Gynecologic Oncology 146 (2017) 368–372

Contents lists available at ScienceDirect

Gynecologic Oncology

journal homepage: www.elsevier.com/locate/ygyno

Hospital readmission after ovarian cancer surgery: Are we measuring surgical quality?☆

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HIGHLIGHTS

- 40% of ovarian cancer postoperative readmissions are unrelated to major complications.
- Risk factors for readmission exist that are independent of complication.
- In hospital complications are not associated with subsequent readmission.

ARTICLE INFO

Article history:
Received 7 March 2017
Received in revised form 8 May 2017
Accepted 9 May 2017
Available online 16 May 2017

Keywords:
Postoperative readmission
Surgical quality
Ovarian cancer
Postoperative complication

ABSTRACT

Objectives. Readmission after surgery is a quality metric hypothesized to reflect the quality of care in the index hospitalization. We examined the link between readmissions and a surrogate of surgical quality – major postoperative complication – among ovarian cancer patients.

Methods. Patients who underwent surgery for ovarian cancer between 2012 and 2013 were identified from the National Surgical Quality Improvement Project (NSQIP). Major complications were defined as grade 3 or ≥ complications on the validated Claviden-Dindo scale and included both NSQIP and non-NSQIP defined complications based on readmission ICD-9 code. Readmissions and complications within 30-days of surgery were analyzed using rate ratios and modified Poisson regression.

Results. We identified 2806 ovarian cancer patients of whom 9.1% (n = 259) experienced an unplanned readmission. Overall major complication rate was 10.9% (n = 307). Major complications in the index hospitalization were not associated with subsequent readmission (RR 1.2, 95% CI 0.7–1.9). Overall, 41.4% of readmissions were not attributable to any major postoperative complication. Of the unplanned readmissions, 55.2% (n = 143) never experienced a NSQIP-defined major complication. Of these 143 patients, the reason for readmission was known for 107 patients and was: 28.0% non-NSQIP-defined major complications; 16.8% cancer or other medical factors; 22.4% minor complications; and 32.7% symptoms without a diagnosis of complication.

Conclusions. Forty percent of unplanned readmissions after ovarian cancer surgery occur among patients who have not experienced a major postoperative complication. Quality metric benchmarks and efforts to decrease readmissions should account for this high percentage of readmissions not associated with a major complication.

1. Introduction

In the mid-2000s, a government analysis of Medicare data revealed that readmissions are costly, representing an approximate cost of up to 41 billion annually [1]. Given this large cost, in 2009, CMS developed a hospital readmission reduction program which began tracking 30-day readmissions for all Medicare patients [2]. In 2013, the first financial penalties were rolled out with hospitals facing penalties of 1% of Medicare reimbursements if risk-adjusted readmission rates are higher than expected for three chronic health conditions: congestive heart failure,

☆ Presentations: The data contained within this article was presented as an oral presentation at the Society for Gynecologic Oncology Annual Meeting March 18th–22nd, 2016.

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http://dx.doi.org/10.1016/j.ygyno.2017.05.012
0090-8258/

myocardial infarction and pneumonia. In 2015, the program was expanded to include surgical procedures. Hip and knee arthroplasty were added as the first surgical procedures and penalties were increased to up to 3% of Medicare reimbursements. In 2017, coronary artery bypass grafting will be added and it is likely that additional procedures will be included in the future.

Attention was originally focused on readmissions as a cost-saving measure. However, currently, readmissions have morphed into a quality metric with the hypothesis that poor quality of care in the index hospitalization is associated with the subsequent readmission. Readmissions as a quality metric began within the paradigm of chronic health conditions and it is unknown if this paradigm extends to surgical procedures. However, if readmission is a marker of surgical quality, the mechanism could be thus: poor surgical care leads to a postoperative complication, which, in turn, leads to a readmission. For surgical procedures, if readmission is a surrogate marker of surgical quality, it should be strongly associated with postoperative complication, a known marker of surgical quality.

The objectives of this study were to: [1] determine the association between major postoperative complication and unplanned readmission and [2] examine the reasons for readmission in the absence of postoperative complication among patients undergoing ovarian cancer surgery.

2. Methods

This study is a secondary analysis cohort study of prospectively collected surgical quality data. The National Surgical Quality Improvement Program (NSQIP) database is a national, hospital-based, surgical quality database. Participation by hospitals is voluntary. Trained clinical reviewers prospectively collect preoperative variables and post-operative outcomes for each individual procedure for 30 days following surgery. Periodic auditing, including for data points occurring after hospital discharge, ensures high quality data specifically for post-discharge complications [3]. Details of methods of data collection and reliability have been previously reported [4]. The Institutional Review Board at the University of North Carolina at Chapel Hill reviewed this study and declared it exempt from formal review.

We identified patients who underwent surgery for ovarian cancer between 2012 and 2013 from the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) using International Classification of Diseases, Ninth Revision codes for ovarian cancer (183.xx). Given that hospital readmission was our primary outcome, patients who died in the index hospitalization or had a length of stay >30 days were excluded from our analysis.

For our first objective, we sought to determine the association between major postoperative complication and unplanned readmission. For this analysis, the primary exposure was major postoperative complication. We identified all major postoperative complications and categorized the complications into major or minor using the Clavien-Dindo scale [5]. Minor complications were grade 2 or less and major complications were grade 3 or higher. Major postoperative complications included myocardial infarction, deep surgical site infection, deep organ space infection wound dehiscence, renal failure, stroke, sepsis, septic shock, pneumonia, cardiopulmonary arrest, venous thromboembolism, unplanned intubation and reoperation. Minor postoperative complications included urinary tract infections, blood transfusions, and superficial wound infections. Exact clinical definitions of these postoperative complications were as per NSQIP [6].

For non-NSQIP defined major complications, such as ileus, bowel obstruction, or febrile neutropenia, these complications were defined by the ICD-9 code linked to the unplanned readmission as the reason for the readmission. This ICD-9 code is not a billing ICD-9 code, but rather an ICD-9 code assigned by the NSQIP trained clinical reviewer after review of the entire readmission hospitalization. Non-NSQIP recorded complications were categorized into the following groups: major surgical complications, medical or cancer related complications, minor complications, and symptoms without a diagnosis of complication. Major postoperative complications included: ileus, bowel obstruction, fistula, clostridium difficile infection and renal failure. Medical or cancer related complications included: febrile neutropenia, pleural effusion, symptomatic ascites, GI ulcer, and other medical problems. Minor complications included superficial wound infections and urinary tract infections. Symptoms without a diagnosis of complication included: nausea, pain, constipation, and fatigue. It is important to note that the diagnosis of a symptom without diagnosis of a complication was only made if the patient had an ICD-9 code recorded for a symptom, but no diagnosis made of any of the NSQIP recorded major complications. Complications were further classified as occurring in the index hospitalization or after hospital discharge by comparing the day of the postoperative complication to the length of the index hospitalization.

Our primary outcome was unplanned hospital readmission within 30-days of surgery. We identified readmissions as 'unplanned' by the NSQIP categorization, which is defined as a readmission that was unplanned at the time of the primary procedure [6]. In order to study whether unplanned readmissions were associated with a postoperative complication, we made a conservative assumption and assumed that if a patient experienced a postoperative complication at any point in the 30 day postoperative period that their readmission could be plausibly linked to that postoperative complication, the symptoms that preceded it, or its sequelae.

For our second objective we examined the reasons for readmission in the absence of postoperative complication among patients undergoing ovarian cancer surgery. Among patients who experienced a readmission in the absence of postoperative complication, we examined risk factors potentially associated with that readmission. This analysis was exploratory and not designed to test a specific hypothesis (i.e. that one risk factor is associated with postoperative complication) and thus, we did not perform a multivariable analysis to adjust for confounding. Examined risk factors included age, race, diabetes, hypertension, smoking, disease burden, >10% weight loss in the preceding 6 months, Charlson comorbidity index, length of index hospital stay, surgical complexity, operating room time and non-home discharge. All of these variables were defined as per NSQIP with the exception of disease burden, surgical complexity and Charlson comorbidity index score. In order to appropriately account for the known increase in complications among ovarian cancer patients with high disease burden [7,8], we defined this variable as those who had either preoperative ascites or had disseminated cancer as per NSQIP definitions. Surgical complexity was defined using the total work relative value units by summing the values assigned to all CPT codes for each surgery. The Charlson comorbidity index was calculated using the comorbid diagnoses reported for each patient as previously defined [9].

We used rate ratios with 95% confidence intervals to measure the association between postoperative complication and unplanned readmission for binary variables. For continuous variables, the association between variables and readmission was measured using a modified Poisson regression. All analyses were performed using SPSS version 20.0 (IBM Corp, Armonk, NY).

Given that there was no ICD-9 code linked to some of the unplanned readmissions, we performed a sensitivity analysis in which we assumed that all of these patients had actually experienced a non-NSQIP recorded major postoperative complication. We know that none of these patients have experienced a NSQIP-recorded major postoperative complication as those are recorded separately.

3. Results

We identified 2806 patients who underwent surgery for ovarian cancer. The demographic and operative characteristics of our population are listed in Table 1. Two hundred and eighty-four patients (10.0%) experienced a readmission within 30 days for surgery. Twenty-five of these patients (0.9%) had a planned readmission and 259