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Research review

Risk factors for 30-d readmission after colorectal surgery: a systematic review

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ABSTRACT

Background: Readmission rates after colorectal surgery remain an ongoing clinical concern. Recent initiation of penalties for excess readmissions in medical patients has encouraged surgeons to reduce readmissions for surgical patients. We conducted a systematic review of the published literature for the purpose of identifying patient-related risk factors for 30-d readmissions after colorectal surgery.

Methods: PubMed and Web of Science were queried for relevant English-language studies published before January 1, 2015, evaluating 30-d hospital readmissions after colorectal surgery in adult patients. Studies were included in this review only if they used a multivariable model to assess various patient-associated predictors and were excluded if the study size was less than 100 patients.

Results: A total of 20 clinical research studies made up of 8 (40%) chart reviews and 12 (60%) administrative data met inclusion criteria. Most studies took place in the United States, and a variety of procedures (e.g., colectomy, rectal resection, stoma creation) and indications for surgery (e.g., cancer, inflammatory bowel disease, diverticular disease) were evaluated. The average ages of included patients was between 37 and 78 y and 36%–97% were men. Readmission rates ranged from 9%–25%. Overall, older age, comorbid conditions, preoperative immunosuppressive therapy, postoperative complications, and nonhome discharge were the most consistent and strongest predictors of readmission.

Conclusions: These identifiable risk factors highlight targets for interventions in an effort to reduce unplanned readmissions. Determining the most efficacious and cost-efficient means to reduce these preventable hospitalizations could save millions of valuable health care dollars.

1. Introduction

Approximately 600,000 patients undergo colorectal surgery in the United States annually [1]. Reported readmission rates over the 30-d period after surgical resection are considerable, ranging from 7% [2] to 27% [3]. Reported risk factors are inconsistent and vary from demographic, baseline clinical, perioperative, and psychosocial factors [4–23]. The Hospital

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Readmission Reduction Program was born out of provisions in the Affordable Care Act to improve information and create incentives to change clinical practice [24]. As a result, in 2013, the Center for Medicare and Medicaid Services has instituted penalties on all Medicare reimbursements for hospitals with 30-d readmission rates in excess of risk-based expectations for the three most common contributory conditions including pneumonia, congestive heart failure, and acute myocardial infarction. Section 3025 of the Affordable Care Act allows for extending these penalties to surgical procedures in 2015. With an estimated annual readmission cost of $300 million [23], colorectal procedures are a likely target for future penalties.

Although several studies have examined the frequency of 30-d readmissions in patients undergoing colorectal surgery, there is little consensus on who is at increased risk for early readmission. Until a consensus is reached, interventions to prevent readmission may be misdirected or futile. The aim of this systematic review was to evaluate published literature to identify patient-related risk factors associated with 30-d readmission after colon and rectal resection in adults.

2. Methods

2.1. Literature search

PubMed and Thomson Reuters Web of Science were searched in September 2013 and May 2015 to identify relevant articles for inclusion. Keywords and medical subject heading terms used for these searches included intestinal surgery, general surgery, colorectal surgery, colectomy, rectal resection, readmission, rehospitalization, predictors, factors, or risk factors. Bibliographies of articles that met inclusion criteria were searched for additional references.

2.2. Study selection

The present systematic review was limited to original scientific articles investigating patient-related risk factors for 30-d readmission after colorectal surgery in adult humans. Only studies that used an adjusted regression model assessing patient-related risk factors for 30-d readmission were included in this study. Additional inclusion criteria were publication date before January 1, 2015, publication available in English, peer-reviewed publication, patient-related risk factors assessed, including demographics, baseline clinical characteristics, and perioperative course. Editorials, reviews, case studies, and meeting abstracts were excluded, as were studies with $n < 100$, or those for which the specific outcome of 30-d readmission was not separately analyzed for patients after colorectal surgery procedures. Publications that did not report risk ratios from their multivariable models were also excluded.

2.3. Data extraction

An initial review of all titles and abstracts was used to exclude any studies that did not meet inclusion criteria. A full review of all remaining abstracts was performed to determine each publication's eligibility for inclusion. Reviews and data abstraction were performed by one author (R.N.D) independently, using a standardized form. Abstracted information included study type, number of subjects, demographic characteristics (age, sex, race/ethnicity, and insurance status), baseline clinical characteristics (comorbidities and severity-of-illness measures), perioperative course (invasiveness of procedure, postoperative complications, length of stay [LOS], discharge status, and need for ICU stay or reoperation), and significant risk factors for 30-d readmission from multivariable analytic models.

2.4. Quality assessment

The Downs and Black [25] criteria were used to examine the overall quality of each study, which includes assessment of validity, bias, power, and other study attributes. The originally published scale was modified according to methods used in prior systematic reviews to account for characteristics of observational studies [26]. Questions related to randomization and/or blinding were removed, as all studies were observational in nature. The item related to power was changed to a dichotomous scale, with one point for sufficient power, and no points if power was not mentioned or power was insufficient. A final quality score was assigned by the percentage of points the study obtained out of the total eligible points. There was a maximum of 22 points.

2.5. Analysis

Basic descriptive statistics were collected from participating studies, including type of data, population and setting, sample size, procedures evaluated, indications for procedures, and the types of patient-related covariates assessed with multivariable models. To assess overall trends in the data, covariates of interest were listed and the number of studies that examined these variables in univariate or multivariable models was documented. Ranges for reported risk ratios for candidate variables from the multivariable models were also included in this reporting. Because of heterogeneity of included studies and their variable definitions, a meta-analysis was not performed as part of this systematic review.

3. Results

3.1. Study characteristics

Initial search returned 421 PubMed and 48 IS Web of Science titles and abstracts, 44 duplicates were removed, and 105 were identified for full-text review (Figure). Of these, 19 met study inclusion criteria and were included in this systematic review. One article was identified by review of references of included articles, putting the total number of included articles at 20 [4–23].

Characteristics of the 20 reviewed studies are summarized in Table 1. The years of study ranged from 1984–2014. All studies were observational in nature and had a follow-up time point of 30 d, except one [13] in which follow-up was 28 d. There were 8 (40%) single institution chart reviews, [4,12,14,16–18,20,22], 11 (55%) were analyses of large,