Approaches to and Perspectives on Digital Insourcing of Pathology Consultation and Second Opinion

Toby C. Cornish, MD, PhD
June 23, 2015
Disclosures

• None
The Johns Hopkins Medicine

- Baltimore, MD
- JHH Founded 1889
- 1,059 beds
- Surgical pathology caseload of ~80k cases per year
- 5 hospitals in Baltimore/DC metro area
Pathology Consult Service at JHH

• True consults and confirming consults

• Expert consults provide value to all parties:
  – To the patient
  – To the submitting pathologist
  – To the consulting pathologist
Consult case volume: 1985-2014
### JHH Consult Service 2013 (Jan-Dec)

#### Surgical Pathology

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#### Cytopathology

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Consult Service at JHH

• Domestic true consult volumes have flattened out

• Our international consultation volumes have also been low in comparison

• Can we use digital pathology expand our international volume?

• What about China?
Why China?
To match the ratio of Pathologists in the USA, China would need growth of **four times** current levels
China the hardest hit by global surge in cancer, says WHO report

The world registered 14 million new cancer cases and 8.2 million deaths in 2012.

China is bearing the brunt of new cancer cases and deaths amid an alarming global rise in the disease in 2012, according to the World Health Organisation.
Chinese Market

• The potential Chinese consultation market is estimated to be around $1.3 billion
• Human specimens, including glass histology slides, cannot be sent out of China
• Language and payment create significant barriers
• Strong central push toward telemedicine and telepathology in China
National Health and Family Planning Commission (NHFPC) Circular 51 on Telemedicine
NHFPC Circular No. 51

《国家卫生计生委关于推进医疗机构远程医疗服务的意见》的解读
An Interpretation of the Opinions of the National Health and Family Planning Commission Regarding the Promotion of the Medical Institution Telemedicine Services
中华人民共和国国家卫生和计划生育委员会2014-08-29
The National Health and Family Planning Commission of the People’s Republic of China
August 29, 2014

AND

国家卫生计生委关于推进医疗机构远程医疗服务的意见
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The National Health and Family Planning Commission of the People’s Republic of China
August 29, 2014
国卫医发〔2014〕51号
National Health Medical Issue 〔2014〕 Number 51
NHFPC Circular No. 51

• Charges local health administrations with creating and promoting telemedicine services

• Remote medical services are explicitly permitted between licensed domestic medical institutions
Remote medical services are also permitted between Chinese medical institutions and foreign medical institutions.

The NHFPC has reportedly indicated that foreign medical institutions are not required to be licensed, but it may elect to review the qualifications of foreign medical institutions.
Using digital telepathology to insource international consultations
International Telepathology

- Many notable examples:
  - Armed Forces Institute of Pathology (AFIP)
  - UICC Telepathology Center (2000)
  - iPath platform (c. 2002)
  - MECES platform (2011)
  - Virtual International Pathology Institute (VIPI)
  - SAHZU-UCLA Joint Academic Center for Diagnosis (2010)
Approach

• Integrate digital pathology into our existing consultation service
• Increase awareness of the value of subspecialty consultation in China
• Increase awareness of Johns Hopkins Pathology in China
Wish list for features

- Web-based
- Vendor solution
- Vendor Hosted
- Easy to use for our admins and pathologists
- Optional LIS interfacing
- Pre-existing Chinese partner(s)
- Mechanisms to address language barriers
- Facilitation of payment for services
Choice of Technology Platforms

1. DIY / Open Source platform

2. Vendor-provided, Customer-hosted platform

3. Vendor-provided, Vendor-hosted ("Consultation Network platform")
Choice of Technology Platforms

1. DIY / Open Source platform

2. Vendor-provided, Customer-hosted platform

3. Vendor-provided, Vendor-hosted “Consultation Network platform”
Choice of Technology Platforms

1. DIY / Open Source platform

2. Vendor provided, customer-hosted platform

3. Vendor-provided, Vendor-hosted “Consultation Network platform”
DIY Platform: UPMC
Welcome to the UPMC Digital Pathology Consultation Service

Connect with our team of internationally recognized leaders in pathology when you need a second set of eyes and subspecialty expertise.

Our pathologists, who are physicians at UPMC and faculty of the University of Pittsburgh, deliver their expertise and high-quality consultation directly to your practice, hospital, or lab. The UPMC Digital Pathology Consultation Portal

Now it's easier than ever to send your slides electronically via a secure internet connection through the UPMC Digital Pathology Consultation Portal. Receive rapid consultations with no mail, courier, or inconvenience required.

The digital portal gives you a valuable second opinion necessary to be accurate and efficient in both diagnosis and treatment.

The UPMC Department of Pathology offers FREE continuing medical education (CME) through this website. The CME modules cover a broad range of topics relevant to pathologists and are presented as case reviews and lectures. Click here for additional details.

SECOND OPINION CONSULTATIONS ONLY

PRIMARY BILLING OF PATIENT INSURER

SUBMIT YOUR CASE NOW!
UPMC KingMed Consulting Service

Destinations

Consultation Services
Transcriptionists
Pathologists

© 2011 UPMC | University of Pittsburgh Medical Center.
Designed and maintained by CDS.
Send questions and comments to the Web Administrator.
DIY: Advantages

• Complete control over the platform
• Complete control over branding / marketing
• Complete control over client relationships
• Customize to fit your workflow and information systems
• No vendor fees
DIY: Disadvantages

- Building and maintaining the platform yourself can be costly & time-consuming
- Customer and user support
- Hardware management
- No pre-built client relationships
- Manage all translation & collection activities
Vendor Client-Hosted Platform
Client-Hosted: Advantages

• Relatively straightforward setup
• Complete control over client relationships, branding, marketing, etc.
• No per-case vendor fees
Client-Hosted: Disadvantages

- Maintenance fees
- Hardware management
- Firewall / VPN issues
- If the server resides with the submitting site, no ability to bring on additional client sites
- No pre-built client relationships
- Server product may not be have an ideal consultation workflow
- No content delivery network for seamless global operations
Vendor Consultation Network
Vendor Consultation Network

• Joined two networks:
  – Xifin ProNet (formerly PathCentral)
  – Leica/Aperio ePathology Network

• Business model:
  – Vendor provides an online marketplace and platform for consultants and contributors
  – Vendor charges the consultant and/or contributor either an annual fee or a per-case fee
XIFIN ProNet

• Secure, “cloud”-based service
• Features include:
  – Digital Consultations
  – Professional networking tools
  – Marketing options within user/group profiles
• Platform independent:
  – Leica/Aperio, Ventana, Simagis, Mikroscan, others
Kindstar Diagnostics

• “First and largest” esoteric clinical laboratory conglomerate in China
• Over 3000 hospital clients, including 1100 level 3 hospitals
• Serving more than 600 cities, and 31 provinces
• Annual growth rate of over 50% in both sales and employees for the past 4 years
System Overview
Case submission

Contributing Pathologists

Central Lab

Consultation Network

Consulting Pathologists
Creating a Consultation Request

- Scanned WSIs are associated with case
- Patient and case information is entered
- Scanned documents and additional image files can be attached to the case
- A consult request letter is attached
- Chinese language localization of user interface
View WSIs in the Case

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Enter the Diagnosis

Dear Doctor Toby Cornish,

I have a 51-year-old female patient.

1) MEDIAL BREAST CALCIFICATIONS 2) LATERAL BREAST CALCIFICATIONS - LT BREAST BIOPSY 1/0/3

Sincerely,
Joseph Nolar

Attachments
- Final Diagnosis Report.pdf

Enter diagnosis here

Attach final Report PDF here

Send report
Challenges
Challenges (General & Specific)

• International barriers
• Special stains
• LIS integration
• Human factors
• Volume
International Barriers

• Language
  – We do have translation services at the hospital level, but are not using them
  – We receive information in English and return reports in English
  – The user interface of the software is localized for use in China

• Payment
  – The network provider handles the collections
Special Stains

• How do we get additional stains on cases?
• Normally, we would request blocks or unstained slides
• Tissue can’t leave China
• Rely on the contributing lab to perform the stain
• Makes having a large reference lab partner advantageous
• No formal mechanism for requesting stains -- use the “send message” function
LIS integration

• We elected for no integration with our LIS
  – Uncertain about volume
  – Workarounds are straightforward

• Resulted in:
  – Cases are accessioned into our LIS manually
  – Results are returned to the consultation network manually
Human Factors

• Would our pathologists be accepting of digital consults?
  – No pathologists refused to be part of the digital consultation group despite being able to opt-out
  – 29 pathologists on the roster

• Human issues remain
  – Forgotten usernames, passwords
  – Confusion about SOPs
Volume

- Case volumes have been low
- Low volumes make the process “occasional” rather than routine
- Low volumes are tolerable because we haven’t invested large sums of money
- Single biggest issue
Where is the business?

• A large traditional consultation service
• Expert subspecialty pathologists
• Technical ability to offer consultation services
  – Xifin ProNet (partnered with Kindstar)
  – Leica ePathAccess

• Where is the business?
Contrast to UPMC & UCLA

• UCLA
  – Directly partnered with SAHZU
  – Over 2000 cases since 2010

• UPMC
  – Directly partnered with KingMed Diagnostics
  – 1251 cases (from 1/2012 to 8/2014)
Re-thinking our approach in China

• Two key aspects missing:

1. Direct relationships with partners in China

2. Better marketing of services in China
Building relationships in China

• Started working directly with several groups in China
• Growing multifaceted relationships that include educational, collaborative, and consultative pieces
Building relationships in China

• Most notably, Zhejiang DIAN Diagnostic, Ltd
  – Largest publically-traded reference lab in China
  – We have launched a number of initiatives, including digital consultation

• Also talking directly with several top cancer hospitals in China
迪安牵手世界医疗大鳄 迈入国际化战略新里程

为加快引进世界领先的病理学知识和技术，推广国际化专业标准和资格证书，提升国际化水平，3月25日，迪安与约翰·霍普金斯医院（The Johns Hopkins Hospital，以下简称“JHH”）在美国共同签署了《战略合作协议》，在病理技术交流与培训、合作办学、合作办医等领域展开全面、深入合作，建立开放、创新的合作关系。该事件是迪安国际化战略中里程碑式的重要部署。

JHH建于1889年，是一所位于美国马里兰州巴尔的摩市的大型综合医院，其在癌症、神经系统疾病、精神科、老年病等多领域的诊疗水平处于全美前三名，且已连续23年被《美国新闻与世界报道》评为“盈利性的医疗保健集团”，被称作“约翰·霍普金斯卫生系统（HHS）”，旗下还包括约翰·霍普金斯社区医师、约翰·霍普金斯医学服务公司、约翰·霍普金斯医学管理公司等机构。

在此次合作中，迪安一方面将向JHH病理科的英语病理教学APP（“约翰霍普金斯病理学图集”）APP完成后，将在苹果商城（App Store）上发售。迪安作为该APP的支持与参与者，将负责中病理科会定期组织病理学领域的国际会议以及系列讲座，由来自JHH病理科和迪安诊断的病理学专家共同“病理学继续教育和培训中心”或探索其他合作办学模式。
Marketing JH Pathology in China

• We don’t really market our consultation services heavily in the United States
• In a nutshell, we are lazy
• Rely on:
  – Faculty reputation
  – Trainee network
  – Existing relationships/contracts
Marketing JH Pathology in China

• Estimated about 80-85% of Chinese Pathologists don’t speak English
• We have an abysmally small Chinese-language footprint
宾夕法尼亚大学病理解剖学与实验室医学院是一所北美最古老的医学院校，排名可经常进入美国研究型医学院前两名。

宾大医学院的病理学与实验室医学院实力雄厚，长期荣获美国联邦卫生和健康研究所 NIH 资金获得者的前三名之名（ NIH 是最大的为世界各地的医学研究提供资金来源的机构）。病理学的历史久远，可追溯至 1877 年，彼时正值院里第一任病理学主任受命上任。

宾大医学院病理学部的咨询专家均是解剖和临床病理学亚专业的业内翘楚，部门的“所有第二意见诊断专家也都是来自各领域的知名、资深带头人物。立足于自动化控制、分子领域、成像和第二代（高通量）测序工具的尖端技术，该部门为复杂病理学病例提供综合性组织诊断服务。

宾大病理学部约有 1200 名成员，向宾大医疗机构系统及其附属医院的医生和院内其他医疗保健服务机构提供临床诊断服务。该部门每年处理大量病例，其中外科病理学的组织诊断约 60,000 例，妇科和非妇科细胞病理学病例分别约为 35,000 例和 12,000 例，还包括大约 3,000 例细针穿刺（FNA）及 250 例尸体解剖服务。同时，通过借助先进的数据化的电子玻片图像系统 (ePathAccess) 提供第二意见数据化会诊服务，它也成为了当地、全美国乃至全球范围的顶尖参考实验室。

病理学第二意见数据化会诊服务

第二意见数据化会诊服务在西方医学界被普遍用于病理学诊断。第二意见临床会诊一般是在对病理学病例进行最初诊断（即第一次诊断）后提供，尤其适用于最初临床诊断非常复杂但又很重要的情况。而在最初诊断有争议时也可能提供第二意见临床会诊服务。在极少的情况下，相关临床医生、病理学家或患者本人要求将最初的病理标本和相关病例信息送至另一家医院的病理学专家以寻求第二意见临床会诊服务或对最初标本进行独立检测。这种诊断方式为根据临床需要而进行的第二意见会诊诊断。

借助先进的数据化的电子玻片图像系统 (ePathAccess)，该部门现已能帮助全球各地的病理学和临床医生实现传统病理玻片数据化并通过全球网络进行传播。如同传统显微镜检查一样，宾大病理解剖的会诊专家能在电脑上查看原始玻片的高清度图像，从而了解病例。ePathAccess 会诊服务是病理学和临床检验医学部的第二意见诊断服务的一部分，也是外展举措之一。PathAccess 服务让全世界任何地点的病理学家都能将病理玻片数据化，并通过安全可扩展的信息技术 (IT) 构架进行传播，这样宾大病理学部的会诊专家也能够读取“病理玻片”并分析病例。
The Department of Pathology at The Johns Hopkins Hospital

A pathologist is a medical doctor who has trained for many years to look at cells and how they are arranged in the tissue. Pathologists base their diagnoses on years of experience, a thorough understanding of medicine, and knowledge of criteria for classifying various diseases. In some cases different pathologists examining the same specimen may report different diagnoses, especially with very limited specimens, unusual cases, and in some more subjective areas like cancer grading. This is why it is sometimes useful to obtain a second opinion from pathologists with greater subspecialty expertise. A second opinion is also helpful if the initial findings are inconclusive, if the diagnosis appears to be a rare disease that only a handful of pathologists can expertly recognize, or if major treatment decisions are going to be based on the diagnosis.

The Department of Pathology at The Johns Hopkins is preeminent nationally and globally in the study and treatment of human disease, and in professional training in all areas of pathology and laboratory science. Our faculty and staff are committed to improving the health of the community and the world through excellence in pathology education, cutting-edge pathology research, and outstanding patient care. Currently there are over 1,400 people in the department, which includes approximately 130 full-time faculty, 34 residents, 45 graduate students, over 100 fellows, and approximately 1000 staff.

The Johns Hopkins Hospital is the only hospital in history to have earned the number one ranking for 22 years from U.S. News & World Report and an unprecedented 21 years in a row from 1991 to 2011, and 2013.

The Johns Hopkins Medical Laboratory provides world-recognized expertise in Surgical Pathology and Cytopathology consultation. Our pathologists accept traditional glass slides or digitally scanned whole slides for second opinion consultations.

When you use our service, you or your patients may send the pathology report, a brief medical history, and traditional glass slides or digitally scanned whole slides through your local hospital pathology department or your treating physician/reporting pathologist to a designated pathologist or leave it to us to choose the most appropriate expert.

The entire process typically takes approximately three days.

Our Consult Physicians

Breast Pathology

Pedram (Peter) Argani, MD
Specialty: Surgical Pathology
Subspecialty: Renal Tumors, Breast Pathology, Biliary Pathology
Professor of Pathology, and Oncology

Dr. Argani is Director of Breast Pathology at Johns Hopkins, and is an internationally-recognized expert. Dr. Argani has over 225 publications in the peer-reviewed literature. He recently authored a book on intraoperative surgical pathology consultation (Intraoperative Frozen Sections) (Demos Medical Publishing, New York, NY, 2013). He won the 2007 Arthur Purdy Stout prize from the Arthur Purdy Stout Society of Surgical Pathologists.

Specialty: Breast Pathology

Ashley Marie Cimino-Mathews, MD
Specialty: Surgical Pathology
Subspecialty: Breast Pathology
Assistant Professor of Pathology

The recipient of Weill Cornell Medical College “Good Physician Award” (2008) and the Johns Hopkins Pathology Young Investigators Top Prize in Clinical Research (2011). Dr. Cimino-Mathews has over 35 publications in the peer-reviewed literature and has co-authored a book on frozen section examination. She is the chairperson of the Johns Hopkins Breast Center Pathology Communications Group, the pathology member of the Johns Hopkins Breast Center Executive Committee, and the pathology member of the Johns Hopkins Rare Tumors/Young Women Clinic.

Specialty: Breast Pathology
Jonathan I. Epstein, MD

**Specialty:** Surgical Pathology  
**Subspecialty:** Urologic Pathology

**Professor of Pathology, Urology and Oncology**

The recipient of the Reinhart Chair of Urological Pathology, and Director of Surgical Pathology, Dr. Epstein is past president of the International Society of Urological Pathology. Dr. Epstein has 762 publications in the peer-reviewed literature and has authored 51 book chapters including Disorders of the Prostate Gland in Sternberg’s Diagnostic Surgical Pathology & Campbell’s Urology & Robbins Pathology Textbook. He is the author/coauthor of 7 books including: Interpretation of Prostate Biopsies (5th edition); Bladder Biopsy Interpretation (2nd edition); WHO Pathology & Genetics of the Urinary System and Male Genital Tract (2004); AFIP Atlas of Tumor Pathology: Tumors of the Prostate Gland, Seminal Vesicles, Male Urethra and Penis. 4th Series 2011; The Gleason Grading System: A Complete Guide for Pathologists and Clinicians (2013); and Differential Diagnoses in Surgical Pathology: Genitourinary System (2014).

**Specialty:** Urologic Pathology

Georges Jaboue Netto, MD

**Professor of Pathology, Urology and Oncology**

George Jaboue Netto, M.D., is a Professor in the Department of Pathology, Urology and Oncology and a Staff Member of the Sidney Kimmel Comprehensive Cancer Centre at Johns Hopkins Medical Institution. He is the Director of Surgical Pathology Molecular Diagnostics. He is the Associate Editor for Basic and Translational Section of the gold journal “Urology”

Dr. Netto has a strong record as clinician scientist of special expertise in the areas of genitourinary pathology and molecular pathology. He is best known for his work in translational molecular research in bladder cancer, prostate cancer and renal cancers. In addition, he has cultivated a strong expertise and reputation in the field of Molecular Diagnostics with special interest in molecular applications to the diagnosis and prognostication of solid tumors.

Dr. Netto's scholarly activities have resulted in over two hundred articles publications in peer reviewed medical journals. He is a co-author of four books in urologic pathology and an Editor of a new textbook in genomic applications in pathology. He is an actively sought speaker for national and international lectures in the fields of urologic oncology and molecular diagnostics.

** Fellowships:** Memorial Sloan - Kettering Cancer Center (New York NY) / Urologic Pathology (1994) Barnes - Jewish Hospital (St Louis MO) / Anatomic Pathology (1993)

**Certifications:** Molecular Genetic Pathology, American Board of Pathology (2005) Anatomic & Clinical Pathology, American Board of Pathology (1992)

**Specialty:** Urologic Pathology and Molecular Diagnostic Pathology
泌尿病理学

Jonathan I. Epstein, MD

专科：泌尿病理学

病理系教授，泌尿系教授，肿瘤系教授

Epstein医生是泌尿病理学领域的Reinhard主席奖的获得者，临床外科病理学主任，前国际泌尿病理学会会长。他拥有超过762篇文献和出版物，以及51本国外科教科书中的有关章节，包括Sternberg外科病理诊断学中的前列腺疾病，Campbell病理诊断学中的前列腺疾病，Robbins病理教科书中的前列腺疾病。他主编以及参与主编了7本国外科教科书，其中包括：前列腺活检的病理学诊断（第5版），膀胱活检的病理学诊断（第2版），世界卫生组织泌尿系统疾病与男性生殖系统疾病的基因与病理分类（2004），AFIP肿瘤病理图谱中的前列腺、精囊、男性尿道及阴茎肿瘤图谱（系列之4，2001年），Gleason格里森前列腺癌分级系统：病理学家和临床医师指南（2013年），以及外科病理学鉴别诊断中的泌尿生殖系统病理学（2014年）。

Georges Jabbour Netto, MD

专科：泌尿病理学

病理系教授，泌尿系教授，肿瘤系教授

Netto医生是外科病理学分子病理学诊断主任，约翰·霍普金斯Sidney Kimmel肿瘤治疗中心的成员，并在其领域中重要杂志“泌尿学”担任副主编。他是公认的泌尿病理学和分子病理学领域的临床病理学专家。他最出名的是他的膀胱癌，前列腺癌和肾癌的分子学研究工作及成果，以及这些成果在临床领域中的应用。除此之外，他的研究成果还包括分子病理学诊断及其在肿瘤诊断及愈后中的临床应用。他的这些成就使他拥有超过200篇文献和出版物，以及4本国泌尿病理学和分子病理学的专科教科书。此外，他还是美国境内机构和国外机构在泌尿病理学和分子病理学领域中的特邀讲师。

Netto医生的病理专科培训包括：Barnes-Jewish Hospital (St Louis MO) 外科病理学 (1993)，以及Memorial Sloan-Kettering Cancer Center (New York NY) 泌尿病理学 (1994)。他具有美国病理学医学委员会认证(1992)，及分子病理学认证(2005)。
When you need a 2nd opinion in pathology, why not choose the experts who wrote the books?

Johns Hopkins is home to many of the world’s leaders in Pathology. We have written many of the leading textbooks in diagnostic pathology, including a number of the Armed Forces Institute of Pathology fascicles and World Health Organization blue books.

Our pathologists currently see in consultation over 26,000 cases per year.

Our pathologists present several current Hopkins and consult cases each week along with their differential diagnoses and discussion in a FREE Surgical Pathology Conference. [http://pathology2.jhu.edu/sp](http://pathology2.jhu.edu/sp)
Johns Hopkins Pathology Atlases for iPad

29,100 downloads in 121 countries

3,700 downloads in 87 countries
Introduction
Welcome to the Johns Hopkins Atlas of Pancreatic Pathology. This "app" is designed to teach residents, fellows, and practicing pathologists advanced pancreatic pathology. We have also created another app that teaches pancreatic cytopathology, the Johns Hopkins Atlas of Pancreatic Cytopathology.

The app is composed of five modules: an interactive teaching algorithm, a searchable image atlas, an image-based quiz, a flashcard module, and an instructional video demonstrating gross dissection of a Whipple specimen. Viewing multiple examples of the same entity or feature from this large, rich image atlas will strengthen your diagnostic skills.

Teaching Algorithm: The teaching algorithm is a tool to aid in the diagnosis of the most common neoplasms of the pancreas. The algorithm consists of a series of usually dichotomous decision points, starting with determining if the tumor is solid or cystic and ending in specific diagnoses. Gross and microscopic photographs, together with didactic illustrations created by medical illustrator Bona Kim, support the instructional design of the algorithm. The algorithm was adapted with permission from R.H. Hruban, M.B. Pitman, and D.S. Kliment, Tumors of the Pancreas. Washington, D.C.: American Registry of Pathology, 2007. Atlas of Tumor Pathology; 4th series, fascicle 6.

Image Atlas: The image atlas contains over 1,400 high resolution color images with captions authored by a leading expert, and covers 115
Solid-pseudopapillary neoplasm

Touch preparation from a solid-pseudopapillary neoplasm showing the characteristic branching delicate vessels and loosely cohesive cells that characterize this neoplasm. These branching vessels are sometimes said to form "Chinese characters," however, I am told that the branching structures in fact look nothing like sinograms.
Johns Hopkins iPad Atlas Series

- Pancreatic Pathology
- Pancreatic Cytopathology
- Thyroid Cytopathology
- Thyroid Pathology
- Prostate Pathology
- Lung Cytopathology
- Eye Pathology
- Neuropathology (Neoplastic)
- Dermatopathology (Neoplastic)
- Dermatopathology (Non-neoplastic)
Summary

• International Diagnostic Consultation represents an opportunity for expanding existing consultation services

• Multiple technical solutions exist that can enable digital consultation services

• Technical solutions alone are insufficient to grow an international consultation business

• Established relationships are critical
Acknowledgements

**JHU**
Ralph Hruban
Jonathon Epstein
Arlene Prescott
Kay Li
Ling Li

**UPMC**
Anil Parwani

**Dian Diagnostics**
Chen Haibin
Weijun Zhang

**Xifin ProNet**
Joe Nollar
Chrystal Adams