White Paper

Health Plan Auditing: 100-Percent-of-Claims vs. Random-Sampling Audits

George P. Sillup, PhD, MS
Ronald K. Klimberg, PhD, MS

January 2011

TRUVEN HEALTH ANALYTICS

Table of Contents

Executive Summary 1
Literature Review 2
Research Methodology 3
Number and Dollar Amounts of Over and Underpayment Claims Exceptions 5
Distribution of Claims Exceptions 6
Results 8
Statistically Correct, But Wrong, Approach 9
Comparing 100-Percent Auditing and Random-Sample Auditing 9
Discussion 10
Random Sampling Missed Over 90 Percent of Claims Errors 11
Conclusions/Implications For Future Research 11
Implications 11
References 13
About the Authors 15

The authors wish to thank Healthcare Data Management, Inc. (HDM) for funding this study. Truven Health (formerly the Healthcare Business of Thomson Reuters) acquired HDM on August 31, 2010.

Abstract

An independent study evaluated the relative efficacy of two different methodologies for auditing self-funded medical claim expenses: an audit of 100 percent of claims that analyzes every aspect of every claim versus random sampling. Multiple data sets of claim errors ("exceptions") determined in the 100-percent-of-claims audit of data from two large Fortune 100 corporations were analyzed and compared to 100 simulated audits each of 300- and 400-claim random samples taken from the same claim errors. Dramatically, the random-sample simulations failed to identify a minimum of 90 percent or more of the errors identified by the 100-percent-of-claims methodology. The errors missed by the random-sample simulations had dollar values ranging from $200,000 to $750,000 for a single year and represent the best possible analytics using random sampling. Executives in charge of governance and management of risk and health plan expenses — particularly in organizations that follow Six Sigma and/or strive for zero defects — should consider how the dramatic results of this study can favorably affect their organization. The study has implications for corporate, government, and Taft-Hartley plans.

Key Words

Auditing Self-Funded Health and Medical Plans, Health Plan Performance, Auditing Judgment, Six Sigma, Zero Defects, Healthcare Expenditures

Executive Summary

Efforts are underway to reform U.S. healthcare by containing expenditures that are increasing at about 15 percent annually and by providing healthcare benefits to all Americans, principally the 46 million uninsured and 25 million "underinsured" or those without comprehensive coverage, e.g., prescription drug benefits (Hanna, 2009; Senate Finance Committee, 2009). This is not an easy task. Determining the most beneficial treatment for a patient at a reasonable cost is de-emphasized by insured Americans' demands for immediate access to the latest medical and pharmaceutical technologies (Aaron & Ginsberg, 2009). Consequently, spending on U.S. healthcare delivery is more than optimal because it ignores the cost component of the cost-quality-access optimal healthcare delivery equation (Ibid., 2009). Meanwhile, healthcare expenditures are increasing for all self-insured organizations to include corporations, government entities and Taft-Hartley plans, which are providing over 60 percent of healthcare benefits for all Americans (Lyke, 2009).

While self-insured companies cannot change the behavior of all the stakeholders in U.S. healthcare delivery, they can control their expenditures. One way to accomplish this is an audit system that effectively identifies claim errors. It can be argued that for health-plan auditing to be truly effective, it should achieve Six Sigma goals, which, within the Quality Improvement Process, include meeting organizational objectives, utilizing the organization's resources efficiently and attaining desired results, such as "zero defects" (Russell, 1998; Juran, 2004). These goals are important for any company but especially for one dealing with millions of medical claims where a single claim can be worth thousands of dollars, as well as be an indication of a much larger problem.

The objective of this study is to examine the implications of two approaches to auditing medical claims data. One is 100-percent-of-claims auditing that analyzes every aspect of every claim and the other is an auditing methodology based on random-sampling, usually involving 300 to 400 claims. In so doing, we will compare the relative efficacy of this specific 100-percent-of-claims auditing methodology with random sampling, as well as establish the basis for identifying and quantifying claim errors missed.

Lierature Review

U.S. healthcare expenditures are the highest in the world, about $560 per person, per month (OECD, 2009). Premium increases are forecasted from seven percent for large businesses to about 15 percent for small businesses, and thereby will drive employer healthcare spending to over $10,000 a year or $830 per member, per month (Towers Perrin, 2009; Abelson, 2009).

Alarmingly, a recent study contends that the U.S. healthcare delivery system wastes between $600-850 billion annually (Truven Health Analytics℠, 2009). This poses a particularly daunting challenge for self-insured employers, who fund about 78 percent of the costs. However, one of Six Sigma's systematic approaches to auditing can address escalating expenses, as well as identify the source of wasted healthcare expenditures (Towers Perrin, 2009; Krouwer, 2004).

Over 30 years ago, Deming (1979) shared concerns about random sampling, and more recently, others extended them to emphasize that auditors must also be concerned with detecting errors which can result in financial misstatements (Srinvastava & Shafer, 1993; Ponemon & Wendell 1995). Given the projections for the increases in healthcare expenditures for self-insured companies and waste due to unidentified sources of waste, they invite further investigation about random sampling, or more specifically:

What type of auditing is optimal for a self-insured organization to contain healthcare expenditures?

Research Methodology

Virtually all self-insured organizations provide medical insurance for their employees and retirees. In the case of large plans, this generates thousands of claims costing millions of dollars on a monthly basis. Data from two companies, Company A and Company B, were used to examine the implications of two approaches to auditing medical claims data: auditing based on an analysis of 100-percent-of-claims and random sampling. Both Company A and Company B are Fortune 100, self-insured corporations that provide medical benefits to their employees and, consequently, generate thousands of medical claims.

The data sets for this study were provided by Healthcare Data Management, Inc., (HDM). This audit and health plan analytics company is capable of conducting a 100-percent-of-claims analysis, scrutinizing every aspect of every claim following a proprietary, five-step protocol that includes an onsite audit to confirm the logic of the analysis. HDM refers to data that have not yet been subjected to the onsite audit as "pre-audit data" and to data that have undergone the onsite logic check as "post-audit data."

The Five-Step Protocol

This protocol applies to HDM's 100-percent-of-claims analysis, and consists of the following steps:

Data Warehouse

HDM downloads all of the data from steps 1 and 2 to a centralized standard data warehouse.

1. HDM requests paid claims data from the Third Party Administrator (TPA) and/or Pharmacy Benefits Manager (PBM).
2. The client provides eligibility data, benefits covered and not covered, place of service, co-pays, etc. — the Summary Plan Description (SPD) and the administrator's business rules — the Administrative Service Only (ASO) Agreement.

Benchmarks

3. HDM integrates comparative logic created from each ASO, SPD, formulary, industry standards (e.g. CMS, AMA, FDA rules, etc.) and HDM's proprietary logic designed to seek out duplicates and fraud.

Exception Analysis

4. The service addresses 100-percent-of-claims and eligibility data for the audit period. HDM compares and analyzes this data against best business practices and administrator's procedures. Exception reports are generated with potential errors and issues identified.

Claims Audit

5. After analyzing 100-percent-of-claims according to the ASO, SPD, and industry standards, HDM performs an onsite claims audit to validate the logic and findings of the 100 percent analysis.

There are other types of "100-percent-of-claims" audits. For example, there is the "focused audit," which scans 100 percent of the claims for the audit period, looking for claim errors (exceptions) that fit a predetermined profile, e.g. incorrect

co-pays collected during office visits in an outpatient setting. On the other hand, HDM's approach does not focus on a particular profile, but examines for all possible exceptions. Both "100-percent-of-claims" methodologies aim to keep the administrator, or, in the case of a prescription drug audit, the Pharmacy Benefits Manager (PBM) compliant with plan documentation.

Additionally, many audits are conducted today that employ a random-sample methodology, which simply extracts and analyzes a 300- to 400-claim sample from the universe of claims. In such a case, only a percentage of these 300/400 random sample claims will be exceptions.

For the purpose of this study, we assumed the best the random sample methodology could do was to extract 100 percent of the exceptions. As a result, we used the data sets of exceptions from the HDM 100-percent-of-claims methodology to stimulate the random-sampling process.

In this study, data from one of the two companies, Company A, spanned over two years and included preaudit and post-audit data. The number of claims records was over 54,000 for the two years. The dollar amounts of the claims paid were $12.8 million in the first year and $12.5 million in the second year. The second company, Company B, was larger and had about 464,000 claims that totaled about $118.4 million in claims paid. Both companies' initial data are illustrated in Table 1 below.

Table 1: Claims Data from Companies A and B

		Entire Population of Claims	
Company	Type	$ Amount of Claims Paid	# of Claims Records
A	Pre-Audit 2006	$12,803,426	54,192
	Pre-Audit 2007	$12,544,893	54,371
	Post-Audit 2006	$12,803,426	54,192
	Post-Audit 2007	$12,544,893	54,371
B	Post-Audit	$118,368,625	463,919

The entire population of claims data for all the data sets was subjected to HDM's 100-percent-of-claims analysis, resulting in exceptions-only data sets. These exceptions data sets were subsequently used to conduct random-sampling simulations.

Number and Dollar Amounts of Over and Underpayment Claims Exceptions

The number of exception claims HDM's 100-percent-of-claims analysis produced ranged from 4.4 percent (post-audit data) to a high of 15.5 percent (pre-audit data), i.e., a high of 15.5 percent of all the claims were exceptions during the pre-audit and a low of 4.4 percent of all the claims that underwent the onsite logic check were exceptions. Importantly, the dollar amount of exception claims ranged from a low of 4.6 percent of total claims paid (pre-audit) to a high of 24.7 percent of (pre-audit data) as indicated in Table 2 below.

Table 2: Exception Claims Identified by 100-Percent Auditing

		Entire Population of Claims		Exception Claims			
Company	Type	$ Amount of Claims Paid	# of Claims Records	$ Amount of Exception Claims	# of Exception Claim Records	% of $ Error	% of Error Claims
A	Pre-Audit 2006	12,803,426	54,192	$2,234,051	8,299	17.4%	15.3%
	Pre-Audit 2007	12,544,893	54,371	$3,092,431	8,428	24.7%	15.5%
	Post-Audit 2006	12,803,426	54,192	$1,327,346	3,850	10.4%	7.1%
	Post-Audit 2007	12,544,893	54,371	$1,792,882	5,465	14.3%	10.1%
B	Post-Audit	118,368,625	463,919	$5,467,944	20,395	4.6%	4.4%

Additionally, the dollar amounts of the over and underpayment exception claims were significant. They ranged from a low of $1.3 million on post-audit data for Company A to a high of $5.5 million for Company B. Overall, the dollar amounts of overpayments and underpayments ranged from 10.4 percent to 16.8 percent of the exception claims. This represents a range of $.19 million to $.76 million and is depicted in Table 3 below.

Table 3: Amount of Over and Underpayment of Exception Claims

Company	Type	$ Amount of Exception Claims	$ Amount of Overpayment Records	$ Amount of Underpayment Claims	$ Total Over-and Underpayment Claims	% Over-and Underpayment Claims
A	Pre-Audit 2006	$2,234,051	$229,012	$87,716	$316,728	14.2%
	Pre-Audit 2007	$3,092,431	$458,049	$62,498	$520,547	16.8%
	Post-Audit 2006	$1,327,346	$162,649	$26,654	$189,302	14.2%
	Post-Audit 2007	$1,792,882	$160,050	$25,459	$185,508	10.4%
B	Post-Audit	$5,467,944	$702,556	$59,417	$761,973	13.9%

Distribution of Claims Execptions

Furthermore, as shown in Figures 1-4, the frequency distribution of claims exceptions and overpayment and underpayment claims exceptions (i.e., the number of claims by claims exception dollar amount), was also determined for both Companies A and B. Company A is depicted in Figures 1 and 2. The point of inflection, at a frequency of over 800 at claims interval 400, invites investigation to discern what claims are responsible for the expenditure.

Figure 1: The High Cost of Healthcare Waste

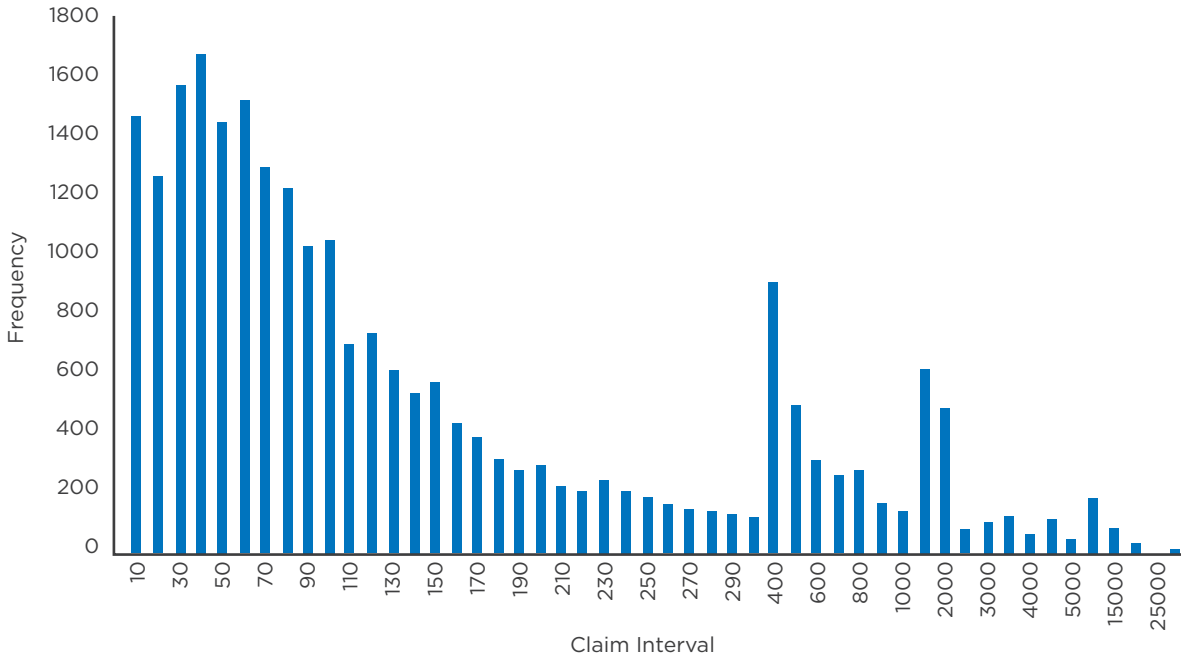
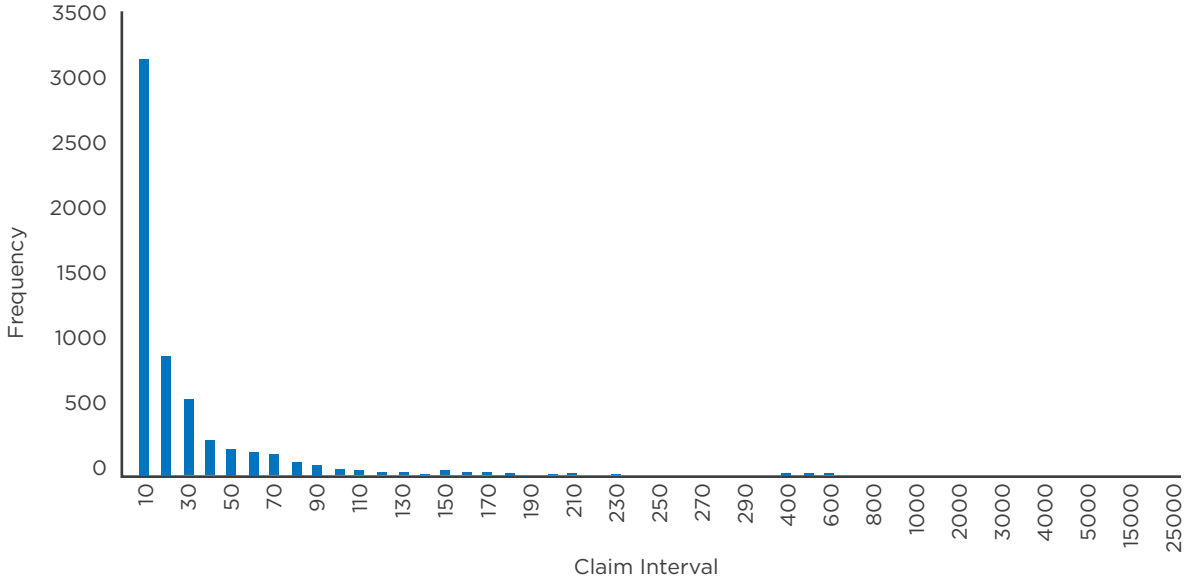


Figure 2: Company A's Over and Underpayment Claims Exceptions



Company B is depicted in Figures 3 and 4. Similarly, there is a point of inflection at the 400 claims interval, which rises to just over 300 and prompts an investigation of what expenses are responsible for the expenditure.

Figure 3: Company B's Claims Exceptions Distribution

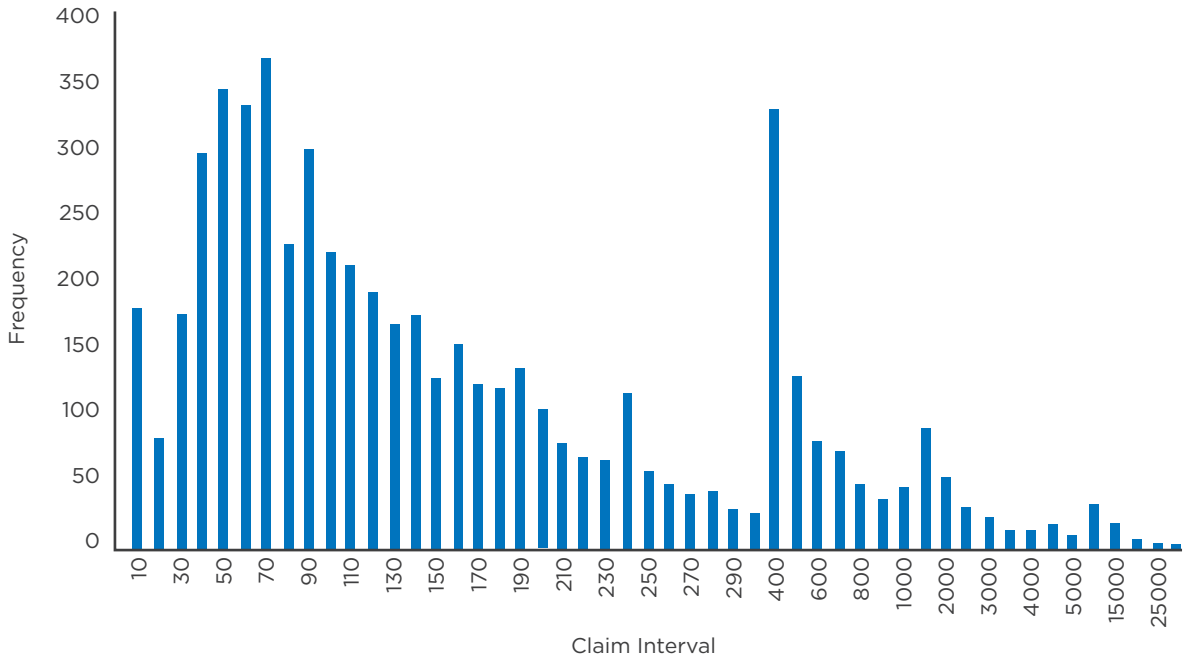
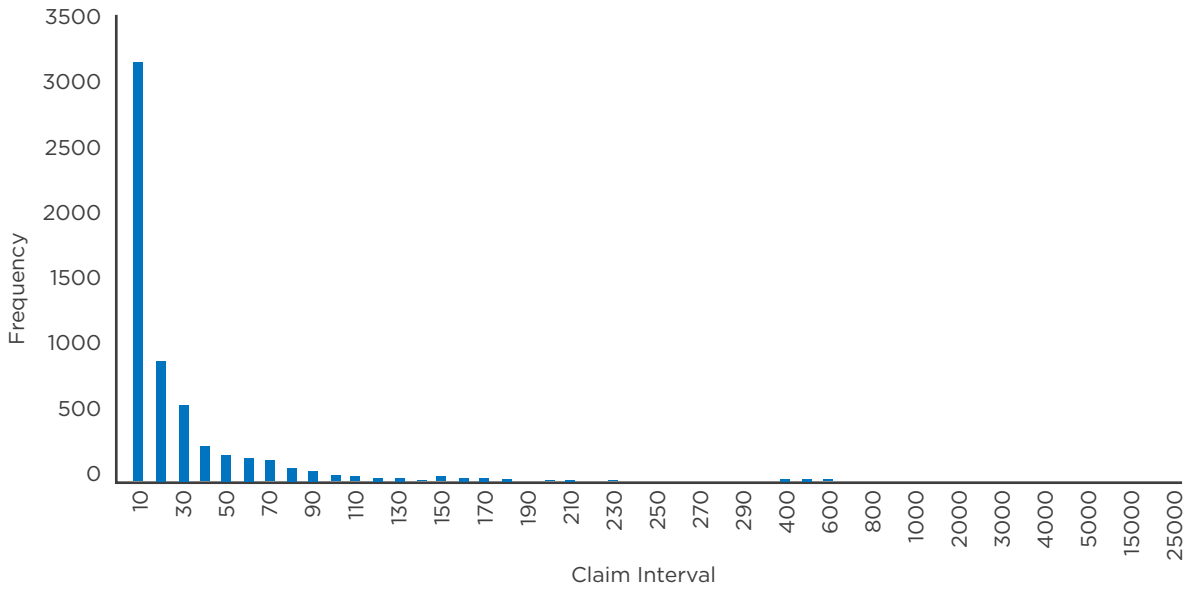


Figure 4: Company B's Over and Underpayment Claims Exceptions



Results

For each exception data set, two sets of simulations were performed: 1) 100 random samples of 300 exceptions were generated, and 2) 100 random samples of 400 exceptions were generated.

These random samples represented the best analysis random-sampling auditing could achieve in data sets determined by HDM's 100-percent-of-claims methodology. Thus, randomly sampling from HDM's data set missed a significant amount of overpayment and underpayment claims.

For both sets of 100 samples (sample sizes of 300 and 400), the average dollar amount of claims paid, the average amount of overpayment records, and the average underpayment claims were determined. Each of these random sample estimates was statistically close to their "population of exceptions" parameters identified by the 100-percent auditing.

The results from the 100 random samples of sample size 300 were compared to the "population of exceptions" determined by HDM's 100-percent-of-claims methodology and are depicted in Table 4. On average, the 300 random-sampling missed from $1.2 million to $5.4 million of the total amount of claims paid. Additionally, the random samples missed overpayment claims ranging from about $150,000 to $700,000, as well as underpayment claims ranging from approximately $24,000 to $85,000.

Table 4: Results of 100% Audit Versus 300 Random Sample Size

		300 Sample Size			Amount Missed		
Company	Type	% of $ Amount of Claims Paid	% of $ Amount of Overpayment Records	% of $ Amount of Underpayment Claims	$ Amount of Claims Paid	$ Amount of Overpayment Records	$ Amount of Underpayment Claims
A	Pre-Audit 2006	3.66%	3.97%	3.64%	$2,152,257	$219,926	$84,522
	Post-Audit 2007	3.57%	3.72%	3.59%	$2,982,092	$441,017	$60,253
	Pre-Audit 2006	7.87%	8.22%	7.73%	$1,222,858	$149,282	$24,593
	Post-Audit 2007	5.46%	5.56%	5.35%	$1,695,056	$151,145	$24,096
B	Post-Audit	1.48%	1.42%	1.45%	$5,386,944	$692,615	$58,554

We similarly analyzed the 100 random simulations of sample size 400, as depicted in Table 5. The 400-sample size simulations missed from $1.2 million to $5.4 million of the dollar amount of the exception claims paid. For overpayments, the amount missed was $145,000 to $688,000. For underpayments, it was about $24,000 to $58,000.

Table 5: Results of 100% Audit Versus 400 Random Sample Size

Company	Type	400 Sample Size			Amount Missed		
		% of $ Amount of Claims Paid	% of $ Amount of Overpayment Records	% of $ Amount of Underpayment Claims	$ Amount of Claims Paid	$ Amount of Overpayment Records	$ Amount of Underpayment Claims
A	Pre-Audit 2006	4.85%	5.12%	4.85%	$2,125,686	$217,294	$83,459
	Pre-Audit 2007	4.85%	4.84%	4.78%	$2,942,504	$435,859	$59,510
	Post-Audit 2006	10.55%	10.78%	10.30%	$1,187,249	$145,123	$23,908
	Post-Audit 2007	7.44%	7.33%	7.24%	$1,659,439	$148,326	$23,616
B	Post-Audit	1.96%	2.02%	1.89%	$5,360,753	$688,396	$58,297

Statistically Correct, But Wrong, Approach

While the 300- and 400- sample size produced statistically valid estimates of exception medical claims, that should not be the purpose of the health-plan-claims audit. The objectives of this type of audit should be to identify the root causes of the errors and, ideally, to eliminate them completely or at least minimize them. The only way these objectives can be met is by 100-percent-of-claims auditing that served as the benchmark for this study.

Comparing 100-Percent Auditing and Random-Sample Auditing

When compared head-to-head with random-sampling, the 100-percent-of-claims auditing methodology we used as a benchmark, of course, identified more claims than the random-sampling approach. However, our study results show that the random-sampling approach missed a significant proportion of claims paid amounts. Note that increasing the random sample size from 300 to 400 did not significantly identify more errors. For example, the 300-sample size identified an error range between 1.4 and 8.2 percent while the 400-sample size identified an error range between 1.9 and 10.8 percent. This fact notwithstanding, even the higher sample size still missed over 90 percent of the claim errors. Translated into dollars for the over and underpayment exceptions, it ranges from about $200,000 to over three quarters of a million dollars.

Discussion

The results of 100-percent auditing were significantly different and better than the results of auditing based on random-sampling. What's more, 100-percent auditing also depicted employee healthcare utilization more accurately. Conversely, random-sampling failed to identify a significant amount of claim errors, which translated into appreciable financial losses. Furthermore, random sampling missed the opportunity to identify the root causes of claim errors that were not identified by the audit.

For example, the 100-percent-of-claims methodology determined over 800 claim errors for Company A at the claim amount of approximately $400 in Figure 1 and over 300 claims for Company B at the same claim amount in Figure 3. When these claims were queried, emergency room and office visits were identified for Company A and lab tests and x-rays were identified for Company B. The benchmark 100-percent of-claims audit methodology enabled identification of the types of services that caused these claim exceptions. Importantly, it also established the possible basis for more sophisticated Six Sigma auditing techniques, such as failure mode effects (and criticality) analysis (Krouwer, 2007).

When the 300-sample and 400-sample size results were reviewed in financial terms, they failed to identify significant amounts of money. The 300-sample size missed from $1.2 million to $5.4 million of the total amount of claims paid. This encompassed overpayment claims ranging from about $150,000 to $700,000 and underpayment claims ranging from approximately $24,000 to $85,000. The 400-sample size also missed from $1.2 million to $5.4 million of the total amount of claims paid. This encompassed overpayment claims ranging from $145,000 to $688,000 and underpayment claims ranging from about $24,000 to $58,000.

Random Sampling Missed Over 90 Percent of Claims Errors

Random sampling missed over 90 percent of the claims errors or from about $200,000 to over three quarters of a million dollars in over and underpayment exceptions. In any economy, these are significant losses. At a time when healthcare expenses are escalating for all U.S. healthcare delivery stakeholders, particularly self-insured companies, this is especially concerning. As noted in Six Sigma philosophy, auditing needs to be conducted at an acceptable level of risk and concerned with detecting all errors that can result in underestimating or missing financial losses (Deming, 1979; Johnson 1984).

Conclusions/Implications For Future Research

Based upon our simulations of these companies, the 100-percent-auditing methodology uncovered approximately $145,000 to $700,000 in overpayments to $24,000 to $85,000 in underpayments as opposed to the random-sampling methodology. Clearly, these findings provide an incentive for plan sponsors to question why they are using a random-sample methodology to audit their employee health plan. Futhermore, in addition to generating information about claims data, 100-percent auditing enables self-insured companies to shift their focus from concerns about what they are missing to identifying the root causes for claim errors and, thereby, eliminate those causes.

Implications

From a practical perspective, the results of this study suggest that all corporations, government entities, and Taft-Hartley plans relying on random-sampling methodologies for health plan auditing should consider 100-percent-of-claims auditing of some type. From the perspective of the Quality Improvement Process, 100-percent auditing, as studied, is a definitive step toward “zero defects.” It meets the requirements of the cost-quality-access optimal healthcare delivery equation because it results in cost containment, and enables greater access and quality through more appropriate use of healthcare delivery resources. (Aaron & Ginsberg, 2009). It is a sustainable effort that is consistent with efforts to reform U.S. healthcare.

References

Aaron, H.J. & Ginsgerg, P.B. (2009). Is health spending excessive? If so, what can we do about it? *Health Affairs*, 28(5), 1260-1275.

Abelson, R. (2009). Small business faces sharp rise in costs of health care. *The New York Times*, Accessed October 24, http://www.nytimes.com, /2009/10/25/business/smallbusiness/25health. html?pagewanted=1&_r=1.

Deming, W.E. (1979). On a problem in standards of auditing from the viewpoint of statistical practice. *Journal of Accounting & Finance*, 2(3), 197.

Hanna, C.A. (2009). A proven money-saver gets short shrift. *Philadelphia Inquirer*, October 4, Section C, C1 & C6.

Johnson, R. (1984), Auditing: sampling? use your professional judgment. *Accountancy*, 95(1085), 70-72.

Juran, J. (2004). *Architect of Quality*, CWL McGraw-Hill, New York, NY.

Krouwer, J.S. (2007). Fmea vs. fracas vs. rca. ASQ's *Healthcare Update Newsletter*, February, pp.1-5.

Krouwer, J.S. (2004). There is nothing wrong with the concept of a root cause. International Journal for *Quality in Health Care*, 16, p. 263.

Lyke, B. (2009). Health care reform: an introduction. *CBS Report for Congress*, Washington, DC: Congressional Research Service, July 29, 7-5700/R40517. OECD (2009). *Oecd health data 2009 - frequently requested data*. Organization for Economic and Development Health Data, http://www.oecd. org/document, doi: 16/0,3343,en_2649_34631_2085200_1_1_1_1,00.

Ponemon, L.A. & Wendell, J.P. (1995). Judgmental versus random sampling in auditing; an experimental investigation. *Auditing*, 14(2), 17-34.

Russell, J.P. (1998). Audit for effectiveness and suitability. *Quality Audit Review*, April-June, 2(2), 1.

Senate Finance Committee (2009). *Expanding health care coverage: Proposals to provide affordable coverage to all Americans*. Washington, DC: US Government Press.

Srinvastava, R.P. & Shafer, G.R. (1993). *Integrating Statistical and Non-statistical Audit Evidence Using Belief Functions: A Case of Variable Sampling.*

Truven Health (2009). *Healthcare reform starts with the facts*. Truven Health, Accessed 11 November, http://truvenhealth.com/content/corporate/articles/healthcare reform

Towers Perrin (2009). *Towers Perrin health care cost survey shows employer-sponsored medical benefit costs to rise 7% to over $10,000 for the first time*. Towers Perrin Press Release, http://www.towersperrin.co, doi: 20091008/2009_10_08.htm.

N.B. The terms "healthcare" and "health care" mean the same thing, and are used to reflect the way authors and journals have referenced them.

ABOUT THE AUTHORS

George P. Sillup, PhD, MS

George P. Sillup, PhD, MS, is an Assistant Professor, Department of Pharmaceutical Marketing and Fellow, Pedro Arrupe Center for Business Ethics at Saint Joseph's University's Haub School of Business, Philadelphia, Pennsylvania. Prior to joining the full-time faculty at Saint Joseph's in 2004, Dr. Sillup worked in the pharmaceutical/medical device industry for 28 years where he held various positions from salesman to COO in major corporations like Johnson & Johnson, as well as in start-up businesses, in which he sold products, attained reimbursement coverage with US and international authorities for new technologies and launched several new medical device/pharmaceutical businesses into global markets. Dr. Sillup has established a presence in peer-reviewed literature, most recently with Professor Klimberg and David McSweeney, COO of Healthcare Data Management, Inc. for the use and documentation of an innovative teaching approach employing real-world health claims data.

Ronald Klimberg, PhD, MS

Ronald K. Klimberg, PhD, MS, is a Professor in the Decision and System Sciences Department at Saint Joseph's University's Haub School of Business. Before joining the faculty of Saint Joseph's in 1997, he was a professor at Boston University and an operations research analyst for the Food and Drug Administration, for a decade each, and a consultant. His research has been directed toward the development and application of quantitative methods, e.g., statistics, forecasting, data mining, and management science techniques that add value to the organization and produce results that are effectively communicated. Dr. Klimberg has published over 40 articles and made over 70 presentations at national and international conferences in the areas of management science, information systems, statistics, and operations management.

FOR MORE INFORMATION

Email **employer@truvenhealth.com**,
call **866-263-1958**,
or visit **truvenhealth.com**.

TRUVEN HEALTH ANALYTICS

ABOUT TRUVEN HEALTH ANALYTICS

Truven Health Analytics delivers unbiased information, analytic tools, benchmarks, and services to the healthcare industry. Hospitals, government agencies, employers, health plans, clinicians, pharmaceutical, and medical device companies have relied on us for more than 30 years. We combine our deep clinical, financial, and healthcare management expertise with innovative technology platforms and information assets to make healthcare better by collaborating with our customers to uncover and realize opportunities for improving quality, efficiency, and outcomes. With more than 2,000 employees globally, we have major offices in Ann Arbor, Mich.; Chicago; and Denver. Advantage Suite, Micromedex, ActionOI, MarketScan, and 100 Top Hospitals are registered trademarks or trademarks of Truven Health Analytics.

truvenhealth.com | 1.866.263.1958