

# Improve Patient Outcomes with Video Pathology Consultations

By Phil Merlo, [SPOT Imaging Solutions](#)

## Abstract

A review of published studies indicates that video conferencing support of intraoperative pathology consultation contributes not only to improved patient outcomes, but also reduces liability and results in significant time savings for the hospital, pathology lab and surgical personnel.

These results can be attributed to a live-sample imaging communication channel connecting the pathologist directly to the surgical suite and subspecialty opinions, which creates the opportunity for real-time consultation and the immediate resolution of orientation and diagnosis questions presented during surgical procedures.

Effective video conferencing systems also provide doctors and staff with methods for immediate archiving and retrieval of key

procedural images, which is essential for reference, QA audits and liability case support. The amortization period for implementation of this technology is remarkably short when calculated against time savings for staff, reduction in surgical site infections and re-excision surgeries and support of liability abatement programs. The impact on key organizational metrics has made the adoption of intraoperative video conferencing the standard practice of leading healthcare organizations.

## Introduction

Cost effective, mission critical patient care, is the goal of leading healthcare systems worldwide. Keeping current with process and technology improvements is key to achieving this goal. Multiple studies state that video conferencing and digital image documentation positively affect intraoperative pathology consultations. The improvements impact four categories of benefit:



## Video Conferencing with the Operating Room using the SPOT PathStation 2

- patient outcomes
- procedural efficiency
- informational integration
- liability abatement

In this discussion we will review both the premise for the value generated by the proposed improvements, as well as studies that have demonstrated the improvements achievable.

### **Intraoperative Pathology Consultation: Current and Proposed**

The intraoperative pathology consultation support of surgical procedure is initiated for four main clinical reasons:

- 51% To establish or confirm a diagnosis to determine the type and extent of operation indicated
- 16% To confirm the adequacy of margins
- 10% To confirm the nature of tissue for immediate culture or other laboratory study
- 8% To confirm that sufficient tissue was submitted to secure a diagnosis in permanent section<sup>1</sup>

These consultations involve a highly specialized team that includes surgeons, anesthesiologist, surgical staff, operations assistant, pathologist, and pathology assistant. This large, often spatially-separated team, poses a communication challenge. The current/legacy solution solves this issue by using a phone/intercom system. This provides fluid verbal communication, but fails to support the inherently visual nature of the consultation. This can lead to confusion, mistakes and deferred opinions. In some instances, the discussion of a critical visual element will force surgeons to physically travel to the frozen section room. These prolonged, confusing discussions, and inconvenient trips present an opportunity for improvement. Video conferencing is a candidate solution that combines both ease of use and fidelity of image presentation. Properly implemented video conferencing systems provide four workflow functions:

- “Speed dial” contact list to simplify conferencing connection
- Real-time audio and HD video for viewing gross and microscopy images
- Drawing tools to support discussion of images
- Image archiving to document procedural and diagnostically significant images to case files

These features significantly impact patient care, procedure cost, and staff utilization.

### **Impact on Surgical Site Infections and Their Associated Costs**

A common target for the improvement of patient care and morbidity rates in healthcare systems today is the reduction of Surgical Site Infection (SSI). The WHO Guide on Hospital standards notes the following with regard to SSI's:

“These problems are serious and costly, and are associated with increased morbidity and mortality as well as with prolonged hospitalization (1–3). Recently, their prevalence has been used as a marker for the quality of surgeons and hospitals (4–7).

Surgical site infection accounts for about 15% of all health-care associated infections and about 37% of the hospital-acquired infections of surgical patients (8,9). Two thirds of surgical site infections are incisional and one third confined to the organ space (9). In western countries, the frequency of such infections is 15–20% of all cases, with an incidence of 2–15% in general surgery (3,10–12). Surgical site infections lead to an average increase in the length of hospital stay of 4–7 days. Infected patients are twice as likely to die, twice as likely to spend time in an intensive care unit and five times more likely to be readmitted after discharge.”<sup>2</sup>

The impact of the SSI statistics are widely recognized and methods to reduce this issue are highly sought after: “Surgical site infections are a big problem,” Schwab added. “In fact, it’s the number one most expensive hospital acquired infection that we’re tackling.”<sup>3</sup>

A 2009 report by Scott in the CDC Publications estimated 300,000 procedures presenting with surgical site infections at an average cost of \$25,000 each, amounting to about \$7.4 billion [per year in the U.S.].<sup>4</sup>

Couple these statistics with the rise of drug resistant nosocomial infections and even small reductions in the risk profile can have a great impact on patient outcomes and hospitalization costs.

One simple and impactful method to limit Surgical Site Infections (SSI) according to the published “WHO Guideline for Safe Surgery” is to: “shorten operating time;”<sup>5</sup>.

Does video conferencing shorten operating time? As noted in the previous section, intercom-based intraoperative consultations, often lead to inconvenient trips between the surgical suite and the frozen section room. These “scrub out” sessions by surgeons can add 10-20 minutes to the intraoperative consultation and surgical procedure. Patients exposed to this additional time have an increased risk of Surgical Site Infections (SSI's). Intraoperative video conferencing systems eliminate the need for surgeons to leave the surgical suite for consultation with pathology and its associated surgical procedure delays.

Beyond the impact on SSIs, hospitals will benefit from a reduction in overtime compensation and greater utilization of the surgical suite and its staff. Average billing rates for surgical suites are \$62/min<sup>6</sup> with billing by Surgeons, Anesthesiologists and Pathologists adding an additional \$8.25 per minute. This turns the 15 minutes savings noted above into a monetary savings of \$1,053 per occurrence. Increased surgical suite utilization could add the hours required for an additional procedure each day generating an additional \$5,000-\$20,000 of revenue.

### **The Impact of Telepathology and Video conferencing on Diagnosis and Secondary Re-Excision Surgeries**

As with any new technology considered for mission critical health care, video conferencing underwent several peer reviewed research studies. The first issue considered in the studies was the accuracy and repeatability of telepathology and video conferencing. This premise was concretely established in studies carried out by University of Pittsburg Medical Center<sup>7,8,9</sup> and the U.S. Defense Department<sup>10</sup>. These studies stated: “Intra-observer agreement between the telepathology diagnosis and glass slide diagnosis was observed. Diagnostic agreement was 100% for a wide variety of specimens.”<sup>10</sup>

The second issue investigated was the overall patient care advantage of using real-time video conferencing and telepathology. Studies conducted by Memorial Sloan-Kettering Cancer Center New York and M.D. Anderson Cancer Center showed: “telepathology/video-conferencing improved patient care by ensuring accurate tumor clearance within the initial surgical procedure”<sup>11</sup> and “reduced costly and patient impactful secondary surgeries”<sup>12</sup>

An investigation into the reason for this reduction in secondary surgeries uncovered the concept of “The consult to the intraoperative consult”.<sup>13</sup> It stems from the fact that surgical pathologists staffing the frozen section room are by necessity a generalist or an expert in a subspecialty. This leads to situations when a real time subspecialty consultation to the frozen section pathologist is instrumental in avoiding a deferred diagnosis during the surgical procedure. Studies of “secondary reads” of anatomical pathology samples by subspecialty pathologists have also been shown to be statistically significant in the diagnosis of tumors as malignant or benign as well as the staging assigned.<sup>14,15</sup> Timely diagnosis of malignant tumor staging provides guidance to the surgeon when determining if sentinel lymph node excision should be performed in the initial procedure thereby avoiding secondary surgeries. A 2012 University of

Michigan study confirms this finding and provides an estimate in the reduction of re-excision surgeries from 26% to 9% with an average \$400 - \$600 savings per cancer patient treated.<sup>16</sup>

The move of the US Healthcare system to the Capitation and Bundled Payment models will soon make secondary surgeries an unreimbursed burden on both hospitals and surgeons. The preceding research indicates that a reduction in secondary surgeries and surgical diagnosis errors can be achieved via an increased use of intraoperative consultations and subspecialty pathology consultations. Real-time video conferencing provides the most effective and efficient tool for realizing these gains.

### **A Step Beyond Real-Time Video conferencing: Image Archiving**

Leading healthcare systems find real-time video conferencing an essential tool for providing cost effective improvements to patient care. Properly configured systems also support image archiving of procedurally significant images in their work flow. These images provide:

- Illustration of pathology reports
- Illustration of research publications
- Reference images for tumor board case consultations
- Support of physician, student and staff training
- Quality Assurance audits of procedure protocol standards
- Professional presentation of evidence in liability cases

### **Diagnostically Significant Pathology Images Enhance Discussion**

Publication, teaching and tumor board case consultations are all enhanced by the inclusion of procedural and diagnostically significant images. Efficient capture, archiving and retrieval of images is imperative for the time-pressured pathologist or technologist. Properly designed and implemented imaging systems minimize the impact of image documentation on the pathology workflow while supporting the inherently visual nature of anatomical pathology diagnosis. Video conferencing makes discussion and consultation regarding diagnostically significant micrographic fields of view and gross morphology lost due to dissection not only possible but also convenient.

### **Quality Assurance Enhancement via Digital Imaging**

Quality assurance and accreditation guidelines are moving toward greater codification, requiring standardized procedures and protocols, as well as the audit of compliance to these protocols. These audits take the form of tumor board case reviews, subspecialty second opinions, and procedure review

audits as noted in the landmark study by Krons et al<sup>17</sup>. Using only glass slides to carry out these reviews will miss the gross specimen dissection and because dissection is a destructive process, the original procedures can never be evaluated. Digital Imaging not only allows for the documentation of the full procedure, it does so in a manner that minimizes the impact of image capture on your work process. Case reviews benefit from digital file retrieval, presentation and reporting. This efficiency is especially beneficial when considering the number of doctors attending a tumor board case review or when subspecialty opinions are offsite and would otherwise require shipment of the glass slides resulting in delayed diagnosis. The ease and image fidelity provided by electronic image archiving has made it a standard work practice for leading institutions.

### **Systematic and Professional Pathology Liability Abatement**

There are several proactive institutional work practices to mitigate anatomical pathology liability. These practices include:

- 1) Systematic and automated tracking of specimens
- 2) Audit of protocol for procedural correctness
- 3) Audit of protocol for operator compliance
- 4) Subspecialty second opinions
- 5) Organized professional documentation of patient records including images and their related metadata

Items 1 and 2 are facilitated by a well-designed set of work practices, driven by an interconnected infrastructure of IT software and hardware, including the integrated image archiving system previously discussed.

Items 3 and 4 involve operator training and discretion and are the basis of the Quantity Assurance and Accreditation programs for the institution.

Item 5 concerns legal defense and persuading arbitrators and jurors. In the past decade, a cultural influence has arisen in the perception and expectations of arbitrators and jurors with respect to evidence presented. It is loosely termed the "CSI effect"<sup>18</sup>. It stems from fictional presentations made on television and movie crime stories. In most TV cases, the presentations and evidence provided are fantastical representations that lack any connection with reality. What they do provide the viewer however, is an impressively groomed professional presentation. The psychological impact of these TV

presentations has reached the point that the expected sophistication of the presentation of evidence overshadows the relevance of the evidence itself:

“They must do it now, lest a jury wonder where the CSI stuff was, and assume that **an absence of proof is a proof of absence**. . . . And really, that is the linchpin of the danger of the “CSI Effect”; a lack of evidence which is expected by an amateur leads to the assumption that if the evidence existed anywhere in the universe, the [advocate] would have offered it, which he or she did not, so therefore it doesn’t exist and the claimed event never happened.”<sup>19</sup>

Pathology case reports with only textual sample descriptions and the absence of images, may lead a jury to question what truly transpired. A captured image is interpreted as an unadulterated presentation of evidence while a textual description is considered an interpretation that has been filtered by the authoring individual and subject to error. Also, the sophistication of the image, the imaging system and the procedures that acquired the image can cast either a positive or negative light on the evidence presented. A consumer camera used in an ad hoc way to provide “snapshots” of a case does not instill confidence in the overall operation of the Pathology Lab. Conversely, a presentation of a procedural method of case documentation, using a built-for-purpose professional imaging system archiving into a PACS or LIS system and presenting a professional report of procedural and diagnostically significant images, will instill a sense of validity to the evidence provided.

Consider your own decision making process for a home improvement contract: Are you going to trust a part-time “Do-It-Yourselfer” with a beat up truck and rusty toolbox to install the gas line in your basement, or are you going to hire the certified professional with the specialized tools to insure this mission critical gas line is installed properly? Your level of confidence is swayed by the presentation rather than by the performance.

### **Improve Hospital Ranking Metrics**

In non-emergency life threatening conditions, patients select care providers based on reputation. Internet-based Hospital Ranking sites such as Leapfrog, U.S. News, Consumer Reports, Healthgrades and Truven Health Analytics are popular (and growing) reference sites for consumer information. These ranking sites are seen to provide one of the few concrete and objective sources of data that newly diagnosed patients can refer to. These sites base their rankings on metrics including patient survival, re-admissions, surgical site infections and medical error rates. As noted in the citations, these same metrics have been positively affected by video conferencing and image archiving systems.

## Conclusion

Video conferencing support of intraoperative pathology consultations provides improvements to the metrics that matter to healthcare stakeholders. Patients benefit from reduction in procedures coupled with better outcomes. Caregivers benefit from efficient workflows, greater certainty of diagnosis, shorter procedure times and reduced incidences of secondary re-excision surgeries. Providers positively impact patient care metrics, hospital rankings, facility utilization and budgets. Payers maintain the health of their subscriber base while reducing un-necessary secondary procedures, extended hospital stays and critical care recoveries. These stakeholder benefits have made the adoption of intraoperative video conferencing the standard practice of leading healthcare organizations.

## References

1. Richard J. Zarbo, MD, DMD; Waldemar A. Schmidt, MD, PhD; Paul Bachner, MD; Peter J. Howanitz, MD; Frederick A. Meier, MD; Ron B. Schiffman, MD; D.Joe Boone, PhD; Ross M. Herron, Jr, MD; Indications and Immediate Patient Outcomes of Pathology Intraoperative Consultations: Archives of Pathology and Laboratory Medicine. January 1996; Vol 120:19-25.
2. WHO Guidelines for Safe Surgery : 2009 : Safe Surgery Saves Lives: Section II. Objective 6: p43 WHO Press: World Health Organization, 20 Avenue, Appia, 1211 Geneva 27, Switzerland [http://whqlibdoc.who.int/publications/2009/9789241598552\\_eng.pdf](http://whqlibdoc.who.int/publications/2009/9789241598552_eng.pdf)
3. Patrick Schwab; Healthcare facilities set sights on SSIs to help meet reimbursement goals: Healthcare Purchasing News. June 2012 <http://www.hpnonline.com/inside/2012-06/1206-ipbg-ssi.html>
4. R. Douglas Scott II, The Direct Medical costs of Healthcare-Associated Infections in U.S. Hospitals and the Benefits of Prevention, March 2009, [http://www.cdc.gov/hai/pdfs/hai/scott\\_costpaper.pdf](http://www.cdc.gov/hai/pdfs/hai/scott_costpaper.pdf)
5. WHO Guidelines for Safe Surgery : 2009 : Safe Surgery Saves Lives: Section II. Objective 6: p46 WHO Press: World Health Organization, 20 Avenue, Appia, 1211 Geneva 27, Switzerland [http://whqlibdoc.who.int/publications/2009/9789241598552\\_eng.pdf](http://whqlibdoc.who.int/publications/2009/9789241598552_eng.pdf)
6. Alex Macario MD, MBA, What does one minute of operating room time cost? Journal of Clinical Anesthesia (2010) 22, 233–236 <http://ether.stanford.edu/asc/documents/management2.pdf>
7. Horbinski C, Fine JL, Medina-Flores R, Yagi Y, Telepathology for intraoperative neuropathologic consultations at an academic medical center: a 5-year report, Journal of Neuropathology Exp Neurol. 2007 Aug;66(8):750-9, Wiley CA. <http://www.ncbi.nlm.nih.gov/pubmed/17882019>
8. Horbinski C, Comparison of telepathology systems in neuropathological intraoperative consultations. Neuropathology, 2009 Dec;29(6):655-63. doi: 10.1111/j.1440-1789.2009.01022.x. Epub 2009 Apr 21., Wiley CA <http://www.ncbi.nlm.nih.gov/pubmed/19422534>



9. Horbinski C, Hamilton RL. Application of telepathology for neuropathologic intraoperative consultations, Brain Pathol. 2009 Apr;19(2):317-22. doi: 10.1111/j.1750-3639.2009.00265.x. <http://www.ncbi.nlm.nih.gov/pubmed/19290998>
10. Keith J. Kaplan, M.D., Jeanette R. Burgess, M.D., Glenn D. Sandberg, M.D., Cris P. Myers, M.D., Thomas R. Bigott, B.S., Renata B. Greenspan, M.D., Use of Robotic Telepathology for Frozen-Section Diagnosis: A Retrospective Trial of a Telepathology System for Intraoperative Consultation, Modern Pathology 2002;15(11):1197–1204 [http://www.theconference.ca/pdf/kaplan\\_modernpathology.pdf](http://www.theconference.ca/pdf/kaplan_modernpathology.pdf)
11. SEAN A. SUKAL, MD, PHD, KLAUS J. BUSAM, MD,† AND KISHWER S. NEHAL, MD‡, Clinical Application of Dynamic Telepathology in Mohs Surgery, Dermatol Surg 31:12:December 2005, <http://www.sukalskininstitute.com/f/Telepathology.pdf>
12. Chagpar A, Yen T, Sahin A, Hunt KK, Whitman GJ, Ames FC, Ross MI, Meric-Bernstam F, Babiera GV, Singletary SE, Kuerer HM. , Intraoperative margin assessment reduces reexcision rates in patients with ductal carcinoma in situ treated with breast-conserving surgery: The American Journal of Surgery, Volume 186, Issue 4, P 371-377, October 2003, [http://www.americanjournalofsurgery.com/article/S0002-9610\(03\)00264-2/abstract](http://www.americanjournalofsurgery.com/article/S0002-9610(03)00264-2/abstract)
13. Dr. Stephen Peters, MD; A Method for Preparation of Frozen Sections, www.ihcworld.com [http://www.ihcworld.com/\\_protocols/histology/frozen\\_section\\_technique\\_4.htm](http://www.ihcworld.com/_protocols/histology/frozen_section_technique_4.htm)
14. Julia Dahl, MD, Quality, Assurance, Diagnosis, Treatment, and Patient Care, Patient Safety & Quality Healthcare, March / April 2006, Lionheart Publishing, Inc. <http://www.psqh.com/marapr06/pathologist.html>
15. Ronald L. Sirota M.D , Mandatory second opinion surgical pathology at a large referral hospital, Cancer, Volume 89, Issue 1, pages 225–226, 1 July 2000. [http://onlinelibrary.wiley.com/doi/10.1002/1097-0142\(20000701\)89:1%3C225::AID-CNCR36%3E3.0.CO;2-1/ful](http://onlinelibrary.wiley.com/doi/10.1002/1097-0142(20000701)89:1%3C225::AID-CNCR36%3E3.0.CO;2-1/ful)
16. Sabel MS, Jorns JM, Wu A, Myers J, Newman LA, Breslin TM, Development of an intraoperative pathology consultation service at a free-standing ambulatory surgical center: clinical and economic impact for patients undergoing breast cancer surgery, m J Surg. 2012 Jul;204(1):66-77. doi: 10.1016/j.amjsurg.2011.07.016. Epub 2011 Dec 16. <http://www.ncbi.nlm.nih.gov/pubmed/22178485>
17. Joseph D. Kronz M.D., William H. Westra M.D., Jonathan I. Epstein M.D., Mandatory second opinion surgical pathology at a large referral hospital, Cancer, Volume 86, Issue 11, pages 2426–2435, 1 December 1999.
18. Max M. Houck CSI: Reality, Scientific American, July 2006, pages 84-89.
19. Richard Matthews, “The CSI Effect . . . in Civil Cases as Well as Criminal Ones,” *The Jury Expert*, June 2007, page 10-11.