

Surgical experience and the practice of pancreatoduodenectomy

Gregory T. Kennedy, MD, Matthew T. McMillan, BA, Laura Maggino, MD, Michael H. Sprys, MS, and Charles M. Vollmer, Jr, MD, Philadelphia, PA

Background. Experienced surgeons demonstrate improved pancreatoduodenectomy outcomes, but little is known about what distinguishes their practice. Furthermore, the concept of experience has been variably interpreted in the surgical literature. We investigated how 4 interpretations of experience influence pancreatoduodenectomy management decisions.

Methods. A survey assessing pancreatoduodenectomy practice patterns was distributed by 6 surgical societies. Regression analysis identified behaviors associated with 4 forms of experience: years in practice, surpassing the learning curve (≥ 50 pancreatoduodenectomies), high annual volume (≥ 25 pancreatoduodenectomy/year), and high career volume (> 200 pancreatoduodenectomy).

Results. In the study, 861 surgeons responded, representing 6 continents. Senior surgeons were more likely to use pancreatogastronomy, dunking/invagination, and external stents (all $P < .05$). Sixty-five percent of respondents surpassed the learning curve, and these surgeons were more likely to use a 2-layer pancreatic enteric anastomosis, stents, and the Fistula Risk Score (all $P < .05$). High annual volume surgeons were more likely to use the same reconstruction on every case and autologous tissue patches but less likely to use the Roux limb technique and multiple drains (all $P < .05$). High career volume surgeons mirrored the behaviors of those surpassing the learning curve except for using the Fistula Risk Score.

Conclusion. Experience encompasses several components, each of which seems to influence decision making in different ways. (Surgery 2017;■■:■■-■■.)

From the Department of Surgery, University of Pennsylvania Perelman School of Medicine, Philadelphia, PA

WITH GROWING CONCERNS ABOUT THE QUALITY AND EFFICIENCY OF HEALTH CARE DELIVERY, scrutiny of individual surgeon performance has intensified in recent years.¹ Multiple studies across a spectrum of surgical specialties have demonstrated that increased surgeon experience is associated with improved outcomes for a number of procedures.² The concept of experience has been variably defined in this literature—alternately referred to as years of surgical practice, attainment of a learning curve, annual operative productivity, or total career procedure volume. However, the mechanisms by which these different interpretations of experience might translate into improved outcomes have not

been elucidated clearly. The morbidity and mortality benefits associated with surgical experience may be due to a number of factors, both institutional (eg, high-volume centers and health-system support) and individual (eg, technical skill, training background, judgment, and management decisions). The present study addresses the latter aspect, examining how each of the various possible interpretations of experience correlates with surgical decision-making and, where appropriate, whether those decisions are in accordance with best available evidence.

Pancreatoduodenectomy (PD) provides an ideal case study for this question. PD is a complex operation with a high risk of postoperative morbidity and mortality, mainly related to the development of postoperative pancreatic fistula (POPF).³ Multiple intraoperative and postoperative management strategies exist for the mitigation of POPF risk, many of which have been evaluated in prospective and randomized controlled trials (RCTs), thereby establishing evidence for best practices in the surgical literature.^{4,9} In addition to evidence supporting certain management decisions,

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Reprint requests: Charles M. Vollmer, Jr, MD, Department of Surgery, University of Pennsylvania Perelman School of Medicine, 3400 Spruce Street, 4 Silverstein Pavilion, Philadelphia, PA 19104. E-mail: Charles.Vollmer@uphs.upenn.edu.

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there also exist compelling data indicating that mortality, survival, and overall life expectancy are improved at centers performing a high annual volume of PD.¹⁰ Within high volume centers, a strong volume-outcome relationship at the level of individual surgeons has been repeatedly demonstrated.¹¹ Furthermore, increased surgeon career PD volume has been associated with improved outcomes, and a learning curve for PD has been described in multiple studies.^{12,13} In the present study, we sought to identify how each of these concepts of experience—total years in practice, attainment of the learning curve, annual practice productivity, or total career procedure volume—influence operative techniques and management decisions for PD.

METHODS

This study was approved by the Institutional Review Board at the University of Pennsylvania. A Web-based survey ([Supplementary File 1](#)) was designed and administered to surgeons who perform pancreatic operation through 22 international gastrointestinal surgical societies. The survey was initially targeted globally through the International Hepato-Pancreato-Biliary Association, the Society for Surgery of the Alimentary Tract, and the Pancreas Club. Subsequently, regional support was engendered from the Americas Hepato-Pancreato-Biliary Association, the Asian-Pacific Hepato-Pancreato-Biliary Association, the European/African/Middle Eastern Hepato-Pancreato-Biliary Association, and their corresponding national chapters. To facilitate its global catchment, the survey was made available in 8 different languages: English, French, German, Italian, Japanese, Mandarin Chinese, Portuguese, and Spanish. Using membership estimates from the participating surgical societies, it is estimated that the survey was distributed to approximately 1,500 to 2,000 surgeons. This survey's responses have previously been used to associate practice patterns for PD with regional variation across the globe.¹⁴ Additionally, results have been used to evaluate the impact of fellowship training on the practice of PD,¹⁵ as well as to better understand surgeons' perceptions of what constitutes risk for POPF.¹⁶ The present study differs from previous analyses using this dataset in that it elucidates practice pattern variation based on markers of experience, a question that has not been studied previously to the best of the authors' knowledge.

Surgeons were asked to report their region of practice and these were clustered subsequently to create 5 geographic zones: Africa/Middle East,

Asia/Australia, Europe, North America, and South/Middle America. Next, surgeons were asked about experience-related parameters such as age, annual PD volume, career PD volume, and years of experience as an attending surgeon. Surgeons also reported relevant fellowship training and the current scope of their clinical practice. Questions regarding the practice patterns of individual surgeons were presented using a modified Likert scale: (i) never, 0%; (ii) occasionally, 1–25%; (iii) sometimes, 26–75%; (iv) frequently, 76–99%; and (v) always, 100%. Specific operative techniques evaluated were pancreaticogastrostomy (PG), pancreaticojejunostomy (PJ), dunking/invagination, duct occlusion, isolated Roux limb, anastomotic suturing techniques, transanastomotic stent placement, biologic sealants (eg, fibrin glue), autologous tissue patch use, and externalized drain placement. Perioperative management decisions referred to the administration of prophylactic somatostatin analogues (eg, octreotide), and early drain removal [postoperative day (POD) ≤ 3] based upon drain amylase values.

Statistical analysis. Descriptive statistics are presented as frequencies for categorical variables, and as the mean \pm standard deviation (SD) and median [interquartile range (IQR)] for continuous variables. Pearson χ^2 test or Fisher exact test, and independent Student *t* tests or analysis of variance testing were used to analyze categorical and continuous variables, respectively. Nonparametric comparisons of continuous variables were assessed by Wilcoxon rank-sum tests or Kruskal-Wallis one-way analysis of variance. In univariable testing, specific practice patterns were associated with the following surgeon experience-related parameters: years of experience (≤ 10 years, 11–20 years, > 20 years), surpassing the PD learning curve (≥ 50 PDs¹²), high annual volume (upper quartile, ≥ 25 PDs/year), and high career volume (upper quartile, ≥ 200 career PDs). Next, a multivariable, stepwise logistic regression analysis ($P \leq .05$ for entry; $P > .10$ for exit) was used to identify practice behaviors that are associated with surpassing the learning curve for PD. A second logistic regression model was used to identify behaviors associated with high annual PD volume. All tests were 2-sided. Statistical computations were performed utilizing SPSS version 23.0 (IBM Corp., Armonk, NY) statistical software.

RESULTS

Demographics and various forms of operative experience. Surveys were completed by 861 practicing surgeons, representing 6 continents and 8

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