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The role of clinical care pathways: an experience with distal pancreatectomy

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ARTICLE INFO

Article history:
Received 4 January 2014
Received in revised form
13 February 2014
Accepted 19 February 2014
Available online 24 February 2014

Keywords:
Distal pancreatectomy
Clinical care pathway
Clinical pathway
Critical pathway
Recovery pathway
Pancreas cancer

ABSTRACT

Background: Previous studies have indicated that clinical pathways may shorten hospital length of stay (HLOS) among patients undergoing distal pancreatectomy (DP). Here, we evaluate an institutional standardized care pathway (SCP) for patients undergoing DP.

Materials and methods: A retrospective review of patients undergoing DP from November 2006 to November 2012 was completed. Patients treated before and after implementation of the SCP were compared. Multivariable linear regression was then performed to identify independent predictors of HLOS.

Results: There were no differences in patient characteristics between SCP ($n = 50$) and pre-SCP patients ($n = 100$). Laparoscopic technique (62% *versus* 13%, $P < 0.001$), splenectomy (52% *versus* 38%, $P = 0.117$), and concomitant major organ resection (24% *versus* 13%, $P = 0.106$) were more common among SCP patients. Overall, important complication rates were similar (24% *versus* 26%, $P = 0.842$). SCP patients resumed a normal diet earlier (4 *versus* 5 d, $P = 0.025$) and had shorter HLOS (6 *versus* 7 d, $P = 0.026$). There was no increase in 30-d resurgery or readmission. In univariate comparison, SCP, cancer diagnoses, intraductal papillary mucinous neoplasm diagnoses, neoadjuvant therapy, operative technique, major organ resection, and feeding tube placement were associated with HLOS; however, after multivariable adjustment, only laparoscopic technique (−33%, $P = 0.001$), concomitant major organ resection (+38%, $P < 0.001$), and feeding tube placement (+68%, $P < 0.001$) were independent predictors of HLOS.

Conclusions: Implementation of a clinical pathway did not improve HLOS at our institution. The increasing use of laparoscopy likely accounts for shorter HLOS in the SCP cohort. In the future, it will be important to identify clinical scenarios most likely to benefit from implementation of a clinical pathway.

1. Introduction

Clinical care pathways—evidence-based multidisciplinary protocols detailing important facets of perioperative care—have emerged as a powerful tool to improve outcomes and increase the efficiency of recovery [1]. They are attractive strategies for quality improvement, in part, because their implementation is typically low in resource requirements and tends to be

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http://dx.doi.org/10.1016/j.jss.2014.02.026

cost-effective [1–3]. Among patients undergoing colorectal, gastroesophageal, orthopedic, and gynecologic surgeries, clinical pathways have demonstrated meaningful improvements in quality and performance metrics [4–7]. Data regarding their utility in pancreatic surgery, however, have been limited [2,8,9].

Distal pancreatectomy (DP) refers to resection of the gland left of the superior mesenteric vessels. The procedure is performed for both benign and malignant diseases of the pancreatic body and tail. Despite the elective nature of most cases, DP is associated with significant morbidity (13%–64%) and mortality (0%–6%) [10,11]. Thus, postoperative recovery varies widely across institutions, with mean hospital length of stay (HLOS) in the current era reported between 4 and 22 d [12]. A number of quality and performance initiatives have been introduced and evaluated as to whether outcomes can be improved in patients undergoing DP. These initiatives include variations in operative technique (e.g., laparoscopy, pancreatic duct stenting, splenectomy, routine drainage) [12–14], adoption of novel surgical technologies (e.g., stapling devices, ultrasonic instruments, fibrin glue or sealants) [9,15], and postoperative care measures (e.g., early refeeding, objective criteria for drain removal, prophylactic anticoagulation) [8,9]. Yet, even among high-volume centers, significant variability exists in standard practice for patients undergoing this procedure [14].

In April 2011, we initiated a standardized care pathway (SCP) for all adult patients undergoing elective DP at our institution, which detailed evidence-based parameters and expectations of care from the day of surgery until the day of hospital discharge. The goal of the SCP was to ensure that all patients were treated according to best practice guidelines. We hypothesized that implementation of the SCP might lead to improved outcomes, and thus, our primary objective was to examine HLOS and readmission rates before and after pathway implementation. At the time of implementation, internal reporting indicated that our outcomes were comparable, if not superior, to national trends [12,16]. It is unknown if pathway effectiveness is affected by pre-implementation outcomes, and thus, a secondary objective of this study was to explore the role of care pathways in centers with already favorable outcomes.

2. Materials and methods

2.1. Patients

After obtaining approval from the Institutional Review Board, the medical records of all patients who underwent DP at Duke University Medical Center from November 2006 to November 2012 were retrospectively reviewed. Inclusion criteria were defined as patients who underwent DP for pathology of the pancreatic body or tail. Patients who required concomitant organ resection (e.g., colectomy, gastrectomy, adrenalectomy) were included in the analysis. Patients who underwent DP for trauma or as part of a nonpancreatic primary diagnosis (e.g., renal cell carcinoma with involvement of—but not metastasis to—the pancreatic tail) were excluded. In April 2011, an SCP was introduced such that all patients who underwent DP after this date were treated according to the SCP. Data were collected from inpatient and outpatient charts, including clinic notes, radiographic studies, operative reports, anesthesiology records, and pathology reports. Data were collected by a physician or an advanced practice nurse with clinical expertise in abdominal surgery.

2.2. Components of the SCP

The clinical pathway details elements of care starting on the day of surgery (Table 1). Before skin incision, perioperative antibiotics (cefoxitin 1–2 g, intravenous [IV] every 8 h), deep venous thrombosis prophylaxis (heparin 5000 U subcutaenous every 8 h and sequential compression devices), and stress ulcer prophylaxis (pantoprazole 40 mg IV every 24 h) are administered unless there is an allergy or other contraindication (cefoxitin is discontinued at the end of surgery; heparin and pantoprazole are continued after surgery). A nasogastric tube (NGT) is placed to aspirate the gastric contents. Hemodynamic status is closely monitored, including Foley catheter and occasionally arterial and central venous catheters at the discretion of the anesthesiology team.

Operative technique (e.g., open *versus* laparoscopic approach) and intraoperative decisions (e.g., splenectomy, feeding jejunostomy tube placement, peripancreatic drainage, transection technique) are left to the discretion of the attending surgeon. Octreotide (100 μg SQ every 8 h) is administered intraoperatively and postoperatively for "soft" glands, also at the discretion of the surgeon.

After surgery, the patient is expected to be out of bed in a chair and is allowed nothing by mouth. On postoperative day (POD) 1, the NGT is discontinued if output has been <700 mL since surgery and the patient is experiencing no nausea. Invasive lines, if they were placed in the operating room, are removed. The patient is allowed sips of clear liquids. IV fluids are slowly decreased by 25 mL/h as long as urine output remains adequate (>30 mL/h). The patient is expected to walk with assistance at least 3×/day. A patient resource manager meets with the patient to discuss and evaluate discharge needs. If blood sugars are elevated (>180 mg/dL on two separate readings), endocrine and nutrition service consults are obtained. On POD2, the surgical dressings are removed and changed, the Foley catheter is discontinued, and deep venous thrombosis prophylaxis is changed to enoxaparin (40 mg SQ every 24 h). The patient is advanced to a clear liquid diet. Starting on POD3, the patient is expected to ambulate independently (or with assistance if needed preoperatively). Incision and drain sites are swabbed daily with of 2% chlorhexidine gluconate or 70% isopropyl alcohol. Also on POD3, serum and drain chemistries are obtained. The surgical drain is removed if the serum amylase-to-drain amylase ratio is ≤3, drain volume is ≤300 mL/d, and drain content is serosanguinous in character. The patient is advanced to a bland regular diet, and all IV or epidural pain regimens are converted to oral analgesics. Hospital discharge is anticipated on POD6.

2.3. Preoperative data

Demographic data including age, sex, baseline comorbidities, pathologic diagnosis, and use of neoadjuvant chemotherapy or radiation therapy were collected from patient charts.