The Spirit of Florence Nightingale and Professional Caregiver Insurance Risk

“What’s in a name? that which we call a rose
By any other name would smell as sweet…”

Shakespeare: Romeo and Juliet

Introduction

As both a student and a nursing educator; as a nurse and a statistician, I am occasionally given to whimsical moments when I wonder: What would Florence think of 21st century health care? When Nightingale led her nurses to Scutari she entered a scene which is all to reminiscent of the situations faced by nurses and patients today: inadequate staffing, problems with basic sanitation, at least a benign disregard for the legitimate needs of patients, and perhaps far worse; windows as incapable of being thrown open by the likes of a Florence Nightingale as was true during the reign of the closed minds of the generals and physicians in the military hospitals in the Crimea in the 19th century. In particular, I have often mused: what would Florence Nightingale think of capitation agreements and other financing arrangements that move health care providers and organizations to positions more aptly described as insurance entities than clinical and professional entities. I am, of course, convinced that Nightingale would view such arrangements with disdain and view those who willingly accept them as adversaries to be dealt with by statistical analysis, politicking, exposure of their baser interests and drawing a sharp distinction between those who do and those who ought to aspire and behave at a
higher level. This then, is a homily to Florence Nightingale, and I will attempt to speak for her as I am certain she would speak herself were she here.

A brief history of Nightingale's contributions to mathematics, statistics, and the statistical and financial operations of hospitals and health care organizations

Nightingale is revered to this day because she was the first of a modern generation of nurses. Schooled in the sciences, mathematics, and the, then nascent, field of statistics, Nightingale played an instrumental role in moving statistics out of the realm of the analysis of games of chance, and a pleasant intellectual diversion, to the fundamental role statistics now plays in modern life. The ubiquitous pie charts, tables, and most certainly the use of statistics to influence health and social policy are among Nightingale’s many lasting legacies. She earned the nickname, the “Passionate Statistician” for her extensive use of quantitative methods for the management of health care systems. Few can aspire to fill the footsteps of someone who was not merely a woman apart from the oppressive conventionalities of her day but a person at or above the best and the brightest minds of her age or any age.

Nightingale’s accomplishments, insights, creativity, and contributions to statistics rank her in a very small group of people who contributed some of the most fundamental and enduring tools and principles upon which modern day statisticians base their work. To be sure, Nightingale was not Leonard Euler or Carl Friedrich Gauss, two of the most brilliant mathematicians the world has ever known. However, considering the formidable
obstacles of social conventionality Nightingale had to overcome, her triumphs in mathematics, statistics, social statistics, epidemiology, and biostatistics are more than enough for mathematical and statistical legends.

But all of those accomplishments might have been of little note were it not for the fact that Nightingale did not merely report what was happening in hospitals, the plight of the weak, the disenfranchised, the uncared for, the destitute, and precisely the patients who in her time and our time are so often reported on but inadequately championed, but she did champion the unwanted and neglected in ways that nurses today would do well to emulate. Nightingale could have easily demurred and bowed to the wisdom of military officers and noble physicians. It was, after all, what was expected of a polite woman in the middle of the 19th century. But, it would have been wrong then as it would be wrong now to remain silent in the face of ignorance, arrogance, and contemptible neglect of our patients. Complicity was not Nightingale's way then and it would, most certainly, not have been Nightingale's way now. Recall that Nightingale stated that:

"I use the word nursing for want of a better. It has been limited to signify little more than the administration of medicines and the application of poultices. It ought to signify the proper use of fresh air, light, warmth, cleanliness, quiet, and the proper selection and administration of diet -all at the least expense of vital power to the patient." F.N.

Is there any reason to doubt that she would be concerned today as she was then? Would
she likely look at our hospitals and declare that hospital care as laudable?

The military officers and physicians were a formidable problem in Nightingale's day. They routinely ignored the needs of the wounded and malnourished British soldiers, left them to die without care, kept them in stagnant environments, ignored their nutritional needs, and lacked the most fundamental commitment to their well being. Would not Nightingale notice that patients are being similarly neglected today in the name of cost-cutting; “managed care” that often looks far more like “mis”managed care; and what may be a far more serious concern, the sterile, lifeless, machine like operation of a system that does little to promote health, and actually consigns its presumed beneficiaries to undocumented morbidity and mortality. Is it likely that Nightingale would not be embarrassing public and private officials, who should and could do better, or threaten to embarrass them with the truth of their ways as she threatened to do with her “Secret Report.”

The Genesis of a Statistical Conundrum

These are, of course, serious statements. One should not, nor did or would Nightingale, draw such conclusions or communicate them lightly. She would, no doubt, find much to admire and support in terms of modern sanitary technology, the use of sterile fields, better nutrition, and far more sophisticated tools to coordinate and control caregiving environments. However, she would also have looked at the commonplace and seen it differently than others. Nightingale did not go to the Crimean on a two day
consultation, to render a report on how to improve the profitability of the military hospitals, she and her nurses went to clean up a deplorable mess created by the military officers and physicians, to tend to the needs of the British soldiers who were injured, diseased, malnourished, hopeless, and considered expendable. She would, I am certain, look at the release of patients with: complicated arrays of IVs, unhealed wounds, implausible and unreliable “home care” plans dependent on the skills and resourcefulness of friends, family or community agencies, that provide, at best, uncertain, at worst certainly inadequate care, with disdain.

Nightingale would not have ignored modern day econometrics, microeconomics, economics, business administration, statistical quality control, operations research, or the theory of interest, and return on investment calculations. However, it is unlikely that Nightingale would, in her zeal for rational and efficient policies, and efficient use of resources, failed to maintain a clear, overriding focus and concern on the delivery of care to the injured and diseased. It is unimaginable that Nightingale would have confined her attention to the nursing staff, the nursing units, the nursing department, or the role of a polite and complicit nursing executive. She could not possibly fail to notice the machinations of finance departments, hospital administrators making 6 and 7 figure salaries while reducing patient services, and restricting access to services, as did Dr. Gall, who “... soon became a specialist, specializing in diseases of the rich.” as satirized by Tom Lehrer's song “In Old Mexico” half a century ago.
Nightingale would have wanted an efficient hospital, but can there be any doubt that she would find modern, profit-driven, healthcare organizations, a problem, rather than a solution? Is it even remotely imaginable that the society woman who abdicated a life of wealth and convenience to tend to the poorest and most vulnerable patients in the British Empire would feel encouraged about hospitals that limit the intrusion of fresh air by eliminating windows that open? Would she not see our carefully contained disease pools, built on recycling stagnant air and our hospital rooms that are noxious and noisy 24 hours a day as a problem? Would she not rail against hermetically sealed environments that prevent the escape of toxins and allow them to endanger both patients and staff in our modern sanctuaries of pollution? Nightingale could not fail to notice and address the fact that so many modern hospitals install revolving doors to reduce, to a minimum, the possibility that fresh air will enter. In quiet moments I can imagine that such situations would most certainly elicit a scowl from the woman who refused to accept the instructions of the military officers and physicians in the Crimea. Nightingale would, I believe, never cave in to the pressures of an MBA’s budget variance report suggesting that instituting financially rather than clinically optimal treatment protocols save money.

It is unlikely that Nightingale would fail to notice the ever-stretching reach of the pharmaceutical, medical instrumentation, and hospital supplies industries and the all too pervasive tendency to substitute medication for caring, cleanliness, and compassion. She would, no doubt, find the misuse of Occam's razor to shave the time from first encounter
to prescription pad unconscionable. Nor would she be likely to ignore the fact that use of broad-spectrum antibiotics as a cure for the ever-present “attention-deficit” in clinics and hospitals, has unwelcome consequences, greater immunity to available antibiotics, of infectious agents and the decreasing utility of what few 'silver bullets' we have left.

Nightingale, I am certain, would have much to say about every one of these issues and many, many more. However, there is one arena I believe Nightingale would choose to make the focal point of her crusade against the immoral, the inefficient, the compassionless, and the truly reprehensible. Of all the modern perversities in the health care system, I believe she would find the financing of health care services and the behavior of profit-seeking hospitals that sacrifice patient care to efficiency and profitability as the focus of their utility maximization, the most offensive and the most deserving of her scrutiny and action.

**How Nightingale Might View Professional Caregiver Insurance Risk**

In Nightingale's day there were no “health insurance plans.” Wealthy people who became sick or injured hired whatever care they could afford to supplement that provided by friends, family, and the few hospitals and health services available. The poor were 'cared' for in charitable institutions, or because they were willing to serve as learning opportunities for medical students; and, of course, the poor were often used as inexpensive guinea pigs in medical research; or as fulfillment of a sense of moral obligations by some physicians. Were Nightingale to arrive, ill or injured, in a
contemporary hospital emergency room, she would not long miss the centrality of the answer to the question: “Ms. Nightingale, Ms. Nightingale, Do you have your insurance card?”

Would Nightingale be impressed with the pre- and post-triage sorting of patients by insurance or payor status? Would she be blissfully unaware of the importance of insurance as the basis of a patient’s right to care? Insurance predates Nightingale by thousands of years. The Code of Hammurabi, contained provisions for credit insurance, ship owners, in ancient times, obtained loans from investors that would not be paid off if the ships failed to return, hence, the interest on the loans served the same function as an insurance premium. Even more to the point, the world's most famous insurance provider, Lloyd's of London, began its informal operations almost 200 years before Nightingale's travels to the Crimea, and the formal phase of Lloyd's operations, begun in 1769, were well established in world trade before her birth. The Law of Large Numbers and the Central Limit Theorem, the probabilistic backbones of insurance, actuarial risk theory, and modern sampling theory, predates Nightingale considerably.

Abraham de Moivre first used the normal distribution in 1733 to calculate the number of heads in multiple flips of a coin, predating Nightingale by over a century. Jakob Bernoulli codified the Law of Large Numbers a century and a half before Nightingale's journey to the Crimea. Nightingale would most certainly be interested in how these mathematical and probabilistic theories influence modern health care practices.
and hospital administration. Nightingale would, using just such tools, notice what is wrong in the present. Yet, few graduates of modern medical and nursing schools, those who have had the advantage of training and computational resources unimagined by Nightingale, would be able to explain something that I am convinced Nightingale would have known and addressed were she alive today. Nightingale simply would not miss that the edifice of insurance has been undermined, physicians and health care organizations are and have been as complicit, in the ongoing unraveling and dissolution of health insurance and the destruction of the potential of our modern healthcare system, as the military officers and physicians in the Crimea were complicit with the promotion of filth, starvation, microbial transfer, unnecessary morbidity, and avoidable mortality in the Crimean Theater.

Nightingale would need no tool whatsoever that she did not possess before her arrival at Scutari, to both observe what has happened and to prove to her own satisfaction why it happened. So let us turn to how Nightingale might have viewed our modern health care finance and reimbursement system with the intellectual tools of the 19th century.

**Essentials of Capitation Contracts and Managed Care**

Capitation contracts (CCs) and average-cost based reimbursement Plans (ACBRPs) generally such as Diagnosis Related Groups (DRGs) have existed for several decades. These legal and financial entanglements create financial and ethical risks for health providers and consumers that would not exist without them. The financial and
ethical risks are integral, though analysts have incorrectly identified and appraised these risks as either non-existent or acceptably benign if somewhat troubling. These profit-sharing, risk-sharing, and cost reduction reward promoting mechanisms have explicitly dire effects on providers and consumers, weaken the insurance industry, its operations and regulation, and foster the unfairly competitive positions of certain products in the insurance marketplace.

The long-term consequence of the use of CCs and ACBRPs is the situation we face now, the virtual complete elimination of insurance coverage for the overwhelming majority of the “insured”, has been inadequately explored. This paper will address and correct these oversights from the standpoint of nursing and nurses. Viewing ACBRPs as insurance contracts reveals serious flaws. Adopting such a view, the view Nightingale could not possibly have failed to take, helps demystify these mechanisms, opens new vistas of research activity, and will contribute to ending the misuse of the harms done by cost containment at the cost of service quality and availability. Once seen as what they are, insurance risk transfers, the unequal footing of service providers and insurance professionals, raise very serious ethical, legal, professional, and business concerns.

Providers engaged in CCs or ACBRPs agree, often involuntarily, to accept prospective payments to care for clients. In doing so they accept certain fixed payments and assume the liability for unknowable and uncertain costs. Predictable, though rarely predicted, risks reflect variations in health costs related to factors such as age, gender,
employment status, or chronic/acute illness status. Other inaccurately analyzed risks include the unique operating characteristics of providers. In hospitals this may vary from unit to unit and shift to shift, based on patient acuity, staffing, resource management, and the availability of needed supplies and auxiliary services. Other poorly analyzed risks include: self-selection biases, financial adversities when borrowing money, and liabilities that result from poorly projected resource needs. Small providers tend to manage these risks very poorly. Despite these wide-ranging problems, the most significant and least understood issue, the most problematic is the inattention to the major risk source, that inadequately resourced providers entered the insurance business and adequately resourced insurers departed the insurance business with little or no regulatory oversight or action.

**Review of Insurance and Basic Economic Theory**

The social and economic benefit of insurance is the accumulation of risk so that the Law of Large Numbers (LLN) and the Central Limit Theorem (CLT) make the aggregate risk that an insurer is exposed to highly predictable, benefiting both insurers and insureds. Role reversal, in CCs and ACBRPs damages legitimate insurers, providers, consumers, and the health care system by causing: business failures, consumer dissatisfaction, provider consolidations and takeovers, reduced access to care, and delayed and deferred patient diagnosis and treatment. Entities that use ACBRPs to avoid the benefits of risk consolidation include: insurers, managed care organizations (MCOs),
HMOs, unions, employers, and governmental entities. Professional caregivers simply cannot perform conflicting roles as insurers, economic and clinical gatekeepers at the doors of service providers that entry into the insurance business entails for health providers. Insurers and government render valuable service to society and earn profits when they aggregate risk and reduce uncertainty for themselves and their policyholders. CCs and ACBRPs thwart and eliminate such benefits.

Insurance risk assumption by providers has radically altered the healthcare system, undermining professional values, eroding consumer confidence, enabling provider consolidations and detrimentally affected the nation's confidence, health, well being, and preparation for disasters and other unexpected demands on the health care system.

**Insurance and Probability Issues**

Insurers manage risk better than their policyholders by being adequately capitalized to meet normal fluctuations in losses from period to period and by being well enough capitalized to handle unusual fluctuations in costs from period to period. Insurers achieve more benefit from high volumes of business, by spreading their risks geographically and by multi-line insurance diversification. The CLT and the LLN explains how insurance companies achieve these benefits because they can predict costs more accurately when they write large numbers of insurance policies. This benefit from the CLT and the LLN is based on the statistical sampling effect of taking ever-larger
samples from an unknown distribution in order to more accurately estimate the value of a population parameter. In this case the population parameter of interest is the average cost per policyholder for a future period of time.

As a researcher increases the size of the sample they take, the smaller the variability in their estimates of the population parameter if all other conditions remain unchanged. Increasing the number of sampling units (policyholders) reduces the error made when an insurer estimates the average costs for each unit (policyholder.) Insurers want to be able to accurately estimate the amount of their future losses because their estimate of future losses determines the price they should charge to provide insurance to policyholders. This notion of obtaining more accurate estimates of population parameters is the familiar principle behind the ubiquitous use of the normal distribution in statistical estimation and hypothesis testing. This article will show how to apply this concept to the analysis of the use of CCs and ACFRs as mechanisms to finance the delivery of health care services. During this discussion, we shall substitute ‘portfolios of policyholders’ for ‘samples,’ but the key concepts remain the same.

Just as small samples sizes lead to big changes in estimates of population parameters from one sample to the next, small organizations, such as community hospitals, private practitioners, local nursing homes and extended care facilities that contract to provide services to small numbers of clients (small portfolios of policyholders) would be expected to have much higher variability in their results, by any
relevant time period, than would insurers who have very large portfolios of policyholders.

As will be demonstrated below, the transfer of the insurance risks these portfolios of policyholders generate, cause, rather than resolves problems for health care providers and consumers. The greater variability in operating results for small health care providers versus large insurers is itself predictable with a few, fairly conservative assumptions.

**Sharing Risk: A Simple Example**

Why do people decide to buy insurance? People buy insurance because it makes a great deal of sense. Suppose you own a house. If something were to happen to your house you could lose the benefit of having it. Storms, fire, and vandals all pose the risk of loss to you. In the worst case, your house might be completely destroyed. Even if the chance of this was pretty small, you might lose a good deal of sleep fretting about it. What could you do to lighten the burden of loss? You might keep enough money to rebuild your house in the bank or under your mattress. That would probably be very difficult to do and the temptation to use those funds for other purposes would likely be very high. You might simply accept the fact that you might one day lose your house but enjoy it as much as possible while you have it.

Suppose you are mulling this over at work one day and mention it to a colleague. Your colleague lives way across town and the two of you realize that it is unlikely that both your houses would be destroyed at the same time and by the same cause. After much discussion the two of you agree that you will come to each other’s aid in the event of a
catastrophic loss. Both houses are worth about the same amount. Each of you agree to set aside half the value of the house and put it in a special, shared account that cannot be touched except in the event of a loss of one of the houses. If one of you suffers a loss, they will be able to draw the funds out of this special account and rebuild their house, restoring the victim to economic wholeness. Because you are sharing the risk, each of you is spared the necessity to maintain a reserve in the full amount of your potential loss. Each of you is considerably better off sharing the risk than facing it alone. This insight is the basis for all insurance.

**Sharing Risk: A Slightly More Complicated Example**

Your colleague and you have been sharing your risk of loss for a few months. Happily, there has been no loss. But it occurs to you that you could do a lot better if there were more people sharing the risk of economic loss that ownership of a house involves. Over lunch one day you decide that life would be much better if instead of just each other, you had dozens or hundreds, perhaps even thousands of people who were sharing the risk. Instead of having to contribute half the value of your houses to the special account, perhaps you could contribute 1/100th or 1/1000th. That, you agree, would be much better than one half. Soon, the two of you are signing up all the people you know to share the risks of loss of a house. In short, you have formed an insurance operation. Of course, the more people that agree to share risks the more likelihood there is that one or more people will actually suffer a loss and this would mean the special account could
soon be empty. To compensate for this you hire an expert to tell you how much each of you should put in the special account for the next year so that even if there are several houses lost, the account will be adequate to pay all the losses. As it turns out, this is still substantially lower than the costs borne by an individual or two individuals sharing the risk of loss.

What has just been described is the story of the development of the insurance industry. Insurers function as intermediaries between a lot of people who have agreed to contribute an amount every year so that in the unlikely event of a loss, there will be sufficient funds available to restore the victims to economic wholeness. Insurers acting in this manner perform a very useful function in society and are accorded special benefits of incorporation and tax advantages. Insurers are also expected to meet relatively high regulatory standards as well. It would not, after all, do to have insurers that ran out of money before they made all the victims whole, would it? To make sure that insurers can meet their promises, federal and state regulations impose obligations for the management of reserves for future losses, and regulate the kinds of investments that insurers can make and the kinds of insurance that they can issue. It stands to reason that you would not want to buy health insurance from an insurer that did not know anything about health insurance.

To recap the situation, we have demonstrated that when a large number of people, each of whom, is exposed to the risk of loss of economic value, agree to share the risk of
loss among them, through the intermediary of an insurer, each of them incurs lower costs to achieve the same benefit. Can we explain these phenomena mathematically? The answer is that we can and two specific mathematical explanations are all we need. First and foremost we have the Central Limit Theorem which states that the more people that share the loss the more accurately we can predict the average loss per policyholder. In our example, this would be the amount each policyholder had to contribute to the special account or pay to an insurer to be protected for the next year. So let’s imagine that the average loss occurs as follows: Each person faces a chance that they will have a loss of $100,000 but that will only occur once in a thousand years. The average loss would then be $100 (100 = 0.999 * 0 + 100,000 * .001). The variance in this example would be 9,990,000 ($9,990,000 = (0 - 100)^2 * .999 + ((100,000 - 100)^2) * .001$).

We now have everything we need to assess how the burden of risk is lowered when people agree to pool their resources rather than facing it alone. The situation we have described can be modeled by assuming that the risk of loss is approximately Normally distributed, a situation we write in statistical shorthand as N(100, 9,990,000). The variance is the problem. It is so high because when a loss occurs, even though it is rare, the loss is very great. Most of the time, no loss occurs, and the loss is 0. But it is the uncertainty in knowledge that is reflected by the large variance when one person goes it alone. But we have statistics on our side. What happens when two people decide to band together and share the risk? Clearly their average loss would remain the same, but how
will the variation in losses change as a result of pooling. We actually have a technique for finding this out. When two people share the risks they each benefit in the form of a change from the distribution above with the large variance to one that has a lower variance, $9,990,000/Square \text{ root } (2)$. The following table quickly summarizes how our situation changes as we add more people to the number of people sharing risk with each other.

<table>
<thead>
<tr>
<th>Variance</th>
<th>Standard Deviation</th>
<th>Reserve or Premium Required</th>
<th>Number of Policyholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>9,990,000</td>
<td>3,161</td>
<td>$100,000</td>
<td>1</td>
</tr>
<tr>
<td>7,063,997</td>
<td>2,658</td>
<td>$50,000</td>
<td>2</td>
</tr>
<tr>
<td>5,767,729</td>
<td>2,402</td>
<td>$33,333</td>
<td>3</td>
</tr>
<tr>
<td>3,159,115</td>
<td>1,777</td>
<td>$10,000</td>
<td>10</td>
</tr>
<tr>
<td>2,233,832</td>
<td>1,495</td>
<td>$5,000</td>
<td>20</td>
</tr>
<tr>
<td>1,823,916</td>
<td>1,351</td>
<td>$3,333</td>
<td>30</td>
</tr>
<tr>
<td>999,000</td>
<td>999</td>
<td>$1,000</td>
<td>100</td>
</tr>
<tr>
<td>706,400</td>
<td>840</td>
<td>$500</td>
<td>200</td>
</tr>
<tr>
<td>576,773</td>
<td>759</td>
<td>$333</td>
<td>300</td>
</tr>
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<td>315,912</td>
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<td>223,383</td>
<td>473</td>
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<tr>
<td>99,900</td>
<td>316</td>
<td>$10</td>
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</tr>
<tr>
<td>70,640</td>
<td>266</td>
<td>$5</td>
<td>20,000</td>
</tr>
</tbody>
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The benefits of insurance are immediately obvious. When we shoulder risk by ourselves we have to keep a reserve in the full amount of our possible loss by ourselves. Even though the risk of loss is small, we must maintain the $100,000 reserve to be certain that we will not become homeless. When another person pairs with us in sharing risk, the chance that at least one of us will have a loss increases but the amount each of us has to
put aside is cut in half. When three people share risk, we again have an increased chance that one or more of us will experience a loss, but we each have to contribute only $33,333.00. If we were able to spread the risk among a total of 20,000 people, each of us would need to contribute only $5. If it sounds too good to be true it is only partially so.

We have ignored the possibility of more than one loss in a year in each of the above situations. This is non-negligible but in truth it is far smaller than the benefit achieved by risk sharing. Even if we look at the situation with 100 people pooling their resources, we each have to contribute only $1,000. Assume that 2 or 3 people have a loss, an extremely unlikely situation, we would still only have to pay $2,000 - $3,000 to be protected compared to 100,000 when we shoulder the risk alone.

As suggested above, this is a very sound model that makes perfect sense mathematically. Another mathematical idea that applies reflects another way we tend to look at the world. This mathematical theory is the Theory of Utility or Utility Theory. It codifies the common experience that we get tired of things. If you are hungry you may really want a hamburger. If you have had one hamburger you may still want a second hamburger. But if you have already eaten 3, 4, or 5 hamburgers the chances are pretty slim that you want a 4\textsuperscript{th}, 5\textsuperscript{th}, or 6\textsuperscript{th} hamburger anywhere near as much as you wanted that first hamburger. In mathematics we describe this situation by saying the utility function for hamburgers is growing at a progressively slower rate. In truth, at some point it plateaus and you are just sick of hamburgers and would give nothing for an extra
hamburger. When you consider the loss of a lot of money, such as would occur if you bear the risk alone versus the loss of a relatively small premium, when you pool exposure to risk, the theory of utility says that most people will prefer the certain loss of a small amount compared to the uncertain loss of a large amount.

When we contract with an insurer, the theory of utility enters in two ways. We would prefer a small but certain premium to a large, though possibly never occurring loss. The insurer will actually improve its estimates of its average loss per policyholder, by adding an additional policyholder. The insurer is motivated to sell an additional policy and we are motivated to buy an insurance policy by the same basic principles. The only thing that remains at this point is to throw some mathematical symbols around so that we look like we really know what we are talking about.

**What Happens When Insurers Do Not Retain Risk?**

If things work so well when we join together and contribute premiums to an insurer and the insurer holds the money and manages the pool of money needed to pay future costs, what happens if the insurer decides that it does not want to do its job but still wants to keep some of the money it gets from writing premiums? Assume that there are 100 policyholders. Each one is paying 1000 currently. Suppose the insurance company says: If you agree to share risks with us, we will, on average, reduce your costs for insurance. Always a wise consumer, you ask how this would happen. The insurer explains that they offer their best customers a special deal. If they agree to an extra
assessment in the event of a loss, their premium will be reduced. But the reduced
premium won’t be immediate. The insurer still wants to make sure that they have enough
money available to meet their losses. So here is the way it works. You continue paying
the old premium. After the year is up, the insurer tallies up its losses. If they lost 300,000
you agree to give them an extra $1000 but if they had no losses they agree to give you
200 back. They further explain that you will probably come out ahead, on average,
because losses are rare.

This is, in essence, the deal insurers struck and keep striking with health care
providers. They call it risk-sharing, perhaps profit-sharing, but as was true of
Shakespeare’s rose, it does not matter what it is called, insurance is still insurance. In our
case, no matter what you call it, when an insurer shares profits or losses with providers,
the providers enter the insurance business. Why this might concern us is that instead of a
big nameless, faceless insurer out there, the people who are acting like insurance claims
personnel are our doctors and nurses. To be sure, neither our doctors nor our nurses, at
least not most of them, really understand that they are now in the insurance business.

Many health care providers keep trying to behave as though it was the insurance
company that is denying benefits rather than that they are denying benefits. So your
mother, brother, husband or daughter gets sick and you take them to their physician. The
physician explains that they are very ill and that the insurance company is saying that
they are not covered. But is it really the insurer that is refusing to treat your loved one?
Chances are the answer, though surprising, is that it is not at all the decision of the insurer. The insurer bought insurance from the physician. In return for a payment up front, called a capitation payment, the physician agreed to treat every member of small group of the insurer’s policyholders. In return, the physician benefited because they do not have to ask permission to treat; they can, and should, render appropriate treatment when it is required. After all, they got paid in advance to provide exactly this service.

The problem here is that getting paid in advance sounds pretty good. Who can argue with getting paid in advance? If your employer suggests that they want to pay you in advance would you object that you don’t want to get paid until after you work? Not likely! But the deal insurers and health care providers struck is not quite the same as an employer and an employee. You are, no doubt, imagining that the payment your employer would give you would be the same amount that you have gotten paid in the past and that you would work the same number of hours that you have always worked.

Capitation agreements do not work that way at all. The capitation agreement has several dramatic differences with what you are probably imagining. First, capitation payments assume cost savings. They pay less than it cost to deliver care in the old paradigm. Imagine if your employer were to say to you – we think you can do your job in less than half the time it has been taking. We will pay you half as much as we used to and if you are very efficient you will work less than half as many hours. Or, alternatively, we will pay you the same amount we always have but you will need to get more than twice as
much work done. But, if you are even more efficient than we think you can be, you will actually make the same amount in less time – so you will be able to enjoy your leisure or you can work a bit more – a full time job equivalent, and you will earn extra money.

Second, insurers do not pay all the money up front. Because insurance companies, above all others, understand that not everyone is able to fulfill their promises, the insurance company assumes that the health care provider may not be able to meet all their obligations. The health care provider may die, go out of business, or get sick. The insurer, if it paid the full amount up front, would be stuck having to provide the services the health care provider was supposed to provide, was paid to provide, but failed to provide. So the insurer holds some of the money the health care provider ‘may’ get it if they actually perform as required.

Third, as demonstrated above, the ability to project average losses rises when more policyholders are involved but declines when there are fewer policyholders involved. Health care providers are very, very small insurance companies and as a result, their costs may vary dramatically, day to day, week to week, month to month and year to year. As above, insurers know this, which is why they hold on to some of the capitation payment until after the work is actually done. But health care providers do not understand this. Most of them think the capitation payment is an accurate measure of the costs they will accrue. Nothing could be further from the truth. Capitation payments are reasonably accurate reflections of the average costs when a very large number of policyholders are
involved, not when small numbers of policyholders are involved, as is the case with the people that the health care provider is insuring. One million policyholders is one thing, one thousand policyholders is another thing entirely. Look back at the table discussed earlier. When we moved from 3 to 3,000 people sharing the risk, we reduced the variance from 5,767,729 to 182,392. At the same time we reduced the standard deviation from 2,402 to 427. Another way of looking at this would be in reverse. What happens if we go from 3000 people sharing the risk to 3? The variance and standard deviation increase dramatically and the ability to predict our losses declines dramatically. Health care providers, at best, are extremely inefficient insurance companies. This is based on the number of policyholders, not on the ethical sincerity, or willingness to serve, of the health care provider.

These more variable outcomes are due solely to the differences in the number of clients in the sub-portfolio compared to the full portfolio in reverse of the usual insurance relationship. This increases the probability of both good and adverse financial outcomes for the smaller providers who receive disaggregated collections of insured clients. This effect is also independent of any discrepancies in the average values of the particular portfolio transferred.

Clearly, if the members of the sub-portfolio are sicker than expected the provider has automatically been exposed to higher costs than those they were paid to accept. Insurers can manage such variability because they insure patients who are both near and
far, are obligated to maintain assets that are far greater than the losses they are intended
to cover, but providers: physicians, hospitals, rehabilitation centers, and clinical
laboratories are neither obligated to maintain such reserves nor do they have the assets
available to them to meet such requirements.

The normal distribution is a good model for statistical issues in a wide variety of
situations (Robbins & Van Ryzin, 1975). However, the normal distribution is a poor
model for insurance because of the small numbers of very large claims and the large
numbers of very small or zero claims that characterize insurance contracts. Nevertheless,
the explanation in this paper uses the normal distribution, a conservative model, to clarify
and simplify issues regarding variability and risk. The normal is conservative in two
ways: the risk of better than average experience equals the risk of worse than average
experience; and the normal has smaller sampling variances than other, more appropriate
distributions. The risks of adverse financial experience are higher when modeled with
other distributions. The approach taken will be a comparison of the likelihood of events
distant from the expected (mean) value in provider groups with the probability of equally
distant, from average, experience for an insurer. The different spread around the average
due solely to the disparity in portfolio sizes between providers and insurers is the focal
point of this paper.

Assume that there is an amount of the insurer's premium that is the actual cost of
providing care to the insureds through providers (i.e. Provider Cost) and that it is
distributed as $N(0.70, 0.05)$ (normal distribution with a mean loss ratio of 0.70 and a standard error of 0.05). The assumptions about these parameter values are not important here. The rest of the premium covers profits, expenses, loss adjustment services, and other necessary costs. If the insurer retains risk, the probability that the insurer will experience a loss ratio other than 0.70 is easy to determine, the probability that the insurer's losses in any year will exceed 0.75 is 0.1587. If the insurer's premium incorporates a 5% profit margin, the insurer will be unprofitable less than 16% of the time.

Now assume that a provider group accepts the average loss cost as payments in a capitation contract. What is the probability that the provider will have a loss ratio in excess of their average payment 0.70? Also, note that consistent with the above assumptions about premium allocation, this represents 100% of their guaranteed income to cover services since the insurer cannot pay out more than their average cost, to each of their contracting providers. The very first critical observation is that the provider’s experience is as likely to fall above the average as below, there is a 50% chance that the provider will have costs that exceed the amount budgeted, on average, for care delivery. If the provider accepts 10% of the insurers portfolio, their standard error is $0.05*(10^{**.5})$ or 0.158. The probability that the provider's loss ratio will exceed 0.75 is 0.376. The relative risk of a provider loss exceeding 0.75 is 2.37 times that for the insurer. If the same provider assumes only 5% of an insurer's portfolio the relative risk of a loss greater
than 0.75 is 2.59 times that of the insurer due to size differentials alone. Coupled with the provider's limited ability to manage such losses this higher probability of a poor result may be devastating.

Extant regulatory bodies are not adequately monitoring whether providers can, in fact, manage such risks. State and federal regulations require insurers to maintain sufficient assets to weather unexpected results. No similar requirements exist for providers that accept risk laden ACRPs. While increased vulnerability to high losses is offset by a greater probability of achieving a lower than expected loss, the advantages of increased profitability are offset, among providers, by the risk of going bankrupt. Most providers would not be willing to risk bankruptcy just for an equal chance of greater profits.

Few providers or consumers realize that the nominal insurers are no longer managing these insurance risks. Both providers and consumers are largely unaware that insurers had actually transferred their insurance role to providers. Providers can only manage ACRP agreements by targeting services at a lower level then the loss costs in the payments they are given by insurers. The only mechanisms available to providers to accomplish this are by limiting care delivery, threatening the health and well-being of their clients and increasing the possibility that they will deliver ethically compromised care. Uncompensated risk assumption is not viable over the long-term.

This example demonstrates that the provider groups have far greater probabilities
of extreme losses than insurers. In addition, provider groups are also financially weaker than insurers. Where well-capitalized insurers can withstand several years of extremely high losses, many small providers cannot survive a single month without precipitating a financial crisis.

Another dissimilarity between insurers and providers that works against risk assumption by providers is that insurers benefit by reducing their expenses when handling a large number of relatively similar policies. Writing more policies introduces small increases in operating costs for insurers. Providers expense costs increase when dealing with dissimilar CCs and ACBR plans that increase the complexity and inefficiency of their operations. The way for a capitated provider to manage the risk of adverse financial experience is by targeting average costs to be lower than guaranteed reimbursements. To do anything other than this invites long-term financial ruin.

While most providers will have trouble with this and will not willingly travel these paths, poor planning for, and poor implementation of, these contracts can quickly place providers in financial jeopardy, necessitating precisely such measures. What is the evidence for this compromised care – look in any managed care practice waiting room. Longer times to appointments, longer waiting times in waiting rooms, shorter examinations, and the ubiquitous reach for the prescription pad are all solid, empirical data.

Other features of these contracts, such as bonuses for limiting the use of expensive
diagnostic and treatment protocols, place providers in an ethical and legal conflict where it is difficult, if not impossible, to act in the best interest of patients and act in the best interest of their group.

Relative Risk of Adverse Experience for Providers Versus Insurers

Table 1 below details the probabilities of losses greater than or equal to a given loss ratio for the insurer, the provider and finally, the relative risk for the provider compared to the insurer. The table is based on an expected loss ratio of 0.70, a standard error of 0.05 for the insurer and the assumption that the provider group accepts 5% of the insurer's clients.

At an actual loss ratio of 0.70 there is no risk differential. However, as the actual loss ratio increases, the fact that the standard error is lower for the insurer, the relative risk becomes greater as the experience moves away from 0.70. The table clearly demonstrates that the provider groups have far greater probabilities of extreme losses than is true for the insurer. This is not all that comes into play however. The provider groups are also weaker financially. Whereas an insurer may be able to withstand several years of extremely high losses, many small providers move from month to month with little margin for higher than expected losses.

Insert Table 1 here “Relativity Probabilities of Adverse Financial Results When Provider Accepts 1/20 Of An Insurers Portfolio

Insurer-Provider Financial Strength Differentials

ACBR plan contracts are clearly biased in favor of the well-being of the larger
organization. State and Federal regulations require insurers to maintain their financial capacity to withstand risk. Insurers hold considerable assets that cover their needs in years in which they suffer unusually high losses. GAAP (Generally Accepted Accounting Principles) and FASB (Financial Accounting Standards Board) accounting standards compel insurers to maintain adequate liquidity that allows them to weather the vicissitudes of the insurance business. Small providers, on the other hand, have no such requirements and, in fact, rarely have this capability.

In many cases providers enter into these contracts because they are financially vulnerable rather than financially strong. A small provider that is not meeting its business costs, or operating at lower profit margins than possible, may be tempted to enter such a contract believing that they will become profitable. They assume this increased vulnerability to high losses without a real appreciation of the fact that the increased risk of loss may mean the difference between a business failure and a marginally profitable and continuing business. That the smaller providers are subject to this higher dispersion of risk is clear. It is difficult to understand the lack of recognition that these contracts force providers into roles as insurers (Cox, 2001).

Can Providers Manage Risk with Stop Loss Reinsurance?

Some might argue that providers can manage the risks of adverse financial experience by securing reinsurance. This is a flawed view. In a steady state condition, market forces will drive the price of insurance down to a minimum. The insurer
transferred the risk to the provider for the insurer's average cost. The average cost does not, and cannot provide a risk premium to the provider because the cost of providing a risk premium would drive the insurer's costs above the loss cost provision in the premiums the insurer receives from their insureds, because the risk increases when the insurer passes it on. In order to purchase reinsurance, the provider must further reduce their targeted service delivery provision level, engendering further reduced service, diagnosis, and treatment to their patients. Purchasing stop-loss insurance simply will not work because the provider doesn't have the money to do this. Such a scenario asks the provider to provide insurance coverage abdicated by the insurer and then to pay a reinsurer to cover the risk the first insurer should have aggregated and retained.

Legal Issues Regarding Contracts of Adhesion

Without intending to enter into legal discussions or ethical discussions, it is clear that these contracts exist between parties that have unequal understandings of the risk theoretic consequences of these contracts. Many private practices, hospitals, and nursing homes have become financially vulnerable because of these inherently unfair financial contracts. In many cases, these provider organizations have been faced with "Take It Or Leave It" contracts imposed by insurer organizations. These contracts have negatively affected providers, legitimate risk assuming and retaining insurers, and the public. It would appear appropriate for litigation to test the validity and fairness of these contracts in the courts and, if deemed appropriate, that victims of these contracts, providers and
disenfranchised consumers, be compensated for their losses. There is a possibility that these pre-emptions on State litigation might be overcome by resort to the legal principle of contracts of adhesion. This principle asserts that when one party to a contract has superior knowledge, the disadvantaged party may be able to have to contract declared null and void, restoring them to their pre-contract status.

However, some of the provisions incorporated in ERISA, the legislation that was supposed to guarantee the viability of employees pension plans, has given risk transferring entities a “Get Out Of Jail Free” card. Under ERISA, Federal law pre-empts State law, leaving entities harmed by these contracts to litigate in Federal courts where the jury awards are significantly lower than in State courts. This too may be subject to litigation since there is an overriding principle in law that no law shall be enacted that is against the public interest. Clearly the provisions protecting risk transferring insurers are not in the public interest since the transfers themselves are demonstrably flawed.

Conclusion

Average-cost based reimbursement plans are similar to insurance contracts in the sense that they transfer insurance risks from one entity to another. They are dissimilar to insurance contracts in that the party accepting the risks, for the average cost premium, is less capable of managing the risk than the original insurer. Provider contractees are smaller, more financially vulnerable, and inevitably harmed by the greater probability of the excessive losses they face. Using a normal distribution as an approximation to the
experience under a CC, this paper compared risk susceptibility between providers and insurers. Capitated health care providers face higher probabilities of financial loss and this can only be moderated by delivering lower levels of service than paid for in these agreements. Over time, one would expect these contracts result in reductions in the quantity and quality of services provided. Properly viewed as insurance agreements rather than service contracts, ACBR plans will result in financial ruin, takeovers and consolidation of health providers as well as reductions in available services, precisely the effects observed in the past three decades.

Public policy should treat CCs and ACBRs as insurance agreements. If providers do not have the financial capacity to effectively manage their risk under these contracts, these contracts should be impermissible. Capitation agreements, average cost reimbursement plans, and diagnosis related group finance plans are inappropriate mechanisms for cost control, and public policy should reflect this fact. Placing providers in the position of insurers, absent regulation and financial capability to fulfill this role is inappropriate and harmful to consumers, providers and insurers.
References

To understand God's thoughts we must study statistics, for these are the measure of His purpose. Florence Nightingale


Wadsworth, Stephans, and Godfrey discuss her work in Modern Methods for Quality Control and Improvement. Specifically her "polar chart" - developed to display mortality rates of Crimean War soldiers as discussed in an article in Scientific American Vol 250, No. 3 March 1984 on Florence Nightingale.

