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YouScript® Cumulative Interactions Feature is Unique in Healthcare Software

Drug interaction checkers are common to most EHRs and e-prescribing solutions, but while other types of drug-interaction software will alert you about how two medications could potentially interact, they don't take into account the effects multiple medications combined could have on each other. These *cumulative* interactions are more likely to be problematic than a single drug-drug interaction because they are more complex and often additive. In these scenarios, the magnitude of the increase or decrease in drug levels is greater than that of a single drug-drug interaction.

For example, a patient who metabolizes medications normally through the CYP2C19 pathway may not notice effects of the drug-drug interaction between citalopram (Celexa), used to treat depression, and omeprazole (Prilosec), used to treat acid reflux disease. However, if that patient were a CYP2C19 intermediate metabolizer, he or she may experience adverse effects from citalopram as a result of this cumulative drug-drug-gene interaction.

The YouScript® Personalized Prescribing software can detect interactions between three or more medications through its

“YouScript® software can detect interactions between three or more medications through its cumulative interactions feature and then offer alternatives with a lower risk of interactions.”

cumulative interactions feature, then suggest alternatives with a lower risk of interactions. YouScript is the only software able to do so.

The cumulative interactions feature is the foundation for every drug and phenotype interaction analysis performed in the YouScript software. YouScript combines pharmacodynamic and pharmacokinetic

interactions documented in clinical literature with a patented algorithm that mimics how the human body would metabolize multiple medications to predict changes in drug-levels and clinical effects. This allows YouScript to evaluate the combined effect of a patient's genetics and their entire drug regimen.

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Smart Medication Management Key to Fall Prevention

Falls among the elderly are nothing to take lightly.

The Centers for Disease Control and Prevention (CDC) cite falls as the leading cause of both fatal and nonfatal injuries among Americans 65 and older. In 2012, 2.4 million nonfatal falls among this age group were treated in emergency departments, and more than 722,000 of these patients were hospitalized. In 2011,

“In 2011, about 22,900 older Americans died from unintentional fall injuries.”

about 22,900 members of this demographic died from unintentional fall injuries.

Multiple government and nonprofit agencies, such as the CDC and National Council on Aging, say effective medication

management is an important way to prevent falls and associated injuries. Many people aged 65 and older take multiple medications, thus raising the specter of drug interactions and adverse side effects, such as dizziness, that could lead to falls.

A 2013 case study in the journal *Canadian Family Physician* told of an 83-year-old woman
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Study: Pharmacogenomic Knowledge Gaps Persist Among Physicians

More work seems needed to better familiarize physicians with the concept of pharmacogenetic testing, according to the results of a recent study.

The study in the August edition of *Pharmacogenomics and Personalized Medicine* found that just 12.6 percent of the 300 physicians surveyed strongly or somewhat agreed with the question, "How familiar are you with pharmacogenomics?"

Study authors Johansen Taber and Dickinson report this study gels with past research on physicians' familiarity with pharmacogenomics, such as a 2012 survey of more than 10,000 physicians that found only 10 percent of respondents felt they were adequately informed about the applicability of genetic testing to drug therapy.

Terminology to Blame?

Despite the 12.6 percent figure, Johansen Taber and Dickinson found that, after being presented with a definition of pharmacogenomics, 37 percent of physicians they surveyed reported being confident in their knowledge about the influence of genetics on drug therapy. This suggests that few physicians may be aware of what pharmacogenomics refers to, the study authors write.

"Pharmacogenomics" is often used to describe the broader study of how genes affect drug therapy and response. "Pharmacogenetics" is generally used to describe testing for specific gene variants that could have an impact on drug response.

Johansen Taber and Dickinson surveyed physicians in primary care, cardiology and psychiatry because these specialties col-

"The authors conclude that more educational resources, ideally web-based and integrated into a physician's daily work flow, are needed."

lectively care for a wide variety of patients.

Nearly 20 percent of respondents said they had ordered a pharmacogenetic test during the last year, with 49.7 percent responding that they anticipated ordering a pharmacogenetic test in the next year. For those physicians that had not ordered tests and did not plan to, the most common reason for not doing so was not knowing which tests to order.

Though nearly half of respondents anticipated they would order a pharmacogenetic test in the next year, a quarter named a test not related to pharmacogenomics when asked what test they predicted

ordering. This underscores the notion, the study authors write, that physicians may not understand the term "pharmacogenomics."

More Education Needed

When asked what should be included in an ideal pharmacogenomic educational resource, almost identical majorities said they would like to learn how to interpret pharmacogenetic results (88.4 percent) and learn recommendations for prescribing (88.1 percent.).

The authors conclude that more educational resources, ideally web-based and integrated into a physician's daily work flow, are needed. Through

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YouScript Cumulative Interactions Feature is Unique in Healthcare Software

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The software then ranks all identified interactions in order of potential harm to the patient and color codes them for quicker review. The closer to red an interaction is, the more potentially serious it could be. Cumulative interactions are often more significant, and this is reflected in the ranking. With a simple click on the medication name in the YouScript

interaction report, providers can review detailed information on how two or more drugs will likely interact and the evidence behind each determination.

By providing clear, actionable guidance, YouScript helps clinicians address the complexities of drug interactions and reduce trial-and-error prescribing.

For a free trial, go to www.youscript.com/getstarted.

The screenshot displays the YouScript interface for a patient named John Doe (Cardiology). It features a 'Drug and Phenotype List' on the left, an 'Interaction Report' in the center, and a detailed view for 'Clopidogrel' on the right. The interaction report shows a 'Major' interaction between Clopidogrel and Warfarin, with a 26-75% increase in risk. The detailed view for Clopidogrel lists its phenotypes: CYP2C19 Intermediate Metabolizer and CYP2C19 Poor Metabolizer.

YouScript® Helps Cardiopulmonologist Unravel Puzzling Patient Case

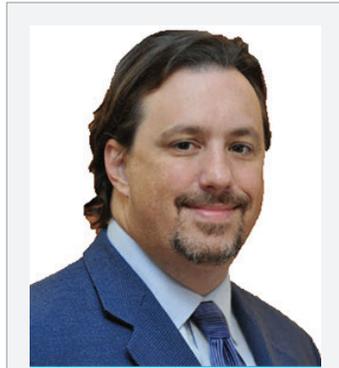
As cardiopulmonologist Mark Pamer, DO, goes about his day at his South Florida practice, one adage from medical school that sticks in his mind is: "All that wheezes is not asthma."

"[As doctors], we probably all heard that. Did we understand it? You know, probably not," said Dr. Pamer. "We understood it later on in residency or fellowship or in life."

This adage proved itself during Dr. Pamer's treatment of a puzzling patient case involving a 59-year-old man who came into his practice with all the classic signs of asthma. It was worse in the winter and around animals, and included nasal congestion. The patient also had history of gastroesophageal reflux disease (GERD) also known as acid reflux, hypertension, irritable bowel syndrome and tremors.

Multiple Medications

The patient was on multiple medications, including fluticasone/salmeterol (Advair) for asthma, dexlansoprazole



Mark Pamer, DO, specializes in cardiopulmonology at his practice in Port St. Lucie, Florida.

(Dexilant) for GERD and primidone (Mysoline) for tremors, in addition to a rescue inhaler. The patient came to Dr. Pamer complaining of worsening asthma symptoms, so the dose of Advair was increased. A month later, the asthma symptoms had not changed. Pulmonary function tests and chest x-rays simply did not point to asthma.

Dr. Pamer stopped the Advair and had the patient evaluated for asthma-mimicking states, which can include acid reflux. These tests showed the pa-

"I'll tell you that your knowledge base improves exponentially once you start to use this test."

tient's reflux was not being controlled by the Dexilant, which is metabolized by the highly variable CYP2C19 enzyme pathway.

YouScript Analysis

Fortunately, Dr. Pamer knew the value of the YouScript® Personalized Prescribing System in figuring out tough cases. Genotyping and YouScript analysis revealed the patient to be a CYP2C19 rapid metabolizer, which was predicted to decrease the blood levels of Dexilant. Primidone, being an inducer of both CYP2C19 and CYP3A4, was likely decreasing Dexilant blood levels even more. Together, these factors resulted in a clinically significant increase in Dexilant metabolism and a decrease in drug effectiveness.

This analysis, in combination with a 24-hour pH probe on the patient, revealed his asthma symptoms were actually a

result of acid reflux. The reflux, in turn, was the result of both the patient's genetics and a drug-drug interaction that was drastically reducing the blood levels of Dexilant.

"I wouldn't have learned any of this from talking to him," Dr. Pamer explained. "It just seemed that he had horrible asthma."

After Dr. Pamer consulted with the patient's neurologist, the 59-year-old was titrated off primidone. Additionally, his Dexilant was replaced with rabeprazole (Aciphex), which is not as dependent on the CYP2C19 pathway for drug metabolism. The patient's "asthma" was controlled, and his cough went away.

"I'll tell you that your knowledge base improves exponentially once you start to use this test," Dr. Pamer said of YouScript. View Dr. Pamer's webinar at <http://genelex.com/resources/webinars>.

Study: Pharmacogenomic Knowledge Gaps Persist

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the YouScript® Personalized Prescribing System, providers have both web-based and live pharmacist support at their fingertips to help interpret pharmacogenetic test results. To learn more about YouScript, go to <http://genelex.com/physicians/>.

Genelex has also partnered with accredited institutions to offer continuing education on pharmacogenetics. To learn more about these resources, visit <http://genelex.com/resources/cme/>.

Why Test?



Every year, more than 2.2 million severe adverse drug events are reported in the US.

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Smart Medication Management Key to Fall Prevention

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taking 17 medications who had a history of falling about once per month. A review of her drug regimen and medical history allowed her doctor to slowly titrate her off two of her three cardiac medications. Adjustments to her pain medications were also made, all of which resulted in a substantial increase in balance, mobility and a reduction in dizziness. Additionally, the patient had no further falls after 10 weeks. “By assessing each medication for indication, effectiveness, safety, and compliance, we

“By assessing each medication...we were able to gradually taper and discontinue cardiovascular medications in order to improve balance and reduce fall risk.”

were able to gradually taper and discontinue cardiovascular medications in order to improve balance and reduce fall risk,” the case study authors write.

In a collection of research compiled for the National Council on Aging’s 2005 Falls Free National Action Plan, Kathleen Cameron, R.Ph, MPH, lists a

bevy of medications classes that can increase fall risk. These include antidepressants, benzodiazepines and cardiac medications, just to name a few.

Cameron writes that changes in cognitive or physical function such as dizziness, lightheadedness or confusion in seniors provide red flags that may

signal the need for a complete assessment by a medical professional. “Medication use may cause these changes and require interventions aimed at medication modification, such as a dosage reduction, drug replacement or drug elimination, to reduce the risk of falls,” Cameron says.

For more information on fall prevention, visit the National Council on Aging’s website here: <http://bit.ly/NCOAFalls> or the CDC site here: <http://bit.ly/CDCFalls>.