Newsbytes

Editors: Raymond D. Aller, MD, & Dennis Winsten

Dashboard drills down into pathology service underbilling

August 2023—How often do pathology departments underbill insurance companies for their services? And how much money do they lose because of underbilling mistakes? A prototype dashboard at Dartmouth Hitchcock Medical Center aims to answer those questions by using natural-language processing and machine-learning algorithms to flag pathology cases that are underbilled.

The dashboard has the potential to "even the playing field," says Louis Vaickus, MD, PhD, associate professor of pathology and laboratory medicine and medical director of pathology informatics at Dartmouth Hitchcock. Insurance providers quickly spot billing errors when pathology departments overbill for services, but medical underbilling often goes unnoticed, he says.

To identify underbilling, the dashboard uses algorithms that have been trained to recognize specific words in pathology reports associated with Current Procedural Terminology billing codes and flag reports that appear to have incorrect codes that could result in underbilling for services, Dr. Vaickus explains.

The dashboard is a product of the Emerging Diagnostic and Investigative Technologies group, which includes the machine-learning and artificial-intelligence research arm of the Department of Pathology and Laboratory Medicine at Dartmouth Hitchcock. Dr. Vaickus is codirector of the EDIT AI program along with Joshua Levy, PhD, assistant professor of pathology and dermatology.

Dr. Levy

Through the EDIT AI program, pathologists, data scientists, and computer science interns collaboratively explore ways to use machine learning and other emerging technologies to simplify a variety of processes within pathology and improve patient care, Dr. Levy says. EDIT AI program interns include high school students, undergraduate college students, and master's and doctoral students nationwide who have backgrounds in computer science and biomedical informatics.

One such intern is Jack Greenburg, who, as an undergraduate college student, spearheaded development of the underbilling dashboard and was the lead author of a *Journal of Pathology Informatics* article describing it (Greenburg J, et al. 2023. https://doi.org/10.1016/j.jpi.2023.100187).

The underbilling dashboard comprises three modules. The first organizes information from pathology reports into a format the dashboard's algorithms can understand. The second includes the natural-language processing and machine-learning algorithms, which predict appropriate CPT codes for pathology cases and identify cases that may be underbilled. The third is a Web interface that presents the CPT code suggestions generated by the algorithms in an easy-to-use format for billing staff.

Dr. Vaickus characterizes the first module of the system, written in Python, as a preprocessing program that "irons out" irregularities in the data. For example, if a pathologist breaks pathology reports into multiple small paragraphs, the module will reformat the reports into strings of text that the algorithms can use, he says.

The algorithms and machine-learning models in the second module are the brains of the system. The algorithms use natural-language processing to parse the text of pathology reports and detect relevant information. The EDIT AI team trained machine-learning models to differentiate between five primary CPT pathology billing codes (88302, 88304, 88305, 88307, and 88309), which are associated with varying levels of reimbursement. A recent Dartmouth master's program graduate is further refining the dashboard's CPT code-prediction capabilities, says Dr. Levy, by comparing dozens of algorithms to see which combination results in the most accurate CPT code predictions.

The Web application in the third module provides users with an easy-to-use interface for interacting with the dashboard and viewing pathology reports that are potentially misbilled, Dr. Levy continues. Billers can upload pathology report data by inputting it into a field at the top of the dashboard screen. For each pathology case, the dashboard delivers CPT code predictions as a numerical percentage, splitting 100 percent probability among the five possible primary CPT code outcomes based on how likely each one is to be correct. "It will say this is likely to be an 88305 with a degree of certainty of 85 percent, for example," Dr. Vaickus says.

To make the predictions easy for billers to view, the Web application plots the probability of each of the five primary CPT codes being correct in a chart on the left side of the screen. On the right side, the dashboard highlights the words in the pathology report that the algorithms used in making the CPT code prediction.

Dr. Vaickus

The highlighted words are intended to make it easier for billers to spot whether the algorithms made an erroneous prediction by identifying words that were used out of context, Dr. Vaickus says. "It partially solves the black box problem where you don't really know what a model is doing because it shows you that this particular word tipped the balance over to an 88305," for example.

The code for the interactive Web application is published on GitHub (github.com/jackgreenburg/cpt_code_app). It can be used by other institutions interested in developing an interface for inputting data into their own machine-learning models and graphically displaying results, Dr. Levy says. The Web application is "very modular," he adds, which allows other institutions to easily attach their own machine-learning algorithms to it.

While the dashboard is still in a prototype stage, early results reflecting its effectiveness are promising, according to Drs. Vaickus and Levy. The *Journal of Pathology Informatics* article about the dashboard highlighted a distal colon partial resection case that the dashboard predicted would fall under CPT code 88307, using the words "colon" and "resection" as part of the basis for selecting that code. Billers had assigned CPT code 88305 to the case, but while colon biopsies are typically 88305, colon resections are more often assigned code 88307 or 88309 to reflect the additional pre- and post-analytic work they involve. Recoding the case as an 88307, as the dashboard algorithms had suggested, would have saved the hospital more than $200.

Using data from 93,039 pathology reports that were part of a five-year-long prior study, the authors of the journal article found that if all the cases that the dashboard flagged as potentially underbilled were truly underbilled, the hospital could have saved as much as $97,084.13 from recoding them. And if those underbilling rates were extrapolated across all pathology subspecialties between January 2011 and December 2021, the annual savings to the hospital from correcting underbilling errors could have reached $110,337.38. But those figures represent an "upper bar" of potential savings to the hospital, Dr. Levy points out. Not all cases flagged as potentially being underbilled are, in actuality, underbilled, he says. Therefore, estimates of potential savings require further analysis.

Drs. Levy and Vaickus plan to conduct a more in-depth audit of pathology billing at Dartmouth Hitchcock in part by

continuing to run cases through the dashboard's algorithms. Furthermore, the EDIT team is creating a larger database, which will contain nearly 1 million cases, to further train the machine-learning algorithms, Dr. Levy says. The team hopes to eventually expand the number of pathology subspecialties for which the algorithms can predict billing codes, he adds.

Having billers review more of the dashboard's predictions to verify their accuracy is also key, Dr. Levy says. "We had our billing staff and some of our pathologists review just a few select examples to give us initial feedback on how to improve [the dashboard], but I think any of these technologies requires having what we call an implementation science perspective," he explains.

A challenge to obtaining medical biller feedback, however, is that the billers are very busy, Dr. Vaickus says. "We would need to have some protected time for them to do a more in-depth study."

Further down the line, the project team hopes to validate the dashboard across multiple institutions to ensure that it can work with data from any EHR or pathology report format, Dr. Vaickus says. "You can't rule out the possibility that a model may be overfit to your data," he adds. "The way to avoid that is to get a bunch of other people's data, pull it in, and make sure [the model] still works"—a lengthy process due to the need for formal data-sharing agreements.

The project team's end goal is for the dashboard to be used as a suggestion tool to assist billers during the coding process or as a review tool that verifies and validates billing codes that have been assigned manually.

"This is a semiautonomous diagnostic aid," says Dr. Vaickus, "and it's not meant to replace anyone's job. It's meant to make people's jobs easier."

—Renee Caruthers

Clinisys introduces Clinisys Laboratory Solutions

Clinisys has launched Clinisys Laboratory Solutions, which comprises Clinisys Toxicology Laboratory, Clinisys Public Health Laboratory, Clinisys Environmental Laboratory, and Clinisys Water Quality.

"Clinisys Laboratory Solutions are discipline-specific laboratory information-management systems built upon the Clinisys Platform, a shared services architecture and data model for SaaS [software-as-a-service] laboratory informatics," according to a company press statement.

The discipline-specific products are scalable and support end-to-end workflow automation and integration with other related information systems and instruments.

Clinisys acquired Horizon Lab Systems early last year and with it the company's toxicology, public health, environmental, and water/wastewater technology expertise.

Clinisys, 520-570-2000

WHO and HL7 partner on global interoperability standards

The World Health Organization and the nonprofit standards-development organization Health Level Seven International have announced that they will collaborate to advance the adoption of open interoperability standards worldwide as part of an effort to further the adoption of digital technologies in health care.

The five-year-long collaboration, according to WHO, will make HL7 FHIR (Fast Healthcare Interoperability Resources)-enabled SMART (Standards-based, Machine-readable, Adaptive, Requirements-based, and Testable) guidelines with multilingual support available free of charge.

The collaboration targets "countries enabled to provide high quality, people-centered health services based on PHC [primary health care] strategies and comprehensive essential service packages and . . . countries enabled to

strengthen health information and data systems, including at the subnational level, and to use this information to inform policymaking," according to a posting on the WHO website.

Under the collaboration, WHO will lead the normative standard for health content and the SMART guideline-development process; identify and coordinate the needs of the global health community and share its findings with HL7 as appropriate; and ensure correct representation of the WHO Family of International Classifications and Terminologies within HL7.

HL7 will provide technical inputs and recommendations to WHO that may assist the latter in developing SMART guidelines, which are intended to advance clinical and data practices and comprise such components as interoperability standards, code libraries, algorithms, and technical and operational specifications. HL7 will also create the technical mechanisms for FHIR-based standards, including those developed by WHO, and translate them into the six official languages of the United Nations—Arabic, Chinese, English, French, Russian, and Spanish. It will assist with the translation process as needed.

This collaboration "will further enable the equitable development of and access to health interoperability standards, evidence-based guidance, and foundational architectural building blocks for digital health to accelerate progress towards universal health coverage," according to a WHO press statement.

Proscia and Mindpeak announce collaboration

Proscia and the German company Mindpeak have formed a partnership to provide integrated artificial intelligence-powered pathology workflows to aid in clinical decision-making for cancer patients.

The joint venture will create a solution that brings together Mindpeak's algorithms for immunohistochemistry quantification and Proscia's Concentriq Dx software platform, both of which are CE-marked under the European In Vitro Diagnostic Medical Devices Regulation. Mindpeak's AI products automatically detect and measure biomarkers, including HER2, Ki-67, and estrogen receptor/progesterone receptor for breast cancer and PD-L1 for lung cancer.

The Concentriq Dx digital pathology open platform is designed to integrate AI applications from Proscia, the company's customers, and third parties, including Mindpeak, into routine pathology workflows.

Concentriq Dx is available for primary diagnosis in the United States under the COVID-19 enforcement policy for remote pathology devices. Mindpeak's AI algorithms are available for research use only in the United States.

Proscia, 215-608-5411

Haemonetics gets FDA nod for upgrade to plasma system

Haemonetics has received FDA clearance for enhancements to its NexSys PCS plasma-collection system. The enhancements include a plasma-collection bowl with a patented design and Express Plus Technology, for reducing procedure time.

"With the latest advancements, Haemonetics expects an average procedure time of 33 to 38 minutes using the standard FDA nomogram," according to a press statement from the company.

Haemonetics reported that it plans to release the enhancements in the coming months.

Haemonetics Corp., 800-537-2802

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