Care Delivery Patterns, Processes, and Outcomes for Primary Ovarian Cancer Surgery: A Population-Based Review Using a National Administrative Database

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Abstract

Objectives: In this pan-Canadian study, we sought to elucidate the current state of surgical care for primary ovarian cancers and factors influencing selected short-term outcomes; these were in-hospital mortality (IHM), major complications (MCs), failure-to-rescue (FTR), and hospital length of stay (LOS).

Methods: We created a population cohort using inpatient admission records from the Canadian Institute of Health Information data set (2004–2012). Multilevel logistic regression and flexible parametric survival analyses, adjusted for hospital clustering effect, were conducted to determine the effect of patient-specific factors (i.e., age, comorbidities, and admission category); procedural complexity; and the surgical volume and specialty of each care provider on the outcomes of interest.

Results: A total of 16 089 women underwent surgeries for primary ovarian cancer across Canada. The crude rates of IHM, MC, and FTR were 0.89%, 5.7%, and 9.09%, respectively, with a median LOS of four days (interquartile range 3 to 6). The majority of surgical procedures were performed by surgeons and hospitals with annual surgical volumes of less than five such procedures. Hospitals with higher surgical volumes were associated with lower risk of IHM (OR 0.95, 95% CI 0.91 to 0.99) and FTR (OR 0.95, 95% CI 0.91 to 0.99) and a higher chance of earlier discharge (hazard ratio [HR] 1.03, 95% CI 1.00 to 1.06). Surgeons with higher surgical volumes were associated with lower odds of early discharge (HR 0.90, 95% CI 0.87 to 0.94) and a higher risk of MC (OR 1.12, 95% CI 1.02 to 1.23). Compared with gynaecologic oncologists, general surgeons had a significantly higher risk of IHM (OR 3.50, 95% CI 1.82 to 6.74) and MC (OR 2.13, 95% CI 1.36 to 3.33) and lower odds of early discharge (HR 0.43, 95% CI 0.40 to 0.47).

Conclusion: Despite limitations in the administrative data set, valuable information was available for this pan-Canadian analysis. Our findings support centralization of surgical procedures for women with ovarian cancer in tertiary care centres with higher surgical volumes that are staffed by in-house multidisciplinary care teams and specialist surgeons.

Key Words: Ovarian cancer, surgery, centralization, quality of care, volume, surgeon specialty

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Résumé

Objectifs : Cette étude pancanadienne visait à expliquer la situation des soins chirurgicaux offerts en cas de cancer primitif de l'ovaire ainsi que les facteurs qui influencent certains résultats à court terme, en l'occurrence la mortalité hospitalière (MH), les complications graves (CG), l'indicateur « failure-to-rescue » (FTR, ou l'échec des secours) et la durée du séjour (DS) à l'hôpital.

Méthodologie : Nous avons créé une cohorte représentative de la population à partir de dossiers d'hospitalisation tirés des données de l'Institut canadien d'information sur la santé (2004-2012). Nous avons ensuite effectué une régression logistique multiniveaux et une analyse de survie paramétrique flexible tenant compte de l'effet de grappe associé au milieu hospitalier afin de déterminer l'incidence sur les résultats à l'étude de facteurs propres aux patients (âge, troubles concomitants, catégorie d'hospitalisation), de la complexité de l'intervention ainsi que du nombre d'opérations pratiquées et du degré de spécialisation de chaque fournisseur de soins.

Résultats : En tout, 16 089 femmes ont subi une intervention chirurgicale pour un cancer primitif de l'ovaire au Canada. Les taux bruts de MH, de CG et de FTR étaient respectivement de 0,89 %, 5,7 % et 9,09 %, tandis que la DS moyenne était de quatre jours (écart interquartile : 3-6). La majorité des interventions étaient pratiquées par des chirurgiens et des hôpitaux qui en pratiquaient moins de cinq du genre par année. Les hôpitaux où un nombre supérieur d'opérations étaient réalisées étaient associés à un risque plus faible de MH (rapport de cotes [RC] : 0,95; intervalle de confiance [IC] à 95 % : 0,91-0,99) et de FTR (RC : 0,95; IC à 95 % : 0,91-0,99) ainsi qu'à une plus grande probabilité de congé précoce (rapport de risque [RR] : 1,03; IC à 95 % : 1,00-1,06). Les chirurgiens qui pratiquaient un nombre d'interventions supérieur étaient associés à une probabilité plus faible de congé précoce (RR : 0,90; IC à 95 % : 0,87-0,94) et à un risque accru de CG (RC : 1,12; IC à 95 % : 1,02-1,23). Comparativement aux gynécologues oncologues, les chirurgiens généraux étaient

associés à un risque significativement plus élevé de MH (RC : 3,50; IC à 95 % : 1,82-6,74) et de CG (RC : 2,13; IC à 95 % : 1,36 à 3,33) ainsi qu'à une probabilité plus faible de congé précoce (RR : 0,43; IC à 95 % : 0,40-0,47).

Conclusion : Malgré des lacunes dans l'ensemble de données administratives, nous avons dégagé des renseignements utiles pour cette analyse pancanadienne. Nos observations appuient la centralisation des interventions chirurgicales destinées aux femmes atteintes de cancer de l'ovaire dans des centres tertiaires où sont pratiquées un grand nombre d'opérations du genre et qui sont dotés, à l'interne, d'équipes de soins multidisciplinaires et de chirurgiens spécialisés.

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INTRODUCTION

Ovarian cancer is the fifth-leading cause of cancer-related deaths in women.[1] Women with ovarian cancer must often undergo a combination of surgery and chemotherapy. The selection of adjuvant therapy is informed by a number of factors, including surgical staging for those women with clinically early disease or the extent of surgical debulking for those with advanced disease. The degree of surgical debulking will influence whether adjuvant treatment is administered intravenously or intraperitoneally, which in turn is correlated with survival. Therefore, surgery remains a crucial treatment component in the overall care of women with ovarian cancer.

The quality of surgical care is defined by the volume of cases managed by a care provider or institution; by aspects of the procedures carried out (e.g., adequacy of surgical debulking, need for reoperation, appropriate chemotherapy); and procedure outcomes (e.g., mortality, morbidity, survival).[2–5] Population-based studies have shown a positive association between the surgical volumes and/or specialty of care providers and improved long-term outcomes and processes of care[6–19]; however, conflicting or non-significant results have also been reported in some studies.[20–25] In addition, the significance of the volume of cases, by hospital or by individual surgeon, or the specialty of the surgeon in predicting such outcomes also remains unresolved.[20,21]

Furthermore, population-based studies reporting on quality indicators at a national level in Canada are very limited. To date, the outcomes in women with ovarian cancer in Ontario have only been evaluated with regard to the adequacy of surgical debulking, 30-day mortality, the need for reoperation, the use of appropriate guideline-informed chemotherapy, and long-term survival.[3,20,26,27] Evaluating the quality of care and the provisions for such care can provide useful information for optimizing processes and outcomes from the perspective of both patients and funding agencies.

We sought to evaluate the quality of surgical care for women with ovarian cancer across Canada by assessing the impact of surgical volume (by both hospital and surgeon) and surgeon specialty on short-term postoperative outcomes (i.e., in-hospital mortality, major complications, failure to rescue, and acute hospital length of stay).

METHODS

For this population-based cohort study we extracted data from the Canadian Institute of Health Information's Discharge Abstract Database (fiscal years 2004–2012). Patient demographics, diagnoses, and intervention are recorded for each in-hospital admission. Each patient admission is considered an abstract record, and repeat admissions or subsequent surgical procedures cannot be identified. The relevant data were submitted by all Canadian provinces, excluding Quebec, for the study period. Our cohort consisted of all women (18 and over) in Canada, excluding Quebec, with newly diagnosed primary ovarian cancer (ICD10CA codes: C56, D391) who underwent abdominal surgery (ICD10CA codes: 1RB/1RF/1RM/1OT.87.^, 1RB/1RD/1RF/1RM.89.^, 1RM.91.^).

Pre-admission comorbidities were used to derive a modified version of the Charlson comorbidity score for individual patients.[28] The modification included an index element associated with secondary cancers, but the element for primary cancer(s) was removed because all women in the cohort had at least one primary cancer. Surgical procedures for ovarian cancer could involve removal of any combination of the ovaries, fallopian tube(s), or uterus using a minimally invasive or open approach. To stratify the risk associated with each surgical procedure according to the number and extent of resections, a scale was used to determine a surgical complexity score.[29] The surgical complexity scale is designed to be applied in women with

ABBREVIATIONS

CIHI	Canadian Institute for Health Information
FTR	failure to rescue
IHM	in-hospital mortality
LOS	length of stay
MC	major complication
SCS	surgical complexity scale