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E-learning

Open Access Publication in Pathology – Advantages, Constraints and New Tools

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Abstract

Background: Open access journals are financed by authors (i.e. research grants), rather than by readers or subscribers. This business model allows a world – wide uncontrolled distribution of medical information and scientific knowledge. The financial shifting and the opportunities for misuse raise significant concerns regarding non – scientific impact and article content integrity. Herein we report and discuss ideas and experiences of open access publication focusing on diagnostic pathology.

Material and Methods: Our experiences are drawn from an electronic communication network in pathology that includes the open access online journal diagnosticpathology.eu. The network includes a) the journal www.diagnosticpathology.eu, b) the Virtual International Pathology Institute (www.diagnomx.eu/vipi), c) several scholar atlases (a selection of common and rare lung diseases (Digital Lung Pathology), an atlas of fine granulate & natural and synthetic mineral fibers, a virtual slide atlas (in preparation)). The journal offers the opportunity to publish case reports "beside the microscope" and to submit data for "interactive publication". Both tools are unique, and cannot be found elsewhere. For publication of suitable articles, we demand the submission of glass slides, which will become completely digitized (virtual slides, VS).

Results and Experiences: The journal is online since March 2015, and the only completely financially independent open access journal in medicine. We have published several case reports under the headline "How do I diagnose…?" The presented form offers a guide through the article and permits a complete publication "besides the microscope", commonly in less than one hour. Automated links to reference search items are included as well as virtual slides. The strict publication format permits fast submission of unique or interesting cases, and, in addition, the implementation of the publication into a case – related open and flexible image date bank.

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Conclusions: The mandatory inclusion of virtual slides is a unique quality control. The journal diagnosticpathology.eu is embedded in a cloud that will consist of an archive of published cases with virtual slides, an express review forum with a corresponding duty plan, an automated measurement system of histological slides, and open access atlases such as hazards of natural and artificial fibers (fine granulate) and a collection of all known pulmonary diseases. Diagnosis assistants and image databanks customized according to the needs of an individual user (reader, author, consultant, automated measurements, etc.) will be available in the near future too.

Keywords: Open Access Publication, Pathology, Virtual Slides, Review Forum, Automated Measurements.

Background – Open Access

The first solely electronically distributed peer reviewed scientific journal, the *electronic journal of pathology and histology*, was implemented in early 1995. Distributed on floppies and later on CDs, it included features that could not be distributed on paper, like the display of algorithms, interactive publication, and others. The journal was terminated in 2000 when the internet offered new techniques to distribute scientific information. [1] Its published articles can be read in the new release of www.diagnosticpathology.eu.
Publishing in the digital environment offers new possibilities for distribution of scientific information [1-5]. In addition, it can be managed using open access software and standardized electronic communication lines (internet, mobile phone application protocols (APPs)) with few costs [1-2, 6]. Advantages are facilitated access and fast publication processes. The business model of digital publication promises a profit that is out of range for printed journals , because it focuses on the main interest of authors, and reaches a far bigger audience [3].

Disadvantages of open access publication have been mentioned as non-negligible financial burden to the authors, lower scientific quality (because outstanding scientists and researchers prefer to publish in “conventional structured journals”), easy, non-controlled “black” copies of compartments of or complete published articles and falsified data that are increasingly difficult to detect.

On the other side, the digital nature of open access publishing brings on several advantages that start with the amount of information and methods in which it can be conveyed. These are greater and more variable than paper prints. Electronic articles can involve more formats, more data, be connected with different information. They might reach a wider audience with fast and world-wide spread of the publications at no cost for the readers. Readers may choose a preferred type of display [3, 5]. Publishers may check the access to specific articles (number of hits), perform article ranking and evaluation of the scientific interest of the readers. Making research freely available to the public supports a greater global distribution of knowledge.

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In pathology, the opportunity exists of introducing quality assurance features like publication of digitized whole glass slides, access to interactive calculations and measurements. Electronic publications might alter from solely (passive) messages (reading) to interactive quality evaluation by the reader. They might include interactive communication with forums, information collections and data processing aids, an exciting potential of future publication features.

Open access publication represents a shift in the scientific publication paradigm brought on by the internet and digital applications. It is financially successful because of globalization. The number of potential readers exceeds by far that of printed papers. In a way it promotes the free distribution of medical and scientific data to the readers, allowing for world wide access and financially independent access to the latest research with fast and cheap distribution [1].

To achieve this free distribution of information to the readers, the mandatory financial source is provided by the authors (or their institutions) usually acquired from research grants. The authors retain the copyright for their work, facilitating its dissemination. This business model opened the door into a new market for research publication, allowing more financial influence on scientific publication. Any publishing company is at least tempted to influence the editors to publish as many articles as possible independent from their scientific quality [1]. To our knowledge international regulation of publication fees does not exist. Most professional educational institutions and even state governments support this system, for example, by including high publication costs in the assigned grants, and giving the researchers the opportunity to publish their data in journals with high reputation (citation index, CI).

Innovative and outstanding research and medical science require time until they become acknowledged and cited [2]. Authors are under pressure and prefer to publish their research results in journals that are equipped with a high CI. They expect that their data will be cited more often and that their research results attain a higher reputation in the scientific community. These expectations (and frequently administrative behavior) open the door to financial pollution in science, because they automatically induce a financial dependence of publications. Journals with high CI are at least tempted to charge more than those with a low or even not existing CI [1].

This financial pressure from publishers and their lack of interest in introducing innovative features are the reasons for the (re-)creation of “The diagnostic pathology journal” (DiagnosticPathology.eu), an open-access, self-published journal. The publishing goal is to disseminate information that might be of significance to colleagues or the public. As so we try to become financially independent as possible and to convince authors not delegate important task to the hands of publishing main players whose values may not align with science.

An innovative open access journal should not be limited to publish articles in an electronically adjusted conventional method, but to provide additional features that can bridge daily work with access to the latest available information. Tests to prove the published statements of the authors, internal article score and training resources should be accessible to the reader too [1, 4].
A recent study has proven that an educational advantage exists to include whole slide images (WSI) in journal articles, stating that WSI offer enhanced information, education, and training to the reader, beyond text and images that have been solely selected by the author [4].

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All these issues will open the door to a new level of open access publication which has not been reached by any other publisher to our knowledge.

Material and Methods

Open access journals might be handled by open source software [6]. An information distribution network that includes several servers with different tasks might steer the communication with the extern (electronic) world outside the firewall [3]. Such a system can be operated with a minimum of costs. It offers the opportunity to be non-profit oriented and completely independent from established publishing companies.

Innovative publication has to be more than just the distribution of digitally formatted articles. It should bridge the mandatory obligations of routine work, research results, easy (or even automated) access to leading information storage (libraries), and teach, educate, and train colleagues at the same time.
At the beginning, the journal should stay in the central node of a communications network. It should be organized in a conventional manner to become accepted by colleagues and interested readers. In addition, it should offer innovative tools that might shift different nodes into the center, for example diagnosis assistants.
Therefore, the diagnostic pathology journal is an open access, peer-reviewed journal embedded as vertex in a communication network <Figure 1>, with innovative electronic communication and quality assurance features and not "a stand alone" journal. Additional nodes have already been included as described below. Therefore, www.diagnosticpathology.eu journal is not only a journal, but more.

The diagnostic pathology journal publishes all kinds of medical manuscripts that contribute to tissue-based diagnosis. These include classic medical diagnosis, prognosis-related diagnosis and therapy, research, training, education, hypothesis, new technologies and applications, innovative ideas and their implementation.
The broad spectrum of accepted and published articles offers both opportunities and limitations. Tissue-based diagnosis includes a broad spectrum of technical, medical, biochemical, and biological research that should be representatively mapped in this journal.

The implemented communication tools include open access, peer reviewed submission, free world-wide accessible reading of scientific articles, automated access to latest content related literature, interactive publications and discussions, as well as specific technological articles. In preparation are unique quality assurance and display of images (virtual slides), modern education tools (case report atlas), automated reader controlled image measurements, and a communication platform for patients directly with the authors.
The new publication and communication tools include interacting with and adding own data to already published articles (Interactive publication), publishing a case “besides the microscope” within less than one hour, (How do I diagnose…?), screening and measuring completely digitized glass slides (virtual slides) that are presented by a specific rare case collection or by published articles. Additional scientific tools are a complete data collection of environmental health hazards and a list of all known lung diseases <Figure 2> that will be presented with virtual slides, and an updated disease description.

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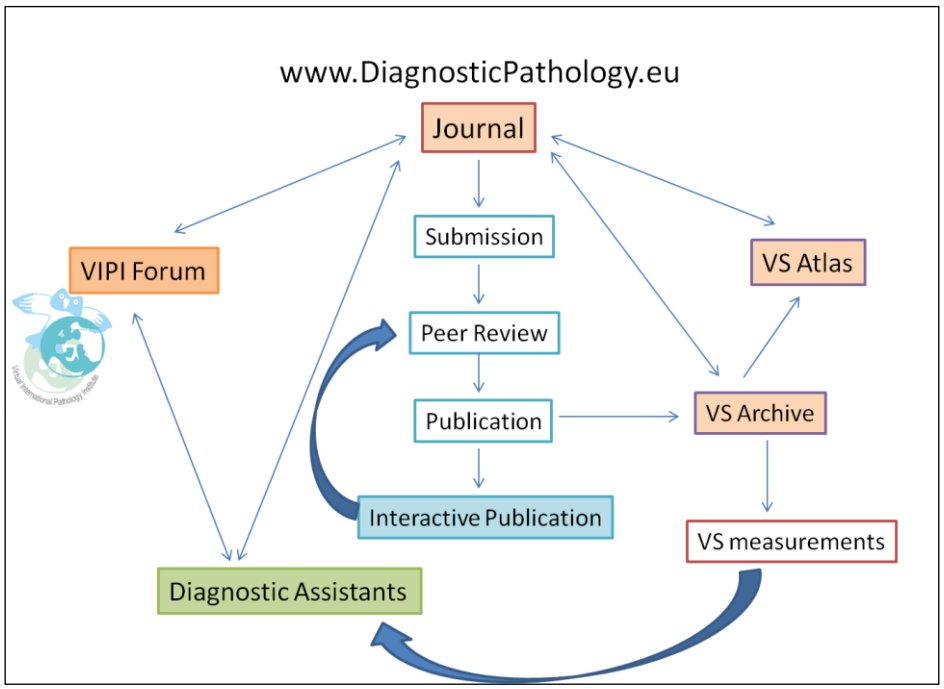

Figure 1: Innovative Communications Network.

The short case report form "How do I diagnose…?" offers a guide through the article and permits a complete publication "besides the microscope", predefined paragraphs permit a fast and structured submission commonly in less than one hour. It allows automated access to related references via the NIH library; i.e. the authors can concentrate on the specific diagnostic problem.

In addition, a new publication form "interactive publication", a completely new manner of information distribution has been included in the journal. Any author can add her/his new data to an already existing publication, if the authors of the already published article have agreed to. The result will be a new – peer reviewed - publication to the benefit of all, the "old" and the "additive" authors.

An additional included node is the closed forum, the Virtual International Pathology Institute (VIPI) (www.diagnomx.eu/vipi), a specialized diagnostic and therapeutic medical forum. It is similarly organized to a conventional pathology institute (in the real world) with duty plans, organizing specific laboratory examinations, education, and training of young colleagues. VIPI is designed for diagnostic support of colleagues working under different conditions and in different countries, offering orders of immunohistochemistry, automated measurements, automated access to the national library of health (pubmed library), automated translation into twelve different languages, and the creation of a liable diagnosis report.

Authors must submit glass slides for virtual slide (VS) production to our slide scanning partners in case of relevant manuscripts - not all research articles are suitable for VS in contrast to case reports that significantly benefit from this technology. In collaboration with the companies DiagnomX, *Huron Digital Pathology, Inc*, Zeiss, and *Motic Medical Diagnostic Systems* three digitalization centers have been implemented for America (Huron), China and Asia (Motic), and

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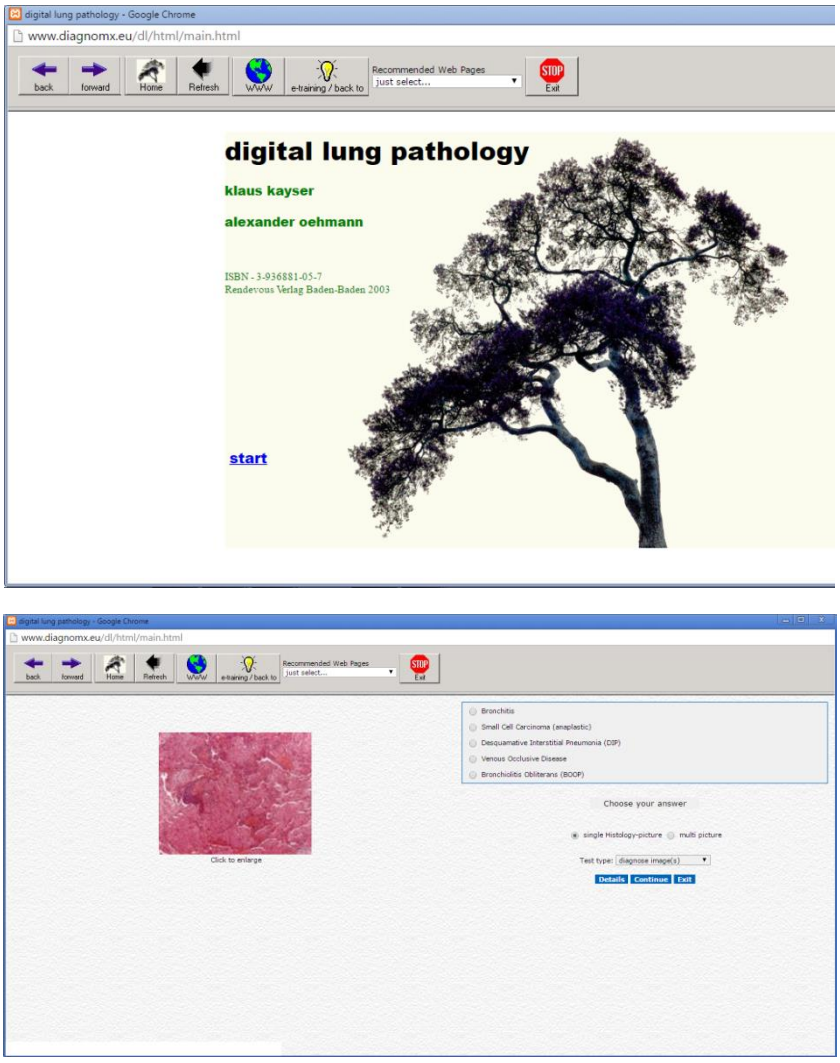

Figure 2: Example of interactive atlas.

Europe (Zeiss). Every reader of an article with virtual slides can screen them, and, in the near future, will be able to measure its features at any spot she/he is interested in. This also means that the reader can check whether the included data are correct and the images are representative for the described results.

The submission of glass slides increases quality level of the article and avoids copies taken from the internet or other sources. All published articles that possess VS are transferred into a separate archive that will be open for education and training. The keywords of published articles are automatically connected with the search items of open access libraries such as pubmed, and articles listed in that library are available at any time. The screening and measuring tools are the first step of so-called diagnosis assistants (similar to spelling correctors). They will be used to assure quality by automated magnification, image quality measurement and detection of Regions of interest (ROI's). They will allow to compare the

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stated diagnosis with the institutions' own statistics and ultimately there will be a databank system that automatically will perform prescreening (or even final diagnosis) with automated adjustment to new included cases.

Results and Experiences

Our journal diagnosticpathology.eu is online since a little more than one year. It is the only completely independent and non profit – oriented journal in pathology. We have published several case reports under the headline "How do I diagnose…?" The presented form offers a guide through the article and permits a complete publication "besides the microscope", commonly in less than one hour. Automated links to reference search items are included as well as virtual slides. The strict publication format permits fast submission of unique or interesting cases, and, in addition, the implementation of the publication into a case – related open and flexible image date bank. All published articles can be expanded to an interactive publication network if the original authors agree. This is a unique opportunity for authors to aggregate their results independent from the date and place of investigations.

Our journal Diagnostic Pathology is the only one that integrates virtual slides in its articles to our knowledge. This is meant for quality assurance and educational purposes. It will certainly be included in other issues [4].
We take advantage of all available electronic tools in order to provide features that bridge daily work with access to the latest available information and continue our efforts to give any colleague a chance to distribute her/his ideas and data at a very small or even without financial contribution.

Conclusions

The diagnostic pathology journal is an innovative and unique communication tool that will be under continuous development and integration of the latest technological developments. A fair, independent and supportive distribution of research and medical information is its aim. We believe in the innovative and unique advantages of electronic publication under the presumption that fair and strict boundaries between the financial issues and science are in place.
We are completely independent from any big publishing company. This independence allows us to flexibly implement new communication issues that are not available in other journals. The open access journal is only one compartment (or vertex) of a complex electronic information acquiring and communication network. It is far more advanced as all comparable open access journals. Its implementation is not at all expensive as nearly all servers are operating in tailored versions of open access programs.

The finishes of this network will be the construction and implementation of diagnosis assistants. These are based upon the published original articles extended by data sets of the laboratories and institutes which are using the assistants.

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