Implementation of digital pathology for primary diagnosis in a tertiary center.

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INTRODUCTION

Modern pathology services are currently under pressure to provide efficient and high-quality diagnoses while experiencing increased workload and diagnostic complexity. Recent studies have shown the utility of digital pathology (DP) in pathology service coverage and in improving laboratory workflow and efficiency.

In partnership with the private sector, TRIBVN Healthcare, we recently initiated the conversion of our entire service to use a DP platform for primary pathology diagnosis. We present our experience on the first phase of DP implementation, with the first 4 pathologists from distinctive career profiles and specialties, as well as short and long-term goals in deploying the platform to the network of laboratories affiliated to our institution.

AIMS

➢ To present our DP implementation process in a tertiary care pathology laboratory
➢ To describe the hardware and software of our DP platform
➢ To share challenges, solutions and impacts on pathology workflow

MATERIALS AND METHODS

The Centre hospitalier de l’Université de Montréal (CHUM) is a tertiary academic center in Montréal, Canada. The pathology laboratory includes 22 pathologists, 112 employees, and 20 medical residents. Over the last year, the service processed 32,683/82,126 surgical/biopsy specimens, 6,893 cytology specimens, 3,700 consultations, 2,040 autopsies and produced approximately 850,000 slides.

Since 2016, we concluded a partnership with TRIBVN Healthcare and Hamamatsu. The partnership is centered on CaloPix software, an Image Management System (IMS) developed by TRIBVN Healthcare. The DP platform currently uses 2 Hamamatsu NanoZoomer X, a high-throughput and high-resolution brightfield scanner (320-slide per batch).

With the long-term goal of wide usage of DP in our province, 3 implementation phases are planned and we here present the preliminary results of Phase I.

PRELIMINARY RESULTS OF THE PILOT PHASE

Conversion of our service to full digital pathology platform required re-organization of our work environments, laboratory and office, to integrate:

➢ 2 scanners, computers, high resolution monitors (Fig. 1)
➢ CaloX solution software, an image manager system (IMS) in interoperability with our LIS (Diamic, Dedalus)
➢ Continuous training, and process evaluation.

Figure 1. Default workspace of each pathologist from the pilot phase.

Table 1. Overview of the workload of each pathologist from the pilot phase

<table>
<thead>
<tr>
<th>Subspeciality and other duties</th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>GI/Liver 75% admin duties</td>
<td>25%</td>
<td>25%</td>
<td>10%</td>
</tr>
<tr>
<td>GI/50% research 75%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GYN/BREAST 80% admin duties</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years of practice</td>
<td>20</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Case load</td>
<td>2166</td>
<td>164</td>
<td>1623</td>
</tr>
<tr>
<td>Slide load</td>
<td>15,270</td>
<td>3,806</td>
<td>12,167</td>
</tr>
<tr>
<td>Transition from glass to digital slides (Table 1)</td>
<td></td>
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</tbody>
</table>

➢ The number of glass slides produced for the primary diagnosis of CHUM cases are similar in 2019 compared to 2018 (~ 850,000 slides)
➢ For the 4 pathologists of the pilot phase, 100% of glass slides are scanned for image interpretation.
➢ Each pathologist was transitioned sequentially, beginning with small biopsies and ending with larger surgical specimens.
➢ Approximately 3% of digital slides were rejected due to focus problem.
➢ This result is similar to other reported DP projects.
➢ Ergonomics are different at the microscope and at the computer and still need individual adjustment.
➢ Continuous training of resources, constant process evaluation and redaction of Standard Operational Procedures (SOP).

Pathologists Turn-Around Time (TAT)

➢ After 2 months of adaptation, there is a tendency of TAT improvement (90% per year for P1)
➢ Due to many factors related to subspecialties and too few results collected, TAT for P2, P3, P4 showed no significant changes after 5 months of conversion in DP (Data not shown).
➢ Our DP TAT includes the time for whole slide scanning

Figure 2. Stakeholders involved in change management and DP implementation.

Figure 3. P1 Turn-around Time - Percentage of difference compared to 2018

ADVANTAGES AND CHALLENGES

➢ Conversion of our service in DP had no major impact in our workflow but significantly improved the analytic phase of the diagnostic process, increasing pathologists’ enthusiasm enough to convert even late adopters.
➢ Accordingly, phase II is expected to begin September 2019.
➢ Stakeholder objective alignment, strategic project management, infrastructures operation, and technical supports are important elements that ensure smooth transition and adhesion.
➢ Development of new approaches and custom applications for the purposes of image interpretation are facilitated by our partnership with TRIBVN Healthcare.

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REFERENCES AND ACKNOWLEDGEMENTS


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