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Speed Costs

A Reappraisal of Alternative Fluids vs. Blood Testing:

By Clifton Titcomb and C. Allen Pinkham

The new millennium has seen increased demands put on underwriters to streamline the risk selection process. Companies are under ever increasing pressure from their current distribution channels to accelerate the speed of the sales process. Many producers and marketing professionals perceive attending physicians' statements as too slow and blood testing as too invasive.

In addition, new insurance industry distribution systems have started to put increased pressure on risk selection professionals to modify their current practices. The arrival of bank sales, Internet retailing, telemarketing, and other nontraditional insurance distributors has created a demand for a new type of underwriting, less burdensome to the client and capable of more rapid turnaround.

Two key principles underlie this new, nontraditional approach. First, speed is critical, with point-of-sale issue being the ideal. Second, pricing must remain competitive.

These new principles have led to a reappraisal of the traditional underwriting tools. In particular, the value of blood testing has been challenged, especially for those applicants aged 40-49 or younger. The logic is that alternative fluid testing using either urine or oral fluid offers comparable protection and a faster turnaround time.

What are the mortality concerns surrounding this issue, especially in light of a recently published paper detailing the superiority of urine in this younger group? (R.A. Bergstrom, E.A. Testa, "A Perspective on the Value of Urine-Based Underwriting," *On The Risk*, 2000; 16(2):44-7).

Underwriting requirements exist solely for the purpose of managing mortality. There's no other logical reason why a business would make such demands on its customers. So before instituting any changes in current practices, it's imperative to assess the protective values of the old and proposed regimens.

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Does this mean that any modification of current practices must produce results equal to those of the standard regimen? Does it then mean that companies shouldn't change underwriting requirements based on shifting market demands?

No, it does not. But it does mean that companies need to acknowledge there may be a mortality cost to such a change. Death claims very well may increase. What the companies need to know is how great this mortality cost will be and whether it can be offset by other factors such as decreased acquisition expenses and the opening of new markets.

The answers to these questions are tied to the current premium structure, underwriting requirements, and marketing strategy. The issue is one of balance. For example, the lower the insurer's mortality assumptions (the more aggressive the pricing, the more extensive the underwriting requirements), the greater the adverse impact of an even modest increase in the number of deaths and the greater the potential cost savings of a liberalization of underwriting practices.

Companies must find the happy medium, the place where profitability is maximized. Not surprisingly, that happy medium may shift depending on

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the company involved and the target market. For a direct writer, the mortality portion may represent just one of many pieces of the overall profitability equation and a change in requirements may make good business sense.

On the other hand, for a reinsurer, mortality costs constitute the lion's share of the expenses that affect the bottom line. There generally will be minimal or no benefit from reduced acquisition costs. In this case a pricing adjustment may be the only means available to make up the shortfall resulting from an increase in claims.

Does this mean that one or the other analysis must be wrong? No, again. It simply means that each has a different way of coping with the mortality impact of a change in requirements. There's no free lunch. The parties involved need to know the price and decide what they're willing to pay. The question here is what is the cost, if any, of trading urine or oral fluid analysis for current blood testing protocols?

Table 1. Original Data

AGE	BLOOD ONLY	BLOOD PLUS URINE	URINE ONLY	RELATIVE VALUE	DIFFERENCE (%)	ORAL FLUD
20–29	5.2%	8.9%	5.9%	1.5	3.0%	0%
30–39	6.0%	9.1%	5.7%	1.6	3.4%	0%
40–49	7.9%	10.3%	6.8%	1.5	3.5%	0%

Table 2. Original Data Preferred

AGE	BLOOD ONLY	BLOOD PLUS URINE	URINE ONLY	RELATIVE VALUE	DIFFERENCE (%)	ORAL FLUD
20–29	7.6%	14.0%	8.9%	1.6	5.1%	0%
30–39	9.5%	14.7%	8.3%	1.8	6.4%	0%
40–49	13.0%	17.7%	10.0%	1.8	7.7%	0%

Table 3. Urine Modified

AGE	BLOOD ONLY	BLOOD PLUS URINE	URINE ONLY	RELATIVE VALUE	DIFFERENCE (%)	ORAL FLUD
20–29	5.2%	5.6%	2.5%	2.2	3.1%	0%
30–39	6.0%	6.3%	2.8%	2.3	3.5%	0%
40–49	7.9%	7.8%	4.1%	1.9	3.7%	0%

Basic Assumptions in Using Alternative Fluids

There is a basic assumption underlying the drive for alternative fluid testing in younger applicants: In order to underwrite this group successfully, all that's required is the ability to identify an individual's trauma risk and human immunodeficiency (HIV) antibody status.

The contention is that the only major causes of mortality in these individuals are violent death, primarily related to accidents, and infection with the HIV virus. Suicide and homicide are also felt to be important and often related to drug abuse. Since HIV infection and cocaine and nicotine use can be detected equally well with blood, urine, or oral fluid testing, many feel that alternative fluid analysis is sufficient and use of the blood profile offers no advantage in the selection process. But is this underlying assumption correct?

What Statistics Show About Mortality

A review of the National Vital Statistics Report from 1998 reveals that for males aged 25-44, violent/HIV deaths accounted for 49 percent while medical illnesses accounted for 51 percent. For the total population (men plus women), the corresponding values were 43 percent and 57 percent.

These percentages changed drastically over age 45. In that group, accidents represented only 5 percent of the deaths in the total population. On the other hand, medical illnesses such as cancer (35 percent), heart disease (26 percent), cerebrovascular disease (4 percent), chronic lung disease (3 percent), diabetes (3 percent), and liver disease (3 percent) represented the lion's share of the mortality burden.

More important, these numbers are also reflected in insured lives statistics. A Lincoln Re study indicated that violent/HIV-related causes accounted for 49.3 percent of the deaths in insureds aged 25-44 in years 1-5 after issue, and 43.1 percent in years 6 and up. The corresponding values for insureds 45-64 were 19.4 percent in years 1-5 and 10.8 percent in years 6 and up.

The key point is that violent and HIV-related mortality ac-

Table 4. Urine Modified Preferred

AGE	BLOOD ONLY	BLOOD PLUS URINE	URINE ONLY	RELATIVE VALUE	DIFFERENCE (%)	ORAL FLUD
20–29	7.6%	10.8%	5.5%	2.0	5.3%	0%
30–39	9.5%	12.0%	5.4%	2.2	6.6%	0%
40–49	13.0%	15.1%	7.3%	2.1	7.9%	0%

Table 5. Re-evaluation

AGE	BLOOD ONLY	BLOOD PLUS URINE	URINE ONLY	RELATIVE VALUE	DIFFERENCE (%)	ORAL FLUD
20–29	4.9%	7.8%	4.0%	2.0	3.8%	0%
30–39	6.3%	9.9%	4.9%	2.0	5.0%	0%
40–49	7.6%	12.4%	6.6%	1.9	5.8%	0%

counts for, at most, only half of the deaths in the under age-45-group. This is a large number, and trauma risk especially needs to be evaluated carefully in the underwriting process. Yet medical illnesses represent significant causes of mortality. In those over age 45, violence and HIV become only minor players. It's the medical illnesses that represent the problem for insurers from a profitability standpoint.

Now, one could choose to ignore the risk of medical impairments in younger people and hope the cost would be acceptable. The concern is, however, that most applicants aren't underwritten for a term of insurance that expires at age 40 or 45. Indeed, the majority of individuals are evaluated for policies that are expected to remain in force for periods of 10, 20, or even more years, thus extending well into the time when impairments such as heart disease, cancer, diabetes, and liver failure cause the majority of deaths.

Yet, while many of these diseases first become clinically evident at a given age, the deaths resulting from them represent, for the most part, the end point of a process that began many years before. Thus, elevated lipids, an impaired glucose tolerance, or elevated liver function first noted at age 25 or 30 may culminate in a premature death at age 45 or 50.

Adequate mortality management requires a reasonably reliable prediction of the probability of these premature deaths. Insurance pricing over the years has evolved to its current low levels based on this ability. Thus, identification of medical impairments, even in the youngest groups, is valuable.

Are Alternative Fluids More Protective?

One very important question is whether alternative fluid testing has the same protective value as blood testing in younger age groups and whether it will allow current pricing structures to remain unchanged.

As noted above, for practical purposes, oral fluid, urine, and blood are of equal value in detecting HIV infection. The issue is, therefore, whether blood testing offers an advantage over the others from a mortality savings perspective. Does it find a sufficient amount of pathology to justify its cost for the company and inconvenience for the applicant?

A recently published study concluded that urine testing had a superior protective value as a percentage of standard mortality and was, in fact, superior to serum analysis in applicants under age 50. If this conclusion is correct, it could open the door

Table 6. Re-evaluation Preferred

AGE	BLOOD ONLY	BLOOD PLUS URINE	URINE ONLY	RELATIVE VALUE	DIFFERENCE (%)	ORAL FLUD
20–29	7.0%	10.6%	4.9%	2.2	5.7%	0%
30–39	9.4%	13.6%	5.8%	2.3	7.8%	0%
40–49	11.5%	17.6%	8.3%	2.1	9.3%	0%

to a major new alternative approach to risk selection in younger individuals. However, the conclusion does seem to fly in the face of conventional wisdom. The issue is of such significant importance to the industry that it bears further review.

Thanks to Calypte, the sponsors of the study, the authors of this article were supplied with the spreadsheet used in the creation of the analysis in the above-noted reference. This data allowed for a more precise review of the conclusions than would have been possible based on the details provided in the published material.

The original study compared two components of the urine test protocol (protein and glucose) with three components of the blood profile (total cholesterol, total cholesterol/HDL cholesterol ratio, and gamma glutamyl transpeptidase (GGT)). This latter combination of components is closer (but not identical) to that seen with a dried blood spot analysis compared with a full blood profile.

The protective-value technique was well constructed and used four different factors:

- The present value of mortality
- The prevalence, in an applicant population, of laboratory values in different ranges for the above-noted assays
- The average mortality risk or number of debits that would be assigned to the different lab values ranges
- An attributable ratio or the probability that the identified abnormality would be found only by the lab test in question (the unique value of the test)

The product of these four factors resulted in a number that was designated *total mortality*. This value was then divided by the present value of standard mortality and expressed as a percentage of standard mortality. This percentage was designated as an estimated protective value.

The analysis was repeated serially for three different age groups (20-29, 30-39, and 40-49) each with its own present value of mortality. The conclusion was that, in each age band, the protective value of urine exceeded that of blood.

However, on closer examination of the analysis, several problems are evident. First, urine glucose wasn't compared with blood glucose. Despite the fact that blood glucose is a more sensitive test than urine glucose for the diagnosis of diabetes (many diabetic individuals will have elevated blood sugars and no glucosuria), all of the protective value for detecting this impairment was attributed to the urinalysis.

Second, the authors assigned a 15 percent increase in mortality (15 debits) to urine protein values in the 10-30-mg/dl range. However, a review of common industry risk selection practice, as well as practical underwriting experience, would suggest that values in this range would not prompt an assessment of increased risk.

This is not to say that there may not indeed be individuals in this group who have an impairment that has mortality implications, but urinalysis results in this range would generally not prompt an underwriting action. Thus such a result should not be assigned protective value. The results of the urine would not change the outcome. This is important because about a quarter of all urine samples have protein concentrations in this range. The result was that this single cell accounted for about one-half of all the protective value assigned to urine.

Third, comparison was made only with the GGT value and not with the other liver function tests. It's well known that the GGT, while used for the detection of alcohol abuse, is a very nonspecific test and its protective value when used alone is limited. In addition, hepatitis or other diseases that cause hepatocellular damage don't typically elevate this test.

Fourth, serum creatinine values weren't considered in the analysis.

Fifth, both the total cholesterol and the total cholesterol/HDL ratio were used in the comparison with debits being assigned to both values. This approach had the effect of assigning debits twice for the same impairment. This double dipping would have the effect of inflating the value of blood testing.

Reevaluating the Alternative Fluids

With the above concerns in mind, the original study was repeated with a series of modifications. The first approach was to simply repeat the original analysis with a change in the blood components. Serum glucose, creatinine, and liver function tests were added to the analysis. The ranges used for glucose values were 0-125 mg/dl, 126-140 mg/dl, 141-200 mg/dl, 201-275 mg/dl, and 276 mg/dl up. Those used for creatinine values were 0-1.49 mg/dl, 1.50 -1.79 mg/dl, and 1.80 mg/dl up.

The liver function tests were divided into three major groupings: ALT (SGPT) with both AST (SGOT) and GGT normal, ALT with either AST or GGT elevated, and ALT with both AST and GGT elevated. The cut points for the ranges of ALT elevation were 0-90 IU (up to 2 times normal), 91-180 IU (2 to 4 times normal), and greater than 180 IU (more than 4 times normal).

Prevalence values for each of these ranges were obtained from the same source and for the same period as the data in the original study. A relative mortality ratio was also assigned to each grouping. This value represented composite underwriting practice and not the assessment of a single company.

Of note, no additional mortality risk was assumed for ALT values less than 2 times normal in any of the above groups, regardless of the number or degree of other elevations. This was an attempt to not overvalue these tests and was considered a conservative mortality estimate.

Attributable ratio values were assigned to the new components, again representing an average of estimated values derived from multiple observers. Blood glucose measurements were given an attributable ratio identical to that for urine glucose. All of the other measures were identical to those in the original study. In particular, the total cholesterol/HDL ratio cells were included and unchanged. The analysis was then repeated using the modified figures. The results are summarized in Table 1. Blood values now exceed those of urine in all except the youngest age group.

Realistic Comparison Is Not to Blood Alone

While these values are certainly different from those presented in the original study, the numbers in both cases are misleading. Currently it would be very unusual for a company to do blood testing without doing a urinalysis at the same time. Virtually all insurers use the combined protocol. Thus, the true comparison of underwriting significance is not between blood alone and urine alone. The real comparison assesses blood testing combined with urine versus urine analysis alone. The central issue really concerns the incremental value of blood testing. Does blood add anything to urine from a mortality protection perspective?

To answer this question a mortality value was calculated for the combination of blood plus urine using the original data. The only modifications to the prior analysis were adjustments of the attributable ratios to account for the overlapping diagnostic capabilities of some of the laboratory components such as urine and blood glucose, serum creatinine, and urine protein.

The results indicated that the combination of blood and urine was superior to urine alone from a mortality protection standpoint. The estimated relative value of the combination was in the range of 1.5 to 1.6 (see Table 1). Of note, both the combination and urine alone are significantly better than the oral fluid panel that is currently available. This isn't surprising since the oral fluid panel contains none of the protective elements used in this review.

The above analysis assigns relative mortality risk as compared to a standard baseline. Yet many companies would like to apply the new, nontraditional underwriting approach to their most aggressively priced products. But what is the relative value of blood and urine testing in a preferred risk pool? This question is very important because maintenance of the current pricing structures is critical if a company is to be able to compete in the new market environment.

What About Preferred?

In order to try to answer that question, the above analysis was again repeated, this time using a generic preferred program as a baseline. A lipid level thought to be representative of an industry average for preferred criteria (total cholesterol < 240) was used as a baseline and debits were assigned using, again, an average estimated difference in mortality between the standard and preferred groups.

The mortality assessments for the other laboratory ranges were also adjusted upward to account for the additional mortality difference between a standard and preferred risk. The results of this reanalysis are summarized in Table 2. Both the absolute and relative values of the combination of blood and urine are increased compared to that for urine alone. Once again oral fluid lags far behind. The difference would be larger with an even more restrictive program.

There was, however, some concern with the assignment of a mortality risk to proteinuria values in the 10-30-mg/dl range. If all of the above analyses are repeated, with the single exception of changing the mortality value of that urine protein cell from 15 percent to the more underwriting-practice-compatible 0 percent, both the absolute and relative values of urine alone decrease significantly. These results are summarized in Tables 3 and 4.

What About New Assumptions?

Finally, in an attempt to assess as closely as possible the mortality savings an insurer might experience in actual practice, the overall analysis was repeated using a completely different set of assumptions.

The concentration was replaced by the protein/creatinine ra-

tio; a measure that the authors felt was a more accurate representation of true protein excretion rates. The baseline relative mortality risk or debit values for all ranges were recalculated based on estimates of the average practice of companies in the industry. The debits applied to the serum and urine glucose and the protein creatinine ratio were further modified by weighting the values in each cell by the percentage of applicants at each level who had positive reflex test results (an elevated hemoglobin A-1-c or abnormal microalbumin assay).

Those with a positive reflex test seemed to most closely match the true burden of actual pathology. The result was that the mortality risk estimate for borderline values was modified in an attempt to account for the specificity of the test. The attributable ratios for all of the laboratory ranges were also recalculated. This was accomplished by the same method noted above.

Finally, the total cholesterol/HDL ratio was dropped from the analysis because of the concern about double-dipping noted above. Although the authors feel that the ratio is better at scaling risk than total cholesterol, the factor is used more as a modifier of total cholesterol in actual practice so it was difficult to estimate an industry-wide average debit value for different cells. For that reason, the total cholesterol was used in the final construct.

The results of the reanalysis of the estimated protective value of blood and urine are summarized in Tables 5 and 6. Once again, urine testing alone and oral fluid analysis have a lower absolute and relative benefit when compared with current practice.

Limitations

Keep in mind, however, that none of these analyses represent a true protective value study. Many assumptions have been made regarding the average debits applied and the attributable ratios. These numbers may vary dramatically from company to company depending on underwriting practices and current requirements. One company may assign more or fewer debits for a given impairment than would another.

In addition, if an insurer gathers less information by using other underwriting tools (APS, inspection reports, limited application information, etc.), the laboratory data will take on greater relative importance. The prevalence numbers used in these analyses are representative of a population of individuals who knew they were going to be fully tested under current underwriting practices.

The sentinel effect—the reluctance of individuals who know or think they may have an abnormality to submit for evaluation—was likely operative and an important factor in the distribution of applicants in various test ranges. If the sentinel effect of the blood and urine combination is lost, these prevalence numbers could shift dramatically.

This analysis is based on the assays currently available using urine or oral fluid protocols. The development of new tests may very well increase the protective value of the alternative fluids. Such changes would certainly alter the current balance between these fluids and current practices in the realm of mortality risk assessment. Thus, the results presented above could change dramatically with the introduction of new technology.

For that reason, new developments in the field of urine or oral fluid testing will need to be monitored closely. These innovations must be able to demonstrate not just theoretical but, most important, practical value from a risk selection perspective. All too often it seems the latest hot test is found wanting on closer examination. It's only with a rigorous comparison to the current gold standard that new techniques for risk selection can be fairly judged and appropriately implemented in a manner that ensures continued profitability.

In summary, it appears clear that, from a protective-value perspective, urine testing alone is inferior to the combination of blood and urine in individuals aged 20 to 49. The difference is even greater for oral fluid. This doesn't mean that the alternative fluids can't be used exclusively. In fact, they may make good sense under certain circumstances. What it does mean is that their use will come at a price and the price will be a reduced protective value.

As long as a company can pay the price and make a profit, there's no problem. If it can't, then underwriting ceases to perform its principal function, which is to maintain the economic viability of the company. Speed can kill, and companies must be very careful that the quest for a faster turnaround time doesn't kill competitive pricing, profitability, and, ultimately, policyholder trust and confidence.