**Value-Based Spine Care**

Special focus on reducing variation from evidence-based, value-oriented practice

*Cleveland Clinic Survey of U.S. Spine Surgeons* Spotlights Wide Variance in Surgical Decision-Making

p. 3
Dear Colleagues,

In most cases, variability is the enemy of healthcare value. Mountains of evidence may accumulate around how best to manage common conditions, but that evidence does our patients good only when it is followed. When it isn’t, the quality of care slips, and the cost of care often rises.

Much of this issue of Spinal Column is focused on reducing variation from best practice in spine care. We start (p. 3) with results from a Cleveland Clinic-conducted national survey showing that surgical decision-making differs substantially among U.S. spine surgeons in certain clinical scenarios — suggesting that optimal treatment needs to be better defined for selected pathologies.

Additional articles profile various initiatives we’ve undertaken to curb variation from best practice here at Cleveland Clinic and beyond. A few examples:

• On p. 6 we update progress in implementation of our Spine Care Path, which has now demonstrated success in reducing inappropriate interventions for acute back pain management in pilot studies.

• On p. 8 we outline the National Orthopaedic & Spine Alliance, a clinically integrated PHO co-founded by Cleveland Clinic to create a new national model for orthopaedic and spine care through coordinated development of standardized care protocols and consistent outcome and cost measurement.

Indeed, the quest for value is the only constant on the healthcare horizon, and this issue is centered on sharing a few snapshots of how we are pursuing that quest in Cleveland Clinic’s Center for Spine Health.

Changes in Center for Spine Health Leadership

I’d like to take this opportunity to share that I will be retiring from Cleveland Clinic in early 2015 and am pleased to hand off leadership of the Center for Spine Health to its two highly accomplished new Co-Directors:

• Thomas Mroz, MD, who has been with the Center for Spine Health since 2004, where he has directed the Spine Fellowship Program and been instrumental in driving the center’s outcomes research

• Michael Steinmetz, MD, who was a member of the Center for Spine Health staff from 2006 to 2011, when he left to assume the role of Chairman of Neurosurgery at MetroHealth Medical Center in Cleveland

Both Drs. Mroz and Steinmetz are widely published spine surgeons who have distinguished themselves as national leaders through service on the boards of organizations like the North American Spine Society and the Congress of Neurological Surgeons. I am highly confident Cleveland Clinic will remain in the vanguard of value-based spine care under their watch.
Survey of U.S. Spine Surgeons Finds Substantial Variations in Surgical Decision-Making

By Daniel Lubelski, BA, and Thomas E. Mroz, MD

The United States’ nearly 3,000 spine surgeons perform approximately 400,000 spine surgeries annually. As the number of surgical approaches, instruments and technologies they use has grown in recent decades, the associated costs have ballooned as well. In response, the federal government and other stakeholders have been working to reduce these costs and improve outcomes by moving toward a value-based healthcare system.

Within spine surgery, these efforts have translated into investigation of the comparative effectiveness and cost-effectiveness of surgical options for a given pathology. Yet despite differences in financial costs and complication profiles among the various procedures, data supporting a relative advantage of one procedure over another are lacking.

We hypothesized that there were variations in treatment practices throughout the U.S. based on spine surgeons’ location, specialty, years of experience and/or practice setting. To explore this hypothesis, we recently surveyed U.S. spine surgeons and published our results.1

The Survey at a Glance
We created an online survey and sent it to 2,460 U.S. spine surgeons selected randomly from a database.

**KEY POINTS**

- Our survey of U.S. spine surgeons found that the probability of disagreement on treatment choice for recurrent lumbar disk herniation was considerably higher (69 percent) after two previous microdiscectomies vs. one previous microdiscectomy (22 percent).

- For herniated disk management following two microdiscectomies, the number of spine surgeries performed annually and years in practice were significant predictors of whether surgeons chose revision microdiscectomy with PLIF/TLIF vs. revision microdiscectomy alone.

- If two similar patients present to different U.S. spine surgeons with the same pathology of recurrent disk herniation, they are likely to undergo different surgeries or surgical approaches.

- Scenario 1 involved a recurrent L5-S1 herniated disk following one microdiscectomy.

- Scenario 2 involved a recurrent L5-S1 herniated disk following two microdiscectomies (Figure).

Other case scenarios (including spondylolisthesis and back pain) were also included, and responses about practice patterns in those scenarios are being analyzed for description in future publications.

Results: Intriguing Differences in Scenario 2 Responses
A total of 445 surgeons completed the survey, representing an 18 percent response rate.

Scenario 1. Responses to Scenario 1 (recurrent lumbar disk herniation following a single microdiscectomy) were fairly uniform, with the vast majority of surgeons selecting revision microdiscectomy and relatively few differences among surgeons.
Scenario 2
This is a 48yo male who has had 2 previous left microdiscectomies at L5-S1. He now presents
with a left L5-S1 disc herniation with a correlative S1 radiculopathy, minimal back pain.

Please choose a treatment option that best reflects your practice.

- Revision microdiscectomy
- Revision microdiscectomy with in situ fusion
- Revision microdiscectomy with posterolateral fusion using pedicle screws
- Revision microdiscectomy with PLIF/TLIF
- ALIF with percutaneous screws
- ALIF with open posterior fusion (i.e. pedicle screws/facet screws)
- None of the above

Figure. The case vignette (with associated radiographs and MRIs) that was presented as Scenario 2 in the survey. Reprinted from reference 1 (Mroz et al) with permission from Elsevier.
Scenario 2. In contrast, responses to Scenario 2 (recurrent lumbar disk herniation following a second microdiscectomy) were considerably more varied. The most common responses to Scenario 2 were revision microdiscectomy and revision microdiscectomy with posterior/transforaminal lumbar interbody fusion (PLIF/TLIF).

Significant differences in responses to Scenario 2 were observed according to the following surgeon characteristics:

- **Number of surgeries performed each year** \( (P = .003) \). Surgeons performing more than 200 surgeries were significantly more likely to select revision microdiscectomy with PLIF/TLIF vs. revision microdiscectomy alone when compared with surgeons performing 100 or fewer surgeries. The odds ratio (OR) for the comparison was 3.47 for surgeons performing 201 to 250 surgeries \( (P = .008) \) and 3.30 for those performing 251 to 300 surgeries \( (P = .01) \). In contrast, surgeons performing 100 or fewer procedures were significantly more likely to select revision microdiscectomy over revision microdiscectomy with PLIF/TLIF.

- **Practice duration** \( (P < .001) \). Surgeons practicing for 15 to 20 years were significantly less likely to select revision microdiscectomy with PLIF/TLIF vs. revision microdiscectomy alone when compared with those in practice less than 5 years \( (OR = 0.37; P = .02) \), 5 to 10 years \( (OR = 0.31; P = .001) \) and 10 to 15 years \( (OR = 0.31; P = .002) \). In other words, surgeons practicing for less than 15 years were about three times more likely to select revision microdiscectomy with PLIF/TLIF vs. revision microdiscectomy alone as compared with those practicing 15 to 20 years, who were more likely to choose revision microdiscectomy alone.

No significant differences in responses to Scenario 2 were observed based on respondents’ region, specialty, fellowship training or practice type.

Drilling Down to Differences Within Cohorts

To understand the level of variability among spine surgeons in selecting a treatment for revision lumbar disk herniation, we then calculated the probability of two randomly chosen surgeons from within specific cohorts (based on region, specialty, etc.) disagreeing on treatment choice.

Across all respondents, there was 69 percent disagreement in responses to Scenario 2 (two previous microdiscectomies) and 22 percent disagreement in responses to Scenario 1 (one previous microdiscectomy).

The degree of disagreement did not differ substantially by respondents’ geographic location, ranging from 68 percent (Midwest, Southeast and West) to 70 percent (Southwest) disagreement for Scenario 2 and from 16 percent (Southeast) to 26 percent (Northeast) disagreement for Scenario 1. Similar probabilities of disagreement were seen when surgeons were categorized by specialty, fellowship training and practice type.

In terms of practice duration, analysis generally showed that the longer respondents had been in practice, the more likely they were to disagree in their responses to each scenario.

When respondents were analyzed by number of surgeries per year, the probability of disagreement on Scenario 2 ranged from 62 percent (those performing 201 to 250 surgeries) to 76 percent (those performing < 50 surgeries). A similar trend was observed for Scenario 1, with a 60 percent probability of disagreement among those performing fewer than 50 surgeries compared with just an 18 to 23 percent probability of disagreement in each of the other surgical volume subgroups.

Why Our Findings Matter

These findings are important, as they indicate that if two similar patients present to different surgeons with the same pathology of recurrent disk herniation after two prior microdiscectomies, they are likely to undergo different surgeries or surgical approaches. Because revision microdiscectomy and fusion procedures have different costs, complications and clinical outcomes, it is important to further investigate the reasons for these differences in practice and to understand the optimal surgical approach. Future investigations will need to define the optimal treatment algorithms for these pathologies.

Reference

Next Steps Along the Spine Care Path: Promising Pilot Results and Fuller Technological Enablement
By Daniel Mazanec, MD

As detailed in previous issues of this publication, the Cleveland Clinic Spine Care Path was created to provide an evidence-informed clinical road map to assist practitioners in managing the full range of spine disorders. We have recently observed encouraging results from initial pilot testing of a key portion of the care path and are proceeding with the care path’s integration into Cleveland Clinic’s electronic medical record (EMR). This article presents a snapshot of these and other recent developments in our Spine Care Path initiative.

The Care Path in Brief
The ultimate objective of the Spine Care Path — one of dozens of condition-specific care paths being developed and implemented at Cleveland Clinic — is to enhance the value of spine care by reducing unnecessary and costly variability in management while improving outcomes. The care path spans the full range of care, from acute symptoms (< 6 weeks) through chronic care needs (> 12 weeks), potentially involving providers from various specialties and professions.

The care path’s foundation is a collection of three evidence- and consensus-based care path “guides” — for low back pain, cervical and lumbar radicular pain, and neck pain. Developed by multidisciplinary teams of Cleveland Clinic experts, these guides detail the appropriate steps in patient management for translation into algorithms and work flows for practical application.

Promising Pilot Results
In autumn 2013, pilot studies of the acute phase (0 to 6 weeks of pain) of the Spine Care Path for low back pain were initiated at two family health centers in the Cleveland Clinic health system. The pilots mainly involved primary care physicians and nurse practitioners. The goal was to test-drive implementation of the care path with an emphasis on the process of diagnosis and management of acute back pain.

For patients with acute back pain, the care path stresses appropriate use of imaging studies — including X-rays, CT and MRI — which are generally reserved for patients with clinical red flags suggestive of serious underlying disease. Initial treatment focuses on patient education that emphasizes the benefits of activity and the generally favorable prognosis that can be expected in the absence of red flags. Use of opioids is not recommended for acute low back pain.

All providers in the pilots were given access to the care path guide for low back pain and invited to attend an informational session. A structured clinical note developed with input from primary care physicians was made available for use during the pilot program. Key process measures assessed included:

- Use of imaging
- Prescription of opioids
- Referral to physical therapy
- Documentation of patient education

These process measures were compared with the same measures from a sample of similar patients managed

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<th>Table. Frequency of Care Processes Before and During Pilot Testing of the Care Path’s Acute-Care Portion</th>
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<td>Process Measure</td>
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<tr>
<td>Imaging</td>
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<td>Opioid prescribing</td>
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<td>Referral for intraspinal injection</td>
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<td>NSAID prescribing</td>
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<td>Documentation of patient education</td>
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at the same family health centers prior to the pilots. Impressive changes in clinical practice for acute back pain management were observed after implementation of the care path pilots, including reductions in imaging orders, opioid prescribing and referrals for intraspinal injections. Meanwhile, increases in appropriate practices, such as prescription of NSAIDs and muscle relaxants and documentation of patient education, were also observed. Specific changes in key measures are detailed in the table on p. 6.

These changes translated to an impressive reduction in the average cost of an episode of back pain care per patient (Figure).

**Pilot of Subacute Phase Now Underway**

In mid-2014, we extended the original clinical pilots of the Spine Care Path beyond the acute management phase into the subacute phase (6 to 12 weeks of back pain). This new pilot program involves additional clinicians, including physical therapists, medical spine specialists and pain psychologists. For persons with subacute, persistent pain, in addition to reassessment and modification of initial diagnosis and treatment, this phase of the care path incorporates appropriate specialty referral in selected cases.

**Technological Enablement — With Real-World Sensitivities**

Current efforts in the development of the Spine Care Path are focused on its integration into Cleveland Clinic’s EMR system, Epic, for use by clinicians across the health system. The objective is to provide clinicians with a tool to:

- Capture the process of care in structured notes and order sets
- Support clinical decision-making based on the care path
- Regularly assess process measures and patients’ health status during treatment

Development has also included incorporating patient-entered data into the EMR documentation.

The enablement team includes spine specialist physicians, emergency medicine physicians, primary care physicians, Epic specialists, programmers and representatives from clinical operations, corporate compliance, finance and business intelligence.

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**KEY POINTS**

- Pilot studies of the acute-care phase of the Spine Care Path showed that it reduced inappropriate interventions for acute back pain management (including imaging orders, opioid prescriptions and referrals for injections) while increasing appropriate measures and reducing the cost per patient by more than half.

- In light of the initial pilot success, Cleveland Clinic has ongoing pilot studies underway of the subacute phase of the Spine Care Path for management of back pain of six to 12 weeks’ duration.

- Current Spine Care Path efforts are focused on its integration into the EMR to provide a tool for use across the health system to capture the process of care in structured notes and order sets, aid clinical decision-making, and regularly assess process measures and patients’ health status.

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**Figure.** Changes in clinical practice in the wake of the care path pilot program translated to substantial reductions from baseline in the cost of care per patient, although further reductions are possible through closer adherence to care path recommendations.
Introducing the National Orthopaedic & Spine Alliance

Cleveland Clinic takes lead role in first clinically integrated PHO for orthopaedic and spine care

Something interesting happened a few years ago when Cleveland Clinic reached out to several large self-insured employers to explore an innovative bundled-payment arrangement for heart surgery care. Many employers asked, “Can you offer this for musculoskeletal care too?”

Those inquiries planted the seed for the National Orthopaedic & Spine Alliance (NOSA), an unprecedented clinically integrated physician-hospital organization (PHO) for orthopaedic and spine care. The alliance was formed in September 2013 when Cleveland Clinic shared the idea with three other top orthopaedic/spine providers — the Philadelphia-based Rothman Institute, the CORE Institute in Arizona and OrthoCarolina in North Carolina — and the four organizations became founding NOSA members. OrthoCalifornia has since become a fifth founding member.

A Model to Standardize Care Across Top Centers

The alliance’s goal is to create a new model for orthopaedic and spine care delivery through coordinated development of standardized protocols on appropriateness of care and consistent measurement of outcomes and cost. The model’s focus is threefold:

• Improving quality and consistency of care
• Reducing costs and increasing efficiencies
• Expanding access to expertise, data and experience

“NOSA is the first and only orthopaedic/spine specialty alliance that is physician-owned and physician-managed,” says Joseph P. Iannotti, MD, PhD, Chair of Cleveland Clinic’s Orthopaedic & Rheumatologic Institute and president of NOSA’s 11-member board. “That’s a distinction that matters. Today everyone talks about providing the highest-quality care at the best cost, but that’s hard to do if the people directing the effort aren’t in the thick of providing healthcare.”

How It Works

As a PHO, the alliance is organized so that participating provider organizations collectively contract with employers to deliver care that’s reimbursed through bundled payments for entire episodes of care. Alliance members then share the financial rewards and risks.

Beyond getting more predictable pricing, employers are promised reliably high-quality care as a result of the alliance’s strict clinical protocols and criteria for measuring performance to demonstrate value. These requirements are aimed at reducing variation from evidence-based best practices inside and outside the surgical suite.

To join NOSA, providers must meet benchmarks for certain metrics, such as readmission and complication rates. They must also be able to collect data for key patient-reported outcomes, such as pain level and functional status, at relevant postoperative time points.

“A provider group needs to have invested in an infrastructure and a culture for collecting patient-reported outcomes data in order for NOSA to measure the group’s outcomes in ways that matter to patients and employers,” explains Gordon R. Bell, MD, Director of Cleveland Clinic’s Center for Spine Health, who serves on NOSA’s quality and nominating committees.

Another key requirement is a demonstrated ability to measure and manage costs.

Building the Alliance

Because NOSA aims to offer a geographically dispersed network of top providers, an early focus is recruiting provider groups in key locations not covered by the initial alliance members. NOSA is currently adding providers in the New York, Chicago and St. Louis areas as well as in Tennessee.

Recruitment efforts fall to NOSA’s nominating committee, which in early fall 2014 was evaluating about 30 providers that expressed interest in joining the alliance. “We’re looking for best-in-class provider organizations to bring on, with a bias toward finding groups in 10 cities where employees of the 500 largest U.S. companies are highly aggregated,” Dr. Bell says.
WHO: National Orthopaedic & Spine Alliance

- Five founding member provider organizations: Cleveland Clinic, Rothman Institute, CORE Institute, OrthoCarolina, OrthoCalifornia
- 400 to 500 orthopaedic clinicians among member organizations
- Several more member providers being added in fall 2014
- Approximately 30 more provider organizations have expressed interest in becoming participating members (as of early fall 2014)

WHAT: Clinically integrated PHO formed to (1) define and measure standardized approaches to care and quality for selected orthopaedic/spine conditions and (2) contract with large employers for value-based reimbursement

WHEN: Formed September 2013, operational as of January 2014, contracting and patient management being rolled out throughout 2014

WHERE: Across the U.S., with a focus on adding best-in-class provider organizations in regions where large employers’ workers are aggregated

WHY: (1) To respond to employer and market demands in an increasingly value-based reimbursement system and (2) to establish better and broader industry benchmarks for quality and value

HOW: Contracting is initially focused on cervical and lumbar spine procedures and total joint arthroplasty

Spine Surgery and Joint Replacement Lead the Way

As of early fall 2014, NOSA was in contracting discussions with 25 to 30 large employers. Although NOSA is prepared to contract for additional services, initial discussions with employers have centered on two areas:

- Hip and knee arthroplasty
- Cervical and lumbar spine procedures

“That’s where the interest is,” Dr. Iannotti explains. “These procedures represent a large spend for most employers, and they were at the heart of the first employer inquiries that triggered NOSA’s formation.”

“There is a tremendous variability in care for spinal procedures, particularly surgery,” adds Dr. Bell. “Since the enemy of quality is variability, it’s important to base surgical care on the best available clinical care guidelines.”

Contracting discussions include efforts to identify opportunities for cost avoidance through appropriateness-of-care criteria, particularly for spine procedures.

A New Benchmark for Clinical Benchmarking

NOSA is intended to benefit its stakeholders — patients, employers and participating providers — in well-defined ways (see sidebar, next page), but it also promises dividends for orthopaedic and spine care overall. Alliance
“We’re looking for best-in-class provider organizations to bring on, with a bias toward finding groups in 10 cities where employees of the 500 largest U.S. companies are highly aggregated.”

– Gordon R. Bell, MD

leaders see it as a unique opportunity to expand the ways top providers share data and to refine how employers use data to ensure value-based care for their employees.

“I expect NOSA will, over time, be able to develop — and eventually external — benchmarking of outcomes in large patient populations that are more reflective of real-world practice than what’s currently reported in highly selected literature reports,” says Dr. Iannotti. The plan is for NOSA to annually publish clinical outcome, safety and patient satisfaction data drawing on member providers’ full patient volumes, not just the care members provide under NOSA.

Such capabilities will come from NOSA’s high standards for data collection and its emphasis on capturing process measures and patient-reported functional outcomes that are not now widely collected. Current data-collection capabilities vary among NOSA members, but all have demonstrated a commitment to NOSA goals in this area.

So far, NOSA’s quality committee has focused on defining best practices among the member providers and identifying metrics that are most associated with superior outcomes.

“There’s not been much variation in what our members view as best practices, so that’s been refreshing,” Dr. Bell says. “The challenge will be for NOSA members to agree on which metrics to use so that uniform reporting can be achieved.”

Providers can learn more about NOSA at nationalorthospine.com.

How NOSA Serves Key Stakeholders

PATIENTS BENEFIT by getting relatively convenient access to the highest-quality care in a highly standardized way at a favorable overall cost to their employer. If employers offer incentives to use NOSA providers, as expected, workers and their covered dependents may have no copayments and can benefit from facilitated, concierge-type care.

EMPLOYERS BENEFIT from reliably high-quality care for their employees at a predictable price that holds providers accountable for value across the episode of care. They also gain from NOSA’s direct-to-employer contracting, which gives access to centers of excellence with the added perk of unprecedented coordination among those centers.

PROVIDERS BENEFIT from the promise of patient volume. They also can count on the alliance’s built-in quality standards to protect the quality side of the cost-vs.-quality value equation as payers look to drive reimbursement down. Providers also stand to gain from the continuous sharing of best practices and comprehensive outcomes data among a network of top-tier providers. It is expected that NOSA members will be financially rewarded by being paid for both quality of the outcome as well as cost of the care, thereby driving value for all stakeholders.
Outcomes Snapshot: Revisiting Conventional Wisdom on Mental Health and Spinal Disease

By E. Kano Mayer, MD

Both conventional wisdom and the current literature support the notion that mental health distress is a negative prognostic indicator for patients undergoing surgery or interventional procedures for spinal disorders. Yet several years of outcomes tracking in Cleveland Clinic’s Center for Spine Health are turning that conventional wisdom on its head.

We are finding consistently that treatments for spinal disease have meaningful effects on depression and other forms of mental health distress. Specifically, our outcomes monitoring shows that the presence of reactive mental changes with impaired function and pain in patients who are otherwise good candidates for spine surgery does not prevent these patients from achieving clinically meaningful improvement in mental health distress scores — improvement that mirrors their functional improvement.

For instance, among patients with at least moderate depressive symptoms prior to treatment for their spine disease:

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<tr>
<th>Procedure</th>
<th>Improvement Rate</th>
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<tr>
<td>Lumbar disectomy for disk herniation (N = 67)</td>
<td>66%</td>
</tr>
<tr>
<td>Lumbar decompression with fusion for spinal stenosis (N = 42)</td>
<td>71%</td>
</tr>
<tr>
<td>Lumbar decompression without fusion for spinal stenosis (N = 46)</td>
<td>65%</td>
</tr>
<tr>
<td>Lumbar spinal injections for disk herniation (N = 22)</td>
<td>64%</td>
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In all cases above, moderate depressive symptoms were defined as a score greater than 9 on the Patient Health Questionnaire-9 (PHQ-9), and improvement was defined as clinically meaningful improvement — i.e., a change of 5 points or more on the PHQ-9. Outcomes are for patients managed over 12- to 16-month periods from late 2012 through early 2014; mean follow-up ranged from 125 to 203 days, depending on the condition and intervention.

These rates of improvement in depressive symptoms actually slightly exceeded rates of self-reported functional improvement and generally mirrored rates of improvement in health-related quality of life.

These findings about mental health outcomes in patients with spinal disease are in keeping with our findings from previous years, which have prompted an ongoing prospective research study in the Center for Spine Health. We look forward to continued reporting of our results in this area — and the potential to perhaps change conventional wisdom on this aspect of spine medicine.

More Outcomes Online

The outcomes tracking efforts profiled here are part of Cleveland Clinic’s broad Outcomes book initiative, under which the health system has published annual Outcomes books for more than a dozen of its institutes since 2007. The aim is to promote transparency and continuous quality improvement.

For more outcomes from the Center for Spine Health and Cleveland Clinic’s Neurological Institute at large, see the 2013 Neurological Institute Outcomes book at clevelandclinic.org/outcomes.
Implementation of the Affordable Care Act has presented physicians and hospital systems with a significant challenge — the reality that soon we will be reimbursed less for many of our services. These changes have prompted hospital systems to re-examine their operating costs and search for new ways to lower daily expenditures without impacting the quality of care.

Evaluating ways to reduce or reuse certain materials in the OR figures prominently in such efforts, and the Center for Spine Health has introduced a novel program we call “Check Please” that is helping lead Cleveland Clinic’s initiatives in this regard. This article briefly profiles the Check Please program after reviewing the factors that prompted its development.

Material Cost in the OR: All About Scale

The OR is a natural place for surgeons to begin the quest for cost savings, and there are undoubtedly savings to be found there. Data from two decades ago suggested that roughly $200 million worth of prepared equipment in the OR was wasted annually in the United States;1 imagine what the cost of such waste amounts to in today’s dollars.

Most of this waste is in the form of prepackaged materials such as sponges, gowns, gloves and so forth. A large amount of this material is opened in the OR before a case, not used during the case and simply discarded afterward. While the cost of material waste for any single case is minimal, when added up over all cases in several ORs throughout the course of a year, the collective cost is significant.

Until recently, the typical surgeon had little knowledge of — or interest in — this type of surgical waste. Yet if efforts to prevent the waste of unused OR materials are properly organized and streamlined, they can potentially save hospitals millions of dollars annually.

A Surprising Study Finding About Cost and Outcomes

A frequent concern is the typically wide variation in cost for a given surgery among different surgeons in the same institution. A recent Cleveland Clinic study2 looked at 652 lumbar disectomy procedures performed at Cleveland Clinic’s main campus by nine different spine surgeons over the course of 47 months. Each surgeon performed an average of 70 lumbar disectomy procedures over that time.

Results of the analysis were striking: Not only was there a significant difference in mean surgical cost (disposable materials and implants used) among the nine surgeons, but there was a significant positive correlation between worse outcomes and higher mean surgical cost.

As surgeons, we have traditionally been led to believe that lowering operative cost by using cheaper or fewer materials would lead to worse outcomes. Yet the data from this study argue for critically revisiting that notion.

Search for Solutions Leads Beyond the Individual Surgeon

A major problem today is that surgeons are not able to readily check the cost of their individual procedures or how these costs stack up against those of their colleagues. Furthermore, there is no easy way to correlate these costs to patient outcomes, short of the surgeon pulling his or her own outcomes data and running a linear regression analysis between cost and outcome. Such data would be a powerful tool in the quest to standardize spine surgeries across the institution and keep operative costs at a minimum while maintaining good outcomes.

Fault also extends beyond the control of the individual surgeon in that surgeons’ lists of preferred items are not routinely reviewed unless a problem arises, and often multiple packs of disposable materials are opened and billed automatically for a given case with little knowledge or appreciation by the surgeon. While this may not significantly impact costs for the given case, when added up over time for several surgeons, the costs become significant.

‘Check Please’ Program Looks to Use Cost Awareness — and Healthy Competition — to Cut Operating Room Waste

By Todd Francis, MD, PhD, and Ajit Krishnaney, MD

Todd Francis, MD, PhD is a spine surgeon in the Center for Spine Health (francit@ccf.org; 440.312.6100).

Ajit Krishnaney, MD is a spine surgeon in the Center for Spine Health (krishna@ccf.org; 216.445.3777).
Enter ‘Check Please’

The Check Please program was developed to increase surgeon awareness of hospital cost per case and the cost of every item used in the OR. This is information that has never been available to surgeons before.

The program allows surgeons to review the cost of any surgery they perform in near real time. When surgeons log on to the online Check Please system, they are able to see the individual costs of all disposable items charged for during a given surgical case as well as the total cost of the case. The system also allows surgeons to compare the cost of a particular case with similar cases managed by other surgeons throughout Cleveland Clinic. The program likewise enables comparison of the cost of OR materials (e.g., disposable items and implants) for given CPT codes among surgeons and by location.

To date, Check Please has been implemented for spine surgeries at Cleveland Clinic’s main campus and will soon be implemented at community hospitals in the Cleveland Clinic health system. Data generated from this powerful tool can be used to correlate surgical outcomes with material costs and to measure trends in cost variability among different CPT codes.

A Quest for More Cost-Effective Choices

The goal of the Check Please program is to give surgeons information that will allow them to make more cost-effective choices in the OR and avoid opening (and triggering charges for) items that are not necessary for optimal care. By providing accurate cost data about the items that Center for Spine Health surgeons use as well as insight on how they compare with their peers, Check Please is empowering surgeons to make more cost-effective choices while maintaining high-quality care. We look forward to reporting the effects this initiative has on costs and patient outcomes in the months and years ahead.

KEY POINTS

Prepackaged materials such as sponges, gowns, gloves, etc., are frequently opened in the OR before a case and discarded without being used. The collective annual cost of these unused materials across a hospital system can be significant.

A recent Cleveland Clinic study found wide variability in costs of surgical materials among a number of spine surgeons performing lumbar discectomies as well as a significant positive correlation between worse patient outcomes and higher mean surgical cost.

The Center for Spine Health has implemented a program that allows surgeons to review online the costs of surgeries they perform (and the costs of disposable items used) in near real time. The program allows for comparative and variability analysis of costs by surgeon, by CPT code and by surgical location. The goal is to reduce costs of surgery while maintaining or improving outcomes.

References


2. Rosenbaum B, Modic M, Krishnaney A. Increased surgical costs are not correlated with improved outcomes in lumbar discectomy. Submitted for publication.
At Cleveland Clinic’s Center for Spine Health, we are increasingly convinced that value in healthcare — understood as \(\text{Value} = \frac{\text{Outcome}}{\text{Cost}}\) — must help define the framework for performance improvement to optimize patient care and outcomes.

Value can be increased in two ways: by improving the quality of care delivered or by reducing costs while maintaining quality. At the Center for Spine Health, we are employing both of these approaches to enhance the value of the care we provide to our patients. Since quality is central to both approaches, we have formed a multidisciplinary quality improvement team tasked with overseeing and continuously improving the quality of care we provide.

The Quality Team and Its Charge

The quality team is made up of physicians — both spine surgeons and medical spine specialists — as well as midlevel providers, nurses and representatives from Cleveland Clinic’s Quality & Patient Safety Institute. Team members meet monthly to review various quality metrics, including:

- The surgical site infection rate during spine procedures
- Readmissions
- Patient safety indicators, including venous thromboembolism rates
- Patient experience metrics
- Outcomes using Cleveland Clinic’s Knowledge Program database, an interactive platform for multidomain data collection

The team then identifies opportunities for performance improvement and defines a process improvement measure or protocol. The process includes identifying specific goals to be achieved and determining specific outcomes or metrics to be measured to monitor progress toward these goals.

Case Study: Curbing Surgical Site Infections

A good example of this process at work has been our effort to curb surgical site infections (SSIs), which has yielded sustained improvement in the rate of postoperative wound infections over the most recent 18 months of monitoring.

The SSI rate has been reported to vary by the type of spine surgery performed. According to the National Nosocomial Infections Surveillance System Report, the rate is 2.46 percent for laminectomies and 6.35 percent for fusion surgeries.1,2 These rates can vary further based on patient risk factors and other variables.

Monitoring SSIs is important, as SSIs affect patient outcomes and can be associated with increases in morbidity and mortality rates, length of stay, and the likelihood of hospital readmission or ICU stay — as well as increased costs of care.

The best approach to managing postoperative infections is obviously to prevent them in the first place. The key to prevention is identifying factors that may increase the risk and minimizing those factors around the time of surgery.

Center for Spine Health staff work collaboratively with colleagues from Cleveland Clinic’s Department of Infectious Disease to closely monitor the SSI rate across all spine surgeries performed. We recently designated reducing our SSI rate as a center goal and target measure for performance improvement. To that end, we identified a variety of potential factors associated with SSIs and developed and implemented a number of protocols to address them. The protocols were divided into preoperative, intraoperative and postoperative interventions, as detailed in the sidebar, and were implemented over the course of 2012.

Outcomes and Implications of the SSI Initiative

These efforts, initiated in 2012, corresponded with a reduction in the Center for Spine Health’s overall SSI rate from 3.7 percent in 2012 to 1.5 percent in...
Center for Spine Health Protocols for SSI Reduction

Preoperative Interventions

Antiseptic shower

• We developed a standardized protocol for a chlorhexidine gluconate (CHG) bath the evening before surgery. We also incorporated preoperative patient education as well as education regarding the rationale for the bath.

• Clear evidence to support a decrease in SSIs with CHG baths is lacking, but the cost of the bath is minor and the potential benefit is likely great enough to outweigh the cost. Several studies have demonstrated a greater decrease in skin colonization with CHG bath vs. iodine or medicated soap.2,3

Nasal Staphylococcus aureus surveillance and decolonization protocols

• Twenty-five to 30 percent of the population are carriers of *Staphylococcus aureus*, the leading cause of SSIs in spine surgery. An association has been noted between nasal carriage of S. aureus and SSI occurrence. A short course of treatment with mupirocin ointment has been shown to eliminate S. aureus in many carriers.2

• We developed a standardized preoperative protocol that includes detection and treatment of *S. aureus* (sensitive and resistant strains) nasal colonization.

• Patients undergo a nasal swab before surgery to test for the presence of *S. aureus*. Preoperative education regarding rationale is also provided.

• Patients with positive results are treated with nasal mupirocin ointment before surgery.

• Patients who have the resistant strain of *S. aureus* (MRSA) are given a dose of vancomycin in addition to standard prophylactic antibiotic therapy immediately prior to incision.

Intraoperative Interventions

Operating room hygiene

Maintaining appropriate sterile fields in the OR and decreasing OR traffic have been priorities. Audits of OR personnel and techniques have been carried out and new rules adopted to ensure proper maintenance of sterile fields and to minimize OR traffic during surgery.

Antibiotic prophylaxis

Preoperative administration of antibiotics within an hour of incision has been proven to reduce SSIs. Ongoing audits of Center for Spine Health procedures have shown near 100 percent compliance with administration of appropriate antibiotics within this time frame.

Skin preparation

• We introduced a standardized prep protocol in 2012 to ensure optimal skin preparation for all surgical patients.

• Administration of vancomycin powder locally in the wound prior to closure for high-risk cases has been used by many Center for Spine Health surgeons. This practice is in keeping with a recent study showing that adjunctive local application of vancomycin powder decreased the SSI rate in posterior thoracolumbar fusions with no reported adverse clinical outcomes.4

Postoperative Interventions

Early mobilization

Early mobilization of patients promotes wound healing by reducing pressure on back and neck wounds. We have implemented protocols to ensure that all able patients are assisted in getting out of bed on the first postoperative day and ambulated as soon as possible.

Wound care

Many Center for Spine Health surgeons now have patients undergo a postoperative wound check by a clinical nurse within two weeks of surgery to ensure proper wound healing.
2013. Review of SSI rates by quarter (Figure) reveals a generally sustained reduction over the six most recent quarters, including two quarters in 2013 with rates of approximately 1 percent or less. Moreover, the center’s readmission rate has decreased in tandem with these SSI reductions, to an average of less than 7 percent in 2013-2014 from approximately 12 percent in 2011 and 2012.

Results like these have reinforced the center’s commitment to continuous quality improvement initiatives. These include initiatives reported elsewhere in this publication — such as the Spine Care Path to reduce unnecessary testing and referrals for cases of acute low back pain (see p. 6) — as well as a patient triaging system to ensure that patients are directed to the appropriate physician right away, and a group of quality-assurance protocols for spine interventions. Our experience from the SSI initiative and these other efforts demonstrates that improving quality not only improves lives by reducing recovery times and improving outcomes, but it also reduces costs to both the patient and the system, thereby increasing the value of the care we provide.

References
Superior Precision Through 3-D Computer-Assisted Spine Surgery

What It Is and How It Works

The O-arm is a mobile X-ray system that provides 3-D imaging as well as 2-D fluoroscopic imaging optimized for use in spine surgery. It allows the surgeon to acquire real-time, CT-quality images in the OR that are used to create a 3-D image of the spine. Through integration with the related StealthStation® surgical navigation system, the 3-D image enables superior spinal navigation to facilitate placement of spinal instrumentation with near-perfect accuracy.

How It’s Used

The O-arm can be used to aid surgery in any portion of the cervical, thoracic or lumbar spine. Its primary uses are for surgical correction of spinal stenosis, spondylolisthesis and spinal deformities. It also can provide 3-D computer-assisted guidance for spinal reconstruction after decompression.

How Patients Benefit

By enhancing visualization of the spinal anatomy, 3-D computer-assisted spinal surgery with the O-arm can significantly improve the safety of spinal procedures and potentially reduce the need for revision surgeries. And because it enables less-invasive approaches, patients stand to benefit from a shortened postoperative recovery period.
Back pain during pregnancy is very common, yet most cases continue to go unaddressed or are inadequately addressed. It is time to change that reality.

Cleveland Clinic’s Center for Spine Health recently began offering a distinctive approach to this challenge: shared medical appointments (SMAs) for pregnant women with low back pain. A centerpiece of the SMAs’ appeal and effectiveness is that they include and train husbands (or partners). As more than one pregnant patient has told me with a smile, “Who better to help reduce my pain than the man who got me into this in the first place?”

The Burden of Back Pain in Pregnancy

Back and pelvic pain have come to be expected by pregnant women. The statistics are stark:

- Fifty to 80 percent of pregnant women experience musculoskeletal pain during their pregnancy.\(^1\)
- Eighty-five percent of women who had low back pain in a previous pregnancy will have low back pain during their next pregnancy.\(^2\)
- In one large U.S. study,\(^2\) 85 percent of women reported they had not received any treatment for pain during their pregnancy. Of the 15 percent who were treated, only 10 percent were satisfied with their symptom relief.

Low back pain alone or in combination with pelvic pain is the major source of severe musculoskeletal pain in pregnant women. Ninety percent of the reports of severe pain in the large study mentioned above involved low back pain.\(^2\)

The highest intensity of pain in pregnant women is in the low back and sacroiliac joints. Low back and sacroiliac pain in this setting is believed to be caused by a combination of biomechanical factors that yield abnormal loading on muscles and joints and behavioral factors related to inadequate patient coping strategies.

A Role for Manipulation Techniques — and for Husbands/Partners

Although research on the use of spinal manipulation to reduce pregnancy-related low back pain has been limited, there is evidence that manipulation can be effective in this setting. For instance, a recent study comparing conservative obstetric treatment (exercise, heat and acetaminophen) with chiropractic manipulation, education and stabilization exercises among pregnant women (24 to 28 weeks’ gestation, with follow-up at 33 weeks) found significant reductions in pain in the group that received manipulation but not in those receiving conservative care.\(^3\)

I have been using osteopathic manipulation to treat pregnant women with low back pain for more than 10 years, employing it for more than 600 pregnant patients to date. I use gentle muscle energy and myofascial techniques and avoid more aggressive high-velocity, low-amplitude (HVLA) techniques. In my experience, osteopathic manipulation with pelvic exercises reduces low back and sacroiliac pain for two weeks, on average, in this patient group.

Approximately four years ago, I started teaching some of these gentle techniques to pregnant patients’ husbands/partners to see if doing so would extend patients’ period of pain relief. I have found that many partners are able to reduce their pregnant partners’ low back and sacroiliac pain in this way.

Taking the Approach to Multiple Couples at Once

Building on that progress, I have started an SMA program for pregnant women with low back and pelvic pain along with their spouses/partners. SMAs are group appointments with patients who have similar medical problems. Offering educational sessions to similar patients who meet and ask questions in a group setting can save time and improve access to care.

In my SMAs for pregnant women and their partners, I examine each patient individually in a private exam room, screening for more serious causes of low back and leg pain while a physical therapist discusses causes of pain with the patient and her partner. Because herniated disks are seen in only 1 in 10,000 pregnant women, screening exams usually reveal patients’ pain to be biomechanical.
The rest of the two-hour SMA is conducted as a group session in which I teach the pregnant women and their partners anatomic landmarks and a few gentle osteopathic manipulation techniques on tables in the physical therapy suite.

The techniques and positions I currently teach have been refined over several years to identify those that have proved most effective while remaining gentle. Examples include the myofascial release to the sacrum and leg traction to the posterior pelvis, as illustrated in the photos above. The partners are taught how to diagnose pelvic imbalance by looking at leg length while their partner is in a supine position in bed. The force used for the pelvic manipulation is applied by the pregnant patient with her partner resisting, which reduces the risk of injury.

When done correctly, the techniques are not difficult for the husbands/partners to perform, and patients consistently tell me these techniques feel good while they are being done to them — even by their partners’ novice hands. No injuries have been reported to me to date.

Next Steps: Possible Expansion and Results Reporting

I have so far treated up to four couples during a single SMA, with a limit of six couples per appointment. We currently schedule one SMA a month, on Saturday mornings, when both members of a couple are more available and our physical therapy suite is free. We envision offering SMAs every other Saturday if we continue achieving good results.

So far several women have reported their partners have been able to reduce their low back and pelvic pain using techniques from the SMA. As I record patients’ pain levels (on a visual analog scale) at each visit, I plan to report results for SMA-managed patients in the future.

To my knowledge, this is the first SMA program that teaches husbands/partners how to use spinal manipulation to treat their pregnant partners with back and pelvic pain. It is still early in the SMAs’ evolution, but I am confident that this new approach will help keep pregnant women with back pain more comfortable while enhancing their partners’ involvement in the pregnancy.

References


KEY POINTS

More than 50 percent of pregnant women have low back and sacroiliac pain. Up to 85 percent of these women are not treated at all, and only 10 percent of those treated report satisfactory relief.

Initial reports suggest that spinal manipulation seems to help reduce pregnancy-related low back and sacroiliac pain.

Experience to date in Cleveland Clinic’s couples-based shared medical appointment program suggests that pregnant women’s husbands/partners can be taught gentle, safe and effective techniques in a group setting to help reduce these women’s back pain.
Case Study in Complexity: The Merits of a Multidisciplinary Approach to Spine Tumors
By Tiffany Perry, MD, and Lilyana Angelov, MD

From Decorating Pains to a Daunting Diagnosis
When 37-year-old Tina Wadsworth lifted a box of Christmas decorations in late 2013, she noticed a bit more back pain than she remembered from the previous year, but she dismissed it as a muscle strain and continued through the holiday season. Weeks later, with the pain in her right hip and left flank worsening, Tina and her partner went to the ER of Cleveland Clinic’s Lakewood Hospital in February 2014 in search of an answer.

Initial X-ray and CT studies began to unveil the pain’s etiology: Large lytic lesions of the right iliac bone, T11 vertebra and left ninth rib were the source of Tina’s symptoms. Her spinal cord was severely compressed by the lesion in her thoracic spine (Figure 1), and the tumor had completely replaced the spine’s structural bony support, causing severe mechanical back pain. A biopsy of the iliac lesion revealed metastatic adenocarcinoma.

Multiple Interventions on Multiple Fronts
From the initial ER visit, Tina’s physicians worked collaboratively to ensure that she received expeditious diagnosis, prompt treatment initiation and efficient coordination of care. In late February, she underwent T11 corpectomy and resection of the tumor and fusion from T9 through L2 (Figure 2).

The surgery was performed at Cleveland Clinic’s Fairview Hospital, where Tina worked with a team of therapists to expedite her mobility and recovery and went home to continue outpatient physical therapy. With the spinal cord decompressed (Figure 3) and her mechanical back pain significantly improved, she was ready for the next steps of treatment.

Two weeks postoperatively, she underwent stereotactic radiosurgery to the surgical tumor bed and left rib mass to ensure that the spinal cord’s radiation exposure was minimized. Two weeks later, she had radiosurgery to the iliac mass.

More Complexities in Store
A team of pathologists diligently pursued a definitive diagnosis. Assessment of molecular markers of the tumor indicated a 90 percent probability of squamous cell carcinoma of the cervix. This seemed highly unusual, given that tissue samples from the iliac lesion and the thoracic lesion both demonstrated adenocarcinoma consistent with breast cancer. The final pathology was triple-negative breast cancer (estrogen-negative, progesterone-negative and HER2/neu-negative), making it more challenging to treat with chemotherapy.

In view of the cervical cancer molecular markers on pathology, Tina was referred to a gynecologic oncologist for a cervical curettage, which was negative for malignancy.

In April, Tina continued to undergo testing to confirm the primary origin of the cancer. Mammography and breast ultrasound showed a small mass in the right breast that was highly suggestive of malignancy. She underwent a fine-needle aspiration that again revealed metastatic carcinoma consistent with breast cancer.

Through the combined efforts of her oncologist, radiation oncologists, gynecologic oncologist, interventional radiologist, pathologists and neurosurgeon, Tina has been the recipient of collaborative, multidisciplinary care for her breast cancer.

Determination and Inspiration
Although the time between her doctor visits is short, Tina is trying to develop some semblance of a routine in her life’s new landscape. Instead of BMX biking, she is learning to enjoy walks outside. Her outlook on life, living and cancer continues to amaze us and all her caregivers at Cleveland Clinic.

When asked how she maintains such infectious optimism, Tina replied, “I’d be lying if I said there weren’t quite a few dark days mixed into the last few months, but that isn’t a place I like to stay for long. Whether I have two days, two years or — by some miracle — two decades, I want to make the most of it.”

The Case for Coordinated, Multidisciplinary Care
Tina’s case is just one of hundreds of challenging spine tumor cases managed at Cleveland Clinic’s Center for...
Spine Health each year. Patients with spine tumors require integrated, multidisciplinary care to optimize their outcome. As with Tina, a patient with a new spine tumor requires a diagnosis of tumor pathology, after which treatment is tailored to address the following:

- Spinal instability due to tumor-induced compromise of the bone’s structural integrity
- Neurological deficits associated with spinal cord or root compression by the tumor
- Disabling tumor-related pain
- Treatment of the patient’s global disease if the cancer is metastatic

Spine Tumor Board Leverages Broad Expertise

To best address the diversity of treatments required by patients with spine tumors, Cleveland Clinic has developed a weekly Spine Tumor Board to coordinate patient care. The Spine Tumor Board consists of neuroradiologists, neuropathologists, neurosurgeons, orthopaedic surgeons, radiation oncologists, radiosurgeons, medical oncologists, neurologists, palliative medicine specialists, pain management specialists, medical spine specialists, nurse practitioners and physician assistants — a truly multidisciplinary consortium.

Cases are typically presented by one of these providers, but cases also are referred by outside physicians for
During board meetings, cases are thoroughly reviewed by the group, information is integrated from multiple sources, and each member provides his or her relevant expertise and insights on the patient’s management. This collective input is developed into a comprehensive treatment plan that lays out care goals in a group recommendation. The recommendation is communicated to the patient, and treatment can begin in an integrated and rapid manner with all team members being familiar with the patient’s overall needs.

Since its inception in 2006, Cleveland Clinic’s Spine Tumor Board has become one of the highest-volume boards in the country, having reviewed and provided management recommendations on more than 2,300 spine tumor cases. All types of spine tumors are discussed — both primary and metastatic, benign and malignant, and those involving the spinal column or spinal cord.

We believe this multidisciplinary strategy is making important differences in spine tumor patients’ treatment and overall quality of life. Patients like Tina help us build on our existing expertise while providing unparalleled inspiration to advance it further.
These specialists see patients for spine-related care at Cleveland Clinic’s main campus and at multiple community hospitals and family health centers throughout Northeast Ohio.

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Michael Steinmetz, MD, Incoming Co-Director (effective Jan. 2015)
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Surgical Staff
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CME EVENTS
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Eighth Annual International Symposium on Stereotactic Body Radiation Therapy and Stereotactic Radiosurgery
Course Directors: Lilyana Angelov, MD; Gene Barnett, MD; Edward Benzel, MD; Samuel Chao, MD; and John Suh, MD
Grand Floridian Resort,
Lake Buena Vista, Florida

JULY 15-21, 2015
Cleveland Spine Review
Course Directors: Edward Benzel, MD; Douglas Orr, MD; Richard Schlenk, MD; Marc Eichler, MD; and Greg Trost, MD
Lutheran Hospital, Cleveland, Ohio

For more information on these or other Cleveland Clinic CME programs in spine health, contact Martha Tobin at tobinm@ccf.org or 216.445.3449.

The Cleveland Clinic Way
By Toby Cosgrove, MD,
CEO and President of Cleveland Clinic

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About Cleveland Clinic

Cleveland Clinic is an integrated healthcare delivery system with local, national and international reach. At Cleveland Clinic, more than 3,000 physicians and researchers represent 120 medical specialties and subspecialties. We are a main campus, more than 75 northern Ohio outpatient locations (including 16 full-service family health centers), Cleveland Clinic Florida, Cleveland Clinic Lou Ruvo Center for Brain Health in Las Vegas, Cleveland Clinic Canada, Sheikh Khalifa Medical City and Cleveland Clinic Abu Dhabi.

In 2014, Cleveland Clinic was ranked one of America’s top four hospitals in *U.S. News & World Report’s* “Best Hospitals” survey. The survey ranks Cleveland Clinic among the nation’s top 10 hospitals in 13 specialty areas, and the top hospital in heart care (for the 20th consecutive year) and urologic care.

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