The first study of laparoscopic colectomy (LC) was published in 1991. Throughout the 1990s, adoption of the technique was hampered by concerns regarding oncologic safety and effectiveness. This concern led to further studies and, by 2004, randomized controlled trial evidence clearly showed that LC accelerated patients’ postoperative recovery and reduced length of hospital stay (LOS) while providing equivalent oncologic outcomes compared with open colectomy (OC). Fewer postoperative complications and shorter LOS imply cost savings to the health care system, which is of considerable importance in an era of rising health care expenditures across all of Canada. Comparisons with other high-income countries suggest a lower adoption rate of LC in Canada. The Canadian Association of General Surgeons sought to evaluate the barriers to adoption of laparoscopic colon surgery and to propose potential intervention strategies to enhance the use of the procedure. Given the clinical benefits of laparoscopic surgery for patients, the increasing needs for surgical care and the desire of Canadian general surgeons to advance their specialty and enhance the care of their patients, it is an important priority to improve the utilization of LC.

**UPTAKE OF LAPAROSCOPIC COLECTOMY IN CANADA**

Population-based data from Ontario show that between 2002 and 2009, the proportion of elective LC increased from 13% to 37%. In British Columbia, the proportion of patients with colon cancer undergoing LC increased from 2% to 25% between 2003 and 2008. Using population-level data, Hoogerboord and colleagues showed that from 2004 to 2014, the pan-Canadian rate of LC for elective surgeries increased from 9% to 52%. Provincial utilization rates ranged from 11% in Newfoundland to 60% in British Columbia. The rate of LC in Canada was lower than in South Korea, the Netherlands and the United States, but higher than in the United Kingdom, Norway and Sweden (Fig. 1). Comparisons with other high-income countries suggest a lower adoption rate of LC in Canada. The Canadian Association of General Surgeons (CAGS) formed a task force to evaluate the barriers to adoption of laparoscopic colon surgery and to propose potential intervention strategies to enhance the use of the procedure. As an initial step, the task force was asked to complete a literature review of existing publications on this topic to identify patterns of implementation and barriers to adoption in Canada and other countries.

**PREDICTORS OF UPTAKE OF LAPAROSCOPIC COLECTOMY**

Compared with OC, the laparoscopic approach is technically more difficult because of the absence of tactile feedback, operating with 2-dimensional vision, and limited degrees of manoeuvrability of instruments. The number of cases required to complete the learning curve for LC varies between 30
and 70 and depends on the extent of formal training in laparoscopic surgery, exposure to other advanced laparoscopic techniques, dexterity and ability to perform delicate manoeuvres with 2-dimensional vision.\textsuperscript{13}

The Canadian health care system can present unique challenges to the adoption of new technology and minimally invasive surgical techniques. In the survey by Moloo and colleagues,\textsuperscript{14} limitations in operating room time allocation were cited by 55% of surgeons as a barrier to LC. Since most hospitals in Canada function with a global operating budget and volume-based and/or quality-based hospital reimbursement is limited in extent and impact, the introduction of new technology and equipment into Canadian operating rooms has been much slower than in other countries. Restrictions in capital and operating budgets have limited investments in permanent and single-use laparoscopic equipment. Approximately 25% of Canadian surgeons felt that they did not have adequate laparoscopic equipment to perform LC at their hospitals.\textsuperscript{14}

**POTENTIAL STRATEGIES TO INCREASE THE USE OF LAPAROSCOPIC COLECTOMY**

Effective strategies to increase use of LC may include greater emphasis on advanced laparoscopic training during residency, more minimally invasive surgery fellowships, and intensive hands-on training courses and mentorship programs for established surgeons (Box 1).\textsuperscript{14–16} Also, dissemination of practice guidelines and consensus statements, practice audits and feedback, and the development of care algorithms and clinical care guidelines have been shown to positively affect change in surgical practice and institutional culture.\textsuperscript{17}

Several methods for teaching advanced laparoscopic techniques to established surgeons exist, including short (weekend) courses, comprehensive programs consisting of didactic sessions, cadaver laboratories, and observation of live surgeries and simulation platforms (e.g., minimally invasive surgery trainer).\textsuperscript{16} The optimal model for training and dissemination of advanced laparoscopic surgery into community practice has not been established. However,
adoption is enhanced when mentorship by laparoscopic experts forms part of a training program. A team-based approach, where training also includes operating room nurses, has been shown to be more effective in establishing successful laparoscopic programs.

**Conclusion**

The rate of LC in Canada appears to be lower than in other comparable high-income countries, including South Korea, the Netherlands and the United States, with significant variability across the country. This variability in use of LC indicates a variety of barriers, some of which may be specific to the Canadian health care environment; a review of the literature includes surgeon-related factors (e.g., completing a steep learning curve, access to training and mentorship) and regional health system factors (e.g., financial constraints, operating room time and resource limitations, hospital and physician reimbursement models, and access to technology). Given the clinical benefits of laparoscopic surgery for patients, the increasing needs for surgical care and the desire of Canadian general surgeons to advance their specialty and enhance the care of their patients, it is an important priority to improve the utilization of LC. Given the complexities of these issues and the importance to patients and the profession, the Canadian Association of General Surgeons has assembled a task force to study the barriers to LC and propose priorities and initiatives to address the identified barriers and increase the use of LC across the country.

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