

Clinical pathology selected abstracts

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Trends in U.S. and Canadian pathologist workforces between 2007 and 2017

September 2019—Pathologists play a critical role in patient diagnosis, and a shortage of pathologists may result in overwork, diminished quality of work, diagnostic errors, and delay in diagnosis. The authors of this study examined trends in the total U.S. pathologist workforce, using the Canadian pathologist workforce as a reference. The primary source of data for the study was the Association of American Medical Colleges' *Physician Specialty Data Book* (2008–2018), a biennial publication that contains the previous year's data. The data for the Canadian pathologists came from an annual survey conducted by the Canadian Medical Association. The authors compared the number of pathologists with overall physician numbers and the number of radiologists and anesthesiologists in the United States and Canada. They found that between 2007 and 2017, the number of active pathologists in the United States decreased 17.53 percent, from 14,468 to 12,839. However, the Canadian data showed a 20.45 percent increase in the number of pathologists, growing from 1,467 to 1,767 during the same period. When evaluated from the perspective of each country's per 100,000 population, the U.S. pathologist workforce declined from 5.16 to 3.94 and the Canadian workforce increased from 4.46 to 4.81. As a percentage of total U.S. physicians, pathologists have decreased from 2.03 to 1.43 percent. And when adjusted based on new cancer cases per year, the U.S. diagnostic workload per pathologist rose 41.73 percent while the Canadian pathologist workload increased by 7.06 percent. The authors speculated that the differences between the U.S. and Canadian pathologist workforces may be due to Canada's highly structured and regulated laboratory system, which had received scrutiny for multiple adverse pathology events and trends, leading to increased awareness of pathologists' key role in diagnostic care. The authors concluded that the U.S. pathologist workforce decreased in total and population-adjusted numbers during a 10-year period. Of interest, there does not appear to be widespread workforce deficits or position vacancies, and new trainees were even reported to have difficulty finding a first job. Overall, the pathologist job market appears stable, as measured by pathology job advertisements from 2013 through 2017, with an average salary increase of 29 percent based on physician salary surveys from 2011 through 2017.

Metter DM, Colgan TJ, Leung ST, et al. Trends in the US and Canadian pathologist workforces from 2007 to 2017. *JAMA Network Open*. 2019;2(5):e194337. doi:10.1001/jamanetworkopen.2019.4337.

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A longitudinal big data approach for precision health

Precision health is defined by the ability to assess disease risk at an individual level, detect early disease, and initiate personalized treatment or early prevention strategies. Multiomics profiling combined with clinical measures may help identify deviations from healthy baselines, thereby improving early disease detection and risk prediction. Multiomics profiling also plays an important role in creating a new diagnostic category of disease based on molecular measures. The authors conducted a study in which they explored the ability of deep longitudinal profiling to make health-related discoveries, identify clinically relevant molecular pathways, and affect changes in behavior in a prospective cohort of participants at risk for diabetes mellitus type 2. They enrolled 109 participants at risk for diabetes mellitus in a longitudinal study for up to eight years. Participants underwent quarterly clinical laboratory tests, including molecular profiling of the genome, immunome, transcriptome, proteome, metabolome, and microbiome. They also participated in exercise testing and sensor monitoring and completed various surveys. Using omics emerging technology in combination with standard and enhanced clinical tests, the authors made more than 67 clinically actionable health discoveries involving metabolism, cardiovascular disease, oncology and hematology, and infectious disease. They used these data to construct prediction models for insulin resistance

using omics measurements. Study participation led the majority of subjects to implement diet and exercise changes since it informed more than half the participants of their prediabetes mellitus and diabetes mellitus status, dyslipidemia, and hypertension. In conclusion, the authors demonstrated that combining untargeted multiomics and physiological longitudinal profiling with targeted profiling of metabolic and cardiovascular risk for diabetes mellitus led to actionable health discoveries and meaningful data for the study participants. They suggest that in the future it will be possible to design personalized testing programs on the basis of individual disease risk.

Schussler-Fiorenza Rose SM, Contrepois K, Moneghetti KJ, et al. A longitudinal big data approach for precision health. *Nat. Med.* 2019;25:792-804.

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