RADIOLOGY MANAGEMENT

The Journal of AHRA: The Association for Medical Imaging Management

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Improving Patient Flow Utilizing a Collaborative Learning Model

By Laura C. Tibor, MBA, BSIE,
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Julie L. Cravath, RT(R)(MR), MBA,
Russell R. Rein, MHA, MBA, FACMPE,
and Karl N. Krecke, MD

Enhancing the Imaging Experience for Pediatric Patients

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Narendra S. Shet, MD,
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Penny Olivi, MBA, RT(R), CRA, FAHRA

Business Intelligence in Hospital Management

By Achim Escher, Nicolin Hainc,
and Daniel Boll

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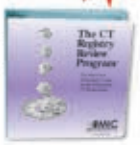

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Collect. Measure. Improve.

Optimizing Quality in Your Diagnostic Imaging Facility

Introducing the new Quality Improvement (QI) Self-Assessment Tool from IAC. Created to help your facility employ and document continuous process improvement, the IAC QI Self-Assessment Tool provides facilities with a mechanism for meeting the quality measures required by each IAC diagnostic imaging accreditation program (Vascular Testing, Echocardiography, Nuclear/PET, MRI and CT).

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Developing Our Own

By Debra L. Murphy

Have your kids ever visited you at work? My children (6 and 9 years old) love coming to the AHRA office. I'd like to think it's because of the awesome staff and the good work we do in serving medical imaging leaders, but really it's for the 3 hole puncher. It's fun to imagine what my kids will be interested in professionally when they grow up and I'm well aware that the example I set for them lays a strong foundation (no pressure!). Similarly, the example you set for your staff also has a significant unspoken presence.

When thinking about employee development, Mark Lerner thoughtfully applies Lean Six Sigma to this concept in his article (p. 29), and provides some hypotheticals. It's difficult to manage people at the most basic levels, never mind proactively growing and shaping them into high performers. The idea of being so methodical in the approach to performance improvement helps structure the process. Elevator speeches, action steps, implementation, measurement—all tenets of Lean Six Sigma—can help managers build a functional framework that will clearly show results.

And the example Gordon Ah Tye has likely set for his staff will leave them well poised to carry his organization forward after his retirement. In his article about "Responsibility Training" (p. 60) he also compares training staff to raising kids (hmmm, there seems to be something to this). His bigger point, though, is that succession planning may be outwardly about mentoring future leaders, but it's also about placing importance on yourself in that plan. Gordon's been writing for *Radiology Management* for a long time and the thought of replacing him when he retires is daunting. I wonder if my eldest will be ready to intern by then.

Deb Murphy is the Deputy Executive Director at AHRA. She is also managing editor of Radiology Management *and may be contacted at dmurphy@ahraonline.org.*

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Springtime in Healthcare

By Paul Dubiel, MS, RT(R), CRA, FAHRA

Springtime has always been my favorite time of the year. I don't know what it is, but it could have something to do with the start of baseball season (I'm hoping for a Mets vs Astros World Series). Or it could be the new crop of wild flowers that appear on every road side in central Texas; or the number of outdoor events that grace Austin this time of year. For many, it's the time that the snow has melted and we can put our shovels away. For others, like us in Texas, it's the calm before the storm or more likely lack of storms and the prelude to the grueling string of 100 degree days that we will soon be facing. Either way, spring comes at us with a sense of newness and rebirth that none of the other seasons can supply.

For healthcare workers, much of the same sense of renewal and rebirth that is happening in nature helps us get through our routines and stressful days. Flu and pneumonia patients are replaced by weekend warriors with twisted ankles and strained back muscles. Many of us managers are finishing up the long and probably hard budget season and planning for the new fiscal year to come—most likely filled with stress and budget cuts and fear of the unknown that has become an annual event for anyone in healthcare today.

Spring is also a time to take stock in all we have accomplished over the long winter and to look ahead at what needs to be done in the months ahead. As we take time to stop and absorb the pure beauty of the spring we also need to remember all the accomplishments that we have made to our organizations, our profession, and to our personal lives.

It's easy to get bogged down with negative reflections. "It's easy enough to tell what is wrong but that's not what I want to hear all night long" is a line from a Lou Reed song (it proves even Lou Reed can be upbeat). We face many pressures on a daily basis—budgets and productivity targets getting tighter, new regulations that affect how we provide services (that may make sense but have unrealistic timelines to achieve them), or just the general atmosphere most of us feel at our institutions of stress and worry. We need to stop, breathe deep, and look around at what we truly have accomplished over the past few months. Just like the flowers that come out of the ground and poke their petals toward the sun, maybe we need to come out of our offices, look around, reintroduce ourselves to the staff we haven't seen in a few months, and take stock of all the good things we've done. I am sure it's out there, maybe buried under a pile of other stuff, but every one of us goes to work to do our best, and every once in a while we need to get out there and remind ourselves that we're doing good and we do make a difference.

One of the ways to best celebrate our accomplishments is to celebrate with friends—especially those who share our unique professional challenges. And there are none better than the connections we've made through AHRA. The AHRA Annual Meeting this summer in Nashville is a great opportunity to feel the pain of another hard year fade away, but also to celebrate all that we have done as team members and individuals that truly makes a difference. It is an opportunity for us to get together to learn, share memories, complain about our organizations, but most importantly to interact with the people that have served as our mentors, teachers, and above all our friends. In the same album, Lou Reed talks about the people in his band as simply, yet as meaningfully as anyone can. "In a way you guys are the best friends I ever had" comes to mind when I think about my AHRA experiences. I don't often see a lot of you, I may not know all your names or the new places you work at or your official titles, but I do know you are out there when I need some help on a particular issue or just to voice a concern or whine about some administrator or physician calling our staff "technicians" (I hate when they do that) and I know that you expect the same of me. I know that through our differences and varying opinions on issues related to healthcare we all are in this together and need each other to be the best that we can be and making that possible happens through the power of connection. It is coming to the national conference to have a drink, a meal, supporting the vendors who help make it possible, taking classes led by our

own remarkable members, or volunteering in one of a number of ways—there is no better way for us to grow than participating in the AHRA.

If you can't make the Annual Meeting, host a local seminar in your area (AHRA staff will help organize), write an article for the journal (if I can do it, so can you), and support the Education Foundation (with its Annual Appeal). Show pride in your profession by taking and passing the CRA exam then promoting the virtue of the credential to anyone who will listen. Devoting your time and talents is easy and what you give to the organization and its members is recuperated tenfold. By giving, you end up getting, and by giving yourself you are helping the present as well as the future be better leaders.

I hope to see you in Nashville. I look forward to reconnecting with a lot of people I haven't seen since the last conference and meeting new people who are as proud of their profession and organizations as I am.

Paul A. Dubiel, MS, RT(R), CRA, FAHRA has been the senior director, imaging at Seton Family of Hospitals in Austin, TX since 2002. An AHRA member since 1993, he is currently editor-in-chief of Radiology Management *and has volunteered for numerous other task forces and committees. Paul can be contacted at pdubiel@seton.org.*

NASHVILLE!

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AHRA's 2016 Annual Meeting will be held in Nashville, TN, one of the nation's most popular conference destinations. Hosted at the Gaylord Opryland Resort, this year's meeting will provide the ideal venue for educational sessions and workshops, peer to peer networking, exhibitor interaction, as well as super easy access to all that Nashville has to offer.

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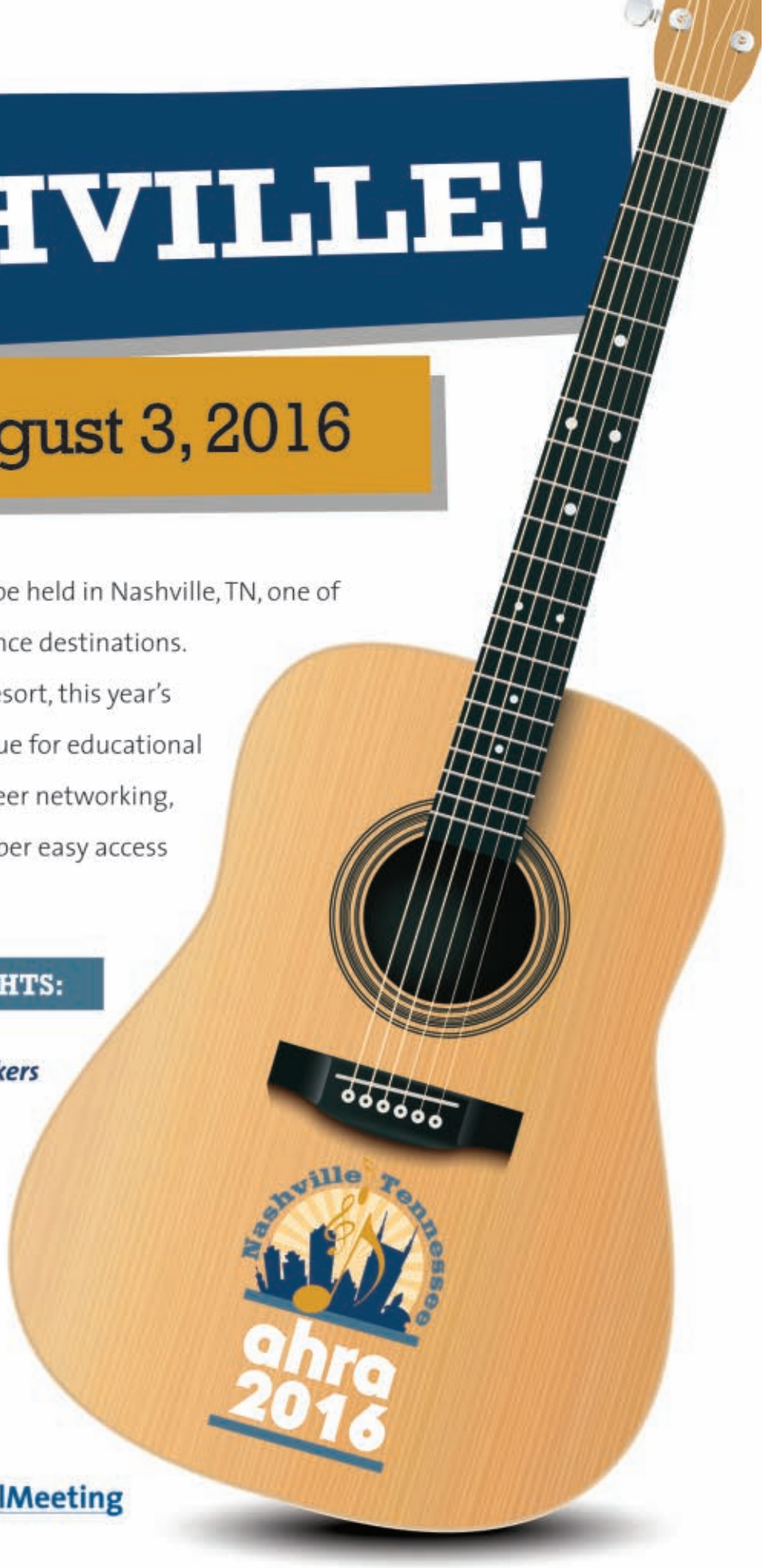

Washington Brings Renewed Focus to Payment Models of the Future

By Bill Finerfrock and Nathan Baugh

Healthcare reform is complicated. Medicare and Medicaid have looming actuarial problems that continue to present serious long term questions about the viability of both programs as currently structured. Healthcare costs continue to rise faster than inflation. Although Democrats and Republicans agree that long term structural reforms of both programs are necessary, they have seemingly vast differences of opinions on what that entails.

Although debate about the Affordable Care Act (ACA) and its future dominates the news, if you cut through the noise you will see that there are many bipartisan efforts already underway that, in theory, could drastically improve the effectiveness of our healthcare system. Only time will tell if these reforms are truly the silver bullets policymakers hope.

In healthcare policy circles, many people throw out the buzzword terms "quality" and "value" as if they have universally accepted and clear meanings. Politically, it is difficult for anyone, regardless of party, to be opposed to "quality" or "value." These terms have universal appeal whether we are talking about healthcare, clothing, or automobiles. There is currently a bipartisan consensus around shifting the Medicare payment method from the "volume-based" fee-for-service system to a to-be-developed "value-based" alternative payment model (APM) that rewards healthy patient outcomes. This consensus was formed through the simple but compelling notion that our healthcare system should pay for quality not quantity. Who can argue against that? While the drive to move from a "volume" to "value" payment methodology is being driven by the federal policy makers, this concept has quickly been embraced by commercial payers as well.

While it seems clear that these new payment models are in everyone's immediate future, it is much less clear how exactly these models will actually work. There is still no universal definition of "quality," making a payment model that rewards quality very difficult. For example, how does one factor in quality and value into reimbursement rates if you don't have a broadly accepted definition of either term? It's one thing to say you want to pay for quality and value; it is an altogether different thing to build that into a workable payment model that actually accomplishes that objective. For example, what metrics are appropriate and what are the operational challenges of collecting those metrics and building them into a workable payment model? These questions have yet to be fully answered and will have to be solved before the transition can be completed.

Until last year, the government had no real plan to implement APMs. However, due to the passage of the Medicare Access and CHIP Reauthorization Act of 2015 (MACRA), and recent actions by the Department of Health and Human Services (HHS), a tangible plan is beginning to develop. In January of 2015, HHS announced explicit goals for Medicare payments to be tied to quality or value through APMs such as Accountable Care Organizations (ACOs) or bundled payment arrangements. HHS wants 30% of Medicare payments to be tied to APMs or bundled payments by the end of 2016 and 50% by the end of 2018. According to a recent announcement from HHS, they have achieved the goal for 2016 and are on pace to achieve the 2018 goal well in advance of that date.

MACRA provides financial incentives (starting in 2019) to providers who move away from volume to one of two new models: APMs or MIPS. Providers

who receive a significant share of their revenue through a qualified APM can receive a significant annual lump sum bonus payment equal to 5% of the care they give Medicare beneficiaries. Alternatively, providers who may be wary of APMs have the option of participating in the newly established quality program known as the Merit-Based Incentive Payment System or MIPS. MIPS will combine three current quality programs (the Physician Quality Reporting System, the Value Modifier, and the Medicare Electronic Health Record) into one. Providers would then receive one MIPS score that will substantially effect their baseline Medicare payment for the next year.

A new wrinkle that will be incorporated into both MIPS and APMs is that physicians and providers will have to accept some level of financial risk for the clinical decisions they make. Over-ordering of diagnostic tests, for example, could result in financial penalties in the case of MIPS or reduced margins in the case of a bundled APM payment.

Under a fee-for-service or volume-based payment methodology, there are no negative financial ramifications to the ordering physician for ordering unnecessary or questionable diagnostic imaging services. Some have argued that with fee-for-service the ordering physician was incentivized to over-order. As currently envisioned, physicians will bear some financial risk for their ordering decisions, whether paid using MIPS or APMs. The goal, in either case, is to encourage physicians to only order those diagnostic imaging tests that are necessary to achieve the most desirable outcome. The message seems to be: when ordering a diagnostic test, order the type of test that is most appropriate for obtaining the information needed to make the proper diagnosis.

We expect CMS to finalize how exactly the three quality programs (PQRS, VM, and EHR) should be combined under MIPS and we should see the proposed methodology sometime this year. APMs, on the other hand, require a little more creativity and as such the MACRA legislation contained a number of measures to help develop APMs over the next few years.

MACRA authorizes $15,000,000 a year through 2019 for HHS to develop a comprehensive plan for adopting APMs and to provide annual reports to Congress on the progress of APM development. Furthermore, the legislation boosts and extends funding for a HHS contract with the National Quality Forum (NQF), an organization tasked with developing and building consensus around APMs and bundled payments. These provisions, among others, should provide the boost HHS and their contractors need to hash out the specifics of the APMs before they go live in 2019.

The past year has certainly brought a renewed focus to developing the payment models of the future. As a result, we now have concrete provider incentives to adopt, and the funding to develop, the heralded value-based models of the future. However, the work is only beginning and quantifying "quality" and "value" in healthcare can be a difficult task. Building consensus towards new payment methods is tough with so many stakeholders involved. Nevertheless, it should be acknowledged that these recent developments from HHS and Congress are significant and should ignite a conversation that is long overdue.

Bill Finerfrock is the president and owner of Capitol Associates, a government relations/consulting firm based in Washington, DC, who has partnered with AHRA on their regulatory affairs issues. Nathan Baugh is an associate with CAI. They can be contacted at bf@capitolassociates.com and baughn@capitolassociates.com.

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New Directions in CMS Bundling: 2016 Update

By Pamela Kassing MPA, RCC, Dominick J. Parris, and Melody W. Mulaik MSHS, CRA, FAHRA, RCC, CPC, CPC-H

This article provides an update on the hospital outpatient prospective payment system (HOPPS) and how to price new bundled codes for radiology services. These issues continue to be relevant and are growing in significance. Although much of this information was provided last year (May/Jun 2015 *Radiology Management*), this article provides important advice on how to keep hospital payments stabilized and at their correct levels as the payment system continues to evolve.

The Centers for Medicare and Medicaid Services (CMS) has been focusing intently on bundling services within its payment systems, and more aggressively within the HOPPS, with the intent of realizing savings and promoting more efficient care. These efforts have taken many different forms including packaging of services, bundling of codes, and most recently in the development of episodes-of-care designations which they refer to as comprehensive ambulatory payment classifications (C-APCs). All of these efforts result in CMS taking the outpatient hospital claims data, running it through their methodology, and reimbursing the hospital via comprehensive or packaged payments. The purpose of these efforts is to further advance the HOPPS as a prospective payment system that is more like Diagnostic Related Groups (DRGs), the inpatient prospective payment system. The accuracy of these payments is highly dependent on accurate coding, cost reporting, and pricing in the charge masters by hospitals. The purpose of this article is to inform hospital staff about the importance of submitting the most accurate data possible in order to insure correct payments are made for services provided to patients in the hospital outpatient setting.

The Structure of HOPPS

The Hospital Outpatient Prospective Payment System is NOT a fee schedule that just lists reimbursement amounts for specific procedure codes; it is a prospective payment system. Services are assigned to ambulatory payment classifications (APCs) by Current Procedural Terminology (CPT®)/Healthcare Current Procedural Coding System (HCPCS) code. Each APC encompasses services that are clinically similar and require similar resources. All services within an APC are generally paid at the same prospectively-fixed rate. In this prospective payment system there are several different ways that services are combined and paid under a single payment.

Packaging

Medicare packages many imaging services considered "ancillary" to the primary reason for the patient encounter including contrast, diagnostic radiopharmaceuticals, imaging guidance, radiology supervision, and interpretation codes, post processing (ie, 3D and CAD), and add-on codes. Most recently, CMS decided to package all imaging codes that cost $100 or less when they appear on a claim with another service provided to a patient. They are still paid separately when the service is submitted alone on an outpatient UB-04/CMS1450 hospital claim.

Any codes that are billed for services provided on the same day are processed through a Medicare edit system. Hospitals report the codes on the claim and CMS does the translation to the appropriate APCs and resulting payment(s). CMS encourages hospitals to report all CPT/HCPCS procedure codes that describe packaged services that were provided to the patient on the claim.

For example, when coding for a diagnostic angiogram, this includes a surgical procedure code, radiology supervision and interpretation (RS&I) code, and contrast. Medicare packages the charges for the RS&I code (the imaging portion of the procedure) and contrast into the surgical code and provides one payment for this code. Hospital finance staff, HIM staff, and radiology staff should not assume that just because CMS does not pay separately for a packaged service that the facility is not receiving reimbursement and therefore there is no need to include the coding on the claim. This misunderstanding is incorrect and will result in lost revenue for the hospital.

Comprehensive APCs

Comprehensive APCs (C-APCs) are Medicare's first attempt at creating episodes-of-care reimbursement for HOPPS. A primary service, known as the independent procedure, is identified and then all other related services submitted on the claim, called dependent services,

TABLE 1. New 2016 Bundled Codes

Bundled Code	Short Descriptor	2016 Payment Rate	Predecessor CPT Codes	APC Payment Rate of Predecessor Codes	Year Bundled Code Was Effective
47531	Injection for cholangiogram	$351.71	47505 + 74305	$336.90	2016
47532	Injection for cholangiogram	$2,177.11	47500 + 74320	$812.89	2016
47533	Plmt biliary drainage cath	$2,177.11	47510 + 75980 + 47500 + 74320	$2,645.66	2016
47534	Plmt biliary drainage cath	$2,177.11	47500 + 74320 + 47511 + 75982	$4,907.18	2016
47535	Conversion ext bil drg cath	$2,177.11	47505 + 74305 + 47511 + 75982	$4,431.19	2016
47536	Exchange biliary drg cath	$2,177.11	47525 + 75984	$1,288.56	2016
47537	Removal biliary drg cath	$482.83	47505 + 74305	$336.90	2016
47538	Perq plmt bile duct stent	$4,118.23	47556 and 74363 + 47500 + 74320	$4,907.18	2016
47539	Perq plmt bile duct stent	$4,118.23	47556 and 74363 + 47500 + 74320	$4,907.18	2016
47540	Perq plmt bile duct stent	$4,118.23	47556 and 74363 + 47510 + 75980 + 47500 + 74320	$6,739.95	2016
47541	Plmt access bil tree sm bwl	$2,177.11	47999	$1,832.77	2016
47542	Dilate biliary duct/ampulla	N/A	47555 + 74363	$1,832.77	2016
47543	Endoluminal bx biliary tree	N/A	47553	$4,094.29	2016
47544	Removal duct glbldr calculi	N/A	47630 + 74327	$1,832.77	2016
10035	Perq dev soft tiss 1st imag	$480.64	19499 + 76942 or 77002 or 77012 or 77021	N/A	2016
10036	Perq dev soft tiss add imag	N/A	19499 + 76942 or 77002 or 77012 or 77021	N/A	2016
72081	X-ray exam entire spi 1 vw	$60.80	72069	$59.34	2016
72082	X-ray exam entire spi 2/3 vw	$100.69	72010 + 72090	$408.67	2016
72083	X-ray exam entire spi 4/5 vw	$100.69	72069 + 72090	$154.32	2016
72084	X-ray exam entire spi 6/> vw	$100.69	72069 + 72090	$154.32	2016
61645	Perq art m-thrombect &/nfs	Not Paid Under Medicare	37184, (37185), 37211, 37213, 37214, 36299	$3219.60, $843.17, $2235.40	2016
61650	Evasc prlng admn rx agnt 1st	Not Paid Under Medicare	37202, 36299, 75896, 75898, 76496	$1575.43, $827.19, $159.47	2016

(*continued*)

TABLE 1. New 2016 Bundled Codes (*Continued*)

Bundled Code	Short Descriptor	2016 Payment Rate	Predecessor CPT Codes	APC Payment Rate of Predecessor Codes	Year Bundled Code Was Effective
61651	Evasc prlng admn rx agnt add	Not Paid Under Medicare	37202, 36299, 75896, 75898, 76496	$1575.43, $827.19, $159.47	2016
49185	Sclerotx fluid collection	$941.98	49423, 49423 + 49424	$1,288.56	2016
78264	Gastric emptying imag study	$332.65	78264	$326.83	2016
78265	Gastric emptying imag study small bowel	$332.65	78264 + 78299	$326.83	2016
78266	Gastric emptying Small Bowel and colon	$441.36	78264 + 78299	$326.83	2016
73501	X-ray exam hip uni 1 view	$60.80	73500 + 72170	$154.32	2016
73502	X-ray exam hip uni 2-3 views	$60.80	73510 + 72170	$154.32	2016
73503	X-ray exam hip uni 4/> views	$100.69	73510 + 72170 or 73530 + 72170 or 73540	$154.32 or $94.98 or $59.34	2016
73521	X-ray exam hips bi 2 views	$100.69	73520	$94.98	2016
73522	X-ray exam hips bi 3-4 views	$100.69	73520	$94.98	2016
73523	X-ray exam hips bi 5/> views	$191.97	73520	$94.98	2016
73552	X-ray exam of femur 2/>	$60.80	73550	$59.34	2016
50430	Njx px nfrosgrm &/urtrgrm	$524.48	50390 + 74425	$1,317.37	2016
50431	Njx px nfrosgrm &/urtrgrm	$524.48	50394 + 74425	$265.15	2016
50432	Plmt nephrostomy catheter	$1,506.42	50390 + 74425	$1,317.37	2016
50433	Plmt nephroureteral catheter	$1,506.42	50390 + 74425	$1,317.37	2016
50434	Convert nephrostomy catheter	$524.48	50393 + 74480	$3,310.51	2016
50435	Exchange nephrostomy cath	$524.48	50398 + 75984	$2,084.03	2016
50606	Endoluminal bx urtr rnl plvs	N/A	50555 + 76942, or 77002, or 77012	$548.72	2016
50693	Plmt ureteral stent prq	$2,243.49	50393 + 74480	$3,310.51	2016
50694	Plmt ureteral stent prq	$2,243.49	50393 + 74480	$3,310.51	2016
50695	Plmt ureteral stent prq	$2,243.49	50393 + 74480	$3,310.51	2016
50705	Ureteral embolization/occl	N/A	53899	$113.19	2016
50706	Balloon dilate urtrl strix	N/A	53899	$113.19	2016

are packaged into the reimbursement. These services can take place during a single encounter or over a period of days. The first comprehensive APCs to be created were for APCs that include high-cost device-dependent procedures. An example of a radiology C-APC is an endovascular revascularization procedure. If these two codes appeared on a claim:

35475 Repair arterial blockage (Arterial PTA)
35476 Repair venous blockage (Venous PTA)

The code with the highest cost would be the primary code and the code with the second highest cost would be the secondary code where CMS determines the complexity of the case. These studies would be paid under APC 5191 at $4592.15 for 2016. The American College of Radiology (ACR) has asked that CMS also consider the costs of a third code appearing on a claim when calculating the C-APC rate in order to capture additional costs and insure proper payment. For endovascular revascularization, the third code could be:

36870 Percutaneous thrombectomy of AV fistula

CMS has asked for input and the ACR has performed data analysis, provided feedback, and made suggestions for improvements in capturing better data when pricing C-APCs. If the costs and complexity of this third study were considered by CMS, when performed, it would almost double the payment for these studies.

CMS is expanding the concept of the C-APCs by looking at services that are provided to patients who receive stereotactic radiology surgery (SRS) over a one month period of time. Effective January 1, 2016 hospitals are required to bill the –CP modifier for services that take place before and after a SRS treatment for a particular patient. This is an attempt by CMS to build episode-of-care payments that appear on multiple claims instead of services for a patient that only appear on a single claim. Like it or not, CMS very well may move forward with this concept and hospitals will be paid for an expanded episode either with complete data, which would stabilize the payment to cover costs, or incomplete data which would underprice the services. Therefore, the sooner hospital finance teams and coders learn to adapt to these new coding and modifier requirements, the better the outcome will be for Medicare reimbursement levels.

The Creation of New Consolidated Codes

Bundled CPT® procedure codes are created by the CPT Editorial Panel because of the frequency in which two or more codes are submitted together. There is a new value assigned for these codes in the Medicare Physician Fee Schedule (MPFS) for the physician payment, but for HOPPS the reimbursement is defined by APCs based on prospective charge data from the predecessor codes. An example of a bundled code is the surgical code for breast biopsy that includes the imaging guidance, biopsy procedure, and the cost of any supplies and device(s):

19281 (Placement of breast localization device(s), percutaneous; first lesion, including mammographic guidance) previously coded as 77032 + 19290 or 19295

The ACR has been working with CMS over many years to help determine where the new bundled codes should be placed in within the APC system. Medicare's data and methodology are used for the recommendations. When CMS assigns the new bundled code placements, they initially use historical data from the codes that were previously used to report the service(s), known as predecessor codes. CMS gives hospitals about a year to begin to use these new codes with the expectation that the facility will accurately report actual charges and costs. CMS then uses the most recent bundled code data from hospitals to price the bundled codes in their APCs for future years.

The Use of a Combination of Methods

Taking this one step further, Medicare's packaged and bundled codes can appear in combinations with each other. For example, a breast biopsy bundled code can also appear on a claim with packaged add-on codes, or endovascular revascularization services could appear on a claim with other ancillary services that are provided in the same patient encounter. These related services in each of these examples would result in Medicare reimbursement comprised of one combined payment.

Medicare has future plans to expand these concepts further to continue to make HOPPS payments more prospective in nature, bringing it even closer to a DRG-like system. It is of vital importance that hospitals assign procedure codes correctly and that the ACR continues to comment to CMS on their methodology on how this claim data is processed for payment.

Site-Neutral Payments

Most recently, CMS mandated off-campus provider-based hospital outpatient departments to report their charges using a -PO Modifier. The use of this modifier is mandatory as of January 1, 2016. This modifier is used to collect data on how much it costs to provide these services in the hospital outpatient setting. CMS intends to compare this data to costs built into the payments made to physicians' offices/Independent Diagnostic Testing Facilities (IDTFs) under MPFS. If the costs in the hospital setting are the same or lower, CMS will accept a recent MedPAC recommendation to cut these payments to match what is paid to physician offices/IDTFs. This places further importance on how much hospital finance staff should focus on the accuracy of the cost and charge data they report to Medicare. The quality of data submitted directly equates to the quality of payments hospitals will receive.

Conclusion

Hospital staff need to make sure they update their Charge Description Masters (CDMs) each year to correctly set the charges for the new bundled codes. If the responsibility for pricing resides in finance and not in the radiology department, it is important that radiology administrative staff work with the appropriate finance personnel to ensure that updates are made in an accurate and timely fashion. Do not assume this will be handled correctly without input and guidance. It is very helpful to have the radiology content expert work with finance to determine the appropriate charges to update in the CDM especially for comprehensive codes. Table 1 gives all the new comprehensive codes that have been created from 2010 to 2016.

Have you updated your CDM to set the charges for the new bundled codes to equal the sum of their predecessor codes? If not, you should evaluate this sooner rather than later. This activity should become an annual review since there are CPT® changes that occur every year. Hospital staff also need to carefully consider how they are reporting their costs to account for these changes. The data each hospital reports to Medicare does have an effect on accurate payment in the future.

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Improving Patient Flow Utilizing a Collaborative Learning Model

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The credit earned from the Quick Credit™ test accompanying this article may be applied to the CRA operations management (OM) domain.

EXECUTIVE SUMMARY

- This initiative utilized a collaborative learning approach to increase knowledge and experience in process improvement and systems thinking while targeting improved patient flow in seven radiology modalities.
- Teams showed improvements in their project metrics and collectively streamlined the flow for 530 patients per day by improving patient lead time, wait time, and first case on-time start rates.
- In a post-project survey of 50 project team members, 82% stated they had more effective solutions as a result of the process improvement methodology, 84% stated they will be able to utilize the process improvement tools again in the future, and 98% would recommend participating in another project to a colleague.

Several articles in the literature have emphasized the need for radiology practices to improve quality, safety, outcomes, and patient satisfaction to achieve the safer health system mandated by the Institute of Medicine's (IOM) reports *To Err is Human* and *Crossing the Quality Chasm*.[1-6] Radiological medical imaging is a core process in the patient experience and central to care that meets the IOM's six aims for safe, timely, effective, efficient, equitable, and patient-centric healthcare processes. Increasing radiology's value to the patient helps the organization achieve its goals of being trusted and affordable.

The primary goals were to educate leadership and staff in systems thinking and process improvement while targeting improved patient flow in each of the radiology modalities. Specifically, the team strived to instill systems thinking from process improvement experts to the frontline supervisors and staff through parallel hands-on modality projects.

The Department of Radiology at Mayo Clinic in Rochester, MN is comprised of nearly 1000 employees divided between seven modalities which include breast imaging, computed tomography (CT), general radiography, interventional radiology, magnetic resonance imaging (MRI), nuclear medicine, and ultrasound. Working within these modalities are eleven radiology specialties: abdominal, breast imaging and intervention, cardiovascular, hospital and emergency, musculoskeletal, neurologic, nuclear medicine, pediatric, thoracic, ultrasound imaging and intervention, and vascular-interventional.

Process improvement across an entire radiology practice is daunting. Experience has shown that a structured teaching and mentoring environment can efficiently educate and facilitate parallel improvement in similar processes with similar goals.

Methods

Prior to this initiative, modality supervisors and assistant supervisors had completed a foundation level of quality and process improvement education through the institution's Quality Academy. The Quality Academy curriculum delivers broad-based quality improvement education and training for individuals and teams. Some individuals had prior experience participating in process improvement teams.

Two months prior to launching the initiative, a planning team was established which included the administrator sponsor, a radiologist sponsor, and process improvement experts. The team was charged with creating the structure and educational plan to guide the seven modality teams through concurrent

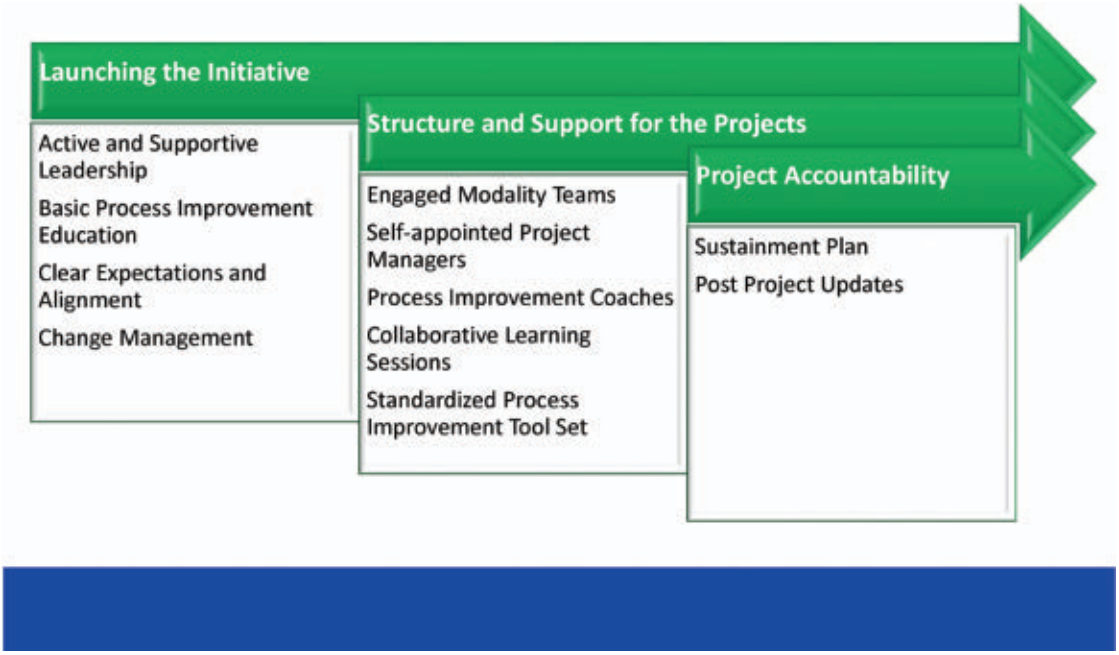


Figure 1 • Framework Developed by the Planning Team.

process improvement. The planning team developed a framework which utilized a collaborative learning approach to educate and engage the modality leaders in learning process improvement tools (Figure 1). Following the work of Berwick, Cleary, and Wilson, the planning team focused on seven components important for success: sponsorship, topic, ideas for improvement, participants, senior leadership support, preliminary work, and strategies for learning about and making improvements.[7] The planning team focused on Six Sigma's DMAIC framework and the use of value stream mapping (VSM) as the fundamental elements of project workflow.

Value stream mapping is a key component of lean improvement emphasizing the end-to-end view of a process and identifying each step of a process; the person or group involved in each step; the task; the time it takes to perform the task; and the time between steps.[2] An additional benefit of VSM is the value-added ratio which measures the time devoted to process steps of interest to the customer divided by the total process cycle time.[8] The process improvement experts prepared training materials and learning session agendas based on the DMAIC project structure. The letters in DMAIC are an acronym for the five phases of Six Sigma improvement: Define-Measure-Analyze-Improve-Control. These phases lead a team logically from defining a problem through implementing solutions linked to underlying causes, and establishing best practices to make sure the solutions stay in place.[9] DMAIC is similar to the better known Plan-Do-Study-Act methodology with an important distinction—the "control" phase of DMAIC assesses the success or "stickiness" of the improvements. Most process changes tend to regress to the old ways if not monitored for stability of gains.

The planning team led the initial learning session to engage modality leaders. The administrative and radiologist sponsors communicated expectations, purpose for the initiative, and alignment to the organization's strategic plan. Each modality team was expected to show improvement in one key patient value stream metric by no less than 10% within six months. The most commonly used metric was patient lead time, defined as "the time from when a work item enters the process until it exits."[9] To encourage focus on the patient-customer, patient lead time was further refined as the time from when the patient arrived in radiology to the completion of the patient's exam. While the majority of teams focused on lead time, which includes all steps in the value stream, other teams focused specifically on process steps

Value stream mapping is a key component of lean improvement.

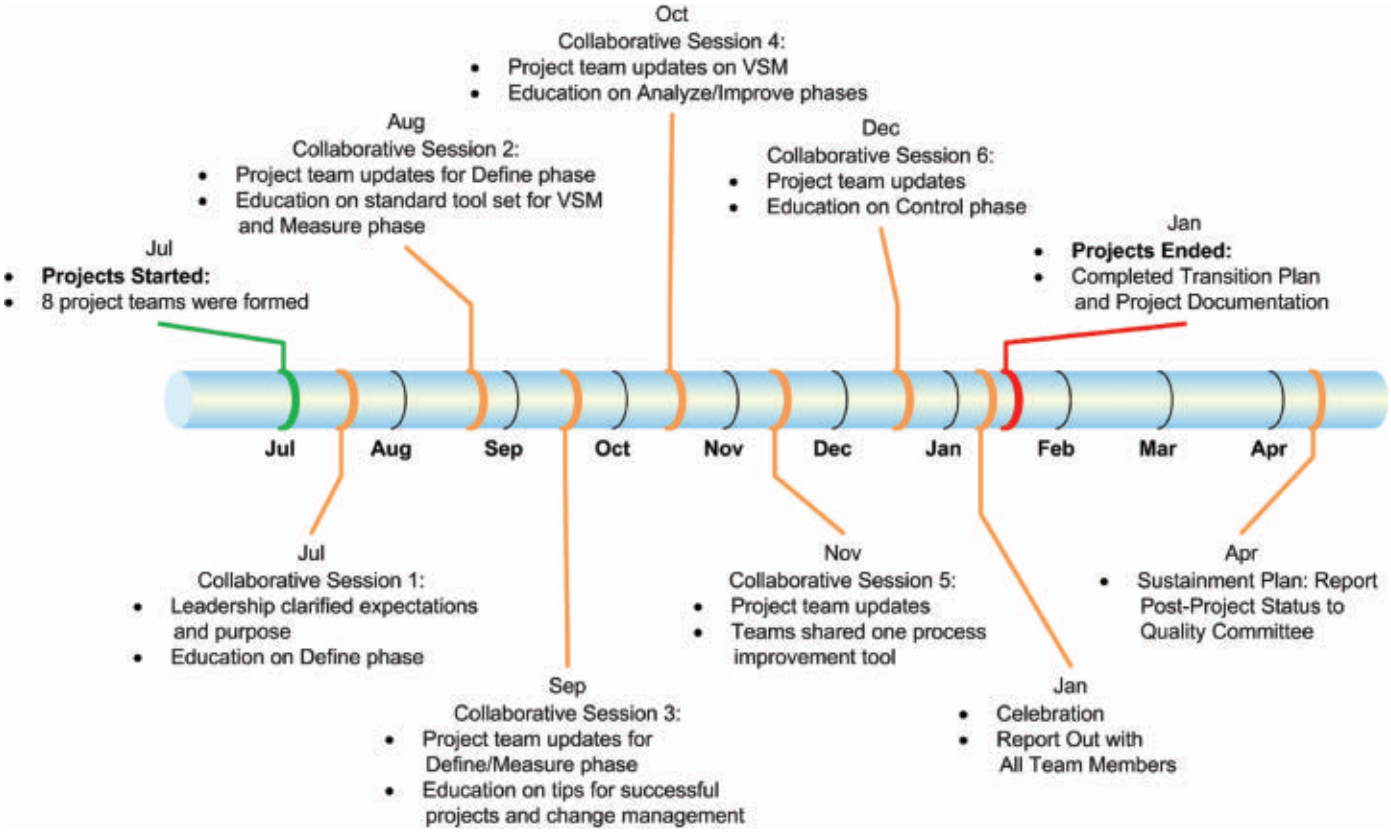


Figure 2 • VSM Initiative Timeline.

which are of no value to the patient, such as time spent waiting.

Structure and Support for the Projects

Each of the modality team leaders identified appropriate team members from key workflow stakeholders and appointed a project manager. The teams were assigned a radiology process improvement expert to guide and coach as needed. A series of six one hour collaborative sessions, one each month, were utilized to provide just-in-time phased education on methodology and tools (Figure 2). The typical session structure consisted of a twenty minute presentation on topics specific to the current DMAIC phase and a limited set of improvement tools. Each team presented a five minute update on project progress and lessons learned to-date. The remaining time was available to share successes, struggles, and lessons learned.

Teams were coached using a limited standardized process improvement tool set which included templates for project charter, VSM, Pareto chart, and run chart. In the define phase, each team created a project charter in order to clarify the project goal, scope, timeline, and team members. A project charter example is shown in Figure 3 which identifies that the nuclear medicine team defined their goal to reduce the patient lead time for bone densitometry exams from 94.3 minutes to 84.9 minutes within six months.

Current and future state VSMs were utilized throughout the project to graphically demonstrate the patient flow from end-to-end and help identify waste in the process. An example is referenced in Figure 4 showing how the nuclear medicine team mapped out the patient flow steps, the duration of each process step, and the first time quality percentage or first pass yield. First time quality is a calculation of the percentage of good parts at the beginning of a production run.[10] In other words, how often is a process step completed accurately and completely the first time?

In the analyze phase, teams created a Pareto chart which is a specialized bar chart that helps you focus on the vital few sources of trouble.[9] As shown in Figure 5, the nuclear medicine team was able to identify that 80% of the patient lead time was attributed to three process steps: batching of the analysis after the scan, scan time, and wait time in the subwait. This analysis provided the

Project Name:	Prepped and Ready for Bone Density Exam		
ⓘ Primary Executive Portfolio	Enterprise Practice Portfolio		
Ⓟ Primary Program	Radiology/Nuclear Medicine/Bone Density		
Ⓟ Governance Level	3 - Department/Division	ⓘ Project Size	Small
ⓘ Approved Stage	Initiate		
ⓘ Description	This project will review the Bone Density process steps and look for ways to reduce the Total Lead Time. Our goal is to reduce the Total Lead Time (Check-in to Completion) for patients by 10% from 94.3 minutes (Sept) to 84.9 minutes (or less) prior to Dec 31.		
ⓘ Primary Operating Objective	C2c: Standardize, improve effectiveness (outcomes, safety, service), and reduce cost - Service		
ⓘ Secondary Operating Objective	C2a: Standardize, improve effectiveness (outcomes, safety, service), and reduce cost - Standardization		

Schedule			
ⓘ Start Date	8/15	ⓘ Finish Date	12/31
Ⓟ Milestones			
Date	Name		
9/5	Define		
9/26	Measure		
10/24	Analyze		
11/21	Improve		
12/19	Control		

Business Need (SBAR)	
ⓘ Situation	The Bone Density process will be reviewed by creating a Value Stream Map. We plan to use the map to determine if there are opportunities to make the process more efficient.
ⓘ Background	The Bone Density patient schedule is typically very busy in the early part of the week (Monday – Wednesday). We need to have the process as efficient as possible to insure we are able to see as many patients as we can each of these days.
ⓘ Assessment	We will perform timings of the process prior to making any changes. We will then determine if changes can be made to improve the process. After any changes have been made, we will complete additional timings to determine what effect the change(s) have made.
ⓘ Recommendation	Reduction of 10% in the Total Lead time for patients having a Bone Density exam.

Figure 3 • Project Charter.

team direction on where to focus their improvement efforts.

Run charts were created in the measurement phase and were utilized throughout the project to monitor progress and sustain the gains. Run charts were selected instead of statistical control charts because they are easy to construct, even by hand, and require fewer data points than control charts, so often used in the field to get an immediate sense of process performance.[9] The run chart in Figure 6 was utilized by the nuclear medicine team to track their performance over time showing that their baseline measure of patient lead time was decreasing as improvements were made.

In the improve phase, teams identified interventions that would help them achieve their goals. On average, teams completed three tests of change. As shown in the value stream map (Figure 4), the nuclear medicine team made improvements through several tests of change known as Plan Do Study Act (PDSA) cycles which included modifying the patient changing and locker process, reducing patient steps and waiting time for those patients needing a bone density exam and a mammogram, developing a pull system by improving communication with the front desk staff, streamlining the patient flow for wheelchair patients to go directly to an exam room, and eliminating the batching process of holding exams overnight to complete the analysis the following day. By implementing these improvements, the nuclear medicine team was able to reduce the bone density patient lead time from 94.3 minutes to 35.3 minutes when the project closed (Figure 6).

In the control phase, a member of each team was provided education so they could sustain the ongoing

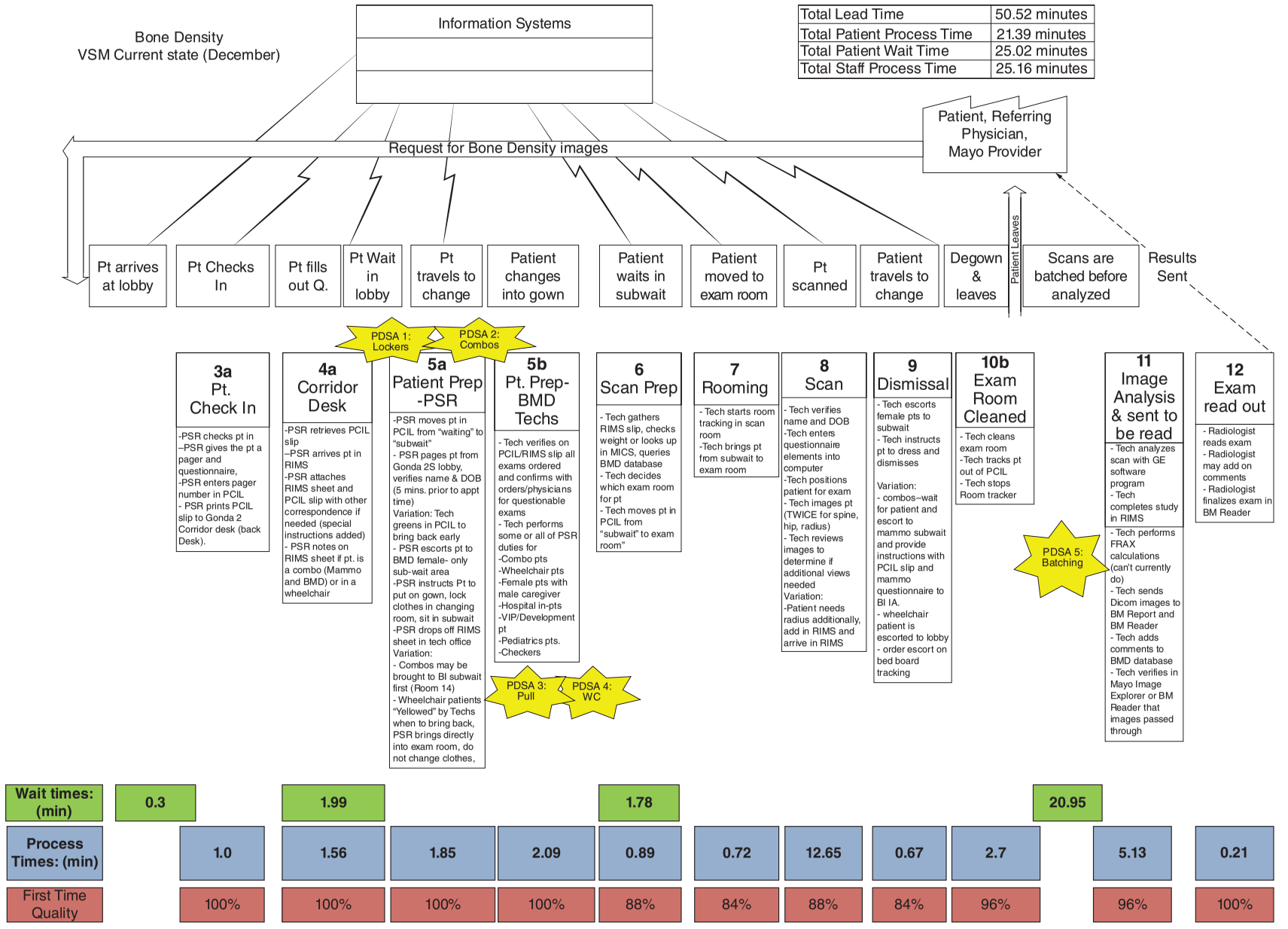
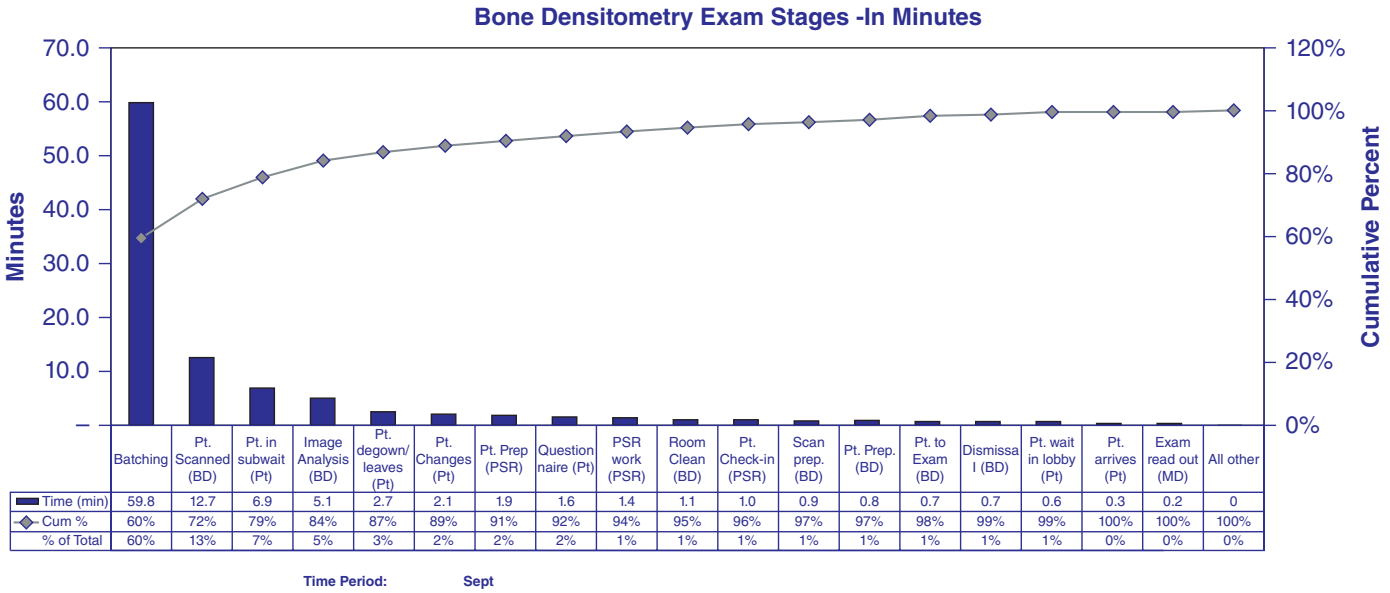


Figure 4 • Value Stream Map.



	Batching	Pt. Scanned (BD)	Pt. in subwait (Pt)	Image Analysis (BD)	Pt. degown/ leaves (Pt)	Pt. Changes (Pt)	Pt. Prep (PSR)	Question naire (Pt)	PSR work (PSR)	Room Clean (BD)	Pt. Check-in (PSR)	Scan prep. (BD)	Pt. Prep. (BD)	Pt. to Exam (BD)	Dismissa l (BD)	Pt. wait in lobby (Pt)	Pt. arrives (Pt)	Exam read out (MD)	All other
Time (min)	59.8	12.7	6.9	5.1	2.7	2.1	1.9	1.6	1.4	1.1	1.0	0.9	0.8	0.7	0.7	0.6	0.3	0.2	0
Cum %	60%	72%	79%	84%	87%	89%	91%	92%	94%	95%	96%	97%	97%	98%	99%	99%	100%	100%	100%
% of Total	60%	13%	7%	5%	3%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%

Figure 5 • Pareto Chart.

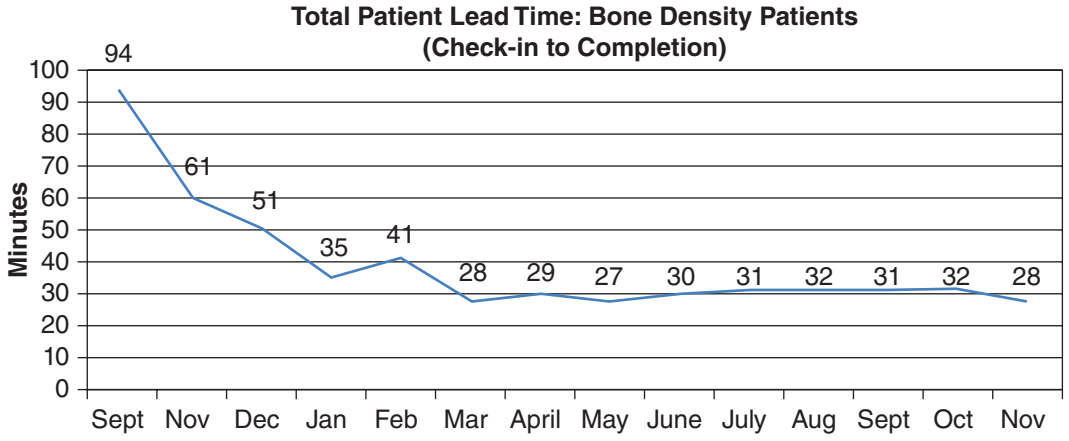


Figure 6 • Run Chart.

monitoring of their data by updating the run chart (Figure 6). This data formed the basis for project accountability and sustainability of improvement. Following the completion of the project, each team developed a sustainment plan to monitor the ongoing performance of their project goal. For the nuclear medicine team, the project manager, who was also the assistant supervisor, was trained to complete the run chart monthly and was able to ensure that the reduced lead time was sustained.

Project teams were invited to a final report-out session and celebration. Department leadership provided lunch and recognized the teams for their successes in process improvement learning and outcomes. Each team was scheduled to present their post- project metrics, lessons learned, and barriers to continued success to department leadership within six months.

Results

When the projects closed, each team showed improvement in their project metrics with five of the eight teams exceeding their goals. In a post project update months later, three teams were able to demonstrate additional improvement with sustained gains, three other teams were able to sustain some improvement from their baseline data and the

Modality	Value Stream	Metric	Baseline	Goal	Improvement (project end)	Sustained Improvement (3-5 mo. later)	Project Manager	Coach
Breast Imaging	Stereotactic Biopsy	Total patient lead time (minutes)	158	134	137 (13%)	*	Supervisor	Radiology Process Improvement Experts
CT	Outpatients	Total patient lead time (minutes)	162	146	148 (9%)	4%	Lead Technologist	
General Radiography	Inpatient Portables	Total patient lead time (minutes)	65	50	47 (28%)	35%	Assistant Supervisor	
General Radiography	Skeletal Outpatients	Total patient lead time (minutes)	48	43	41 (15%)	27%	Supervisor	
Interventional	Neuro Outpatient Lumbar Puncture	Patient wait time (minutes)	48	43	20 (58%)	31%	Supervisor	
MR	Outpatients	First case on-time start rate (%)	36%	66%	76% (40%)	34%	Lead Technologist	
Nuclear Medicine	Bone Densitometry	Total patient lead time (minutes)	94.3	84.9	35.3 (63%)	66%	Assistant Supervisor	
Ultrasound	Outpatient Diagnostic Scans	Total patient lead time (minutes)	50.5	45	46.7 (8%)	*	Supervisor	

(Definition of lead time: From patient arrival/report to exam completion)
* Unable to provide an update

Figure 7 • Table for Project Metrics.

remaining two teams were unable to provide an update due to a lack of a clear and consistent measurement strategy or concurrent initiatives that made it difficult to assess impact. The projects, teams, and goal table documents the outcomes of each project when they closed and their updated metrics several months after the projects closed (Figure 7).

Collectively, these projects improved the patient experience for 530 patients per day. Staff commented that "there is smoother patient flow through the process and there are no bottlenecks," "this has reduced the stress and feeling that we're being rushed," and "the day seems to flow better."

Team Learning Outcomes

In a post-project survey of 50 project team members, 82% stated they had more effective solutions as a result of the process improvement methodology, 84% stated they will be able to utilize the process improvement tools again in the future, and 98% would recommend participating in a future quality improvement project to a colleague. The collaborative learning and coaching approach was helpful as measured by the post-project team satisfaction survey with a 93% favorable response.

Overall, the teams identified several key components that made this initiative successful. Factors critical to success were a well-defined framework and timeline, coaching and hands-on application of VSMs, visible leadership from managers and physicians, and frontline staff huddles prior to testing changes. Teams that struggled noted confusion about expectations, underutilization of their process improvement expert, and that they did not have regularly scheduled team meetings.

Conclusion

Overall, this collaborative learning initiative was successful because it resulted in several improvements in flow for 530 patients per day, a smoothed workflow for staff, and provided a valuable learning experience to augment the process improvement skillset within each radiology modality team. This model can be successful in a large department spanning multiple concurrent projects or a large organization coordinating improvement efforts across multiple practice locations.

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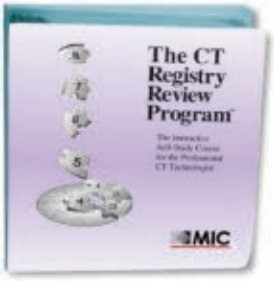

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QUESTIONS

Instructions: Choose the answer that is most correct. Note: Per a recent ARRT policy change, the number of post-test questions has been reduced from 20 to 8.

1. **The Institute of Medicine's six aims for healthcare include safe, timely, effective, efficient, equitable, and _____ care.**
   a. Physician-centric
   b. Payer-centric
   c. Provider-centric
   d. Patient-centric

2. **Six Sigma's DMAIC project structure includes the following phases:**
   a. Data, Management, Accountability, Implementation, Control
   b. Define, Management, Accountability, Improvement, Committee
   c. Define, Measure, Analyze, Improve, Control
   d. Documentation, Measurement, Application, Innovation, Creativity

3. **A tool that can clarify the project goal, scope, timeline, and team members is a:**
   a. Value Stream Map
   b. Project Charter
   c. Run Chart
   d. Pareto Chart

4. **A tool that can graphically demonstrate the patient flow from end-to-end and help identify waste in the process is a:**
   a. Value Stream Map
   b. Project Charter
   c. Run Chart
   d. Pareto Chart

5. **A tool that can place the focus on the vital few sources of trouble or opportunity is a:**
   a. Value Stream Map
   b. Project Charter
   c. Run Chart
   d. Pareto Chart

6. **A tool that can monitor progress and aid in sustaining the gains is a:**
   a. Value Stream Map
   b. Project Charter
   c. Run Chart
   d. Pareto Chart

7. **Plan Do Study Act (PDSA) cycles are utilized in which DMAIC project phase?**
   a. Improve
   b. Implementation
   c. Data
   d. Control

8. **A collaborative learning model can be a successful method for teams to learn the process improvement skillset and improve the practice simultaneously.**
   a. True
   b. False

Lean Six Sigma and Employee Development

By Mark Lerner

This summer I will deliver the "Introduction to Process Improvement" lecture for the Basic Management Track at the AHRA Annual Meeting in Nashville. I have given this talk numerous times before and, as in the past, I will use the opportunity to introduce the audience to the subject of facilitating a Lean Six Sigma project. As I point out during the lecture, if the Lean Six Sigma methodology is strictly followed it can be utilized to improve almost any system by 30–50%. But, recently, this realization had me thinking: What if we apply this technique to our management of people?

We know from our experience that providing employees feedback regarding their performance is vital to their professional growth. We also know that this information should be offered to staff as soon as possible from the moment that a particular behavior is observed. As my boss likes to remind me: "What you permit you promote." I have been working hard to increase the amount of advice I provide to those who report to me. The experience has proved to be extremely valuable. The individuals with whom I work have listened to my words with an open mind and they have provided valuable insight into the areas we have discussed.

Now, I want to take this subject further. Just as we create an elevator speech and steps around improving a procedure in Lean Six Sigma, I want to follow a similar approach to dealing with people. Let's take a hypothetical example. Imagine that I have a radiology manager who works for me and, on occasion, utilizes inappropriate language in counseling their employees. The words this individual utters frequently upset staff members; in fact, a number of them have resigned after experiencing one of these encounters. The manager is not doing this on purpose. I envision setting up a meeting to discuss the issue with this manager and during the session I would start by developing an elevator speech.

The elevator speech gets its name from the idea that if someone was to get in an elevator with you and ask about the performance improvement activity you were working on, the speech would allow you to provide a description while traveling just a few minutes between floors. A good elevator speech has three distinct parts. The first describes the problem. The second summarizes the importance of the matter. The final part states the improvement that will be made. In working with the manager, I would imagine the speech might look like this:

> "The words that you use in interactions with our employees in many instances unintentionally leave them feeling disrespected. This has resulted in several of them resigning from our facility to work somewhere else. Together, we need to figure out an improved method of communication with these staff members that will correct the behavior while simultaneously have them feeling respected."

The next step in using Lean Six Sigma as an employee development tool would be to agree on action steps that would be taken to improve the identified issue. For instance, I could envision in this case having the manager role play for me the interaction with the staff member before it actually takes place, or me sitting in on the session with the manager and the employee to monitor what is being said, or even simply having the manager visualize the conversation before it takes place. We would then implement the plan and measure the results. Of course, measurement is a key component of Lean Six Sigma projects. There are several ways that this could be accomplished in our fictitious example, such as asking the staff member whether he or she felt valued at the end of the conversation, requesting honest feedback on how the employee thinks the conversation went, or measuring the turnover of individuals who report to this manager.

Also, as with Six Sigma, if positive results are not realized with the action plan then the whole project must be started again from the beginning. In our example, one step that could be taken if the original plan does not bring about the intended results is to begin the progressive counseling process with this manager.

We all deal with serious issues regarding employee performance on a daily basis. Perhaps applying Lean Six Sigma methodology to these interactions can bring about the same improvements that it does when utilized with systems.

Mark Lerner is the director of diagnostic imaging at the George Washington University Hospital. He can be reached at Mark.Lerner@gwu-hospital.com.

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Enhancing the Imaging Experience for Pediatric Patients

By Molly Baron, BS, CCLS, Shannon Joslin, MS, CCLS, Jane S. Kim, MD, Narendra S. Shet, MD, Brigitte Pocta, MLA, and Penny Olivi, MBA, RT(R), CRA, FAHRA

The credit earned from the Quick Credit™ test accompanying this article may be applied to the CRA communication & information (CI) management domain.

EXECUTIVE SUMMARY

- The University of Maryland Medical Center's goal was to improve the safety and comfort of pediatric imaging by enhancing the experience for children. Two pediatric radiologists and two child life specialists worked together to create a training program to help guide radiology technologists on how to approach and interact with children undergoing medical imaging.
- The results of surveys administered to technologists and parents or caregivers helped refine the strategy for both creating training sessions for technologists and reading materials for children and their parents to optimally prepare for the procedures.
- Training sessions included information on language choices, developmental considerations, comfort techniques, patient- and family-centered care practices, procedural support techniques, and coping styles.
- Through the implementation of learning sessions and distraction resources for technologists, and the development of preparation books, the imaging experience for pediatric patients at UMMC has improved.

Imaging pediatric patients can present challenges to both the technologists acquiring the exams and the radiologists interpreting them. Radiologic exams can be a stressful experience for many children who may feel anxious, nervous, or even frightened. This may translate into a suboptimal exam, ranging from a mildly limited exam due to patient motion to early termination of an exam, thus reducing image quality and diagnostic confidence. For this reason, many pediatric patients are sedated when undergoing exams such as MRI. Sedation comes with its own risks and expenses.[1,2] Furthermore, our medical center serves a large population of sickle cell patients, for whom sedation poses the additional burden of blood transfusion, as sedation can trigger vaso-occlusive crises.[3]

The University of Maryland Medical Center (UMMC) is a 750+ bed, urban hospital with a Level I trauma center. UMMCs physicians are faculty members at the University of Maryland School of Medicine, the nation's first public medical school. Founded in 1823, the medical center is one of the oldest academic medical centers in the United States and serves as a tertiary care facility for the state of Maryland and the surrounding region. The University of Maryland Children's Hospital (UMCH) based within UMMC serves a broad range of primary and subspecialty care pediatric patients. The Department of Diagnostic Radiology and Nuclear Medicine at UMMC has state-of-the-art facilities to provide cutting edge imaging services to pediatric and adult patients. Over 27,000 imaging studies in pediatric patients were performed in 2014.

UMMC's goal was to improve the safety and comfort of pediatric imaging by enhancing the experience for children. Using a grant from the AHRA & Toshiba Putting Patients First Program, two pediatric radiologists and two child life specialists worked together to create a training program to help guide radiology technologists on how to approach and interact with children undergoing medical imaging. In addition, they created exam preparation books for each modality to educate children and their caregivers in advance of their scheduled imaging. Child life specialists have expertise in child development, children's normal responses to stressful healthcare

Box 1. Pre-training Survey for Technologists

In which area do you primarily work?

a. X-Ray
b. Fluoroscopy
c. Ultrasound
d. CT
e. MRI

What is your level of comfort with imaging children?

a. Very comfortable
b. Comfortable
c. Neither comfortable nor uncomfortable
d. Uncomfortable
e. Very uncomfortable

Do you have any prior training specific to imaging children?

a. Yes
b. No

Have you worked with children before in another setting? (i.e., another job)

a. Yes
b. No

If yes, please explain.

Have you had any prior bad experiences with imaging children?

a. Yes
b. No

If so, please describe incident.

What is the most single challenging aspect you find when imaging children?
In your opinion, what do children have the most difficulty with during the exam?
Please rank in order from #1 to #5 (from easiest to most challenging) the age group with which you find most challenging to work.

a. Newborns / Infants 0-1yr
b. Toddlers 2-4yr
c. Children 5-12yr
d. Teenagers 13-18yr

Please explain your #5 choice (most challenging to work with).

Do you feel that you are able to communicate with children effectively?

a. Yes
b. No

If no, please explain your answer choice.

Box 1. Pre-training Survey for Technologists (*continued*)

Have you worked with child life specialists before?

a. Yes
b. No

If so, what was your experience like?

Do you believe that children are optimally prepared for the examination?

a. Yes
b. No

If no, what do you think could be done to improve their level of readiness?

What are some techniques that can be used when approaching a fearful child prior to their scan?
What information would you like to gain from this seminar?

events, and best practices for minimizing stress and maximizing coping in children and families.[4] By training technologists in developmentally appropriate and psychosocially supportive practices, we sought to improve the child's experience with imaging by increasing readiness and reducing anxiety. The expectation was that this would ultimately result in better image quality and increase radiologists' diagnostic confidence.

Over the course of a few months, several separate training sessions were conducted for fluoroscopy, ultrasound, CT, and MRI, since training for these imaging modalities consists of differing approaches given the unique aspects of each exam. Training included information on language choices, developmental considerations, comfort techniques, patient- and family- centered care practices, procedural support techniques, and coping styles. Examples of challenging cases were solicited prior to training for incorporation into training scenarios. These issues were identified by a survey administered to technologists prior to training.

Surveys of Technologists and Parents

The survey included questions about technologists' experience and level of comfort imaging children. It included whether they had any prior training and asked them to discuss any prior bad experiences. Recipients were also asked to describe what they thought children have the most difficulty with during the exam and to rank various age groups in order from easiest to most challenging. Technologists were asked if they felt they were able to communicate effectively with children and if the children and parents are optimally prepared for exams and, if not, what could be done to improve readiness. They were also asked if they had worked with child life specialists before and, if so, what the experience was like. Lastly, they were asked what they would like to gain from the training. See Box 1.

Seventy-six technologists from five modalities (x-ray, fluoroscopy, ultrasound, CT, and MRI) completed the survey. The results showed that although 86% of technologists described themselves as either "very comfortable" or "comfortable" imaging children, 39% reported a prior bad experience. These experiences included difficulty controlling motion and dealing with fearful, crying children and anxious parents. When asked to rank age groups with which to work (newborns, toddlers, children, teenagers, parents) in order from easiest to most challenging, not surprisingly technologists ranked toddlers the most difficult (46%). However, the second most challenging group identified was parents (19%), which illuminated the need to prepare not only children but also their parents for the exams. See Figure 1.

In addition to administering surveys to technologists, a survey was also developed for parents or caregivers to complete prior to their child's exam. Nearly 100 individuals completed the survey. When asked if they felt they were prepared for their child's exam, 87% responded that they were. However, only 60% of parents felt their children

We sought to improve the child's experience with imaging by increasing readiness and reducing anxiety.

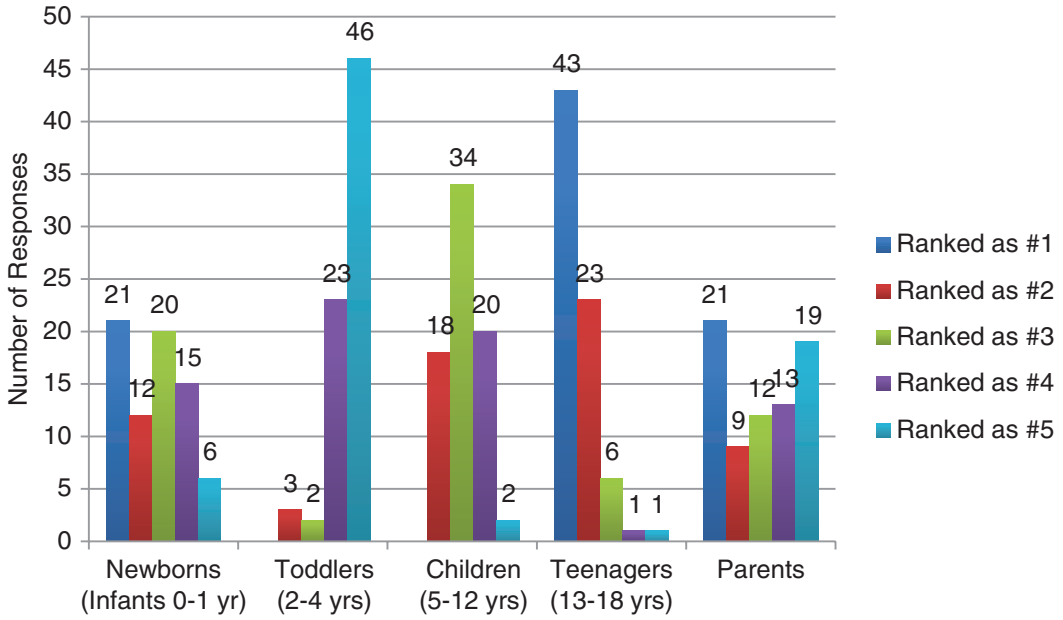

Figure 1 • Results of pre-training survey question: Please rank in order from #1 to #5 (from easiest to most challenging) the age group with which you find most challenging to work.

were prepared for the exam. When asked if parents or caregivers read any materials beforehand explaining the exams their children were having, 42% responded that they had. When asked if they would read an online resource tool explaining the exams, 82% replied that they would.

The results of the surveys administered to technologists and parents or caregivers helped refine the strategy for both creating training sessions for technologists and reading materials for children and their parents to optimally prepare for the procedures.

Training Sessions

Training sessions specific to each modality were conducted over the course of several months by a certified child life specialist. To optimize attendance, training sessions were conducted during the time usually allotted for technologists' team meetings. These were the goals of each training session:

- Increase knowledge about the common stressors and fears related to pediatric patients and best practices for supporting the pediatric population during imaging.
- Increase knowledge of coping styles and techniques for supporting a child's preferred coping style.
- Learn strategies for using preparation resources to improve patient and family compliance and imaging success.

Among the items discussed were: different ways to calm children, methods of distraction, techniques to improve communication with children and parents (including the use of age-appropriate language), positioning and supportive techniques, how to best approach each age group based on their developmental level, and how to handle challenging parent situations. Technologists had ample time to ask questions during the training sessions. Post-training support was provided by the child life specialist during high volume scheduled pediatric imaging timeframes. The child life specialist was available to observe, support, and model training techniques with technologists for real-time feedback.

Distraction Tool Kits and Preparation Books

Two deliverables directly funded by the grant were distraction tool kits and preparation books. The distraction tool kits were created by the child life specialists in conjunction with the pediatric radiologists and were provided to every imaging modality at both inpatient and outpatient facilities. Bins were labeled with contents and suggestions for use appropriate for each age group. The tool kits contained items such as pacifiers, board books, spinning light wands, pinwheels, look and find books, and View-Masters® along with suggestions of non-tangible distraction methods such as singing to infants and using guided imagery with teenagers.

To address the need identified on the technologists' and parents' surveys to better prepare children and caregivers prior to their exams, preparation books were developed for each imaging modality (Figure 2). Using child-friendly language, the preparation

Welcome to the University of Maryland Medical Center!

Today you will be having a CT Scan. "CT" stands for Computed Tomography. A CT is a way to take pictures of the inside of your body.

Figure 2 • Sample Page from Preparation Book.

books describe each imaging modality accompanied by photographs of children going through each of the imaging exams from start to finish. These books are available online (http://umm.edu/programs/diagnosticrad/patients/pediatric-prep) and in the radiology waiting areas. During scheduling, patients are given information regarding accessing the book online.

Post-Training Surveys

A post-training survey was administered several months after initial training for feedback on the program. Sixty-four percent of respondents said the seminar increased their level of confidence in imaging children, with 81% reporting using child life techniques on subsequent imaging exams. The seminar increased the technologists' ability to communicate more effectively with children (64%). The majority of technologists (75%) had used the distraction kit, and all of them found it useful. Respondents were asked what they found most helpful from the seminar—sample responses included: the role of child life in the hospital setting, specific techniques on how to work with children including using a soothing voice, the use of age-appropriate toys for distraction, and the importance of explaining the procedure to the child and parent. Specific suggestions were gathered with the intent to incorporate into future sessions.

Conclusion

Child life education brings value to pediatric imaging by optimizing comfort and increasing compliance. Through the implementation of learning sessions and distraction resources for technologists, and the development of preparation books, the imaging experience for pediatric patients at UMMC has improved. With a more patient friendly imaging encounter, we foresee improved pediatric patient compliance, thus increasing image quality and diagnostic confidence.

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QUESTIONS

Instructions: Choose the answer that is most correct. Note: Per a recent ARRT policy change, the number of post-test questions has been reduced from 20 to 8.

1. **Through the implementation of learning sessions and distraction resources for technologists, the imaging experience for pediatric patients at the University of Maryland Medical Center (UMMC) has:**
   a. Not changed
   b. Improved
   c. Declined
   d. Improved at first, but then declined

2. **UMMCs goal was to:**
   a. Improve the safety of pediatric imaging
   b. Improve the comfort of pediatric imaging
   c. Teach radiology technologists how to approach and interact with children undergoing imaging
   d. All of the above

3. **Training sessions included information about:**
   a. Spanish language usage
   b. Techniques for comforting anxious children
   c. Conflict resolution with co-workers
   d. Anesthetic sedation

4. **Imaging pediatric patients can present challenges to:**
   a. The technologists acquiring the exams
   b. The radiologists interpreting the exams
   c. Both a and b
   d. None of the above

5. **Traditionally, many pediatric patients are sedated when undergoing exams such as MRI because:**
   a. Technologists generally do not like to image children who are awake
   b. Radiologists prefer to read studies of children who are sedated or asleep
   c. It's less costly to image children who are sedated
   d. Children may feel anxious during the exam and not be able to hold still long enough to obtain good quality images

6. **Examples of challenging imaging cases were obtained prior to the training for radiology technologists by:**
   a. A survey distributed to radiology technologists
   b. Information overheard in staff meetings
   c. Information provided by another hospital
   d. A survey distributed to pediatric radiologists

7. **Child life specialists have expertise in:**
   a. Child development.
   b. Children's normal responses to stressful healthcare events
   c. Best practices for minimizing stress and maximizing coping in children and families
   d. All of the above

8. **Item(s) developed by UMMCs child life specialists and pediatric radiologists to optimize the imaging experience for children is/are:**
   a. Toys and games
   b. A brief video that demonstrates the ultrasound procedure
   c. Distraction tool kits and preparation books
   d. A puppet show

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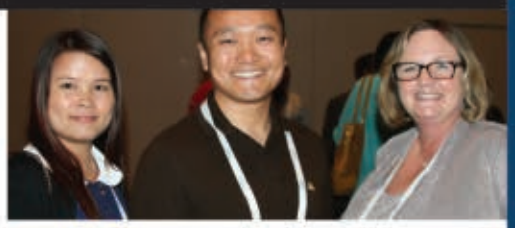






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De-nied!

By Melody W. Mulaik, MSHS, CRA, FAHRA, RCC, CPC, CPC-H

How you pronounce the word "denied" is probably driven by what sitcoms you watch and/or if you have teenagers who utilize this word in some form or fashion. In my house, the "n" tends to get more of an emphasis than the "d" at the moment. The relevance is the sharp emotion reflected in the emphasis which arguably can be translated into how you feel when a payor chooses not to pay for something that you think they should have.

In the past, payment for a service was contingent upon accurate insurance information and correct coding. If you properly addressed those two key items the payor paid the claim without any real hassle. Today that is not necessarily the case. In theory, for radiology services, the right service will be ordered (correctly the first time), the performed services will match the order (always!), the correct CPT®/HCPCS procedure codes, modifiers, and ICD-10-CM diagnosis codes will be assigned, and the payor will quickly pay the claim within 14 days. Note that I said "in theory." While this process should accurately reflect what occurs with every outpatient service it is unfortunately not the case. This article will highlight some of the key issues that drive denials so that you can ask the right questions to find the true cause of the problem.

My initial geeky thought was to create a big flow chart that showed all the different scenarios of denials and if/then, but I quickly realized that would be unmanageable and frankly depressing all at the same time. So instead I am going to hit the two biggest areas that drive denials with the goal of at least providing the basics that will help in your identification and resolution.

In a nutshell, most denials that do not relate to medical necessity are caused by bundling edits and/or incorrect modifier usage. These two topics are intertwined and it is hard to address them as independent issues so keep that in mind as you read through the following sections.

Bundled Services (aka, Edits)

Unbundling is the practice of assigning multiple procedure codes for a combination of services that is covered by a single code. Providers can unbundle services unintentionally due to a misunderstanding of coding guidelines, or intentionally in an effort to unethically increase their payments. Most payors use bundling edits to recombine services that were unbundled by the provider. The Centers for Medicare and Medicaid Services (CMS) uses the Correct Coding Initiative (CCI) edits for this purpose. There are separate versions of the CCI edits for Medicare claims and Medicaid claims. There are also separate versions of the edits for hospitals and for non-hospital providers. The edits are updated on a quarterly basis.

The CCI edits include several different types of edits:

- Procedure-to-Procedure (PTP) edits: Pairs of codes that should not usually be reported together.
- Medically Unlikely Edits (MUEs): The maximum number of units of a procedure code that a single provider should normally report on a single day.
- Add-on Code Edits: A list of add-on codes with their recognized base codes.

Procedure-to-Procedure Edits

When the two codes in one of the PTP code pairs are reported by the same provider for the same patient on the same date of service, the provider will receive payment for the code that appears in Column 1 of the edits. The code in Column 2 will not be paid. In most cases, the higher paying code is in Column 1. However, when the two codes are "mutually exclusive," the lower paying code is in Column 1. Mutually exclusive codes are pairs of services that cannot reasonably be performed at the same anatomic site or same patient encounter. For example, a two-view chest x-ray (code 71020) is mutually exclusive with a two-view chest x-ray with fluoroscopy (71023).

Each PTP code pair has a modifier indicator that shows whether the edit can be bypassed with a modifier. If there are situations when it is appropriate to

report the two codes on the same day, the code pair will have modifier indicator 1, meaning that the provider can use a modifier to show that the services were separate and distinct, and both will be paid. However, if the code pair has modifier indicator 0, this means there are no circumstances under which Medicare would ever consider both services to be separate and distinct, and the Column 2 service will be denied even if a modifier is applied.

Medically Unlikely Edits

The MUEs indicate the maximum units of a procedure code that a provider would report under most circumstances for a single patient on a single date of service. For example, the MUE limit for non-contrast MRI of the brain (70551) is 1, meaning that it should be extremely unusual for a provider to report more than one exam for the same patient on the same day. Not all procedure codes have MUEs, and CMS does not publish all of the MUEs that it has implemented. Some of the edits are kept confidential to prevent providers from gaming the system. The current MUE file can be downloaded from the CMS website at: http://www.cms.gov/Medicare/Coding/NationalCorrectCodInitEd/MUE.html

The MUE files contain the following fields for each procedure code:

- MUE Values: This field indicates the number of units of the procedure that the MUEs allow.
- MUE Adjudication Indicator: This field shows you whether the procedure is subject to a line item limit (indicator 1) or a date of service limit (indicators 2 and 3).
- MUE Rationale: This field shows you whether the edit is based on anatomy, CMS policy, CPT® guidelines, or other factors.

Some of the MUEs are applied to each line item on the claim. These edits have an MUE Adjudication Indicator (MAI) of 1. If a provider performs a number of services that is in excess of the MUE limit, and if all services were medically necessary and appropriately documented, the provider may use a modifier (usually modifier 76) to report the additional units as separate line items. For example, single-view abdomen x-ray (74000) has an MUE limit of 3 and an MAI of 1. If a patient has 4 medically necessary single-view abdominal x-rays on the same day, the provider can report one line item with 74000 × 3 units and another line item with 74000-76 × 1 unit. If the services are not reported exactly as required, a denial may occur.

Other MUEs are applied to the date of service (DOS) rather than to the line item. There are two types of DOS edits. If the edit has an MAI of 2, CMS believes there are no instances when it would be appropriate to report units in excess of the MUE. For example, diagnostic CT colonography (74261) has an MUE limit of 1 and an MAI of 2. This means that Medicare will not pay for more than 1 unit of this code on the same day, even if the units are reported on separate claims.

The majority of DOS edits have an MAI of 3 rather than 2. For MAI 3 edits, CMS believes it would be rare (though not impossible) for a patient to need additional units in excess of the MUE limit. If this situation arises, the provider can bill for the additional units, but they will be denied and the provider will need to appeal. For example, a cervical esophagram (74210) has an MUE limit of 1 and an MAI of 3. Normally, Medicare will pay for no more than 1 unit of this code per day, but it may be possible for the provider to be paid on appeal in the rare instance that a patient requires an additional exam.

When applying DOS edits, the Medicare contractor will sum up the units of the code on the current claim, regardless of modifiers, as well as those on any past paid claims for the same DOS. If the total is greater than the MUE limit, the contractor will deny all claim lines for that code on the current claim, but the paid claim will not be reopened.

CMS considers MUE-related denials to be coding denials rather than medical necessity denials. Therefore, providers are not permitted to use an Advance Beneficiary Notice (ABN) to shift payment responsibility to the patient.

Add-on Code Edits

The Add-on Code Edits designate the allowable base codes for an add-on code. Add-on codes are divided into three categories:

- **Type 1:** The edits for these codes prevent payment for the add-on code unless it appears in conjunction with one of its designated base codes.
- **Type 2:** There are no national edits for Type 2 add-on codes, but Medicare contractors have the authority to establish their own edits.
- **Type 3:** If a Type 3 add-on code appears in conjunction with one of its designated base codes, the contractor must pay for it. However, the contractor also has the authority to designate additional base codes with which the add-on code is payable.

National Correct Coding Policy Manual

In addition to the CCI edits, CMS also publishes the National Correct Coding Initiative Policy Manual, which describes the principles on which the edits are based. The manual is available on the CMS website at: http://www.cms.hhs.gov/NationalCorrectCodInitEd/

Radiology coding and billing professionals should download a copy of the latest version of the manual and review it carefully. The manual is updated each year in the fourth quarter for the coming calendar year. Particular attention should be paid to Chapter 1 (General Correct Coding Policies) and Chapter 9 (Radiology Services).

Other Payors

The CCI edits are published by CMS for Medicare and Medicaid claims, but other payors also use bundling edits. Commercial payors, Blue Cross Blue Shield plans, and managed care plans may use some or all of the CCI edits and may also use their own edits that are not part of CCI. For example,

ClaimCheck® is a proprietary software product that contains bundling edits.

Non-governmental payors are not required to publish their bundling edits, so you should review your remittances to determine what edits your contracted payors are using.

Modifiers

Many claims are denied because the "right" modifier was not properly applied. The challenge is that there is not always a clear definition of what is "right." The CPT® code set and the HCPCS code set both contain modifiers. Most CPT® modifiers consist of two numbers, such as modifier 50 (Bilateral Procedure). Appendix A of the CPT® manual contains a listing of CPT® modifiers. HCPCS modifiers, on the other hand, are issued by CMS. They consist of two letters or a letter and a number, such as modifier LT (Left side). Depending on the circumstances and the payor's policies, it may be appropriate to apply a CPT® modifier to a HCPCS code or a HCPCS modifier to a CPT® code. Some modifiers can be used only by physicians, some are limited to hospital outpatient use only, and some can be used in any setting. For example, modifier 26 is limited to physician use, modifier 73 is limited to hospitals, and modifier 52 can be used by both physicians and hospitals.

Guidance on modifier use is available in the CPT® manual, in CPT® Assistant, and in the National Correct Coding Initiative (NCCI) Policy Manual. That said, you will find that all private payors do not follow published information. Many times they will publish, or not, their own guidelines regarding modifiers and use this information to adjudicate their claims. In the absence of published guidelines the only way to find out this information is through trial and error. The trial and error process can be lengthy and frustrating especially for lower priced exams. Sometimes resources never get devoted to investigating the cause of the denial(s) and the charges are written off instead of determining the cause of problem.

Summary

It is important to remain current on the latest edit and modifier guidelines from the AMA, CMS, and your contracted payors. Failure to use modifiers correctly can result in under- or overpayments and can put a provider at risk of penalties. Also, since payors vary in how they adjudicate claims with modifiers, it is important to monitor payments for claims with modifiers to make certain you are being paid correctly.

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ICD-10: Intervertebral Disc Disease

By Melody W. Mulaik, MSHS, CRA, FAHRA, RCC, CPC, CPC-H

The intervertebral discs are located between adjacent vertebrae and serve to cushion the spine. There are 23 discs in the normal spine, with the highest located at the C2-C3 level and the lowest at the L5-S1 level. ICD-10-CM groups the discs as seen in Table 1.

Cervical disc disorders (C2-C3 through C7-T1) are classified to category M50 *(Cervical disc disorders)*, while all of the remaining levels are classified to category M51 *(Thoracic, thoracolumbar, and lumbosacral intervertebral disc disorders)*. The codes in categories M50-M51 can be located in the ICD-10-CM Index to Diseases and Injuries under the entry "Disorder, disc (intervertebral)."

The two most common disc disorders are:

- Disc degeneration—The disc loses water content, shrinks, and develops small tears. This is a normal part of the aging process. It is also known as degenerative disc disease (DDD).
- Disc displacement—The nucleus pulposus (soft material inside the disc) protrudes into the spinal canal, causing pain and inflammation. Disc displacement is also referred to as herniated nucleus pulposus (HNP).

Disc disorders are coded differently depending on whether they are causing radiculopathy, myelopathy, or neither. Radiculopathy is a disorder of the nerve root, the most proximal part of a spinal nerve where it leaves the spinal cord and exits through the intervertebral foramen. It can be caused by pressure on the nerve root from a degenerative or displaced disc. For coding purposes, sciatica is a type of radiculopathy. Likewise, myelopathy (a disorder of the spinal cord) can occur if the disc material presses on the cord rather than a nerve root. (Note that the spinal cord usually terminates in the upper part of the lumbar spine, so disc disorders below this level do not cause myelopathy.)

There are codes in categories M50-M51 for disc disorder with radiculopathy and disc disorder with myelopathy. For example, code M51.14 *(Intervertebral disc disorders with radiculopathy, thoracic region)* represents any type of thoracic disc disorder that is causing radiculopathy. This same code would be used regardless of whether the patient's radiculopathy is due to thoracic disc degeneration or thoracic disc displacement.

If the patient has disc degeneration or displacement but does not have myelopathy or radiculopathy, then a code for "other disc degeneration" or "other disc displacement" is assigned. For instance, thoracic disc displacement without radiculopathy or myelopathy is reported with code M51.24 *(Other intervertebral disc displacement, thoracic region)*.

There is an instruction under category M50 *(Cervical disc disorders)* in the Tabular List to "Code to the most superior level of disorder." This refers to the level that is highest up on the spine. *Coding Clinic® for ICD-10-CM/ICD-10-PCS* (First Quarter 2016) provides the example of a patient with myelopathy due to disc disorders at the C3-C4 level and C5-C6 level. The C3-C4 level is classified as high cervical (M50.01) while the C5-C6 level is classified as mid-cervical (M50.02). In this situation only the high

TABLE 1. ICD-10-CM Grouping of Intervertebral Discs

Region	Levels
High cervical region	C2-C3 and C3-C4
Mid-cervical region	C4-C5, C5-C6, and C6-C7
Cervicothoracic region	C7-T1
Thoracic region	T1-T2 through T11-T12
Thoracolumbar region	T12-L1
Lumbar region	L1-L2 through L4-L5
Lumbosacral region	L5-S1

cervical level would be coded, not the mid-cervical level. This rule applies only to cervical disc disorders, not disc disorders in the thoracic or lumbar spine.

Finally, ICD-10-CM does not contain a code for intervertebral disc degeneration in an unspecified part of the spine. According to *Coding Clinic*® (Third Quarter 2013), the National Center for Health Statistics plans to make appropriate corrections to the Index entry for this condition. In the meantime, if documentation does not indicate the location of the disc degeneration, the radiologist or referring physician should be queried to obtain more specific information.

Melody W. Mulaik is president and co-founder of Coding Strategies, Inc. She is a nationally recognized speaker and has delivered numerous presentations at AHRA annual meetings and conferences. Melody is a member of AHRA, has published extensively, and may be contacted at melody.mulaik@codingstrategies.com.

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Business Intelligence in Hospital Management

By Achim Escher, Nicolin Hainc, and Daniel Boll

EXECUTIVE SUMMARY

- Business intelligence (BI) is a worthwhile investment, and will play a significant role in hospital management in the near future.
- Implementation of BI is challenging and requires resources, skills, and a strategy, but enables management to have easy access to relevant analysis of data and visualization of important key performance indicators (KPI).
- Modern BI applications will help to overcome shortages of common "handmade" analysis, save time and money, and will enable even managers to do "self-service" analysis and reporting.

Management cannot work without defining and utilizing key performance indicators (KPI) to control entire business procedures. This is also a must for the health management sector. Cuts in reimbursement and higher demand from patients and referring physicians combined with a permanently varying political and legal framework requires high transparency and the ability to react quickly, change strategies, and optimize processes. This leads to increased requirements in the availability of information and data analysis. The implementation of modern methods in business intelligence (BI) opens up the opportunity to face these challenging tasks.

Why should managers in the healthcare sector care about BI? What are the costs of implementation and operation and what is the benefit? Calculating the cost of BI is definitely less complex then calculating its benefits, especially on a monetary basis.[1] The underlying problem is that BI cannot create revenues by itself, and the benefit arises from the consequences driven by its results. The use of BI is the key to identifying and implementing precise actions and observing their outcomes. BI has to become a major part of the strategy of each department and the overall hospital management. Maurer et al show that the use of the balanced scorecard (BSC) is suitable for the management of a radiology department.[2,3] For each perspective of the BSC, objectives, measures, targets, and initiatives have to be defined. The measures or KPI should be permanently observed to ensure that the predefined targets are achieved.

What Is BI and What Is Needed for Its Implementation?

There are many definitions of the term BI published in the literature. Technically, BI summarizes all applications used for the analysis of data and decision support. Thus, a simple Microsoft Excel spreadsheet displaying the number of examinations and interventions at a hospital is one form of BI. This is, however, a very narrow perspective, as BI is more than that.

> "Business Intelligence (BI) is an umbrella term that includes the applications, infrastructure and tools, and best practices that enable access to and analysis of information to improve and optimize decisions and performance."[4]

This definition shows that, besides the tools and applications, appropriate organizational structures are necessary. For a successful implementation of a BI environment, investment in technical and personnel resources is required.

Data and Its Availability

First, it must be clear what data is needed for the analysis. IT architecture is very heterogeneous, especially in a hospital environment. It is dominated by specific and mostly self-sufficient departmental IT systems (eg, radiology, laboratory, operating rooms). Access to the data in these departmental systems

can be challenging, especially if it is necessary to combine data from different systems. Depending on complexity and requirements of the analysis it is usually necessary to build a data warehouse and implement a solid ETL (Extraction, Transformation, and Loading data from different systems) process. This helps consolidate and prepare the data and enables easy and reliable data analysis. The implementation of such a professional BI environment is complex and time-consuming, and often collides with the need for immediate and valid results at the management level. It also requires specific know-how that isn't usually available in a hospital setting, especially when it comes to the analysis of data of departmental systems. Consolidation of these data requires a deep understanding of the specific application and database, ideally in combination with a deep insight into the procedures of the corresponding department. For optimal results close cooperation between IT experts and the service owner of the departmental application is mandatory.

Professional BI Applications

Microsoft Excel is probably still the most common tool for data analysis and control tasks. Even in the near future it will play a significant role in detailed and ad-hoc analysis. However, for more complex and standardized data analysis the use of a professional BI application is encouraged. BI applications are suitable for the needs and requirements of quick, reliable, and intuitive KPI. They outperform the common means of reporting and analysis with high performance and flexibility, especially in handling big data, complex algorithms, and visualization of KPI. Additionally, as the extraction and preparation of data can be run automatically, independent data access can be granted to all staff.

Currently, many different and powerful applications exist, and finding the right application is not easy. As always, individual solutions and vendors have their own strengths and restrictions, making it helpful to start with an overview of the BI solutions market. The following professional market overviews may help to sift the eligible applications.

- Magic Quadrant for Business Intelligence and Analytics Platform—Gartner (www.gartner.com)
- Healthcare Analytics Performance—KLAS (KLASresearch.com)
- BI Survey -BARC (barc-research.com)

The second step in choosing the right solution is based on individual requirements. It is strongly recommended to create a detailed requirements specification, which should be drawn up in collaboration with users (such as controllers and managers), the departmental applications administrators, and IT experts. The resulting document will assure that defined specifications are fulfilled. The document should contain the following topics.

- Goal (Why should a BI application be implemented?)
- Visualization and analysis (eg, dashboards, charts, interactive visualization, drill-down)
- Additional functionalities (eg, use of mobile devices, export of data)
- Data integration (eg, compatibility, transformation)
- Installation (eg, servers, compatibility)
- Administration (eg, performance, support, community)

Personnel Resources, Know-How, and Skills

For successful BI solution implementation personnel resources with specific know-how and skills must be considered. Permanent training is a must to suit continuous development in this dynamic field. For instance, in a radiology department the administrator of the radiology information system (RIS) will be the one with knowledge and access to the database and a good insight into departmental procedures. He/she might not, however, have the skills for implementing and operating a professional BI solution, and might lack data access to other applications if needed for further analysis. This is when other experts come into play. For personnel with usual IT skills the use of modern BI applications is easy to learn. Initial results are available within the first two weeks, but for routine use of the extensive features a training period of at least one year must be taken into consideration. Modern teaching methods, such as video tutorials, online courses, and user communities are helpful and, compared to conventional teaching methods, less expensive.

The ongoing effort to prepare and publish reports and analysis will decrease with successful implementation of a BI approach. However, a substantial investment in the initial implementation of the new system is required. But this investment will result in a greater benefit. At the start, management is responsible for evaluating if the required personnel resources and skills are available. In bigger hospitals a central unit for control and BI might be in charge of delivering reports and KPI to the CEO on the level of a management information system. Nevertheless, a decentralized control structure is necessary, as staff from a central control unit are too far removed from the business of specific departments. Definition and deployment of KPI in these departments always demands knowledge of its processes and rules. For radiology, Busch describes the need to establish a position alongside the chairman to offer support in areas like organizational development, process optimization and control in a modern radiology department.[5]

What Happens if Technical Implementation Is Done?

How many CT scans did we have in neuroradiology in the first five months of the current year compared to the same time period last year? And how do they divide among the different referring physicians?

Questions like these will be asked frequently by responsible managers. With a professional BI solution these types of

BI will take over the tasks of common retrospective reporting such as the monthly utilization report.

questions can be answered in seconds. Above all, these questions can also be independently answered by the user. The user interfaces of these applications are very intuitive, and the database beneath the charts is well prepared to guarantee valid KPI. This relieves the analyst of the time-consuming, endless preparation of new insights on data and the building of new reports and charts. Finally, the analyst can spend more time on the interpretation of data than on preparing it.

Now, two important prerequisites for a successful implementation—quick availability and low running effort—are fulfilled.[6] The next step defines the required KPI. These should be oriented to the strategic objectives of the hospital or department, and should include strategies and consequences in case targets are missed. A description of each KPI's interpretation and metric is necessary to avoid misinterpretation by different recipients. Ideally, these descriptions are included directly in the BI application, to synchronize access to KPI, their definition, and explanation at the same time.

Initially, the definition of KPI seems straightforward, but the daily use of KPI shows that it is quite difficult, and misinterpretations occur frequently. This can be illustrated using the most common KPI in radiology—the number of examinations. How to count a combined CT scan of the thorax and abdomen? It can be counted as a single examination, corresponding to the number of time slots that one has to plan in the scheduler. But it also can be counted as two examinations, corresponding to the different body regions read by the radiologist which can be reimbursed. Neither interpretation is right or wrong. The key is to determine which of these interpretations is valid to guarantee that all recipients are working with the same format. For this reason, it is recommended to verify the algorithm on which the KPI is based and its interpretation in the sense of quality assurance. Verification and quality assurance is not the responsibility of the analyst. Rather it is that of the customer (management) to the supplier (analyst), and should be confirmed with an acceptance document.

Implementation Phases

Initially, BI will take over the tasks of common retrospective reporting such as the monthly utilization report. But even for this simple task a modern BI solution offers significantly more possibilities. Performance, availability, flexibility, and the depth of possible views on the reports exceed the capacity of conventional manual provision of reports. Figure 1 shows an example of a BI dashboard used in a radiology department to show utilization figures. Success and acceptance of BI depends massively on the early availability of initial results.[7] These "quick wins" are the basis for further development and support by the

Figure 1 • Dashboard for Monthly Utilization Reporting, University Hospital Radiology Department.
Key: Charts for utilization per month (1), modality (2), subspecialties (3), workplaces (4), daytime (5), weekday (6), outpatient ratio (7), years (8) and single days (9).

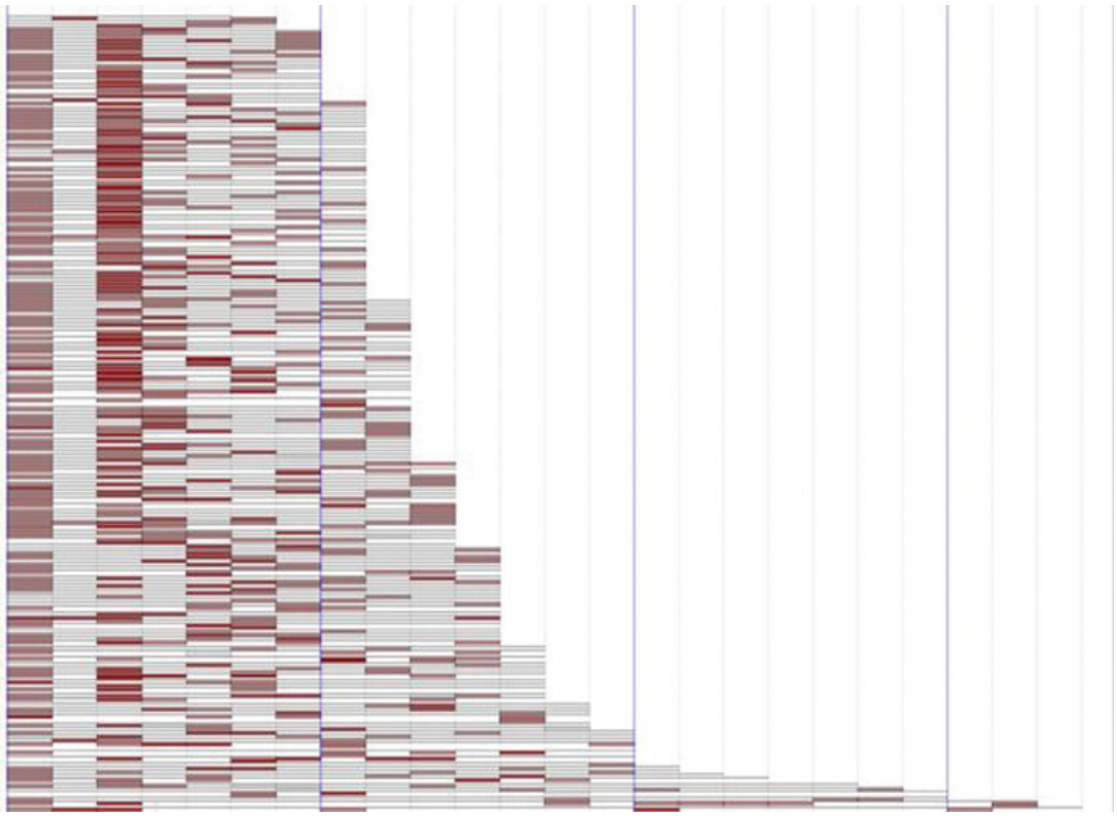

Figure 2 • Visualization of Patterns of Diagnostic Imaging Correlated to Length of Stay (LOS) of Inpatient Treatment in the Diagnosis Related Groups (DRG) System
Each line indicates an inpatient stay in the hospital; its length represents the LOS. Cases are ranked by LOS. Red rectangles indicate a radiology examination. A stable pattern can be seen for cases with shorter LOS (examination mostly on first and third day of the stay). This pattern dissolves for cases with longer LOS, especially for examinations on the third day.

board and the recipients. The easiest way to achieve this is by transforming retrospective reporting into a BI system, because well-known content and visualization can be enriched with new functionalities and more flexibility.

Soon after this kind of reporting is available users will start to dig deeper into data analysis. This is when requirements of data complexity start to increase, as data from other applications come into play. Figure 2 shows an example in which data from the RIS is matched with data from the Diagnosis Related Group (DRG) system. The visualization in this case helps to identify correlations between patterns in radiology procedures and the length of stay of inpatient treatment.[8] Figure 3 shows another example of the analysis of patient's pathways within a hospital and its visualization, using a 3D model of the campus.[9] Possibilities seem to be infinite, but on the other hand this demands high discipline from the recipients of data analysis and visualization. Every complex analysis is accompanied by additional effort, and not every fancy visualization is rational. There should be no analysis without a specific goal and a corresponding consequence.

Another important use for BI is real-time monitoring (RTM). In this context RTM is defined as a continuous extraction of data in real time (or near real time) for the purpose of controlling processes. In health management this approach is underrepresented, as it has been established in productive industries (eg, automotive or chemistry) for decades. No chemical reaction would run properly without control of temperature, pressure, etc. Naturally, procedures in healthcare are not as deterministic as in the production of automotive parts, yet the control process can be a very helpful approach for all stakeholders.[10] A remarkable example is the provision of the status of patients sent from the emergency room to the radiology department for further diagnosis. This is deployed by monitoring status based on RIS data, which shows the status of all patient orders from the emergency room (see Figure 4). Knowledge of the whereabouts

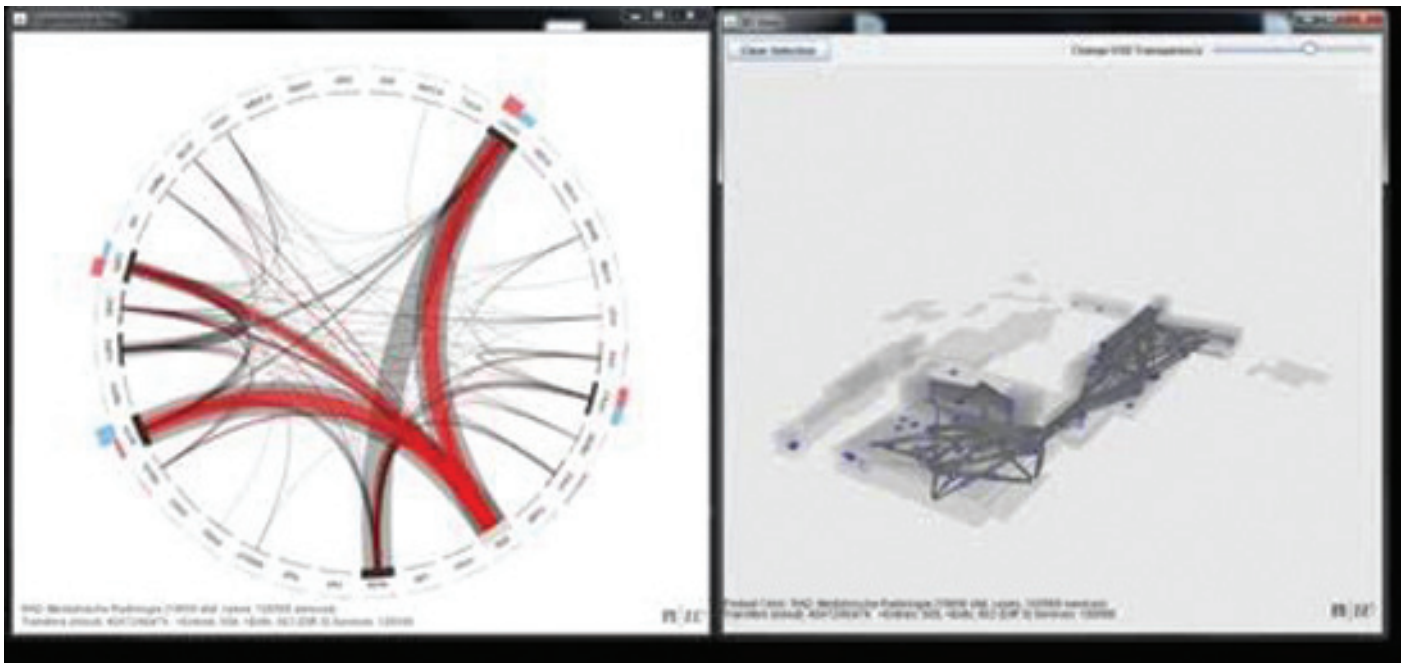

Figure 3 • Visualization of Patient Pathways
L: Graph to visualize the volume of traffic from and to the different units in a hospital R: Same pathways visualized in a 3D-model of the campus

Angeforderte Untersuchungen

Name	Vorname	Geb.dat.	amb/stat	Gerät	Untersuchung	Anforderungszeitpunkt
[redacted]	[redacted]	[redacted]	A		MRI Halswirbelsäule	19.03.2014 16:31

Terminierte Untersuchungen

Name	Vorname	Geb.dat.	amb/stat	Gerät	Untersuchung	Ungefährer Untersuchungsbeginn
[redacted]	[redacted]	[redacted]	A	UMRIABRUF	Aufklärungsgespräch	26.03.2014 11:40
[redacted]	[redacted]	[redacted]	A	UMRI2	MRI Arthrografie Schulter re	27.03.2014 15:30
[redacted]	[redacted]	[redacted]	A	UMRI2	MRI Kniegelenk rechts	21.03.2014 18:00

Achtung: Der angegebene Termin ist provisorisch. Eine Verzögerung bis zu zwei Stunden, aber auch ein kurzfristig früherer Aufruf ist möglich.

Abgeschlossene Untersuchungen

Name	Vorname	Geb.dat.	amb/stat	Status Untersuchung	Untersuchung	Untersuchungsbeginn
[redacted]	[redacted]	[redacted]	S	Befund finalisiert	MRI Schädel	19.03.2014 17:30
[redacted]	[redacted]	[redacted]	A	Befund finalisiert	MRI Schädel	19.03.2014 18:30
[redacted]	[redacted]	[redacted]	S	Befund finalisiert	MRI Schädel	19.03.2014 11:30
[redacted]	[redacted]	[redacted]	S	Befund finalisiert	MRI Schädel	19.03.2014 10:20
[redacted]	[redacted]	[redacted]	S	Befund finalisiert	MRI Schädel	19.03.2014 13:37

Figure 4 • Real-Time Status Monitor for Emergency Room Patients
Top table shows all patients with pending orders. Middle table shows all scheduled patients. Bottom table shows all completed examinations and the status of the images and the report.

of the patient, the availability of images and reports will help the emergency physician monitor progress of the requested examination. Time-consuming frequent inquiries by telephone decrease to a minimum. This is a benefit for the emergency room, the radiology department, and even the patient.

BI: A Worthwhile Investment!

There are many possible uses for BI. For example, it can answer many questions about business administration. The effort to implement and operate BI should not be underestimated, but it can ultimately reduce the running effort for the conventional labor-intensive provision of data. Managers will see the value combined with rapid availability and flexible analysis and visualization possibilities. This is why BI will be an indispensable tool in central and decentralized hospital management.

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Observations from a Healthcare User

By Stephen L. Spearing, RT(R), CRA-Retired

I retired in 2012 after a fruitful forty-four year career managing radiology and radiation therapy centers across the United States. In January 2015, I was diagnosed with the "Big C" as some folks refer to it. I had a Stage 3B N2 M0—adenocarcinoma of the distal esophagus with four involved lymph nodes as defined by that fantastic equipment called a PET/CT. I am now on the other side of healthcare, a "user" not provider. WOW! It has given me a very different perspective.

Prior to my diagnosis, I had the world by the butt—great wife, amazing children, and beautiful grandchildren plus unbelievable friends and church family. Yes, we've had our bumps like all families, but I was turning 67 years old and had no real financial concerns. We vacationed for 25 days in the United Kingdom the previous summer finishing with a college football game in Croke Park, Dublin, Ireland. Placekicker Sam Ficken made the last minute field goal that won the game for our Penn State Nittany Lions over the University of Central Florida. All was good in my world until that Tuesday. The following are some observations I've had since from the other side of healthcare.

Observation #1

I shifted into a "secret shopper" mode and decided that I needed to make something good out of this major setback. Here I am in a bed on the 4th floor of a 650-bed Magnet hospital with amazing nursing care, great doctors, and so forth. It's the base hospital of a major healthcare system which has five other smaller hospitals sprinkled in northeast Ohio. They have their telltale green roofs identifying where the various urgent care centers and other outpatient services can be utilized. This is a model healthcare system run very professionally and cost-efficiently.

My medical oncologist ordered a PET/CT. The procedure performed was in a mobile unit, which was initially shared between the two large Canton hospitals which total over 1100 beds. I thought, "Wow," the little 123-bed Pennsylvania hospital imaging department that I managed the last ten years of my career had a fix-sited PET/CT back in 2004. In fact, we put in the replacement upgrade unit in 2009. We upgraded to the new crystal technology and software. That got me wondering why we could purchase a multi-million dollar unit when these big hospitals were sharing a seven year old mobile technology unit. First thing that came to mind was that we utilized the unit for multiple solutions: a 64-slice CT scanner, a PET/CT, and a CT simulator for radiation oncology where they are only using it for one application. Because of my curiosity, I contacted several old business contacts to do some research on their situation. I found out that they have been talking with manufacturers since 2010 to get a fixed-site unit but were deciding on where to place it for its best use: imaging or the new cancer center they are building soon. That made some sense, but as my father always told me, "Son, no decision is a final decision! You are better to make a decision when an opportunity shows its head and adjust the decision later if it doesn't work."

Taking pen in hand, I wrote my "secret shopper" letter to the healthcare system CEO, hospital CEO, and CNO. I complimented the quality Magnet care that I received and my concern with their PET/CT "no decision" position. On a follow-up PET/CT this progressive, well managed hospital had addressed not only the technology issue, but had instituted several minor and important smaller issues that I had documented. The secret shopper approach had worked. The only item they did not address was the double-flush toilet and even there they had switched to using a segregated less used bathroom which addressed the potentially "radiation hot" bathroom water issue.

Observation #2

While talking with my radiation oncologist friend and PET/CT expert friend after my diagnosis, I found out that there was some displeasure with the recent takeover of the small hospital from which I retired. The personnel and doctors were used to replacing their imaging department tools on a written planned timeframe and now their equipment purchases were almost at a standstill.

They also shared some concern with the approach that everything has to be what the acquiring system designates. They had no input, which was a major strategic change. Previously, the acceptable systems had been chosen for technology and functionality first and price second by a multi-departmental panel. There was a site visit group of the panel normally consisting of a section chief radiologist, section technologist, department nurse (if applicable), and vice president of plant engineering (for technical and installation evaluation). These folks plus the administrative director would make site visits to the potential equipment show-site hospitals. One very important caveat was that no discussion of financial dollars, etc could be had between the site visit group and the manufacturers. It took only one vendor being removed to stop any actions of this nature. The site visits were very valuable to all parties.

The plant engineer was available to not only see the option, but to take a picture of it and possibly talk to an on-site person who was integral to its design and installation. Therefore, they felt very strongly that they had the best HIS and RIS systems. Besides site visits, national surveys and articles backed-up most of their decisions. The systems they were being told that they were getting were inferior—a major step backwards in some situations.

I gave this some thought and my question became very clear: Why is it necessary to dismantle good systems just so the entire system is on the same one? Why do healthcare systems want one solution? We live in the wonderful United States of America with the best healthcare system in the world, although everything is not 100% rosy. We have government gridlock which holds back progress in Washington that impacts every town, business, and healthcare system.

Today, the systems will not share information with each other up there in the cloud. We need our grid-locked representatives in Washington to forget the politics and get down to real impact issues like requiring these manufacturers to share the necessary data so that whole system deinstalls do not have to happen. This move could have a major impact on the exploding costs of healthcare. Let's take a look at the rough financial impact of replacing the HIS and RIS systems at that small Pennsylvania hospital. The HIS system cost over $5 million and that's the system cost alone not considering the cost of pulling forward the patient's past data (pulling a year or more of histories, etc for comparisons) and the cost of retraining on this new system. The RIS system cost in excess of another $4 million without the same pulling data forward and retraining costs. Collectively, that is over $10 million at one hospital. What would that impact be nationally? What impact would those savings have on the ever increasing healthcare costs and possibly the national deficit?

Observation # 3

The control of the number and place of services is another issue. The gridlock over the Affordable Care Act in Washington is a joke. My understanding is that Obamacare originated out of Republican Governor Romney's Massachusetts plan. If so, it is a Republican program that the Democrats revised and somehow passed—that sounds like bipartisan to me.

Massachusetts has always been the testing ground: they had DON (Demand of Need) before the rest of us had CON (Certificate of Need) and so forth. That is not anything new. The previous healthcare system that we were working under was called "Fee for Service." This concept was started in 1966—the year I graduated from high school and entered radiological technology (x-ray) training.

In 1966, we only had x-ray, some nuclear medicine (rectilinear scanners), some radiation therapy and echoline. B ultrasound scanners used to diagnose mid-line brain shifts so neurosurgeons could relieve pressure from accident victims' brains. Today, we have 64-slice CT, 3T MRIs, PET/CT, advanced ultrasound, and more. Healthcare (not just imaging) has changed big time. Another part of healthcare that has advanced is the use of PAs, CNPs, CRNPs and other healthcare extenders. It only makes sense that our 49 year old system may need updating. As my wise father stated, "make a decision and change it as you go." So Congress needs to quit fighting over the approved Affordable Care Act—only make the adjustments to the areas of the bill that are NOT working. Then they can get back to productive work and pass laws and policies that keep our country strong and functional.

Observation #4

Duplication of provision of service is another problem that drives the increase of healthcare costs. Recently, I had the pleasure to discuss the differences of our healthcare system and the strained overburdened multi-tiered system in India with a Cleveland Clinic physician visiting from Delhi, India. Out of the discussion, I had another observation—we're blessed with too much healthcare compared to other countries. India has too many patients to care for, whereas we have duplication of services in areas, which if controlled, could cut the costs of healthcare and still not affect access to healthcare negatively. I thought immediately of an example just north of Canton, Ohio where two competing healthcare systems have placed 24 hour emergency departments that are within visual distance of each other. Think about the costs of two emergency physicians and all of the necessary support systems and personnel constantly staffed no matter what the patient load.

Observation #5

My wife has been asking a lot of questions about why our PCP doesn't know information from either of the hospitals I am being treated at. I explained that his office has not computerized as they should have. Today, the patient or patient advocate needs to be the conduit to make sure that healthcare information is shared. However, this is too big of a topic for this article!

I would like to see AHRA and our industry begin the push for a realistic look at these observations and what legislation and regulations we can help shape. We need to put in place the fixes. In the meantime, my own treatment continues and my story will hopefully go on for a long time to come. When you experience the system from the consumer side it definitely shifts your viewpoint. I want to thank every member of the AHRA and medical community for their service to humanity.

Stephen L. Spearing, RT(R), CRA-Retired has been a member of AHRA since 1983 and earned his CRA in 2002, the inaugural year of its offering. He retired in 2012 after a forty-four year career managing radiology and radiation therapy centers across the United States. He can be contacted at stevefirestarter@sssnet.com.

RADIOLOGY MANAGEMENT

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Responsibility Training

By Gordon Ah Tye, FAHRA

I want to talk to you about the importance of Responsibility Training. You've probably never heard of it because I made it up. I've been extremely focused on it lately, mainly because my retirement date is set for mid-2017 and it's coming quickly. I have this innate desire to see that my responsibilities as a leader are transitioned smoothly to my successors. I want there to be few surprises and to ensure duties are coached and mentored in good time.

When you really think about it, Responsibility Training is applicable to just about anything that we do in our lives. If you're a parent, it's an ongoing responsibility. We start Responsibility Training when our children are born. Eating healthy, sleeping right, being neat, using manners, using the potty, crossing the street safely—all are learned responsibilities that are very basic. Many of you will attest to the fact that when your children are babies, their temperaments and personalities are already programmed and are consistent to their personalities as adults. Without question, each of us is unique. However, it is our responsibility to do our best to train them to be responsible individuals. Just don't dwell on how much you may have screwed them up (sometimes I cringe).

I know there are many of you who get an immense amount of gratification providing Responsibility Training by mentoring future leaders, whether they be at home, in the workplace, or within AHRA. Ask any AHRA past-president of what it is that was most gratifying about their presidency. I'd bet that many of them would say, "When I could personally connect with someone and it helped make them a better individual or helped make AHRA a better organization." They may have volunteered to write an article, participate on a Design Team, or scan attendees for CE credit at the Annual Meeting. They may have decided to pursue their CRA, or that one day they wanted to be the president of AHRA. These things do not happen by accident. They happen because of a consistent and continual effort to plant seeds in the minds of those who you have the opportunity to influence. It is a wonderful gift that all of us can exercise as leaders in our organizations in a variety of capacities.

At work, most of you have likely lost count of the number of people who were in entry level positions in your departments that you encouraged to aspire for more. Not that their jobs were easy, or their work not valued. But it could be as simple as helping them see a vision, or guiding them to have the self-confidence to take risks. Small moments of coaching and encouragement can impact people in ways that go beyond your wildest dreams. Getting simple encouragement from a leader may be something an individual may never have received. Don't be a legend in your own mind, but know that you're a person who can influence others.

I have always been a proponent and do Responsibility Training on shared governance and accountability. I believe it is critical in building the kind of department that can develop point of service decision makers, who are given ownership of what they do in everyday situations. They take ownership when they are confident in what they do and their purpose is clearly evident in the importance of what they do in the big picture. It's amazing what can be developed in people when they feel the importance of their work, and that what they do and who they are is valued.

As some of you may be in a similar boat, whether nearing retirement or moving on to a new job, don't forget to include yourself in your Responsibility Training plan. The need to feel value in yourself and what you can do to make a difference around you is critical to a successful future. I have heard many testimonials from a majority of friends who have retired that they wish they had retired sooner, and that they are busier than ever. And as I am trying to be so thorough about my succession planning with everything around me, I need to make sure I give some attention to myself. Isn't it strange that our tendency is to look out for the welfare of those who surround us: our patients, staff, physicians, family, and loved ones? Don't forget how important we are in the plan, and that our futures should be prepared for with similar energy and care.

Gordon Ah Tye, FAHRA is director of imaging and radiation oncology services for Kaweah Delta Health Care District in Visalia, CA. He holds a bachelor's degree in biological sciences from California State University in Fresno. Gordon is a past president of AHRA, received the AHRA Gold Award in 2001, and received the 2006 Minnie for Most Effective Radiology Administrator of the year. He may be contacted at gahtyes@aol.com.

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