†</td>
<td>Pain relief</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Absence of psychological disorders</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Achieved functioning‡</td>
<td>Mental functions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Achieved activities§</td>
<td>Movement functions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Achieved participation¶</td>
<td>Self care</td>
<td></td>
</tr>
<tr>
<td><strong>Process of recovery</strong></td>
<td>Disability of care</td>
<td>Care-related problems**</td>
<td>Physical and emotional pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Discomfort</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Postoperative complications</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Loss of mobility</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Unresolved conditions</td>
</tr>
<tr>
<td><strong>Sustainability of health</strong></td>
<td>Sustainability of health or recovery and nature of recurrences</td>
<td>Sustained mental health††</td>
<td>Emotional control</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pain control</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Absence of relapse</td>
</tr>
<tr>
<td></td>
<td>Sustained functioning‡‡</td>
<td>Mental functions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sustained activities §§</td>
<td>Movement functions</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Self care</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mobility</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Domestic life</td>
</tr>
<tr>
<td></td>
<td>Sustained participation¶¶</td>
<td>Reduced interpersonal relationships</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Incomplete return to school or work</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Reduced social and civic life</td>
</tr>
</tbody>
</table>

*Includes modified Glasgow Outcome Scale; Sickness Impact Profile; World Health Organization Disability Assessment Schedule II.
†Includes Modified Barthel Index; Pediatric Quality of Life Inventory; Quality of Life Inventory; Sickness Impact Profile; World Health Organization Disability Assessment Schedule II.
‡Includes Modified Barthel Index; Pediatric Quality of Life Inventory; Quality of Life Inventory; Sickness Impact Profile; World Health Organization Disability Assessment Schedule II.
§Includes 12-item Short-Form Health Survey; Sickness Impact Profile; World Health Organization Disability Assessment Schedule II.
¶Includes Child Health Questionnaire Parent Form 28; EuroQol health outcome instrument; Quality of Life Inventory; Sickness Impact Profile; World Health Organization Disability Assessment Schedule II.
††Includes 12-item Short-Form Health Survey; Sickness Impact Profile; World Health Organization Disability Assessment Schedule II.
‡‡Includes Child Health Questionnaire Parent Form 28; EuroQol health outcome instrument; Quality of Life Inventory; Sickness Impact Profile; World Health Organization Disability Assessment Schedule II.
§§Includes 12-item Short-Form Health Survey; Sickness Impact Profile; World Health Organization Disability Assessment Schedule II.
¶¶Includes 12-item Short-Form Health Survey; Sickness Impact Profile; World Health Organization Disability Assessment Schedule II.
of trauma care, in which success of 1 intervention may in turn benefit the interventions that follow.

The groups in Table 1 are relevant to disability outcomes achieved and sustained through care. The “survival” group achieves longitudinal indicators of alive status over various periods after injury. The next 4 groups classify outcomes achieved shortly after acute care. The “achieved mental health” group experiences outcomes describing the success in restoring mental status, including emotional adjustment, pain relief and the absence of psychological disorders. The “achieved functioning” group experiences outcomes characterizing the best attainable physiological and anatomical mental and movement functions. The “achieved activities” group experiences outcomes describing the execution of tasks or actions, including self-care, mobility, the ability to live independently and domestic life. The “achieved participation” group experiences outcomes describing the best attainable involvement in life situations, including the extent of return to participation, interpersonal relationships, school, work, as well as social and civic life. The “care-related problems” group experiences disability conditions caused by care that affect outcomes achieved or sustained, including pain, discomfort, postoperative complications, loss of mobility due to ineffective intervention and unresolved conditions needing intervention. The last 4 groups are relevant to outcomes sustained from long-term services and support. The “sustained mental health” group experiences outcomes describing the extent of permanent psychological problems, including emotional control, pain control and the absence of relapse. The “sustained functioning” group experiences outcomes describing the level of permanent impairment of mental and movement functions. The “sustained activities” group experiences outcomes describing the scope of permanent limitations in self-care, mobility and domestic activities. The “sustained participation” group experiences outcomes describing the scope of permanent restrictions in participation including reduced interpersonal relationships, incomplete return to school or work and reduced social and civic life.

Our concepts for the organization of outcomes of trauma care were adapted from the International Classification of Functioning, Disability and Health.3 In addition, we also modified Porter’s framework. First, we dropped dimensions defined by Porter if they were specific to morbidity and not disability, although we retained survival in our classification as it is often measured in relation to the course of rehabilitation, return to normal activities or participation. Second, we dropped dimensions in instances where a corresponding disability outcome was not identified in the literature. Finally, we created 2 new groups related to mental health outcomes following trauma that were not previously defined,3 but are emerging as key outcomes in the trauma literature relevant to patient recovery.

Table 1 also lists currently used disability outcome instruments recommended for evaluating trauma care as identified from our review. For each outcome group, there are a number of instruments or scales. These include instruments for assessment of health status by clinicians or by patients, such as the Glasgow Outcome Scale or the Euro-Qol health outcome instrument’s visual analogue scale. General instruments, such as the 36-Item Short-Form Health Survey or the Sickness Impact Profile, measure multiple aspects of disability, including abilities, participation and mental health states. Condition-specific instruments, such as the Functional Independence Measure or the Brief Symptom Inventory, supplement general information as they assign clinical relevance to specific medical conditions.

In trauma care, measuring success necessitates monitoring the patient from injury to recovery. Tracking recovery identifies events and emerging trends that can be corrected early (e.g., cognitive deficits following brain injury, gait abnormalities resulting from prosthesis use). Comparing outcomes, such as the effect of early rehabilitation during acute hospitalization on return to work, establishes protocols for future health care. Measuring success also requires tracking outcomes over time and across different parts of the health care delivery system. This requires using the same terminology to define outcomes.

In our view, classifying disability outcomes and recovery-process outcomes in relation to the intended results of interventions creates a powerful tool for research in trauma care. First, such classification complements the concept of disability as a decrement in health,5 forming a basis for understanding the effectiveness of trauma care in restoring health. Second, it places the outcomes of multiple interventions within the dimensions of achieved recovery and sustained health after trauma. Third, the classification forms a basis for studying disability outcomes as predictors of subsequent interventions (e.g., readmission resulting from adverse events caused by treatment). Fourth, it advances the standardization of outcome measurement, forming a basis for comparing findings across studies and sites. Finally, the classification provides criteria for appraising the literature on outcomes of trauma care.

Competing interests: None declared.

Contributors: All authors contributed substantially to writing and/or revising and to the conception and design of the manuscript and approved the final version submitted for publication.

References
“I’ve never asked one question.” Understanding the barriers among orthopedic surgery residents to screening female patients for intimate partner violence

Lesley Gotlib Conn, PhD*  
Aynsely Young, BScN, RN†  
Ori D. Rotstein, MD‡  
Emil Schemitsch, MD§

From *Sunnybrook Research Institute, Toronto, Ont., †Department of Surgery, St. Michael’s Hospital, Toronto, Ont., ‡Keenan Research Centre of the Li Ka Shing Knowledge Institute of St. Michael’s Hospital, Toronto, Ont., §Division of Orthopaedic Surgery, St Michael’s Hospital, and Department of Surgery, University of Toronto, Toronto, Ont.

Accepted for publication  
Apr. 9, 2014

Correspondence to:  
L. Gotlib Conn  
Affiliate scientist, Clinical Evaluative Sciences  
Trauma, Emergency & Critical Care Program  
Sunnybrook Research Institute  
2075 Bayview Ave. Suite K3W-28  
Toronto ON M4N 3M5  
Lesley.gotlibconn@sunnybrook.ca

DOI: 10.1503/cjs.000714

Background: Intimate partner violence (IPV) is a global public health problem. Orthopedic surgery residents may identify IPV among injured patients treated in fracture clinics. Yet, these residents face a number of barriers to recognizing and discussing IPV with patients. We sought to explore orthopedic surgery residents’ knowledge of IPV and their preparedness to screen patients for IPV in academic fracture clinic settings with a view to developing targeted IPV education and training.

Methods: We conducted focus groups with junior and intermediate residents. Discussions explored residents’ knowledge of and experiences with IPV screening and preparedness for screening and responding to IPV among orthopedic patients. Data were analyzed iteratively using an inductive approach.

Results: Residents were aware of the issue of abuse generally, but had received no specific information or training on IPV in orthopedics. Residents did not see orthopedics faculty screen patients for IPV or advocate for screening. They did not view IPV screening or intervention as part of the orthopedic surgeon’s role. Residents’ clinical experiences emphasized time management and surgical intervention by effectively “getting through clinic” and “dealing with the surgical problem.” Communication with patients about other health issues was minimal or nonexistent.

Conclusion: Orthopedic surgery residents are entering a career path where IPV is well documented. They encounter cultural and structural barriers preventing the incorporation of IPV screening into their clinical and educational experiences. Hospitals and academic programs must collaborate in efforts to build capacity for sustainable IPV screening programs among these trainees.

Contexte : La violence conjugale (VC) est un problème de santé publique à l’échelle mondiale. Les résidents en chirurgie orthopédique seraient bien placés pour identifier des victimes de VC parmi les patients qu’ils voient dans les cliniques de fractures, mais ils font face à de nombreux obstacles qui les empêchent de les reconnaître et d’entamer un dialogue avec ces victimes. Nous avons voulu vérifier les connaissances des résidents au sujet de la VC et leur degré de préparation à dépister les cas de VC chez leurs patients dans le contexte des cliniques de fractures des hôpitaux universitaires dans le but de concevoir une formation théorique et pratique concernant la VC.

Méthodes : Nous avons organisé des groupes de discussion avec des résidents juniors et intermédiaires. Ces discussions ont mis au jour les connaissances et expériences des résidents en ce qui concerne le dépistage de la VC, leur degré de préparation à dépister la VC chez les patients orthopédiques et à y réagir. Les données ont fait l’objet d’une analyse itérative par approche inductive.

Résultats : Les résidents étaient généralement conscients du problème de violence, mais n’avaient reçu aucune formation théorique ni pratique sur la VC en orthopédie. Ils n’ont été témoins ni du dépistage de la VC ni de la promotion de son dépistage de la part de leurs professeurs en orthopédie. Selon eux, le dépistage de la VC ou une quelconque intervention à ce sujet ne fait pas partie du rôle du chirurgien orthopédiste. Les expériences cliniques des résidents portaient avant tout sur la gestion du temps et l’intervention chirurgicale en procédant efficacement à l’examen clinique et en prenant en charge la problématique orthopédique. La communication avec les patients au sujet de tout autre problème de santé était minime, voire inexistante.

Conclusion : Les résidents en chirurgie orthopédique amorcent un parcours professionnel où la VC est bien documentée. Ils font face à des obstacles culturels et structurels qui les empêchent d’intégrer le dépistage de la VC dans leurs expériences cliniques et didactiques. Les programmes hospitaliers et universitaires doivent collaborer aux efforts visant à promouvoir l’application d’initiatives de dépistage de la VC par les résidents.
Violence against women is a global public health problem. The World Health Organization (WHO) reports 30% of women worldwide will experience abuse by an intimate partner (intimate partner violence [IPV]). Intimate partner violence is physical, sexual or psychological harm by a partner or spouse, varying in frequency and severity and ranging from a single incident to constant, severe battering. Significant adverse health outcomes of IPV include physical, psychological and emotional effects, directly or indirectly causing injury and/or death. Among women experiencing IPV worldwide, 42% have had resulting physical injuries. Although most IPV experienced by women is not physical, those who do experience physical harm often endure musculoskeletal injuries. These injuries are the second most common physical outcome of IPV, and their treatment frequently requires referral to an orthopedic surgeon. The prevalence of IPV in the orthopedic surgeons' patient population has been found to match that reported in the general population by the WHO. Among women treated by orthopedic surgeons in 2 Ontario fracture clinics 32% report experiencing IPV within the past 12 months, with 2.5% reporting physical injury as the reason for the fracture clinic visit during which data were collected. International data from nearly 3000 women in injury clinics reveals the overall lifetime prevalence of IPV to be 35%, with 1 in 6 women having experienced IPV within the past 12 months, 3% of which was physical abuse.

Health care providers are well positioned to identify cases of IPV. Screening for IPV is encouraged by many professional organizations — medicine, nursing and other health professions. Screening involves looking for IPV despite the absence of overt signs and/or symptoms. The 2013 U.S. Preventive Services Task Force recommendation statement on screening for IPV recommends that clinicians perform routine screening on women of childbearing age based on evidence demonstrating its reduction in violence and harm for this group. Despite these recommendations, many barriers prevent clinicians from screening in various settings. Research suggests a lack of effective interventions for IPV once clinicians have identified it and that lack of education about IPV impedes screening. Resource barriers, including time constraints, poor knowledge of and training in screening practices and inadequate resources for disclosure response, are reported as the most common explanations for not screening. A recently conducted randomized controlled trial showed that reducing barriers by providing training and support to clinicians and administrative staff in general practices can achieve a significant increase in referrals to domestic violence support services.

Among orthopedic surgeons, a knowledge gap pertaining to IPV has been identified. Many orthopedic surgeons believe IPV is rare among their female patients, estimating a prevalence of less than 1%. Research confirms orthopedic surgeons’ misconceptions about the prevalence of IPV in fracture clinic patients and the social complexity of abusive relationships. Not knowing how to ask about and respond to IPV are also barriers for these surgeons, with very few reporting having had any training in this area.

These findings have led to a call for targeted IPV education in injury clinics, specifically for orthopedic surgeons, with a view to removing knowledge barriers and integrating IPV screening into practice. In 2009, the Canadian Orthopaedic Association endorsed surgeons’ knowledge of and preparedness for IPV screening and response. However, the endorsement does not address the issue of how surgeons should be provided with the skill set to screen for IPV. In an effort to develop IPV education for incoming orthopedic surgery residents, we undertook a qualitative investigation exploring current residents’ knowledge of IPV and their capacity for screening and responding to IPV disclosures. Given the well-documented problem of IPV in this domain, we sought to determine the type of intervention needed among orthopedic surgery residents. Our study, therefore, aimed to identify knowledge gaps, perceived barriers and enablers for practising IPV screening in the clinical orthopedic setting. We report findings among junior and intermediate residents who participated in our study.

**METHODS**

**Participants and sampling**

All residents in the orthopedic surgery program at the University of Toronto (n = 64) were invited to participate in a focus group. Focus groups are often used in medical education research as an exploratory and evaluative method. Participant recruitment took place between August 2012 and February 2013. Residents were contacted by a research coordinator via email and in person at existing academic sessions. We used a convenience sampling approach. Participation in the research was voluntary. We obtained research ethics approval from the University of Toronto Health Sciences Research Ethics Board.

**Data collection and analysis**

Four focus groups were conducted averaging 1 hour in duration each. These sessions were moderated by an experienced research coordinator while a second researcher took detailed notes. A semistructured moderator guide was used to lead the discussion. The focus groups were audio-recorded and transcribed. All data were deidentified, and transcripts were anonymized.

An inductive analysis of the qualitative data was conducted in iterative fashion. After the first focus group, 2 researchers (L.G.C., A.Y.) began independent coding of the transcript. Each coder identified emerging ideas and concepts to confirm or refute in subsequent focus groups.
The transcript from the second focus group was also coded by the 2 researchers independently. The researchers then met to compare and discuss an emerging overarching coding scheme. Parallel coding continued for the remaining transcripts, after which the researchers met to discuss and finalize the coding and thematic organization of the data. Saturation of themes occurred after 4 focus groups were completed (i.e., the point at which no new data categories were discovered). We used Nvivo10 software (QSR International) for data management.

RESULTS

Eighteen residents participated in the study. Eight participants were postgraduate year 1 (PGY1). Seven participants were intermediate residents (PGY2–3) with considerable experience in the orthopedics residency. The remaining 3 participants were senior (PGY4) residents. Two focus groups comprised solely PGY1 residents; the other 2 groups were heterogeneous, involving trainees from PGY1–4 (Table 1). Three participants were women. Owing to the small number of senior resident participants in the study, findings reflect the experiences and attitudes of junior and intermediate residents only (PGY1–3).

Findings revealed 4 main thematic categories pertaining to barriers: knowledge gap, cultural barriers, structural barriers and conceptualizing the surgeon’s role (Table 2).

**Theme 1: knowledge gap**

Junior and intermediate residents had an understanding of the general issue of abuse from their undergraduate medical education. Many described didactic learning on this topic in pediatrics, obstetrics and elder care. Yet, most participants were not aware of the prevalence of IPV among women seen by orthopedic surgeons in fracture clinics. A PGY1 resident in focus group 1 stated, “I think that’s what’s shocking from the protocol. You said in an anonymous survey of women in the last year 32% were abused in that period, and I think how many people I’ve seen in my time at fracture clinic and I’ve never asked one question.”

**“It’s more theoretical”**

A number of residents had screened children for abuse in postgraduate pediatric rotations. Despite having completed clinical rotations in orthopedic surgery, a large majority had not screened any patients for IPV in an adult orthopedic setting. A PGY1 resident in focus group 1 explained, “I feel like it’s more theoretical because we’re taught it, but then in actual practice I’ve rarely seen it.” Another PGY1 resident in focus group 2 with similar exposure to the clinical setting agreed, stating, “I think we’ve been given some information about it, but as far as dealing with it in real life, that’s a totally different thing.”

<table>
<thead>
<tr>
<th>Table 1. Focus group participants</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Characteristic</strong></td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>PGY</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Sex</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
</tbody>
</table>

**Table 2. Major themes and subthemes emerging from focus group discussions**

<table>
<thead>
<tr>
<th>Barriers; major theme</th>
<th>Subtheme</th>
<th>Indicating quote</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Knowledge gap</td>
<td>Lack of experiential knowledge</td>
<td>It’s more theoretical</td>
</tr>
<tr>
<td></td>
<td>Lack of preparedness</td>
<td>I’m not even sure what I would do about it</td>
</tr>
<tr>
<td>2. Cultural barriers</td>
<td>Priority is injury manifestation and fix</td>
<td>You’re not really thinking about it</td>
</tr>
<tr>
<td></td>
<td>Selective screening</td>
<td>I don’t think it’s proper to screen everyone</td>
</tr>
<tr>
<td></td>
<td>No role model for screening</td>
<td>It has to trickle from your superiors down</td>
</tr>
<tr>
<td>3. Structural barriers</td>
<td>Lack of time</td>
<td>It’s like a hundred patients a day</td>
</tr>
<tr>
<td></td>
<td>Lack of privacy</td>
<td>It’s so open</td>
</tr>
<tr>
<td></td>
<td>Lack of staff support</td>
<td>It throws the whole clinic off</td>
</tr>
<tr>
<td>4. Conceptualizing the surgeon’s role</td>
<td>Not the surgeon’s role</td>
<td>We’re the surgeons, we look at surgical issues</td>
</tr>
</tbody>
</table>

Enablers

1. Reinforcement | It’s just keeping it relevant |
2. Champion identification | Hearing from orthopedic surgeons |
3. Embedment into current program | There are a lot of educational initiatives |
“I’m not even sure what I would do about it”
Most junior and intermediate residents did not feel prepared to respond to an IPV disclosure. As a PGY1 participant in focus group 2 explained, “I’m not really sure what I would do if a lady comes in with a fracture and says, ‘Oh, by the way, I did actually fall and this happened but, by the way, sometimes I get hurt at home because my husband beats me.’” Lack of preparedness to respond due to a training gap was common, as described by a PGY3 resident in focus group 3:

I would add, along with ignorance, I’m not even sure what the protocol would be if I had someone who I suspected was being abused. Again, at [pediatric hospital] it’s easy, you just call this one service and then you kind of wash your hands of it, which is nice for us because we don’t have to get involved in being the treating doctor, as well as the person talking to them about being abused. Here [at adult hospital], if I saw someone, I’m not even sure what I would do about it.

Theme 2: cultural barriers
Cultural barriers refer to the way that orthopedic residents think about the problem of abuse as it relates to their postgraduate education and clinical training.

“You’re not really thinking about it”
Findings revealed that treatment of the presenting injury is often the sole clinical priority when residents see injured patients. The resident is much less likely, if at all, to be attuned to psychosocial concerns. Intermediate-level residents in particular described being focused on treatment based on patients’ radiographs; none expressed concern with talking to patients and exploring etiology. As a PGY3 participant in focus group 4 explained, as a result of their treatment focus, orthopedic surgeons “have the reputation of being a bit less touchy-feely, a bit less talkative, a bit more goal-directed and up-front, and very quick with our decision-making.” Another PGY3 participant in focus group 3 described this treatment approach as follows: “The injury is what it is, you see it on the x-ray. It happened and let’s get it fixed.”

“I don’t think it’s proper to screen everyone”
Most participants found routine, universal screening of orthopedic patients difficult to envision in practice. Some felt that the emergency department was a more appropriate setting for IPV screening because a complete health history is expected, whereas in a fracture clinic this is not the norm. For example, a PGY2 resident in focus group 3 commented, “I think they’re being screened as they come through the emerg, so I don’t think that they’re screened again in the fracture clinic adds anything.” Some residents were clear about who would not require screening among their patients. This included those with obvious mechanisms of injury, such as a child who fell off his bike and broke his arm, and patients not fitting the stereotype of an IPV victim. For instance, a PGY1 resident in focus group 1 posed a rhetorical question about screening both sexes: “What about the huge guy that gets hurt on the construction site? Are you going to ask him if he’s safe at home?”. However, this was not a uniform belief as another PGY1 participant in focus group 1 commented, “I think it’s important. I think men get abused.”

“It has to trickle from your superiors down”
According to residents, IPV screening was not part of the current practice or training approach of their clinical supervisors. No participant had observed an orthopedic faculty or senior trainee member screen for IPV. A PGY2 resident in focus group 4 commented, “I’ve never actually seen screening being done in fracture clinic.” A PGY3 resident in focus group 4 confirmed this, stating, “I don’t actively try to get patients to admit to being abused, nor have I really seen any of my mentors or teachers do the same.”

Theme 3: structural barriers
Structural barriers relate to the organization of the clinic and training described by residents as being suboptimal for IPV screening and response. Three main barriers are found to influence residents in this regard: time, space and staff support.

“It’s like a hundred patients in a day”
Residents believed that the brief amount of time spent with patients was not conducive to IPV screening by either surgeons or residents. Lack of time was perceived to limit their attention to the immediate orthopedic problem. A PGY1 resident in focus group 2 stated, “There’s definitely very little focus on social anything in a high-volume fracture clinic. You’re kind of looking at: Is the fracture healing? Is the wound okay? Awesome — see the next patient. That’s kind of it.” Some participants felt that time constraints impeded the formation of sufficient patient rapport that would lead to an IPV disclosure; a PGY1 participant in focus group 1 commented, “I think it takes time to build that relationship for them to disclose something so personal.”

“It’s so open”
Lack of privacy to speak with patients was believed to hinder residents’ screening opportunities. Participants felt the proximity of stretchers prevented confidential conversations. Clinic settings were described by PGY1 and PGY3 residents, respectively, as “one large room with multiple beds,” where patients are “separated by a single screen.”

“It throws the whole clinic off”
Residents indicated that, owing to patient volume, clinic staff offered minimal support for initiatives that extend
appointments. Delays in patient flow were perceived to frustrate nurses and clerical staff, who were left to manage aggravated, waiting patients. As described here by a PGY3 resident in focus group 3, when spending unexpected time with a single patient, “You have unhappy patients and unhappy staff because the patients in the waiting room are yelling at the front desk, the front desk is telling nurses to hurry up, the nurses are mad. So it’s unfortunately a vicious cycle.” While acknowledging that, as a PGY1 resident from focus group 1 described, “in a fracture clinic setting there’s a lot of pressure on you to just see patients quickly,” there was also the belief that screening and response were manageable. A PGY1 resident in focus group 1 explained, “If you do pick up on something, I think it’s prudent to take a step back, try to get them in a private setting, and then ask them more pointed questions.” Strategies that were discussed for addressing this barrier with patients for whom IPV was suspected or disclosed included admitting patients to hospital or asking them to stay until the end of clinic when more time was available.

Theme 4: conceptualizing the surgeon’s role

“We’re the surgeons, we look at surgical issues”
All participants felt that knowledge of IPV and IPV screening were relevant to their practices; yet, they questioned the surgeon’s role in investigating or intervening if s/he suspected IPV, or if a patient had sustained and disclosed IPV — physical or otherwise — that was not directly related to the orthopedic injury. Many participants felt that dealing with IPV was not part of the surgeon’s specialized knowledge and expertise. For instance, a PGY1 resident in focus group 2 stated, “It’s not really something that we would deal with; it’s not a surgical problem, right? And we kind of deal with the surgical problem.”

Residents did not see themselves as the optimal care provider to address the broader issue of IPV, as illustrated by a PGY1 resident in focus group 1: “Because as an orthopedic surgeon, you screen and pick it up, but ultimately we’re not the ones who are translating it into actual action in the community.” Another PGY1 resident in focus group 1 stated, “There’s a difference between abuse and physical abuse. I mean, financial abuse, sure, that’s a real issue, but the orthopedic fracture clinic may not be the best place to discuss that. Like, it isn’t really your role. But physical abuse, I think, is a lot more relevant, a lot more important for people in our position to pick up on.” However, only a minority of participants felt strongly that regardless of their specialty, they were well positioned and willing to screen patients for IPV. It was suggested by 2 participants (residents in PGY1 and PGY2) that any trained health care provider could effectively encourage a patient to consider disclosing her/his situation and assist them to seek help.

Enablers to the implementation of IPV screening and response among residents

Three themes pertaining to enablers to IPV screening and response were identified: reinforcement, champion identification and embedment in the current program.

Theme 1: reinforce the issue
There was strong consensus among participants that efforts to sustain awareness of IPV must be ongoing. The focus group discussion itself was viewed by participants as a useful forum to remind them about the importance of IPV awareness. A PGY1 participant in focus group 2 explained, “I think even just having this session just puts it back on the radar as something that you’re going to be watching out for. Most residents felt capable of addressing sensitive issues, such as IPV, with their patients, but felt the reminder to ask about IPV specifically was needed. A PGY3 participant from focus group 3 stated, “I think through all of our career so far we’ve dealt with, not necessarily abuse, but we’ve dealt with something that’s very emotionally charged, and had to tell the patient, tell a family member something and follow it up with those questions. So I think we can deal with that part. I think it’s just keeping it relevant, on top of our minds, and just building it into our daily practice.”

Theme 2: identify champions
Participants described the positive influence of champions within their field. Shared experience was believed to be an effective enabling tool. A PGY1 resident in focus group 2 stated, “Hearing from other clinicians who’ve had experience, ideally orthopedic surgeons, who’ve had experience screening and then having positive results and being able to hear how they dealt with it would be beneficial.” Clinical role modelling was similarly viewed as enabling, as described by another PGY1 participant in focus group 2: “If I see it in a clinical setting, like if I were to be in emerg, as a medical student, and something like that happened and the emerg doc is like, ‘Okay, now I have to go talk to the nurse because now we’re going to call this organization, and all this is going to happen because of that,’ then I’m like, ‘Oh, okay.’ Then I’m going to remember it, right?”

Theme 3: embed IPV education in an existing, mandatory program
There was agreement among participants that focused IPV education must be embedded within the existing postgraduate training program. Incorporating information into established mandatory learning sessions was considered to be critical to success. As explained by a PGY1 resident in focus group 4, “There are a lot of educational initiatives within which IPV could be relevant.” Participants identified a number of existing teaching seminars
where they believed discussions of IPV would fit seamlessly. Residents cautioned against the use of online teaching or optional seminars, which a PGY3 participant in focus group 4 described as “guaranteed won’t be utilized, and probably easily brushed over or deleted.”

**Discussion**

Findings from this qualitative study enhance our current understanding of junior and intermediate orthopedic surgery residents’ knowledge and awareness of IPV and offer some insight into their experience with and exposure to IPV training. Residents in this study were aware of the issue of abuse generally and how it manifested clinically in vulnerable populations, such as children and elderly patients. Their knowledge of any kind of screening pertained to these populations. They had comparatively little knowledge of the relevance of IPV and IPV screening for adult orthopedics patients. During their orthopedic surgery training, they received little to no specific information or preparedness training on IPV in orthopedics patients. Residents did not see orthopedics faculty members screen for IPV or support screening. In this regard, participants believed that providers working in other specialties and settings, such as the emergency department, were better positioned to screen and respond to IPV disclosures. Neither junior nor intermediate residents viewed IPV screening or intervention as part of the orthopedic surgeon’s role. Residents’ current experiences in fracture clinic emphasized time management and direct patient care issues by effectively getting through clinic and dealing with the surgical problem. Communication with patients about other health issues was described as minimal or nonexistent.

Residents in this study had limited knowledge of the prevalence of IPV in the general population and, thus, in orthopedics patients. Medical and surgical trainee misperceptions about the problem of abuse in other populations and their lack of preparedness to address it have been previously demonstrated. Among U.S. pediatric medicine residents, one-third of graduates were exposed to fewer than 5 cases of child abuse, whereas 50% of Canadian residents had seen 5 or fewer cases of possible abuse during training. These findings resonated with the experiences of our participants, among whom even PGY3 trainees had minimal if any experience with IPV screening and were not prepared to manage IPV disclosures. In addition to demonstrated knowledge gaps, our participants described lack of exposure to clinical preceptors who were screening injured patients for IPV. Narayan and colleagues reported that pediatric residents’ increased clinical experiences were associated with improved preparedness to identify abused children. Residents in this study have identified the enabling influence of champions within orthopedic surgery. Role modelling by faculty and mentors in orthopedic training units is therefore 1 plausible strategy that may lead to increased uptake of IPV screening, as this form of social learning has been effective with surgeons in other domains when imparting nonsurgical skills. Given the critical role of clinical preceptors, it is essential that these individuals become armed with a knowledge base to screen and respond to IPV. This may occur through faculty development initiatives and should be integral to training programs for future orthopedic care providers.

Residents in our study believed that other care providers are already screening their patients, and that 1 screening experience for patients may be enough to elicit a disclosure. Neither of these assumptions is supported by current evidence. To the contrary, research suggests that neither emergency department clinicians nor primary care providers are routinely screening patients and that disclosure rates may increase when screening questions are asked at every clinical encounter. Moreover, residents expressed differing views about the appropriateness of IPV screening by orthopedic specialists, stating that on the one hand IPV screening would be more acceptable from an emergency department clinician because they are often asking social history questions, but that on the other hand orthopedic specialists cannot establish sufficient patient rapport owing to short clinical visits, such as those that are typical in an emergency setting. Sprague and colleagues report similar findings related to perceived barriers for patients and trainees in their study of orthopedic faculty and residents. Timing, opportunity, and patient–clinician relationships were interrelated aspects of the screening process that residents in our study grappled with.

The structural barriers that residents described are substantial and, in fact, they overlap categorically with the cultural barriers that were also identified. Protecting valuable clinic time focused on the provision of orthopedic care while simultaneously providing a nonsurgical intervention, such as IPV screening and response, requires a shift in the current way of thinking about the structure and function of the academic fracture clinic setting. Previous research highlights the importance of organizational support to effectively implement and sustain IPV screening programs, including time management and resource allocation. Successful IPV intervention programs use comprehensive approaches, including ongoing staff and clinician training and institutional policy integration, which are instrumental to sustainability. For instance, the implementation of a multifaceted IPV training and support program in a general practice setting in the United Kingdom has equipped clinicians and administrative staff to screen and respond to IPV effectively and has increased referrals for support. However, findings from our study suggest that in academic fracture clinic settings, junior and intermediate residents experience structural barriers that are closely tied to cultural ideas of what orthopedic surgeons do in a fracture clinic and how they do it well. Residents in our study have
learned that effectively managing high patient volumes and maintaining clinic flow while maximizing attention to direct patient care issues and follow-up care are most desirable. This finding suggests that junior and intermediate residents are training for efficient care, but not necessarily for the breadth of patient-centred care. The concept of efficiency has been used to characterize residents’ socialization experience in hospital inpatient wards where trainees are implicitly taught to keep the transfer of patient information succinct and communications with inpatients brief. In the academic fracture clinic, the practice of efficiency lends to residents’ current perception that there is no time to talk to patients about nonsurgical issues, as this approach might result in slower and less efficient care. Based on residents’ reported experiences, the net effect will be longer patient wait times and potential conflict among clinic staff and surgical faculty. The clinical and educational implications of this finding are important. In order for an educational intervention to be successful, contextual barriers produced by both the hospital and the academic institution must be jointly addressed. Efforts to increase faculty knowledge of and support for IPV screening and response in the fracture clinic setting should be accompanied by structural modifications to optimize faculty and trainee opportunities to exercise this new knowledge and practice. Thus, the success of an IPV screening program in this setting requires both structural and cultural changes to organizational and individual conceptualizations of quality learning and patient care. Hospitals and academic programs must collaborate in efforts to build capacity for sustainable IPV screening programs among orthopedic surgery trainees, nonsurgical staff and faculty members.

Importantly, while residents in this study identified enablers to IPV education and training in their program, strategies that they felt would be most effective were those that do not add any additional work on their part. Residents expressed a lack of interest in participating in any educational activity that could be perceived to increase their already heavy workload. While completely unsurprising, this finding reinforces the complexity with which IPV screening and response implementation among residents is met within the academic environment: if IPV is not fundamentally viewed as part of the orthopedic surgery residents’ core training program, it will not be perceived as necessary. Embedding IPV awareness and preparedness into existing mandatory postgraduate training is needed to transform their future professional role identity and practice.

Limitations

There are some limitations to this study. Participants were all trainees in the same orthopedic surgery program. Resident experiences in other training programs with other fracture clinic settings may be different than those described here. In addition, the perspectives accounted for here are limited to those of PGY1–3 residents. Senior residents (PGY4–5) may have different experiences than junior and intermediate residents that are not reflected in the present data. Although the knowledge and experiences of the 3 senior (PGY4) residents who participated in this study were thematically congruent with those reported here, the research team could not report with certainty that they had reached data saturation among senior residents, whose exposure to the clinical environment was presumably greater than that of PGY1–3 residents. Despite very determined efforts to recruit PGY5 trainees for participation in the study, we were unable to do so. The barrier to participation among PGY5 residents is unknown. The unique or similar experience of these senior orthopedic residents is, therefore, an area for further research. Finally, an acknowledged limitation of focus group research is that participants may feel uncomfortable or unwilling to speak their minds in front of their peers. Given that participation in this study was voluntary and that there was presentation of opposing views and opinions, it appears that residents who volunteered for this study spoke candidly.

Conclusion

While IPV is considered an important issue in the practice of medicine, junior and intermediate orthopedic surgery residents face a number of significant and inter-related barriers to screening patients for IPV in their clinical experience: lack of knowledge of IPV, lack of faculty role modelling, lack of time, lack of privacy and the belief that this is not the surgeon’s role. Enablers to IPV awareness that residents identify reinforce the complex relationship between residents’ learning, professional identity formation and clinical experiences. Based on findings from our study, we developed and implemented an educational and interactive IPV awareness and response training seminar that was mandatory for incoming orthopedic surgery residents at the University of Toronto in 2013. The seminar aimed specifically to address the barriers of IPV knowledge, preparedness for IPV screening and response and role understanding. During the seminar, 2 highly respected orthopedic surgeons who have championed awareness of IPV in orthopedics for many years delivered information about the evidence and its relevance to the orthopedics profession in general as well as to their own practices. Residents were subsequently trained by a nurse educator to screen for and respond to IPV and engaged in simulated clinical scenarios with patient actors to practise newly acquired IPV screening and response skills. While these efforts are a first step to address individual level barriers for new residents, this study has identified a number of key contextual issues that arise in the clinical environment that should also be considered in the development and implementation of targeted IPV screening programs.
Future research should also consider how to determine the effectiveness of implementing IPV screening and response in the academic fracture clinic setting.

Competing interests: None declared.

Contributors: All authors designed the study. L. Gotlib Conn and A. Young acquired and analyzed the data, which O. Rotstein also analyzed. L. Gotlib Conn and O. Rotstein wrote the article, which all authors reviewed and approved for publication.

References

Management and outcomes of small bowel obstruction in older adult patients: a prospective cohort study

Jeremy E. Springer, MSc*
Jonathan G. Bailey, MSc, MD*
Philip J.B. Davis, MSc, MD*
Paul M. Johnson, MSc, MD†

From the *Division of General Surgery and †Department of Community Health and Epidemiology, Dalhousie University, Halifax, NS

This research was presented in poster format at the annual meeting of the Canadian Association of General Surgeons, Ottawa, Ont., September 2013.

Accepted for publication Apr. 22, 2014

Correspondence to:
P.M. Johnson
Rm 8–025 Centennial Building
VGH Site, QEII Health Sciences Centre
1276 South Park St.
Halifax NS B3H 2Y9
Paul.johnson@dal.ca

DOI: 10.1503/cjs.029513

Background: The purpose of this research was to examine the morbidity, mortality and rate of recurrent bowel obstruction associated with the treatment of small bowel obstruction (SBO) in older adults.

Methods: We prospectively enrolled all patients 70 years or older with an SBO who were admitted to a tertiary care teaching centre between Jul. 1, 2011, and Sept. 30, 2012. Data regarding presentation, investigations, treatment and outcomes were collected.

Results: Of the 104 patients admitted with an SBO, 49% were managed nonoperatively and 51% underwent surgery. Patients who underwent surgery experienced more complications (64% v. 27%, p = 0.002) and stayed in hospital longer (10 v. 3 d, p < 0.001) than patients managed nonoperatively. Nonoperative management was associated with a high rate of recurrent SBO: 31% after a median follow-up of 17 months. Of the patients managed operatively, 60% underwent immediate surgery and 40% underwent surgery after attempted nonoperative management. Patients in whom nonoperative management failed underwent surgery after a median of 2 days, and 89% underwent surgery within 5 days. The rate of bowel resection was high (29%) among those who underwent delayed surgery. Surgery after failed nonoperative management was associated with a mortality of 14% versus 3% for those who underwent immediate surgery; however, this difference was not significant.

Conclusion: These data suggest that some elderly patients with SBO may be waiting too long for surgery.

Contexte : Le but de cette recherche était d’analyser la morbidité, la mortalité et le taux de récurrence de l’occlusion intestinale grêle (OIG) chez des adultes âgés.

Méthodes : Nous avons inscrit de manière prospective tous les patients de 70 ans ou plus présentant une OIG qui ont été admis dans un établissement de soins tertiaires entre le 1er juillet 2011 et le 30 septembre 2012. Nous avons recueilli les données concernant les tableaux cliniques, les épreuves diagnostiques, les traitements et leurs résultats.

Résultats : Parmi les 104 patients admis pour OIG, 49 % ont été traités non chirurgicalement et 51 % ont subi une intervention chirurgicale. Les patients soumis à la chirurgie ont présenté davantage de complications (64 % c. 27 %, p = 0,002) et ont séjour plus longtemps à l’hôpital (10 j. c. 3 j., p < 0,001) comparativement aux patients qui n’ont pas été opérés. La prise en charge non chirurgicale a été associée à un taux élevé de récurrences de l’OIG : 31 % après un suivi médian de 17 mois. Parmi les patients opérés, 60 % ont subi une chirurgie immédiate et 40 % ont subi leur chirurgie après une tentative de prise en charge non chirurgicale. Les patients chez qui la prise en charge non chirurgicale a échoué ont subi leur chirurgie après une période médiane de 2 jours et 89 % en l’espace de 5 jours. Le taux de résection intestinale a été élevé (29 %) chez ceux dont la chirurgie a été retardée. La chirurgie après une intervention non chirurgicale infructueuse a été associée à un taux de mortalité de 14 %, contre 3 % chez les patients immédiatement soumis à la chirurgie. Toutefois, cette différence n’est révélée non significative.

Conclusion : Ces données laissent penser que certains patients âgés présentant une OIG attendent peut-être trop longtemps pour leur chirurgie.
Small bowel obstruction (SBO) is a common reason for elderly patients to be admitted to hospital under the care of general surgery. Treatment of SBO may involve immediate surgery, a trial of nonoperative management followed by surgery, or nonoperative management leading to resolution of the obstruction. Decisions regarding the most appropriate treatment approach in older patients with SBO can be challenging for several reasons. Elderly patients with SBO often present late in the course of their illness and report atypical or nonspecific symptoms. In addition, their clinical presentation and physical examination may be less reliable. Previous research has consistently demonstrated that emergency abdominal surgery in elderly patients is associated with increased morbidity and mortality compared with elective surgery or emergency surgery in younger patients. Accordingly, the decision to proceed with surgery must be considered carefully. In contrast, delaying necessary surgery in elderly patients has also been associated with very poor outcomes. These issues make decisions regarding the timing of surgery and duration of nonoperative treatment difficult.

Despite these treatment challenges, very little research has specifically examined the treatment and outcomes of SBO in elderly patients. This is particularly concerning given current demographic trends. It is expected that the elderly population in Canada will double and the number of individuals older than 80 years will triple by 2050. This will likely lead to a substantial increase in the number of elderly patients admitted to hospital with SBO in the future. Therefore, the purpose of this research was to examine the morbidity, mortality and rate of recurrent bowel obstruction associated with the treatment of SBO in elderly patients (≥70 years old) at a tertiary care teaching centre.

**METHODS**

We prospectively enrolled consecutive patients aged 70 years or older who had an SBO and were admitted to an acute care general surgery service at a tertiary care teaching hospital between Jul. 1, 2011, and Sept. 30, 2012. Patients were included if they had symptoms (abdominal pain, nausea, vomiting, decreased bowel function with or without obstipation) and radiographic findings (plain film or computed tomography [CT]) consistent with an SBO. Patients with obstructing cecal cancers or other large bowel pathology were excluded.

One of us obtained consent from all patients at the time of admission. When patients did not have the capacity to provide consent, either the substitute decision maker or the next of kin provided consent. At the time of admission a comprehensive geriatrics assessment (CGA) was completed for each patient. Patients were asked to describe their functional level 2 weeks before admission to provide a measure of baseline status. If patients could not provide the information it was obtained from their families or caregivers. Frailty was measured during the CGA using the Canadian Study of Health and Aging Clinical Frailty Scale Score. Each patient was assigned a score of 1–9. Data regarding presentation, investigations, treatment and outcomes were collected through a comprehensive review of the patients’ medical records. All patients were contacted by phone 6 months after discharge to determine their vital status (dead v. alive). If patients could not be reached, then we called their predetermined designates. If the designates could not be reached, then we called the family doctor if the patient had provided consent for the investigators to do so. We reviewed the medical records for all patients up until May 30, 2013, (study end date) to determine if patients were readmitted for complications after the index admission or for recurrent SBO.

We determined the etiology of SBO based on physical examination findings, radiologic reports and operative records. Time to return of bowel function was calculated as the time lapse between the surgical consultation and the first documented episode of flatus or stool recorded in the medical record by either the nursing or medical team. Patient comorbidities were categorized using the Charlson Comorbidity Index. This did not take into account patient age. Postoperative morbidity was classified according to the Clavien–Dindo system, which categorizes complications according to a 5-level ordinal scale. Minor complications correspond to grades 1 and 2, major complications to grades 3 and 4, and death corresponds to grade 5 on the Clavien–Dindo scale. Morbidity occurring during the index admission for each patient was recorded. All-cause perioperative and 6-month mortality were also recorded. Perioperative mortality was defined as death during the index admission or within 30 days of surgery.

Approval for the study was obtained from our institutional research ethics board.

**Statistical analysis**

Data were entered into a computerized database. We performed all statistical analyses using Graphpad Prism statistical software version 6.0. We performed $\chi^2$ tests for all analyses of categorical variables, and the Student $t$ test was used for statistical analyses of continuous variables. We calculated 95% confidence intervals (CIs) when comparing means. Mann–Whitney nonparametric tests were used to analyze the difference between median values for continuous variables when the assumption of normality was not met. We considered results to be significant at $p < 0.05$.

**RESULTS**

During the study period 104 patients were admitted with an SBO. The median patient age was 79 years, the median frailty scale score was 5, most patients were women, and the most common etiology of SBO was postoperative adhesions.
(Table 1). Overall, 51 patients (49%) were managed nonoperatively and 53 patients (51%) underwent surgery.

**Patients managed nonoperatively**

In the 51 patients with an SBO who were managed nonoperatively, adhesions were responsible for the majority of cases (86%), followed by malignancy (8%) and hernias (6%). Patients who were managed nonoperatively were similar to those who required surgery in terms of age, sex, comorbidities and body mass index (BMI), but were more likely to have undergone prior abdominal surgery and to have been admitted for an SBO in the past (Table 2). The median time to return of bowel function was 1.3 (range < 1–4.4) days, and the median length of stay in hospital was 3 (range < 1–19) days. The in-hospital complication rate was 27%, and the most common complications were delirium, urinary tract infection and atrial fibrillation. Complications were less common and length of stay was shorter among patients treated nonoperatively than among those who underwent surgery (Table 3).

During the index admission 1 patient (2%) managed nonoperatively died of intra-abdominal sepsis. Five additional patients died during the 6 months after discharge, yielding a 6-month mortality of 12%. The deaths that occurred after discharge were due to cancer in 2 patients (40%), stroke in 1 patient (20%), heart failure in 1 patient (20%) and line sepsis in 1 patient (20%). The readmission rate during the first 6 months after discharge was 39% (20 of 51) in the patients managed nonoperatively. The most common reasons for readmission were recurrent SBO in 11 patients (55%), urinary tract infection in 3 patients (15%) and failure to thrive in 1 patient (5%). The median duration of follow-up after discharge was 17.1 (range 8.2–23.2) months. The rate of readmission for recurrent SBO during the entire follow-up period was 31% (16 of 51), and 25% (4 of 16) of patients required surgery at the time of recurrent SBO. The median time to readmission for recurrent SBO was 2.6 (range 0.13–14.8) months.

**Patients managed surgically**

Of the 53 patients who underwent surgery for SBO, adhesions were responsible for the majority of cases (49%), followed by hernias (43%) and malignancy (4%). Thirty-five percent of patients underwent a lysis of adhesions (LOA), 18% had a small bowel resection, 25% had a hernia repair, 13% had a small bowel resection and LOA, and 9% had a hernia repair and small bowel resection. The overall

---

**Table 1. General characteristics of patients aged 70 years or older presenting with SBO (n = 104)**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean (95% CI) or median (range)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (range) yr</td>
<td>79 (70–97)</td>
</tr>
<tr>
<td>Sex, % men</td>
<td>43</td>
</tr>
<tr>
<td>BMI</td>
<td>25 (24.1–26.2)</td>
</tr>
<tr>
<td>LOS, d</td>
<td>6 (≤ 1–90)</td>
</tr>
<tr>
<td>Charlson score</td>
<td>2 (0–12)</td>
</tr>
<tr>
<td>Frailty scale score, %</td>
<td></td>
</tr>
<tr>
<td>1–3 (well)</td>
<td>22</td>
</tr>
<tr>
<td>4 (prefrail)</td>
<td>25</td>
</tr>
<tr>
<td>5 (mildly frail)</td>
<td>26</td>
</tr>
<tr>
<td>6–8 (moderate/severely frail)</td>
<td>21</td>
</tr>
<tr>
<td>9 (palliative)</td>
<td>6</td>
</tr>
<tr>
<td>Previous abdominal operation, %</td>
<td>88</td>
</tr>
<tr>
<td>Previous SBO, %</td>
<td>29</td>
</tr>
<tr>
<td>SBO etiology, %</td>
<td>67</td>
</tr>
<tr>
<td>Adhesions</td>
<td>6</td>
</tr>
<tr>
<td>Malignancy</td>
<td>6</td>
</tr>
<tr>
<td>Ventral hernia</td>
<td>12</td>
</tr>
<tr>
<td>Groin hernia</td>
<td>9</td>
</tr>
<tr>
<td>Stoma hernia</td>
<td>2</td>
</tr>
<tr>
<td>Umbilical hernia</td>
<td>2</td>
</tr>
<tr>
<td>Inflammatory bowel disease</td>
<td>1</td>
</tr>
<tr>
<td>Stricture</td>
<td>1</td>
</tr>
</tbody>
</table>

BMI = body mass index; CI = confidence interval; CT = computed tomography; SBO = small bowel obstruction.

*Unless otherwise indicated.

**Table 2. Comparison of baseline characteristics between patients aged 70 years and older with SBO who were managed nonoperatively or operatively**

<table>
<thead>
<tr>
<th>Group, median (range) or %*</th>
<th>Operative, n = 53</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic</td>
<td>Nonoperative, n = 51</td>
</tr>
<tr>
<td>Age, yr</td>
<td>79 (70–96)</td>
</tr>
<tr>
<td>Sex, % male</td>
<td>43</td>
</tr>
<tr>
<td>BMI, mean (95% CI)</td>
<td>25.7 (24.3–27.1)</td>
</tr>
<tr>
<td>Charlson score</td>
<td>2 (0–8)</td>
</tr>
<tr>
<td>Previous abdominal operation</td>
<td>96.1</td>
</tr>
<tr>
<td>Previous SBO</td>
<td>41</td>
</tr>
<tr>
<td>Patients who received CT</td>
<td>73</td>
</tr>
</tbody>
</table>

BMI = body mass index; CI = confidence interval; CT = computed tomography; SBO = small bowel obstruction.

*Unless otherwise indicated.

**Table 3. Comparison of outcomes between patients aged 70 years or older with SBO who were managed nonoperatively or operatively**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group, median (range) or %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nonoperative, n = 51</td>
</tr>
<tr>
<td>In-hospital morbidity</td>
<td>27</td>
</tr>
<tr>
<td>Major complications</td>
<td>0</td>
</tr>
<tr>
<td>Mortality</td>
<td>2</td>
</tr>
<tr>
<td>LOS</td>
<td>3 (1–9)</td>
</tr>
<tr>
<td>All-cause 6-mo readmission rate</td>
<td>39</td>
</tr>
</tbody>
</table>

LOS = length of stay; SBO = small bowel obstruction.
perioperative mortality was 8%, and the causes of death included line sepsis (25%), intra-abdominal sepsis (25%) and cancer (50%). The overall complication rate was 64%, with respiratory complications being the most common (Table 4). The median duration of follow-up after discharge was 14.4 (range 8.1–22.6) months. The overall rate of recurrent SBO during follow-up was 15%, and the median time to recurrence was 5.4 (range 0.7–14.2) months.

Thirty-two patients (60%) were booked for immediate surgery after the initial assessment by the surgical team. The remaining 21 patients (40%) were admitted for nonoperative management, but required surgery when nonoperative management failed. The imaging performed at the time of presentation for this group of 21 patients included abdominal radiography followed by CT in 76%, CT only in 19% and no imaging in 5%. Only 2 of 21 patients underwent abdominal radiography more than once after admission, and only 1 of 21 patients underwent CT a second time. The decision to proceed to surgery for patients initially treated nonoperatively was made owing to lack of clinical improvement in 67%, worsening findings on clinical examination in 9.5%, elevated white blood cell count (≥ 13 ×10^9/L) in 9.5%, new findings on imaging (high-grade SBO and findings suggestive of ischemic bowel on CT scan) in 4.5% and a combination of these reasons in 9.5%. The median time from the initial general surgery assessment to the decision to operate was 2 (range < 1–13) days; 21% of patients waited more than 3 days, 15% waited more than 4 days and 11% waited more than 5 days. There were no significant differences in the rate of bowel resection, overall complications, readmissions and mortality between patients who were taken for immediate surgery and patients in whom initial nonoperative management failed (Table 5). There was no significant difference in the postoperative median length of stay between the groups (12 d for delayed surgery v. 8 d for immediate surgery, p = 0.09).

We compared outcomes between the 18 patients who underwent a small bowel resection at the time of surgery and the 35 patients who did not require a resection. There was no difference in the rate of complications between these 2 groups (61% after resection v. 66% without resection, p = 0.74). While perioperative mortality was 17% in patients who underwent resection versus 3% in those who did not undergo a resection, this difference was not statistically significant (p = 0.07).

**Discussion**

The goal of treatment in patients with SBO is to achieve resolution of the obstruction and minimize morbidity and mortality. Nonoperative treatment is particularly appealing in elderly patients given the increased risk of poor outcomes associated with nonelective surgery in this patient population. In the present study, nonoperative management of SBO was associated with decreased rates of complications and length of stay compared with surgical management. However, nonoperative treatment is not successful in all patients. Overall, 49% of patients in the present study were successfully managed nonoperatively. There is wide variation in the reported rate of successful nonoperative management among patients with SBO, ranging from 43%–76%.26–31 This likely reflects variation in the etiology of SBO among patients included in previous studies, different clinical thresholds for taking patients with SBO to the operating room and changing practice patterns over the past 3 decades. In the only study that specifically examined treatment of SBO among elderly patients, 19% of patients older than 70 years were treated nonoperatively.15

A downfall of nonoperative management is that it is associated with an increased risk of recurrent SBO compared with surgery.26,29,34,36 In the largest study of recurrent SBO

---

**Table 5. Comparison of outcomes between patients aged 70 years and older with SBO who underwent immediate surgery and delayed surgery after failure of nonoperative management**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Immediate surgery n = 32</th>
<th>Failed nonoperative management n = 21</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-hospital morbidity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All complications</td>
<td>21 (68)</td>
<td>13 (62)</td>
<td>0.78</td>
</tr>
<tr>
<td>Major complication</td>
<td>7 (23)</td>
<td>4 (9)</td>
<td>0.80</td>
</tr>
<tr>
<td>Mortality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-hospital</td>
<td>1 (3)</td>
<td>3 (14)</td>
<td>0.13</td>
</tr>
<tr>
<td>6-mo</td>
<td>1 (3)</td>
<td>3 (14)</td>
<td>0.13</td>
</tr>
<tr>
<td>All-cause 6-mo readmission rate</td>
<td>5 (16)</td>
<td>2 (10)</td>
<td>0.52</td>
</tr>
<tr>
<td>Readmission for SBO</td>
<td>3 (9)</td>
<td>5 (24)</td>
<td>0.24</td>
</tr>
<tr>
<td>Surgical procedure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgery with resection</td>
<td>12 (38)</td>
<td>6 (29)</td>
<td>0.50</td>
</tr>
<tr>
<td>Surgery without resection</td>
<td>20 (62)</td>
<td>15 (71)</td>
<td>0.50</td>
</tr>
</tbody>
</table>

SBO = small bowel obstruction.
Readmission for SBO 3 (9) 5 (24) 0.24

readmission rate

All-cause 6-mo

Surgical procedure

Mortality

SBO = small bowel obstruction.28,32,37,38 Delayed surgery for SBO has been associated with increased morbidity 21,30,39,40 and mortality.21 However, it is difficult to interpret this literature given that the threshold used to define early versus delayed time periods varied from 24 hours to 4 days. A recent study using data from the National Surgical Quality Improvement Program reported on outcomes for 4163 patients who underwent laparotomy for adhesive SBO.41 Patients who underwent surgery more than 72 hours after admission experienced a 3-fold increase in mortality and a 2-fold increase in systemic infectious complications compared with patients who underwent surgery sooner. Only 1 study has specifically examined outcomes associated with delayed surgery for SBO in elderly patients. In 56 patients older than 70 years, surgery for SBO performed 48 hours after admission was associated with increased morbidity and length of stay, but not mortality, compared with surgery performed earlier.42

Given that the timing of surgery is critical in the management of SBO and that delayed surgery has been associated with poor outcomes, practice guidelines have recommended that conservative management should be attempted for only 3–5 days.41,44 In the present study the median duration of nonoperative treatment before surgery was 2 days, with 79% of patients undergoing surgery within 3 days and 89% undergoing surgery within 5 days. Despite the fact that almost all of the patients received their operation within the timeframe recommended by current guidelines, our results suggest that some patients may have waited too long. Although there was no difference in the complication rate between those who underwent immediate versus delayed surgery (22% v. 19%, respectively), the mortality was 14% in the delayed group compared with 3% in the immediate surgery group. While this difference was not statistically significant, it suggests that delaying surgery for SBO for up to 5 days in elderly patients may be associated with increased mortality. In addition, the rate of bowel resection after failed nonoperative management was 29%. This seems high for a group of patients who were being watched in hospital and also suggests that patients may have waited too long for surgery. Had surgery been performed earlier in these patients, resection may not have been required. This is important as bowel resection for SBO has been associated with both increased morbidity and mortality.45

Limitations

There are several limitations associated with this research that should be considered. The major study limitation was the relatively small sample size. This limits the strength of the conclusions that can be made from this study and prevented the use of multivariate analysis. However, this research adds to the literature, as it is one of the few studies that specifically examined SBO in elderly patients. In addition, a heterogeneous population with various etiologies of SBO was included, and the follow-up period was relatively short.

Conclusion

While nonoperative resolution of SBO in elderly patients is ideal, waiting too long to operate may lead to poor outcomes. Our results suggest that older patients with SBO may be waiting too long for surgery. Larger studies are clearly needed to specifically examine the management of SBO in elderly patients to better define the role of nonoperative management and the appropriate duration of nonoperative treatment in this patient population. Until better data are available, caution should be used when deciding to continue with nonoperative management beyond 24–48 hours in older patients with SBO.

Funding/support: This research was supported by the Department of Surgery at Dalhousie University, the Nova Scotia Health Research Foundation and the Dalhousie Medical Research Foundation Music-in-Medicine endowment.

Competing interests: None declared.

Contributors: All authors designed the study. J. Springer, J. Bailey and P. Davis acquired and analyzed the data, which P. Johnson also analyzed. All authors wrote and reviewed the article and approved the final version for publication.

References

3. Kay L. Abdominal symptoms, visits to the doctor, and medicine
Self-reported practice patterns and knowledge of rectal cancer care among Canadian general surgeons

Devon P. Richardson, MD, MSc*
Geoff A. Porter, MD, MSc†
Paul M. Johnson, MD, MSc†

From the *Division of General Surgery and †Department of Community Health and Epidemiology, Dalhousie University, Halifax, NS

This research was presented at the annual meeting of the Canadian Association of General Surgeons, Quebec City, Quebec September 2010.

Accepted for publication Apr. 22, 2014

Correspondence to:
P.M. Johnson
Rm 8–025 Centennial Building
VGH Site, QEII Health Sciences Centre
1276 South Park St.
Halifax NS B3H 2Y9
Paul.johnson@dal.ca

DOI: 10.1503/cjs.001814

Background: Our objective was to examine the knowledge and treatment decision practice patterns of Canadian surgeons who treat patients with rectal cancer.

Methods: A mail survey with 6 questions on staging investigations, management of low rectal cancer, lymph node harvest, surgical margins and use of adjuvant therapies was sent to all general surgeons in Canada. Appropriate responses to survey questions were defined a priori. We compared survey responses according to surgeon training (colorectal/surgical oncology v. others) and geographic region (Atlantic, Central, West).

Results: The survey was sent to 2143 general surgeons; of the 1312 respondents, 703 treat patients with rectal cancer. Most surgeons responded appropriately to the questions regarding staging investigations (88%) and management of low rectal cancer (88%). Only 55% of surgeons correctly identified the recommended lymph node harvest as 12 or more nodes, 45% identified 5 cm as the recommended distal margin for upper rectal cancer, and 70% appropriately identified which patients should be referred for adjuvant therapy. Surgeons with subspecialty training were significantly more likely to provide correct responses to all of the survey questions than other surgeons. There was limited variation in responses according to geographic region. Subspecialty-trained surgeons and recent graduates were more likely to answer all of the survey questions correctly than other surgeons.

Conclusion: Initiatives are needed to ensure that all surgeons who treat patients with rectal cancer, regardless of training, maintain a thorough and accurate knowledge of rectal cancer treatment issues.

Contexte : Notre objectif était d’évaluer les connaissances et les processus décisionnels thérapeutiques des chirurgiens canadiens qui traitent des patients atteints de cancer rectal.


Résultats : Le sondage a été envoyé à 2143 chirurgiens généraux; parmi les 1312 répondants, 703 traitent des patients atteints de cancer rectal. La plupart des chirurgiens ont répondu de façon appropriée aux questions concernant les épreuves de stadification (88 %) et la prise en charge du cancer du bas rectum (88 %). Seulement 55 % des chirurgiens ont correctement répondu à la question sur le nombre optimal de ganglions lymphatiques à prélever, soit 12 ganglions ou plus, 45 % ont donné 5 cm comme marge distale recommandée pour le cancer du haut rectum et 70 % ont déterminé de manière appropriée quels patients il faut orienter vers un traitement adjuvant. Les chirurgiens qui avaient reçu une formation spécialisée étaient significativement plus susceptibles de fournir des réponses exactes à toutes les questions du sondage comparativement aux autres chirurgiens. On a noté une variation limitée entre les réponses selon les régions. Les chirurgiens spécialisés et les nouveaux diplomés étaient plus susceptibles de répondre correctement à toutes les questions du sondage comparativement aux autres chirurgiens.

Conclusion : Des initiatives s’imposent pour s’assurer qu’indépendamment de leur formation tous les chirurgiens qui traitent des patients atteints d’un cancer rectal maintiennent des connaissances complètes et exactes sur les enjeux thérapeutiques entourant le cancer rectal.
The management of rectal cancer has evolved considerably over the past 2 decades with significant advances in many areas, such as preoperative staging investigations, use of and timing of adjuvant therapies, surgical technique, reconstructive options and surveillance protocols.\(^1\) As a result, the management of patients with rectal cancer has become increasingly complex. In order to make good treatment decisions and counsel patients appropriately, it is essential that surgeons acquire and maintain a comprehensive knowledge of rectal cancer treatment issues. The importance of surgeon knowledge was illustrated in a recent study in which patients with rectal cancer were more likely to receive sphincter-preserving surgery and a total mesorectal excision and were less likely to experience local recurrence if they were treated by a surgeon with greater knowledge of rectal cancer care.\(^6\) However, very little is currently known about how much variation may exist in surgeon practice patterns and knowledge of rectal cancer care.

Two prior Canadian survey studies have suggested that there is variation in practice patterns among surgeons who treat rectal cancer and that there may be differences according to surgical training (fellowship v. non–fellowship trained).\(^7\),\(^8\) However, these studies were small and examined regional patterns of care, and it is unknown if these findings reflect trends in other parts of the country or if there is geographic variation. Therefore, the purpose of the present research was to examine knowledge of rectal cancer care and treatment decision practice patterns among all surgeons who treat rectal cancer in Canada and to determine if there are differences in care according to geographic region or subspecialty training.

**Methods**

A mail questionnaire was sent to all practising general surgeons in Canada. A second questionnaire was mailed to non-responders after 6 weeks. The survey was developed by the study investigators, and the content was reviewed by 2 colorectal surgeons who were not affiliated with the study. The survey collected information regarding surgical training, years in clinical practice and practice location. It consisted of 6 questions pertaining to preoperative staging investigations, surgical management of low rectal cancer, surgical margins, lymph node harvest and adjuvant therapy. The questions and response choices were developed in such a way that the response could be scored as “appropriate” or “inappropriate.” The survey was translated into French, and surgeons in Quebec were sent both the English and French versions so they could complete the survey in the language of their choice.

Appropriate responses to the survey questions were defined a priori. Specifically, we defined appropriate preoperative staging investigations as complete assessment of the colon (colonoscopy or sigmoidoscopy with barium enema), imaging of the chest (computed tomography [CT] or chest radiography) and imaging of the liver and pelvis (abdominal and pelvic CT or magnetic resonance imaging [MRI]) based on National Comprehensive Cancer Network (NCCN) guidelines.\(^9\) Two clinical scenarios regarding the management of low rectal cancer were presented to evaluate treatment decision practice patterns. Appropriate management of a healthy 55-year-old woman with normal continence and a mid-rectal cancer with T3N1 staging on preoperative imaging was defined as a low anterior resection (with or without loop ileostomy) and either neoadjuvant chemotherapy and radiation or adjuvant therapy based on the final pathology. Referral to a specialized treatment centre was also considered an acceptable response. Appropriate treatment for a healthy 55-year-old woman with normal continence and a midrectal cancer that was 3 cm in diameter and encompassed 20% of the lumen staged as T2N0 was defined as a low anterior resection (with or without loop ileostomy) followed by adjuvant therapy if indicated by pathology or referral of the patient for surgical treatment at a specialized centre. An adequate lymph node harvest was defined as 12 nodes.\(^10\) An adequate distal resection margin for upper rectal cancer was defined as 5 cm.\(^11\) Use of adjuvant therapy was defined as appropriate if surgeons indicated that they would refer patients with stage II and III rectal cancer for chemotherapy and radiation.

Approval for this study was obtained from our institutional research ethics board.

**Statistical analysis**

Analysis of survey responses was performed according to geographic region and according to fellowship training. Surgeons were grouped into 1 of 3 geographic regions: Atlantic (N.L., N.S., N.B., P.E.I.), Central (Que., Ont.) and West (Sask., Man., Alta., B.C.). We compared the responses of surgeons who indicated they had colorectal or surgical oncology fellowship training with those of surgeons without this type of fellowship training. Proportions of correct responses were compared using the \(\chi^2\) test, with significance set at \(p < 0.05\). If a 2 \(\times\) 2 table contained a cell count less than 5, we used the Fisher exact test. Multivariate logistic regression was performed to determine which factors were associated with correct responses to all of the items in the mail survey of practice patterns and knowledge of rectal cancer care. Factors entered into the multivariate model were determined a priori and included colorectal or surgical oncology fellowship training, region of practice, practice setting and years in practice. No significant interaction terms were identified. We considered results to be significant at \(p < 0.05\). Analyses were performed using SAS software version 9.2 (SAS Institute).

**Results**

Surveys were sent to 2143 general surgeons in Canada, and the overall response rate was 61% (1312 of 2143).
Response rates ranged from 54% to 89% across the 10 provinces. Of the 1312 respondents, 703 indicated that they treated patients with rectal cancer and formed the study cohort. The demographic and practice characteristics of these surgeons are reported in Table 1. Only 7.5% of surgeons in the Atlantic region worked in an academic centre compared with 26% and 28% in the Central and West regions, respectively. Similarly, fewer surgeons in Atlantic Canada than in the rest of the country had fellowship training (11% vs. 18%, respectively).

Regarding knowledge, 88% of surgeons correctly identified appropriate staging investigations for the evaluation of a new patient with rectal cancer. There were no differences in the correct response rate across practice regions (Atlantic 90%, Central 88%, West 88%, \( p = 0.85 \)). However, surgeons with colorectal or surgical oncology fellowship training were more likely to select appropriate staging investigations than non–fellowship trained surgeons (94% vs. 87%, respectively, \( p = 0.032 \)). Among those who responded incorrectly, 95% omitted imaging of the chest.

The majority of surgeons (88%) selected an appropriate treatment for the clinical scenario involving a healthy 55-year-old patient with a rectal cancer 5 cm above the anorectal ring and T2N1 staging on preoperative imaging (Table 2). There was no significant difference in responses according to practice region (Atlantic 82%, Central 91%, West 87%, \( p = 0.07 \)). Surgeons with colorectal or surgical oncology fellowship training were more likely to give a correct response than non–fellowship trained surgeons (99% vs. 86%, respectively, \( p = 0.004 \)). Given the second clinical scenario involving a healthy 55-year-old patient with rectal cancer 5 cm above the anorectal ring and T2N0 on preoperative imaging, 87% of surgeons selected an appropriate response (Table 3). There was a significant variation in the proportion of appropriate responses according to both practice region (Atlantic 62%, Central 76%, West 65%, \( p = 0.007 \)) and completion of specialty training (fellowship-trained surgeons 83%, non–fellowship trained surgeons 69%, \( p < 0.001 \)).

Surgeons were asked how many lymph nodes are recommended for staging rectal cancer, and 55% answered correctly (\( \geq 12 \) nodes). The median response was 12 nodes and responses ranged from 1 to 25 nodes. The proportion of correct responses was significantly different according to practice region and fellowship training (Table 4). Only 45% of surgeons indicated that an adequate distal resection margin for an upper rectal cancer was at least 5 cm. The mean response was 3.55 cm and responses ranged from 1 cm to 15 cm. There was no difference in responses according to geographic region; however, surgeons with colorectal or surgical oncology fellowship training were more likely to give a correct response (Table 4). Surgeons were asked about adjuvant therapy for rectal cancer, and 69% of respondents knew which TNM-stage tumours require adjuvant therapy. There was no difference in

### Table 1. Demographic and practice characteristics of 703 Canadian general surgeons who treat patients with rectal cancer

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Median (range) or %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years in practice</td>
<td>12 (1–44)</td>
</tr>
<tr>
<td>Self-reported annual procedure volume</td>
<td>10 (1–100)</td>
</tr>
<tr>
<td>Subspecialty (colorectal or surgical oncology) training</td>
<td>Yes 17, No 83</td>
</tr>
<tr>
<td>Practice location</td>
<td></td>
</tr>
<tr>
<td>Atlantic</td>
<td>11</td>
</tr>
<tr>
<td>Central</td>
<td>61</td>
</tr>
<tr>
<td>West</td>
<td>28</td>
</tr>
<tr>
<td>Practice type</td>
<td></td>
</tr>
<tr>
<td>Academic</td>
<td>27</td>
</tr>
<tr>
<td>Community hospital serving &gt; 500 000</td>
<td>15</td>
</tr>
<tr>
<td>Community hospital serving 100 000–499 999</td>
<td>31</td>
</tr>
<tr>
<td>Community hospital serving &lt; 100 000</td>
<td>27</td>
</tr>
</tbody>
</table>

### Table 2. Treatment recommendations of Canadian general surgeons for a healthy 55-year-old woman with normal continence and a midrectal cancer with T3N1 preoperative staging

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Overall responses, %</th>
<th>Responses by practice region, %</th>
<th>Responses according to surgeon training, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neoadjuvant therapy and low anterior resection?</td>
<td>78</td>
<td>Atlantic 66 Central 81 West 77</td>
<td>Fellowship* 97 Other 74</td>
</tr>
<tr>
<td>Low anterior resection ± adjuvant therapy based on pathology?</td>
<td>1</td>
<td>5 1 2 1 2</td>
<td></td>
</tr>
<tr>
<td>Referral to a specialized treatment centre?</td>
<td>9</td>
<td>11 9 8 2 11</td>
<td></td>
</tr>
<tr>
<td>APR and neoadjuvant or adjuvant therapy</td>
<td>12</td>
<td>18 9 13 0 13</td>
<td></td>
</tr>
</tbody>
</table>

*Colour/surgical oncology fellowship. Indicates a correct response.
Études de référence

Il est important de noter que les résultats de cette étude démontrent que le traitement de cancer du rectum en Canada est dispensé dans une variété de contextes cliniques et que la majorité des chirurgiens qui traitent des patients atteints de cancer du rectum travaillent dans des hôpitaux de la communauté et n’ont pas de formation spécialisée. Toutefois, la majorité des chirurgiens qui traitent des cancer du rectum ont répondu correctement aux scénarios cliniques et aux questions du sondage, ce qui suggère que les chirurgiens avec une formation spécialisée étaient plus susceptibles de fournir une réponse correcte au sujet de toutes les questions (Tableau 5).

Discussion

Les résultats de cette étude démontrent que le traitement de cancer du rectum en Canada est dispensé dans une variété de contextes cliniques et que la majorité des chirurgiens qui traitent des patients atteints de cancer du rectum travaillent dans des hôpitaux de la communauté et n’ont pas de formation spécialisée. Toutefois, la majorité des chirurgiens qui traitent des cancer du rectum ont répondu correctement aux scénarios cliniques et aux questions du sondage, ce qui suggère que les chirurgiens avec une formation spécialisée étaient plus susceptibles de fournir une réponse correcte au sujet de toutes les questions (Tableau 5).

Tableau 3. Recommandations de traitement de chirurgiens canadiens pour une patiente de 55 ans avec une continence normale et un cancer du rectum médial mesurant 3 cm de diamètre, englobant 20% du lumen, classé comme T2N0 d’après l’imagerie préopératoire

<table>
<thead>
<tr>
<th>Traitements</th>
<th>Réponses globales, %</th>
<th>Réponses selon la région de pratique, %</th>
<th>Réponses selon formation de chirurgien, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neoadjuvant therapy and low anterior resection†</td>
<td>14</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Low anterior resection ± adjuvant therapy based on pathology†</td>
<td>56</td>
<td>58</td>
<td>68</td>
</tr>
<tr>
<td>Referral to a specialized treatment centre†</td>
<td>9</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>APR and neoadjuvant or adjuvant therapy</td>
<td>7</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Transanal excision</td>
<td>6</td>
<td>15</td>
<td>4</td>
</tr>
</tbody>
</table>

*Colorectal or surgical oncology fellowship.
†Correct response.

Tableau 4. Connaissances des chirurgiens canadiens en matière de collecte des ganglions, du marges distales pour les cancers supérieurs du rectum et des indications de traitement adjuvant dans les patients atteints de cancer du rectum

<table>
<thead>
<tr>
<th>Facteur</th>
<th>Réponses selon la région de pratique, %</th>
<th>Réponses selon formation de chirurgien, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgeons who indicated that ≥ 12 lymph nodes are recommended for staging rectal cancer†</td>
<td>36</td>
<td>61</td>
</tr>
<tr>
<td>Surgeons who indicated that an adequate distal resection margin for upper rectal cancer is ≥ 5 cm†</td>
<td>37</td>
<td>46</td>
</tr>
<tr>
<td>Surgeons who would refer patients with stage II/III rectal cancer for adjuvant therapy†</td>
<td>62</td>
<td>70</td>
</tr>
</tbody>
</table>

*Colorectal/surgical oncology fellowship.
†Significant difference across practice regions (p < 0.01).
‡Significant difference according to fellowship training (p < 0.01).
non–subspecialty trained surgeons. These differences may explain, to some extent, the previously reported variation in patient outcomes according to surgeon training.

While subspecialty-trained surgeons were more likely to respond correctly to the survey questions, the present study suggests that there is room for knowledge improvement among all surgeons who treat patients with rectal cancer. There was considerable variation in the responses regarding distal margin for upper rectal cancer and appropriate selection of patients for adjuvant therapy. Decisions based on inaccurate knowledge in these areas of rectal cancer care could clearly have a negative impact on patient outcomes. It is particularly concerning that only 55% of surgeons responded correctly to the question regarding lymph node harvest given that, for more than a decade, practice guidelines from several North American organizations have consistently recommended the assessment of at least 12 lymph nodes. Furthermore, lymph node harvest after colorectal cancer resection has been the focus of many papers, reviews and editorials in recent years. This raises questions about how surgeons acquire and maintain knowledge.

Formal surgical training plays a central role in surgeon education. In the present study fellowship-trained surgeons and recent graduates were more likely to respond correctly to all of the survey questions than other surgeons. However, continuing professional development (CPD) after completion of training is necessary to maintain existing knowledge and to acquire new knowledge and learn technologies and techniques that were not part of residency or fellowship curricula. Continuing education may occur in several formats but has traditionally involved attending didactic sessions at conferences, courses or rounds. Such activities can improve professional practice and health care outcomes; however, the effects are typically small and do not impact complex behaviours. Interactive CPD activities involving hands-on practice or case discussions in addition to didactic sessions may be a more effective way to alter physician behaviour and improve patient outcomes. However, most of this research has come from nonsurgical disciplines, and it is unclear how various CPD formats may impact or improve specific aspects of surgeon knowledge.

Most of the existing CPD literature related to rectal cancer care, including 2 Canadian studies, has examined training surgeons in the technique of TME. Phang developed a province-wide strategy to improve rectal cancer care in British Columbia using didactic sessions, videos and hands-on cadaveric dissection. Approximately 80% of surgeons performing rectal cancer surgery in the province participated in the program, resulting in increased use of TME and neoadjuvant radiation and decreased local recurrence in patients with stage III disease. Surgeon knowledge of the course content was assessed using a written test. There was a significant improvement in surgeon knowledge after completion of the course, and this was maintained when reassessed a year later. These data suggest that well-designed, comprehensive courses attended by interested surgeons can lead to improvements in surgeon knowledge and clinical outcomes.

However, at present, participation in such educational events is voluntary. Although the Royal College of Physicians and Surgeons of Canada requires all general surgeons to participate in CPD annually, there are no stipulations that the content of the CPD activities must relate to specific areas of a surgeon’s clinical practice. Surgeons simply need to accumulate adequate CPD hours in order to maintain certification. Ideally, CPD should involve a 4-step process: 1) physician assessment to identify areas in need of improvement, 2) participation in learning activities, 3) application of new knowledge/skills into practice and 4) assessment of patient outcomes. Previous research has suggested that providing general surgeons with a simple framework to complete these steps can have a favourable impact on clinical practice. However, widespread implementation and regulation of such a program presents significant challenges given the broad scope of diseases treated by general surgeons and the lack of infrastructure to assess both physician knowledge and patient outcomes.

**Limitations**

There are several limitations associated with the present study that should be considered. A low response rate may limit the conclusions that can be drawn from survey research. However, our survey had an overall response rate of 61%, which exceeds the generally acceptable threshold for this type of research. We did not have any information for the nonresponders in this study, therefore we were not able to assess response bias. If respondents reported what they perceived to be the correct responses as opposed to their actual clinical practice, then reporting bias may be a concern. However, a previous study has suggested that physician practice patterns measured using a
CONCLUSION

Although there were differences in practice patterns and knowledge of rectal cancer care between surgeons with colorectal/surgical oncology training and non–subspecialty trained surgeons, our study suggests that there are important deficiencies in knowledge among both groups of surgeons. Initiatives are needed to ensure that all surgeons who treat patients with rectal cancer, regardless of training, maintain a thorough and accurate knowledge of rectal cancer treatment issues.

Funding/Support: This research was supported by a research grant from the Canadian Society of Colon and Rectal Surgeons and a Canada Graduate Scholarship from the Canadian Institutes of Health Research.

Competing interests: None declared.

Contributors: All authors designed the study. D. Richardson and G. Porter acquired and analyzed the data, which P. Johnson also analyzed. All authors wrote and reviewed the article and approved the final version for publication.

References


Can the Blaylock Risk Assessment Screening Score (BRASS) predict length of hospital stay and need for comprehensive discharge planning for patients following hip and knee replacement surgery? Predicting arthroplasty planning and stay using the BRASS

Danny Cunic, MD, MSc, PhD*
Shawn Lacombe, BPHE, MSc†
Kiarash Mohajer, BSc†
Heather Grant, MSc‡
Gavin Wood, MBChB*‡

From the *Division of Orthopedic Surgery, Queens University, 1School of Medicine, Queens University, †Human Mobility Research Centre, Kingston, Ont.

Accepted for publication
Apr. 29, 2014

Correspondence to:
D. Cunic
Department of Surgery
Victory 3, Kingston General Hospital
78 Stuart St.
Kingston ON K7L 2V7
7dc12@queensu.ca

DOI: 10.1503/cjs.024113

Background: Knee and hip arthroplasty constitutes a large percentage of hospital elective surgical procedures. The Blaylock Risk Assessment Screening Score (BRASS) was designed to identify patients in need of discharge planning. The purpose of this study was to evaluate whether the BRASS was associated with length of stay (LOS) in hospital following elective arthroplasty.

Methods: We retrospectively reviewed the charts of individuals undergoing primary elective arthroplasty for knee or hip osteoarthritis who had a documented BRASS score.

Results: In our study cohort of 241, both BRASS (p < 0.001) and replacement type (hip v. knee; p = 0.048) were predictive of LOS. Higher BRASS was associated with older patients (p < 0.001), higher American Society of Anesthesiologists score (p < 0.001) and longer LOS (p < 0.001). We found a specificity of 83% for a BRASS greater than 8 and a hospital stay longer than 5 days and a specificity of 92% for a BRASS greater than 10.

Conclusion: The BRASS represents a novel and significant predictor of LOS following elective arthroplasty. Patients with higher BRASS are more likely to stay in hospital 5 days or more and should receive pre-emptive social work consultations to facilitate timely discharge planning and hospital resources.

Contexte : Les arthroplasties du genou et de la hanche représentent un fort pourcentage des interventions chirurgicales non urgentes pratiquées dans les hôpitaux. Le score BRASS (Blaylock Risk Assessment Screening Score) a été conçu pour reconnaître les patients dont il faut planifier le congé de l’hôpital. Le but de la présente étude était de vérifier s’il y a un lien entre le score BRASS et la durée du séjour hospitalier (DSH) après une arthroplastie non urgente.

Méthodes : Nous avons analysé rétrospectivement les dossiers de patients soumis à une arthroplastie primaire non urgente du genou ou de la hanche dont le score BRASS avait été documenté.

Résultats : Dans la cohorte de 241 patients de notre étude, le score BRASS (p < 0.001) et le type d’arthroplastie (hanche c. genou, p = 0.048) ont été des facteurs prédictifs de la DSH. Un score BRASS plus élevé était associé à un âge plus avancé des patients (p < 0.001), à un score plus élevé à l’échelle de l’American Society of Anesthesiologists (p < 0.001) et à une DSH plus longue (p < 0.001). Nous avons observé une spécificité de 83 % pour un score BRASS supérieur à 8 et un séjour hospitalier de plus de 5 jours, et une spécificité de 92 % pour un score BRASS supérieur à 10.

Conclusion : Le score BRASS constitue un nouveau prédicteur important de la DSH après une arthroplastie non urgente. Les patients dont le score BRASS est plus élevé, risquent davantage de séjourner plus de 5 jours à l’hôpital et devraient bénéficier de consultations préventives auprès du personnel des Services sociaux afin de faciliter la planification des congés en temps opportun et d’assurer l’utilisation efficace des ressources hospitalières.
Osteoarthritis (OA) is among the most common conditions affecting elderly individuals. As a result, hip and knee arthroplasty have become widely performed elective procedures for patients with degenerative joint disease. These relatively low-risk procedures provide patients with improved mobility, reduced pain and substantially improved quality of life. Owing to the aging population, the number of hip and knee arthroplasty procedures performed in developed countries has been increasing steadily over the past decade. Advancements in provision of care have reduced the average length of stay (LOS) in hospital. However, in some cases, patients may encounter a delay in discharge. Factors that contribute to prolonged hospital stay include pre-existing medical comorbidities, unforeseen perioperative medical events and poor or unsafe discharge disposition. Unanticipated postponed discharge not only decreases efficiency, but also delays future elective procedures owing to the scarce availability of postsurgical beds. Effective discharge planning is critical to the timely discharge of patients and greatly facilitates the efficiency of hospital resource and bed management.

The need for effective discharge planning has led to a demand for an effective preoperative screening tool to identify such patients before admission. Ideally, this tool would identify patients at risk for increased postoperative LOS and allow staff to pre-emptively take measures that would facilitate a safe postoperative course and appropriate discharge destination without substantially increasing the expected postoperative LOS. This would ultimately increase the efficiency of both patient care and hospital resource allocation.

The Blaylock Risk Assessment Screening Score (BRASS) is a presurgical screening tool that can be used to identify patients who may require a more comprehensive discharge plan. A copy of the BRASS is shown in Figure 1. In brief, it comprises a 10-item scale that derives a score between 0 and 40, with a higher score correlating with a greater likelihood of discharge complications and LOS. The 10 items that are used to derive the BRASS score are the patient’s age, living situation/social support, functional status, cognition, behavioural pattern, mobility, sensory deficits, number of previous admissions/emergency department visits, number of active medical problems and number of drugs.

Typically, a score of 0–10 identifies patients at low risk for complications, 11–20 identifies those requiring discharge planning, and scores above 20 indicate patients who require extensive discharge planning and who are likely to be discharged to a location other than home. The current clinical utility of the BRASS is debated. This screening tool has been used previously with varied success for patients admitted to the intensive care unit (ICU) and in medical patients postdischarge. However, the patient population for these 2 studies was not specific to knee or hip arthroplasty patients or elective admissions.

The aim of our study was to assess the BRASS in terms of its ability to correctly predict patients at risk of increased hospital stay, specifically, after elective hip or knee arthroplasty at our institution. Other risk factors for delayed discharge (e.g., American Society of Anesthesiologists [ASA] score, body mass index [BMI], type of surgical replacement) were also analyzed and corroborated with this tool in hopes of identifying which patient factors, when used in addition to BRASS scores, could facilitate more accurate identification of patients at risk of longer than expected postoperative LOS.

**METHODS**

Data collection consisted of a retrospective chart review of orthopedic patients treated at Kingston General Hospital.
Hospital (KGH) between August 2007 and June 2010. Individuals undergoing primary elective arthroplasty for knee or hip OA were eligible for inclusion. Exclusion criteria were nonelective hip or knee arthroplasties and revision procedures.

A sample size calculation to determine a statistically significant difference in mean LOS between hip and knee replacement participants with an $\alpha$ of 0.5, power of 0.8, a mean difference of 1 day and standard deviation (SD) of 3 required analysis of 284 cases. We therefore reviewed a sample of 300 cases stemming back from 2010 that would reflect our modern practice for inpatient stay discharge record. Patients who did not consent to have their data used for research purposes and patient charts with absent Blaylock Scores were excluded from analysis.

At KGH, the average LOS for our elective total joint replacement patients is 4.6 (range 1.2–21.2) days. This is comparable to the Canadian national average. In the Canadian Joint Replacement Registry 2013 annual report, the median LOS in 2010–2011 for both sexes combined was 5 days for hip replacements and 4 days for knee replacements. For the purpose of our study, we defined prolonged LOS as 5 or more days. Other variables that could influence LOS were collected: patient age, ASA score, BMI and type of replacement (knee v. hip).

**Statistical analysis**

Data were organized and collected with Microsoft Excel and analyzed with SPSS software version 17.0. Statistical significance was established a priori at $\alpha = 0.05$. We performed multiple linear regression analysis to explore variables predictive of LOS. A multivariate analysis of variance (MANOVA) was performed to identify differences in dependent variables for BRASS quartiles. Post hoc comparisons were Bonferroni corrected. We used contingency tables to calculate sensitivity and specificity as well as positive and negative predictive values according to a BRASS of 8 or more and 10 or more for LOS of 5 days or longer. These results were depicted in a receiver operating characteristic (ROC) curve. Length of stay was analyzed for outliers, and individuals exceeding 2.5 SDs were excluded ($n = 2$).

**RESULTS**

A total of 2718 procedures were performed at KGH during our study period. We excluded the charts of 442 patients who underwent nonelective hip or knee arthroplasties and 342 who underwent revision procedures, leaving 1934 charts that met our inclusion criteria. As per our sample size calculation, we reviewed a sample of 300 charts. Of these, 243 case files met our inclusion criteria. A further 2 charts were excluded as outliers, leaving a final sample of 241 patients.

Descriptive statistics are reported in Table 1. Individuals with knee OA accounted for 67% of the cohort, and most patients returned home upon discharge (86%). Age, ASA, LOS and sex were similar between groups, while the average BMI of individuals with knee OA was significantly greater than that of individuals with hip OA (Table 2). Also, patients discharged to hospital had a significantly longer LOS than those discharged home (Table 3). The BRASS for patients discharged home were significantly lower than for those discharged to hospital (Table 3). Multiple linear regression results are summarized in Table 4. Of the variables included in the regression model, higher BRASS and hip replacement were predictive of longer postoperative LOS. The BRASS quartiles (3, 5 and 7.5 representing the 25th, median and 75th percentile, respectively) explored associations with age, sex, type of replacement, ASA score, BMI and LOS (Table 5). We observed a significant main effect of BRASS on age, ASA and LOS. We also found a significant difference in knee and hip OA distribution among the quartiles. Greater BRASS were associated with older age, greater ASA category and longer LOS. Post hoc analysis revealed significant differences in age between all of the quartiles except between the second and third quartiles.

**Table 1. Descriptive statistics**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No. or mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total sample</td>
<td>241</td>
</tr>
<tr>
<td>Age, yr</td>
<td>68 ±11</td>
</tr>
<tr>
<td>Sex, male:female</td>
<td>117:124</td>
</tr>
<tr>
<td>ASA score</td>
<td>2.6 ± 0.6</td>
</tr>
<tr>
<td>BMI</td>
<td>31.7 ± 7.2</td>
</tr>
<tr>
<td>LOS, d</td>
<td>4.0 ± 2.4</td>
</tr>
<tr>
<td>BRASS</td>
<td>5.9 ± 3.5</td>
</tr>
<tr>
<td>Discharge location</td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>206</td>
</tr>
<tr>
<td>Retirement home</td>
<td>2</td>
</tr>
<tr>
<td>Nursing home</td>
<td>3</td>
</tr>
<tr>
<td>Hospital</td>
<td>30</td>
</tr>
<tr>
<td>Replacement type</td>
<td></td>
</tr>
<tr>
<td>Hip</td>
<td>80</td>
</tr>
<tr>
<td>Knee</td>
<td>161</td>
</tr>
<tr>
<td>Surgery</td>
<td></td>
</tr>
<tr>
<td>Knee arthroplasty</td>
<td>161</td>
</tr>
<tr>
<td>Total</td>
<td>123</td>
</tr>
<tr>
<td>Total Cemented</td>
<td>3</td>
</tr>
<tr>
<td>Knee</td>
<td>25</td>
</tr>
<tr>
<td>SIGMA Knee Replacement System</td>
<td>6</td>
</tr>
<tr>
<td>Unicompartmental</td>
<td>4</td>
</tr>
<tr>
<td>Hip arthroplasty</td>
<td>80</td>
</tr>
<tr>
<td>Hip</td>
<td>26</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
</tr>
<tr>
<td>Total uncemented</td>
<td>15</td>
</tr>
<tr>
<td>Total cemented</td>
<td>7</td>
</tr>
</tbody>
</table>

ASA = American Society of Anesthesiologists; BMI = body mass index; BRASS = Blaylock Risk Assessment Screening Score; LOS = length of stay; SD = standard deviation.
quartiles. Individuals in the first quartile had significantly lower ASA scores than those in the second \((p = 0.002)\), third \((p < 0.001)\) and fourth \((p < 0.001)\) quartiles. The fourth BRASS quartile was associated with significantly longer LOS than all other quartiles (first quartile \(p < 0.001\), second quartile \(p < 0.001\), third quartile \(p < 0.001\)). No significant differences in LOS existed among the first 3 quartiles. We used BRASS of 8 or more and 10 or more when assessing the sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of the BRASS (Table 6). Sensitivity was low for the cut-offs of both 8 and 10, decreasing for the latter. Specificity, however, was higher, with a value of 83% for a BRASS cut-off of 8 or greater and increasing to 92% with a BRASS cut-off of 10 or greater. An ROC curve is depicted in Figure 2. The area under the curve was 0.76 \(\pm 0.03\) \((p < 0.001)\), indicating the accuracy of the measured diagnostic test to be of fair quality.

### Table 2. Descriptive statistics by surgery type (knee v. hip)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Knee, (n = 161)</th>
<th>Hip, (n = 80)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, yr</td>
<td>68 (\pm 10)</td>
<td>69 (\pm 13)</td>
</tr>
<tr>
<td>Sex, male:female</td>
<td>72:89</td>
<td>45:35</td>
</tr>
<tr>
<td>ASA score</td>
<td>2.7 (\pm 0.5)</td>
<td>2.5 (\pm 0.6)</td>
</tr>
<tr>
<td>BMI</td>
<td>32.9 (\pm 7.3)</td>
<td>29.3 (\pm 6.4^*)</td>
</tr>
<tr>
<td>LOS, d</td>
<td>3.8 (\pm 1.8)</td>
<td>4.4 (\pm 3.2)</td>
</tr>
<tr>
<td>BRASS</td>
<td>5.9 (\pm 3.1)</td>
<td>5.9 (\pm 4.1)</td>
</tr>
</tbody>
</table>

**Discharge location**
- Home: 139 (67)
- Retirement home: 2 (2)
- Nursing home: 2 (1)
- Hospital: 20 (10)

ASA = American Society of Anesthesiologists; BMI = body mass index; BRASS = Blaylock Risk Assessment Screening Score; LOS = length of stay; SD = standard deviation.

\(^*\)Significantly different from Hospital group.

---

### Table 3. Descriptive statistics by discharge location demographics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Home, (n = 206)</th>
<th>Retirement home, (n = 2)</th>
<th>Nursing home, (n = 3)</th>
<th>Hospital, (n = 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, yr</td>
<td>68 (\pm 11^*)</td>
<td>69 (\pm 12)</td>
<td>74 (\pm 19)</td>
<td>73 (\pm 12)</td>
</tr>
<tr>
<td>Sex, male:female</td>
<td>105:101</td>
<td>1:1</td>
<td>1:2</td>
<td>10:20</td>
</tr>
<tr>
<td>ASA score</td>
<td>2.6 (\pm 0.6)</td>
<td>2.5 (\pm 0.7)</td>
<td>3.0 (\pm 0.0)</td>
<td>2.7 (\pm 5.4)</td>
</tr>
<tr>
<td>BMI</td>
<td>31.6 (\pm 7.1)</td>
<td>37.2 (\pm 11)</td>
<td>23.4 (\pm 1.4)</td>
<td>33.2 (\pm 8.0)</td>
</tr>
<tr>
<td>LOS, d</td>
<td>3.7 (\pm 1.6^*)</td>
<td>3.0 (\pm 0.0)</td>
<td>5.7 (\pm 1.5)</td>
<td>6.5 (\pm 4.6^*)</td>
</tr>
<tr>
<td>BRASS</td>
<td>5.3 (\pm 2.9^*)</td>
<td>2.5 (\pm 0.7)</td>
<td>18.0 (\pm 5.0)</td>
<td>8.7 (\pm 3.7)</td>
</tr>
</tbody>
</table>

**Replacement type**
- Knee: 139 (0)
- Hip: 67 (2)

ASA = American Society of Anesthesiologists; BMI = body mass index; BRASS = Blaylock Risk Assessment Screening Score; LOS = length of stay; SD = standard deviation.

\(^*\)Significantly different from Hospital group.

First, higher tabulated BRASS and hip replacement were significant predictors of increased postoperative LOS. Other collected patient demographic factors, such as age, sex, BMI and ASA score did not show a significant correlation with increasing LOS in our multiple regression analysis. Consistent with the results of Mistiaen and colleagues, our data show that patients with increased BRASS had longer postoperative LOS. Although not statistically significant \((p = 0.10)\), patients undergoing hip arthroplasty tended to stay longer than those undergoing knee arthroplasty (Table 2). This finding could be explained by our specific patient cohort, as our sample comprised 80 hip arthroplasty patients and 161 knee arthroplasty patients. It is possible, given the smaller number of hip arthroplasty patients, that this may have skewed our results in the smaller hip arthroplasty population pool. It does contradict other publications showing that knee arthroplasty patients tend to stay longer in hospital postsurgery than hip arthroplasty patients.\(^9\),\(^10\) Pain and function improve less and more slowly in early and intermediate postoperative periods for patients who undergo knee arthroplasty than those who undergo hip arthroplasty.\(^11\) In addition, Waddell and colleagues\(^12\) found that knee arthroplasty patients are typically older, have a higher BMI and have a poorer health status than hip arthroplasty patients. Knee arthroplasty participants in our study were similar in age to the hip arthroplasty patients, but they did have poorer health status, as measured by the ASA score, and had higher BMIs.

Second, quartile analysis showed that patients with higher BRASS not only had significantly longer postoperative LOS, but were also significantly older and had higher...
ASA scores. Patients’ BMIs were similar across all 4 quartiles. These findings are supported in the literature. Foote and colleagues\textsuperscript{13} showed that increased age and ASA scores were associated with prolonged postoperative LOS. Forrest and colleagues\textsuperscript{14} when looking for correlation of patient age, sex, marital status, BMI and comorbid illness, found that the only factor that correlated with LOS was age. Moreover, Jonas and colleagues\textsuperscript{15} reported that the female sex, patients living in more deprived areas, high ASA scores, elevated BMI and age, were all associated with increased LOS following knee arthroplasty. Interestingly, Abbas and colleagues\textsuperscript{16} also reported that female sex predicted prolonged LOS following total hip replacement. Our quartile analysis also showed a higher percentage of women in the fourth quartile group. Joshi and colleagues\textsuperscript{17} showed a significant positive correlation between ASA, but not BMI, and LOS for hip and knee arthroplasty patients. Differences among previous studies may be partly explained by different patient cohorts.

Third, analysis of discharge destination showed that both postoperative LOS and BRASS were greater in patients discharged to a nursing home/hospital than in patients discharged home. Theoretically, the unanticipated procurement following arthroplasty surgery of a rehabilitation, retirement or nursing home bed for a patient previously residing at home is a time-consuming process, which increases postoperative LOS. Oldmeadow and colleagues\textsuperscript{3} showed targeted postoperative care resulted in more patients being discharged directly home after hip or knee arthroplasty, thus decreasing hospital LOS.

Finally, BRASS Scores of 8 or more, and especially 10 or more, had a high specificity when accessing an LOS of 5 days or longer. Both cut-off values were associated with high NPVs. This indicates that there is a high propensity to consider an individual likely to stay in hospital 5 or more days after their surgery if their BRASS is 8 or higher, and even more so if their BRASS is 10 or higher. Sensitivity and PPVs, however, were low. Our low sensitivity is consistent with the results of Mistiaen and colleagues\textsuperscript{5} who also found BRASS to poorly identify patients with problems or unmet needs after discharge.

**Table 4. Summary of multiple regression analysis for length of stay (n = 239)\textsuperscript{*}**

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE(B)</th>
<th>β</th>
<th>t</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.025</td>
<td>0.016</td>
<td>0.115</td>
<td>1.592</td>
<td>0.11</td>
</tr>
<tr>
<td>Sex</td>
<td>-0.517</td>
<td>0.285</td>
<td>-0.110</td>
<td>-1.815</td>
<td>0.07</td>
</tr>
<tr>
<td>BMI</td>
<td>0.015</td>
<td>0.021</td>
<td>0.045</td>
<td>0.703</td>
<td>0.48</td>
</tr>
<tr>
<td>BRASS</td>
<td>0.216</td>
<td>0.049</td>
<td>0.318</td>
<td>4.423</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Replacement type</td>
<td>0.615</td>
<td>0.309</td>
<td>0.123</td>
<td>1.988</td>
<td>0.048</td>
</tr>
<tr>
<td>ASA score</td>
<td>-0.006</td>
<td>0.271</td>
<td>-0.001</td>
<td>-0.023</td>
<td>0.98</td>
</tr>
</tbody>
</table>

ASA = American Society of Anesthesiologists; BMI = body mass index; BRASS = Blaylock Risk Assessment Screening Score; SE = standard error.

\textsuperscript{*}R\textsuperscript{2} = 0.18, F\textsubscript{6,232} = 8.545, p < 0.001.

**Table 5. BRASS MANOVA results\textsuperscript{*}**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Quartile 1, n = 61</th>
<th>Quartile 2, n = 62</th>
<th>Quartile 3, n = 58</th>
<th>Quartile 4, n = 60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, yr\textsuperscript{†}</td>
<td>62 ± 10</td>
<td>67 ± 8</td>
<td>68 ± 10</td>
<td>76 ± 9</td>
</tr>
<tr>
<td>Sex, % female</td>
<td>45</td>
<td>48</td>
<td>49</td>
<td>63</td>
</tr>
<tr>
<td>Diagnosis\textsuperscript{†}</td>
<td>Knee OA 34</td>
<td>51</td>
<td>39</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>Hip OA 27</td>
<td>11</td>
<td>19</td>
<td>23</td>
</tr>
<tr>
<td>ASA score\textsuperscript{†}</td>
<td>2.3 ± 0.5</td>
<td>2.7 ± 0.5</td>
<td>2.8 ± 0.6</td>
<td>2.8 ± 0.4</td>
</tr>
<tr>
<td>BMI</td>
<td>30.4 ± 6.0</td>
<td>33.9 ± 7.8</td>
<td>32.8 ± 7.5</td>
<td>30.6 ± 7.2</td>
</tr>
<tr>
<td>LOS\textsuperscript{†}</td>
<td>3.1 ± 0.6</td>
<td>3.7 ± 1.6</td>
<td>3.9 ± 1.4</td>
<td>5.5 ± 3.8</td>
</tr>
<tr>
<td>BRASS\textsuperscript{†}</td>
<td>2.1 ± 1.0</td>
<td>4.6 ± 0.5</td>
<td>6.4 ± 0.5</td>
<td>10.6 ± 3.0</td>
</tr>
</tbody>
</table>

ASA = American Society of Anesthesiologists; BMI = body mass index; BRASS = Blaylock Risk Assessment Screening Score; SD = standard deviation.

\textsuperscript{*}χ\textsuperscript{2}\textsubscript{3 sex} = 4.935, p = 0.177; χ\textsuperscript{2}\textsubscript{3 diagnosis} = 10.765, p = 0.013.

\textsuperscript{†}Main effect of BRASS.

**Table 6. BRASS 2 × 2 table results for a length of stay of ≥5 days**

<table>
<thead>
<tr>
<th>Factor</th>
<th>BRASS, %</th>
<th>≥ 8</th>
<th>≥ 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>0.49</td>
<td>0.29</td>
<td></td>
</tr>
<tr>
<td>Specificity</td>
<td>0.83</td>
<td>0.92</td>
<td></td>
</tr>
<tr>
<td>Positive predictive value</td>
<td>0.48</td>
<td>0.53</td>
<td></td>
</tr>
<tr>
<td>Negative predictive value</td>
<td>0.83</td>
<td>0.80</td>
<td></td>
</tr>
</tbody>
</table>

BRASS = Blaylock Risk Assessment Screening Score.

**Fig. 2.** The area under the receiver operating characteristic (ROC) curve was 0.76 ± 0.03 (p < 0.001). This indicates that the accuracy of the measured diagnostic test to be of a fair quality.
They provided possible explanations for this finding that could also be applied to our data. Following surgery, elderly patients may show a decline in their preadmission functional status, and thus, any preoperative screening tools attempting to identify patients at risk of longer than expected postoperative LOS could have missed these patients and not have identified them as high risk based on their preoperative admission status. To better identify patients at risk of longer than expected postoperative LOS following arthroplasty surgery, other patient factors, such as increased age, ASA score and type of surgery, should be included in conjunction with the BRASS to improve the sensitivity or PPV. The high specificity is helpful preoperatively in that scores greater than 10 will most likely lead to increased LOS; anyone scoring higher than 10 will need alternative arrangements, and surgery can be delayed until arrangements are in place. This will maximize bed use efficiency and keep average LOS down. Also, it will allow for the concatenated efforts by allied health care professionals preoperatively on specific targeted patients to prepare for possible discharge issues and organize rehabilitation in hospital or temporary nursing home care if full home care services are not sufficient.

Longer than expected LOS, as predicted by various BRASS cutoff scores, is consistent with a recent review of our institution’s average LOS for elective hip and knee arthroplasty patients: the average LOS was 4.1 days for patients with a BRASS of 0–10 and 7.3 days for patients with a BRASS of 11–21. Furthermore, patients with an LOS longer than 4 days had an average BRASS of 8. Like Mistiaen and colleagues, we argued that the BRASS index is a promising instrument for discharge planning, but needs further development. As shown by our ROC curve, when used alone as a diagnostic tool BRASS is fairly accurate. However, our results showed that there are other patient-specific factors that also correlate with prolonged LOS that, when used, can increase the sensitivity or PPV of such an assessment.

Our results showed that patient-specific factors, such as age, type of surgery and elevated ASA score, were all correlated with a prolonged postoperative LOS. Thus, when used in conjunction with the BRASS screening tool, they could potentially more effectively and accurately identify patients at risk of prolonged LOS. Results from Husted and colleagues, who looked at predictors of LOC in fast-track hip and knee arthroplasty procedures, found that patient variables, such as age, sex, marital status, comorbidity, preoperative use of walking aids, pre-and postoperative hemoglobin levels, need for blood transfusions, ASA scores, and the time between surgery and mobilization, all influenced LOS. However, the greater the number of variables accessed, the harder it is to control and interpret any resulting findings. We advocate the use of the BRASS score, ASA and type of surgery to target the at-risk population and simplify the screening process without too much effort. Keeping screening simple and effective improves efficiencies all around and is valuable in minimizing complications and LOS in our arthroplasty group.

**CONCLUSION**

The BRASS represents a novel and significant predictor of LOS following elective orthopedic surgery. We demonstrated that patients with a BRASS of 8 or more — especially a BRASS of 10 or more — following elective hip and knee arthroplasty surgery, are likely to stay in hospital 5 or more days and should receive pre-emptive social work consultations to facilitate discharge planning. Patient-specific factors, such age, type of surgery and ASA score, are correlated with prolonged postoperative LOS and can be used in combination with the BRASS to more effectively and accurately identify patients at risk of prolonged LOS. This would facilitate necessary arrangements for safe hospital discharge before admission and in turn facilitate timely and efficient posthospital continuity of care. This would allow for more hospital beds and resources to be available for future surgical procedures, reducing cancellations for lack of surgical beds and reducing costs per case for hospital budgets.

**Competing interests:** G. Wood declares being a paid consultant and receiving speaker fees from Stryker. No other competing interests declared.

**Contributors:** D. Cunic and G. Wood designed the study. D. Cunic, S. Lacombe and K. Kohajer acquired and analyzed the data, which H. Grant also analyzed. All authors wrote and reviewed the article and approved the final version for publication.

**References**

8. Canadian Institute for Health Information. *Hip and knee replacements*


---

**Change of address**

We require 6 to 8 weeks’ notice to ensure uninterrupted service. Please send your current mailing label, new address and the effective date of change to:

**CMA Member Service Centre**

1870 Alta Vista Dr.
Ottawa ON K1G 6R7

tel 888 855-2555 or
613 731-8610 x2307
fax 613 236-8864
cmamsc@cma.ca
The location of surgical care for rural patients with rectal cancer: patterns of treatment and patient perspectives

Michelle C. Nostedt, MD
Andrew M. McKay, MD, MSc
David J. Hochman, MD
Debrah A. Wirtzfeld, MD, MSc
Clifford S. Yaffe, MD
Benson Yip, MD
Richard Silverman, MD
Jason Park, MD, MEd

From the Department of Surgery,
University of Manitoba, Winnipeg, Man.

Presented as a poster at the Canadian Surgery Forum, Calgary, Alta., Sept. 13–16, 2012

Accepted for publication
May 20, 2014

Correspondence to:
J. Park
St. Boniface General Hospital
Z-3031-409 Taché Ave.
Winnipeg MB R2H 2A6
jpark@sbgh.mb.ca

DOI: 10.1503/cjs.002514

Background: Where cancer patients receive surgical care has implications on policy and planning and on patients’ satisfaction and outcomes. We conducted a population-based analysis of where rectal cancer patients undergo surgery and a qualitative analysis of rectal cancer patients’ perspectives on location of surgical care.

Methods: We reviewed Manitoba Cancer Registry data on patients with colorectal cancer (CRC) diagnosed between 2004 and 2006. We interviewed rural patients with rectal cancer regarding their preferences and the factors they considered when deciding on treatment location. Interview data were analyzed using a grounded theory approach.

Results: From 2004 to 2006, 2086 patients received diagnoses of CRC in Manitoba (colon: 1578, rectal: 508). Among rural patients (n = 907), those with rectal cancer were more likely to undergo surgery at an urban centre than those with colon cancer (46.5% v. 28.8%, p < 0.001). Twenty rural patients with rectal cancer participated in interviews. We identified 3 major themes from the interview data: the decision-maker, treatment factors and personal factors. Participants described varying input into referral decisions, and often they did not perceive a choice regarding treatment location. Treatment factors, including surgeon factors and hospital factors, were important when considering treatment location. Personal factors, including travel, support, accommodation, finances and employment, also affected participants’ treatment experiences.

Conclusion: A substantial proportion of rural patients with rectal cancer undergo surgery at urban centres. The reasons are complex and only partly related to patient choice. Further studies are required to better understand cancer system access in geographically dispersed populations and to support cancer patients through the decision-making and treatment processes.
Colorectal cancer (CRC) is the third most common cancer diagnosis and the second most common cause of cancer-related death in Canada. In the province of Manitoba, nearly 900 people received diagnoses of CRC in 2012. Given the population distribution in which nearly half of the province’s population resides in nonurban regions, the number of people from rural areas requiring treatment for CRC is substantial.

Numerous authors and health care policy-makers have advocated for the regionalization of cancer services (particularly of high-risk cancer procedures) to high-volume centres. These authors argue that regionalization may improve patient outcomes as well as lower systemic costs by concentrating and making more efficient use of resources and personnel. Much of their argument is based on studies that report an association between hospital or surgeon case volumes and outcomes for major cancer operations. For rectal cancer, several studies suggest that long-term survival may be improved when surgical resection is performed at high-volume hospitals and by surgeons with high case volumes. Numerous studies have also reported an association between case volume and sphincter preservation rates, suggesting the chances of being stoma-free may be higher when surgery is performed at high-volume hospitals and by surgeons with subspecialized colorectal or oncology training.

There are, however, inconsistencies in the literature on the association between volume and outcomes pertaining specifically to rectal cancer. Furthermore, policies based solely on volume–outcome associations do not consider the preferences of patients residing in rural areas who may be most directly affected by regionalization. In fact, several studies suggest that patients are willing to risk significantly higher surgical mortality in order to be treated closer to home. Given a hypothetical scenario of resectable pancreatic cancer, Finlayson and colleagues reported that even if the operative mortality risk was doubled (6% at a local hospital v. 3% at a regional hospital), 45% of study participants would still prefer surgery at their local hospital to treatment at a regional centre.

While studies like those by Finlayson and colleagues attempt to determine where patients prefer to have surgery, they do not examine how patients make this choice. The present study aimed to quantify where patients from rural Manitoba underwent surgery for rectal cancer (local v. urban hospital) and to explore their perspectives on the factors that influenced their decision on where to undergo surgery.

**Conclusion:** A proportion considerable of patients atteint du cancer du rectum et vivant en milieu rural subissent leur chirurgie dans des établissements urbains. Les raisons sont complexes et ne sont qu’en partie reliées au choix du patient. Il faudrait mener d’autres études pour mieux comprendre l’accès aux services offerts aux personnes atteintes de cancer dans les populations géographiquement dispersées et pour les appuyer dans le processus de prise de décision et de traitement.

**Methods**

**Setting**

The University of Manitoba Health Research Ethics Board approved this study. The province of Manitoba covers a vast geographic area of almost 650 000 km². Its area is twice that of the entire United Kingdom. It has a population of more than 1.2 million people, 57% of whom live in Winnipeg, the capital city and only major urban centre. Manitoba has 2 urban tertiary care and 4 urban nontertiary care hospitals in Winnipeg and 8 rural hospitals outside of Winnipeg where major colorectal surgery can be performed. Manitoba’s health care system, like all of Canada’s, is publicly funded, and seeing a specialist usually requires a referral from another medical practitioner.

**Population-based analysis of surgical care location**

All patients who received a diagnosis of adenocarcinoma of the colon or rectum between Jan. 1, 2004, and Dec. 31, 2006, were identified from the population-based Manitoba Cancer Registry (MCR), which collects information on all patients with a cancer diagnosis in Manitoba. The MCR contains high-quality cancer reporting data and is maintained by CancerCare Manitoba, the province’s central cancer agency. We obtained patient demographic, tumour and treatment data from the MCR. We performed χ² analyses to test associations between tumour site and place of residence and surgery (α = 0.05).

**Patient interviews**

A convenience sample of surgeons in Manitoba (from both rural and urban settings) who performed rectal cancer surgery were contacted and asked to enroll patients. English-speaking patients residing outside of Winnipeg who had stage I–III rectal cancer diagnoses and were scheduled to undergo curative-intent surgery were eligible to participate in our study. We offered participating patients a small honorarium (CAD $20 gift card).

We conducted telephone interviews with individual participants before surgery in order to more closely approximate the preoperative decision-making context (as opposed to the postoperative context when outcomes may affect perceptions). Interviews were conducted from June 2010 to July 2011. We used a semi-structured interview script (see...
the Appendix, available at canjsurg.ca) that included open-ended questions on the factors patients considered when deciding on treatment location, how this decision affected them and their personal supports (i.e., family, friends and caregivers), and their satisfaction with their decision. Interviews were audio-recorded and transcribed verbatim.

**Data analysis**

The data were analyzed for emergent themes using a grounded theory approach. Grounded theory describes a systematic approach to interpreting qualitative data that aims to generate theory in an area of social inquiry.\(^{19,20}\) Two researchers (M.N. and J.P.) read and analyzed the interview transcripts as they were collected. Themes were identified and further refined with each iteration of analysis. Sampling continued until no further themes were forthcoming from the data, consistent with a theoretical sampling strategy. A single researcher (M.N.) applied the final coding structure to the entire data set. We used NVivo qualitative data analysis software (QSR International Pty Ltd.) to organize the data.

**RESULTS**

**Population-based analysis of surgical care location**

Over the 3-year study period, 2086 patients received diagnoses of CRC in Manitoba (Table 1). The proportions of patients with rectal compared with colon/rectosigmoid cancer did not differ between patients in Winnipeg and those outside of Winnipeg (odds ratio [OR] 1.1, 95% confidence interval [CI] 0.9–1.3, \( p = 0.39\)). These proportions closely mirrored Manitoba’s population distribution, in which about 57% of the population lives in Winnipeg. However, a significantly higher proportion of patients with rectal compared with colon/rectosigmoid cancer underwent surgery in Winnipeg (OR 1.5, 95% CI 1.2–2.0, \( p < 0.001\)).

A total of 427 rectal cancer patients underwent surgical treatment (Table 2). Of the 172 patients from rural areas who had surgery, 80 had procedures in Winnipeg and 92 had procedures at a rural hospital. This means that 80 of 172 patients (46.5%) had procedures in Winnipeg, while 92 of 172 (53.5%) rural patients underwent surgery at a rural hospital. In comparison, 363 rural patients with colon/rectosigmoid cancer underwent surgery; of these, 162 (28.8%) had surgery in Winnipeg. The proportion of rural patients who underwent surgery in Winnipeg was significantly higher for patients with rectal cancers than those with colon/rectosigmoid cancers (OR 2.1, 95% CI 1.5–3.1, \( p < 0.001\)).

**Patient interviews**

We conducted interviews with a convenience sample of 20 patients, all of whom went on to have surgery at 1 of 2 tertiary care centres in Winnipeg (Table 3). Participants lived a median of 186 (range 58–769) km from the centre where they were scheduled to have surgery. In comparison, they lived a median of 70 (range 0–187) km from the closest rural hospital that performed rectal cancer surgery. Our study protocol also included
Patients were referred to their surgeon by their family doctors, gastroenterologists, oncologists or another surgeon. At this referral decision point, 2 subthemes emerged: the patient had some input into the decision, or the patient was not offered a choice as to where they would have surgery.

Patients who had input in the referral decision cited many treatment-related factors (described below) as reasons for their decisions. Patients who were not offered the choice of surgical location fell into 2 categories: those who needed tertiary care for medical reasons and those who were referred without any perceived doctor–patient discussion. Some patients had extensive disease or significant medical comorbidities that required care at a tertiary centre. Other patients who planned to have surgery outside of Winnipeg; however, we were unable to accrue any of these patients.

Participants’ discussion on location of surgical care reflected 3 major themes: the decision-maker, treatment factors and personal factors. The decision-maker described who decided on where to send the referral. Treatment factors described how the hospital or surgeon might influence the patient’s choice based on treatments or perceived outcomes. Personal factors described how individual patients’ personal circumstances, including finances and support, were considered and/or affected by the location of care. Boxes 1 and 2 show quotations for the themes of treatment and personal factors.

### Decision-maker

Patients were referred to a tertiary centre for medical reasons and those who were not offered a choice as to where they would have surgery. At this referral decision point, 2 subthemes emerged: the patient had some input into the decision, or the patient was not offered a choice as to where they would have surgery.

Patients who had input in the referral decision cited many treatment-related factors (described below) as reasons for their decisions. Patients who were not offered the choice of surgical location fell into 2 categories: those who needed tertiary care for medical reasons and those who were referred without any perceived doctor–patient discussion. Some patients had extensive disease or significant medical comorbidities that required care at a tertiary centre. Other patients who planned to have surgery outside of Winnipeg; however, we were unable to accrue any of these patients.

### Table 3. Clinical characteristics and treatment data on patients who participated in the interviews, n = 20

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Median (range)</th>
<th>mean ± SD*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, yr</td>
<td>63 (35–86)</td>
<td>62 ± 11.2</td>
</tr>
<tr>
<td>Sex, female:male</td>
<td>6:14</td>
<td></td>
</tr>
<tr>
<td>Distance of tumour from anal verge, cm</td>
<td>8 (0–10); 6.6 ± 3.1</td>
<td></td>
</tr>
<tr>
<td>Neoadjuvant treatment, no.</td>
<td>Yes 16</td>
<td>No 4</td>
</tr>
<tr>
<td>Stage 0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Stage 1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Stage 2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Stage 3</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

SD = standard deviation; TNM = tumour–node–metastasis.
*Unless otherwise indicated.
†Final pathological stage, no.

### Box 1. Example comments from rural patients with rectal cancer about treatment-related factors involved in decisions on location of surgery

**Surgeon-related**

Skill and volume: “I would probably want to go to the city... because they would see more of that kind of surgery. They would have more experience. Obviously you want to have the surgery where someone’s doing it all the time, that particular surgery” (participant 011, 63-year-old woman).

Reputation: “I just wanted the best doctor that we referred to... I guess that’s pretty much it. I asked [the referring doctor] for the background on [the surgeon]. I guess who the best doctor was. The doctor here... had recommended Dr. A, and then I just asked a few doctors what he was like” (participant 010, 35-year-old man).

Interpersonal relationship: “Sometimes when you meet someone [like the surgeon], in a few minutes you trust them” (participant 017, 71-year-old man).

**Hospital-related**

Volume: “They do more surgery there [in Winnipeg], I think, than anywhere else. You feel more secure at a bigger hospital. The smaller towns, how many they do in a month? Where in Winnipeg, they be doing it regular, wouldn’t they?” (Participant 004, 57-year-old man).

Reputation: “If I did have a choice, I would have chosen Hospital X. It’s a top notch hospital.” (Participant 015, 63-year-old man).

Medical expertise and resources: “I never actually chose [where I wanted to have surgery]. I was going to go to [my local hospital], but they said that I had breathing problems.” (Participant 012, 75-year-old man).

Previous experiences: “[The tertiary care centre], I know, has some dandy doctors in there. Like, they’ve saved my wife’s life twice already, so...” (Participant 012, 75-year-old man).

Coordination of care: “That’s the reason that I like seeing my general practitioner... because he is in Hospital Y and I like that whole idea of my general practitioner is not far from there, and whatever he does, he does it at Hospital Y. When he made a referral, he referred me to somebody from there, and the tests were there. Then when I got referred to an oncologist, it’s somebody just across the street, and who also operates there. I like all of that. To me, it’s very more family-oriented” (participant 014, 60-year-old woman).

### Box 2. Example comments from rural patients with rectal cancer about patient-related factors involved in decisions on location of surgery

**Travel:** “It’s all the travelling. We’ll probably do a good 35–40 trips into Winnipeg. It involves a good part of the day each time. It’s 28 trips for the radiation alone... round trip, it’s 260 km, but I like to leave about 21/4 hours before my appointment. Now our world revolves around going to Winnipeg. It’s consumed our life. The distance doesn’t get any shorter. And we’re both not feeling well, so it’s easier if someone drives us in” (participant 020, 63-year-old man).

**Personal supports:** “It is a problem for family to get to wherever you are. So, the closer you can be to where family is, the better, basically” (participant 008, 53-year-old man).

**Accommodation:** “Once I got proper accommodation and I was able to secure an apartment, at least I had some kind of home base, instead of working out of a motel” (participant 011, 63-year-old woman).

**Finances:** “It’s just hard for someone like us that come from a rural area and the whole cost falls on us. It doesn’t matter what it is, the whole cost is just phenomenal. We’re in the thousands of dollars now” (participant 011, 63-year-old woman).

**Work:** “We ranch, and of course my husband won’t be here to help feed calves and stuff like that for the next couple weeks. His brother will be doing it” (participant 018, 55-year-old woman).
patients were simply referred without any discussion of options regarding surgeon or treatment location. Many of these patients described following through with the referring doctor’s decision because they trusted their doctor. One patient stated, “It wasn’t really a choice. I was just recommended by my family doctor, who’s been my family doctor for over 30 years. Whatever he decides for me, that’s what I’m going to do” (participant 015, 63-year-old man). However, some patients followed their referring doctors’ recommendations because they were otherwise too overwhelmed by the context of the cancer diagnosis and treatments, as demonstrated by the following: “So, all of a sudden I was told this and to think about, okay, like where should I have surgery, who should be the surgeon? I didn’t even think about those things. My doctor said, ‘there’s [a surgeon] in Winnipeg, she’s very good, yadda yadda...’ And I just said, ‘okay.’ There really wasn’t much discussion around other surgeons or other hospitals. I think providing a little more information might be helpful” (participant 019, 51-year-old woman).

**Treatment factors**

The treatment factors taken into account when participants made their decisions were divided into 2 subthemes: surgeon and hospital factors. Participants described how the surgeon’s skill and case volume, reputation and interpersonal relationship with them affected their decisions about where to have surgery. Some participants wanted to be referred to a specialist who was experienced in that particular field and who had performed the required operation many times. Others asked to be referred to the “best” doctor or had heard about a particular surgeon and asked to be referred to that surgeon. Participants often expressed establishing a good and trusting relationship with their surgeons after meeting them, which seemed to make them more comfortable about the location of surgery and the treatment process.

Hospital factors that influenced where participants chose to have surgery included the hospital’s reputation and case volume, other medical specialists and resources, participants’ previous experience with that hospital and the coordination of care. First, it was important to patients that the hospital they chose had a good reputation and substantial experience in the type of surgery they would be undergoing. Second, participants also mentioned the hospital’s medical expertise (including the concentration of other medical specialists) and resources as a factor in their decisions. This was especially important for those with other significant medical conditions who may have required tertiary care support in the peri- or postoperative periods.

Some participants quoted familiarity and past experiences with particular hospitals when considering a location of care. In addition, some patients were already seeing an oncologist or another doctor at a certain hospital and wanted to continue being cared for in the same place in order to better coordinate all of their care.

**Personal factors**

Personal factors, including travel, support, accommodation, finances and work, were considerations in participants’ decisions. However, for our study participants, all of whom travelled for treatment, these were less often described as primary reasons to have surgery in a given location. Exceptions to this included patients who actually had more personal supports in Winnipeg than in their local communities. Rather, most participants described these factors as something of a burden or trade-off that required their acquiescence in order to receive surgery at a tertiary care centre.

Many patients described travelling for long distances to appointments, some up to 9 hours of driving. This travel took up a lot of time and often negatively affected their work, personal supports and finances, but many accepted it as a necessary trade-off to receive treatment at their desired or prescribed location. However, many of the participants who had no choice but to have treatment at a tertiary care centre because of comorbidities expressed a preference to have surgery closer to home. Other participants stated that because they lived in rural locations, they were used to travelling long distances, and for some patients, travelling to their local hospitals was only marginally closer than travelling to Winnipeg.

Having personal supports nearby was important for patients. However, some patients had more family members in Winnipeg, which actually made travelling less of an ordeal. Another consideration for participants travelling from far away was accommodation. Some participants had family members with whom they stayed when coming for appointments or surgery, but many did not and instead bore the additional costs of accommodations themselves. Participants stated that most of the travel and accommodation costs were their responsibility, and some felt this responsibility was quite a burden.

Twelve of 20 interview participants were working, whereas 8 were retired. Among those who were still working, their work was affected to varying degrees. Some patients’ employers had no problem allowing them time off work. Other patients had to personally make work arrangements; for example, 1 participant owned livestock and had to ensure his animals were cared for while he was away.

**Discussion**

In the first part of this study, we conducted a population-based analysis to examine patterns of treatment among patients with rectal cancer in Manitoba. There are few comparable population-based studies in the medical literature examining rural patients with CRC, and there is little information specific to Canadian populations. A recent
Australian study similarly reported that rural patients in New South Wales who had CRC were less likely to undergo surgery in a specialist cancer centre than patients from metropolitan or urban areas. In their study, only 11% of rural patients underwent surgery at specialist cancer centres. In contrast, almost half of all patients with rectal cancer in rural Manitoba underwent surgery in Winnipeg. Many Canadian provinces, like Manitoba, cover extremely wide geographic areas, but each may have unique characteristics with respect to population distribution and treatment patterns. Undertaking reviews of regional treatment patterns are thus important from policy and regional planning standpoints.

In the second part of this study, we performed a qualitative analysis to gain insight on how these treatment patterns develop and their effects on patients. We found that the underlying reasons for the patterns reported in the first part of this study were not always straightforward and that the effects could be quite burdensome for some patients. Previous qualitative studies involving rural obstetrical patients and patients undergoing more minor procedures reported decision factors similar to those in our study, including the desire for safety, availability of family support, familiarity with hospital staff and their environment, and financial costs. A major theme that was not described in these studies, however, was the lack of choice pertaining to treatment provider and location perceived by many rural patients.

While a lack of choice was understandable in patients with particularly extensive cancers or other significant medical problems, in other cases the underlying reasons were less clear. Previous qualitative studies have reported that health care professionals often do not involve patients in important treatment decisions. Some patients may not want an active role and are more than willing to let their doctors select their care providers. Other patients may be too overwhelmed, especially when given the cancer diagnosis, to process all the information and ask questions about the referral process. It may also be, however, that some doctors practise in a more paternalistic manner without making any efforts to engage patients. The consequences of these decisions are substantial and potentially burdensome, and multiple studies have shown that most patients desire involvement in the decision-making process.

We do not necessarily support a strict policy of centralization for rectal cancer surgery; instead, we have adopted an approach with provincial guidelines and a system of education with selective referrals to improve province-wide outcomes. In this context, the implications of our study include the need to understand the perspectives of referring doctors and how they make referral decisions and the need to understand when and how much patients want to be involved in decision-making and to develop resources to facilitate the process accordingly.

We propose a conceptual model of the decision process with the decision-maker, either the patient or referring physician, deciding where to make the referral based on treatment or patient-related factors (Fig. 1). Depending on individual patient circumstances and desires, these factors may work in concert to support a decision or they may work in opposition; in the latter case, some factors have to be prioritized at the expense of others. For example, rural patients who seek treatment at high-volume centres may have to yield on personal factors to receive this treatment. Alternatively, for an urban patient seeking treatment at a high-volume centre, treatment and personal factors both support treatment at a tertiary centre. Further study is, however, required to test this model.

**Limitations**

Several limitations require discussion. First, all interview participants planned to undergo surgery in Winnipeg. Despite our attempts, we were unable to accrue any rural patients in the presurgery setting who were planning to undergo surgery at their local hospital. One reason for this

![Conceptual model of the decision process showing the decision-maker considering treatment and patient-related factors.](image-url)
may have been that only a small number of rural patients (we estimate about 30) actually underwent surgery outside of Winnipeg during the interview period. Another reason may have been a lack of incentive for rural surgeons to enroll patients, or even possible concern over how a study asking about decisions on location of care for cancer surgery might be perceived by their patients. As a result, we were unable to gain the perspectives of rural patients undergoing surgery at their local hospitals, which may be different than those who planned to travel for their surgeries. Given other studies reporting that patients greatly prefer to have surgery closer to home,\textsuperscript{1,2} the uninterviewed sample may represent patients who actually had more input into the referral decision. Second, we limited our questions to more generic aspects of rectal cancer surgery. We did not specifically ask more technical questions, such as the likelihood of avoiding a stoma, as our interviews were conducted before surgery; we did not want to influence participants’ perceptions going forward, particularly when we were still trying to recruit patients planning to undergo surgery at a rural hospital. Third, our conceptual model is limited by context. Further study to include the perspectives of referring physicians and a broader range of patients is needed to test our model and assess its transferability.

**Conclusion**

Almost half of all rural patients with rectal cancer in Manitoba underwent surgery at urban hospitals. The reasons for this pattern are complex and only partly related to patient choice. We plan further studies to include referring physicians’ perspectives in order to better understand access and cancer treatment pathways in a publicly funded system with geographically dispersed populations. These studies can play important steps in informing health policy and planning, educating practitioners, promoting patient-centred care and supporting patients through the cancer-related decision-making and treatment processes.

**Competing interests:** None declared.

**Contributors:** All authors designed the study. M. Nostedt, J. Park, A. McKay and B. Yip acquired the data, which M. Nostedt and J. Park analyzed. M. Nostedt and J. Park wrote the article, which all authors reviewed and approved for publication.

**References**

Anastomotic salvage after rectal cancer resection using the Turnbull–Cutait delayed anastomosis

Background: Turnbull–Cutait abdominoperineal pull-through followed by delayed coloanal anastomosis (DCA) was first described in 1961. Studies have described its use for challenging colorectal conditions. We reviewed our experience with Turnbull–Cutait DCA as a salvage procedure for complex failure of colorectal anastomosis.

Methods: We performed a retrospective cohort study from October 2010 to September 2011, with analysis of postoperative morbidity and mortality.

Results: Seven DCAs were performed for anastomotic complications (3 chronic leaks, 2 rectovaginal fistulas, 1 colovesical fistula, 1 colonic ischemia) following surgery for rectal cancer. Six patients had a diverting ileostomy constructed as part of previous treatment for anastomotic complications before the salvage procedure. No anastomotic leaks were observed. All procedures but 1 were completed successfully. One patient who underwent DCA subsequently required an abdominoperineal resection and a permanent colostomy for postoperative extensive colonic ischemia. No 30-day mortality occurred.

Conclusion: Salvage Turnbull–Cutait DCA appears to be a safe procedure and could be offered to patients with complex anastomotic complications. This procedure could be added to the surgeon’s armamentarium as an alternative to the creation of a permanent stoma.


Résultats : Sept CAD ont été réalisées en raison de complications anastomotiques (3 fuites anastomotiques chroniques, 2 fistules rectovaginales, 1 fistule colovesicale, 1 ischémie colique) résulut du traitement chirurgical d’un cancer rectal. Six patients avaient subi une iléostomie de dérivation pour fuite anastomotique, dans la période précédant la CAD de sauvetage. À l’exception d’un patient, toutes les procédures se sont soldées en succès. Aucune fuite anastomotique n’a été observée après CAD. Un patient a dû subir une résection abdominopérinéale avec colostomie terminale permanente en raison d’ischémie colique aigue du colon distal après CAD. Aucun décès n’est survenu dans les 30 jours suivant la CAD.

Conclusion : La CAD de sauvetage apparait comme une intervention sécuritaire qui représente une option thérapeutique valable pour les patients souffrant de complications complexes de fuites anastomotiques colorectales. Cette intervention pourrait s’ajouter à l’arsenal du chirurgien comme alternative à la création d’une stomie permanente.
More than 50 years ago, Turnbull and Cutait described colonic pull-through with delayed colonic anastomosis (DCA) after rectal resection for the management of rectal cancer, chagasic megacolon and other colorectal conditions. Later developments regarding low rectal dissection and colorectal anastomosis, especially the advent of stapler anastomotic devices, made immediate primary anastomosis the preferred technique. Because it allows adhesion of the serosa of the distal colonic segment to the anal canal, DCA theoretically reduces anastomotic leaks and improves sphincter function preservation. It can be used as an ultimate procedure to salvage intestinal continuity and improves sphincter function preservation. The objective of our study was to review our initial experience with Turnbull–Cutait DCA as a salvage procedure for complex anorectal cases.

Methods

We conducted a retrospective cohort study to report the technical and clinical results of DCA as a salvage procedure. The Centre Hospitalier Universitaire de Québec (CHUQ) approved this study as a quality of care assessment study.

Selection of participants

From October 2010 to September 2011, all adult patients (≥18 years old) consecutively operated for salvage DCA in a single centre (CHUQ) were identified. Salvage DCA included surgeries performed for the treatment of complex anastomotic complications following colorectal anastomosis that failed previous treatment attempts and/or for which a permanent colostomy would be the next step. The DCA procedure was considered on an individual basis for challenging cases for which sphincter amputation and creation of a permanent stoma was otherwise believed to be the only remaining option. The clinical decision to proceed with DCA was made by the attending surgeon; DCA was not attempted for patients with fecal incontinence or anal sphincter hypotonia before the previous treatments (procedures that led to the condition to be potentially salvaged by DCA), as restoration of intestinal continuity was deemed unreasonable. Assessment of this premorbid fecal continence function was based on the attending surgeon’s judgment when posing the indication for DCA. Informed consent was obtained from all patients, who were offered a permanent stoma as the alternative therapeutic option.

Operative technique

Four colorectal surgeons performed all DCAs. The DCA procedure was performed in 2 surgical stages: the rectal resection and exteriorization of the proximal colon followed by a DCA several days later. For the first stage, the patient is in the lithotomy position under general anesthesia, and an abdominal approach is used. This part of the procedure is adapted to the modified anatomy that resulted from the previous rectal surgery, including previous splenic flexure mobilization. The distal remaining colon is mobilized enough to allow it to reach the anal verge without tension, and the neorectum is dissected down to the pelvic floor. Then, a perineal transanal approach is used to transect the distal neorectum at the level of the dentate line below the diseased segment and the previous anastomosis. The specimen is pulled through the anus. Mucosectomy is not routinely performed, and the anal sphincters are left intact. Proximal transection is performed with a linear stapler in order to respect the part of the neorectum involved in the anastomotic complication process. This leaves an exteriorized colonic stump of descending colon measuring 6–8 cm. This stump is then secured to the perianal skin with 2 sutures. A small venting hole is created by removing a corner of the staple line to allow for decompression of the stump (Figs. 1 and 2). The stump is enveloped in saline-soaked gauzes, and its viability is visually assessed daily when changing dressings. Final anastomosis is planned to take place 7–10 days later. During that interval, patients are fully ambulatory and resume a low-residue diet when judged appropriate.

During the second stage of the procedure, the colonic stump is sectioned at the level of the anal verge (Fig. 3). In order to preserve the adhesions between the colonic serosa and the anal canal, no dissection is made into this plane. A handsewn coloanal anastomosis is then performed at the level of the anal verge using interrupted absorbable sutures (Fig. 4).

Outcomes

The primary outcomes were technical feasibility (completed DCA) and 30-day morbidity and mortality. Secondary outcomes included rate of surgical reintervention and length of stay in hospital.

Data were prospectively captured using a standardized form. We collected information regarding demographics (age, sex, comorbidities, American Society of Anesthesiologists [ASA] score), investigation and details of previous procedures. Operative details (duration, estimated blood loss, laparoscopic v. open); delay between the 2 stages of DCA; length of stay after the first stage; postoperative complications, including anastomotic events (leaks, pelvic abscess, colonic stump necrosis); and 30-day mortality were recorded. The surgeon digitally assessed the integrity of the anastomosis at discharge, with other exams performed according to the clinical evolution. All patients had a clinical visit scheduled 3–4 weeks after discharge.
Statistical analysis

Observational description was undertaken. We conducted statistical analyses using XLSTAT version 2011.5 (Addinsoft SARL) for Excel (Microsoft). Continuous data are expressed as means with standard deviation (SD) or medians with interquartile range (IQR), as deemed appropriate, and categorical data are reported as proportions (no., %).

RESULTS

Seven patients underwent salvage DCA. Demographic and clinical data are presented in Table 1.

Three men and 4 women with a mean age of 60.3 (range 49–74) years underwent DCA for coloanal anastomosis salvage. Indications for surgery are detailed in Table 1. All were complications of a colorectal anastomosis that persisted and/or worsened despite previous treatments, including initial fecal diversion, multiple attempts at transrectal drainage or advancement flaps for fistulas. One patient (patient B) presented with severe sepsis due to colonic ischemia proximal to his anastomosis 9 days after his initial surgery. At the time of emergent surgery he was not stable enough to undergo repeated immediate anastomosis. Thus, resection of the ischemic colon and DCA were performed. The last patient (patient G) was referred to our institution for anastomotic rescue after a misfire of the

Fig. 1. Phase 1: After mobilization, the specimen is pulled through the anus and transected proximally.

Fig. 2. Phase 1: The colonic stump is secured to the perianal skin, and a venting hole is created.

Fig. 3. Phase 2: The colonic stump is sectioned at the level of the anal verge.

Fig. 4. Phase 2: Hand-sewn coloanal anastomosis is created with interrupted absorbable sutures.
stapling device during low colorectal anastomosis; the referring general surgeon was unable to perform a handsewn anastomosis. In total, 6 patients already had a diverting ileostomy from previous surgical treatment attempts of the anastomotic complication.

Median operative duration for the first stage was 145 (IQR 120–280) minutes, with a median estimated blood loss of 685 (IQR 563–2400) mL. A diverting loop ileostomy was created in the patient who did not have a previous one because of the complexity of the case.

The second stage was undertaken at a mean of 10 days after the first stage. This part of the procedure took less than 15 minutes in 6 patients; the other patient (patient E) had a reversal of her loop ileostomy at the same time.

Six of 7 (85.7%) DCA procedures were completed. One patient needed an abdominoperineal resection with a permanent colostomy post-DCA after extensive colonic ischemia.

Outcomes are detailed in Table 2. Five (62.5%) patients experienced complications: 2 had urinary tract

---

Table 1. Demographic and clinical characteristics of the 7 patients who underwent salvage DCA

<table>
<thead>
<tr>
<th>Patient</th>
<th>Sex</th>
<th>Age, yr</th>
<th>ASA score</th>
<th>Initial diagnosis and surgery</th>
<th>Indication for DCA</th>
<th>Previous treatment attempts</th>
<th>Previous stoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Female</td>
<td>61</td>
<td>1</td>
<td>Distal rectal cancer (pT1N0M0) Laparoscopic LAR</td>
<td>Large rectovaginal fistula with cloaque (subtotal anastomotic disruption) Anal stricture</td>
<td>Noninvasive anal dilations Transrectal drainage</td>
<td>None</td>
</tr>
<tr>
<td>B</td>
<td>Male</td>
<td>62</td>
<td>2</td>
<td>Distal rectal cancer Neoadjuvant brachytherapy Laparoscopic LAR</td>
<td>Distal colonic ischemia on POD 9, with severe sepsis</td>
<td>None DCA at the time of intervention for ischemia.</td>
<td>Loop ileostomy at initial surgery</td>
</tr>
<tr>
<td>C</td>
<td>Female</td>
<td>49</td>
<td>1</td>
<td>Distal rectal cancer Neoadjuvant chemoradiotherapy Laparoscopic LAR</td>
<td>Anastomotic leak (&gt; 180° disruption) on POD 6 Chronic pelvic abscess</td>
<td>Multiple transrectal drainage</td>
<td>Loop ileostomy at initial surgery</td>
</tr>
<tr>
<td>D</td>
<td>Female</td>
<td>64</td>
<td>2</td>
<td>Distal rectal cancer Neoadjuvant chemoradiotherapy Laparoscopic LAR</td>
<td>Rectovaginal fistula</td>
<td>Rectal advancement flap Fecal diversion</td>
<td>Loop ileostomy</td>
</tr>
<tr>
<td>E</td>
<td>Female</td>
<td>74</td>
<td>2</td>
<td>Mid-rectal cancer Open LAR</td>
<td>Anastomotic leak (&gt; 180° disruption) on POD 6</td>
<td>Transrectal drainage</td>
<td>Loop ileostomy at initial surgery</td>
</tr>
<tr>
<td>F</td>
<td>Male</td>
<td>51</td>
<td>2</td>
<td>Mid-rectal cancer Neoadjuvant chemoradiotherapy Open LAR</td>
<td>Colovesical fistula</td>
<td>Fecal diversion Noninvasive anal dilations</td>
<td>Loop ileostomy</td>
</tr>
<tr>
<td>G</td>
<td>Male</td>
<td>61</td>
<td>2</td>
<td>Mid-rectal cancer Neoadjuvant chemoradiotherapy Laparoscopic LAR</td>
<td>Failure to initially perform CAA (misfired stapler) — referral to tertiary centre</td>
<td>Failed attempt at initial handsewn CAA</td>
<td>Loop ileostomy at initial surgery</td>
</tr>
</tbody>
</table>

ASA = American Society of Anesthesiologists classification; CAA = coloanal anastomosis; DCA = delayed coloanal anastomosis; LAR = low anterior resection; POD = postoperative day.

---

Table 2. Postoperative outcomes for the 7 patients who underwent salvage DCA

<table>
<thead>
<tr>
<th>Patient</th>
<th>Time to oral intake, d</th>
<th>Interval between DCA stages</th>
<th>Reoperation</th>
<th>Postoperative course</th>
<th>Post-DCA length of stay, d</th>
<th>Follow-up, d</th>
<th>Stoma reversal, time interval</th>
<th>Anastomotic leak*</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3</td>
<td>12</td>
<td>No</td>
<td>Urinary tract infection</td>
<td>12</td>
<td>427</td>
<td>Awaiting reversal surgery</td>
<td>No</td>
</tr>
<tr>
<td>B</td>
<td>10</td>
<td>8</td>
<td>No</td>
<td>Ileus</td>
<td>12</td>
<td>521</td>
<td>Yes, 217 d</td>
<td>No</td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>11</td>
<td>No</td>
<td>Pelvic abscess</td>
<td>13</td>
<td>436</td>
<td>Yes, 597 d</td>
<td>No</td>
</tr>
<tr>
<td>D</td>
<td>3</td>
<td>9</td>
<td>No</td>
<td>Urinary tract infection</td>
<td>17</td>
<td>292</td>
<td>Refused stoma reversal</td>
<td>No</td>
</tr>
<tr>
<td>E</td>
<td>2</td>
<td>11</td>
<td>No</td>
<td>Uneventful</td>
<td>17</td>
<td>254</td>
<td>Yes, 154 d</td>
<td>No</td>
</tr>
<tr>
<td>F</td>
<td>1</td>
<td>8</td>
<td>Yes: APR Colonic stump necrosis</td>
<td>14</td>
<td>184</td>
<td>NA</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>3</td>
<td>12</td>
<td>No</td>
<td>Uneventful</td>
<td>12</td>
<td>265</td>
<td>Yes, 193 d</td>
<td>No</td>
</tr>
</tbody>
</table>

APR = abdominoperineal resection; DCA = delayed coloanal anastomosis; NA = not applicable.

*Radiological assessment of anastomotic leak was undertaken based on clinical evolution of patients.
infections, 1 had ileus, 1 had colonic stump necrosis and 1 had a pelvic abscess. No major cardiorespiratory events and no 30-day mortality were observed. Oral intake was resumed by a mean of 3.5 ± 3.3 days after the first stage of DCA and 1.6 ± 0.8 days after the second stage. On last follow-up, 4 patients had a stoma reversal, 1 patient was awaiting reversal surgery and another patient refused to have his stoma closed. The median time to stoma reversal was 205 (range 143–597) days. At a median of 274 (IQR 258.5–394) days, no anastomotic leak was noted based on clinical evaluation, and 1 pelvic abscess (12.5%) occurred in a patient with a chronic cavity at the time of DCA. The mean length of stay following the first stage of DCA was 13.9 ± 2.3 days.

**DISCUSSION**

We report our initial experience with the use of Turnbull–Cutait DCA as a salvage procedure in patients with complex anorectal conditions. Since reports by Cutait himself,\(^2,3\) to our knowledge, the present study involves the first reported cohort undergoing DCA specifically for salvage purposes. Our patients had a previous low anterior resection with coloanal anastomosis and experienced severe anastomotic complications despite multiple treatment attempts. salvage DCA was considered for the most challenging cases as a last resort before sphincter amputation and permanent colostomy. Indeed, in these patients a permanent stoma was considered to be the only other option. We successfully completed DCA in 6 patients, and intestinal continuity was restored in 4. One patient had an abdominoperineal excision for proximal colonic ischemia after DCA. In this patient, the clinical situation and the remaining length of the colon precluded a new attempt at DCA.

Most patients experienced a relative ischemia and, sometimes, necrosis of the exteriorized colonic stump. We believe that the inevitable radial pressure exerted on the colonic stump by the sphincter complex likely leads to a relative ischemia of the exposed colon. Despite this phenomenon, the colon was found to be viable at the level of the anal verge at the time of transection during the second stage of the procedure. Therefore, the anastomosis could be performed in 6 of 7 patients. The patient who had extensive colonic ischemia that precluded the second stage of DCA and required a permanent colostomy was an obese man (body mass index 37) with a narrow pelvis. Technical difficulties associated with bringing the proximal colon through the anus were experienced at the initial stage, and this may have compromised the blood supply of the distal colon. With this exception, our experience indicates that a distal colon segment of sufficient length can be obtained for safe pull-through in most patients, as long as time is taken to perform a generous colon mobilization during the abdominal portion of the procedure. In this very specific population of patients in whom initial anastomosis has failed, the need to exteriorize a segment of distal colon through the anal canal to perform DCA appears to be an interesting strategy to ensure truly tension-free salvage anastomosis. Finally, we should mention that rectal prolapse resulting from DCA has not been an issue in our experience, nor has it been reported in the current literature on this technique.\(^6\)

Once considered surgical legacy, Turnbull–Cutait DCA has recently been reintroduced in surgical practice. Recent experience with DCA has been reported by only a few centres in France and by the Cleveland Clinic in the United States.\(^6\) In 1996, Baulieux and colleagues\(^4\) reported on the use of DCA for the treatment of low rectal carcinoma that received radiation therapy. Of 24 patients who underwent DCA without fecal diversion, no anastomotic leak was reported, and 1 patient experienced anastomotic stenosis. In 2011, Jarry and colleagues\(^7\) reported 2% leak and 6% pelvic abscess rates with DCA performed for primary management of distal rectal carcinoma. The only other cohort considering DCA for salvage purposes was reported by Remzi and colleagues\(^8\) as a prospective case-matched study comparing a mixed cohort of 44 patients undergoing salvage and primary DCA to 88 patients undergoing immediate anastomosis. Significant decreases in anastomotic leaks (3% v. 7%; \(p < 0.05\)) and pelvic abscesses (0% v. 5%; \(p < 0.05\)) were observed with DCA. In the present cohort, we achieved similar success (85.7%) and leak rates (none). One patient had a pelvic abscess drained percutaneously, and 1 needed an APR because of colonic stump necrosis. Because this is a highly selected population, global morbidity remains high. Four of our patients initially presented with acute or chronic sepsis, which compares to rates reported in previous series.\(^5,8\)

Most patients remained ambulatory and were able to resume a low-residue diet between the 2 stages of the procedure. A systematic review of the literature on DCA revealed that the mean interval between the 2 stages of the procedure is 7 (range 5–10) days.\(^6\) In the present study, the mean time between the 2 stages was 10 (range 8–12) days. While we aimed to perform the second stage after 7 days, we encountered difficulties related to access to the operating room whereby many cancellations occurred owing to human resources issues. All patients in our cohort had a diverting ileostomy. Some studies have reported good success with DCA without fecal diversion.\(^7,8\) However, that was in elective settings, such as resection for primary treatment of rectal cancer. In a salvage situation, most patients require diversion of fecal stream to help with
the control of local sepsis before treatment with DCA. Moreover, one could argue that fecal diversion may not be required at the initial stage of DCA once the initial sepsis is controlled. However, we felt our approach was safer given the magnitude of the damages in the pelvis. Remzi and colleagues also reported their experience with the use of routine fecal diversion when performing DCA with salvage purposes and achieved a 7% leak rate. Fecal diversion for the treatment of complex anastomotic complications is often used, and its combination with DCA in our series reflects the selection of patients with complex cases. At this point, it is difficult to ascertain whether fecal diversion is essential in these complex situations, although it appears prudent to use it liberally.

Few data are available on the functional outcomes after DCA. As the procedure results in a straight colorectal anastomosis, one would expect worse initial function. Colonic J-Pouch has been demonstrated to offer less daily bowel movement and fecal urgency after rectal resection than straight colorectal anastomosis. Given the need to pull a colonic segment straight through the anal canal, creation of such a reservoir is not possible with DCA, especially in salvage cases where one has to deal with the previously resected colon and modified anatomy. Recent data suggest that the straight neorectum can adapt over time to achieve similar function as a reservoir after 2 years. Comparison of functional issue after DCA is difficult because no assessment tool has been consistently used in previous series. In one study, Remzi and colleagues did not observe a significant difference on the mean Wexner score between DCA and immediate anastomosis (10.6 v. 12.2; p = 0.09). Overall, fair to good functional impairment has been suggested with DCA, depending on the scale used for measures. Unfortunately, no functional data were prospectively collected in our cohort. None of our patients required a new fecal diversion for poor function. In this population compared to patients having elective resection without anastomotic failure, functional results may not be optimal. However, considering that the traditional alternative treatment option for these patients involves the creation of a permanent stoma, salvage DCA offers an opportunity to maintain intestinal continuity and sphincter function that would otherwise be nonexistent. Owing to the scarring repercussions of a stoma, in our experience, many patients are willing to accept decreased functional results in order to avoid a permanent stoma.

The patients in our cohort were highly selected on an individual basis. Notwithstanding the benefit of DCA to maintain fecal function in challenging situations, it is not suited to all patients. Patients with potential contraindications include those for whom return of proper fecal continence is not anticipated despite restoring intestinal continuity (e.g., patients with fecal incontinence before the anastomotic complication, with sphincter hypotonia or with such a devascularized pelvic floor that function of the sphincter complex is compromised). A detailed history and physical examination are needed to evaluate the potential for fecal continence recuperation. To be technically feasible, DCA requires sufficient length of remaining distal colon to reach the anal verge without tension or risk of devascularisation. As the anal canal exerts pressure on the pulled-through colon, a very long anal canal could also be an issue depending on the length and vascularization of distal colon available for mobilization. Thus, careful review of the chart, previous operating report and current imaging are essential to appreciate the anatomy and plan for DCA.

Limitations

Our study has several limitations. Its descriptive nature and its small sample size cannot be overlooked. Patients were selected at the discretion of the attending surgeon without specific criteria; therefore, selection bias is possible. Because the patients selected for salvage DCA were unique and would have otherwise undergone permanent stoma creation, it was difficult to identify a proper sample of patients to match for comparison. Indeed, the control group would have differed either in the indication for surgery (nonsalvage) or in the procedure and expected outcomes (permanent stoma creation). This observational cohort details the use of DCA for very challenging cases to allow for individual appreciation of the feasibility and benefit of the technique. We acknowledge that the occurrence of anastomotic leaks was not systematically assessed by routine postoperative radiology exams and that subclinical leaks may then have been missed. Follow-up remains short, and more investigation will be needed to assess functional results. Although this study represents a small number of patients, to our knowledge, it is the first reported experience of the use of DCA for salvage purposes outside of the Cleveland Clinic series. Our study shows that DCA could be considered as an option for challenging complications of colorectal anastomosis and offers patients a chance at maintaining their anal sphincter function.

Conclusion

Turnbull–Cutait DCA appears to be safe as a salvage procedure for complex anastomotic failure following colorectal anastomosis. This remains a difficult procedure, especially in patients with previous pelvic sepsis. However, the procedure allowed for preservation of intestinal continuity.
for the majority of patients in our cohort. Data regarding functional outcomes and long-term follow-up are needed.

Competing interests: None declared.

Contributors: J. Hallet, A. Bouchard and R. Grégoire designed the study. J. Hallet, H. Milot, E. Desrosiers and A. Lebrun acquired the data, which J. Hallet, A. Bouchard, S. Drolet, E. Desrosiers and R. Grégoire analyzed. J. Hallet, A. Bouchard and S. Drolet wrote the article, which all authors reviewed and approved for publication.

References
Getting by with less — the “frugal tie”

Jacques Rizkallah, MD  
John M. Rothschild, MD  
Derek V. Exner, MD, MPH

From the Libin Cardiovascular Institute of Alberta, University of Calgary, Calgary, Alta.


Accepted for publication Apr. 3, 2014

Correspondence to:  
D.V. Exner  
3280 Hospital Dr. NW, Rm GE 63  
Calgary AB T2N 4Z6  
exner@ucalgary.ca  
DOI: 10.1503/cjs.003814

The ability to tie surgical knots efficiently and effectively is an essential surgical skill for medical procedures, especially pacemaker implantation. Device generators and their leads need to be safely anchored with sutures during implantation to prevent dislodgement and inadequate packaging in the pacemaker pocket. With most knot tying techniques, a generous amount of suture slack is required. We introduce a new technique that is a variation of the 2-handed surgical square knot and the 1-handed surgeon’s knot that allows one to finish or tie a knot when left with little slack.

**The frugal tie technique**

To start the knot, the short end of the suture is wrapped below the index finger (step 1; Fig. 1A). The long end of the suture then locks the short end in place.

**Summary**

The ability to tie surgical knots efficiently and effectively is an essential surgical skill for medical procedures, especially pacemaker implantation. Device generators and their leads need to be safely anchored with sutures during implantation to prevent dislodgement and inadequate packaging in the pacemaker pocket. With most knot tying techniques, a generous amount of suture slack is required. We introduce a new technique that is a variation of the 2-handed surgical square knot and the 1-handed surgeon’s knot that allows one to finish or tie a knot when left with little slack.

There are many ways to tie a suture during a surgical procedure. Depending on the surgeon’s experience and familiarity with a technique, most knots can be completed fairly rapidly. The 1-handed knot technique, or surgeon’s knot, is a common method. With most knot tying techniques, a generous amount of suture slack is required. We introduce a new technique that is a variation of the 2-handed surgical square knot and the 1-handed surgeon’s knot that allows one to finish or tie a knot when left with little slack. Depending on the finger size of the surgeon, with this new technique a knot can be made with a few centimeters or less of suture slack, obviating the need for a new suture or an instrument tie. This new technique allows greater efficiency and allows salvaging a knot during the crucial part of a procedure. This new 1-handed knot tying technique, which we term the “frugal tie,” allows the completion of a knot with very little slack.
Fig. 2. (A) Step 3: using the thumb of the hand holding the short end of the suture, the short end is folded over the long end and then (B) folded over the short end of the suture. (C–E) Steps 5–7: the folded end of the suture is pinched by the thumb and passed through the loop. The short end is subsequently grasped by the same thumb and index fingers or the same thumb and middle finger once passed through the loop and the knot placed down over the anticipated area. Steps 3–7 are completed in a continuous motion.
place (step 2; Fig. 1B). Using the thumb of the hand holding the short end of the suture, the short end is folded over the long end (step 3; Fig. 2A) and then folded over the short end of the suture (step 4; Fig. 2B). The folded end of the suture is pinched by the thumb and passed through the loop (step 5; Fig. 2C). The short end of the suture is then grasped by the same thumb and index fingers or the same thumb and middle finger once passed through the loop and the knot placed down over the anticipated area (steps 6 and 7; Figs. 2D and E). Steps 3–7 are completed in a continuous motion. To lock/reverse the tie, complete the second throw by wrapping the short end of the suture above the index finger instead of below it, as in step 1 (step 8; Fig. 3A). The long end of the suture locks the short end in place (step 9; Fig. 3B). As in step 3, using the thumb of the hand holding the short end of the suture, the short end is folded over the long end (step 10, Fig. 4A) and the knot is completed as described in steps 5–7; the short end of the suture is subsequently grasped by the same thumb and index fingers or the same thumb and middle finger once passed through the loop, and the knot is placed down over the anticipated area. Steps 10–14 are also completed in a continuous motion (Fig. 4C–E). Figure 5 shows the final configuration of the frugal tie, similar to a surgeon’s knot. Figure 6 shows a variation of the frugal tie technique using a needle driver when both ends of the suture are very short; the end of the suture held by the needle driver becomes the long end represented in Figure 1, and the described technique to complete the frugal tie is performed.

**Discussion**

In the surgical field, knot tying is an essential component of the procedure. In experienced hands surgical knots can be tied quickly, but they typically require a generous amount of suture slack. We introduce a knot tying technique that is a variation of the 2-handed surgical square knot and the 1-handed surgeon’s knot that allows one to finish or tie a knot with very little slack on the suture. If completed properly with adequate tension, this modified technique will have similar strength as the 1-handed surgeon’s knot as they both have similar locking principles in their throws (Fig. 5). The flat square knots and surgeon’s knot have been shown to have similar tension at failure and similar likelihood of untangling. Given the similarity in the knot configuration to the surgeon’s knot, the frugal tie technique will offer the same reliability as this standard approach.

**Acknowledgements:** Dr. Exner is Canada Research Chair in Cardiovascular Clinical Trials. Images provided by Joseph Rizkallah Photography.

**Competing interests:** None declared.

**Contributions:** All the authors read, approved, and contributed to the manuscript.

**References**

Fig. 4. (A) Step 10: as in step 3, using the thumb of the hand holding the short end of the suture, the short end is folded over the long end. (B) Step 11: the short end of the suture is folded over. (C–E) Steps 12–14: the folded end of the suture is pinched by the thumb and passed through the loop. The short end of the suture is subsequently grasped by the same thumb and index fingers or the same thumb and middle finger once passed through the loop and the knot placed down over the anticipated area. Steps 10 to 14 are completed in a continuous motion.
Fig. 5. Final configuration of the frugal tie. Note that the configuration is similar to a surgeon’s knot.

Fig. 6. Variation on the frugal tie technique using a needle driver when both ends of the suture are very short. The end of the suture held by the needle driver becomes the long end represented in Fig. 1, and the same technique to complete the frugal tie is performed.
What is the diagnostic value of C-reactive protein for the prediction and the exclusion of postoperative infectious complication after colorectal surgery?

Prosanto K. Chaudhury MD;
Marc G. Jeschke MD;
John R. Monson MD;
for the Members of the Evidence Based Reviews in Surgery Group

*The CAGS/ACS Evidence Based Reviews in Surgery Group comprises

Correspondence to:
M. McKenzie
Administrative Coordinator, EBRS
Mount Sinai Hospital, L3-010
60 Murray St., PO Box 23
Toronto ON M5T 3L9
fax 416 586-5932
mmckenzie@mtsinai.on.ca

DOI: 10.1503/cjs.015414

The term “evidence-based medicine” was first coined by Sackett and colleagues as “the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients.” The key to practising evidence-based medicine is applying the best current knowledge to decisions in individual patients. Medical knowledge is continually and rapidly expanding. For clinicians to practise evidence-based medicine, they must have the skills to read and interpret the medical literature so that they can determine the validity, reliability, credibility and utility of individual articles. These skills are known as critical appraisal skills, and they require some knowledge of biostatistics, clinical epidemiology, decision analysis and economics, and clinical knowledge.

Evidence Based Reviews in Surgery (EBRS) is a program jointly sponsored by the Canadian Association of General Surgeons (CAGS) and the American College of Surgeons (ACS). The primary objective of EBRS is to help practising surgeons improve their critical appraisal skills. During the academic year, 8 clinical articles are chosen for review and discussion. They are selected for their clinical relevance to general surgeons and because they cover a spectrum of issues important to surgeons, including causation or risk factors for disease, natural history or prognosis of disease, how to quantify disease, diagnostic tests, early diagnosis and the effectiveness of treatment. A methodological article guides the reader in critical appraisal of the clinical article. Methodological and clinical reviews of the article are performed by experts in the relevant areas and posted on the EBRS website, where they are archived indefinitely. In addition, a listserv allows participants to discuss the monthly article. Surgeons who participate in the monthly packages can obtain Royal College of Physicians and Surgeons of Canada Maintenance of Certification credits and/or continuing medical education credits for the current article only by reading the monthly articles, participating in the listserv discussion, reading the methodological and clinical reviews and completing the monthly online evaluation and multiple choice questions.

We hope readers will find EBRS useful in improving their critical appraisal skills and in keeping abreast of new developments in general surgery. Four reviews are published in condensed versions in the Canadian Journal of Surgery and 4 are published in the Journal of the American College of Surgeons. For further information about EBRS, please refer to the CAGS or ACS websites. Questions and comments can be directed to the program administrator, Marg McKenzie, at mmckenzie@mtsinai.on.ca.

Reference

SELECTED ARTICLE


KEY POINTS ABOUT THE ARTICLE

Objective: To assess the predictive value of C-reactive protein (CRP) level for postoperative infectious complications after colorectal surgery. Data source: PubMed. Study selection: The article included all studies that analyzed the diagnostic accuracy of CRP for predicting postoperative infectious complications after colorectal surgery. Methods: Data on 1832 patients were extracted independently by the same 2 reviewers. Any discrepancies were resolved by discussion. Each reviewer extracted true- and false-positive results and true- and false-negative results; in the 3 studies where this information was not directly available from the publications, the authors were contacted by email to request the data. All of the authors provided the additional information. For 1 study, the authors had access to the raw data. Results: Six studies were identified. The best performance of CRP to predict postoperative infectious complications was on postoperative day 4, on which the mean CRP cutoff value was 135 ± 10 mg/L, the pooled sensitivity was 68% (95% confidence interval [CI] 57%-79%), the specificity was 83% (95% CI 77%-90%) and the negative predictive value (NPV) was 89% (95% CI 87%-92%). The pooled area under the receiver operating characteristic curve was 0.81 (95% CI 0.73–0.89). Conclusion: The meta-analysis provides compelling evidence that CRP on postoperative day 4 has a high NPV for infectious complications (89%). Therefore, CRP measurement allows safe and early discharge of selected patients after colorectal surgery.

COMMENTARY

Postoperative infections remain a common cause of morbidity following colorectal procedures. They may occur in up to 40% of patients. However, in an era of enhanced recovery after surgery (ERAS) and other fast-track protocols, patients are being discharged from hospital within 3–4 days of surgery. There is concern among surgeons that these discharges happen before the infectious complications manifest and may thus lead to a delay in their diagnosis and treatment. The authors argue that this highlights an urgent need for tools to exclude infection before discharge.

C-reactive protein was discovered in 1930 and was described as the first acute phase protein. It is produced by the liver, and increases in CRP levels have been used by clinicians to detect infections or infectious complications. C-reactive protein is a short-acting acute phase protein with a half-life of 16–19 hours and is produced in response to an infectious or stress stimulus. However, despite some properties making it an ideal candidate for infectious complication detection, controversy remains about its use as a predictive marker. The authors have thus performed a systematic review and meta-analysis to assess the diagnostic value of CRP for the prediction and the exclusion of postoperative infectious complications after colorectal surgery.

The reporting of this study is based on the “Meta-analysis of observational studies in epidemiology” (MOOSE) consensus statement, which provides a structure for the reporting of meta-analyses of observational studies. This tool is specific for the meta-analysis of observational studies and has certain differences from the “Preferred reporting items for systematic reviews and meta-analyses,” (PRISMA) which is the most widely accepted tool, and is endorsed by many leading journals. The overall methodologic quality of the study is acceptable. The search strategy is outlined and, although limited to PubMed, reasonably comprehensive.

All the included studies were evaluated using a modification of the “Quality assessment of studies of diagnostic accuracy included in systematic reviews” (QUADAS) tool — a 6-item checklist. The most recent revision of this tool is available at www.bris.ac.uk/quadas/quadas-2/ but was not used by the authors. Studies were not excluded or weighted on the basis of this assessment. The presentation of the results of the assessment is, however, not in keeping with the format suggested by QUADAS. Readers are simply given a numerical score, whereas the suggested format presents a great deal more information that would enable the reader to better understand the strengths and weaknesses of the included studies.

Of 296 studies initially evaluated, only 6 studies involving a total of 1832 patients were included in the final analysis. There was considerable heterogeneity among the studies. All of them included data on postoperative infectious complications. The rate of infectious complications varied between 11% and 39%, with a pooled estimate of 23.7% (95% CI 16.2%–32.1%). Receiver operating characteristics (ROC) for CRP were plotted for postoperative days 1–5. C-reactive protein with a cutoff value of 135 mg/L performed best as a predictor of postoperative infectious complications on postoperative day 4, as indicated by the greatest area under the curve (AUC).

An ROC curve is created by plotting the fraction of true-positive results out of the total actual positive results (true-positive rate [TPR]) versus the fraction of false-positive results out of the total actual negative results (false-positive rate [FPR]) for the different possible cut points of a diagnostic test. The TPR is also known as sensitivity. The FPR can be calculated as 1 – specificity. The ROC curve shows the trade-off between sensitivity and specificity. The AUC is a measure of test accuracy. The area measures discrimination — the ability of the test to correctly classify those with and without the disease. An
AUC of 1 represents a perfect test, whereas an AUC of 0.5 represents a worthless one. The AUC of CRP on postoperative day 4 was 0.81, which would be considered reasonably good performance for a diagnostic test. Of historical note, ROC analysis is part of the field of signal detection theory developed during the Second World War for the analysis of radar images. Royal Air Force radar operators needed to decide whether the signals they were viewing represented actual enemy targets, friendly vessels or simply noise. Signal detection theory measures the ability of radar operators to make these decisions. Their ability to do so was called the “radar receiver operator characteristics.” It was not until the 1970s that signal detection theory was applied to the interpretation of medical test results.

The best pooled diagnostic odds ratio for CRP was 11.7 (95% CI 6.1–22.3) on postoperative day 4. The odds of patients with a postoperative infectious complication having a CRP value above the threshold were 11.7-fold higher than in patients without infection. Similarly, the NPV of a CRP of 135 mg/L on postoperative day 4 was 89.3% (95% CI 87.1%–91.5%).

The evidence presented in the meta-analysis comes from heterogeneous studies of variable methodological quality. There is a strong potential for reporting bias (negative studies of CRP being unlikely to be published). The meta-analysis included only a few studies, and they had small sample sizes, therefore, the effect size may also be prone to bias. The clinicians were also not blinded to CRP results; thus, knowledge of CRP results may have influenced the diagnosis of infectious complications. The authors state, “conversely, if the CRP level on [postoperative day] 4 exceeds this cutoff, the patient must not be discharged and should be followed with clinical examination, laboratory testing, and imaging if necessary to actively confirm or exclude imminent postoperative infectious complications.” Wisely, this statement was not repeated in their conclusion, as the data were by no means strong enough to support it.

At best, we can say that CRP levels may be predictive of infectious complications, but that prospective evaluation is required. In the era of ERAS-based care pathways for the management of colorectal surgery patients, the target date for discharge is often postoperative day 3 or 4. The data presented here do not justify delaying discharge to investigate potential complications, but would serve to reassure clinicians that patients with CRP levels less than 135 mg/L are very unlikely to experience postoperative infectious complications after discharge.

Competing interests: None declared.

References:
PRACTICAL TIPS FOR SURGICAL RESEARCH

How to optimize participant retention and complete follow-up in surgical research

Ensuring all participants attend the follow-up visits is crucial to achieving an unbiased assessment of treatment effect. An important consideration is the feasibility and willingness of patients to participate in the trial and comply with the requirements mandated in the trial protocol. Patients' refusal to participate may result in low enrolment and limit the generalizability of the findings. Patients agreeing to participate but failing to complete the trial (i.e., those deemed lost to follow-up or those who withdraw from the trial) present a major threat to the internal and the external validity of the trial. This threat to validity is most prominent when there are systematic differences between the patients who do not complete the trial in the treatment groups. Akl and colleagues assessed the reporting and handling of loss to follow-up and its potential impact on the estimates of treatment effect in randomized controlled trials (RCTs) in highly ranked medical journals. The authors concluded that plausible assumptions of outcomes for the participants who were lost to follow-up could change the interpretation of findings. Therefore, surgical researchers should anticipate and strive to limit the loss to follow-up at the stage of trial design, during the trial conduct and at the time of data analysis.

OBJECTIVES

This article discusses the methodological impact of loss to follow-up on the internal and external validity of a trial and provides practical methods of obtaining complete follow-up in RCTs. We focus on the importance of minimizing and handling loss to follow-up in surgical trials. The reader will appreciate why minimizing loss to follow-up is important.

METHODOLOGICAL IMPACT OF LOSS TO FOLLOW-UP

The purpose of randomization in surgical trials is to balance the known and unknown prognostic factors at the initiation of the trial to provide an unbiased estimation of the treatment effect at the conclusion of the trial. If the prognostic factors are balanced across the treatment groups and the treatment has no effect, the number of participants experiencing the target outcome will be comparable among the groups. If the treatment has an effect and the between-group differences in outcome of interest are ascertained, the investigators can confidently relate the differences to the novel treatment. Failure to account for all included participants at the end of the trial presents a major threat to the internal validity of the trial. In reality, when conducting large RCTs, some participants are inevitably lost to follow-up. There are various reasons for participants not attending follow-up appointments — participants may have died, experienced the outcome of interest or ill health, or have satisfactory outcomes. Follow-up may be lost for practical and legitimate reasons; participants may change their names, addresses and phone numbers, or personal circumstances may prevent them from completing the trial.
At other times, participants may simply be noncompliant and/or lose interest in the trial.

Participants who do not attend follow-up visits often have different baseline characteristics than those who do attend. Previous research has demonstrated that losses to follow-up are higher when no treatment is needed after surgery, especially when a longer follow-up period with no specific treatment is required. The threats to credibility and validity of the trial are most prominent when there are systematic differences between comparison groups in the losses to follow-up or when there is attrition bias (i.e., withdrawals from the study). The differential loss to follow-up is greater when concomitant interventions, such as rehabilitation or physiotherapy, are required postsurgery for 1 group, but not the other. When comparing a surgical treatment to a medical treatment, there is a significant chance of attrition owing to participants who fail to attend follow-up visits or withdraw from the trial in the medical group owing to dissatisfaction with their treatment option. Michaels and colleagues conducted an RCT to compare surgery with conservative treatment for uncomplicated varicose veins. At 1-year follow-up, there was significant attrition owing to patients failing to attend follow-up visits or withdrawing from the trial. Further attempts to contact patients revealed that none in the surgical group withdrew owing to dissatisfaction with surgery, while in the conservative group most withdrawals were among patients who decided to undergo surgery. In fact, from our own experience, loss to follow-up is less of a problem in oncology trials than trauma trials. Different regions have reported contradictory data on participant retention in cancer trials. Judson and colleagues asked participants receiving chemotherapy at a tertiary cancer centre who had access to a home computer and prior email experience to self-report 7 symptomatic toxicities via the Internet, and they reported a monthly compliance rate of 83% without attrition until the month before a patient’s death. On the other hand, Sharma reported a very high loss to follow-up for cancer patients in India and suggested that methods used to minimize loss to follow-up in developed countries may not be practical in countries like India. Regardless of the reason, the participants who drop out or who are lost to follow-up represent an atypical subgroup. The systematic differences between the discontinuers and continuers threaten the credibility as well as the generalizability of the findings.

Many losses to follow-up particularly increase the possibility of a type-2 error (i.e., false-negative result), undermining the study power. A few patients lost in a 1000-patient trial may not threaten power, but a few hundred patients lost in a trial that size most likely will threaten power. In such a scenario, the probability that an effective intervention will be abandoned is not unrealistic. If an investigator strives to maintain the sample size, a high attrition rate can result in inflating the sample size and extending the length of the trial. This can create a delay in the roll-out of a potentially effective intervention, while increasing the cost and workload of the trial itself.

**METHODS OF OPTIMIZING PARTICIPANT RETENTION AT DIFFERENT STAGES OF A TRIAL**

The best strategy to limit loss to follow-up is prevention. To prevent loss to follow-up, we propose a more beneficial framework: segmenting the trials into consecutive stages. These stages not only represent the natural progression of a trial, but also the unique opportunity for minimizing participant attrition.

**Stage 1: planning the trial**

The planning stage is typically characterized by procurement of funding, establishment of the research team, selection of the clinical site, finalization of the trial protocol and case report forms, and development of the recruitment and retention strategy. The study protocol defines the population and the eligibility criteria, clinical setting (walk-in clinics v. hospital) and source of eligible patients. The rationale behind choosing a particular eligibility criterion must be well defined. Eligibility criteria that are too lax might give results that are not specific to the disease under consideration, and criteria that are extremely stringent will result in slow recruitment and will not be generalizable to the patient population.

Once the eligibility criteria are ascertained and the recruitment strategy developed, the investigators at each participating clinical site, in the case of a multicentre trial, may retrospectively estimate the possible recruitment rate (i.e., the number of patients that will be eligible for the study divided by the number of patients screened). This estimation can be accomplished by applying the eligibility criteria to patient charts at the centre retrospectively for 3 months or by conducting prospective sham enrolments. The research ethics board office will need to approve the method. In prospective sham enrolments, every study centre completes a patient screening form for all potential participants and ascertains the interest in participation for the eligible patients if such a trial were to exist. This method assists the investigators to obtain a real world sense of the time it will take to reach the sample size, resolve eligibility issues and recruit more study centres if required.

The compliance rate is an important factor to be considered during the trial planning stage. For example, a patient may be unable to refuse participation outright, possibly fearing a poor relationship with the investigator, but may eventually drop out later in the treatment protocol (passive resistance). Several studies have demonstrated a direct association between certain patient characteristics, such as race, age and history of substance abuse, and higher
rates of participant attrition. While excluding these patients may make the study less generalizable, including the patients poses a potential risk to the completeness of the data. Including a “run-in” or “wash-out” period in clinical trials in which patients complete 1–2 visits before inclusion in the study, can help differentiate compliant from noncompliant participants. Further, during the run-in period, collecting feedback on the intervention burden (i.e., issues related to the intervention that may affect adherence and compliance, such as injections or multiple trips to hospital) can assist to further resolve the noncompliance issue. Some tips to alleviate the intervention or patient burden and optimize participant retention are presented in Box 1.

Conducting a pilot or feasibility study on a smaller number of patients will assist in troubleshooting the operational aspects of a protocol for a full-scale trial. Issues such as participant recruitment and retention strategies, efficient use of resources (time and funds), intervention burden, choice of patient-important outcomes, appropriate length of follow-up and attrition likelihood, could be resolved with a feasibility study. In addition, duration, frequency and timing of the follow-up visits could be determined and maintained as close to “standard care” at the pilot stage. Furthermore, pilot studies are helpful in determining the minimal clinically important difference and calculating the sample size for the full-scale trial.

Because the estimated sample size represents the minimum allowable numbers, factors such as anticipated losses to follow-up, dropouts, drop-ins and noncompliance should be accounted for in sample size calculations to ensure an adequate level of power throughout the trial.

**Stage 2: initiation of the trial**

At this stage, the eligible participants (those who meet all of the inclusion criteria and none of the exclusion criteria) will undergo screening for enrolment in the trial. These eligible participants, depending on the design of the study, could be recruited sequentially or as a cluster. The “supremo” of this stage is the person, usually the onsite research coordinator, who will make the first contact with the patient about the trial. The goal is to assess the patients’ interest in the trial and provide detailed information on the trial if the patient is interested. The amount of effort, time commitment and associated risks should be discussed in detail. The screening process can vary from asking a few questions for some trials (e.g., Are you at least 18 years old? Do you read, write and understand English? Are you diabetic?) to conducting more detailed physical and laboratory examinations for others (e.g., prostate specific antigen testing, bone densitometry, magnetic resonance imaging). The time lag between the first contact, patient screening and the length of screening has been found to be proportional to the increased susceptibility of patients to drop out after enrolment. Patients who do not have a fixed address or who are going through a divorce or moving to another location, for example, should be handled with care for enrolment as it is highly probable that they will withdraw from the study. Any delay in completion of screening independent of the patient’s health and situation should alert the research personnel of the increased likelihood of attrition. Detailed characteristics of the patients screened and deemed eligible and those who agreed to participate as well as reasons for refusal to participate should be documented for reporting trial results according to the Consolidated Standards of Reporting Trials guidelines for early detection of selection bias and for generalizability of the study findings.

Once the patient is enrolled in the study, special consideration must be paid to establishing the relationship between the research coordinator and the participant. The research coordinator should be trained to collect the participant information in a culturally and sociodemographically sensitive manner. The standard set of information collected at this stage is provided in Box 2. For elderly patients, it is helpful to collect the contact information for their children or next of kin instead of collecting the address of an elderly spouse. A statement to this effect would have to be included in the informed consent form. If the patient is employed or owns a business, collecting information pertaining to the name of the employer/business, mailing address, phone number and website can also help in locating the patient. Additional age-specific strategies, like collecting Facebook or Twitter account details for younger patients can be used. More recently, trials in North America have resorted to collecting patients’ social insurance, drivers license and/or health card numbers, though ethics approval must be obtained and patient confidentiality must be protected at all times. Gathering this extra information takes only few minutes and may be vital to contacting a patient for future follow-up visits.

---

**Box 1. Tips to optimize participant retention**

**Target-oriented data collection**
- Collect only what is absolutely necessary to answer the research question.
- Prepare 2 sets of questions — 1 that is mandatory and 1 that can be waived in case it is not feasible for patients to complete.
- Alleviate the need for long-term follow-up by using proxy measures with earlier end points.
- Select questionnaires/procedures with lesser response time without compromising the result.

**Make it convenient for the participant**
- Complete questionnaires via telephone or send them in the mail.
- Email the questionnaires to the participant.
- Offer evening (after work hours) or weekend follow-up visits.
- Systematically organize trial procedures so that the patient moves quickly through the visits.
- Remain sensitive to wait times.
- Conduct the follow-up visits at a location convenient for the patient if possible (i.e., close to home/workplace/school).
Stage 3: conduct of the trial

During this stage, enrolment and follow-up visits are ongoing and it is expected that the logistical aspects of the trial be optimized. The most commonly advocated aspect in this stage is to maintain contact with the study participants. The research coordinator can contact the participants to confirm their full names (in case the name changed after to marriage or deed poll), mailing addresses, telephone numbers and names of general practitioners. This regular contact will assume greater importance if the time points or follow-up visits are spaced out. A tracking system (manual or electronic) can be used to improve scheduling of patients’ visits. Logbooks, automated email reminders, or computer software capable of ongoing updating and monitoring can be used. Computerized systems, though helpful, can be expensive and time-consuming to establish, but as more and more practices incorporate electronic health records, the use of computer-driven tracking and reminder systems will become more prevalent. Sharma20 has noted that the methods used to retain participation in Western countries may not apply to developing countries where treatment resources are not easily available. The study reported that a prepaid postcard system increased the follow-up rate from 33% to 69% among cancer patients.

A detailed report of the up-to-date status of every participant must be maintained. For instance, if a participant reports that her husband is scheduled for surgery at the time of her next follow-up visit, this should be noted and attempts should be made to accommodate this conflict.

The use of answering machines and toll-free numbers in addition to responding to patient phone calls in a timely manner will aid in this process.22 Details on patients who were missed or lost to follow-up and the related reasons should be documented. This information will be handy particularly if there is a change in research personnel. When a research coordinator leaves, temporarily or permanently, it can disrupt the trial substantially and hamper the trust and relationship established between participants and the coordinator. An agreement between the research staff and the principal investigator to provide 4 weeks’ notice before leaving the study allows adequate time to ensure that a replacement is found and may help avoid the possibility of damaging the participant–coordinator relationship.23 The training of new recruits by the senior staff is mandated apart from ensuring a long-term commitment from the coordinators.

The investigators should frequently review enrolment and follow-up rates across each of the participating clinical sites. If the enrolment is progressing at a rate slower than expected, a decision to involve more clinical sites can be contemplated. Regular meetings (quarterly or biannually), newsletters or emails from the principal investigators might be particularly opportune in maintaining contact with the participating sites. Collins and colleagues24 have proposed some strategies for salvaging a study when the recruitment is very slow. These strategies are to increase intake or the recruitment period (least likely to lead to bias) if slightly underestimated, to find other sources of study patients (e.g., community screening, media strategies, mass mailing), to increase the number of participating sites (impractical if it will take a long time to obtain ethics approval and start recruitment) and to replace the sites experiencing no or very slow recruitment. A “pay-for-performance” model19 in which sites are compensated based on enrolment and follow-up is recommended. Another proposed strategy is to relax the criteria for exclusion and include patients that were formerly excluded; however, the resulting problem with this option is that the study population will now be different from that entered previously. Another strategy is re-evaluation of the calculated sample size that most affects the integrity, credibility and decisiveness of the trial. A decision to recalculate sample size without compromising the clinically important differences, significance level and study power may be considered. Some of the planned subgroup analyses built into the sample size can be forfeited, or the study end points might have to be redefined.24 These approaches will reduce the confidence in the findings if the compromises are too great. Finally, the optimal decision might be early termination of the trial. Regardless of the wasted time, efforts and funds, this may be the only sensible decision if the recruitment is so slow that the required sample size cannot be achieved in a timely manner.24 Additional and practical strategies that can be used in certain population are described in Box 3.

**Box 2. Standard information collected at the baseline visit*\**

- First and last name
- Age
- Sex
- Date of birth
- Residential address
- Phone number (cellular:_________ home:_________)
- Email address
- Best time to contact
- Marital status
- Employment status
- Education level
- Income level

Additional information that could be collected (avoid misspellings)

- Next of kin name, address, telephone number
- Business name, address, telephone number and website
- General practitioner name, address and telephone number
- Facebook/MySpace/Twitter account name
- Drivers license number
- Health card number
- Social insurance number
- Passport number/permanent residency (or green card) number
- Participant photograph

*Information presented in this box must be collected in accordance with ethical principles, and patient confidentiality must be ensured at all times.
Stage 4: trial close-out

Once the last follow-up visit of the last enrolled patient is completed, the data are analyzed for patterns of missing data, and an effort is made to locate patients who were lost to follow-up. Contacting the patients’ next of kin, alternate contacts and/or employers should be the first steps to locate the patients. Hospital or electronic medical records, if available and up-to-date, are also useful to determine the patients’ current location and health status. Apart from this, publicly available resources, such as telephone directories, obituaries and death records, can be found via online searches. There are several information brokers who provide paid service and help in tracking a patient; however, use of such a service will depend on the trial budget and the stringency of privacy laws that apply in the trial location. Free websites, such as www.canadamissing.ca and www.findthemissing.org/en, also offer information.

Searching for surnames on Facebook or Twitter, enquiring in local churches and other searches can be performed to locate the patient. The reality of clinical research is that despite the best efforts of the research team, some patients will be lost to follow-up. They might have, for example, moved to a different location, been a part of natural calamity, gone to prison or died. Hence, it is crucial that every resource is used to identify the missing participants. Once they are deemed missing, different strategies to handle the missing data at the stage of data analysis should be considered. This is often anticipated and taken into account a priori at the stage of trial design. Tips to minimize loss to follow-up are provided in Box 4.

Methods of handling and reporting missing data

As mentioned, missing data can have a profound impact on the results of research studies by introducing bias and skewing the interpretation of the results. If the missing data are substantial, the power, credibility and validity of a research study can be substantially compromised. While some missing data are inevitable, these can be addressed using a variety of statistical approaches. It has been reported that missing data in RCTs are often improperly reported or handled. Therefore, it is crucial to plan for the handling of missing data at the stage of trial design. The methods of handling missing data vary depending on the nature of the data and the study design. Some common methods include imputation, likelihood-based methods, and multiple imputation. The choice of method depends on the type of data, the pattern of missingness, and the research question.

Box 3. Strategies for preventing loss to follow-up in certain populations

Pediatric patients
• Provide study-specific educational material to parents and children.
• Provide education and training manual to study staff (physicians, research coordinator, nurses, etc.) with tips for educating and motivating the patients.
• Organize semiannual or annual parties, gift toys, t-shirts, coffee mugs, pens, key chains, calendars, story books, and hats with study logo for the participants.
• Give certificate of appreciation to participants and thank you notes to parents.
• Give a “passport” containing a picture of the child. The child’s height and weight at each appointment are recorded in the passport, as well as the dates of scheduled food diary completion and activity.
• Update the passport by inserting a new photograph of the child at each clinic visit or annually. Take pictures of the entire family and post on a display board with a different theme each year.
• Respond promptly to questions and problems. Provide feedback on participation, and ask patients what motivates them.
• Provide babysitting services for guest children.
• Keep staff consistent.

Working population
• Schedule suitable visit times — early morning/evenings/weekends.
• Schedule visits close to work or home.
• Make arrangements for child care during visits.

Elderly patients
• Involve the patient’s family/caregivers.
• Allow rest between interviews/tests as needed.
• Arrange transportation to the visit location or reimburse the transportation costs.
• Keep the visit short (< 2 h).
• Provide opportunity for building social support by means of organized group educational sessions.
• Keep in touch, schedule appointments in advance and send reminders.

Patients with psychological issues
• Employ well-trained research personnel. Allow time to bond with the patient.
• Involve a family member or caregiver.

Racial minorities
• Employ well-trained research personnel; the same racial background is an advantage.
• Involve family members and translators if required.

Box 4. Tips to minimize loss to follow-up in surgical trials

Stage 1. Planning of the trial
• Determine clear eligibility criteria.
• Identify the patient population and clinical setting.
• Involve motivated investigators with previous successful trial records.
• Hire and train committed research staff.
• Calculate the recruitment yield (retrospective/prospective with sham enrolment).
• Include a “run-in” or “wash-out” period to identify compliant patients.
• Pilot the study to assess intervention burden and streamline logistics of the study.

Stage 2. Initiation of the trial
• Keep the duration between screening and enrolment short.
• Establish a relationship between participant and research personnel.
• Collect additional information at the baseline visit.
• Maintain a log of all events.

Stage 3. Conduct of the trial
• Regularly update the demographic status of participant via phone or mail.
• Use a manual or online tracking system to schedule visits.
• Immediately follow up on missing or incomplete information.
• Provide participants with a study newsletter summarizing any updates or preliminary results, or simply send a letter of appreciation.
• Send patients birthday or anniversary cards.
• Keep an up-to-date record of all patients in the study, and document reasons for drop-outs or exclusions.

Stage 4. Trial close-out
• Identify the loss to follow-up patients, and make an effort to locate them.
• Make the most optimal statistical adjustments.

Multicentre/international trials
• Have well-designed and repeated training sessions.
• Employ research personnel to coordinate the trial and answer the questions at each site.
• Arrange quarterly reliability checks.
• Organize a centralized data management and monitoring system.
addressed.\textsuperscript{25} This can be problematic, as evidence from RCTs is important for adequately evaluating interventions and forming the basis of evidence-based surgery. Once a patient is lost to follow-up, there are several means by which missing data can be handled. To decide how to handle the missing data, it is beneficial to know the reason why data are missing. Data could be missing completely at random (MCAR), missing at random (MAR) or missing not at random (MNAR).\textsuperscript{26} Data that are MCAR occur if the probability of missing data is the same for all participants and is not related to the values of that variable or any other variable in the data set\textsuperscript{27} (e.g., in a patient who had bariatric surgery, the missing value to the question asking about the participant’s weight was not related to the patient's weight or to the patient’s sex). Data that are missing owing to malfunctioning equipment, to data entry errors, or to the patient missing his/her follow-up visit because of traffic, for example, would be considered MCAR. Data that are MAR occur when the probability of missing data for a variable is not related to the values of that variable but rather to other variables in the data set (e.g., missing data on surgical wait times are unrelated to the wait times but are related to the hospital where the surgery is performed). Finally, data that are MNAR occur when the probability of missing data for a variable is related to the values of that variable but not related to other variables in the data set (e.g., a patient with hypertension misses her/his postoperative follow-up visit because of abdominal pain; in this situation, the missingness relates to the abdominal pain on the day of the postoperative visit but not to hypertension). Prior to conducting the statistical analyses to address missing data, it is important to consider the possible causes for the missing data and determine if they are MCAR, MAR or MNAR. There are different approaches to handle the missing data, including deletion, weighting, single imputation and multiple imputations.

The deletion method assumes that the missing data are MCAR and deletes cases with missing values. There are 2 approaches. Listwise or casewise deletion excludes all cases with missing data for any of the variables in the data set for all statistical analyses.\textsuperscript{28,29} The reduced sample size may lead to a decrease in statistical power of the study and increase type-II error rates.\textsuperscript{30} Nonetheless, this issue can usually be overcome with a larger sample size.\textsuperscript{10} With missing data that are not MCAR, the deletion method can lead to biased results, such as insufficient standard errors and too-large or too-small regression coefficients.\textsuperscript{27,30} The pairwise deletion approach involves deleting the cases with missing data for each analysis and leads to different sample sizes for different parts of the statistical analysis; this approach is not recommended.\textsuperscript{29} Weighting deletes the case with missing data but weights the cases with complete data to compensate for the cases with missing data. For example, if 1 case with complete data has very similar characteristics to 4 cases with missing data, the case with complete data will be weighted by 4 to supplement the data for the cases with missing information.\textsuperscript{27} Patrician\textsuperscript{27} stated that “weighting decreases the variation because multiple identical values are replacing the missing values.” Weighting reduces the bias that arises by case deletion methods but makes standard error calculation quite cumbersome.\textsuperscript{26,27}

Single imputation aims to generate data sets that are complete. Mean imputation involves replacing the missing data of a variable with the observed mean of all the available data for that variable.\textsuperscript{29} Hot-deck imputation assumes no difference between cases with complete and incomplete data and matches the cases with missing data to those with similar characteristics and imputes the known values.\textsuperscript{27} Finally, regression analysis (i.e linear regression or stochastic regression) is another way of dealing with missing data by imputing complete case information.\textsuperscript{27} Although single imputation is easy to use, it can be problematic because the uncertainty inherent in missing values is not taken into account. The imputed values are treated as if they were true, which overstates precision.\textsuperscript{27}

Last observation carried forward (LOCF) applies to repeated measures in longitudinal studies and is commonly used to deal with dropouts. It replaces the missing data with the measured data from the patient’s last follow-up visit. The flaw of this method is distorted calculation of effect size, which leads to wrong inferences and false conclusions unless the proportion of missing data is too small to affect inferences.\textsuperscript{11} When there are missing data on binary outcome measure, a common sensitivity analysis is to explore best and worst case scenarios by replacing missing values once with good outcomes and another time with bad outcomes.\textsuperscript{32} The disadvantage is that imputing all missing values as either good or bad is a strong assumption and can give a wide range of estimates of the treatment effect.\textsuperscript{12}

Multiple imputation is considered the most optimal method as it addresses the problem with a single imputation approach because it preserves the uncertainty inherent in missing data.\textsuperscript{33,34} There are several assumptions that are made with multiple imputations. The missing data are assumed to be MAR.\textsuperscript{15} For example, if a patient is likely to miss follow-up appointments because of some medical condition on the day of the appointment, then it is unlikely to justify the plausibility of an MAR assumption.\textsuperscript{12} Other assumptions are that the imputation model should reflect the intended model for the final analysis\textsuperscript{11} and should take into account other variables in the data set and their associations with the missing data.\textsuperscript{12} Multiple imputation involves the following 3 steps: randomly generate multiple data sets; analyze the data sets individually; and combine the results from the multiple data set analyses to produce a single set of parameter estimates, standard errors and test statistics.\textsuperscript{27,35,34} It is an advantageous approach as it can maintain sample size and thus statistical power for the study.
DISCUSSIONS EN CHIRURGIE

Transparency in the reporting of findings is essential, and Sterne and colleagues\(^1\) have provided guidelines for reporting the details of analysis potentially affected by missing data. In summary, the authors encourage researchers to report the number of missing values for each variable of interest; provide a flow chart with number of dropouts and patients lost to follow-up as well as the reason if possible; include a table comparing the baseline characteristics and outcomes of interest between participants with complete and incomplete data if substantial; describe the details of methods used to impute the missing data (i.e., the details of multiple imputation methods, modelling, included variables and used software) and the assumptions made to justify the use of that method (i.e., MAR); and provide results from analyses of the original and complete data set for comparison and discuss the differences.

**Economic aspects of patient attrition**

The budget for clinical trials could include compensating patients, staff, centres and referring institutes, with or without public campaigns. In lieu of available funding, 2 approaches might be adopted: the first is to start with the available budget and then determine what it can purchase in terms of recruitment and retention of participants, and the second is to set up a budget on a per-patient basis by calculating approximate recruitment costs to offset the research coordinator time on the trial. One strategy might be to contact the researchers from similar previous trials or to search the literature to deduce a reasonable cost for each participant.\(^6\) Laboratory tests, dropouts, compliance, office supplies, computer-related costs, travel expenses and advertising campaigns are some of the considerations that should be factored into the budget planning.

Commonly, patients are offered compensation in the form of cash, gift cards or parking passes, for example, to reimburse them for their time and research-related expenses. How much and when to compensate have been a matter of debate for past decade.\(^3\) Some researchers suggest that providing compensation to participants who complete the trial might put an undue pressure on the participants who will then participate passively.\(^3\) Ultimately, the decision to compensate lies in the hands of the investigator and the budget approved for the study. The compensation should not be so low that it barely compensates the patients for their time or so unreasonably high that it is not ethically acceptable.\(^9\)

**Conclusion**

Participant retention and complete follow-up increases the integrity and credibility of a research study. It optimizes the internal and external validity of the study findings. The possibilities of loss to follow-up should be anticipated and accounted for at the stage of planning a trial. Strategies should be used a priori at different stages — from design to trial close-out — to enhance participant retention and complete follow-up and to optimally handle the missed follow-up data in order to draw definitive conclusions.

**Acknowledgements:** The authors thank Dyda Dao for her contribution in gathering and summarizing the literature for selected sections of the manuscript.

**Competing interests and Funding:** The authors have no conflicts of interest to disclose. No funding was received for this article. M. Bhandari is funded, in part, by a Canada Research Chair, McMaster University.

**Contributors:** All authors contributed substantially to writing and revising and to the conception and design of this article and approved the final version for publication.

**References**

How you can get involved in the CMA!

The CMA is committed to providing leadership for physicians and promoting the highest standard of health and health care for Canadians. To strengthen the association and be truly representative of all Canadian physicians the CMA needs to hear from members interested in serving in elected positions and on appointed committees and advisory groups. The CMA structure comprises both governing bodies and advisory bodies either elected by General Council or appointed by the CMA Board of Directors. The Board of Directors — elected by General Council — has provincial/territorial, resident and student representation, is responsible for the overall operation of the CMA and reports to General Council on issues of governance.

CMA committees advise the Board of Directors and make recommendations on specific issues of concern to physicians and the public. Five core committees mainly consist of regional, resident and student representation while other statutory and special committees and task forces consist of individuals with interest and expertise in subject-specific fields. Positions on one or more of these committees may become available in the coming year.

For further information on how you can get involved please go to https://www.cma.ca/en/Pages/get-involved-in-cma.aspx, or contact

Cherise Araujo
Corporate and Governance Services
Canadian Medical Association
1867 Alta Vista Drive, Ottawa ON K1G 5W8
Fax 613 526-7570, Tel 800 663-7336 x1949
cherise.araujo@cma.ca

By getting involved, you will have an opportunity to make a difference.

We hope to hear from you!
Subscription rates (2015)
Libraries, research establishments and other multiple-reader institutions: Canada, Can$326; United States and other countries, US$378. Individual: Canada Can$210; USA US$247. Canadian subscribers please add applicable taxes. For other pricing information, please contact the Canadian Medical Association Subscription Office, PO box 810350, Birmingham AL 35283-0350; phone 800 633-4931 (Canada, USA) or 205 995-1567; fax 205 995-1588; cma@subscriptionoffice.com.

Other subscription information
All subscriptions are payable in advance, in Canadian currency to Canadian addresses, in US currency to all other addresses. Payment should be made to CMA in the funds specified, drawn on a Canadian or US bank, respectively. Visa, MasterCard and American Express are also accepted. Orders and requests for information on other journals should be addressed to the Member Service Centre.

Change of address
We require 8 weeks’ notice to ensure uninterrupted service. Please send your current mailing label, your new address and the effective date of change to the Member Service Centre.

Replacing missing issues
Claims for missing issues must be made within 3 months of the date of publication to be honoured and replaced (subject to availability) free of charge. Replacement copies of older issues, when available, must be prepaid at the single-copy rates listed below. Please submit claims, with a copy of your mailing label, to the Member Service Centre.

Single-copy sales
Subject to availability, single copies may be purchased for Can$22 or US$22. Please submit your order and payment to the Member Service Centre.

Article reprints
Commercial and author reprints can be purchased through Sheridan Press. To purchase commercial article reprints and ePrints, or to request a quote, please contact Matt Neiderer, Content Sales, Sheridan Content Services at 800 635-7181, ext. 8265; matt.neiderer@sheridan.com. Authors can order reprints by submitting an author reprint order form available at the Sheridan Press Electronic Order Centre at sheridan.com/cma/eoc or by contacting Lori Laughman, Customer Service Representative, Sheridan Reprints Services; lori.laughman@sheridan.com

Microform, abstracting and indexing
CJS appears in the following indexing/abstracting services: ASCA, AhlHyg, CBCARef, CINAHL, CPerf, ChemAb, CurCont, DentInd, ESPM, ExcerptMed, H&SSA, HelMc, ISR, IndMed, ImPharma, MEDLINE, NRR, NutrAb, PE&ON, RM&VM, Reac, RefZh, SCI, TDB.
— BLDCS (3035.800000), CISTI, GNLM, IDS, IE, infotrieve, ingenta, KNAW.CCC.

Electronic availability
All articles are available on the Internet (canjsurg.ca) in PDF format.

Permissions
Copyright for all material is held by CMA or its licensors. The CMA is a member of Access Copyright, The Canadian Copyright Licensing Agency, and has an agreement in place permitting them to grant organizations and individuals, on behalf of CMA, the right to respond to copyright requests. Please submit requests to Access Copyright using the Online Permission Request Service: http://discovery.accesscopyright.ca/. To find more information on licensing or to obtain a quote, please visit the Permission Services page at www.accesscopyright.ca/permissions/

Tarifs des abonnements (2015)
Bibliothèques, établissements de recherche et autres établissements à lecteurs multiples : Canada, 326 $Can; États-Unis et ailleurs, 378 $US. Individuels : Canada 210 $Can; États-Unis 247 $US. Pour les abonnés au Canada, veuillez ajouter les taxes applicables. Pour obtenir des renseignements sur les prix, veuillez communiquer avec le Canadian Medical Association Subscription Office, PO box 810350, Birmingham AL 35283-0350; tél 800 633-4931 (Canada, É-U) ou 205 995-1567; fax 205 995-1588; cma@subscriptionoffice.com.

Autres renseignements sur les abonnements
Tous les abonnements sont payables d’avance en dollars canadiens s’ils sont livrés au Canada, et en dollars américains ailleurs dans le monde. Prière d’envoyer son paiement, tiré sur une banque canadienne ou américaine respectivement, à AMC. Visa, MasterCard et American Express sont aussi acceptés. Les commandes et les demandes de renseignements sur les autres journaux doivent être adressées au Centre des services aux membres.

Changement d’adresse
Un préavis de 8 semaines est nécessaire pour assurer la livraison ininterrompue de votre abonnement. Veuillez envoyer votre étiquette postale actuelle, votre nouvelle adresse et la date d’entrée en vigueur au Centre des services aux membres.

Remplacement de numéros manquants
Pour recevoir gratuitement (sous réserve de sa disponibilité) un numéro manquant, vous devez présenter votre demande dans les 3 mois de la date de publication. Toute commande d’anciens numéros doit être réglée d’avance selon les prix de vente au numéro qui sont indiqués ci-après. Veuillez envoyer votre demande ainsi qu’une copie de votre étiquette postale au Centre des services aux membres.

Vente d’exemplaires à l’unité
On peut se procurer des exemplaires à l’unité (sous réserve de leur disponibilité) pour 20 $Can, 20 $US. Veuillez envoyer votre commande et votre paiement au Centre des services aux membres.

Tirés à part
On peut acheter des tirés à part d’auteur ou commerciaux auprès de Sheridan Press. Pour les tirés à part commerciaux et les cyberimpressions (ePrints), ou encore pour demander un prix, veuillez communiquer avec Matt Neiderer, Ventes de contenu, Sheridan Content Services (800 635-7181, poste 8265; matt.neiderer@sheridan.com). Les auteurs peuvent commander des tirés à part en remplissant le bon de commande de tirés à part d’auteur disponible au centre de commandes électroniques de Sheridan Press (sheridan.com/cma/eoc) ou en communiquant avec Lori Laughman, représentante du service à la clientèle, Sheridan Reprints Services (lori.laughman@sheridan.com). Microcopies, résumés et index Le JCC est résumé et fiché dans l’index des services spécialisés suivants : ASCA, AhlHyg, CBCARef, CINAHL, CPerf, ChemAb, CurCont, DentInd, ESPM, ExcerptMed, H&SSA, HelMc, ISR, IndMed, ImPharma, MEDLINE, NRR, NutrAb, PE&ON, RM&VM, Reac, RefZh, SCI, TDB.
— BLDCS (3035.800000), CISTI, GNLM, IDS, IE, infotrieve, ingenta, KNAW.CCC.

Accès électronique
Tous les articles sont disponibles sur internet en format PDF (canjsurg.ca).

Permissions
Le droit d’auteur de tout le matériel appartient à l’AMC ou à ses concédants. L’AMC est membre d’Access Copyright, l’agence canadienne de gestion du droit d’auteur, avec qui elle a conclu une entente qui permet à l’agence d’accorder à des organisations et à des personnes, au nom de l’AMC, le droit de répertoire à des demandes de reproduction de matériel protégé par droit d’auteur. Veuillez soumettre vos demandes au http://discovery.accesscopyright.ca/. Pour plus de renseignements ou pour obtenir un prix, veuillez consulter la page www.accesscopyright.ca/permissions/.

428 J can chir, Vol. 57, N° 6, décembre 2014 © 2014 Association médicale canadienne
Le Journal canadien de chirurgie accepte volontiers les annonces sur les carrières et annonces classées. Celles-ci doivent être reçues au JCC au plus tard 1 mois avant la date de parution.

Tarifs:
Grand format: 1 page 1200 $; 2/3 page 900 $; 1/2 page vert/horiz 800 $; 1/3 page 650 $; 1/4 page 500 $; 1/6 page 400 $. Mot des annonces: 120 $ jusqu'à 40 mots et 1.20 $ par mot supplémentaire (25 $ pour encadrement au trait). Encadré spécial jusqu'à 100 mots, 55 × 55 mm, 205 $. 20 charge (first insertion only) for CJS confidential reply box numbers.

VISA, MASTERCARD AND AMERICAN EXPRESS ACCEPTED.

Advertisements should be sent to: Journal of Surgery, Canadian Journal of Surgery, 1867 Alta Vista Dr., Ottawa ON K1G 5W8; tel 800 663-7336 or 613 731-8610 x2107/2041; fax 613 565-7488; email advertising@cma.ca

Send all box number replies to: Box . . . , Canadian Journal of Surgery, 1867 Alta Vista Dr., Ottawa ON K1G 5W8.

The Ontario Human Rights Code prohibits discriminatory employment advertising.

The Canadian Journal of Surgery is pleased to accept career/classified advertisements. The deadline is 1 month before issue date.

Rates:
Display ads: 1 page $1200; 2/3 page $900; 1/2 page vert/horiz $800; 1/3 page $650; 1/4 page $500; 1/6 page $400. Word ads: $120 for the first 40 words or less, additional words $1.20 each (additional $25 for frame). Special Display under 100 words, 55 × 55 mm, $205. $20 charge (first insertion only) for CJS confidential reply box numbers.

VISA, MASTERCARD AND AMERICAN EXPRESS ACCEPTED.

Advertisements should be sent to: Journal of Surgery, Canadian Journal of Surgery, 1867 Alta Vista Dr., Ottawa ON K1G 5W8; tel 800 663-7336 or 613 731-8610 x2107/2041; fax 613 565-7488; email advertising@cma.ca

Send all box number replies to: Box . . . , Canadian Journal of Surgery, 1867 Alta Vista Dr., Ottawa ON K1G 5W8.

The Ontario Human Rights Code prohibits discriminatory employment advertising.

Western University
London Health Sciences Centre & St. Joseph’s Health Care London
invites applicants for the position of

ACADEMIC VASCULAR SURGEON
DEPARTMENT OF SURGERY

The Division of Vascular Surgery, Department of Surgery, Schulich School of Medicine & Dentistry at The University of Western Ontario is seeking a full-time clinical academic vascular surgeon at the rank of Assistant, Associate, or Full Professor. The Division of Vascular Surgery is affiliated with London Health Sciences Centre and is comprised of three vascular surgeons with busy clinical practices providing all aspects of open and endovascular surgery. The Division has a strong clinical research interest with a dedicated research coordinator and has an accredited primary entry vascular surgery training program.

The successful candidate must have a strong academic background and will be expected to participate actively in the Division’s academic and educational initiatives including teaching and supervision of undergraduate students, residents, and fellows. Applicants considered at the rank of Associate or Full Professor must have demonstrated the ability to publish in the highest quality academic and subspecialty outlets and be a recognized expert in his or her field of research. In addition, candidates will be expected to provide in the full range of clinical services required of a vascular surgeon.

The successful candidate must have an MD or equivalent; have completed an accredited vascular surgery training program; have received (or are eligible for) a Certificate of Special Competence in Vascular Surgery from the Royal College of Physicians and Surgeons of Canada (or equivalent); and be eligible for licensure in the Province of Ontario.

London is Canada’s 10th largest city with a population of 400,000, a catchment area of 2 million, and is situated in southwestern Ontario between Toronto and Detroit. The region has a diverse economy and excellent educational opportunities. It is a safe and diverse city and its numerous parks, trails, recreational, cultural and sporting opportunities make it an attractive place to live. Western University is a research-intensive university with full-time enrolment of about 34,000 students with a full range of academic and professional programs. The Schulich School of Medicine & Dentistry (Schulich) provides an outstanding educational experience within a research intensive environment where tomorrow’s physicians, dentists and health researchers learn to be socially responsible leaders in the advancement of human health.

Interested candidates should send a letter of interest, curriculum vitae, and the names and addresses of three references to:

Gaetano DeRose, MD
Acting Chair/Chief, Division of Vascular Surgery
London Health Sciences Centre
800 Commissioners Rd E, E2-123
London, ON, Canada, N6A 5W9
Tel 519 667-6644 • Fax 519 667-6573
Email Guy.DeRose@lhsc.on.ca

Applications will be accepted until the position is filled. Review of applications will begin after January 1, 2015.

This position is subject to budgetary approval. Applicants should have fluent written and oral communication skills in English. All qualified candidates are encouraged to apply; however, Canadian Citizens and Permanent Residents will be given priority. The University of Western Ontario is committed to employment equity and welcomes applications from all qualified women and men, including visible minorities, aboriginal people and persons with disabilities.
PLASTIC SURGEON

McMaster University, in conjunction with St. Joseph’s Healthcare is seeking an academic Plastic Surgeon. The HNHB LHIN (4) Plastic Surgery Program serves a catchment area of more than 2.5 million residents. The service provides tertiary and quaternary level care to patients within the catchment area and plays an essential role in the support of other programs including head and neck surgery and surgical oncology. The Plastic Surgery Division within the Department of Surgery, McMaster University is a fully accredited Royal College of Physicians and Surgeons of Canada training program in Plastic Surgery with full involvement in undergraduate, post-graduate and continuing medical education programs.

The successful applicant will have Fellowship training in both microsurgery and hand/upper limb surgery. The successful applicant’s clinical skill set must include the full spectrum of Plastic Surgery care. He/she will be expected to show evidence of interpersonal and collaborative skills and initiative to further advance the clinical and academic productivity of the Plastic Surgery Division. A full time appointment at the appropriate level in the Department of Surgery, Faculty of Health Sciences, McMaster University is required and will be available to the successful applicant. A commitment in surgical education at all levels is essential, as well as active participation in research and academic initiatives of the Plastic Surgery Division leadership, including active leadership in research and surgical education.

Applicants must have a Fellowship in Plastic Surgery, Certification from the Royal College of Physicians and Surgeons of Canada, and be eligible for licensure in the Province of Ontario. In accordance with Canada’s immigration policy, this advertisement is directed to Canadian Citizens and permanent residents of Canada. St. Joseph’s Healthcare and McMaster University are committed to employment equity and encourage applications from all qualified candidates including women, members of visible minorities, Aboriginal peoples, members of sexual minorities and persons with disabilities.

Applications must include an up-to-date curriculum vitae, and a description of previous academic experience, as well as of specialty training. Applications must be received by December 31, 2014. Applications are to be submitted to:

Dr. Susan Reid, Professor and Chair
Faculty of Health Sciences, McMaster University
B3-155 Juravinski Hospital & Cancer Centre
711 Concession Street East, Hamilton, ON L8V 1C3
Email painebr@mcmaster.ca

CHEF – DÉPARTEMENT DES SERVICES CHIRURGICAUX

L’Hôpital général juif (Montréal, Québec) lance un appel de candidatures pour le poste de chef du Département des services chirurgicaux. Cet hôpital d’enseignement de 637 lits de renommée internationale, affilié à l’Université McGill, se prépare à inaugurer une nouvelle aire de soins critiques ultramoderne comportant 17 salles d’opération à la fine pointe de la technologie. Le Département de chirurgie est constitué de représentants de toutes les disciplines chirurgicales, particulièrement dans le domaine des chirurgies oncologiques et des techniques minimal invasives. Le candidat ou la candidate retenue aura un profil universitaire et devrait être admissible à un poste clinique universitaire à temps plein au rang de professeur agrégé ou de professeur titulaire à l’Université McGill. Il (elle) devra avoir démontré des qualités de leader et de l’expérience en gestion et continuera à promouvoir l’excellence clinique et une approche axée sur le patient au sein du département. Il (elle) devra aussi poursuivre ses priorités académiques et en recherche. De plus, il (elle) fera preuve d’une vision quant au rôle du Département de chirurgie de l’Hôpital général juif au sein du réseau McGill. Les candidats et candidates potentiels devraient posséder la certification du Collège Royal des médecins et chirurgiens du Canada, ou son équivalent, et devraient avoir une vaste expérience dans les hôpitaux d’enseignement universitaires. Une formation ou une expérience en rapport avec les principes de gestion allégée et de gestion du changement serait un atout. Conformément aux exigences en matière d’immigration au Canada, la priorité sera accordée aux citoyens canadiens et aux résidents permanents du Canada. La maîtrise de l’anglais et du français sera considérée comme un atout. La date limite pour soumettre une candidature est le 31 décembre 2014.

Les candidats et candidates intéressés doivent faire parvenir une copie de leur curriculum vitae et une lettre de présentation à l’attention de :

Dr. Paul Warshawsky
Responsable du comité de recrutement et de sélection
3755, ch. de la Côte Sainte-Catherine, suite B-300
Montréal, Québec H3T 1E2
Courriel : paul.warshawsky@mcmill.ca

CHEF – DEPARTMENT OF SURGICAL SERVICES

The Jewish General Hospital (Montreal, Quebec) is inviting applications for the position of Chief of the Department of Surgical Services. This world class, 637 bed McGill University teaching hospital is preparing to open a new, state-of-the-art critical care wing with 17 cutting edge operating theaters. The Department of Surgery includes representation from all surgical disciplines, with an emphasis on oncologic surgery and minimally invasive techniques. The successful applicant will have an academic profile and should be eligible for a full-time clinical academic appointment at the rank of Associate or Full Professor at McGill University. He/she should have demonstrated leadership qualities and management experience, and will continue to promote the clinical excellence and patient centered focus of the Department as well as furthering its academic and research priorities. In addition, he/she will demonstrate a vision for the role of the Jewish General Hospital Department of Surgery within the McGill network. Potential candidates should have Royal College of Physicians and Surgeons of Canada certification, or the equivalent, and should have significant academic experience in teaching hospitals. Training or experience with Lean principles, and change management would be an asset. In accordance with Canada immigration requirements, priority will be given to Canadian citizens and permanent residents of Canada. Fluency in English and French would be considered an asset. The deadline for application is December 31, 2014.

Interested candidates should send a copy of their curriculum vitae and a letter of intent to:

Dr. Paul Warshawsky
Chair, Search and Selection Committee
3755 Côte St. Catherine Road, Suite B-300
Montreal, Quebec H3T 1E2
e-mail: paul.warshawsky@mcmill.ca
The Division of Cardiac Surgery, Department of Surgery, Schulich School of Medicine & Dentistry at Western University is seeking a full-time clinical academic cardiac surgeon at the rank of Assistant, Associate, or Full Professor. The Division of Cardiac Surgery is affiliated with London Health Sciences Centre and is comprised of eight cardiac surgeons with busy clinical practices providing all aspects of coronary artery, complex valvular and aortic, transplantation, assist devices and minimally invasive robotic-assisted cardiac surgery. The Division has a strong clinical research interest and employs two research coordinators and has an accredited cardiac surgery training program. The successful candidate must have a strong academic background and training or interest in assist devices and heart transplantation and will be expected to participate in the Division's academic and educational initiatives including teaching and supervision of undergraduate students, residents, and fellows. Applicants considered at the rank of Associate or Full Professor must demonstrate the ability to publish in the highest quality academic and subspecialty outlets and be a recognized expert in his or her field of research.

The successful candidate must have an MD or equivalent; have completed an accredited cardiac surgery training program; have received (or are eligible for) a Certificate of Special Competence in Cardiac Surgery from the Royal College of Physicians and Surgeons of Canada (or equivalent); and be eligible for licensure in the Province of Ontario.

London is Canada's 10th largest city with a population of 400,000, a catchment area of 2 million, and is situated in southwestern Ontario between Toronto and Detroit. The region has a diverse economy and excellent educational opportunities. It is a safe and diverse city and its numerous parks, trails, recreational, cultural and sporting opportunities make it an attractive place to live. The University of Western Ontario is a research-intensive university with full-time enrolment of about 34,000 students with a full range of academic and professional programs. The Schulich School of Medicine & Dentistry (Schulich) provides an outstanding educational experience within a research intensive environment where tomorrow's physicians, dentists and health researchers learn to be socially responsible leaders in the advancement of human health.

Interested candidates should send a letter of interest, curriculum vitae, and the names and addresses of three references to:

Bob Kiaii, MD
Chair/Chief, Division of Cardiac Surgery
London Health Sciences Centre
339 Windermere Road, B6-108
London, ON, Canada, N6A 5A5
Tel 519 663-3181 • Fax 519 667-3044
Email Bob.Kiaii@lhsc.on.ca

Applications will be accepted until the position is filled. Review of applications will begin after March 1, 2015.

This position is subject to budgetary approval. Applicants should have fluent written and oral communication skills in English. All qualified candidates are encouraged to apply; however, Canadian Citizens and Permanent Residents will be given priority. Western University is committed to employment equity and welcomes applications from all qualified women and men, including visible minorities, aboriginal people and persons with disabilities.
The Division of Vascular Surgery, Department of Surgery, Schulich School of Medicine & Dentistry at The University of Western Ontario is seeking a Chair/Chief, full-time clinical academic vascular surgeon, at the rank of Associate or Full Professor. The Division of Vascular Surgery is affiliated with London Health Sciences Centre and is comprised of three vascular surgeons with busy clinical practices providing all aspects of open and endovascular surgery. The Division has a strong clinical research interest with a dedicated research coordinator and has an accredited primary entry vascular surgery training program.

This is a dual position as Chair, Division of Vascular Surgery – Western University; and as Chief, Division of Vascular Surgery – London Health Sciences Centre. The Chair/Chief will manage a very complex enterprise within an evolving health care system. The ideal candidate will possess the vision and scholarly profile to understand and develop the complex interrelationships between clinical obligations and the teaching and research strengths of the Department.

The successful candidate must have a strong academic background and will be expected to participate actively in the Division's academic and educational initiatives including teaching and supervision of undergraduate students, residents, and fellows. Applicants must have demonstrated the ability to publish in the highest quality academic and subspecialty outlets and be a recognized expert in his or her field of research. In addition to administrative responsibilities as Chair/Chief, candidates will be expected to provide in the full range of clinical services required of a vascular surgeon.

The successful candidate must have an MD or equivalent; have completed an accredited vascular surgery training program; have received (or are eligible for) a Certificate of Special Competence in Vascular Surgery from the Royal College of Physicians and Surgeons of Canada (or equivalent); and be eligible for licensure in the Province of Ontario.

London is Canada's 10th largest city with a population of 400,000, a catchment area of 2 million, and is situated in southwestern Ontario between Toronto and Detroit. The region has a diverse economy and excellent educational opportunities. It is a safe and diverse city and its numerous parks, trails, recreational, cultural and sporting opportunities make it an attractive place to live. Western University is a research-intensive university with full-time enrolment of about 34,000 students with a full range of academic and professional programs. The Schulich School of Medicine & Dentistry (Schulich) provides an outstanding educational experience within a research intensive environment where tomorrow’s physicians, dentists and health researchers learn to be socially responsible leaders in the advancement of human health.

Interested candidates should send a letter of interest, curriculum vitae, and the names and addresses of three references to:

John D. Denstedt, MD, FRCSC, FACS, FCAHS
Chair/Chief, Department of Surgery
268 Grosvenor St., Room E3-117
London, ON, Canada, N6A 4V2
Tel 519 663-3349 • Fax 519 646-6347
E-mail john.denstedt@sjhc.london.on.ca

Applications will be accepted until the position is filled. Review of applications will begin after January 1, 2015.
Tory Regional Trauma Centre, the Division of General Surgery, and the Department of Critical Care Medicine at Sunnybrook Health Sciences Centre and the University of Toronto are inviting applications for the position of a full-time trauma and acute care surgeon, and intensivist. The effective date for this appointment would be July 1, 2016.

We seek a full-time faculty general surgeon with fellowship training in trauma and acute care surgery, and critical care medicine. The successful candidate will also fill a clinician scientist role, spending up to 75% of his/her time in research (clinical epidemiology, translational research, or clinical research), and 25% in clinical duties. The successful candidate will possess a strong track record and graduate level training in a relevant area of research related to trauma care. Evidence of excellence in teaching is required.

Clinically, the successful candidate will join an academic group providing comprehensive trauma care spanning the entire continuum, ranging from resuscitation, operative care, acute care in the ICU and ward, to rehabilitation and recovery. Our centre includes a strong resident and fellowship training program.

The candidate must be eligible for appointment at the rank of Assistant/Associate/Full Professor at the University of Toronto and be eligible for certification with the Royal College of Physicians and Surgeons of Canada and licensed with the College of Physicians and Surgeons of Ontario.

Sunnybrook Health Sciences Centre is one of Canada’s leading clinical and research hospitals. Sunnybrook is a fully affiliated academic health sciences facility of the University of Toronto and home to one of the Universities three academies for undergraduate education. Sunnybrook has an international reputation for clinical excellence in research and is an acknowledged academic leader. The Sunnybrook Research Institute hosts well established programs in basic, applied and clinical research occupying over 250,000 square feet of state of the art infrastructure with annual peer reviewed grants of $75 million dollars.

The mission of Tory Regional Trauma Centre is not only excellence in care but furthermore to innovate in novel therapies, surgical as well as critical care approaches to trauma care, and integrated patient-focused trauma care. The Centre is well-resourced and fulfills an important role as a hospital priority. One of the Centre's priorities is Quality and Performance Improvement. The candidate's involvement in these initiatives is desired.

Salary will be between the range of $350,000 to $450,000, and commensurate with qualifications and experience. This estimate is based on fee for service billings.

APPLICATION INSTRUCTIONS
Please submit a letter of intent and curriculum vitae to:

Homer Tien, MD MSc FRCS FACS
Director, Trauma Services
Sunnybrook Health Sciences Centre
2075 Bayview Avenue Room H171, Toronto, ON M4N 3M5
Email homer.tien@sunnybrook.ca

This job posting will remain open until January 30, 2015.

The University of Toronto and Sunnybrook Health Sciences Centre are strongly committed to diversity within its community and especially welcomes applications from visible minority group members, women, Aboriginal persons, persons with disabilities, members of sexual minority groups, and others who may contribute to the further diversification of ideas. All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority.

For more information on about Sunnybrook Health Sciences Centre and the Faculty of Medicine, Department of Surgery, Division of General Surgery please visit our home pages at www.sunnybrook.ca and http://surgery.utoronto.ca.
When it comes to your health, more medical tests, treatments and procedures are not always better. In fact, sometimes they’re unnecessary. Find out when you need medical tests, treatments and procedures — and when you don’t.

Talk with your doctor or visit ChoosingWiselyCanada.org

@ChooseWiselyCA

Choosing Wisely Canada
A healthy conversation.