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A proactive outreach intervention that decreases readmission after hepatectomy

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ABSTRACT

Background. After hepatectomy, 7%–19% of patients are readmitted within 30 days, accounting for substantial cost and poor patient experience. The purpose of this study was to analyze the impact of a proactive outreach intervention on readmissions.

Methods. Consecutive patients undergoing hepatectomy by a single surgeon 2012–2016 were identified in a prospectively maintained database. In August 2013 a postoperative intervention was implemented; an advanced practice provider called each patient within 72 hours of discharge. Readmission rates were compared pre- and postintervention using standard statistics.

Results. Two hundred thirty-one patients met the inclusion criteria and major hepatectomy was performed in 45.5% of patients. Although the complication rate was similar (25.0% preintervention and 19.4% postintervention, $P = .324$), readmissions within 30 days of operation decreased from 14.5% pre- to 6.5% postintervention ($P = .046$). Approximately 30% of outreach interactions required outpatient intervention. Factors associated with readmission on univariate analysis included increased operative time ($P = .007$), major hepatectomy ($P = .012$), hemi or extended hepatectomy ($P = .032$), second stage operation ($P = .031$), bile leak ($P = 0.022$), and any complication/modified Accordion complication ≥ 3 within 30 days ($P < .0001$). On multivariate analysis, lack of post-discharge intervention ($P = .012$) and bile leak ($P = .031$) were independently associated with readmission.

Conclusion. These data demonstrate the efficacy of a proactive communication intervention after discharge to decrease readmissions after hepatectomy. The additional work created by the intervention is likely offset by decreased inpatient care needs and costs. Identification of high-risk populations and application of technology are likely to lead to further improvements.

Introduction

Readmission rates after an operation vary depending on the specialty. On the lower end are breast, melanoma, and endocrine cases at 2.1% and on the higher end are transplant cases at 24.8%.[1] Specifically for hepatectomy, readmissions occur in 7%–19% of patients.[2-8] Clearly, this is a burden to the patients and the healthcare system. For example, in patients who had private insurance, hepatectomy readmissions cost an average of $34,100—almost a doubling of total cost care.[9] An additional concern for oncologic surgery is that readmission for postoperative complications can lead to an inability to return to intended oncologic treatment, thereby potentially impacting disease-free and overall survivals.[2-4,8,10,11] In addition to the acute readmission event, complications can result in a delay of further care and may substantially affect longer-term oncologic outcomes.[10,12,13]

Various risk factors for readmission have been identified. Specifically in hepatectomy, these are numerous and have included blood loss, postoperative pulmonary embolus, surgical site infection (SSI), postoperative hyperbilirubinemia or jaundice, transfusion within 72 hours postoperatively, complexity of procedure, greater operative time, low albumin, increased alkaline phosphatase, American Society of Anesthesiologists (ASA) class, Model for End-Stage Liver Disease (MELD) score, vascular disease, renal failure, bile leak, major hepatectomy, fewer number of hepatic operations performed at the institution, and duration of stay greater than 7 days. Most importantly, any complication or severe complication has been associated consistently with readmission.[2-4,6-8,11,14]

Interventions to decrease postoperative readmissions have had success and many have been reported in the colorectal literature.

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Some interventions include: ileostomy pathways and checklists,[15,16] an education tool, daily telephone call after ileostomy creation,[17] a series of interventions in total hip and knee replacements,[18] and preoperative duplex vein mapping in vascular bypass patients.[19] Interestingly, greater costs during the initial hospital stay have not been associated with improvements in readmissions.[20] Consequently, increased attention is being directed toward process measures that may decrease readmissions after surgery. One recent study using an iterative Delphi methodology has described multiple recommended measures, with several focused on communication around the postoperative period.[21] Less data are available on preventing readmissions specifically in patients who have had a hepatectomy. To address this knowledge gap, this study was designed to analyze the impact of a proactive outreach intervention on post-hepatectomy readmissions.

Methods

This study was compliant with Health Insurance Portability and Accountability Act regulations, and the Institutional Review Board of the University of Texas MD Anderson Cancer Center approved waiver of consent. After this approval, consecutive patients who underwent hepatectomy by a single surgeon (TAA) from 2012–2016 were identified in the prospectively maintained departmental hepatobiliary surgery database. Biopsy or wedge liver resections were excluded. Simultaneous multivisceral resections by the primary surgical team were included; however, we excluded multiteam cases in which another surgeon performed a resection (e.g., colectomy) and therefore resulted in comanagement of postoperative and outpatient care. Readmission, emergency department (ED) visits (whether or not they resulted in readmission), complications, return to operating room, and postdischarge mortality within 30 and 90 days of operation were reviewed. All patients had a minimum of 90 days of follow-up including capture of any readmissions to other hospitals. Patient demographics, comorbidities, intraoperative details, and postoperative factors were also collected.

At baseline (preintervention), patients were informed at discharge to notify the team by phone about any concerns or issues. During business hours advanced practice providers (APPs) fielded outpatient phone calls and during after-hours and weekends an in-house, on-call surgery fellow responded to patient calls. Discharged patients who lived more than a 2-hour drive from Houston were asked routinely to remain local until the first postoperative visit, which typically occurred within 10 days of discharge.

In August 2013 an active postoperative intervention was added to this passive program: an APP called each patient within 72 hours of discharge to assess his or her progress. A template was used to standardize the collection of information from the patients. These prompts consisted of asking the patient about pain control and use of medications (narcotic and non-narcotic analgesic use), other medications used (home medications, venous thromboembolic prophylaxis, and laxatives), oral intake, bowel habits, infectious issues (fever and wound redness or drainage), pedal edema, drain output (if applicable), and confirmation of scheduled follow-up. If any wound issues were reported, the patient was asked to photograph the wound and text the photo to the provider for review.

The result of each phone interaction was communicated directly to the attending surgeon. For normal phone contact findings, a simple e-mail confirmation was sent from the APP to the team members, including the inpatient care team, the outpatient care team, and the attending surgeon. For abnormal findings, communication to the attending surgeon was done by phone, and a plan was made for further investigation; typically medication adjustment with scheduled phone follow-up or laboratories and short-interval outpatient appointment with a local provider or the main center. Trainees who had operated on or cared for the patient were included in all communications to maintain continuity of education and the plan of care.

During the 4-year–intervention period, no other substantial changes in care were made, including consistency in the enhanced recovery protocol, order sets, and other pathways. Overall hospital care, including clinic and ED access, as well as availability of interventional radiology, did not change during this period. The only modification to the protocol was that in 2016 an additional pilot using interactive videoconferencing was added for high-risk patients (i.e., those who underwent major hepatectomy, were discharged with a drain, or were older than 65 years of age).

Major hepatectomy was defined as resection of 3 or more segments. A standard definition for bile leak was used.[22] Operations consisting of a hepatectomy, as well as an additional resection were classified as "multivisceral," including colectomy, pancreatectomy, appendectomy, adrenal resection, diaphragm and peritoneal stripping, or omentectomy. Biopsies, hernia repair, or other more minor procedures that did not result in resection of an organ were not categorized as "multivisceral." Preoperative chemotherapy was classified as receipt of cytotoxic and/or biologic treatment within 90 days before operation. A postoperative drain was a drain that was placed to detect liver-related complications at the end of the operation. The diagnoses of chemotoxicity and cirrhosis were assessed from the operative and the pathology notes. For staging of complications, the modified Accordion Severity Grading System was used, with severe complications defined as grades 3–5.[23] For patients with multiple reasons for readmission, the main or most serious reason was recorded for data analysis.

Readmission rates, ED visits, complications, return to operating room, and postdischarge mortality were compared pre- and postintervention. Two-tailed χ^2 and Fisher exact tests were used to compare categorical variables and Mann-Whitney *U* tests were used to compare nonparametric continuous variables. For the multivariate analysis, univariate factors associated with readmission at a $P < .100$ were entered into a binary logistic model with backward step-wise elimination of factors. Final significance was determined by a $P < .050$ in multivariate analysis. Statistical analyses were performed using SPSS software, v 24 (IBM Corp, Armonk, NY).

Results

We included 231 patients in this analysis, 76 pre- and 155 postintervention. Demographic, clinical, comorbidity, operative, and pathologic variables shown in Tables 1 and 2 were distributed equivalently between the pre- and postintervention groups with the exception of trends toward more postoperative drains in the preintervention group, and higher ASA class and age in the postintervention group. The distribution of operative approaches, hepatectomy magnitudes, and multivisceral resections were also similar.

Pathology of the initial primary lesion, if in the case of a metastasis or presumption, was as follows: 53.7% colorectal cancer, 11.3% hepatocellular cancer, 10.8% cholangiocarcinoma, 2.6% gallbladder adenocarcinoma, 2.6% hepatic adenoma, 2.2% adrenocortical cancer, and 16.8% other (each fewer than 5 cases). Pathology of the liver lesion on final resection was as follows: 50.6% colorectal cancer, 10.4% hepatocellular cancer, 10.4% cholangiocarcinoma, 3.0% hepatic adenoma, 3.0% no tumor present, 2.2% adrenocortical cancer, and 20.4% other (each fewer than 5 cases, including 1.7% or 4 cases of treatment effect or no residual tumor).

Regarding the primary study aim, the 30-day readmission rate decreased from 14.5% in the preintervention group to 6.5% in the postintervention group ($P = .046$). The average duration of stay on the first readmission for patients' preintervention was 5.6 days and in patients postintervention was 4.9 days. The average number of readmissions for patients' preintervention was 1.3 times and in

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