

# Readmission Prevention Management Program

A reliable solution for managing the problems and costs associated with hospital readmissions

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Population Health Made Simple

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# **Readmission Prevention Management Program**

## **Introduction**

I first realized the magnitude and impact of readmissions on healthcare delivery systems in 1982 when I served as the physician advisor for utilization review at a community hospital in Michigan. I attended weekly meetings with the Social Services staff, VNA nurse and the charge nurse to safely discharge patients. There was not much support from the medical staff, as the activity was perceived as unnecessary, but in retrospect this practice was ahead of its time.

In 1983, I assisted the hospital with implementation of a new program named Inpatient Prospective Payment System (also known as the DRGs), which at that time was regarded as nebulous and a nuisance by many practicing physicians. The DRGs were thought to be bad for both the patients and their physicians because it allowed the government to dictate how much patient care was to be delivered and the means of doing so. The DRG program was the first major change in Medicare since its inception 18 years before but it had almost no provisions for readmissions. Growth of the managed care industry in the early 1990s brought attention to readmissions in terms of managing costs. In the last decade, readmission rates have become a performance measure and with healthcare reform, it became a part of the law.

I have followed the trends and issues associated with readmissions over the past 30 years. This whitepaper document is a compilation of some of the best articles that are related to readmissions and has been regularly updated through the years. It is intended to provide an accurate and comprehensive picture that represents different perspectives, examines policy issues, identifies best practices, and offers possible solutions to manage readmissions. The last part describes a new groundbreaking and innovative approach to readmission prevention by Avixena Population Health Solutions, LLC.

## **National Landscape**

Reducing hospital readmission rates has captured the imagination of US policymakers because readmissions are common, costly and (at least in theory) a reasonable fraction of them should be preventable. Policymakers therefore believe that reducing readmission rates represents a unique opportunity to simultaneously improve quality of care and reduce costs. As part of the Affordable Care Act (ACA), Congress directed the Centers for Medicare and Medicaid Services (CMS) to penalize hospitals with “worse than expected” 30-day readmission rates. This part of the ACA has motivated hospitals, health systems, professional societies, and independent organizations to invest substantial resources into finding and implementing solutions for the “readmissions problem.”

## Background

Nearly one-fifth of all Medicare beneficiaries - roughly 2.5 million per year - who are discharged from a hospital are readmitted within 30 days, according to the Medicare Payment Advisory commission (MedPAC). The issue of avoidable, preventable, or unnecessary (APU) hospital readmissions is now front and center in the national conversation about the quality of health care. The APU readmissions are a strong indicator of a fragmented health care system that too often leaves discharged patients confused about how to care for themselves at home, follow their physician’s instructions and get the necessary follow-up care.

### Definitions:

- Readmission - An all-cause admission to an acute care hospital within 30 days of a discharge from the same or another hospital for the same or a different diagnosis.
- Planned Readmission - An intentional readmission within 30 days of discharge from an acute care hospital that is scheduled as part of the patient’s plan of care (e.g., staged interventions, multiple surgeries).

### Classification of Readmissions:

	Unplanned Readmission	Planned Readmission
Unrelated to the Initial Admission	An <b>unplanned</b> readmission for which the reason for readmission is not related to the reason for the initial admission.	A <b>planned</b> readmission for which the reason for readmission is not related to the reason for the initial admission.
Related to the Initial Admission	An <b>unplanned</b> readmission for which the reason for readmission is related to the reason for the initial admission.	A <b>planned</b> readmission for which the reason for readmission is related to the reason for the initial admission.

According to AHRQ 90% of readmissions within 30 days appear to be unplanned, the result of clinical deterioration, and 75% of readmissions are preventable (MedPAC). Particularly, a recent article in Annals of Internal Medicine indicated that 36% of readmissions within seven days of discharge are preventable.

Not all readmissions are included; CMS excludes the following categories:

- Patients who are not enrolled in Medicare Fee-For-Service (FFS) 30-days post-discharge
- Patients who expire in the hospital
- Patients who leave against medical advice
- Patients younger than age 65
- Planned readmissions and transfers to other facilities

It is emphasized that it is not logical to expect a readmission rate of zero because planned or elective readmissions are an integral part of care. However, efforts should be directed at unplanned readmissions that are related to the initial stay which likely will offer the best opportunity for savings and care improvements.

### **Financial Impact**

Readmissions come with a hefty price tag in a world where health systems often do not have resources to spare:

- In 2016, there were approximately 4.087 million readmissions in the US, and they were associated with about \$41.3 Billion in hospital costs. Medicare readmission alone costs in 2016 were \$26 Billion.
- Medicare's average national hospital readmissions rate has remained steady over time at approximately 17.1%.
- 4% of Medicare beneficiaries have two or more readmissions within 30 days.
- Readmissions cost more than the initial (index) admissions.
- In 2017, 26.4% of inpatient discharges were followed by a return to the ED within 30 days. 42% of the first visit occurred within 7 days, and 44% resulted in readmission and 8% resulted in placement in observation status with an average cost of more than \$1,900 per ED visit.
- Medicare's spending for Observation care increased from \$490 million in 2011 to \$3.1 Billion in 2016.
- Medicare ED visits per 100,000 population increased from 54,371 in 2006 to 56,803 in 2015, while the percentage of ED visits resulting in admission decreased from 42% to 31% for the same period.
- Average readmission penalty in 2018 is \$217,000 which is usually three to four times higher than what CMS paid the hospitals for quality improvement incentives.
- The problem cuts across all lines of business: Medicare, Medicaid, Commercial payers and the Uninsured.
- Average readmission rate for inpatient psychiatric facilities is 21% (range 11%-35%).
- Readmission rate for Pediatric population ( $\leq 20$  years) is around 5.6%. (Sickle Cell disease and Bipolar Disorder have the highest readmission rates).

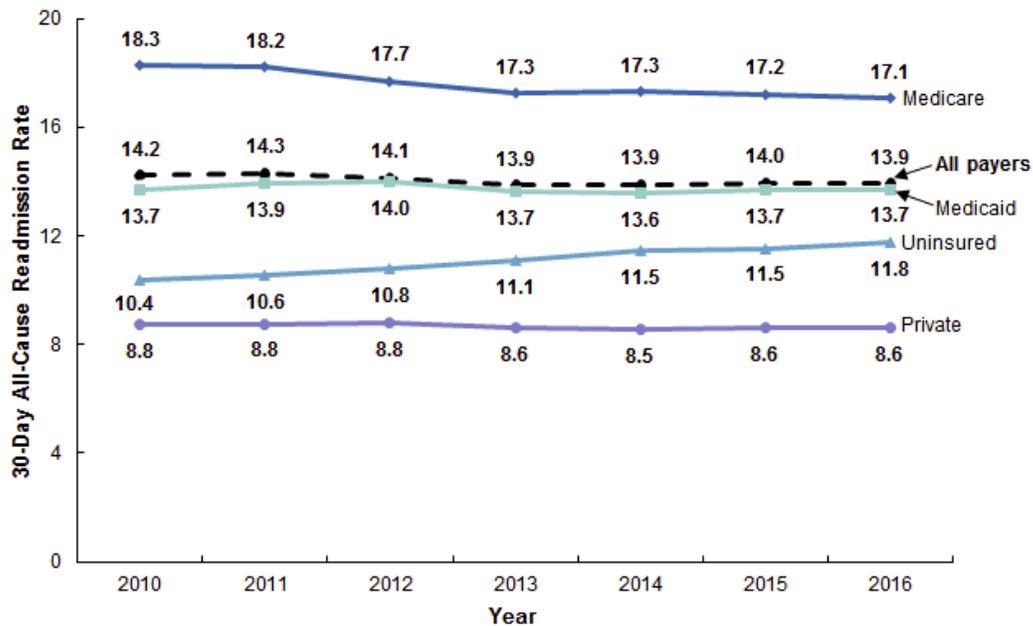
It should also be noted that State Medicaid Agencies are required by CMS to implement payment reform initiatives and as such, many State Medicaid Agencies are now mandating their managed Medicaid contractors to implement risk-based programs. Readmission prevention is the most widely used of these initiatives.

Commercial payers begun implementation of readmission programs and the major national carriers' contracts now routinely include provisions for readmission prevention.

Accountable Care Organizations (ACOs) and large self-funded employer coalitions have increasingly used readmission prevention as a primary cost containment tool.

Finally, there has been a recent wave of Pediatric ACOs and Clinically Integrated Organizations (CIOs) that have implemented or are in the process of implementing readmission prevention in their most recent contracts with Children’s hospitals.

**Figure 1. Rate of 30-day all-cause readmissions by expected payer, 2010-2016**



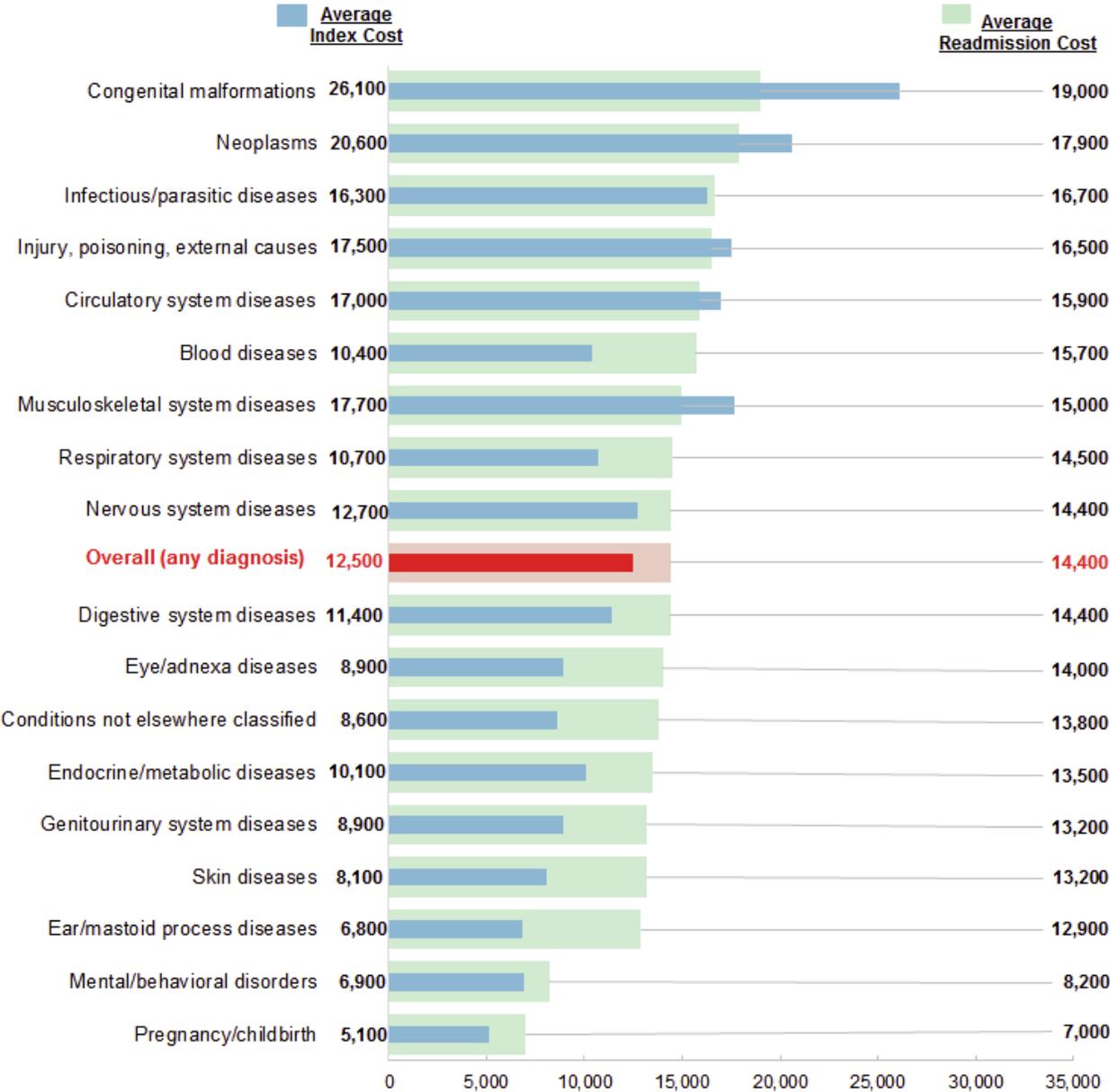
The above figure indicates that from 2010 to 2016:

- Medicare readmission rate decreased from 18.3% to 17.1%
- The uninsured rate increased from 10.4% to 11.8%
- Medicaid and privately insured patients had relatively stable readmission rates
- The highest readmission rates were among Medicare patients aged 21-64 years (21.2%) and nonmaternal Medicaid patients aged 45-64 years (20.4%)
- The largest increase in readmission rates from 2010 to 2016 across payers was for patients aged 1-20 years.
- The readmission rate for maternal patients of any age decreased by 20.5% for uninsured patients, by 17.7% for privately insured patients, and by 14.1% for Medicaid patients
- In 2016, blood diseases had the highest readmission rate (25.3%), followed by neoplasms (17.9%)
- Pregnancy/childbirth had the lowest readmission rate (3.6%)

Table-1 Rate and number of 30-day all-cause readmissions by expected payer and patient age group, 2010 and 2016 (Source AHRQ)- (latest available data)

Expected payer and age group	Readmission rate			Number of readmissions (thousands)		
	2010	2016	Percent change, 2010-2016	2010	2016	Percent change, 2010-2016
<b>Medicare</b>						
Total	18.3	17.1	−6.7	2,615	2,447	−6.4
21-64 years	21.8	21.2	−2.7	627	626	−0.2
65 years and above	17.4	16.0	−8.1	1,985	1,818	−8.4
<b>Medicaid</b>						
Total	13.7	13.7	0.1	804	862	7.2
1-20 years, non-maternal	11.4	12.3	7.8	111	105	−4.9
21-44 years, non-maternal	19.0	17.8	−6.6	241	276	14.5
45-64 years, non-maternal	21.9	20.4	−6.9	347	395	14.0
Maternal	5.1	4.4	−14.1	104	84	−18.9
<b>Private insurance</b>						
Total	8.8	8.6	−1.3	735	641	−12.8
1-20 years, non-maternal	9.4	10.8	15.7	62	58	−6.6
21-44 years, non-maternal	9.6	10.2	6.2	173	153	−11.9
45-64 years, non-maternal	11.0	11.0	0.2	434	378	−13.0
Maternal	3.4	2.8	−17.7	67	54	−18.3
<b>Uninsured</b>						
Total	10.4	11.8	13.7	169	137	−18.7
1-20 years, non-maternal	6.1	7.9	28.7	5	4	−30.8
21-44 years, non-maternal	9.9	11.8	18.7	75	64	−14.3
45-64 years, non-maternal	11.9	13.0	9.4	85	67	−21.2
Maternal	4.84	3.8	−20.5	3	2	−35.2

Figure 2. Average cost of index admissions and 30-day all-cause readmissions by principal diagnosis at index admission, ranked by average readmission cost, 2016 (Source AHRQ) - (latest available data)



The above figure indicates:

- The average cost of readmissions was highest for congenital malformations (\$19,000) and lowest for pregnancy/childbirth (\$7,000)
- In 2016, the average readmission cost across any type of principal diagnosis at index admission was \$14,400
- Compared with the average cost of the index admission, two-thirds of the principal diagnoses had a higher cost of readmission. A total of 12 of the 18 principal diagnosis types had an average readmission cost that was at least 10 percent higher than the average cost of the index admission in 2016

Table-2 Average Dollar Cost per Inpatient Day Across the US - 2016

State	State/Local Government Hospitals	Nonprofit Hospitals	For-profit Hospitals	State	State/Local Government Hospitals	Nonprofit Hospitals	For-profit Hospitals
United States	2052	2488	1889	Missouri	1681	2426	2024
Alabama	1421	1655	1456	Montana	533	1528	2363
Alaska	1541	2569	2991	Nebraska	915	2127	2069
Arizona	2034	2675	1959	Nevada	1933	2195	1715
Arkansas	1724	1717	1656	New Hampshire	NA	2479	1988
California	3068	3833	2189	New Jersey	4570	2749	1858
Colorado	2423	3119	2692	New Mexico	3029	2759	2203
Connecticut	3717	2680	2636	New York	2813	2512	NA
Delaware	NA	3162	1578	North Carolina	1973	1931	1510
DC	NA	2875	2364	North Dakota	NA	1980	4501
Florida	2190	2320	1682	Ohio	1696	2702	2656
Georgia	754	1956	1809	Oklahoma	1347	1893	2010
Hawaii	1274	2705	NA	Oregon	3820	3522	2442
Idaho	1733	3329	2141	Pennsylvania	760	2384	1942
Illinois	2810	2460	1688	Rhode Island	NA	2851	2071
Indiana	1533	2633	2360	South Carolina	2346	1966	1503
Iowa	1505	1524	1562	South Dakota	435	1352	3460
Kansas	1316	1835	2026	Tennessee	1547	1959	1656
Kentucky	1898	1861	1720	Texas	2427	2578	1874
Louisiana	1767	1951	1877	Utah	2885	2973	2417
Maine	1567	2298	920	Vermont	NA	2244	NA
Maryland	NA	2702	1191	Virginia	3266	1824	1835
Massachusetts	1850	3168	1838	Washington	3375	3582	2570
Michigan	1366	2298	2200	West Virginia	891	1861	1235
Minnesota	1225	2477	NA	Wisconsin	2526	2360	2780
Mississippi	970	1528	1757	Wyoming	1157	3592	2300

### Impact on Commercial Payers

Prices for inpatient care have risen more rapidly for patients with private insurance when compared to prices for patients with Medicare or Medicaid. Between Mid-2014 and first quarter 2018, inpatient prices for patients with private insurance rose about 13% compared to about 3% for patients with Medicare and Medicaid, and about 6% for the general economy.

In 2017 report Congressional Budget Office analysis of three large insurers and Medicare's claim data for 2013 found that the average Commercial payment rate for a hospital admission was

about \$21,400, but the prices for common types of admissions usually varied widely. By contrast, that the average payment rate in Medicare's FFS program for the same mix of admissions and hospitals was about \$11,400 (including Medicare's additional payments for admissions to teaching hospitals and certain other supplemental payments). On average, therefore, Commercial rates for inpatient services were 89% higher than Medicare's FFS rates-or Medicare's FFS rates were 47% lower than commercial rates, on average.

### **Accountable Care Act and Readmissions**

Section 3025 of the ACA outlines the details of the hospital readmission reduction program (HRRP) which limits payments to hospitals with excessive Medicare readmissions. The HRRP provides a financial incentive to hospitals to lower readmission rates. Effective Oct. 1, 2012, CMS began penalizing hospitals for what it determined to be excessive avoidable readmissions ( $\geq 14\%$ ). The penalties are grounded in the belief that clinicians should improve transition of care and ensure that patients and families are educated about their care before they leave the hospital. Additionally, hospitals are held accountable for the collaboration and coordination with patients, caregivers, physicians, and community agencies in the transition of care processes to improve patient care post discharge.

Available data at that time painted a very gloomy picture of care provided in hospitals. According to the Agency for Healthcare Research and Quality (AHRQ), 90% of readmissions within 30 days appeared to be unplanned, the result of clinical deterioration, and 75% were reported to be preventable in a MedPAC report of June 2008. The figures remain mostly unchanged as evidenced by a recent article in Annals of Internal Medicine indicating that 36% of readmissions within seven days of discharge were preventable.

The HRRP does not apply to all conditions. Rather, it focuses on specific disease conditions cited in the 2007 "Report to Congress: Promoting Better Efficiency in Medicare." MedPAC identified several conditions and procedures that accounted for 30% of potentially preventable readmissions. Currently HRRP includes: Acute Myocardial Infarction (AMI), Coronary Artery Bypass Grafting (CABG) surgery, Heart Failure (HF), Chronic Obstructive Pulmonary Disease (COPD), Pneumonia, and Total Hip Arthroplasty/Total Knee Arthroplasty. At present, 81% of the acute care hospitals in the US are receiving readmission penalties. It is important to note that HRRP does not include Cancer hospitals, Acute Rehabilitation hospitals, Long-Term Acute Care, Pediatric and Behavioral Health inpatient admissions.

### **Cost of Inpatient Care for Medicaid Expansion Members**

CMS had expected healthcare costs for new enrollees to reach only 80% of those of traditional Medicaid enrollees. But the new enrollees' costs were higher than those of traditional enrollees, and a new analysis showed that those costs continued to increase in the years after

enrollment. A new analysis found that average monthly costs for expansion enrollees who gained coverage in the first half of 2014 increased from \$324 to \$389 in 2017, a 20% increase.

### **Evidence of Improvement**

MedPAC's June 2013 Report to Congress indicated that, at a national level, all-cause readmissions for the three reported conditions had a larger decrease in readmissions over the three-year measurement period than for all conditions, suggesting a strong connection between public reporting and implementation of the HRRP. The results tell a compelling story that underlies the adage that, "what gets measured gets attention." But nonetheless, despite the decrease, the readmission rates remain stubbornly high.

The CMS had hoped that linking financial incentives to public reporting and standardized quality metrics would drive improvement in patient outcomes and reduce unnecessary costs to the system. However, latest figures indicate that from 2010 to 2013 readmission rate for Medicare dropped from 18.3% to 17.3%. It should be noted that this 1.0% actual reduction ( $18.3\% - 17.3\% = 1.0\%$ ) has been inappropriately reported as a 10% reduction ( $1.8\% / 19.5\% = 5.4\%$ ), and a success. **Again, on the contrary, the evidence over the past decade clearly indicates that many of the interventions currently in place to curb readmissions are ineffective.**

Unfortunately, too much of the conversation of late has turned to whether the penalties for excessive readmissions treat hospitals fairly, whether hospitals should be held accountable for issues patients face after discharge, and whether the readmission rate is even a valid measure of quality. The debate has grown particularly loud as the readmission penalties increased from 1% to 2% and now to a maximum of 3%, as directed by the ACA.

While the news about the increased penalties had drawn a great deal of attention, the fact is the average hospital was fined less in 2018 compared to 2017. This means some hospitals were making some progress. It may also indicate that patients are getting better care and as a result, fewer of them are revolving back through the hospital door. This is as it should be; going to the hospital should be a last resort. Hospitals are a costly, and at times even dangerous, venue for care.

### **Readmission Penalty Expansion in 2017 and Beyond**

Attention to the readmission issue was due to its identification as a cost containment initiative, and this initial focus resulted in a brief decline in the national rate of readmissions from 19.8% in 2008 to 17.8% in 2013. The next phase of expansion included the addition of more diagnoses, increasing maximum penalties from 1% to 3%, and then changing the calculation base from an annual to a 3-year average performance. Recent analysis of penalty data from 2013 to

2017 for 3,229 acute care hospitals revealed that 52.4% were penalized all five years. And hospitals that were penalized in the first year of the program were more likely to continue to be penalized, and to be penalized more, throughout the program. In 2017, the total financial penalty for the hospitals which received the maximum 3% penalty was approximately \$11.6M, or an average of about \$305K per hospital. The average penalty in 2018 was \$217K which indicates more hospitals are receiving penalties and the number of those with maximum penalty doubled to 6% in 2018.

This abatement failure is multifactorial and may be the result of a continued lack of understanding of the root causes, lack of resources, lack of market demand or differentiation, and/or insignificant penalties. It also may signal that certain hospitals are indifferent to or non-supportive of this national initiative.

The CMS recently released a slew of revisions how it will pay hospitals in its fiscal 2018 (which began in October 2017). The rule applies to about 3,348 acute-care hospitals and 430 long-term acute-care hospitals. Those penalties were around \$556 million or an increase of about \$20 million over the previous year. The CMS estimated that it 81% of hospitals were penalized in 2018. It does so by reducing Medicare payments to hospitals whose readmission ratios exceeded the national average, although it limits those penalties to 3%.

Driving the anticipated increase in penalties for fiscal 2017 were changes in how the CMS calculated readmissions for the selected diagnoses, as well as the procedures for which hospitals can be penalized for readmissions within 30 days.

According to the 2018 figures, the percentage of hospitals that received the maximum penalty increased to 6% compared to 3% in 2017. The average fine is 0.73% of base payment rate. To further compound the matter, CMS announced that beginning in 2016 the new methodology to calculate the readmission rates will be the average score over the past three fiscal years. This means many institutions will continue to face the penalties for at least one or two more years even if their readmission rate were to be corrected today. Moreover, the law requires that penalty assessments be based on average hospital performance, rather than on fixed targets. In other words, CMS assesses hospital penalties based on a curve, resulting in a certain percentage of hospitals always be penalized, regardless of improvements in national readmission rates.

Latest figures indicate that in 2017 only 792 hospitals (22.6%) received net payment increases after readmission and hospital acquired condition penalties were factored in. Recent analysis of penalty data from 2013 to 2017 for 3,229 hospitals revealed that 52.4% were penalized all five years. In addition, hospitals that were penalized in the first year of the program were more likely to continue to be penalized, and to be penalized more, throughout the program. The significant financial

impact on these institutions has limited their ability to meet the needs of their patients, to invest in quality improvement activities and has eroded their competitiveness.

It is the authors' experience, that the current reported readmission rates are understated. Exclusion of patients who expired during readmissions artificially reduces the readmission rate. The Two-Midnight-Rule may erroneously classify an Inpatient admission as an Observation. Increased number of Observation stays and prolonged care in the ED, by increasing the time interval between admissions, also results in underreporting of the incidence of readmissions. Finally, coding changes also artificially lower the readmission rate by allowing more diagnoses to be listed on inpatient claims.

Surprisingly, there has been little focus on best practices and sharing those best practices that have resulted in better readmission rates for the 19% of the acute care hospitals that are not penalized. It should also be noted that there is no additional reimbursement for best-in-class (lowest) readmission rates. There has been little valid information made available not only to the public but also to patients deciding on where or where not to receive care at a selected hospital.

### CMS Penalty Calculations

CMS publishes a readmissions adjustment factor for each affected hospital to indicate the level of its penalty, which ranges from 0.9700 (reflecting the maximum 3% penalty for FY 2016) to 1.0000 (indicating no penalty). The penalty is assessed against Medicare base operating DRG payments for all discharges at a penalized hospital. However, CMS does not publish an estimated penalty for individual hospitals. (The Avixena website [www.avixena.com](http://www.avixena.com) will allow individual hospital's rates to be calculated if CMS Certification Number [CCN] is known.) Below is a sample calculations based on the formulas laid out by CMS at: <https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Readmissions-Reduction-Program.html>

- **Base Operating DRG Payment Amount:**  
[case mix index × (labor share × wage index) + (non-labor share × COLA)] + new technology payments, if applicable] × total Medicare cases  
[[1.3656 × (3,804.40 × 1.0537) + (1,661.69 × 1)] + 0] × 5,433 = 41,852,953

To estimate a hospital's total readmission penalty, the Medicare case-mix index can be used in place of the DRG weights for each case.

- **Readmissions Payment Adjustment Amount:**  
(base operating DRG amount for all admissions × readmissions adjustment factor) – base operating DRG amount for all admissions  
(41,852,953 × .9765) – 41,852,953 = 983,544

For FY 2016, 2,620 facilities were penalized. The highest penalty for a single facility was over \$3.6 Million. 49 hospitals were penalized at least \$1M in FY 2015. 38 hospitals received the maximum 3% penalty, but only two hospitals are members of both groups. In fact, eight of the hospitals experiencing over \$1M in penalties had a readmissions adjustment factor of 99% or greater, indicating a penalty of less than or equal to 1%. This demonstrates that the penalty percentage played only a small part in the total impact for a given hospital. More important drivers were the total volume of Medicare patients and the case-mix index of the provider.

In 2017, the total penalty for the hospitals which received the maximum 3% penalty was approximately \$11.6 Million, or an average of about \$305K per hospital. The average penalty in 2018 was \$217K which indicates more hospitals are receiving penalties, and the number of those with maximum penalty doubled to 6% in 2018.

Due to a flaw in the language describing the calculation of the excess readmission penalty in the ACA, measures with a low overall readmission rate will cause a penalty to increase by a factor that is the inverse of the Medicare-wide readmission rate. For example, for Total Hip and/or Knee Arthroscopy, this measure has an overall readmission rate of only about 5%. Therefore, the calculation of the penalty imposes a reduction in Medicare reimbursement of approximately twenty times the payments hospitals receive for excess readmissions. It is believed this was the greatest driver of the increase in the overall FY 2015 HRRP penalty by almost \$200M. This higher overall penalty has continued in FY 2017.

It is remarkably interesting to examine the calculations behind the HRRP as described in Section 3025 of the ACA as amended by section 10309 of the ACA.

Table-3 The MedPAC provided a simplified example of how the calculation overly penalizes providers in their June 2013 Report to Congress.

<b>Number of admissions in Measure</b>	<b>100</b>
<b>National average readmission rate for the Measure</b>	<b>20%</b>
<b>Expected hospital readmissions</b>	<b>20</b>
<b>Actual hospital readmissions</b>	<b>24</b>
<b>Adjusted hospital readmissions</b>	<b>22</b>
<b>Excess readmissions</b>	<b>2</b>
<b>Excess readmissions ratio</b>	<b>1.1</b>
<b>Average base operating DRG payment for Measure</b>	<b>\$10,000</b>

In this example, the base operating DRG payments for the two excess readmissions would be \$20,000 (\$10,000 x 2).

However, the definition of “aggregate payments for excess readmissions” in the ACA, section 3025(4)(A), is “the product, for each applicable condition, of (i) the base operating DRG payment amount for such hospital for such applicable period for such condition; (ii) the number of admissions for such condition for such hospital for such applicable period; and (iii) the excess readmission ratio...minus 1.” Based on this definition the excess readmissions ratio is multiplied by the operating DRG payments for total admissions for the measure, not the operating DRG payments related to the expected readmissions. **The result in the example above is \$100,000 [(100 x \$10,000) x (1.1000 – 1)], five times the actual payments received for the excess readmissions.**

The “aggregate payments for excess readmissions”, \$100,000 in the above example, flows into the calculation of the readmission adjustment factor. Therefore, the hospital is penalized at a much higher rate. (For the record, the actual cost of a knee arthroplasty admission in the top 20 largest cities in the US range from \$19,961 in El Paso, Texas to \$31,751 in San Francisco, California.)

A recent study in Health Affairs indicated that reductions in readmissions rates corresponded to a change the CMS made allowing hospitals to increase the number of diagnosis codes that could be submitted in inpatient claims. That change impacted the risk-adjustment the CMS uses to determine changes in readmission rates, making patients overall appear sicker and therefore caused any readmission improvements made by hospitals to appear better. This was the **second** study in 2018 that pointed that some of the improvements seen in readmission rates were caused by changes in coding practices.

### **HRRP Program Faults and Shortcomings**

HRRP has several major flaws:

#### **1- Program Design:**

- A.** There is no scientific data that supports 30 days as the interval for readmissions. (Our analysis indicates that for most diagnoses, the accurate measure is between 45 and 60 days).
- B.** By allowing only a limited number of diagnoses, HRRP allows potential gaming of the system such as by allocating resources to only a subsection of admissions that count rather than improve the overall delivery of care. This may have resulted in unintended consequences such as an increased rate of death following premature discharges for congestive heart failure. It should be noted that the 21st Century Cures Act asked MedPAC to assess the decline in relation to increases in observation stays and emergency department (ED) visits. MedPAC found that the penalty program did lead to lower readmission rates but was not the sole cause of increases in observation stays and ED visits. Another factor is coding changes permitted by CMS that may have driven reductions in readmission rates by allowing an increase in reported diagnosis codes that impacted the risk-adjustment calculation CMS uses to determine changes in readmission rates.

- 2- The program does not require proof of continuous quality improvements.
- 3- There are no penalties or denied reimbursement for those physicians who inappropriately discharged patients when their care was not optimized or if patients were discharged to the wrong destination or level of care.
- 4- Hospitals classified as “Number of Cases Too Small” are exempt from inclusion.
- 5- The penalties are minimal, and most hospitals are treating them as just a cost of doing business.
- 6- The analysis is based on the use of raw claim-based data and with no provisions for Social Determinants of Health or Risk severity.
- 7- There is a major flaw in the formula that calculates the penalty. For example, this results in receiving penalties for joint replacements with penalties several times the cost of the original DRG. This is evidenced by MedPAC, who in their June 2013 Report to Congress provided a simplified example of how the calculation overly penalizes providers.

### **Readmission penalties for Skilled Nursing Facilities**

Beginning on October 2018 CMS began penalizing SNFs for high readmission rates. Of the 14,959 skilled nursing facilities that are included in the CMS' Skilled Nursing Facility Value-based Purchasing Program, 73% (11,000 facilities) received a penalty while 27% got a bonus. The data also showed that the SNFs on average got worse at managing readmissions the longer they were in the program. The penalties were mandated by the Protecting Access to Medicare Act of 2014 in an effort to transition SNFs from fee-for-service to value-based payment. Under the program, SNFs will see up to a 1.6% bonus in their **Medicare Part A payments or up to a 2% cut.**

### **Lack of Consideration for Social Determinants of Health**

Although CMS adjusts for clinical risk factors (including patients' age, gender, and comorbidities), it does not adjust for socioeconomic factors, which often play a significant role in access to home and community support services aiding a patient's recovery after hospitalizations. For example, lower-income communities and families may have limited resources for reliable transportation to take patients to follow-up medical appointments, assistance with patient mobility and daily living needs during recovery, and access to foods that meet patients' special dietary needs. Further examination of ways to address patient and community needs in lower income areas has offered insights into ways to lower hospital readmissions among patients in hospitals with higher shares of low-income patients. It should be noted that CMS recently has proposed to implement the socioeconomic adjustment approach mandated by the 21st Century Cures Act for the FY 2019 HRRP. Under this proposal, CMS would assess penalties based on a hospital's performance relative to other hospitals with a similar proportion of patients who are dually eligible for Medicare and Medicaid.

## **Improving Medicare Post-Acute Care Transformation Act of 2014**

Lack of substantial improvement which is largely attributed to ineffective transition to post-discharge led to enactment of “Improving Medicare Post-Acute Care Transformation Act of 2014”, which required development of new ways to track sharing of drug information between providers as well as between clinicians and patients. The CMS is accepting comment through May 8 of 2018 on what it formally calls "Transfer of Health Information and Care Preferences When an Individual Transitions." The two proposed measures are Medication profile transferred to provider, and Medication profile transferred to patient.

The goal of the CMS' effort is to make providers more accountable for transferring important medication information such as dose and frequency, according to the agency. When a resident is discharged home, the second measure would track the transfer of medication information from a provider to the patient, family, or caregiver.

It is yet to be determined how CMS will enforce compliance with the new rules, and how it will address poor performance.

### **Potential Implications of Expanding the Hospital Readmissions Reduction Program to the Inpatient Psychiatric Facility Prospective Payment System**

The potential for decreased costs and increased quality of care may make policymakers want to expand the HRRP to other inpatient settings. Of the total 470,399 psychiatric discharges in CY 2010, 147,443 were readmissions from either a freestanding Inpatient Psychiatric Facility (IPF) stay or psychiatric unit. Thus, the overall readmission rate was 31.4%. Of the many reasons to implement a hospital readmission penalty program, one of them is to ensure and improve quality of care received by the patients. Maintaining the quality of care furnished to patients with serious mental illnesses may require looking beyond the IPF stay. CMS has developed various initiatives to ensure quality of care. For example, the ACA mandated the development of a quality reporting program for IPFs by 2014, which included a payment incentive. For rate year 2014 and beyond, annual Medicare payment updates were reduced by 2.0% for any freestanding IPF or psychiatric unit paid under the IPF Prospective Payment System (PPS) that did not comply with quality data submission requirements.

### **Medicare's Bundled-payment Expansion**

Bundled payment is a single payment to providers or health care facilities (or jointly to both) for all services to treat a given condition or provide a given treatment. In simple terms, the payer makes one single payment to multiple providers in the care. Bundled payments usually cover all costs associated with a procedure or treatment up to 90 days post discharge and would include readmissions. The idea is to create a financial incentive for providers to better coordinate care and keep costs down.

The CMS was planning to implement a five-year demonstration project on July 1, 2017 in 98 randomly selected metropolitan areas. The project would make hospitals in 98 markets financially accountable for the cost and quality of all care associated with coronary bypass surgery and heart attacks. The CMS also plans to expand its first and mandatory bundled-payment model which took effect in January 2016 and covers total hip and knee replacements to include surgeries repairing hip and femur fractures. But for unexplained reasons these were put on hold.

The change came as part of a broader nationwide shift toward value-based payment systems that aim to reward physicians, hospitals, and other providers for quality over quantity of care. The CMS aimed by 2018 to have half of FFS Medicare payments in value-based payment models. However, in February 2017 the HHS Secretary delayed the effective date of the program, despite a strong support from the American Medical Association.

### **New Public Reporting Requirements**

CMS expanded the publicly reported outcome measures to include 30-day readmissions in 2009. In addition, CMS requires hospitals to post their readmission rates for Medicare and all other payers on its website. CMS believes that publicly reporting these measures increases the transparency of hospital care, provides useful information for consumers choosing care, and assists hospitals in their quality improvement efforts. In addition to negative public relations impact, public reporting of readmission rate can be detrimental to hospitals' all other lines of business and services, and overall competitiveness.

### **What Is at Stake?**

Recent reports indicate that in most US hospitals lose money from Medicare and Medicaid admissions. In 2013 Medicare losses were reported to be three times higher than Medicaid. The average hospital profit margin on Medicare patients has is at negative 10%, and it is closer to negative 18% for the three-quarters of hospitals that lost money on their Medicare business. Intense pressure from the Medicare program on hospitals will invariably worsen in the coming years ahead. Hospitals must act now to prevent an already bad situation from getting worse and possibly even threatening their viability.

### **Summary**

Readmissions have become an increasingly painful and public problem for hospitals in financial, competitiveness and patient care related issues. In 2017 the Medicare all-cause 30-day readmission rate for acute care facilities and SNFs were 17.1% and 25% respectively. While no easy fix exists to prevent readmissions, hospitals and health systems must take a proactive approach

by accepting readmissions as a real problem and allocating the appropriate resources needed to fully understand the problem at hand, as well as enlisting the involvement of the many different groups that can contribute to a successful readmission prevention initiative. As a public policy matter, the readmission problem remains a disturbing national issue, one that reflects a fragmented care delivery system with divergent interests, misaligned incentives, lack of focus on patient needs, absence of information sharing and interoperability, as well as an antiquated, ineffective payment model. Over the past eight years HRRP has failed to achieve its desired goals, warranting the need for a paradigm shift.

### Potential Solutions

What is needed is a new system based on 3 elements: Patient centered care, a new financial model for hospitals and providers, and the use of technology.

- **Patient centered approach-** CMS should require hospitals to readily demonstrate a readmission preventions and quality improvement program based on continuous quality improvement. This may include implementation of new tools to identify high-risk individuals, proof of a fully implemented and functional Transition of Care Program, and ensuring that every single person is discharged with an evidence-based, real-time readmission prevention plan that provides care continuity and information continuity. New performance metrics focused on APU readmissions, individuals with multiple readmissions within a 12- month period, and correct calculation of readmission rate should be included. Creation of new partnership is critical for the success of the program
- **Replacement of the penalties with a new reimbursement pay for readmissions** - As demonstrated previously, 82% of acute care hospitals are currently receiving readmission penalties despite the maximum allowable penalties. Increasing the amount of penalties is very unlikely to change the hospitals' attitude toward readmissions. CMS can financially reward for lower rate of readmissions, refuse to pay for an APU readmission, or implement a new payment methodology for inpatient admission.
- **Impact of Technology** - Medicine is an information-rich enterprise. Federal regulation has accelerated the need for adoption of Electronic Health Records (EHR). Health care providers and administrators have been scrambling to find ways to comply. Currently, a significant portion of data and information is still collected via standard paper-based records and then entered into EHR and legacy systems. Many health care providers are now using mobile tablet and laptop systems for the purposes of eliminating paperwork and making the collection process more efficient. This adoption of technology for EHR and the use of mobile devices and apps for gathering data have opened an opportunity for apps that will not only make the process of gathering data more efficient but more importantly, provide ready access to useful information and value-added solutions that will be available to hospitals, caregivers and

payers.

The impact of technology via the use of apps and Machine Learning will also be cost avoidance with significant savings to providers and payers. This will support the triple aim of better care outcomes, reducing costs, and improved patient and provider experience with care delivery.

### **Implementing a Readmission Prevention Program**

There is no doubt that CMS will expand the readmissions reduction program. Therefore, it is highly recommended that hospitals and health systems develop a readmission reduction and/or prevention process. Readmission prevention is a complex task and it should become an ongoing effort, not a short-term project that ends after results improve.

### **Root Cause Analysis**

The majority of APU readmissions result from a combination of healthcare delivery systematic issues and individual patient attributes.

System issues:

- Failure to accurately identify individuals who are at high or medium risk for readmission
- Lack of evidence-based assessment tools for Pediatric and Behavioral Health populations
- Lack of system support to create and execute post discharge care plans
- Lack of information continuity
- Lack of interoperability amongst Electronic Health Record Systems
- Lack of analytic support needed for organizational learning

Individual patient attributes:

- Clinical factors that lead to readmissions:
  - o Disease burden
  - o Inability to adhere to and comply with a treatment plan
  - o Lack of timely follow-up
  - o Coexisting Behavioral Health diagnosis
- Non-clinical factors that lead to readmissions:
  - o Poor access and availability of care
  - o Low health literacy
  - o Lack of adequate support structure
  - o Lack of information continuity

### **Where to Start?**

To reduce readmissions, hospitals should create a multidisciplinary team, including individuals who are committed to reducing readmissions and represent different stakeholders who can influence readmissions. Participants might include employees from partner entities outside the primary organization, such as skilled nursing facilities' staff, patients and their

caregivers, physicians and providers, community stakeholders, payers, and Durable Medical Equipment (DME) and technology vendors.

### **Goals and Objectives**

The process team should be tasked with clear goals and objectives. These include defining a plan for implementing change, reducing readmissions, and monitoring performance. The federal program currently focuses only on patients admitted with heart failure, acute myocardial infarction, pneumonia, COPD, and elective total knee/hip arthroplasty. However, the inevitable expansion of the program will include additional conditions or diagnoses, and this should motivate hospitals to begin work on all readmissions rather than on specific conditions or diagnoses.

### **Selection of Strategies**

After the work group is established, the team might use several strategies to achieve its goals, such as:

- Developing a better understanding of the problems
- Identifying patients at increased risk for readmission
- Preparing standardized discharge education tools
- Implementing an effective Transitions-of-Care Program
- Coordinating care with community home care agencies, physician groups, skilled nursing facilities, other community hospitals and payers

### **Understanding the Problem**

It is tempting to start implementing changes in multiple areas simultaneously but doing so might be a waste of resources. Consequently, the first task for the management team is to understand the scope of the hospital's problem. One critical task is to evaluate the financial impact of the hospital's current performance (the penalty for excessive readmissions). This analysis should not only measure the effect of the current year's penalty, but also consider the impact on future years.

Other outcomes such as negative publicity, impact on future growth, market competitiveness and staff retention should also be completely reviewed and analyzed.

### **Identifying Patients at High Risk for Readmission**

Case Management departments should have processes in place to identify patients at high- or moderate-risk for readmission and prioritize discharge planning for these patients. The

risk factor includes, but are not limited to:

- Behavioral health diagnoses
- Substance use disorder
- Three or more ED visits in a two-month period
- High-risk medications (anticoagulants or diuretics)
- Polypharmacy (more than six medications)
- Multiple chronic diseases
- High or low body mass index
- Leaving against medical advice
- Social determinants of health

### **Interventions**

After patients are identified to be at high or moderate risk for readmission, specific interventions should be included in these patients' discharge plans.

### **Standardizing Discharge Activities and Educational Tools**

Reducing readmissions is not just a concern for case managers. Because patient education is a primary responsibility of the nursing staff, nurses should be educated on the high-risk factors as well as on actions that can be taken to avoid readmission. These actions include:

- Educating and re-educating patients and their caregivers
- Assessing patients' understanding of their care requirements
- Assessing patients' awareness of early warning signs that require immediate notification to their physicians
- Beginning discharge education as soon as the patient and caregiver can cooperate
- Providing a comprehensive plan prior to discharge, including the following components:
  - medication reconciliation
  - Arranging for follow-up appointments and tests prior to discharge
  - Post-discharge services set-up
  - A written discharge plan; instructions on what to do if a problem arises
  - Disease specific education
  - A discharge summary sent to the patient's primary care provider and/or specialist.
- In many cases, providing ongoing education throughout the hospitalization and for 24 to 48 hours after discharge has proven to be beneficial for patients. Patients should be educated regarding the importance of keeping their own medical journals to include their medications, test results and hospitalizations.
- Ideally, a pharmacist should also be involved in patient education and medication

reconciliation at discharge. Case managers need to verify that:

- Patients have all their medications and that they understand why they are taking those medications
  - They grasp the importance of taking the medications as prescribed
  - They understand any potential side effects
  - Degree of caregiver and family support
- While the patient is still in the facility, all care providers should ensure that patients and caregivers are educated about the disease process. Discharge instructions can also be offered on the hospital's website so that patients can access this information at home and more fully understand the instructions. Hospitals can also use their websites to promote ongoing communication with patients, to answer questions and to provide more clinical education. Each of these steps will improve patient outcomes, increase customer and provider satisfaction, and reduce readmissions.

### **Transition-of-Care Programs**

Over 22% of all hospital discharges, or nearly eight million patients, received post-acute care services in 2013, and Medicare expenditure for post-acute services is estimated to be around \$60 Billion annually (12 percent of its annual expenditure). But nonetheless, despite the critical importance of post-acute care outcomes and financial implications, very few patients and their caregivers are familiar with it. Many health systems and providers have only elementary understanding of post-acute care services and give little thought to where their patients are heading after discharge, if it does not extend the acute LOS. Needless to say, that this lack of understanding correlates well with limited infrastructure deployed to manage post-acute care services. In addition, Medicare, Medicaid, and most Commercial health plans, generally take little notice of the differences in services across post-acute providers and service lines.

Hospitals must either collaborate with managed care organizations' Case Management Departments or develop a transition-of-care work group to include home health care agencies, skilled nursing facilities, long-term acute care hospitals, rehabilitation hospitals, DME vendors and community providers. Standardized intervention and education tools will result in hospital, physician, home health agency and skilled nursing facilities all using the same language and documents to educate and instruct the patients.

Additionally, hospitals should try to engage home health care agencies and skilled-nursing facilities in addressing some of the causes of readmissions and assist with managing patients to prevent APU readmissions. Activities intended to build collaboration and reduce or prevent APU readmissions could include:

- Working with home health care agencies to develop disease-specific programs that track data and create plans to reduce readmission rates;

- Working with skilled nursing facilities to inform of the moderate and high-risk admissions prior to patient's transfers to skilled nursing facility;
- Working with skilled nursing facilities to identify reasons why patients are sent back to the hospital and the challenges they face;
- Working with the skilled nursing facilities to provide advanced cardiac life support training, tele-monitoring links, ECGs with quick reads and access to Hospitalists to answer clinical questions instead of sending the patient directly to the ED;
- Partnering with community agencies to assist with education and access to other healthcare professionals; and,
- Working with Post-Hospital Care Providers - Although hospitals may not have influence over the clinical practices of other facilities, given the consequences of readmissions, hospitals should establish stronger working relationships with other providers to extend care beyond the hospitalization. Case Managers and Social Workers, who work with other care providers daily, need to redefine these relationships to establish better communication both preceding and following discharge. Working collaboratively with these other facilities is imperative when tracking patients who are subsequently admitted to other hospitals and when developing patient identifiers. This tracking can be used for a hospital's internal quality improvement purposes as well as for validating readmission data.

### **Avixena Population Health Solutions, LLC**

Mission Statement: Avixena Population Health Solutions provides real-time state of the art Population Health Management support systems via Cloud-based mobile devices for Health Systems, Payers and Physicians.

Vision Statement: Avixena Population Health Solutions will be the unique provider of a complete suite of applications covering the entire spectrum of cloud-based Population Health Management initiatives via mobile devices.

Founders: Avixena Population Health Solutions (PHS) with offices in Tempe, Arizona was formed in 2014 by Mehrdad Shafa, MD, Mario Vassaux and Elisabeth Graf- Shafa, MD.

### **Products and Solutions**

Avixena PHS' first set of cloud-based products include the Readmission Assessment Survey Tool, Behavioral Health Readmission Assessment Survey Tool, Pediatric Readmission Assessment Survey Tool, High Risk Transfer to Extended Care Facility Tool and Readmission Root Cause Analysis Tool. These tools are designed for mobile platforms on the iOS and Android operating systems as well as traditional desktop and laptops running

Windows, Apple OSX and Chrome OS. The system includes a program application (AKA app), HIPAA compliant data warehouse and real-time information availability.

These evidence-based products were developed by Dr. Shafa and Dr. Graf-Shafa based on their experience with reviewing more than 60,000 inpatient Medicare FFS, Medicare advantage, D-SNP, and Managed Medicaid admissions; 20,000 pediatric admissions; and 4,000 behavioral health admissions in Arizona, Arkansas, California, Georgia, Indiana, Maryland, Missouri, Oklahoma, South Carolina and Texas from 2007-2014. This total includes approximately 5,000 Adult, 500 Behavioral Health and 1,200 Pediatric readmissions.

- Readmission Risk Assessment Survey (RAS) Tool - This Tool is the most advanced assessment tool in its class and is designed to identify patient's readmission risk status, has a scoring system, and allows for automatic generation of options (such as a discharge plan).
- Pediatric RAS Tool - Pediatric RAS Tool has all the features described in the Adult RAS Tool but also incorporates and quantifies the effect of issues limited to pediatric population on readmissions (i.e., impact of pre-term birth, genetic conditions, congenital malformations, immunization status, impairment of growth and development, and caregiver's mental health status). The Pediatric RAS Tool was developed based on Dr. Shafa's experience with two of the largest Pediatric-only managed care organizations in the US.
- Behavioral Health RAS Tool - The Behavioral Health RAS Tool has all the features described in Adult RAS Tool and is the only tool of its kind that identifies and incorporates the impact of age, previously diagnosed behavioral health conditions, and discharge destination on readmissions.
- Extended Care Facility Transfer Readmission Risk Assessment (TRRA) Tool - This Tool is designed to alert and assist extended care facilities with managing moderate- and high- risk patients prior to transfer from the acute care setting. The same methodology was used to develop and validate its effectiveness as was used for the RAS Tools.
- Readmission Root Cause Assessment (RRCA) Tool - This Tool was designed to assess root causes and contributing factors that have resulted in readmissions and automatically creates an action plan to mitigate and manage the identified issues.

The Avixena PHS apps were fully designed to work with Legacy IT systems. To validate the RAS and TRRA Tools, approximately 700 adult, 500 pediatric and 250 behavioral health readmissions were assessed. Each question was evaluated for validity, applicability, ease of assessment and up-to-date medical evidence. The results indicate that all Tools have a specificity, sensitivity, and positive predicting value of >90% for identification of patients who are at high-risk for readmission.

Technical Specification of RAS and TRRA Tools - The apps and infrastructure to support these tools are built with the following attributes:

- Secure cloud-based application servers
- Web app support for modern desktop and mobile browsers including Chrome, Internet Explorer, Firefox, and Safari
- Native app support for mobile and desktop devices including those operating on the iOS, Android, Windows, Mac OSX and Chrome OS platforms
- HIPAA-compliance
- Integration-capable with existing EHR/EMR and legacy systems
- RESTful HTTP API to integrate features into custom applications
- Feature rich reporting and analytics
- Simple web-based user administration

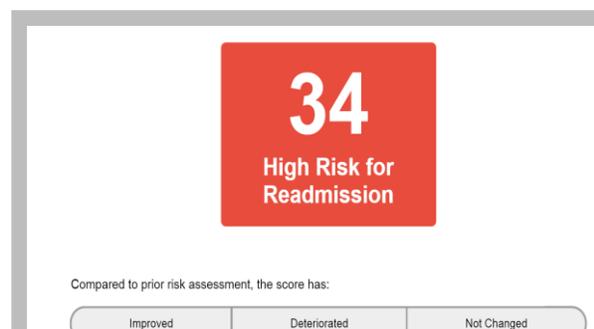
### Examples of How Avixena PHS Tools Can Be Used to Prevent Readmissions

The following real-life examples demonstrate effectiveness and accuracy of Avixena PHS Tools:

#### Sample Case for RAS Tool

85-year old patient with the diagnosis of dementia and chronic atrial fibrillation controlled on Coumadin was brought to ED from his assisted living facility. He was admitted with the diagnosis of aspiration pneumonia 8 days ago. He has had 2 previous admissions and 3 ED visits in the past year for the same reason. In addition to right lower lobe pneumonia, he is found to have mild anemia of 9 grams/dL and a serum albumin of 2.5 grams/dL. Hospital social worker is working with Special Need Plan (SNP) case manager to facilitate discharge to an Extended Care Facility (ECF) for one week to complete his IV antibiotics. His Power of Attorney (POA) is his son who was contacted by phone and approved the transfer.

It may appear that this patient's problem is a simple and uncomplicated case of aspiration pneumonia, and all he needs is to complete one week of IV antibiotics. However, **if assessed with the RAS Tool this patient has a high score and is at high-risk for readmission.** A snapshot of the Tool is presented Figure-3:

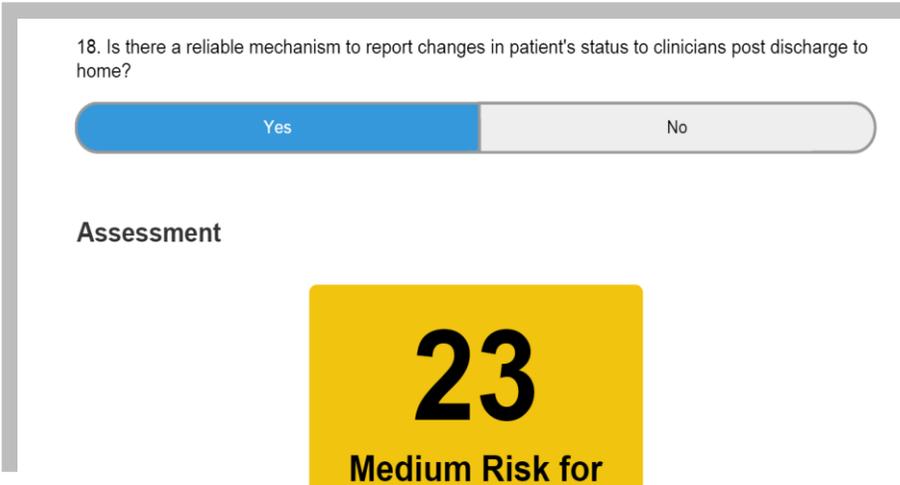


**Sample Case for Extended Care Facility Transfer Readmission Risk Assessment (TRRA) Tool**

The patient described in the RAS Tool was accepted by the ECF for one week of IV antibiotics. His discharge orders and antibiotics regimen were faxed to the ECF. Discharge summary was not available and was to be faxed to the ECF in 3 days after dictation by the hospitalist. Upon arrival to ECF the admitting physician verbally approved continuation of previous medications and the nurse practitioner was to perform a complete H&P on the third day of admission.

On the second day of stay in ECF, patient was found to be very agitated and required constant supervision. He was later found to be very tachypneic with bedside oximetry of 82% on room air. EMS was activated, and patient was transported back to the originating hospital ED.

By using the TRRA Tool, this member would have been identified to be at very high risk for readmission from the ECF since important factors (i.e., the need for complete discharge plan and medication reconciliation) had not been communicated to the ECF. A snapshot of the Tool for another case is presented in Figure-4:



**Sample Case for Readmission Root Cause Analysis (RRCA) Tool**

Following readmission to the hospital it was discovered that the patient had suffered another episode of aspiration pneumonia affecting RUL and LLL. The RRCA Tool should be completed for this patient to prevent another readmission. The RRCA Tool can identify the failed steps that resulted in readmission and can provide a work plan that should be implemented to prevent avoidable future ED visits and inpatient readmissions.

A snapshot of the Tool is presented in Figure-5:

## Assessment

- Plan of care was not adequate to meet patient's needs after discharge from hospital
- The patient was not identified as a High Risk for Readmission.
- Necessary follow up arrangements were not made prior to discharge

### Sample Case for Pediatric RAS Tool

A 5-month-old male infant was admitted to the hospital 5 days ago with fever and irritability. Full work-up revealed a urinary tract infection due to E. coli and was treated with IV ceftriaxone. A PICC line was placed and he is being discharged home with IV antibiotics for 9 more days. A urology appointment was made prior to discharge. He was born premature at 28 weeks and was in the NICU for 8 weeks. While in NICU he had three generalized seizures and was started on antiepileptic medication with good results. He also has a diagnosis of bronchopulmonary dysplasia and is currently on Lasix, Albuterol treatments and oral Iron supplementation. He has been taken to the ED on 3 different occasions since discharge for minor issues and was later admitted for bronchiolitis 4 weeks after he was discharged from the NICU. He is currently in custody of his aunt after Child Protective Services (CPS) removed him due to neglect because of his mother's mental health and substance abuse issues. Despite a good appetite, his weight gain has dropped 5 percentiles compared to his 4-month visit's weight measurement. He did not receive his 4-month immunizations due to family's unreliable transportation.

It may appear that this patient's problem is a simple and uncomplicated urinary tract infection and that there are no other issues beside the need for IV antibiotics. However, **if assessed with the Pediatric RAS Tool, this patient has a high score and is at high-risk for readmission.** A snapshot of the Pediatric RAS Tool is presented in Figure-6:

13. Caregiver/Guardian with history of mental health or substance abuse issues 

Yes	No
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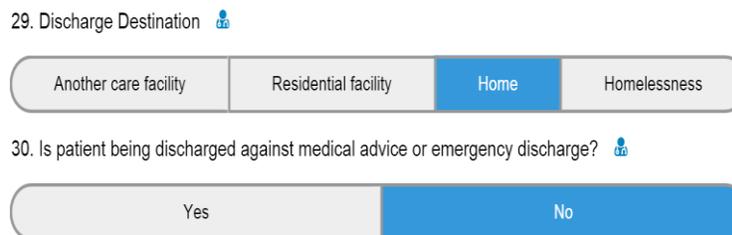
14. Home pulse oximetry monitor use 

Yes	No
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### Sample Case for Behavioral Health RAS Tool

A 27 years old homeless man with history of uncontrolled mood disorder was brought to the ED by law enforcement after an altercation with another homeless person. He had been to the ED five times in the past three months. He was admitted to the inpatient setting six months before but he self-discharged against medical advice. He is now stabilized and is being discharged to a group home. The Social Worker is assisting him with arranging follow-up visits with a Community Health Center within 30 days of discharge and obtaining temporary supply of his medications.

It may appear that this patient's major issues such as medication treatment and homelessness have been adequately managed. However, **if assessed with the Behavioral Health RAS Tool, this patient has a high score and is at high-risk for readmission.** A snapshot of the Tool is presented Figure-7:



### The Avixena PHS' Difference

The commonly used readmission assessment tools are unsophisticated, are not based on solid medical evidence, are highly dependent on post-service claims and risk adjustment data, are not very actionable, and are mainly designed for adult populations. The Avixena PHS' RAS, Pediatric RAS, Behavioral Health RAS and TRRA Tools are the first in their class of service, providing a previously unexplored approach to readmission prevention by offering several unique features to successfully tackle the following issues:

- Accurate Identification of Patients at High Risk for Readmission - The RAS Tools are cloud-based applications (proprietary technology) with the following features:
  - o Real-time
  - o HIPAA-compliant
  - o Use of the most innovative and advanced technologies
  - o Compatible with Legacy Systems
  - o Engineered to be extremely user friendly
- Evidence-based - Development of the Survey Tools involved exhaustive medical literature review and obtaining input from the leading clinicians and population health management experts. It must be noted that every survey question has been rigorously tested and validated. The Tools are regularly updated to ensure accuracy and completeness.

- Differentiated Products - Avixena PHS has developed specific survey tools for Adult, Pediatric and Behavioral Health admissions.
- Information Continuity - All Avixena PHS Tools can be accessed by multiple authorized providers, at different care settings, who are in different organizations. All Tool contents are updated in real time.
- Process Reengineering - Avixena tool development did not automate paper-based operation but rather involved an in-depth process evaluation using Porter’s Value Chain Analysis, resulting in care transformation and creation of competitive advantage for clients.
- Lack of System Support to Create and Execute Post Discharge Care Plans - RAS, Pediatric RAS, Behavioral Health RAS, and TRRA Tools have created a paradigm shift from the current state of operations, which typically involves sending discharge orders to the receiving facility or providers, to an Actionable Care Plan which includes critical lab values, needed follow-ups, medication reconciliation and communications with other providers.
- Lack of Analytical Support to Induce Organizational Learning - RAS, Pediatric RAS, Behavioral Health RAS, and TRRA Tools have several other unique features that allow:
  - o Continuous monitoring of patient’s conditions and automatic identification of any changes that have occurred since the previous assessments
  - o Simulation mode
  - o Assessment of high utilizers and identification of those at risk of readmission
  - o Enhanced reporting
  - o Data mining capability
- Differentiated Approach to Readmissions - The RRCA Tool is the only available tool that has two separate modules for patients who are readmitted from the home setting and for patients who are readmitted from ECFs.
- Patient/caregiver Access - Avixena tools development is informed by the fact that patient and caregiver’s involvement in the care delivery is critical for improving care outcomes. Therefore, the Avixena assessment tools, when appropriate, can be simply used by lay persons with no clinical background.
- Proven Effectiveness - RAS Tools were tested by a Palliative Care Provider in Phoenix, Arizona; an Independent Physician Organization (IPA) in California; and, a large health plan with multiple lines of business in Phoenix, Arizona. Analysis demonstrated a dramatic reduction in preventable readmissions.

**Avixena Readmission Cost Reduction Projections (non-Medicare FFS)**

Table 4- The following assumptions are based on 10,000 annual adult discharges:

Line of Business	% of Total	Case Volume	Readmission Rate	Average Cost Per Admission (\$)
Medicare Advantage	24%	2400	20%	13,500
Medicaid	20%	2000	20%	12,500
Commercial	10%	1000	10%	14,500
Uninsured	5%	500	12%	14,500

The following were not considered in cost reduction calculations:

- Medicaid, Commercial and the uninsured rates are based on the volume and no case-mix adjustment was applied
- Patients with multiple readmissions within 30 days
- ED and Observation costs
- Avixena fees

Table 5 - Projected cost reductions based on 10,000 annual discharges and national average readmission rates

Line of Business	% of Total	Volume	Excess Readmission Rate	Excess Readmission Volume	Average Cost per Admission (\$)	Penalty or Lost Revenue (\$)
Medicare Advantage	24%	3600	7%	252	13,500	3,402,000
Medicaid	20%	2000	5%	100	12,500	1,250,000
Commercial	10%	1000	4%	40	14,500	580,000
Uninsured	5%	500	11%	55	14,500	797,500
<b>Total Cost Reduction</b>						<b>6,029,500</b>

### Other Tools and Products

A single tool will not resolve a complex issue such as readmission. Therefore, Avixena PHS has designed multiple products that will manage patients across the post-discharge spectrum of care. These tools can also be used for mobile devices. They include:

- **Post-SNF Discharge Care:** The only available tool that is specifically designed to prospectively identify and manage patients' needs such medication reconciliation, follow-up care, DME and supplies needs, health education and home health care.
- **Patient Follow-up:** Is designed to assist providers to monitor and assess patients' post-visit compliance and creates a highly effective tool for patients to accurately report back their status or change of condition in a timely manner. The tool is designed to allow two-way communication between patients and providers and will improve compliance with care plan and instructions, reporting back obtaining needed appointments, care outcomes, and informing providers when a patient had an ED visit or inpatient admission post encounter.
- **High-risk/High Need patients;** A simple survey that accurately allows identification of High-risk/High Need individuals without use of claims data. In addition, the tool allows providers to set the survey parameters based on the specific characteristic of the population, geography, or case management needs.

- **Social Determinants of Health (SDOH):** Are major contributor and obstacle for patients to manage their chronic conditions and other health needs. The first of its kind, this app allows longitudinal monitoring of patient's status, and allows institutions such as Community Health Centers to generate reports that will facilitate determining the network and community resources needed to meet those demands.
- **Medication Reconciliation Form:** Designed to produce an accurate and complete source of all medications taken by the patient, assess effectiveness and appropriateness of the medications, identify patient compliance and adherence to prescribed medications, and automatically generates an action plan based on the complete reconciliation.
- **Patient Engagement Survey:** Designed to assess Patient and/or Caregiver's engagement is a particularly useful tool to initiate an effective care plan in pre- to post-discharge spectrum of care.
- **Transition of Care Tool:** Is intended to help with an effective discharge planning and to provide care information continuity after discharge from acute setting.
- **Post-operative Pain Management:** Is designed to assist providers monitor and assess post-operative pain management issues. The tool is designed to allow two-way communication between patients and providers to improve care outcomes and avoid unnecessary ED visits. One additional feature of this tool is to allow practitioners to monitor and communicate potential opioid and controlled substance utilization issues. This tool can also be used for by other specialists such oncologist, rheumatologist, and emergency medicine physicians.
- **Health Risk Assessment:** A tool designed to be completed by the patient and Clinician.
- **Home Safety and Security Assessment Tool:** The only tool that automatically generates an action plan based on the assessment findings.
- **Activities of Daily Living Assessment Tool:** The only tool of its kind that assesses and scores patient's basic and industrious daily activities and allows objective longitudinal comparisons.
- **PHQ-9 Depression Survey:** A standard tool for depression screening.
- **Palliative Care Assessment Tool:** The only available tool that allows assessment and follow-up for patients who are enrolled in Palliative Care. The tool also contains an action plan that allows documentation and communication for the planned interventions.
- **Home Healthcare Referral Tool:** A comprehensive tool that streamlines the process of ordering Home Healthcare services, documentation of provided services, and instructions how to inform the ordering providers of the patient's progress.

- **High-risk Pregnancy Assessment Tool:** Developed by Robert Johnson, MD, one of the most prominent and respected perinatologists in the US.
- **In-Home Social Work Assessment:** This tool is designed to initiate intake and screening with careful documentation of the implemented steps and an up-to-date summary of relevant information.
- **Fall Risk Assessment:** This tool was designed to serve as a guide to assess the patient's fall risk factors through physical examination, observation, and interaction with patient.
- **Diabetic Check List:** This tool provides real time alerts and prompts for the comprehensive care needs of individuals with diabetes. It is an excellent tool for use in HEIS and other pay-for-performance programs to maximize the outcomes and profits.
- **Advance Directives:** An effective tool to document and monitor changes in patient's desires in case of incapacitation.
- **COVID-19 app For Patients:** An evidenced-based tool to allow a rapid self-assessment questionnaire that allows public to assess their risk status. This tool is in public domain and can be provided to businesses free of charge.
- **COVID-19 App For Providers:** This tool is designed to capture all historical information, Capture risk status, a complete action plan with links to the ancillary and support entities. It significantly reduces the encounter time and improves care outcomes.
- **Clinical Practice Guidelines:** 23 one-page, evidence-based, Clinical Practice Guidelines (CPGs) for the most common and prevalent diagnoses and conditions. At present, CPGs for Low Back Pain and Diabetes have been completed.
  - **Clinical Practice Guidelines for Diabetes-** This evidence-based tool provides a systematic approach to assessment, risk identification and clinical management of diabetes for primary care providers. In addition, Avixena has developed a diabetic check list that includes the most recent and the future dates of all needed interventions and measures needed for appropriate management of diabetes. The diabetes guideline is HEDIS compliant, which will allow clinicians to provide optimal care and qualify for pay-for-performance measures.

In addition, the content for the following set of custom-designed tools have been completed:

- Oasis Homecare Assessment
- High-risk Drugs in the Elderly

Moreover, several other tools have been identified for the next phase of development and they include:

- Action Plan to Manage High-risk Readmissions - A complimentary tool that is designed to create an action plan to manage risk factors identified in the RAS Tools.
- Individualized Care Plans - For patients that are referred to case management, this tool will serve as a ready-to-implement care plan based on the RAS Tool's findings.

- Medicare Annual Wellness Exam

### **Potential Business Expansion**

Avixena PHS' Tools can be used in a host of other healthcare settings such as:

- Chronic Care Management
- Data Mining and Predictive Modeling
- Combination with HEDIS and Five-Star Rating
- Care provided in Long-term Residential and Assisted Living Facilities

### **Target Markets**

Avixena PHS' Tools and solutions have excellent utility for value-based contracting initiatives, and can be used by:

- **Health Systems:** The hospital industry has the largest exposure to the negative financial impact of readmissions. However, most of health systems lack a well-articulated vision statement that focuses on improving patient care and describes how technology can help achieve this objective. As a result, there is limited use of mobile devices other than those which only include communication and patient locations.
- **Post-acute Care Providers:** Post-acute care includes care delivered at or by long-term acute care hospitals, skilled nursing facilities, inpatient rehabilitation facilities, and hospice and home health and is often described as “fragmented and siloed” from the rest of the health care system. A report by the Institute of Medicine indicates that 73% of variation in total Medicare spending is due to utilization of post-acute care services. As the industry moves from volume to value-based purchasing, this section of the industry will inevitably be targeted for regulators to improve care and generate savings.
- **Health Plans:** Medicare Advantage health plans have the second largest financial exposure relative to readmissions but nonetheless, the use of smart phones and mobile devices for healthcare initiatives is almost non-existent in the health insurance industry. Several State Medicaid Agencies and Commercial payers have implemented readmission prevention programs as part of payment reform initiatives included in the ACA.
- **ACOs that participate in Medicare Shared Saving Program (MSSP).** These ACOs have tremendous exposure to the financial impact of readmissions because included in MSSP ACO quality measures is the population all-conditions readmission rate.
- **Self-Funded Employers:** Employee Health benefit is the second highest cost expenditure for US businesses. Escalating healthcare costs directly affect the competitiveness and financial health of all segments of US industries.

### **What is Avixena PHS' Competitive Advantage?**

In a nutshell, the suite of Avixena PHS Tools combines the most effective and proven evidence-based Population Health Management Strategies with state of the art, cloud-based, mobile device applications that provide real-time information at the point of care delivery. Presently, there are no other comparable products or services on the market that provide these overly complex solutions.

### **Call to Action**

Reducing hospital readmissions is a substantial task given financial, regulatory, and systemic constraints. While challenging, the gains may be enormous. From a systemic level, preventing APU readmissions could reduce costs and promote patient-centered, high quality care. Given the current financial and demographic challenges facing the US Health Care Industry, elimination of waste and inefficiencies in the system are no longer an option but rather a business requirement or a necessity for business survival.



### **Avixena Population Health Solutions**

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## Executive Teams' Background and Expertise

- **Mehrdad Shafa, MD, MMM, DFACMQ, Chief Executive Officer** - Dr. Shafa is a Healthcare Consultant with significant expertise in all aspects of healthcare delivery. Over the past 15 years, Dr. Shafa has worked with thirty-one health plans in eight states and District of Columbia. He has served as Chief Executive Officer and Chief Medical Officer for fourteen health plans across the US and is a recognized authority in project execution, population health management, resource utilization and medical quality management and outcomes. He also has a successful record of nine consecutive turnaround operations resulting in net gains exceeding \$1 Billion.
- **Mario Vassaux, Chief Innovation Officer** - Mr. Vassaux is a seasoned technology executive and entrepreneur with experience in the development and commercialization of intellectual property, technology, and software in a variety of fields. Mr. Vassaux has advised companies developing medical applications and he developed the award-winning Track My Back App for PhDx Systems.
- **Kevin Fickenscher, MD, CPE, FACPE, FAAFP - Member of Board of Directors.** Dr. Fickenscher is a recognized physician executive and technology leader with extensive experience in strategic and operational development in complex healthcare organizations. He is a thought leader related to technology and information management with extensive experience in organizational transformation, physician management, health policy analysis, leadership development, clinical quality, and resource/care management, among other areas.
- **Elisabeth Graf-Shafa, MD, MHA, FACMQ, Chief Operating Officer** - Dr. Graf-Shafa is a practicing anesthesiologist in Phoenix, Arizona and has extensive experience with Medicare, Special Needs Plans, Medicaid, and Long-term Care Health Plans' utilization management in multiple states. Dr. Graf-Shafa has broad knowledge of CMS Oversight and Compliance rules and regulations.
- **Dave Balmer, Chief Technology Officer** - Mr. Dave Balmer is a 30-year veteran of software engineering who is equally at home with startups and large corporations like Wal-Mart, Yahoo, Palm, HP, and BlackBerry. In addition to engineering management, his roles have included engineer, architect, mentor, and speaker. Mr. Balmer's past medical software experience ranges from insurance claim management to leading mobile medical apps (Epocrates for Android and webOS).
- **Thomas Curzon, JD/Jonathan Ariano, JD, Osborn Maledon Law Firm, Chief Legal Counsel** - Mr. Curzon and Ariano are primarily focused on serving as outside general counsel to emerging, growth-oriented companies and on entrepreneurial transactions, including venture capital and other private placements of securities, entity formation and transaction structuring, mergers, acquisitions and divestitures, initial public offerings, corporate governance, licensing and distribution of software and other products, employee matters, and executive compensation.

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