# Planning to Avoid Trouble in the Operating Room: Experts' Formulation of the Preoperative Plan

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**OBJECTIVE:** The purpose of this study was to capture the preoperative plans of expert hepato-pancreato-biliary (HPB) surgeons with the goal of finding consistent aspects of the preoperative planning process.

**DESIGN:** HPB surgeons were asked to think aloud when reviewing 4 preoperative computed tomography scans of patients with distal pancreatic tumors. The imaging features they identified and the planned actions they proposed were tabulated. Surgeons viewed the tabulated list of imaging features for each case and rated the relevance of each feature for their subsequent preoperative plan. Average rater intraclass correlation coefficients were calculated for each type of data collected (imaging features detected, planned actions reported, and relevance of each feature) to establish whether the surgeons were consistent with one another in their responses. Average rater intraclass correlation coefficient values greater than 0.7 were considered indicative of consistency.

**SETTING:** Division of General Surgery, University of Toronto.

**PARTICIPANTS:** HPB surgeons affiliated with the University of Toronto.

**RESULTS:** A total of 11 HPB surgeons thought aloud when reviewing 4 computed tomography scans. Surgeons were consistent in the imaging features they detected but inconsistent in the planned actions they reported.
Of the HPB surgeons, 8 completed the assessment of feature relevance. For 3 of the 4 cases, the surgeons were consistent in rating the relevance of specific imaging features on their preoperative plans.

**CONCLUSION:** These results suggest that HPB surgeons are consistent in some aspects of the preoperative planning process but not others. The findings further our understanding of the preoperative planning process and will guide future research on the best ways to incorporate the teaching and evaluation of preoperative planning into surgical training. (J Surg 72:271-277. © 2014 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

**KEY WORDS:** preoperative planning, surgical judgment, surgical decision making, expertise

**COMPETENCIES:** Patient Care, Medical Knowledge, Practice-Based Learning and Improvement

## INTRODUCTION

Surgical judgment has historically been difficult to define and even more challenging to teach and assess. A recent series of studies outlined a framework for understanding expert surgical judgment focusing on a cognitive phenomenon known as "slowing down when you should."[1-3] This phenomenon describes the mental transition from a routine mode of operating to a more attentive mode when required, a transition initiated by critical moments in the operating room.[2] In these original studies, the surgeons, all of whom had a reputation for having outstanding judgment, identified preoperative planning and the ability to anticipate critical slowing down moments, or "landmines," as important aspects of expert practice. However, in a recent survey of approximately 5000 categorical general surgery residents in the United States, only one-third of trainees believed they were being taught preoperative planning as part of their

This work was funded by a Medical Council of Canada Research in Clinical Assessment Grant no. MCC/7-1314. Dr. Zilbert was supported by a Fellowship for Studies in Medical Education from the Royal College of Physicians and Surgeons of Canada. The funding source had no role in the collection, analysis, or interpretation of any data; writing of this manuscript; or decision to submit it for publication.

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  *1931-7204/$30.00*
*http://dx.doi.org/10.1016/j.jsurg.2014.09.015* 

**FIGURE 1.** A representative axial image from case 1. A 3.5-cm hypodense mass in the proximal body of the pancreas encasing the proximal splenic artery and compressing the distal splenic vein near the portal vein-splenic vein-superior mesenteric vein confluence.

training.[4] The study presented here was undertaken as a first step toward addressing this deficiency in contemporary surgical training by attempting to better understand the process of preoperative planning before creating educational initiatives to teach it.

Preoperative identification of slowing down moments requires good situation awareness.[1] In describing her model of situation awareness, Endsley[5] states that the perception of relevant information is the first step toward effective decision making. This indicates that a surgeon must sift through all preoperative information available from the history, physical examination, or results of investigations to identify the critical cues necessary to formulate his or her operative plan. Once these cues are recognized, the surgeon must then interpret them accurately and decide how they would affect future actions.[5] The ability to attend to specific cues relies on 2 pathways: unexpected stimuli that capture our attention in a "bottom-up" process and anticipated stimuli that are sought out and detected in a "top-down" process.[6] When examining preoperative information, it is likely that both processes are occurring simultaneously as surgeons sort through the relevant preoperative information and consider how it would affect their operative plan. Access to this planning process requires a methodology that captures surgeons' thoughts in real time.

Using the think-aloud method, we specifically explored whether expert surgeons were consistent in describing their preoperative plans. The ability to find consistent components of the preoperative planning process among a sample of surgeons would lead to opportunities for standardization of this process for future assessment tools. This study therefore served as the first step in this ongoing research program that endeavors to make surgical judgment more explicitly teachable and more rigorously assessable.

## MATERIAL AND METHODS

The think-aloud method was chosen for this study to gain access in a nonscripted way to surgeons' thoughts as they created their operative plan. It was important that surgeons not be prompted in a way that would direct their attention to relevant cues. Thinking aloud involves a participant verbalizing his or her thoughts when engaging in a specific task.[7-9] The think-aloud method has been used to distinguish between novice and expert performance in medical activities such as interpretation of electrocardiograms, examination of histopathology slides, and decision making in simulated clinical vignettes.[10-12]

To evaluate surgeons' preoperative plans, we chose an operation for which the technical aspects of the operative plan are based primarily on preoperative imaging, as opposed to the physical examination or other investigations. This was done so that the preoperative planning process could be accurately simulated in a standardized nonclinical environment. Experts were asked to think aloud as they viewed the images and constructed their preoperative plan. Research ethics board approval was obtained from the University Health Network, and all participants provided informed consent.

### Operation

The distal pancreatectomy was considered to be an ideal choice for this study because operative plans for this procedure are constructed using cross-sectional imaging and each operation varies based on patient-specific nuances. This heterogeneity of distal pancreatic tumors results in case-specific implications for resection with preoperative plans that are tailored to these specific nuances. We selected 4 preoperative computed tomography (CT) scans of patients with distal pancreatic tumors from the clinical practices of the authors (C.A.M. and S.G.). Representative images demonstrating the key findings for each case are provided in Figures 1 to 4. These cases were chosen to ensure variability regarding tumor location, relationship with major vascular structures, local invasion of adjacent organs, and ultimately the implications for the procedure performed. Copies of each preoperative CT scan were

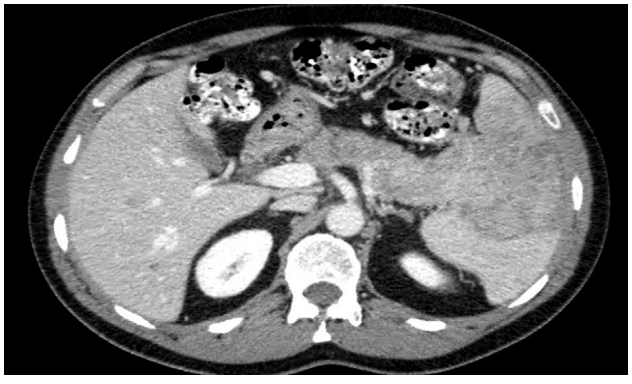

**FIGURE 2.** A representative axial image from case 2. An 11-cm hyperdense mass arising from the tail of the pancreas invading the spleen.