Could LabPiQture™ Results Serve as a Substitute for Insurance Labs?

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Abstract

Context

- There is great interest in the market to assess whether LabPiQture™ reports can replace insurance labs.
- Using a dataset provided by ExamOne®, containing results of both insurance- and physician-requested lab test results (i.e., LabPiQture), we performed a protective-value comparison study. In this study, protective value is defined as the ability of an underwriting requirement to detect rateable impairments.

Key Takeaways

- If, at underwriting, a search by ExamOne's LabPiQture produces hits, the average protective value of those LabPiQture hits is about 50% that of insurance labs. The protective value of LabPiQture can vary with the recency and presence of certain lab tests.
- LabPiQture reports may contain lab test results not typically included in insurance lab reports, such as hemoglobin, which can increase their protective value relative to insurance lab reports.
- LabPiQture's protective value is likely to vary for each portfolio; thus, we encourage insurers to perform their own analyses using data from their target market.

In this paper, we focus on the important role physician-ordered lab test results available from test-data aggregators, such as ExamOne's LabPiQture, can play in detecting impairments, as well as the potential value of those tests in underwriting.

Underwriters and actuaries are constantly looking for ways to improve underwriting processes – to make them seamless, fast, client-friendly, and cost-efficient. Not long ago, U.S. insurers were focused on the development of accelerated underwriting (AUW) programs, which enable cases to be underwritten without requiring a paramedical exam and insurance labs. Insurers today are investigating ways to refine these programs to serve two aims:

1. To reduce the need for additional contacts as the COVID-19 pandemic continues unabated
2. To improve acceleration rates, i.e., the number of cases that can be accepted without paramedical exam and insurance labs

Physician-ordered lab-test data, if readily available, might enable insurers to make underwriting offers without needing to request insurance labs. Considering that LabPiQture's medical test database comprises results from the two largest lab test providers in the U.S., being able to access available test results – rather than order new ones – could speed up underwriting at the point of sale for a material portion of an insurer's applicant pool.

To assess this assumption, RGA devised the Protective Value Indicator (PVI), a new index, which produces a ratio of the protective value of LabPiQture-obtained test results to traditional insurance lab results. Such ratios allow the comparison of the impairment-detection capability and expected impact

on mortality rates of traditional insurance labs versus results obtained by a LabPiQture search. This enabled us to quantify LabPiQture's suitability as an alternative to insurance lab tests.

What is LabPiQture?

LabPiQture is a data product from ExamOne that allows carriers to access physician-ordered clinical laboratory test information electronically at the point of underwriting assessment. The information is derived from a search of databases contributed to by two major clinical lab test providers, Quest Diagnostics and LabCorp®. (LabPiQture, formerly known as QuestCheck, underwent a name change in 2019 when LabCorp results were added to its database). LabPiQture's database contains test results going back seven years, and the average age of the tests is two to three years. Results are available for tests conducted for preventive care, diagnostic purposes, and disease monitoring.

Data we used

The data provided to RGA by ExamOne consisted of test results for a unique cohort of 83,295 de-identified insurance applicants (mean age 46; 50:50 gender split) from 2017 to 2019. For each applicant we had full standard insurance labs (both urine and blood) and a LabPiQture hit. The dataset did not include LabCorp data.

The LabPiQture data included the type of test (identified by LOINC code), the medical specialty of the ordering physician, the date the test was administered, and the result. About 85% of the data also contained ICD codes recorded by the physicians who ordered the lab tests.

This is a retrospective study and the data extraction was performed recently. Therefore, to reflect underwriting conditions, our analyses only considered test results dated before the application date.

It is important to note that the database we used contained only applicants who had both insurer-requested and physician-generated lab test results, and for whom at least one test result could be retrieved from the LabPiQture database, i.e., a LabPiQture hit. (According to ExamOne, LabPiQture's hit rate is approximately 50% of applicants).

Tests analyzed

Table 1 lists all of the tests included in our analysis, along with availability in both insurance labs and LabPiQture, and the frequency of each test in LabPiQture. Most tests commonly conducted for insurance labs to detect rateable impairments were included in the analysis. It's worth noting that although cotinine tests are important, they do not detect rateable impairments, and therefore, were not included. We also considered results of two additional clinical lab tests available from LabPiQture: hemoglobin and INR (blood coagulation measurement). We chose these tests to illustrate the potential additional protective value of tests obtained from LabPiQture that could go beyond a typical insurance lab test order.

Considering that LabPiQture's medical test database comprises results from the two largest lab test providers in the U.S., being able to access available test results – rather than order new ones – could speed up underwriting at the point of sale for a material portion of an insurer's applicant pool.

Table 1: Lab Tests – Insurance and LabPiQture

	Insurance Labs	LabPiQture		
Lab Test	Availability (%)	Availability (%)*	Availability (%)* in previous 12 months	Average number of tests
Albumin	99.9%	58.7%	15.6%	3.8
Globulin	99.8%	57.2%	15.2%	3.7
Total protein	99.8%	58.6%	15.6%	3.8
ALT	99.9%	58.8%	15.6%	3.8
AST	99.7%	58.5%	15.6%	3.8
ALP	99.6%	58.2%	15.6%	3.7
GGT	99.9%	4.2%	1.0%	1.9
Bilirubin	99.8%	58.2%	15.0%	3.7
HbA1c	94.1%	24.2%	11.4%	2.9
Total cholesterol	99.9%	52.7%	14.1%	3.3
HDL	99.9%	51.6%	14.1%	3.3
Triglycerides	99.9%	51.5%	14.0%	3.4
PSA	18.0%	16.7%	4.3%	2.8
Free PSA	0.3%	1.6%	0.3%	1.7
BUN	99.9%	59.5%	16.2%	3.8
Serum creatinine	99.8%	59.8%	16.3%	3.8
Urine-protein/creatinine	99.1%	9.7%	2.6%	2.8
NT-ProBNP	15.5%	0.1%	<0.1%	1.5
CEA	0.9%	0.7%	<0.1%	2.0
CDT	2.8%	<0.1%	<0.1%	3.6
Blood alcohol	1.0%	<0.1%	<0.1%	1.3
HIV (blood or urine)	86%	15.5%	2.1%	1.7
Hepatitis B surface antigen	5.6%	17.0%	2.0%	1.5
Hepatitis C antibody	15.6%	14.3%	2.3%	1.4
Various drug tests**	98.3%	3.2%	0.5%	NA
Hemoglobin	NA	60.1%	14.8%	3.4
INR	NA	5.2%	0.6%	2.4

* This percentage availability only applies if there is a LabPiQture hit

** Insurance drug tests are mostly urinalyses for detection of cocaine, but some also include detection of various opioids and heroin. LabPiQture results can provide a mixture of drug abuse screening tests (a total of 98 specific LOINC codes).

Comparing consistency of lab test results between insurance labs and LabPiQture

For tests where results were available from both traditional insurance labs and LabPiQture, we compared consistency of results. If the tests produced numerical results (that is, a specific metric), correlation coefficients were used to measure level of agreement (0 indicating no correlation; and 1 indicating the strongest possible correlation). If, however, the results were categorical (e.g., indicating positive or negative), a percentage of agreement metric was used to measure consistency.

Insurance lab results were compared side by side with the most recent results for the same tests that could be obtained from LabPiQture.

Table 2: Correlation coefficients and percentage agreement between insurance and LabPiQture lab test results*

Lab Tests	Number of Cases with Results from Both Insurance Lab and LabPiQture	
Numerical		**Correlation Coefficients**
Albumin	48,816	0.52
Globulin	47,576	0.71
Total protein	48,695	0.50
ALT	48,900	0.41
AST	48,658	0.28
ALP	48,449	0.58
Bilirubin	48,180	0.62
HbA1c	19,997	0.77
Total cholesterol	43,793	0.62
HDL	42,911	0.79
Triglyceride	42,771	0.48
PSA	13,825	0.33
BUN	49,526	0.58
Serum creatinine	49,749	0.72
Categorical (Positive/Negative)		**Agreement (%)**
HIV	13,329	99.8%
Hepatitis B surface antigen	14,486	99.1%
Hepatitis C antibody	12,024	98.8%

*Lab tests not included due to too small number of overlap cases are: GGT, Free PSA, urine protein/creatinine ratio, NT-ProBNP, CDT, alcohol and drug tests.

As shown in Table 2, among the tests where results were available from both insurance-requested labs and LabPiQture, most were moderately to highly correlated.

Impact on protective value

In our analysis of protective value, one of the basic underlying concepts of insurance underwriting is defined as the ability of an underwriting requirement to exclusively detect rateable impairments. That can be quantified as the present value of future claims. Therefore, protective value, if expressed as a metric, is a quantification of these future claims that might be circumvented by obtaining the underwriting requirement. The protective value metric increases in line with the number and/or severity of clinical abnormalities detected by an underwriting requirement.

For this study, we followed a standard protective value assessment methodology. Specifically, we assumed the following: the SOA 2008 VBT table as base mortality; 10-year term policies; lapse rates of 0.1, 0.09, 0.07, 0.06, 0.05 for the first five years, respectively, and 0.04 yearly thereafter; a 0.045 yearly discount rate; and the same face amount for every applicant. Mortality ratios for each clinical abnormality or impairment is explained later in this report.

To compare the protective value of insurance lab tests versus the LabPiQture-obtained test results, we first assessed the clinical abnormalities typically detected by each type of test. Clinical abnormalities were defined as "impairments severe enough to be rated or declined by RGA's Global Underwriting Manual (GUM)".

One of the basic underlying concepts of insurance underwriting is defined as the ability of an underwriting requirement to exclusively detect rateable impairments.

Impairments considered

For this study, we considered two types of impairments. Group A impairments consisted of any impairment detectable via lab tests commonly requested by insurance underwriters. Group B impairments consisted of two clinical abnormalities, low hemoglobin and abnormal blood coagulation (INR), for which insurers generally do not request tests but results for which are available from LabPiQture. (Raised hemoglobin was not considered in this study as polycythemia, one of the few diseases characterized by raised hemoglobin, is relatively rare.)

Table 3 lists the impairments considered with their corresponding lab tests. To detect impairments from LabPiQture-obtained test results, time-weighted average values were applied, i.e., higher weightings for more recent tests.

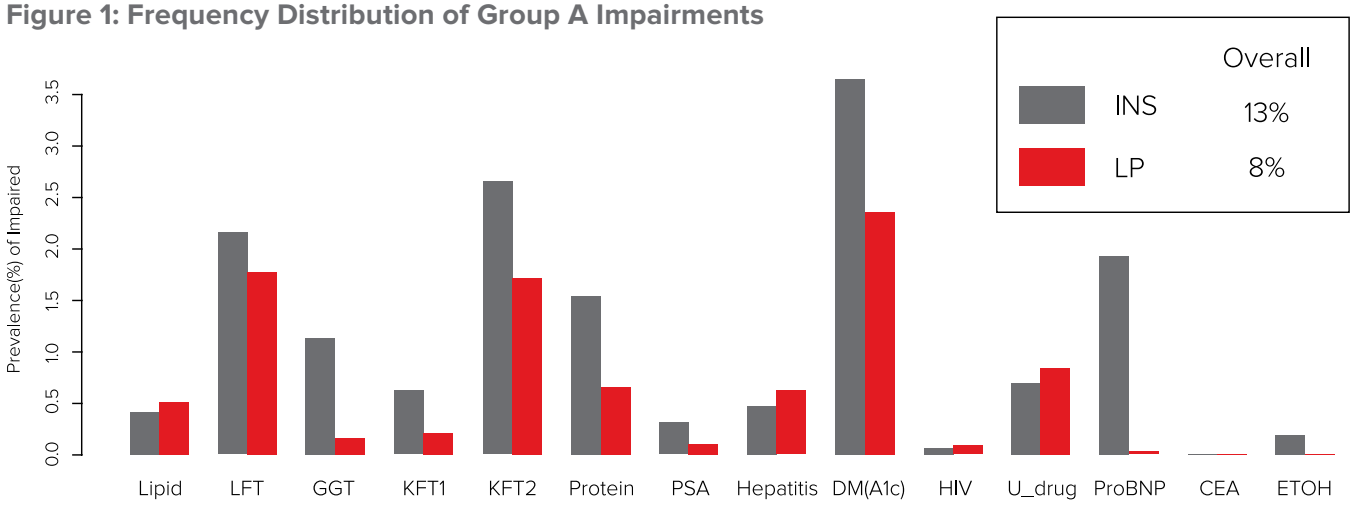
Table 3: Impairments and Lab Tests

Impairment	Lab Test(s)
Group A	
Hyperlipidemia	Serum cholesterol, HDL, triglycerides
Blood protein abnormality	Serum total protein, albumin, globulin
LFT elevation	Serum AST, ALT, ALP, bilirubin
GGT elevation	Serum GGT
Abnormal kidney function (blood test)	BUN, serum creatinine
Proteinuria	Urine protein, urine micro albumin
Diabetes	HbA1c
Prostate cancer	PSA, Free PSA
Hepatitis B and C	Hepatitis B surface antigen, Hepatitis C antibody
HIV infection	Blood or urine test
Drug panel positive	Various blood and/or urine tests
Elevated NT-ProBNP (cardiac impairments)	NT-ProBNP
Elevated CEA (cancer risk)	CEA
Excess alcohol use	CDT, blood alcohol
Group B	
Anemia	Hemoglobin
Abnormal blood coagulation	INR

Impairments detected by insurance labs vs. LabPiQture labs

Figure 1 shows the frequency distribution of Group A impairments both in labs conducted at insurer requests and those obtained from LabPiQture. Overall, 13% of the applicants had at least one Group A impairment detected by insurance labs (INS), while 8% of the applicants had Group A impairments detected by labs obtained from LabPiQture (LP).

Figure 1: Frequency Distribution of Group A Impairments



* KFT1: blood kidney function test; KFT2: urine kidney function test; ETOH test related to alcohol use

Of those applicants whose tests did not indicate any Group A impairments (whether requested by insurers or obtained from LabPiQture), 7% were found to have a Group B impairment detected by LabPiQture data.

Quantifying mortality for each impairment

As mortality outcomes were not available for this dataset, we needed an alternative method to determine the mortality impact of each detected impairment. This was calculated by performing two separate mortality experience studies.

In the first study, we used a dataset from another source containing four million life insurance applicants with insurance lab test results at underwriting and up to 10 years of mortality experience. The same impairment definitions were applied (per Table 3, Group A) and mortality ratios for each impairment were calculated using a multivariate Cox-model with expected mortality adjusted by SOA VBT tables (i.e., age, gender, and smoking).

Using this dataset, we calculated two sets of mortality ratios, as shown in Table 4: one on the full dataset including the first two years of exposure, and the other after excluding the first two years. The second set of mortality ratios aimed to reflect mortality ratios for impairments detected by LabPiQture, as on average LabPiQture test results are about two years old.

The second mortality experience study used another dataset containing about three million electronic medical records that included long-term mortality outcomes. Mortality ratios for low hemoglobin and INR were derived from a multi-variate Cox model adjusted for age, gender, BMI, and smoking.

Table 4: Experience Studies – Mortality Ratios

Impairment	Mortality Ratios	
	Full data-set	After excluding first 2 years of exposure
Group A		
Hyperlipidemia	1.31	1.30
Blood protein abnormality	2.38	2.22
LFT elevation	1.56	1.52
GGT elevation	2.05	2.00
Abnormal kidney function (blood test)	2.23	2.20
Proteinuria	2.21	2.19
Diabetes	1.75	1.77
Prostate cancer	1.24	1.19
Hepatitis B and C	1.35	1.46
HIV infection	2.35	2.48
Drug panel positive	1.89	1.88
Elevated NT-ProBNP (cardiac impairments)	1.25	NA*
Elevated CEA (cancer risk)	2.00	NA*
Excess alcohol use	1.25	NA*
Group B		
Anemia	NA	1.8 (F, age<50), 2.12 (F, age>=50), 2.16 (M, all ages)
Abnormal blood coagulation	NA	1.60

NA = Not Available
NA* = Limited results in LabPiQture for analysis

Comparing protective values

We used the new Protective Value Indicator (or PVI) index to determine the relative protective value for LabPiQture. PVI expresses the protective value of LabPiQture-obtained labs as a percentage of the protective value of insurance-requested labs. We assumed the exclusive value (i.e., the independent contribution of a lab test to impairment detection) of LabPiQture-obtained tests and insurance lab tests would be similar.

Figure 2 illustrates the four different scenarios of impairment detections:

1. Impairment identified by insurance labs only (Area A) (i.e., abnormal lab tests detected by insurance labs that were not captured by LabPiQture)

2. Impairment identified by both insurance- and LabPiQture-obtained test results (Area B)

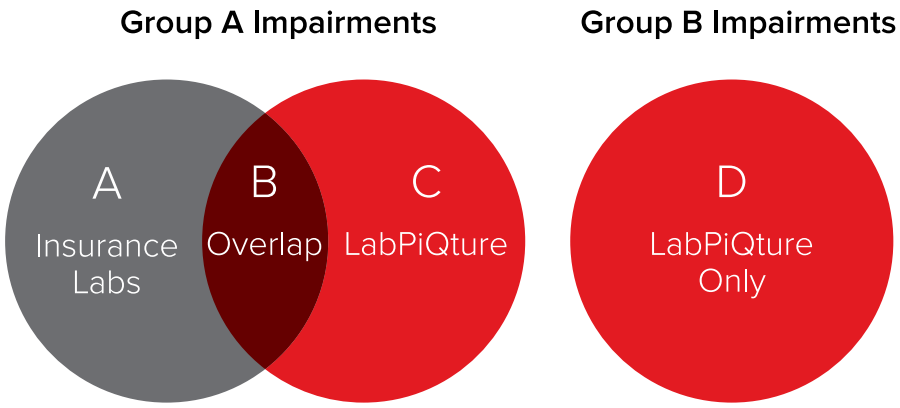
3. Impairment identified by LabPiQture-obtained test results only (Area C). In this situation, an applicant may have had a lab test in the past indicating an abnormality that was captured by LabPiQture, but the insurance lab test at the time of underwriting was within normal limits. This is intuitive, as

an underlying impairment could be at a different stage at any given time. However, we did see reasonable correlation between insurance lab test results and LabPiQture-obtained results (see Table 2).

4. Impairment(s) identified by additional LabPiQture-obtained tests, which insurance labs do not typically include (Circle D)

Areas A and C and the overlap Area B cover Group A impairments, and Circle D covers Group B impairments.

Figure 2: Impairment Detection Scenarios



Depending on which impairment defined by LabPiQture-obtained test results was used, three possible PVI values could be calculated:

PVI_low = Protective value ratio of (B)/(A+B)

PVI_mid = Protective value ratio of (B+C)/(A+B)

PVI_high = Protective value ratio of (B+C+D)/(A+B)

PVI_low represents the most conservative protective value ratio estimate. It only gives protective value credit to LabPiQture-obtained test results if an impairment was detected by both LabPiQture and insurance labs (Area B, overlap)

PVI_mid represents a moderate protective value ratio estimate. It gives protective value credit to tests available from LabPiQture for their ability to detect all Group A impairments regardless of whether insurance labs defined the applicant as impaired or not.

PVI_high represents the most aggressive PVI estimate. It gives protective value credit to LabPiQture-obtained test results for their ability to detect both Group A and B impairments.

While PVI_low to PVI_high provides an estimated range of LabPiQture results' relative protective value, PVI_mid may represent the most reasonable overall PVI estimate.

Table 5 shows PVI index calculations according to age, gender and test panel availability.

Table 5: PVI Index Calculations

Applicants	Number of cases	PVI_low	PVI_mid	PVI_high
All	83,295	0.38	0.50	0.75
Male	41,433	0.41	0.51	0.72
Female	41,862	0.33	0.49	0.84
Age <40	28,955	0.24	0.59	0.97
Age 40-59	39,295	0.36	0.56	0.87
Age >=60	15,045	0.40	0.48	0.71
CBC panel in previous 12 months	12,250	0.68	0.97	1.36
CMP panel in previous 12 months	13,045	0.68	0.97	1.31
Lipid panel in previous 12 months	11,593	0.69	0.97	1.32

Our findings in Table 5 indicate the average protective value of LabPiQture-obtained results is about 50% (PVI_mid) of insurance labs when only accounting for findings from tests within the traditional insurance panel (Group A Impairments). If we add in the value of clinical labs outside of traditional insurance laboratory tests, the protective value increases to 75% (PVI_high).

The table shows that the PVI of LabPiQture results can increase significantly if a recent (within 12 months) CBC, CMP or lipid panel is available, i.e., the PVI_mid value is close to 1, implying that the protective value is similar to insurance labs. In our data, 18% of LabPiQture hits included either a CBC, CMP, or lipid-panel result within the last 12 months.

Factors not included in our analysis

Our study was designed to address the protective value of lab tests by their ability to detect impairments. We did not address the impact of lab tests on risk classification (e.g., tobacco use or preferred risk classification).

In addition, our study does not consider the protective value of the insurance lab test by its sentinel effects. Sentinel effect refers to the fact that knowing one's health conditions are being tested using blood and urine could increase the truthfulness of medical history disclosure from an insurance applicant. It is expected that the sentinel effects from insurance-lab testing would not be recovered by LabPiQture.

Due to the limitations mentioned above, caution is required in how the PVI is interpreted.

Underwriting implications

The significance of our study is twofold. First, we devised the Protective Value Indicator (PVI), a new index to quantify the relative protective value of LabPiQture. This methodology was used to compare the impairment detection capability and expected impact on mortality rates of a LabPiQture report with results from traditional insurance labs. Based on the dataset provided by ExamOne, we found the average protective value of LabPiQture hits is about 50% of insurance labs.

Secondly, we established that the PVI index can be used to identify groups for whom the relative LabPiQture protective value is higher. This methodology can be used to stratify applicants into different PVI groups, and applicants with a high PVI can potentially be underwritten without traditional insurance lab reports in terms of detecting rateable impairments. However, any business decisions should take into account the limitations mentioned above.

We encourage insurance carriers interested in studying the value of LabPiQture to use our methodology to help refine their usage of LabPiQture reports. We welcome the opportunity to discuss our scientific methodology and to offer our guidance to support your research objectives.

Future investigations

In the future, we plan to look at how LabPiQture-obtained lab test results can be used for risk classification. We will also evaluate the risk scores LabPiQture produces along with ICD diagnosis codes available from LabPiQture reports to determine their added value.

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