

Towards a “Net” generation of Pathologists: the pathCast online remote learning platform

Luca Cima¹, Rifat Mannan², Emilio Madrigal³, Mattia Barbareschi¹

¹ Pathology Unit, Department of Clinical Services, Santa Chiara Hospital, Trento, Italy; ² Department of Pathology, Perelman School of Medicine at University of Pennsylvania, Philadelphia, USA; ³ Department of Pathology, Massachusetts General Hospital, Boston, USA

Summary

In recent years, digital and communication technology has been changing the way to spread knowledge in Medicine. In the field of Pathology, several remote learning resources have been made available through multiple social media platforms (Facebook, Twitter and others), YouTube channels and dedicated Websites, with a growing number of freely available lectures or tutorials, broadcasted live and/or archived for on-demand viewing. All these internet-based resources enable the pursuit of a flexible, independent, self-motivated and self-directed way of learning that fits perfectly with the increasing limitations of time, space and speed of modern day learners.

These resources have played a significant role in filling the void of conventional education during the ongoing Covid-19 pandemic. Moreover, with their widespread diffusion throughout communities of Pathologists from all over the world they help to reduce the educational gap between resource-rich and resource-poor countries, having the potential to become standardized knowledge-sharing platforms and to be incorporated into curricula at any level.

pathCast is one of the most robust and reliable open-access online remote learning platforms for pathologists, which live-streams lectures across the world. In the present paper we describe its structure, its acceptance by the global community of pathologists, what innovation elements has introduced regarding methodologies for education and its powerful and positive impact for residency training and continuing life-long education of practicing pathologists. A comprehensive list of the pathCast lectures with the respective links is also provided along with a brief discussion on other freely accessible online educational resources for pathologists.

Key words: pathology, education, pathCast, remote learning, YouTube, social media

Introduction

Advances in digital and communication technology have revolutionized modern education, for both learners and the educators. The phenomenal expansion of internet and the easy availability of mobile and desktop devices with incredible functionalities, enables us to take advantage and interact with educational contents that are made available online.

Modern day learners face an arduous challenge with increasing limitations of time, space and speed. They prefer flexible self-learning options, which they can adjust to suit their lifestyle, and educational needs. Medicine is not far away on these trends. Physicians are life-long learners, and are in desperate need of easily accessible online resources to update their educational requirements. Independent, self-motivated and self-directed learners are very willing to access quality online educational resources, which are available either open-access, or at an affordable price.

Received and accepted: October 8, 2020
Published online: October 20, 2020

Correspondence

Luca Cima
Pathology Unit, Department of Clinical Services, Santa Chiara Hospital, Largo Medaglie D'Oro 9, 38122 Trento, Italy
Tel. +39 0461 903202
E-mail: lucacima85@gmail.com

Conflict of interest

The Authors declare no conflict of interest.

How to cite this article: Cima L, Mannan R, Madrigal E, Barbareschi M. Towards a “Net” generation of Pathologists: the pathCast online remote learning platform. *Pathologica* 2020;112:160-171. <https://doi.org/10.32074/1591-951X-210>

© Copyright by Società Italiana di Anatomia Patologica e Citopatologia Diagnostica, Divisione Italiana della International Academy of Pathology



OPEN ACCESS

This is an open access journal distributed in accordance with the CC-BY-NC-ND (Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International) license: the work can be used by mentioning the author and the license, but only for non-commercial purposes and only in the original version. For further information: <https://creativecommons.org/licenses/by-nc-nd/4.0/deed.en>

Despite the revolutionary advances in technology and communication, conventional methods of delivery of medical education have not changed effectively in recent years. Didactic teaching in a lecture hall and attending conferences/workshops still remain the principal methods of delivering medical education. However, such methods are inadequate as they allow educational access only to those who can physically attend these learning activities. This creates knowledge disparity between advantaged and less-advantaged regions, where learners are unable to access traditional educational methods. Unfortunately, this knowledge disparity adversely affects patient care in such less privileged regions.

To circumvent this problem, massive open online courses (MOOCs) and lectures are good options, which are easily accessible online at little or no cost, and without limits on participant numbers or need of pre-registration^{1,2}. With widespread availability of internet, MOOCs can be accessed by anyone anywhere in the world.¹ They are also kept interactive, for example, through frequent knowledge checks that make the viewers attentive, provide immediate feedback and guide them if they have not understood the key concepts². Such educational outreach programs also encourage cultural awareness, promote interpersonal peer relationships and globalization.

The field of Pathology has witnessed the growth of several online educational resources over the past few years. The current COVID-19 pandemic has opened up an urgent need for remote learning options as everyone was suddenly isolated following social distancing guidelines. Starting March 2020, educational Institutions across the world were forced to cancel all activities that require in-person contact. That has resulted in cancellation of didactic lectures for trainees, microscope sessions, consensus conferences, tumor boards etc., adversely affecting educational opportunities for trainees³⁻⁵. The need for remote learning opportunities were never felt as strongly. At this unprecedented and challenging time, available remote learning resources have become the only method to maintain some semblance of continuing education amid isolation and despair³⁻⁵.

There is a wealth of online resources for pathologists, including different social networking platforms such as Facebook, Twitter and Instagram, providing various educational information through posts, images (both static and whole slide images), or recently published articles, etc.⁶. There are also several YouTube channels providing on demand open access lectures or tutorials. Leveraging different communication platforms makes it easier to reach anyone across the world, and can be used to disseminate education globally. All these

internet-based applications increase our ability to understand complex subjects in histopathology and to translate easily what has been learned into the clinical practice.

If the combination of digital Pathology and artificial intelligence has the potential to transform the way in which we operate as diagnosticians, it can soon become the third revolution in pathology⁷. The widespread use of Net-based applications in pathology may well be considered the beginning of that revolution and its necessary consequence, calling for a “Net” generation of Pathologists who will be able to deal with and continue to nurture this enormous amount of information.

In this article, we focus on one of the most robust and reliable open-access online remote learning platform in pathology, “pathCast” that live-streams lectures for pathologists across the world. We will analyze all its features and its enormous impact on the way in which continuing education in Pathology is provided to a global audience.

pathCast: an overview

pathCast, a portmanteau of the words ‘pathology’ and ‘broadcast’, is an “open-access” online platform that broadcasts and archives pathology lectures to a global audience⁸, with a view to bridge the knowledge gap between resource-rich and resource-poor regions of the world and thereby help improve patient care.

The project was started in 2016 by the co-founders (Rifat Mannan and Emilio Madrigal) during their pathology residency training in New York’s Mount Sinai West Hospital. Over the course of 4 years a total of 145 lectures (*updated on October 2, 2020*) encompassing various pathology topics were broadcast.

The ongoing lectures are broadcast live simultaneously (simulcasted) on multiple social networking platforms (Facebook, YouTube, and Periscope) and on a dedicated website and cover various aspects of pathology, including commonly debated / challenging topics and updates to disease classifications⁸. Lectures are scheduled on an average twice a month and during COVID-19 pandemic have been more frequent to help the global audience during the lock-down (8-10 lectures a month since April 2020). An audience is generated by posting promotional banners one or two weeks prior to the lecture on the website, on various social networking platforms, such as Twitter, Facebook, on WhatsApp groups and also by sending emails to those who have subscribed to the newsletter. Both the co-founders are actively involved in the entire process, starting from choosing the speakers, decid-

ing the topics, publicizing the events, hosting, broadcasting and moderating the live sessions, maintaining the online platforms, as well as archiving the lectures on the website (www.pathologycast.com) for on demand viewing. Moreover, they bear the entire cost of the process, as pathCast is entirely open-access with no external funding.

The speakers are recognized experts from prestigious Institutes across the US and overseas and can be either local (same place where the moderators are broadcasting) or remote (moderators and speakers being in different locations, connected via a video conferencing platform). Online attendees can actively engage with the speakers in real time by posting questions or comments on the Facebook/YouTube chat windows and the speakers answer questions at the end of the session. After the end of the live broadcast, the lectures remain archived on the YouTube channel (pathCast), the Facebook page (pathCast) and the website (www.pathologycast.com) for on demand viewing at any time. Viewers have different options to stay updated about upcoming lectures: they can subscribe to the YouTube channel, follow the Facebook page, follow the Twitter account (@pathologycast), follow the calendar on the home page of the website and subscribe to the newsletter. Suggestions on how to improve the system or for lecture topics can be made directly during or after session by sending message on Facebook/YouTube chats, or sending email (pathologycast@gmail.com).

The minimum software and hardware requirements for the lectures include a computer workstation with internet connection, a live broadcasting software (such as OBS, Wirecast, vMIX, etc.), a microscope supplemented with a camera for live glass slide seminars, and a good quality microphone. The lectures/slide seminars can be accessed on a number of supporting devices such a smartphone, tablet, laptop, or a conventional desktop computer.

pathCast: organization of lectures

pathCast assists residents and practicing pathologists in: 1) understanding the basic histopathological features of common and uncommon, neoplastic and non-neoplastic diseases; 2) forming differential diagnoses; 3) formulating a correct histopathological report; 4) understanding the clinical implications of the histopathological report for the patients; 5) learning about new immunohistochemical or molecular markers; 6) updating about translational research in pathology and laboratory medicine.

The scientific program of pathCast focuses on the

progressive formation of the pathologist's professional identity by offering multiple learning pathways that can be adapted in a flexible way to meet the needs of both trainees and practicing pathologists.

The multiple learning opportunities that pathCast offers to its followers are enabled by the absence of a rigid categorization of the lectures, by their different structuring (traditional computer slideshow, glass slides workshops, digital slide workshops and a combination of these) and by the easy access modality through multiple platforms:

- Website (www.pathologycast.com);
- Facebook (<https://www.facebook.com/pathCast/>);
- Twitter (<https://twitter.com/pathologycast?lang=en>);
- Periscope (<https://www.pscp.tv/pathology-Cast/1YqKDLjXrzQKV>);
- YouTube (<https://www.youtube.com/channel/UCVxosS9hPP3ikMQXAE9Pamw>).

The lectures are arranged as playlists on a subspecialty based manner and can be searched quickly by typing the specific shortends (Fig. 1). The most recent playlist is called #COVID-19 and covers the laboratory aspects of Covid-19 disease and the impact of the pandemic on Pathologist's work. Most lectures were presented in English; 8 lectures were delivered in a foreign language.

The number of lectures for different subspecialties topics is showed in Figure 2 while the number of lectures for different institutes is showed in Figure 3.

The website provides an easy tool for navigation, the

- #AUTOPSY: Autopsy Pathology
- #BLOODBANK: Blood Banking & Transfusion Medicine
- #BREASTPATH: Breast Pathology
- #BSTPATH: Bone And Soft Tissue Pathology
- #COVID19: COVID-19 caused by SARS-CoV-2
- #CYTOPATH: Cytopathology
- #DERMPATH: Dermatopathology
- #ENDOPATH: Endocrine Pathology
- #ENTPATH: Head And Neck Pathology
- #GIPATH: Gastrointestinal Pathology
- #GROSSPATH: Gross pathology: macroscopic manifestations of disease
- #GUPATH: Genitourinary Pathology
- #GYNPATH: Gynecologic Pathology
- #HEMEPATH: Hematopathology
- #INTRAOP: Intraoperative Consultation
- #LIVERPATH: Hepatobiliary pathology
- #MICROBIOLOGY: Clinical Microbiology
- #NEUROPATH: Neuropathology
- #OBPATH: Obstetric and Perinatal
- #ORALPATH: Oral Pathology
- #PANCPATH: Pancreatic pathology
- #pathCast: pathCast educational session
- #PEDIPATH: Pediatric Pathology
- #PULMPATH: Pulmonary And Pleural Pathology

Figure 1. List of specific shortends which group lectures belonging to the same subspecialty.

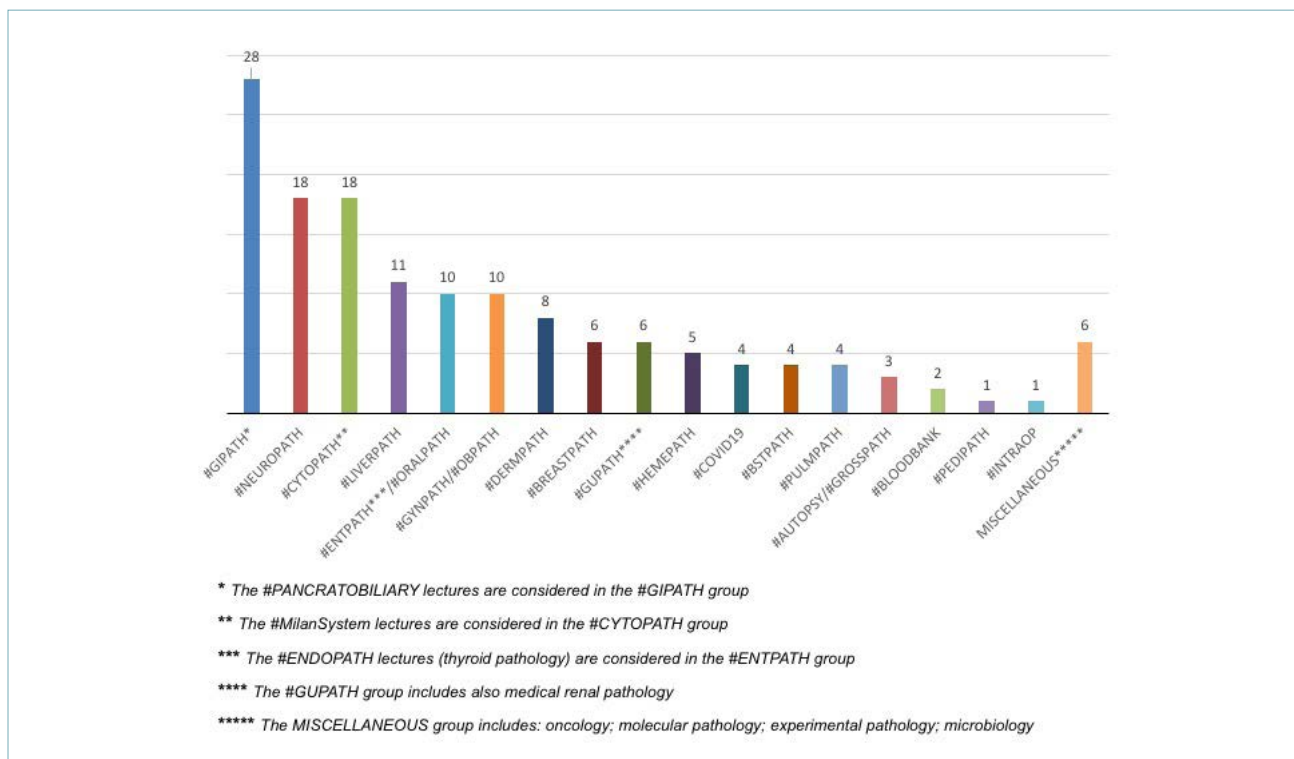


Figure 2. Number of pathCast lectures for different subspecialties.

lectures can be searched by chronological date, by subspecialties and by presenter, a short biography of the speakers is also featured. Moreover, the website makes available the slideshow of some lectures (at the author's discretion) allowing their download in .pdf format and a quiz section to test the learning.

The lectures can be searched directly on Google or YouTube by typing the name of the lecture or of the speaker of interest followed by the word "pathCast".

A detailed list of all the pathCast lectures performed between June 2016 and October 2020 is provided in the supplementary data.

pathCast: acceptance

The popularity of pathCast on social media is continuously growing. To date (02 October 2020) it has 13,000 subscribers on YouTube channel, 16597 followers on Facebook, and 5137 followers on Twitter. Given that lectures can deal with basic themes but also difficult topics and recent findings the type of audience includes both pathology residents and practicing pathologists.

Users from 170 countries approached the livestreams or the on-demand views⁸, being India and USA the

most involved. As of October 2, 2020, the lectures hosted on the YouTube pathCast channel have generated a total of 533,043 views with a prevalence of laptop or desktop computer as access devices, while the lectures hosted on Facebook pathCast page have generated a total of 12,861 likes again with a prevalence of laptop or desktop computer for the visualization.

Each lecture garners on average by 4000-5000 views on Facebook and 1000-2000 views on YouTube with a prevalence of more on-demand views after the broadcast compared to livestreaming views. In the latter modality, viewers have the opportunity to interact with the speaker during or immediately after the lecture on Facebook and YouTube chat windows, asking questions to speakers, thanking them and pathCast staff and delivering considerations about the lecture and/or technical features of the broadcast with most comments giving positive feedbacks and expressing gratitude. The speaker answers the questions at the end of the lecture.

pathCast: quality and educational impact

The only constant in education is "change." The same holds true for pathology and medicine in general. New

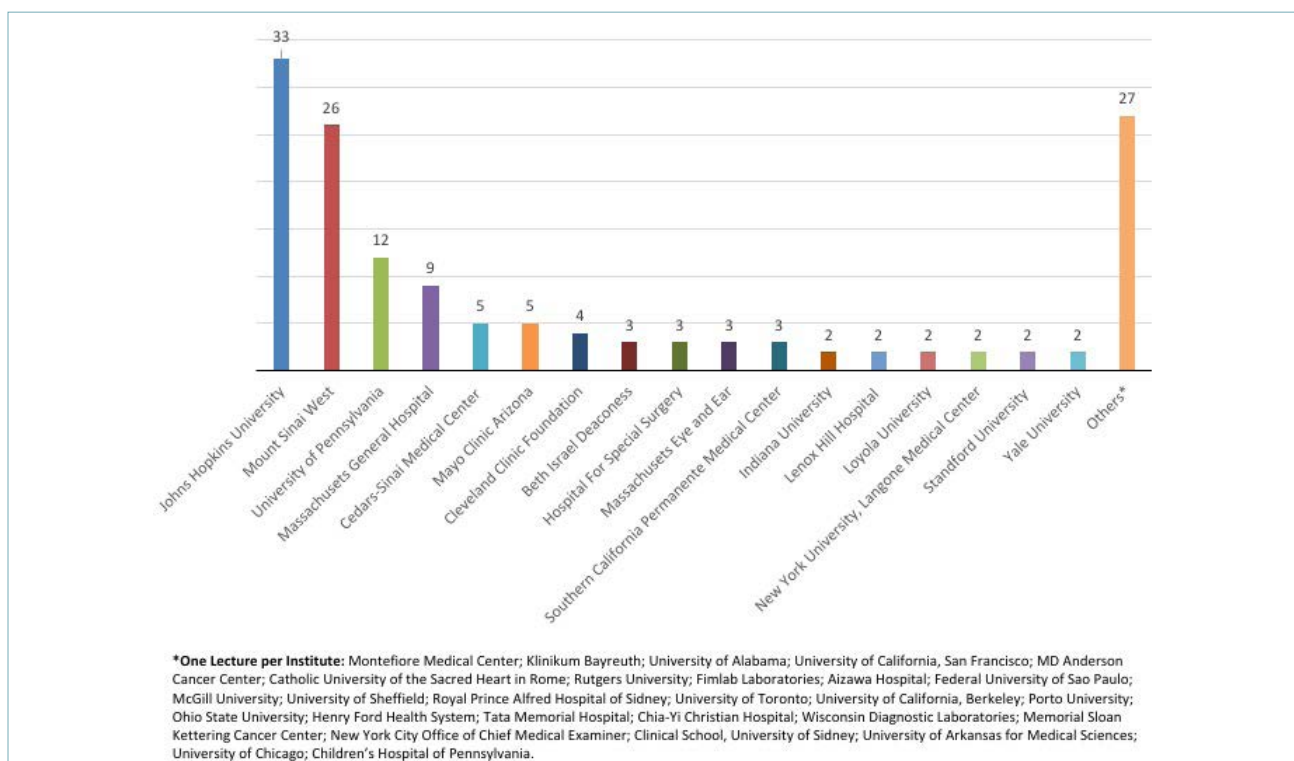


Figure 3. Number of pathCast lectures by different host institutions.

diseases are discovered; new pathogens emerge; diagnostic criteria, expert opinions, and favorite systems of terminology remain forever in flux⁹. Nowadays with extensive use of new technologies, a great opportunity exists for pathologists to easily advise their colleagues about how to approach specific fields, how to interpret difficult cases, how to read guidelines, how to manage laboratory testing etc., but the pathology world is not always democratic since our profession is continuously exposed to the dominance of views by individuals or small groups, even in the case of wrong ideas or interpretations.

pathCast is very selective about the speakers who are known experts from reputed Institutions to ensure the quality and correctness of content. Moreover, through pathCast the learning conversation has become more egalitarian and has moved out from academic circles, encouraging speakers to be more democratic in their thoughts.

pathCast has adopted a digital permanence plan of education, meaning that lectures are permanently stored on YouTube, Facebook and the website in order to ensure the permanence of data. Digital permanence allows followers to organize lectures of interest in the most convenient way with respect to work duties and familiar/social life and in fact the on-demand

views after the broadcasts are favored, on the other hand it requires a very rigid control about quality of content that pathCast staff supply systematically.

Currently pathCast is included as an educational resource at the Harvard Medical School and Johns Hopkins Pathology Departments and by the Philadelphia Association of Pathologists. The Association of Indian Pathologists of North America (AIPNA) also promotes pathCast and in addition hosts lectures through pathCast as an outreach initiative.

Given the fact that pathCast contributes strongly to knowledge dissemination in the same way as scientific journals mainly devoted to publication of review articles, it should be put on the same level as journals and should be recognized with an "impact factor." pathCast is not yet tracked by scientific analytics (e.g. Cambridge Analytica, Clarivate etc.) but it is desirable in the future and may render it the first broadcast subjected to a new type of science metrics based on the number of followers/likes of the online lectures and the quality/type of contents following the concept that online lectures should be equate to review articles. Moreover, pathCast is careful about ethical issues and protecting patient privacy without providing personal informations.

pathCast: old and new methodologies for education

The world of healthcare is being transformed through e-health innovations including widespread implementation of healthcare information systems, electronic health records, medical decision support systems, web-based conferencing and imaging technologies. In addition to their impact on healthcare services, e-health innovations have pushed the integration of technology into training of health professionals¹⁰. There has been increased interest in the use of e-learning and social media throughout the continuum of medical education, from medical school, through residency and fellowship training, and in continuing medical education (CME)¹¹.

As increasing demands and time constraints are placed on healthcare professionals, e-learning and social media has increased educational capacity and makes it easy to share educational resources, perfectly complimenting the need to remain up-to-date with current medical knowledge and evidence based practices¹¹. Furthermore, their use in medical education has the potential to enhance opportunities for social connections and increased accessibility among learners¹².

Exploration of how adults best learn, pioneered by Knowles and colleagues more than 50 years ago, highlighted the impact of motivation, attention, and disposition to learning¹³⁻¹⁴. Moreover, following the Malcom Knowles' theory of adult learning (andragogy) whose fundamental principles are "relevance orientation" and "goal orientation" adults respond best to educational approaches that integrate methodologies of their everyday life, including technology, and which are orientated toward problem solving skills that facilitate them in achieving their career goals^{15,16}.

pathCast fully meets andragogy by helping learners feel responsible for and in control of their own learning; enabling learners to select the things they need to know; giving a problem-centered way to learn; providing contents that can help learners to perform tasks or deal with problems that they approach in their life situations; making learners more responsive to the internal motivators factors (desire for increased job satisfaction, self-esteem, quality of life, and the learning pleasure) which are the most potent motivators in adult learning¹⁷. pathCast is also fully compliant with the concept of digital professionalism, a critical intersection between the principles of professionalism, the roles and opportunities of digital media and the shifting social contexts within which they are realized given that it allows followers and speakers to gain proficiency, maintain their reputation and have responsi-

bility in a deliberate, ethical and accountable use of e-learning and social media¹⁸.

As third feature, pathCast reflects some aspects of expected utility, a normative theory of decision making under uncertainty that can be applied to medicine¹⁹. This model produces coherent and elaborate results about the value of information and flexibility, which can be simultaneously referred to pathCast contents and its transmission to followers with a certain level of experience, helping them to cope in the best possible way the decision making under diagnostic uncertainty. By its adherence to andragogy, digital professionalism and expected utility concepts pathCast can change the way of teaching pathology in medical school programs/residency programs and CME. Overall, it can bring new paradigms in pathology education across the world, by providing a strong open access resources for low income countries.

pathCast is training a "Net" Generation of Pathologists able to enrich their clinical background with pathCast lectures, start similar initiatives and provide an intellectual networking that overcomes every physical and cultural boundary by placing the common language of pathology over any difference. The "Net" Generation of Pathologists will be increasingly skillful to learn more quickly and rapidly exchange opinions about difficult cases and ideas for research and textbooks even at long distances.

pathCast: future scenarios

Doctors are destined to lifelong learning in which dynamic web-based education experience is important if they want to face rapidly with expensive development of biomedical sciences²⁰. Lifelong learning has always been formally considered an ethical obligation of doctors, and is critical in order to ensure high quality healthcare²¹⁻²³.

Over the last 20 years, pathology has evolved tremendously being terminologies, classifications, grading and staging of neoplastic and non-neoplastic diseases in continuous change. There are growing demands for molecular tumor sub-classification and information on prognosis, response to therapy and molecular therapeutic targets that are increasingly covered by molecular pathology and require extended biomedical knowledge^{24,25}. To cite Zygmunt Bauman, we are living the "liquid modernity" of pathology where the continuous change in classifications, grading and staging constitutes a fluid flow of information that can be easily navigable in some parts, however it may also present storms that make navigation difficult.

In this sea of information, pathCast could become a

standardized pathology knowledge-sharing platform by standing as a new forum to communicate rapidly a new classification or protocols approved by World Health Organization (WHO), College of American Pathologists (CAP), Royal Collage of Pathologists (RCP) or other international organizations, allowing a broad adoption and uniform utilization of that classifications/protocols.

In addition, pathCast can act also as fast and efficient tool to set reference standards/guidelines/best practice guidelines at an international level.

For example, pathCast hosted a multilingual (English, French, Japanese, Italian, Mandarin Chinese and Portuguese) series introducing the Milan System for Reporting Salivary Gland Cytopathology which was presented directly by the system's international group of editors and collaborators before the release of the accompanying 10-chapter atlas⁸. In this way, pathCast has eased its understanding, utilization and adoption between different centers dedicated to salivary gland cytopathology across the world.

The introduction of the pathCast model of learning is not an isolated experience, but globally it is acting as a stimulus for bring changes to various aspects of the learning and teaching environment in pathology. The number of pathCast lectures shows that they have become widely embraced by pathology educators and their popularity and usefulness suggest that they should be incorporated into pathology education curricula. The attendance to pathCast online lectures integrated in a synergic way with real-life diagnostic practice could lay the foundation of an innovative design template of online curriculum that gets relevant and specific to learners needs, roles and responsibilities in professional life and overall augments the practical implications of e-learning.

Moreover, the inclusion of pathCast and other web-based video lectures in curricula can be a further push towards the acquisition of an impact factor rating like official scientific journals, thereby facilitating a greater involvement of faculty.

In this era of social distancing, innovations in utilization of online platforms to share slides, images, PowerPoint presentations and other materials remotely is rapidly evolving³. The pathCast live and on-demand video streaming acted as a forerunner for free of charge pathology e-learning. There are similar freely accessible video resources for pathologists that are currently available. The United States and Canadian Academy of Pathology (USCAP) offers for free some videos of their interactive microscopy sessions²⁶. The CAP has a number of freely accessible live and on-demand webinars covering every aspect of pathology from molecular testing to digital/computational pathol-

ogy and laboratory management, accessible in the official website²⁷ or on YouTube as CAP today²⁸; in addition, since April 1st a new set of live and on-demand online video lectures named "Virtual Lecture Series for Pathology Residents" has started and is currently in progress²⁹. There are several other online educational resources currently available, which include: the "Virtual Pathology Ground Rounds" series^{30,31}; the video-lectures hosted by ARUP Laboratories and the Department of Pathology at University of Utah³²; the PathPresenter Conferences Project³³; the video-lectures about grossing hosted by the Department of Pathology and Laboratory Medicine at Weill Cornell University in New York³⁴ and several other YouTube channels which host lectures delivered by eminent pathologists³⁵⁻⁵⁶.

Given the large number of freely available pathology video-lectures, a systematization of these resources would be necessary. It would be desirable the development of tools and mobile applications ("apps") for mobile devices and desktop computers capable to collect all the existing projects of web-based video lectures in pathology with respect for copyrights. This kind of multi-device educational app platform will facilitate a homogeneous spreading of pathCast and of all the other web-based video lectures throughout communities of pathologists from all over the world helping to reduce the educational gap between resource-rich and resource-poor countries. Moreover, it will favor their inclusion in curricula and their use as CME providers by representing a unified system for education and training of residents and practicing pathologists from different countries.

Conclusion

Through its increasing world-wide popularity pathCast has made a significant impact in the field of education in Pathology. Against this background, practicing pathologists and the academic community should embrace this modern e-learning pathway. Residency training programs should fully incorporate web-based resources, allowing residents to learn the principal topics of the different pathology subspecialties in a uniform way and to interact globally. With this article, we invite the readers to be part of the pathCast community and of other modern e-learning pathways in Pathology. We believe that continuing e-learning education is crucial for the future of our profession being part of the third revolution in pathology together with digital pathology and artificial intelligence and we want to contribute strongly to its standardization at national and international levels.

Acknowledgements

This study did not receive any funding from the National Institutes of Health (NIH), the Wellcome Trust and the Howard Hughes Medical Institute (HHNI) and other(s). Internal funding from Department of Clinical Services has been used in part for study-related facilities.

References

- Liyanagunawardena TR, Williams SA. Massive open online courses on health and medicine: review. *J Med Internet Res* 2014;16:e191. <https://doi.org/10.2196/jmir.3439>
- Setia S, Tay JC, Chia YC, Subramaniam K. Massive open online courses (MOOCs) for continuing medical education - why and how? *Adv Med Educ Pract*. 2019;10:805-812. <https://doi.org/10.2147/AMEP.S219104>
- Mukhopadhyay S, Booth AL, Calkins SM, et al. Leveraging technology for remote learning in the era of COVID-19 and social distancing. *Arch Pathol Lab Med* 2020;144:1027-36. <https://doi.org/10.5858/arpa.2020-0201-ED>
- Madrigal E. Going remote: maintaining normalcy in our pathology laboratories during the COVID-19 pandemic. *Cancer Cytopathol* 2020;128:321-22. <https://doi.org/10.1002/cncy.22276>. Epub 2020 Apr 7.
- Kwon R, Zhang ML, VandenBussche CJ. Considerations for remote learning in pathology during COVID-19 social distancing. *Cancer Cytopathol* 2020;128:642-7. <https://doi.org/10.1002/cncy.22289>. Epub 2020 Jun 4.
- Isom J, Walsh M, Gardner JM. Social media and pathology: where are we now and why does it matter? *Adv Anat Pathol* 2017;24:294-303. <https://doi.org/10.1097/PAP.0000000000000159>
- Salto-Tellez M, Maxwell P, Hamilton P. Artificial intelligence-the third revolution in pathology. *Histopathology* 2019;74:372-6. <https://doi.org/10.1111/his.13760>
- Madrigal E, Mannan R. pathCast: an interactive medical education curriculum that leverages livestreaming on Facebook and YouTube. *Acad Med* 2020;95:744-50. <https://doi.org/10.1097/ACM.00000000000003148>
- Parslow TG, Adsay NV, Krasinskas AM, et al. Impacts of new concepts and technologies on the practice of diagnostic pathology: an Emory University perspective. *Arch Pathol Lab Med* 2017;141:325-8. <https://doi.org/10.5858/arpa.2016-0357-ED>
- Vaona A, Banzi R, Kwag KH, et al. E-learning for health professionals. *Cochrane Database Syst Rev* 2018;21;1:CD011736. <https://doi.org/10.1002/14651858.CD011736.pub2>
- Lewis KO, Cidon MJ, Seto TL, et al. Leveraging e-learning in medical education. *Curr Probl Pediatr Adolesc Health Care* 2014;44:150-63. <https://doi.org/10.1016/j.cppeds.2014.01.004>
- Roy D, Taylor J, Cheston CC, et al. Social media: portrait of an emerging tool in medical education. *Acad Psychiatry* 2016;40:136-40. <https://doi.org/10.1007/s40596-014-0278-5>. Epub 2015 Mar 24.
- Knowles MS, Holton EF, Swanson RA. The adult learner: the definitive classic in adult education and human resource development. 8th ed. New York: Routledge 2015.
- Knowles MS. The modern practice of adult education: from pedagogy to andragogy. 1st ed. New York: Association Press 1970.
- Knowles MS. Andragogy in action: applying modern principles of adult learning. 1st ed. San Francisco: Jossey-Bass 1984.
- Kaufman DM. Applying educational theory in practice. *BMJ* 2003;326(7382):213-6. <https://doi.org/10.1136/bmj.326.7382.213>
- Misch DA. Andragogy and medical education: are medical students internally motivated to learn? *Adv Health Sci Educ Theory Pract* 2002;7:153-60. <https://doi.org/10.1023/a:1015790318032>
- Ellaway RH, Coral J, Topps D, et al. Exploring digital professionalism. *Med Teach* 2015;37:844-9. <https://doi.org/10.3109/0142159X.2015.1044956>. Epub 2015 Jun 1.
- Cohen BJ. Is expected utility theory normative for medical decision making? *Med Decis Making* 1996;16:1-6. <https://doi.org/10.1177/0272989X9601600101>
- Masic I. E-learning as new method of medical education. *Acta Inform Med* 2008;16:102-17. <https://doi.org/10.5455/aim.2008.16.102-117>
- Melnick DE. Physician performance and assessment and their effect on continuing medical education and continuing professional development. *J Contin Educ Health Prof* 2004; Fall;24 Suppl 1:S38-49. <https://doi.org/10.1002/chp.1340240507>
- Teunissen PW, Dornan T. Lifelong learning at work. *BMJ* 2008;336(7645):667-9. <https://doi.org/10.1136/bmj.39434.601690.AD>
- Davis N, Davis D, Bloch R. Continuing medical education: AMEE Education Guide No 35. *Med Teach* 2008;30:652-66. <https://doi.org/10.1080/01421590802108323>
- Müllauer L. Milestones in pathology-from histology to molecular biology. *Memo* 2017;10:42-5. <https://doi.org/10.1007/s12254-016-0307-z>. Epub 2017 Jan 9.
- Salto-Tellez M, Raison C. An interview with Manuel Salto-Tellez on diagnostic pathology: the future is morphomolecular. *Expert Rev Mol Diagn* 2015;15:585-8. <https://doi.org/10.1586/14737159.2015.1033603>. Epub 2015 Apr 3.
- <https://www.pathlms.com/uscap/courses> - Accessed October 9, 2020.
- <https://www.cap.org/calendar/webinars/listing> - Accessed October 9, 2020.
- <https://www.youtube.com/channel/UCcFUrfWfybHEPvY-7UrzXo8A/featured> - Accessed October 9, 2020.
- <https://www.cap.org/calendar/virtual-lecture-series-for-pathology-residents> - Accessed October 9, 2020.
- <https://www.youtube.com/channel/UCbJhATZrVy2Nhq2V4W-baVZw/featured> - Accessed October 9, 2020.
- <https://www.virtualpath.org> - Accessed October 9, 2020.
- <https://arup.utah.edu/education/videoIndex.php> - Accessed October 9, 2020.
- <https://conferences.pathpresenter.net/#/login> - Accessed October 9, 2020.
- <https://pathology.weill.cornell.edu/education-training/grossing-series> - Accessed October 9, 2020.
- Jerad Gardner <https://www.youtube.com/user/JeradMGardnerMD> - Accessed October 9, 2020.
- Sanjay Mukhopadhyay <https://www.youtube.com/user/smurf3073> - Accessed October 9, 2020.
- Micheal Arnold <https://www.youtube.com/channel/UC1NPPc-BRHqTwFPIHvNR-A> - Accessed October 9, 2020.
- Rajal B. Shah <https://www.youtube.com/channel/UC15OjboCni-2ywhX9JGmG8iw> - Accessed October 9, 2020.
- Matt Cecchini https://www.youtube.com/channel/UCG39jXxaKiNcGLM_2a1IXZQ - Accessed October 9, 2020.
- Philip McKee <https://www.youtube.com/channel/UCDMtR-TYs9ZkHU6x41YuMUw> - Accessed October 9, 2020.

- ⁴¹ Alexander Damron https://www.youtube.com/channel/UCVHN-TIQZsMLX1q53IsB__tQ/ - Accessed October 9, 2020.
- ⁴² Lewis Hassel <https://www.youtube.com/channel/UCSiHvdzle8AXLkb-dWO8jhg> - Accessed October 9, 2020.
- ⁴³ Pathology mini tutorials <https://www.youtube.com/channel/UCeSFXMp6UGR8ryO68v0PcOw/videos> - Accessed October 9, 2020.
- ⁴⁴ Pathweb Teacher <https://www.youtube.com/channel/UC3FweZwONWAicB72vF9P5ew/videos> - Accessed October 9, 2020.
- ⁴⁵ ilovepathology <https://www.youtube.com/channel/UCE066pcrH-SrvRxGgebkkig/videos> - Accessed October 9, 2020.
- ⁴⁶ Pathology Simplified <https://www.youtube.com/channel/UCGSeNNROsrZpoU1ALYxAjpA/videos> - Accessed October 9, 2020.
- ⁴⁷ Cockerell Dermatopathology <https://www.youtube.com/channel/UCifzqklb-owNDhm1e5v3uBg/videos> - Accessed October 9, 2020.
- ⁴⁸ Pathology Now <https://www.youtube.com/channel/UCpCgk-kQx2T6bVaSh82I5lrA/videos> - Accessed October 9, 2020.
- ⁴⁹ University of Michigan, Department of Laboratory Medicine and Pathology <https://www.youtube.com/channel/UChSc0zfvq-6SUnNvDQI6oLwA/videos> - Accessed October 9, 2020.
- ⁵⁰ Pittsburgh Computational Pathology Lecture Series <https://www.youtube.com/channel/UCWfBS3PLWHTIACeccm2Clog/videos> - Accessed October 9, 2020.
- ⁵¹ Cirdan <https://www.youtube.com/channel/UCf5ERQiAqKIPJ-o2A30wQAA/videos> - Accessed October 9, 2020.
- ⁵² Cleveland Clinic Laboratories <https://www.youtube.com/channel/UCWZvQOfSwgbqpW7BWJdtR8A/videos> - Accessed October 9, 2020.
- ⁵³ Mount Sinai Department of Pathology <https://www.youtube.com/channel/UCck4UW9jf7V97Khc1AQu1nA/videos> - Accessed October 9, 2020.
- ⁵⁴ DigiPath Tutorials <https://www.youtube.com/channel/UC3GOPY-iffix1gU0uq8tC0w> - Accessed October 9, 2020.
- ⁵⁵ Adventures in Neuropathology https://www.youtube.com/channel/UCw_0moRmVeFNF5kkVHrAU4g - Accessed October 9, 2020.
- ⁵⁶ Pathodoodles https://www.youtube.com/channel/UCRSC-to470D7XKhu-_3Ml8Zg - Accessed October 9, 2020.

Supplementary Data

PATHCAST LECTURES (MAY 2016-OCTOBER 2020) ORGANIZED BY SUBSPECIALTY AND SHOWING TITLE, DATE, HOST INSTITUTE AND THE CORRESPONDING YOUTUBE LINK.

| Title - Date | Link | Host Institute |
|---|---|---|
| Gastrointestinal Pathology, Pancreatobiliary Pathology #GIPATH, #PANCREATOBILIARYPATH | | |
| Barrett Esophagus: Basics, Pearls & Pitfalls – 13/9/17 Cystic Lesions of the Pancreas – 5/2/18 Colitis: A Pattern Based Approach – 2/28/17 Colonic Polyps – 11/28/17 Ductal Adenocarcinoma of the Pancreas – 4/11/18 Esófago de Barrett: Conceptos básicos y algunos escollos – 25/10/17 Gastric Polyps – Mushrooms in the Dirt – 9/28/17 Iatrogenic GI Tract Lesions: Some Tough Pills to Swallow – 7/4/20 Non-neoplastic Mimickers of Pancreatic Neoplasms – 26/5/20 Pólipos gástricos y la compañía que guardan (gastritis) – 01/11/17 | https://www.facebook.com/watch/live/?v=525235847819074&ref=watch_permalink https://www.youtube.com/watch?v=NkMizQFB_cl https://www.youtube.com/watch?v=3qtvpyGvlll https://www.youtube.com/watch?v=2_fQITRaxKw https://www.youtube.com/watch?v=lv2pv0eSXg4 https://www.youtube.com/watch?v=HAUcyRXwCx8 (Spanish) https://www.youtube.com/watch?v=LuTWR7nDH_Y https://www.youtube.com/watch?v=Vno0-OlaYcE&frags=pl%2Cwn https://www.youtube.com/watch?v=dK1EfvhojoM&t=8s&frags=pl%2Cwn https://www.youtube.com/watch?v=0xvig_CZYOAA (Spanish) | JHH, Baltimore, Maryland |
| Do You Anything Beyond GIST – 24/02/17 GI Pathology slide seminar – 07/09/16 High Yield GI Pathology for the Boards – 05/05/17 Keep calm and learn polyps – 08/11/16 Pearls of GI Pathology – 27/01/17 | https://www.youtube.com/watch?v=u4C_Kz1mbjc https://www.youtube.com/watch?v=eF-H_uRj57A https://www.youtube.com/watch?v=aLZCGwZH8TU https://www.youtube.com/watch?v=8t5m2zOI3Q https://www.youtube.com/watch?v=UFJDMpxZwhE | MSW, New York, New York |
| Fiend of the RLQ: An Hour with the Vermiform Appendix – 11/02/20 Mesenchymal Madness in the GI Tract – 22/10/19 Neuroendocrine Nuttiness in the Digestive System – 29/05/20 | https://www.youtube.com/watch?v=fj8LW2UgHo0&frags=pl%2Cwn https://www.youtube.com/watch?v=NOE4FWB3Hec https://www.youtube.com/watch?v=OpJg6BDgaw4 | Beth Israel Deaconess Medical Center, Boston, Massachusetts |
| Go with the flow: selected cases of GI vascular pathology – 17/07/20 Pattern approach to non-IBD colitis: a case-based discussion – 08/05/20 When your GI biopsies are blue: a tour of GI lymphomas – 08/09/20 | https://www.youtube.com/watch?v=ViJy8Vlk43s https://www.youtube.com/watch?v=9FbnUvfGz9c https://www.youtube.com/watch?v=7cGtV1GAs6l&frags=pl%2Cwn | CCF, Cleveland, Ohio |
| How the Pathology Report Affects the Treatment of Patients with Colorectal Cancer – 25/05/20 Logical Approach to the Luminal GI Biopsy: Development of a Generalizable, Mechanistic Model – 12/05/20 | https://www.youtube.com/watch?v=dgaNWWu3910 https://www.youtube.com/watch?v=hXwTv1UxxA | UPenn, Philadelphia, Pennsylvania |
| Bugs, Sprue, Drugs and More: Adventures in the Small Intestine – 20/11/17 | https://www.youtube.com/watch?v=oZNH8z9-fu | MMC, New York, New York |
| Neoplasie im oberen GI Trakt. Alles klar?/Neoplasia in the upper GI Tract. Everything clear? – 14/12/17 | https://www.youtube.com/watch?v=sjQWDCryE_8 (first half in German, second half in English) | Klinikum Bayreuth, Bayreuth, Germany |
| Premalignant Lesions of the Pancreatobiliary Tract – 31/03/20 | https://www.youtube.com/watch?v=HY4WCK_XfVI | UA, Birmingham, Alabama |
| Solid Tumors of the Pancreas – 28/07/20 | https://www.youtube.com/watch?v=qezMa_RnDPQ | MSKCC, New York, New York |
| The Problematic Colorectal Polyp – 10/12/19 | https://www.youtube.com/watch?v=lrADTly1Cic | Mayo Clinic, Phoenix, Arizona |
| Neuropathology #NEUROPATH | | |
| Choroid Plexus Tumors – 26/09/19 Embryonal Neoplasms – 30/07/19 Ependymal Tumors – 02/07/19 Germ Cell Tumors of the CNS – 29/10/19 Hematolymphoid and Secondary Tumors of the CNS – 21/01/20 Meningiomas – 30/04/19 Neuronal and Glioneuronal Tumors – 26/03/19 Nonmeningeal Dural Masses – 28/05/19 Surgical Neuropathology Pearls: Intraoperative Consultations – 13/06/18 Surgical Neuropathology Pearls: Sellar Lesions – 14/11/18 Surgical Pathology Pearls – 16/05/18 Tumefactive Pseudoneoplastic Lesions – 26/02/19 Tumors of Peripheral Nerve – 26/11/19 Tumors of the Pineal Region – 27/08/19 Update on Selected Surgical Neuropathology Entities – 28/04/20 | https://www.youtube.com/watch?v=xZ_1J1SOPGk https://www.youtube.com/watch?v=5pbjFK8PAMc https://www.youtube.com/watch?v=ntJaUp-iTO0 https://www.youtube.com/watch?v=0T2fr4o1rhk&frags=pl%2Cwn https://www.youtube.com/watch?v=bMjL0fNtQAK&frags=pl%2Cwn https://www.youtube.com/watch?v=XvSQmnRu_ba https://www.youtube.com/watch?v=ih_U-uM-RZE https://www.youtube.com/watch?v=5V5uqPuU0bg https://www.youtube.com/watch?v=LIQD19RxB6E https://www.youtube.com/watch?v=R8s1KRKV8Bw https://www.youtube.com/watch?v=2gNjnlwQ20 https://www.youtube.com/watch?v=oEDIRV29A2w https://www.youtube.com/watch?v=6KBo2F9-cuc&frags=pl%2Cwn https://www.youtube.com/watch?v=gUKcKZ7rndo https://www.youtube.com/watch?v=a4yty3AahYc | JHH, Baltimore, Maryland |
| Neuropathology: Glass slide review, part 1 – 21/10/16 Neuropathology: Glass slide review, part 2 – 16/11/16 | https://www.youtube.com/watch?v=CkB5kWWtI9c https://www.youtube.com/watch?v=npPW48fazOw | MSW, New York, New York |
| Approach to Diagnosis of Glial Neoplasms – 22/02/17 | https://www.youtube.com/watch?v=jILsCHb5TaE | UCSF, San Francisco, California |
| Cytopathology #CYTOPATH | | |
| Algorithmic Approach to Thyroid FNA – 24/05/18 Interesting Cases Raising Important Questions in Everyday Practice of Cytopathology – 16/06/20 | https://www.youtube.com/watch?v=bJMf3WrHshY https://www.youtube.com/watch?v=4QJWQbQh_ik | UPenn, Philadelphia, Pennsylvania |
| Salivary gland FNA and the Milan System – 23/03/17 The Milan System for Salivary Gland Cytopathology – an update with FNA examples – 27/11/17 | https://www.youtube.com/watch?v=LvyDI_LIR4E https://www.youtube.com/watch?v=iZMuHt7LeWM | MEE, Boston, Massachusetts |
| Anal Cancer Screening – Why? Whom? How? – 02/02/17 | https://www.youtube.com/watch?v=XaooTNvrv8A | Lenox Hill Hospital, New York, New York |
| FNA Cytology of Salivary Gland Lesions: a Novel Practical Pattern Based Approach – 27/08/19 | https://www.youtube.com/watch?v=CgzL399a4LQ | Mayo Clinic, Phoenix, Arizona |

| | | |
|---|---|---|
| Molecular Cytopathology: Opportunities, limitations, and pitfalls – 05/03/19 | https://www.youtube.com/watch?v=kmQFXpGKxlg | MD Anderson, Houston, Texas |
| Preoperative diagnosis of pancreatic cysts: interactive sign out with the expert – 31/01/19 | https://www.youtube.com/watch?v=lzSgjf9WRA8 | MGH, Boston, Massachusetts |
| The atypical thyroid FNA: What's atypical and what's not? – 02/02/17 | https://www.youtube.com/watch?v=YabBxxDgZBc | Lenox Hill Hospital, New York, New York |
| The IAC Yokohama System for Reporting Breast Cytopathology – 05/11/18 | https://www.youtube.com/watch?v=NDFI39ea7Ik | MGH, Boston, Massachusetts |
| The Milan System for Salivary Gland Cytopathology (Multilanguage version) | https://www.youtube.com/watch?v=iZMuHt7LeWM (English – 27/11/17) https://www.youtube.com/watch?v=hqrG7hWbzO0 (Italian – 08/02/18) https://www.youtube.com/watch?v=HKrDoEoYLLc (Chinese – 04/01/18) https://www.youtube.com/watch?v=WTbqqMMzyM4 (Finnish – 22/03/19) https://www.facebook.com/pathCast/videos/579446622397996/ (French – 10/01/18) https://www.youtube.com/watch?v=NdWCF05Tli8 (Japanese – 19/12/17) https://www.youtube.com/watch?v=NMajkohYFjE (Portuguese – 04/12/17) | MEE, Boston, Massachusetts CUSH, Rome, Italy Rutgers University, Newark, New Jersey Fimlab Laboratories, Tampere, Finland McGill University, Montreal, Canada Aizawa Hospital, Matsumoto, Japan Federal University, Sao Paulo, Brazil |
| Liver Pathology #LIVERPATH | | |
| Learning to love the Liver logically pt.1 – 12/04/19 Learning to love the Liver logically pt.2 – 17/05/19 Livers with Lipid – 10/09/19 Liver Transplantation: Key issues and logical approaches – 25/02/20 | https://www.youtube.com/watch?v=92d0fw8KDPo https://www.youtube.com/watch?v=L7FS37bzZQ4 https://www.youtube.com/watch?v=muTUpLGGKow&pbjreload=10 https://www.youtube.com/watch?v=rurJoP4_IYg&t=1319s&frags=pl%2Cwn | UPenn, Philadelphia, Pennsylvania |
| Autoimmune Hepatitis – 31/08/16 PBC: A new name and new approach to liver biopsy diagnosis – 19/07/16 Regression of fibrosis in chronic liver disease (the Beijing Classification) – 14/07/20 | https://www.youtube.com/watch?v=Ew7YKtozLP4 https://www.youtube.com/watch?v=otv_y6cn6il https://www.youtube.com/watch?v=bnKQN723t9o | MSW, New York, New York |
| Liver Pathology: let's start with the basics – 07/01/20 | https://www.youtube.com/watch?v=P-NiyDLGmWE&frags=pl%2Cwn *AIPNA Lecture (#AIPNA) https://www.youtube.com/watch?v=e-2Szy4WuGQ&frags=pl%2Cwn | IU, Indianapolis, Indiana |
| The Fatty Liver: pathology of NASH – 21/07/20 | https://www.youtube.com/watch?v=hKRJ3iWJkIU | RPAH, Sidney, Australia |
| Liver Pathology Master Class: Mistakes made and Lessons Learnt – 19/05/20 | https://www.youtube.com/watch?v=UoH535B4284 | JHH, Baltimore, Maryland |
| Liver Transplant Pathology – 30/05/18 | | |
| Ear, Nose and Throat Pathology, Oral Pathology, Thyroid Pathology #ENTPATH, #ORALPATH, #ENDOPATH | | |
| An Alphabet Soup of Thyroid Neoplasms – 30/07/18 WHO keeps changing the names of salivary gland tumors – 17/09/18 WHO's new in sinonasal tract pathology – 21/05/18 | https://www.youtube.com/watch?v=A_RdJGQ5h4M https://www.youtube.com/watch?v=beoWeGKSc1w https://www.youtube.com/watch?v=kuwY7asNZGM | SCPMG, Woodland Hills, California |
| Intraepithelial dysplasia and squamous cell carcinoma of the head and neck – 16/06/16 Pathology of the oral cavity – 01/09/16 Potpourri of head and neck lesions – 29/09/16 | https://www.youtube.com/watch?v=O-oeAVrAkio https://www.youtube.com/watch?v=kYkI5Q10LNw https://www.youtube.com/watch?v=BxpXSQGBpFs | MSW, New York, New York |
| Oncocytic Lesions of Thyroid Gland: Interesting, Challenging and Controversial – 15/05/20 Update on recently described tumors of the sinonasal tract: A case-oriented approach – 18/12/18 | https://www.youtube.com/watch?v=sdFUtpE_F7g https://www.youtube.com/watch?v=341bBl-aCzc | UPenn, Philadelphia, Pennsylvania |
| A Mouthful of Neoplasms – An Overview of Odontogenic Tumours – 29/05/20 | https://www.youtube.com/watch?v=sHCax2Y6HFU *Oral Pathology Lecture (#ORALPATH) | University of Sheffield, Sheffield, United Kingdom |
| Salivary Gland Neoplasia: Practical Approaches to Evolving Entities – 02/11/18 | https://www.youtube.com/watch?v=3ewl4DHTRpI | MGH, Boston, Massachusetts |
| Gynecological Pathology, Placental/Obstetric Pathology #GYNPATH, #OBPATH | | |
| Categories of Placental Pathology – part 1 – 25/03/20 Categories of Placental Pathology – part 2 – 02/06/20 Products of Conception: What Not to Miss – 28/08/20 | https://www.youtube.com/watch?v=V7WoSRq_jzI https://www.youtube.com/watch?v=S97DFJzKIBM https://www.youtube.com/watch?v=jqUbjBwwXmk&frags=pl%2Cwn *Obstetric Pathology Lectures (#OBPATH) https://www.youtube.com/watch?v=bkd0DmlqkLE | MGH, Boston, Massachusetts |
| Sex Cord-Stromal Tumors of the Ovaries and Some of Their Mimics – 14/12/18 | https://www.youtube.com/watch?v=MOMPrpH_aT8 https://www.youtube.com/watch?v=BjYrL9YvI9k | CSMC, Los Angeles, California |
| Ovarian Mucinous Tumours: Primary or Metastasis? A Practical Approach to Differential Diagnosis – 21/05/20 | https://www.youtube.com/watch?v=VCvDes_AZm4 | University of Toronto, Toronto, Canada |
| Uterine Biphasic Tumors – a practical guide – 07/07/20 | https://www.youtube.com/watch?v=brbNejITMjY&t=32s | UAMS, Little Rock, Arkansas |
| Benign and pre-malignant endometrial pathology for the everyday practice – 22/05/20 | https://www.youtube.com/watch?v=YYSeqZ6rKhU | UC Berkeley, San Francisco, California |
| Endometrial adenocarcinoma, challenging differentials – 25/08/20 | https://www.youtube.com/watch?v=zl_bvyGAQU | UChicago, Illinois |
| Uterine mesenchymal neoplasms: recognizing the wolves in sheep clothing – 19/06/20 | | |
| The zebras of uterine mesenchymal neoplasms – 15/09/2020 | | |
| Dermatopathology #DERMPATH | | |
| 15 Diagnoses in Inflammatory Dermatopathology Every Path Resident Should Know – 09/05/17 Adnexal Neoplasms – 26/02/17 Approach to lichenoid dermatitis – 20/01/17 Introduction to dermatopathology reaction patterns, part 1 – 20/06/16 Introduction to dermatopathology reaction patterns, part 1 – 12/08/16 The molecular basis of melanoma – 14/12/16 | https://www.youtube.com/watch?v=SfSjGJtaN7Q https://www.youtube.com/watch?v=cdSIPWYu34I https://www.youtube.com/watch?v=fND0CD_vjEE https://www.youtube.com/watch?v=naGfv7V13J8 https://www.youtube.com/watch?v=nXWykG7RP40 https://www.youtube.com/watch?v=O1hBtERIJG | MSW, New York, New York |
| Highlights from the new WHO Classification of Skin Tumours – 05/08/20 | https://www.youtube.com/watch?v=91cY2JEdrTg | Central Clinical School, USYD, Sidney, Australia |
| Vasculitis and Vasculopathy - A Case-Based Approach – 03/10/19 | https://www.youtube.com/watch?v=gnr6BpHjFM0 | MGH, Boston, Massachusetts |
| Breast Pathology #BREASTPATH | | |
| Breast spindle cell lesions – 07/02/18 Papillary Lesions of the Breast – 21/04/20 | https://www.youtube.com/watch?v=vRUI8IZdq8w https://www.youtube.com/watch?v=u2Ek1MXk7xc&frags=pl%2Cwn | JHH, Baltimore, Maryland |

| | | |
|--|---|---|
| Breast cases that make you slow down and pause – 17/04/20 | https://www.youtube.com/watch?v=WwarCJrmQZ8&t=3s&frags=pl%2Cwn | YU, Providence, Rhode Island |
| High-yield breast pathology cases for boards – 05/05/1 | https://www.youtube.com/watch?v=nCoSnLC-8SQ&frags=pl%2Cwn | |
| Breast Core Needle Biopsy: Potentials and Limitations – 26/06/20 | https://www.youtube.com/watch?v=fZ08XLlaj7g | Porto University, Porto, Portugal |
| Breast Pathology from Basics to Esoterics – 29/07/19 | https://www.youtube.com/watch?v=YM7QT4rZPmc | UPenn, Philadelphia, Pennsylvania |
| Genitourinary Pathology #GUPATH | | |
| Mesenchymal Kidney Tumors – 09/05/18 | https://www.youtube.com/watch?v=T_XsF9ORrAc&frags=pl%2Cwn | JHH, Baltimore, Maryland |
| Non-germ cell tumors of the testis – 18/11/18 | https://www.youtube.com/watch?v=DZcLJwh4xYc | |
| Somatic Malignancy in Germ Cell Tumors – 23/06/20 | https://www.youtube.com/watch?v=D0tj-FBtSel | |
| A Practical Update on Classification, IHC and Molecular Pathology of Urothelial Neoplasms – 05/05/20 | https://www.youtube.com/watch?v=Gln362IncBw | OSU, Columbus, Ohio |
| Benign Mimics in the Urinary Bladder and Prostate – 11/05/17 | https://www.youtube.com/watch?v=9V4YAAW1XRg | HFHS, Detroit, Michigan |
| Medical renal pathology for boards – 17/06/16 | https://www.youtube.com/watch?v=y3Prv5AyvRM | MSW, New York, New York |
| Hematopathology #HEMEPATH | | |
| Acute leukemia: A practical approach to diagnoses – 29/09/16 | https://www.youtube.com/watch?v=o_qWQ8CVOQo | SU, Stanford, California |
| Too much of a myeloid thing – 16/08/16 | https://www.youtube.com/watch?v=yYWDy05Uy58 | |
| Approach to the Lymph Node – 30/06/20 | https://www.youtube.com/watch?v=EbZGWXY3m-s | CCF, Cleveland, Ohio |
| Flow Cytometric Immunophenotyping and Acute Leukemia – 10/01/17 | https://www.youtube.com/watch?v=HK1ZHa6i2xU | Tata Memorial Hospital, Mumbai, India |
| Hodgkin Lymphoma: Diagnosis and Differential Diagnoses – 08/08/20 | https://www.youtube.com/watch?v=qySmAMgkf5c | MGH, Boston, Massachusetts |
| Bone and Soft Tissue Pathology #BSTPATH | | |
| Bone forming tumors – 01/05/20 | https://www.youtube.com/watch?v=ltqobvGhzLo | HSS, New York, New York |
| Cartilage forming tumors – 05/06/20 | https://www.youtube.com/watch?v=8VuLGBvEV8U | |
| Miscellaneous Bone Tumors – 10/07/20 | https://www.youtube.com/watch?v=wKbpac-k7rs&frags=pl%2Cwn | |
| Soft tissue tumors: Molecular testing is great, but don't forget the morphology – 12/06/18 | https://www.youtube.com/watch?v=UvvXrh1vQfA | JHH, Baltimore, Maryland |
| Covid-19 Management #COVID-19 | | |
| Covid-19 in Taiwan: A Pathology Laboratory's Perspective – 17/04/20 | https://www.youtube.com/watch?v=O26HGDgRdHY | Chia-Yi Christian Hospital, Chiayi City, Taiwan |
| SARS-CoV-2 & Covid-19 in the Laboratory: Data, Testing & Validation Considerations – 10/04/20 | https://www.youtube.com/watch?v=BOmbLvLEN98 | LUC, Chicago, Illinois |
| Molecular diagnosis of SARS-CoV-2: implementation and ongoing challenges – 14/05/20 | https://www.youtube.com/watch?v=enT7LSMfJu0 | JHH, Baltimore, Maryland |
| Pathologists Talk Daily to COVID19 Families: NYU Family Connect – 12/06/20 | https://www.youtube.com/watch?v=QQmrJ6K9xkM | NYULMC, New York, New York |
| Pulmonary Pathology #PULMPATH | | |
| Interstitial lung diseases (ILD) basic injury patterns – 11/09/20 | https://www.youtube.com/watch?v=jA_4VIV1npk | Mayo Clinic |
| Additional patterns of lung fibrosis and inflammatory infiltrates in ILD – 02/10/20 | https://www.youtube.com/watch?v=McE6SaGaVqg | Scottsdale, Arizona Rochester, Minnesota |
| Pulmonary pathology: A board's eye view – 21/10/16 | https://www.youtube.com/watch?v=YdJkED_x_RE | MSW, New York, New York |
| Pleural pathology: Pitfalls and pearls – 30/06/16 | https://www.youtube.com/watch?v=uJteih8NvKk | |
| Autopsy and Gross Pathology #AUTOPSY, #GROSSPATH | | |
| An Introduction to Gross Specimen Examination: Basic Principles – 16/07/20 | https://www.youtube.com/watch?v=cZSzeMAL0c | WDL, Milwaukee, Wisconsin |
| Introduction to Autopsies – 20/07/16 | https://www.youtube.com/watch?v=P3Qbv33f1Xg | MSW, New York, New York |
| Importance of autopsy procedure in pathology training – 30/07/20 | https://www.youtube.com/watch?v=bfPU7YsE32o&frags=pl%2Cwn | OCME, New York, New York |
| Transfusion Medicine #BLOODBANK | | |
| Immunohematology and Transfusion Medicine: A Case Study Approach – 08/10/19 | https://www.youtube.com/watch?v=HNuducKIZUE | MSW, New York, New York |
| Therapeutic Plasma Exchange – 28/03/17 | https://www.youtube.com/watch?v=D_AmFF50h_M | |
| Intraoperative Pathology #INTRAOP | | |
| Intraoperative Consultation: Tips and Tricks for Successful Outcomes – 18/08/20 | https://www.youtube.com/watch?v=wqMgFKvV6r8 | Mayo Clinic, Phoenix, Arizona |
| Pediatric Pathology #PEDIPATH | | |
| Neonatal Cholestasis – 29/10/20 | https://www.youtube.com/watch?v=-70popkwu0 | Children's Hospital of Pennsylvania |
| MISCELLANEOUS: Oncology; Molecular Pathology; Experimental Pathology; Microbiology | | |
| Bacteriology I – 04/08/20 | https://www.youtube.com/watch?v=plmdlUsqCq4&frags=pl%2Cwn | CSMC, Los Angeles, California |
| Mycology I – General Introduction and Dimorphic Fungi – 14/07/20 | https://www.youtube.com/watch?v=hULry4ePQKs | |
| Mycology II – Yeast, Fungi That Cause Cutaneous and Subcutaneous Infections, and the Opportunistic Fungi – 14/08/20 | https://www.youtube.com/watch?v=3-gGXO_NqWA&frags=pl%2Cwn | |
| Continuity of fibrous tissue interstitial spaces throughout the human body: implications for pathology – 09/06/20 | https://www.youtube.com/watch?v=Zd1KxVRS5lg&t=3611s&frags=pl%2Cwn | NYULMC, New York, New York |
| Molecular biology of cancer and paradigm shift in cancer care – 02/11/19 | https://www.youtube.com/watch?v=B_bHh8W7DaQ | LUC, Chicago, Illinois |
| Therapeutic approach to the colorectal cancer patient based on pathology – 25/09/20 | https://www.youtube.com/watch?v=l4qPnUibsKw | UPenn, Philadelphia, Pennsylvania |
| <p>Abbreviations of Institutions: JHH, The Johns Hopkins Hospital; MSW, Mount Sinai West; CCF, Cleveland Clinic Foundation; UPenn, University of Pennsylvania; MMC, Montefiore Medical Center; UA, University of Alabama; MSKCC, Memorial Sloan Kettering Cancer Center; UCSF, University of California, San Francisco; MEE, Massachusetts Eye and Ear; MGH, Massachusetts General Hospital; CUSH, Catholic University of the Sacred Heart; IU, Indiana University; RPAH, Royal Prince Alfred Hospital; SCPMG, Southern California Permanente Medical Group; CSMC, Cedars-Sinai Medical Center; UAMS, University of Arkansas for Medical Sciences; UChicago, University of Chicago; USYD, University of Sydney; YU, Yale University; OSU, Ohio State University; HFHS, Henry Ford Health System; SU, Stanford University; HSS, Hospital for Special Surgery; LUC, Loyola University Chicago; NYULMC, New York University, Langone Medical Center; WDL, Wisconsin Diagnostic Laboratories; OCME, Office of Chief Medical Examiner; AIPNA, association of Indian pathologists in North America.</p> <p>Other Abbreviations: GI, gastrointestinal; GIST, gastrointestinal stromal tumor; RLQ, right lower quadrant; IBD, inflammatory bowel disease; CNS, central nervous system; FNA, fine needle aspiration; IAC, International Academy of Cytology; PBC, primary biliary cholangitis; NASH, Non alcoholic steatohepatitis; WHO, World Health Organization.</p> | | |