Pathology informatics selected abstracts

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A machine-learning model to predict CML using retrospective EHR data

September 2021—Chronic myelogenous leukemia is a clonal stem cell disorder driven by the *BCR-ABL1* fusion oncogene and accounts for 15 percent of adult leukemias. Patients typically present with abnormalities in their complete blood cell counts with differential classification. While a "CBC with diff" collected immediately before the diagnosis of chronic myelogenous leukemia (CML) can predict presence of the disease, the authors conducted a study to determine whether it is possible to predict a CML diagnosis from CBCs collected at various time intervals between six months and five years prior to a definitive diagnosis of the disease via *BCR-ABL1* mutation testing. Using data collected between 1999 and 2020 from the Veterans Health Administration, the authors identified 12,112 patients who had undergone *BCR-ABL1* testing, of whom 1,623 patients had a continuous electronic health record and 10,489 patients had incomplete records. Data from the patients with continuous health records were split into two groups to train/validate (80 percent) and test (20 percent) two machine-learning models—LASSO and XGBoost. Seven data sets were created, each using the same 1,623 patients but differentiated by time from CML diagnosis (time = 0, 6 months, and 1, 2, 3, 4, and 5 years), to assess the ability of each machine-learning model to predict CML status. Using the test data, the authors showed that model performance, as measured by area under the curve (AUC), was best at the time of diagnosis and declined for each time period thereafter (AUC range of 0.87–0.96 for time = 0; 0.75–0.80 for time = 6 months to 1 year; and 0.59–0.67 for time = 2 to 5 years). Adding incomplete data records into the test data had no impact on model performance, suggesting that even partial data can be used to predict a patient's potential for CML. Overall, the authors demonstrated how longitudinal clinical laboratory data could be used to predict a patient's risk for CML, leading to earlier diagnosis, treatment, and, ideally, better prognosis.

Hauser RG, Esserman D, Beste LA, et al. A machine learning model to successfully predict future diagnosis of chronic myelogenous leukemia with retrospective electronic health records data. *Am J Clin Pathol*. 2021. doi:10.1093/ajcp/aqab086

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Use of three-dimensional surface imaging and printing in anatomic pathology

Many pathologists may be familiar with three-dimensional imaging in the entertainment or gaming industry. However, 3D imaging is also increasingly being incorporated into various medical specialties, including surgery and radiology. Anatomic pathology has been evolving into an image-intensive discipline, so innovative 3D technology is particularly relevant to this field. The authors shared their experience at the Mayo Clinic and expertise regarding the use of 3D imaging within AP for patient care, education, and research. They discussed specific use cases, including utilizing 3D digital files for viewing on a two-dimensional screen, populating 3D extended reality platforms (that is, virtual reality, augmented reality, and mixed reality), and generating 3D printed photorealistic specimen models. For example, in the Mayo Clinic's solid-organ transplant practice, offering patients the opportunity to interact with a digital image or a 3D printout of their explant has several benefits. Not only does it allow them to achieve closure and learn about their disease, but it facilitates a healthy relationship between the pathologist and patient. In the solid-organ transplant practice, images of explanted organs were generated using a handheld 3D scanner (Space Spider, Artec 3D) with Artec Studio modeling software. The specimens were formalin fixed prior to scanning and dissected to optimally demonstrate key anatomic or other pathologic features. Specimens were printed on binder jetting on a Projet 660 (3D Systems) or material jetting on a Mimaki 3D UJ-553 and Stratasys Objet 500 or J55. The authors make a strong case for investing in this emerging technology.

Bois MC, Morris JM, Boland JM, et al. Three-dimensional surface imaging and printing in anatomic pathology. *J Pathol Inform*. 2021;12:22. doi:10.4103/jpi.jpi_8_21

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