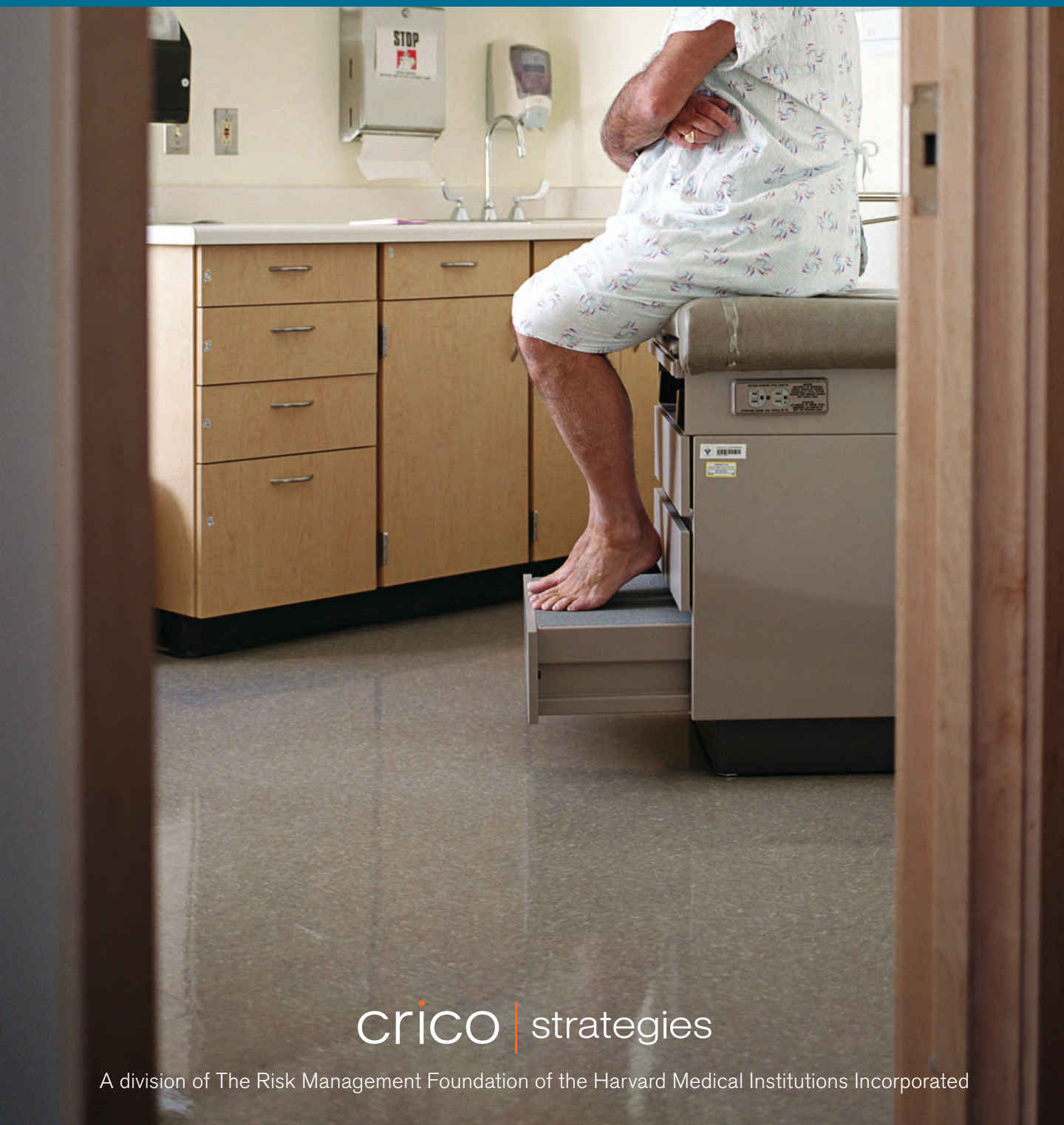
CRICO 2018 CBS BENCHMARKING REPORT

Medical Malpractice in America

A 10-YEAR ASSESSMENT WITH INSIGHTS



crico | strategies

A division of The Risk Management Foundation of the Harvard Medical Institutions Incorporated

“Knowing is not enough; we must apply.
Willing is not enough; we must do.”

—JOHANN WOLFGANG VON GOETHE

Shared Data and a Common Mission

The knowledge of what happened to one patient (no matter how tragic), or one physician (no matter how distraught), is rarely enough to understand the systemic risks underlying adverse events. Health care and insurance leaders must determine what goes wrong repeatedly, gauge concerning trends, spot emerging risks, and compare that information over time and across peer groups.

Twenty years ago, CRICO Strategies' national Comparative Benchmarking System (CBS) was developed to gain those insights. Health care providers and medical professional liability (MPL) insurers began to engage in collaborative efforts to apply that knowledge toward risk reduction. Capitalizing on the intrinsic value of malpractice cases—including open cases, cases with zero indemnity, and case management information—required larger data sets than were available to any individual organization. Sharing data was essential to making sound decisions and initiating effective actions.

Twenty years later, CBS represents 30% of U.S. MPL cases, the industry's most robust coding taxonomy, and risk-related data unavailable elsewhere. CBS offers insurers and insureds unique data tools and unmatched analytic power.

And, as CBS has become an essential learning platform, its value has grown beyond the big numbers. The organizations that have shared their data also come together to share solutions, and form a community of members with a common mission to improve patient safety and reduce MPL losses.

OVER VIEW

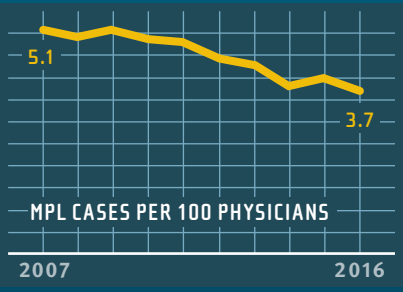
CRICO Strategies' Comparative Benchmarking System (CBS) contains 30% of the medical professional liability (MPL) cases filed from across the U.S., and reflects the experience of more than 500 health care entities and 180,000 physicians from commercial and captive insurers.

This Report analyzes 124,000 MPL cases with claim-made dates or indemnity close dates between 2007–2016.

Medical Malpractice in America

A 10-Year Assessment with Insights: Top Takeaways

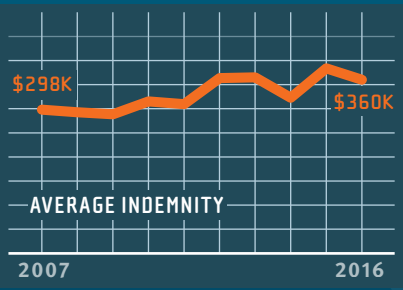
1



Case frequency went down.

see CASE FREQUENCY page 4

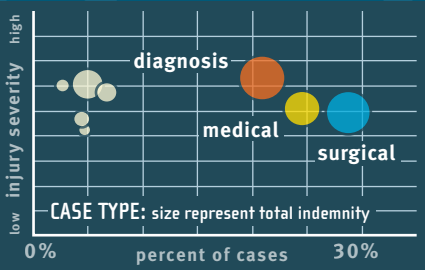
2



Expenses and indemnity payments (especially $1M+ payments) rose, but not beyond expectations.

see CASE MANAGEMENT page 6
INDEMNITY page 8

3



The more deeply coded clinical components of MPL cases provide actionable insights.

see CLINICAL SEVERITY page 10
CASE TYPE page 12
RESPONSIBLE SERVICE page 14
NURSING page 17
CONTRIBUTING FACTORS page 18
THE DIAGNOSTIC PROCESS page 20

There's safety in numbers.

see MPL DATA ACCELERATE PRACTICAL SOLUTIONS page 23

MARK E. REYNOLDS, PRESIDENT & CEO, CRICO
MICHAEL PASKAVITZ, ASSISTANT VICE PRESIDENT, CRICO STRATEGIES

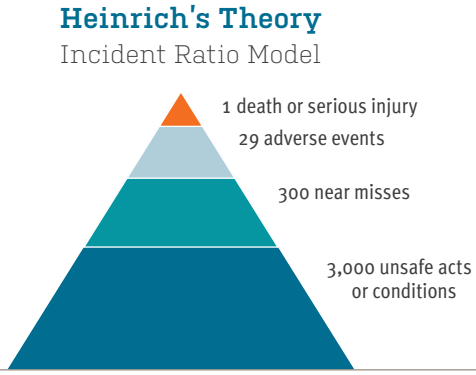
Analyzing Medical Malpractice in America

Medical malpractice devastates individuals and exposes weaknesses… and it is uncomfortable to talk about. But discussing and analyzing malpractice cases is essential to bringing about the changes necessary to prevent similar injuries. Indeed, the human tragedy of malpractice cases drives our mission to turn that data into credible evidence: what failed, why, and changes in vulnerabilities over time. This Report, covering 2007–2016, analyzes events that affected 124,000 patients, their families, and the health care providers involved; we hope our findings prompt frank discussions that change lives.

Among the findings, analysis of the 10 years from 2007 to 2016 reveals:

- a 27% drop in the frequency of malpractice claims and suits being asserted, with downward trends in the rate of cases per 100 physicians across virtually all specialties
- for obstetricians/gynecologists, the risk of having a claim or suit filed against them has dropped 44%
- case management expenses increased an average 3.5% annually (4.7% annually for zero-indemnity cases)
- the volume of indemnity payments of $3M–11M increased 7% annually

These macro-trends, and the micro-learnings within them, are increasingly employed by actuaries writing reinsurance, health



care executives assessing business plans, and claims managers establishing defense strategies.

Perhaps the most poignant value of MPL data can be found in the patient safety movement. The 2016 National Academies of Sciences report, *Improving Diagnosis in Health Care,* recommended that health care providers work directly with their malpractice insurers to learn about diagnostic failure. That put the value of malpractice data on a national stage, a platform upon which a forward-thinking MPL community armed with credible data is eminently qualified to stand.

Heinrich's Theory—a near 100-year-old framework for safety programs worldwide—illustrates the extraordinary power of deeply-coded MPL cases. CRICO's 20-year-old Comparative Benchmarking System (CBS), upon which this Report is based, contains 30% of all U.S. MPL claims and suits: the top of Heinrich's pyramid. Further down the pyramid, incident and near-miss data are more frequent, but the sources are uncoordinated, data quality is inconsistent, learning is less shared at scale, and analyses are rarely actionable. Clearly, MPL data are a foundation for understanding vulnerabilities and an essential tool for reducing those risks.

As an organization, CRICO Strategies believes there's safety in numbers. The big numbers behind this Report reflect the commitment of our partners in the CBS database. We are indebted to the commercial and captive insurers who have helped turn the notion of an MPL community into a dynamic reality. When like-minded leaders use data together to solve problems, health care providers are better protected and their patients are safer.

As an MPL insurer, we recognize that there are inherent risks in the complex world of health care. Our mission is to advance, protect, and reward the practice of good medicine. Over the years, we have gained extraordinary insights for supporting that mission from studying patient harm—primarily through CBS data. We share that information with anyone who desires to learn, and use data to advocate for the health care providers and organizations we insure. We partner with physician experts to make our findings and publications relevant to practicing clinicians. Increasingly, this data is becoming more relevant to other disciplines within our company. Actuaries, underwriters, claims professionals, and marketing and communications professionals are accessing and using data in their decision-making.

The road ahead has many uncertainties. We are learning that collaboration with reliable partners and the use of data enhance our ability to be prepared.

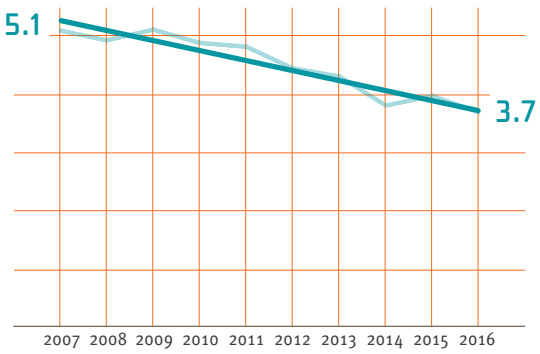
DARRELL RANUM
VICE PRESIDENT PATIENT SAFETY, THE DOCTORS COMPANY

Case Frequency

Overall MPL case frequency dropped 27% from 2007–2016, with an especially compelling trend for obstetrician-gynecologists.

Fewer cases are being asserted relative to the physician population.
The 2016 rate, 3.7 cases per 100 physicians, reflects a steady downward trend.

MPL CASES PER 100 PHYSICIANS



27%
DECREASE IN THE CASE RATE OVER TEN YEARS

From 2007 to 2016, the rate of MPL cases asserted per 100 physicians dropped 27%—from 5.1 to 3.7. For the roughly one million physicians across the country, this trend signals a dramatic change in their risk of being named in an MPL case. While no single factor can be aligned with an across-the-board reduction, changes in the tort environment, improved patient safety, and increasing financial risks for plaintiffs' attorneys likely contributed.

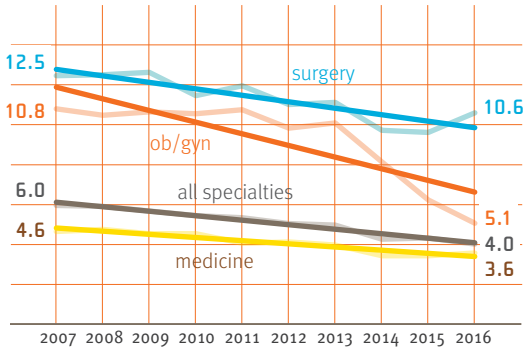
MPL experience fluctuates across legal jurisdictions and health care delivery structures, but the breadth and depth of the CBS database helps smooth variation. The downward trend in case frequency seen from 2007–2016 was universal across the many segments of health care delivery. Of course, a physician's risk of being named in an MPL case varies considerably by clinical area of practice, but for obstetrics/gynecology and the primary subspecialties within medicine and surgery, MPL case frequency declined steadily.

For ob/gyns (whose rate is historically higher than the average for all MDs), the risk of having an MPL case filed against them dropped 44% from 2007–2016. Such sustained results demonstrate that initiatives such as training to improve team communication during labor and delivery, and

Defendant rates declined most steeply in obstetrics/gynecology.

These declines correlate with long-term safety interventions in these areas.

DEFENDANTS PER 100 PHYSICIANS



CHANGE IN THE DEFENDANT RATE

SPECIALTY	10-YEAR CHANGE*
OB / GYN	-44%
MEDICINE	-29%
SURGERY	-23%

* based on the linear trend

multidisciplinary education on fetal heart rate tracings, are being rewarded.

Medical subspecialties, whose case rate historically falls well below the rates for surgeons and ob/gyns, experienced a modest decline from 2007–2016. A heightened awareness of diagnosis-related trouble spots (see page 20)—and efforts to "close the loop" for test results and referrals—may be gaining traction.

The combined case rate for the surgical subspecialties, historically highest among all physicians, also declined at a modest rate (3% per year). Initiatives to reduce the risk of harm to surgery patients have aimed at pre-, intra- and post-operative vulnerabilities. Those interventions (e.g., more holistic pre-op assessment, patient-centered consent, simulation-based drills, timeouts and debriefs, and teamwork training) appear to be impacting MPL case frequency.

OTHER PERSPECTIVES

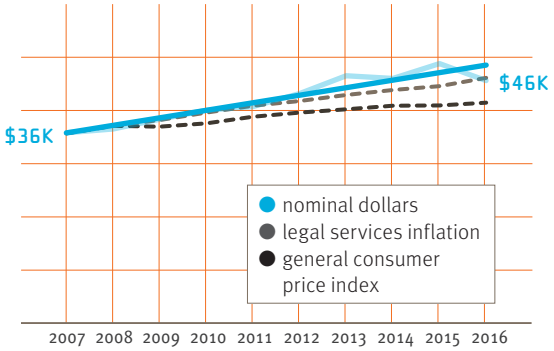
- Claims frequency overall and for physicians remains at a historic low
  [Willis Towers Watson, Health Trek, May 2017]
- Frequency of health care professional liability claims is showing a stable trend over recent years
  [Aon/ASHRM, Hospital and Physician Professional Liability, October 2017]
- From 1992–1996 to 2009–2014, the rate of paid claims decreased by 55.7%
  [JAMA Internal Medicine, 2017;177(5):710–718]

Case Management

From 2007–2016, MPL closed-with-pay rates held steady, but expenses (especially for zero indemnity cases) rose faster than inflation.

Case management expenses outpaced both consumer and legal inflation indices.

AVERAGE EXPENSE PER CASE



$42K
TEN-YEAR AVERAGE EXPENSES PER CASE

+$1.5K
AVERAGE CHANGE PER YEAR

+3.5%
AVERAGE PERCENT CHANGE PER YEAR

0.7%
ABOVE LEGAL INFLATION

1.8%
ABOVE CPI INFLATION

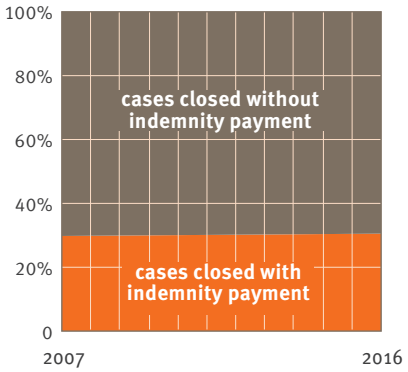
A frequency decrease (page 4), and an unchanged rate of closings with payment, meant a drop in both zero-indemnity and paid MPL case volume from 2007–2016. The cost to manage those cases—with or without indemnity payments—increased steadily and outpaced inflation. Concurrently, the average number of defendants per case rose significantly. Cases with multiple defendants reflect both the complexity of team-based care (patients encounter more clinicians) and policy limit "stacking" (plaintiffs adding policy holders to an MPL case to increase potential indemnity). Typically, cases with more defendants require individual legal representation, adding complexity and cost to case management. Beyond legal fees, the use of MPL defense tools (mock trials, computerized renderings, jury studies, witness preparation) is increasing, as are their costs.

An upward trend in expenses is seen for all MPL cases. The fastest growth was for cases closed without an indemnity payment, which incur expenses comparable to any case up until they are dropped, denied, dismissed, or adjudicated in the defendant's favor. Of note, the average time to resolve for cases with indemnity dropped from 29 to 27 months between 2007 and 2016. That trend may indicate that strategies to expedite resolution (e.g., disclosure and apology) are having an impact, and are, perhaps, slowing the growth of case management expenses.

Case disposition was static.

The percent of cases closed with payment was virtually unchanged from 2007–2016.

PERCENT OF CASES

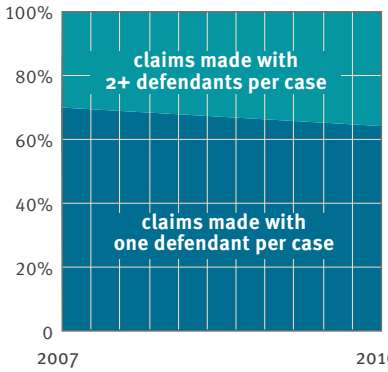


cases closed...	TEN-YEAR AVERAGE	AVERAGE PERCENT CHANGE PER YEAR
...with payment	30%	+0.6%
...without payment	70%	-0.3%

The proportion of cases naming multiple defendants is growing.

This drove an increase in the overall number of defendants.

CASES BY NUMBER OF DEFENDANTS



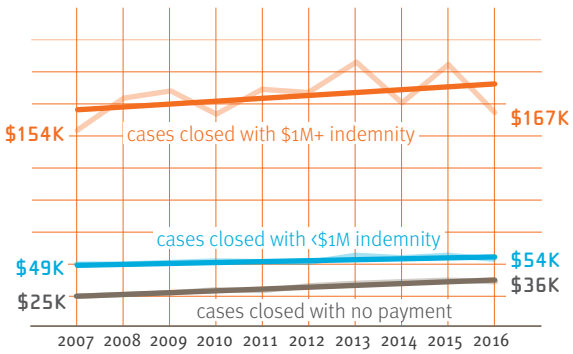
For the cases studied, the total number of defendants grew on average 257 per year. With the average expense per defendant being $25K (and rising, as seen below), this added about $6.5M to expenses per year.

	TEN-YEAR AVERAGE	AVERAGE CHANGE PER YEAR		AVERAGE PERCENT CHANGE PER YEAR
number of defendants	17K	—	+257 DEFENDANTS	+1.5% DEFENDANTS
cases with 1 defendant	63% OF CASES	-79 CASES	-79 DEFENDANTS	-1.2% DEFENDANTS
cases with 2+ defendants	37% OF CASES	+96 CASES	+348 DEFENDANTS	+3.3% DEFENDANTS

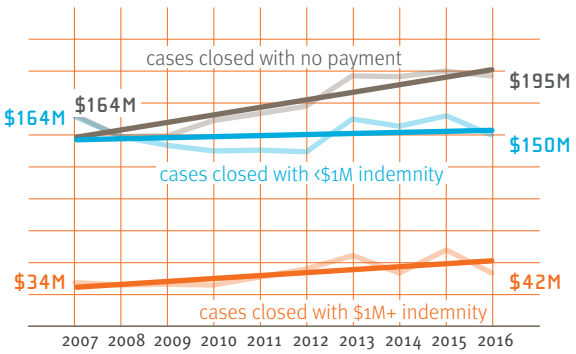
Total expenses rose fastest for cases closed without an indemnity payment.

Average per case expenses increased most dramatically for cases closed with a $1M+ payment.

AVERAGE EXPENSE PER CASE
(NOT INFLATION ADJUSTED)



TOTAL EXPENSES
(NOT INFLATION ADJUSTED)



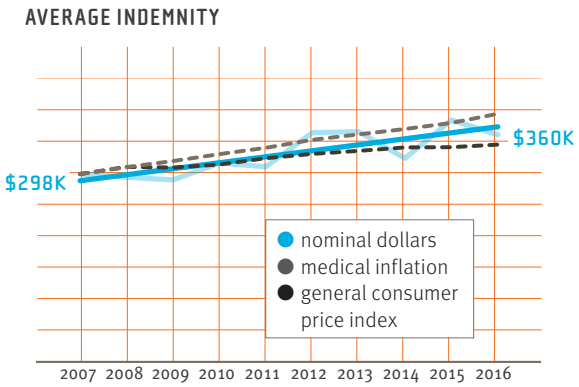
Cases closed...	TEN-YEAR AVERAGE	AVERAGE CHANGE PER YEAR	AVERAGE PERCENT CHANGE PER YEAR
...with no payment	$31K	+$1.5K	+4.7%
...under $1M	$52K	+$0.7K	+1.4%
...$1M+	$180K	+$2.3K	+1.3%

Cases closed...	TEN-YEAR AVERAGE	AVERAGE CHANGE PER YEAR	AVERAGE PERCENT CHANGE PER YEAR
...with no payment	$175M	+$6.0M	+3.4%
...under $1M	$150M	+$0.8M	+0.6%
...$1M+	$41M	+$2.4M	+5.7%

Indemnity

$1M+ payments drove an overall increase in both average and total indemnity paid.

The 10-year profile for average indemnity matches inflation-based expectations.
Indemnity's position above the general CPI demonstrates the influence of future medical expenses on payment amounts.



$330K
TEN-YEAR AVERAGE INDEMNITY PAYMENT

+3%
AVERAGE CHANGE PER YEAR

0.1%
BELOW MEDICAL INFLATION

1.3%
ABOVE CPI INFLATION

MPL indemnity payment trends for the 10-year study period were not dramatic. The median payment increased in line with inflation (from $110K in 2007, to $120K in 2016). The average payment, even though distorted by a few atypical payouts, grew on average 3% annually (from $298K to $360K). While that outpaced the consumer price index, it fell below medical inflation, a fair proxy for medical expenses which, along with policy limits, heavily influence payments.

Total MPL losses were extremely concentrated in cases with $1M+ payments, especially those paying $1M–3M. This analysis found that 2.2% of all cases had $1M+ payments, but the volume of such cases rose (on average) 4.4% annually from 2007–2016. In aggregate, $1M+ payments accounted for 49% of MPL losses. Meanwhile, the volume of cases closing under $1M dropped, as did their share of total indemnity.

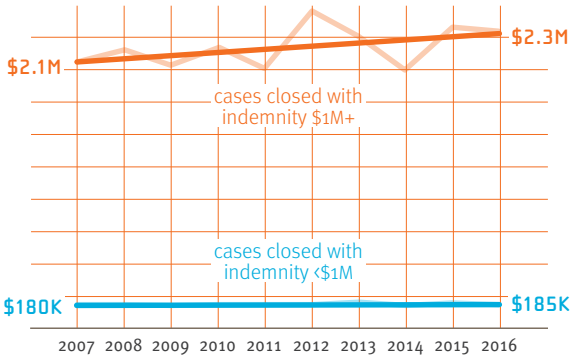
Certainly, extraordinary jury awards draw media attention, pique the interest of reinsurers, and can skew the focus of patient safety improvements, but they remain rare. Per 1,000 cases closed, only one or two cases closed with more than $5 million indemnity. Outlier payments (those exceeding $11M) had a minimal impact on overall indemnity trends.

Cases paying $1M+ drove an overall growth in indemnity.

The majority of indemnity paid now accrues from $1M+ cases.

AVERAGE INDEMNITY

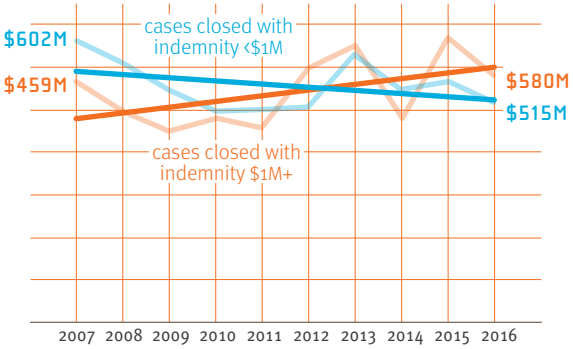
(NOT INFLATION ADJUSTED)



CASES CLOSED...	TEN-YEAR AVERAGE	AVERAGE CHANGE PER YEAR
...under $1M	$183K	+0.6%
...$1M+	$2.2M	+1.1%

TOTAL INDEMNITY

(NOT INFLATION ADJUSTED)

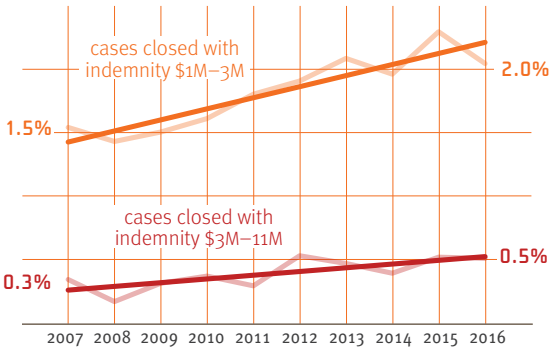


CASES CLOSED...	TEN-YEAR AVERAGE	AVERAGE CHANGE PER YEAR
...under $1M	$525M	-0.3%
...$1M+	$496M	+5.5%

$1M+ payments are changing the indemnity landscape

The volume of cases closed with $1M+ payments rose an average of 4.4% per year from 2007–2016; payments below $1M dropped. Although $3M–11M cases are still rare, the cumulative indemnity for these cases grew the fastest and outpaced medical cost inflation. For a case set of 102,000, the 24 payments above $11M, while non-trivial, did not affect the overall indemnity growth trend.

PERCENT OF CASES CLOSED

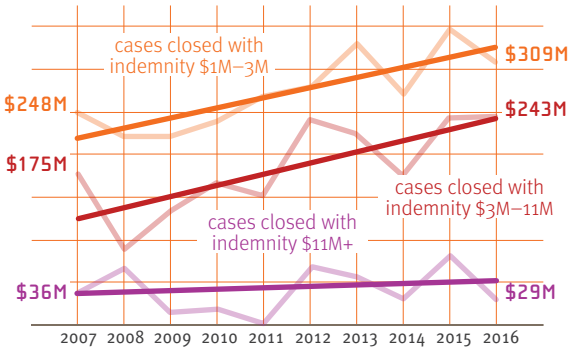


Cases closed...	TEN-YEAR AVERAGE	AVERAGE CHANGE PER YEAR	AVERAGE PERCENT CHANGE PER YEAR
...$1M–3M	1.8%	+0.09%	+5.0%
...$3M–11M	0.4%	+0.03%	+8.6%
...$11M+*	0.02%	—	—

*The incidence of cases with greater than $11M indemnity paid is too small to graph or determine trends.

TOTAL INDEMNITY

(NOT INFLATION ADJUSTED)

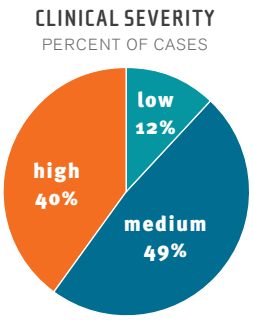


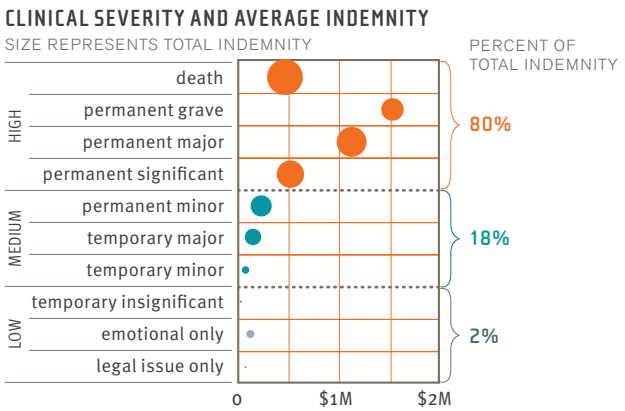
Cases closed...	PERCENT OF ALL INDEMNITY 2007	PERCENT OF ALL INDEMNITY 2016	AVERAGE CHANGE PER YEAR	AVERAGE PERCENT CHANGE PER YEAR
...$1M–3M	23%	28%	+$12M	+4.4%
...$3M–11M	17%	22%	+$15M	+7.9%
...$11M+	3%	3%	–	–

Clinical Severity

MPL cases compensating future medical expenses for younger patients with severe permanent injuries drive indemnity costs.

High-severity injuries are more likely to result in indemnity payment.
The increasing cost of long term life-care plans are reflected in the average indemnity for patients with severe, but non-fatal outcomes of care.





41%

HIGH-SEVERITY INJURIES ARE 41% MORE LIKELY TO LEAD TO AN INDEMNITY PAYMENT

Although occasional case results seem random or arbitrary, the primary determinant of financial damages in MPL cases is injury severity. High-severity injury cases closed more often with an indemnity payment, and those payments were, on average, four times higher than for medium and low severity cases.

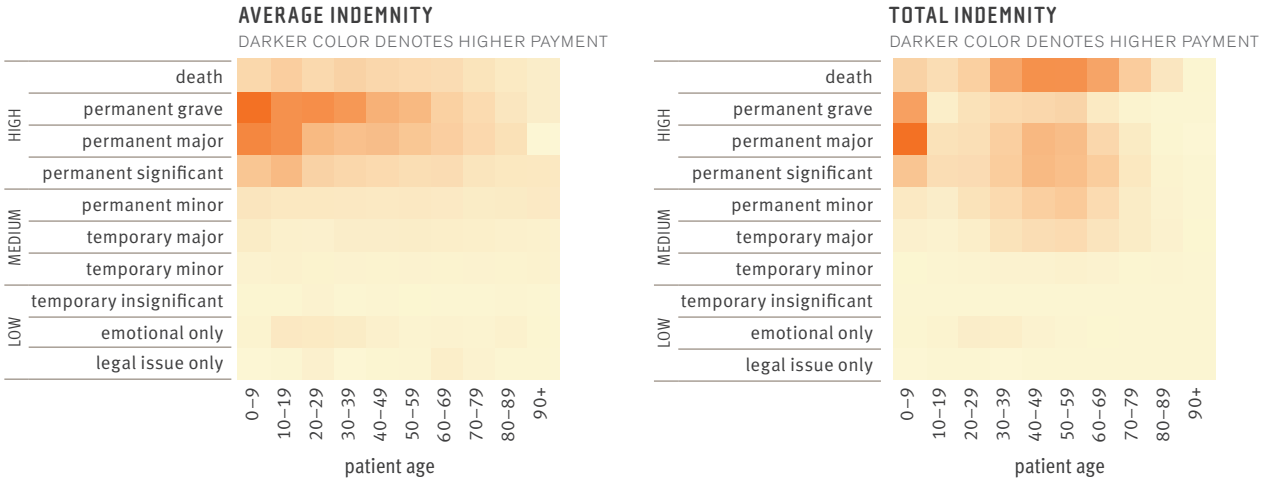
Over the 10-year study period, nearly two-thirds of obstetrics-related cases and 63% of those alleging a diagnostic error involved high-severity injuries. On the other hand, 72% of surgery-related cases involved medium or low severity injuries. Many of the latter were relatively moderate injuries with a finite recovery period.

Patients with severe, permanent (non-fatal) injuries seek compensation—in addition to pain and suffering—to cover the health care costs and lost income of their remaining years (sometimes decades). Thus, for the 22% of cases involving a patient's death, the average payment ($453K) was just over half the average payment for patients with permanent severe injuries.

Tragic outcomes and a greater likelihood of closing with high payments elevate severe-injury cases to focal points for both claims management and risk management. Effective risk reduction efforts targeting the root causes of high-severity cases should help to reduce less severe events as well.

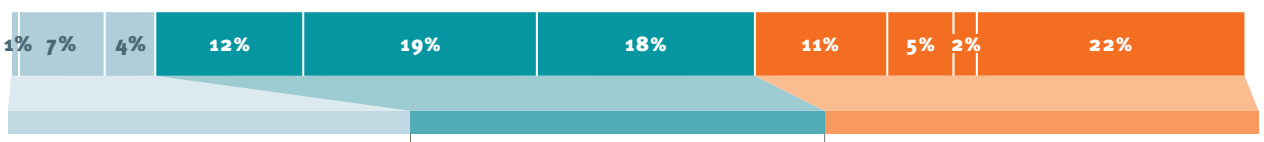
Indemnity was impacted most by injury severity and patient age.

Death-related cases accounted for the largest amount of total indemnity, but severely-injured patients under age 40 received the highest average payment.



Examples of clinical injuries by severity level

MPL injuries are assigned to one of 10 categories grouped into low, medium, and high severity.



LOW-SEVERITY INJURIES

Legal Issue Only: 1%
Illegal access of patient's medical record without necessity, resulting in HIPAA violation and invasion of privacy allegation.

Emotional Only: 7%
After the loss of a biopsy specimen, a patient with a strong family history of skin cancer required ongoing monitoring to ensure areas around her initial lesion did not worsen.

Temporary Insignificant: 4%
Complaints of pain during IV insertion, dismissed as patient's fear of needles, resulted in IV infiltration.

MEDIUM-SEVERITY INJURIES

Temporary Minor: 12%
Patient burned by malfunctioning part of intraoperatively used warming blanket. Failure to monitor patient's skin during procedure resulted in second degree burn.

Temporary Major: 19%
A cerclage stitch was not located after a cesarean delivery. Failure to document and follow up on this retained foreign body resulted in abdominal pain, infection, and additional surgery.

Permanent Minor: 18%
Misread CT resulted in delayed diagnosis of appendicitis (mistaken for kidney infection) leading to ruptured appendix, large abscess, sepsis, need for additional surgery, and prolonged hospitalization.

HIGH-SEVERITY INJURIES

Permanent Significant: 11%
Sub-optimal management of a non-English speaking patient's compliance with specialty consults delayed the diagnosis of a brain tumor, resulting in permanent vision loss.

Permanent Major: 5%
Patient with vascular occlusions required bilateral leg amputations after a requested vascular consult was unreasonably delayed.

Permanent Grave: 2%
Patient suffered a stroke following a heart attack. Mismanagement of anticoagulants was tied to gaps in clinical monitoring and communication.

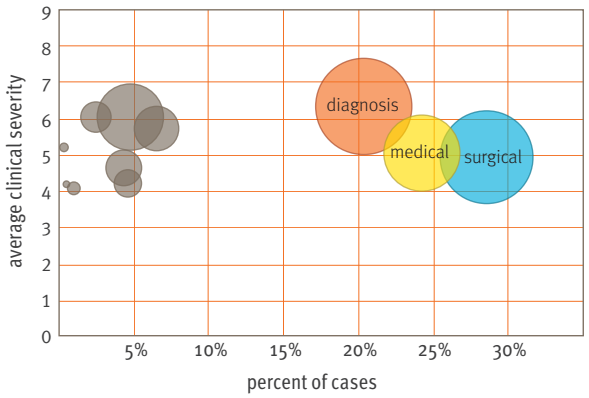
Death: 22%
Patient with history of aortic dissection complained to PCP of chest pain. After an X-ray, the patient died at home. Posthumous reading of the X-ray showed an enlarged aorta, which ultimately ruptured.

Case Type

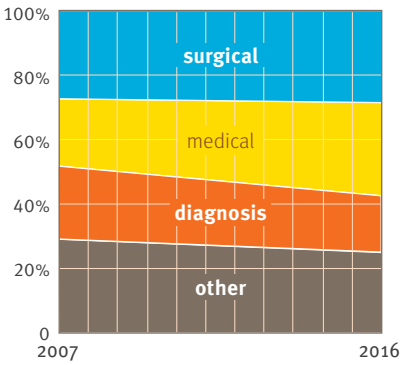
The vast majority (73%) of MPL cases stem from three categories of health care: surgical treatment, medical treatment, and the diagnostic process.

Surgical treatment remains the most common source of MPL cases.
Allegations of a medical treatment failure are becoming more common.

CASE TYPE
SIZE REPRESENTS (RELATIVE) TOTAL INCURRED LOSSES



PERCENT OF CASES



Examining MPL cases for shared components consolidates risk reduction interventions and defense strategies. CBS case types comprise adverse events with similar profiles, e.g., failure to diagnose, patient monitoring, medication management, technical performance. Even though like cases might derive from care in disparate settings or involve a mix of clinical services, they lend themselves to comparable mitigation strategies. For example, failure to detect a post-operative complication shares some diagnostic missteps with a missed myocardial infarction in the Emergency Department. Protocols to prevent recurrence in both settings could be based on a common framework. Case typing is also key to defense and settlement strategies.

From 2007–2016, diagnostic issues demonstrated a downward shift in the MPL case mix. That trend aligns with widespread attention on diagnostic errors (see page 20) and some concerted efforts to reduce them. Concurrently, the proportion of cases alleging errors during medical treatment (i.e., non-surgical procedures and ongoing care management) moved upward, perhaps signaling the need for similar scrutiny.

Surgical Cases

A substantial share (44%) of surgical cases involve ambulatory care patients.

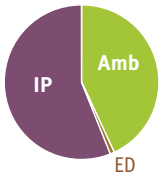
TOP PROCEDURES

- **28% orthopedic**
- 17% gastrointestinal
- 11% skin
- 9% gynecologic
- 8% nervous system
- other

TOP INJURIES

- **17% perf./laceration**
- 11% infection
- 8% nerve damage
- 7% hematologic
- 6% retained foreign body
- other

CARE SETTING



SURGICAL CASES	
28%	of all cases
24%	of all losses
29%	closed with payment
$347K	average indemnity
$152K	median indemnity

ODDS RATIO FOR SURGICAL CASES
compared to non-surgical cases

0.49	to involve a high-severity injury
0.82	to close with payment
0.78	to close with payment $1M+

Medical Cases

Medical cases are evenly divided between improper management of ongoing care and improper performance of a procedure.

RESPONSIBLE SERVICES

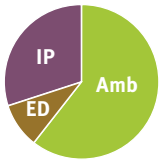
IMPROPER MANAGEMENT OF A MEDICAL PATIENT

- **48% medicine**
- 15% surgery
- 9% emergency medicine
- 7% dentistry
- 7% nursing
- other

IMPROPER PERFORMANCE OF A MEDICAL PROCEDURE

- **30% medicine**
- 25% dentistry
- 15% surgery
- 7% nursing
- 7% radiology
- other

CARE SETTING



MEDICAL CASES	
24%	of all cases
16%	of all losses
28%	closed with payment
$265K	average indemnity
$69K	median indemnity

ODDS RATIO FOR MEDICAL CASES
compared to non-medical cases

0.80	to involve a high-severity injury
0.77	to close with payment
0.47	to close with payment $1M+

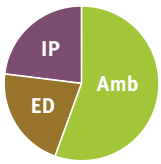
Diagnosis Cases

Among a wide range of missed or delayed diagnoses, cancers were consistently most prevalent.

FINAL DIAGNOSES IN MISSED/DELAYED DIAGNOSIS CASES

- **30% cancers**
  - top cancers
    - 16% breast
    - 14% lung
    - 10% colorectal
    - 7% uterine & ovarian
    - 6% skin
- 18% cardiac/stroke
- 17% complications of care
- 7% digestive system
- 7% nervous system
- other

CARE SETTING



DIAGNOSIS CASES	
21%	of all cases
28%	of all losses
35%	closed with payment
$472K	average indemnity
$213K	median indemnity

ODDS RATIO FOR DIAGNOSIS CASES
compared to non-diagnosis cases

3.43	to involve a high-severity injury
1.16	to close with payment
1.72	to close with payment $1M+

Care settings are Ambulatory, Inpatient, and Emergency Department

Responsible Service

One-third of MPL cases involved clinicians from a surgical service, one-quarter involve clinicians from a medical service. Those proportions remained constant during the 10-year study period.

The 10-year decline in overall case rate was distributed evenly among the top responsible services.

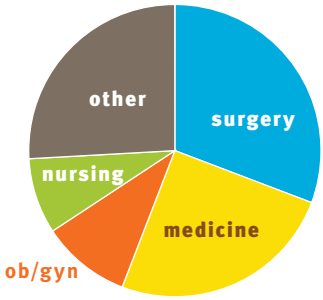
RESPONSIBLE SERVICES AS A PERCENT OF CASES

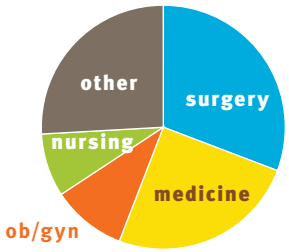
THE RELATIVE SIZE OF THE PIE CHARTS REFLECTS THE DECLINE IN THE CASE RATE

2007

5.1

CASES PER 100 PHYSICIANS





2016

3.7

CASES PER 100 PHYSICIANS

Most patients interact with a team of caregivers from one or more clinical service, and not every MPL case names a physician defendant. To reduce the risk of patient harm and litigation, analysts need to look beyond physician specialty to understand which clinical service was responsible for a patient at the crux of an adverse event. Responsible service designations incorporate all staff and functions involved in patient care. Engaging all segments of a given service in efforts to address recurring patient safety issues, as a team, boosts effectiveness.

For some services, injury severity has a greater influence on overall MPL exposure than does case volume. Neurosurgery and obstetrics—where the consequences of medical errors are often permanent and devastating—incur significantly disproportionate financial losses when compared to their shares of total cases. Alternately, nursing and orthopedics have a higher frequency of cases with less severe–and often temporary—injuries.

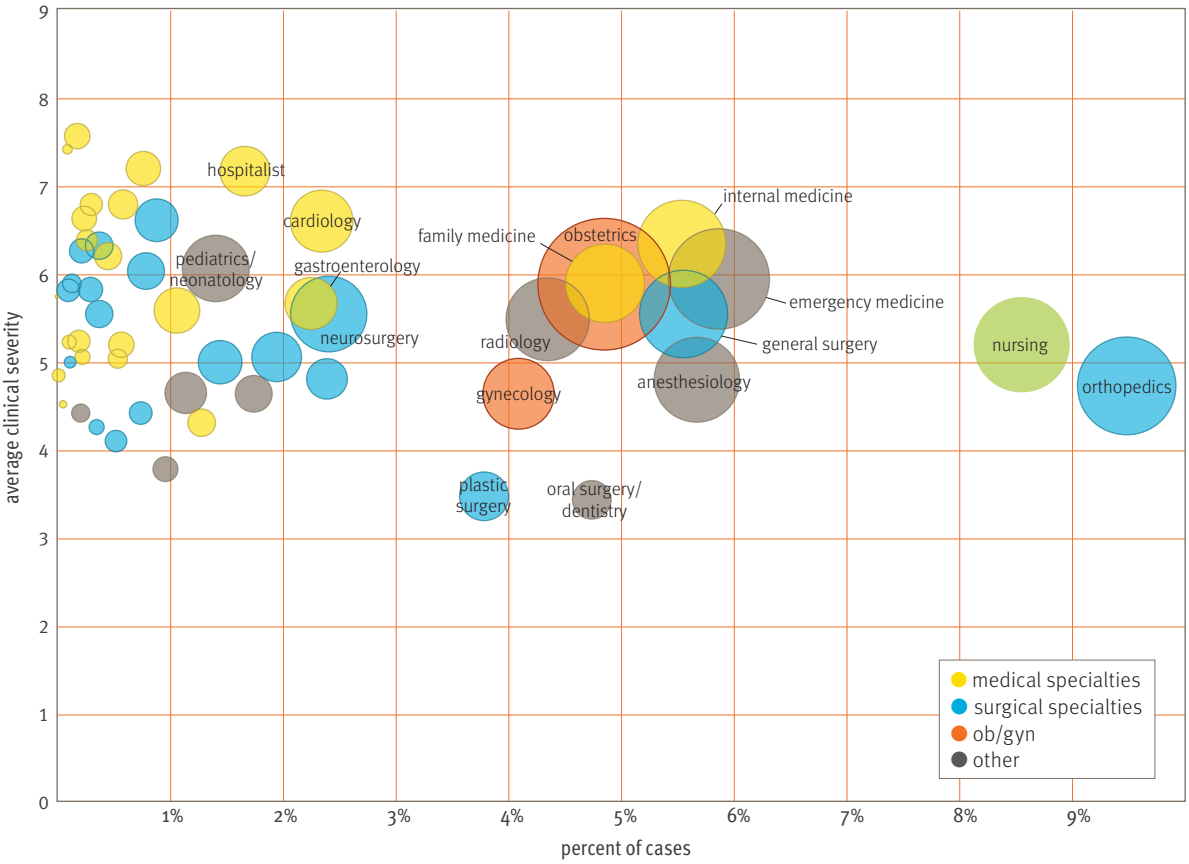
Over the recent decade, the distribution of cases across medicine, surgery, nursing, and obstetrics/gynecology was unchanged. Drilling down to more specific services also indicates few dramatic shifts. Deeper analyses of individual organizations or smaller volume specialties may expose more subtle trends.

Case frequency and average injury severity vary considerably by service.

More cases does not necessarily mean more losses.

RESPONSIBLE SERVICE DETAILS

SIZE REPRESENTS (RELATIVE) TOTAL INCURRED LOSSES

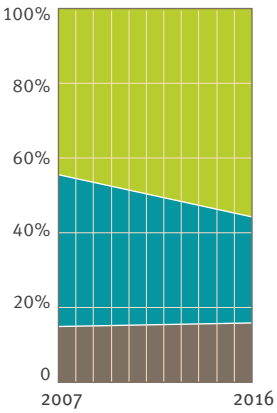


Proportionate shifts among sub-specialty services are evident.

Over the 10-year study period, downward (blue) trends can be identified among medical and surgical sub-specialties.

SURGERY: DISTRIBUTION OF CASES

PERCENT OF SURGERY CASES



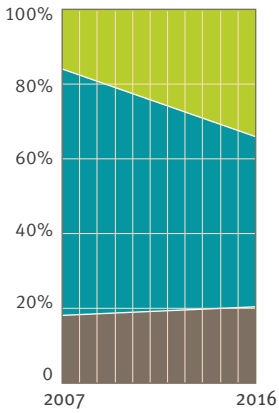
PROPORTION INCREASING
colorectal surgery, ENT without plastic, ophthalmology, orthopedic, podiatry, urology surgery

PROPORTION DECREASING
bariatric surgery, cardiac surgery, ENT with plastic, general surgery, neurosurgery, transplant, vascular surgery

MINIMAL OR NO CHANGE
hand surgery, pediatric surgery, plastic surgery, thoracic surgery, surgical oncology

MEDICINE: DISTRIBUTION OF CASES

PERCENT OF MEDICINE CASES



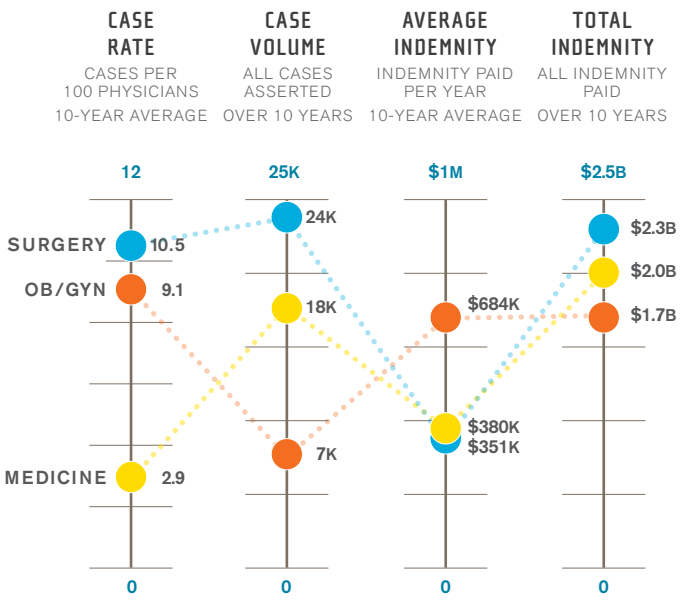
PROPORTION INCREASING
gastroenterology, hospitalist, intensivist, neurology

PROPORTION DECREASING
cardiology, family medicine, internal medicine

MINIMAL OR NO CHANGE
dermatology, infectious disease, medical oncology, pulmonary disease, physical medicine/rehabilitation, etc.

COMPARING SERVICES

Surgery-related cases dominated case volume and total losses, despite having the lowest average indemnity.



The total indemnity incurred by the three prominent service categories accumulates from strikingly different patterns. Medicine's case rate (2.9 per 100 physicians) is below the average for all services (4.5) despite case volume proximate to surgery, reflecting a high volume of health care providers in that discipline. Medicine cases most commonly involve diagnostic challenges, treatment complications, and medication errors, and patients with high-severity injuries. However, the odds of a medicine case closing with pay are 14% lower than for other services.

The case volume for surgery is 34% greater than medicine, but impacts a smaller population of clinicians. Surgery cases tend toward less severe (and often temporary) injuries and lower average indemnity. The total indemnity for obstetrics is carried by considerably fewer but significantly more severe cases that often include extraordinary lifetime medical and home care costs.

Academic medical centers had lower case rates.

CASES PER 100 PHYSICIANS (10-YEAR AVERAGE)

	ACADEMIC MEDICAL CENTERS	ALL OTHERS
ALL	3.7	4.8
MEDICINE	1.7	3.2
SURGERY	6.6	11.9
OB/GYN	7.8	9.8

For surgery and obstetrics, practice volume impacts case rate.

SURGERY CASES PER 10K SURGERIES

SURGERIES PER YEAR	CASE RATE
<10K	1.5
10K–20K	2.9
20K+	4.2

OB/GYN CASES PER 10K BIRTHS

BIRTHS PER YEAR	CASE RATE
<1K	3.5
1K–2K	6.8
2K+	9.5

Non-academic settings experienced more cases per physician than academic medical centers. For medicine services, the case rate was 87% higher than for AMCs; surgery was 81% higher. One factor impacting those differences: AMC-based physicians often split their professional time with non-clinical activities. Analyses of case rate by patient volume (for surgeries and births) point to greater risks in larger capacity settings, possibly a result of a more complex patient mix.

NURSING

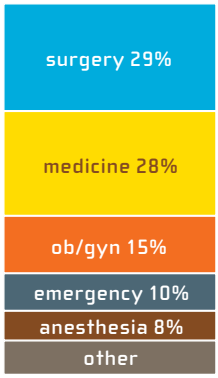
MPL cases with nursing identified as the secondary responsible service closed with indemnity more often than when nursing was the primary service (and with higher average payments).

PERCENT OF ALL CASES

9% nursing as primary responsible service
9% nursing as secondary responsible service

TOP TEN CASE TYPES	nursing as primary PERCENT OF THESE CASES	nursing as secondary PERCENT OF THESE CASES
safety & security/falls	32%	4%
patient monitoring	21%	2%
medical treatment	20%	20%
surgical treatment	8%	27%
medication	8%	11%
diagnosis	3%	15%
obstetrical treatment	2%	12%
policy & procedure	1%	<1%
anesthesia treatment	1%	7%
provider behavior	1%	<1%

PRIMARY RESPONSIBLE SERVICES WHEN NURSING IS SECONDARY
PERCENT OF CASES



For cases in the CBS database, a clinical service is identified as having been primarily responsible for the patient when the alleged malpractice occurred. Cases with nursing deemed primarily responsible cluster around "bedside" skills, (e.g., medication administration and monitoring, IVs, catheters, wound care) as well as clinical assessment and monitoring activities (e.g., minimizing fall risks and maintaining skin integrity). The odds of a case with nursing as the primary service closing with a payment are 56% higher than all other cases. The average for those payments ($243K) is, however, 38% lower than for all other cases.

In 31% of CBS cases, a second service sharing responsibility for the patient at the time of the adverse event was recorded. Most commonly, the secondary service was nursing. Those cases frequently involved inadequate patient assessment or provider-provider communication breakdowns in care related to diagnosis, surgery, or obstetrics. Injuries from those events and the other cases within that subset were, overall, more severe than for all other CBS cases. That, in large part, contributes to cases with nursing as the secondary service having double the odds of other cases to close with a payment. In this analysis, those payments averaged $570K, 54% higher than the average for all other payments.

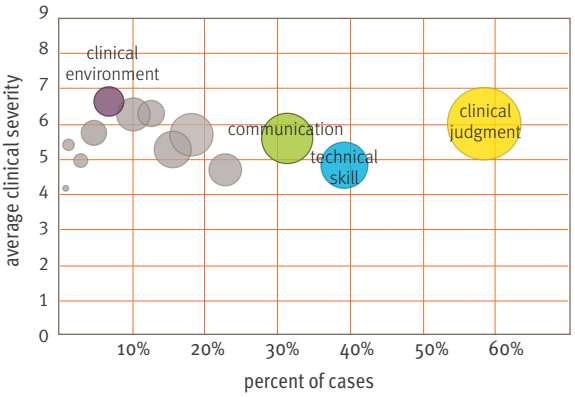
Contributing Factors

The most prevalent factors in MPL cases pertain to a provider's clinical judgment, in particular, patient assessment.

Contributing factors in MPL cases predominantly reflect breakdowns in clinical judgment, procedural skills, and communication.

CONTRIBUTING FACTOR CATEGORIES

SIZE REPRESENTS (RELATIVE) TOTAL INCURRED LOSSES



3.3

AVERAGE CONTRIBUTING FACTORS PER CASE

ODDS RATIOS FOR CLINICAL JUDGMENT CASES

compared to cases without these issues

3.76	to involve a high-severity injury
2.80	to close with payment
5.63	to close with payment $1M+

The critical factors that triggered an allegation of malpractice are coded at a level of detail that enables precise analysis of why things go wrong (on average, 3–4 contributing factors per case). Within CBS, specific factors can be grouped at a higher level to help identify predominate vulnerabilities. In addition to judgment issues, the most common and costly missteps seen in MPL cases are poor technical performance (surgical and non-surgical procedures), and miscommunication (between clinicians and with patients). Both are prevalent across care settings. From this broad perspective, variation over the 10 years studied were, generally, modest.

Shifts reflective of changes in the health care environment are better identified at the more granular coding levels. At the most detailed layer, variations among the key factors seen in different care settings emerge. There, distinct areas for risk reduction efforts (e.g., responding to unresolved complaints, sponge/needle counts, premature discharge from the ED) become more evident. And, because high-risk systems and processes are often shared across settings, services, and case types, those improvement strategies can be disseminated throughout an organization.

The top contributing factors in MPL cases were found in all care settings.

Judgment, technical, and communication issues were pervasive.

			PERCENT OF CASES* IN THE SETTING
AMBULATORY CARE	**Clinical Judgment** 52% of ambulatory cases*	**patient assessment** e.g., inadequate history and physical	35%
		selection and management of therapy e.g., failure to order appropriate medication	20%
		failure/delay in obtaining consult/referral e.g., despite symptoms or clinical findings	10%
	Technical Skill 40%	**technical performance** e.g., incorrect body position/site	36%
		retained foreign body e.g., intentionally retained objects forgotten	2%
	Communication 31%	**communication between patient/family and providers** e.g., inadequate consent; medication risks	22%
		communication among providers e.g., unprofessional; responsibility unclear	11%
INPATIENT CARE	**Clinical Judgment** 63% of inpatient cases*	**patient assessment** e.g., premature discharge; failure to rescue	38%
		selection and management of therapy e.g., inappropriate procedure, candidate, or medication	29%
		patient monitoring e.g., response to clinical alarm; failure to monitor physiological status	16%
	Technical Skill 43%	**technical performance** e.g., inexperience with procedure	39%
		retained foreign body e.g., tools, devices, sponges, etc.; broken fragments	3%
	Communication 31%	**communication among providers** e.g., reading the medical record, reaching consensus	18%
		communication between patient/family and providers e.g., discharge/follow-up instructions; notification of adverse event	15%
EMERGENCY DEPARTMENT CARE	**Clinical Judgment** 76% of ED cases*	**patient assessment** e.g., inadequate triage	65%
		selection and management of therapy e.g., most appropriate medication not used	21%
		failure/delay in obtaining consult/referral e.g., despite symptoms or clinical findings	18%
	Communication 32%	**communication among providers** e.g., hierarchical issues	19%
		communication between patient/family and providers e.g., language barrier, follow-up instructions	15%
	Clinical Environment 21%	**shift/off hours conditions** e.g., busyness	13%
		workflow/workload e.g., busyness, weekend/night shift/ holiday	8%

Examining Patient Assessment

At the detail level, contributing factors pinpoint specific opportunities for care improvement and MPL risk reduction.

PATIENT ASSESSMENT CASES

38%
of all MPL cases involved patient assessment issues

44%	closed with payment
$523K	average indemnity
$222K	median indemnity

AMONG CASES INVOLVING A PATIENT ASSESSMENT FAILURE

	PERCENT OF CASES*
failure/delay in ordering diagnostic test	33%
failure to appreciate and reconcile relevant signs or symptoms	33%
failure to establish differential diagnosis	20%
misinterpretation of diagnostic studies (X-rays, slides, film)	17%
inadequate history and physical	14%

*Cases may have multiple issues.

MPL Risks During the Diagnostic Process

The majority of (ambulatory care) patients in diagnosis-related MPL cases encountered problems at multiple points along the diagnostic process.

DIAGNOSTIC PROCESS OF CARE	% DIAGNOSIS CASES*
PHASE 1: INITIAL DIAGNOSTIC ASSESSMENT	
1. **Problem Noted, Care Sought** Access issues impede the patient from seeking care.	1%
2. **History and Physical Conducted** Patient's history is not updated; physical examination is absent or inadequate.	10%
3. **Patient Assessed and Symptoms Evaluated** Patient's complaints or symptoms are not thoroughly addressed.	35%
4. **Differential Diagnosis Established** Narrow diagnostic focus, failure to establish a differential diagnosis.	39%
5. **Diagnostic Test(s) Ordered** Ordering of appropriate tests/imagings is impeded by an incomplete or biased assessment.	36%
PHASE 2: TESTING AND RESULTS PROCESSING	
6. **Test Performed** Ordered test/imaging not performed, performed incorrectly, or mislabeled/mishandled.	4%
7. **Test Interpreted** Incomplete or inaccurate reports; abnormal findings not ruled out.	26%
8. **Test Results Transmitted to/Received by Ordering Physician** Receipt/review of test result by ordering clinician incomplete or delayed.	5%
PHASE 3: FOLLOW UP AND COORDINATION	
9. **Physician Follows Up with Patient** Findings not communicated to patient, follow up not arranged or not documented.	21%
10. **Referrals/Consults** Appropriate referrals not made or adequately managed.	24%
11. **Patient Information Communicated Among Care Team** Failure to fully review/share information that influences ongoing diagnostic process.	16%
12. **Patient and Providers Establish Follow-up Plan** Patient fails to adhere to the follow-up plan, appointments, or treatment regimen.	17%

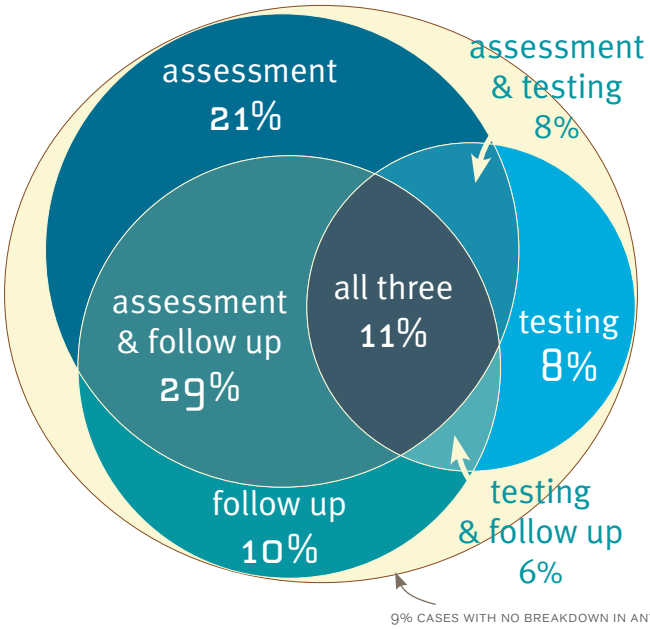
*Diagnosis cases in the ambulatory care setting. Cases may have multiple issues.

Reducing diagnostic errors requires attention to all phases of the process.

Clinical judgment is the key component of missteps during the assessment and follow up phases.

OVERLAP OF ERRORS IN INDIVIDUAL CASES

PERCENT OF CASES*



PHASE 1

INITIAL DIAGNOSTIC **ASSESSMENT**

68% OF CASES, 79% OF LOSSES

Covers the patient's presentation with a complaint, through the physician's assessment, differential diagnosis, and test orders.

PHASE 2

TESTING AND RESULTS PROCESSING

32% OF CASES, 38% OF LOSSES

From the scheduling, performance, and interpretation of diagnostic tests, through the management of the test results.

PHASE 3

FOLLOW UP AND COORDINATION

54% OF CASES, 61% OF LOSSES

Encompasses decisions made and actions taken after assessment and testing, including consultations and communication.

Eleven percent of the 62,000 fully-coded cases studied alleged misdiagnosis during ambulatory care. Mapping the contributing factors to a 12-step diagnostic process of care (POC) model identified 91% of cases with breakdowns within one or more of the three POC phases: assessment, testing, and follow up. Negligible change among the three phases was noted over the 10 years studied.

In 68% of these cases, at least one misstep in patient assessment was identified. As shown on page 20, three of the five assessment steps were particularly problematic, highlighting a focal point for risk reduction efforts. Test-related errors (primarily interpretation) were found in 32% of the cases, and patient follow up issues (including mismanaged referrals) showed up in 54%.

A majority of the 6,700 ambulatory diagnosis cases involved errors from two or all three POC phases. Clinician overreliance on cognitive and intuitive skills can narrow the diagnostic focus, obscuring contrary signals, inhibit test or consult orders, and limit their ability to interrupt a cascade of missed opportunities. In aggregate, multi-phase cases involve more severe injuries, more often close with an indemnity payment, and resolve with average indemnity payments higher than cases with less complex scenarios.

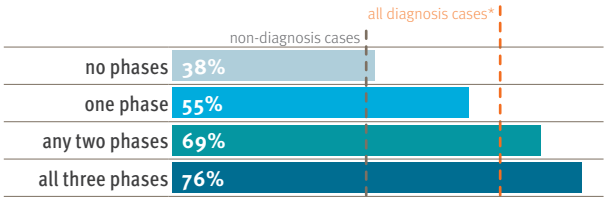
MULITIVARIATE ANALYSIS OF PHASES & OUTCOMES

Complex diagnosis-related cases are more severe and costlier.

Ambulatory care cases involving multiple diagnostic missteps are more likely to close with payment and for higher amounts.

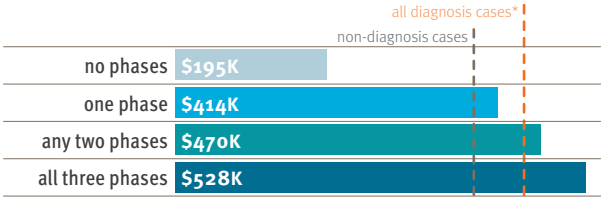
PERCENT OF CASES INVOLVING A HIGH-SEVERITY INJURY

WHEN THE DIAGNOSTIC PROCESS OF CARE BREAKS DOWN IN...



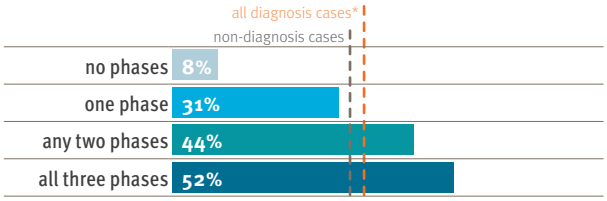
AVERAGE INDEMNITY

WHEN THE DIAGNOSTIC PROCESS OF CARE BREAKS DOWN IN...



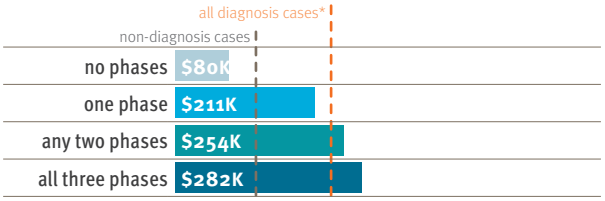
PERCENT OF CASES CLOSED WITH PAYMENT

WHEN THE DIAGNOSTIC PROCESS OF CARE BREAKS DOWN IN...



MEDIAN INDEMNITY

WHEN THE DIAGNOSTIC PROCESS OF CARE BREAKS DOWN IN...



*Diagnosis cases in the ambulatory care setting. Cases may have multiple issues.

BREAKDOWNS IN ONE PHASE

ODDS RATIOS when failures occurred in one phase only	HIGH-SEVERITY INJURY[1]	CLOSING WITH PAYMENT[2]
assessment vs testing	1.90	0.65
testing vs follow up	0.71	2.69
assessment vs follow up	1.35	1.74

When breakdowns occur in one phase only, assessment failures have greater odds for incurring high-severity injuries. Cases involving testing failures have greater odds of resulting in indemnity payment.

BREAKDOWNS IN TWO PHASES

ODDS RATIOS when failures occurred in pairs of phases			HIGH-SEVERITY INJURY[3]
assessment & testing	vs	testing & follow up	1.31
assessment & follow up	vs	assessment & testing	1.36
assessment & follow up	vs	testing & follow up	1.78

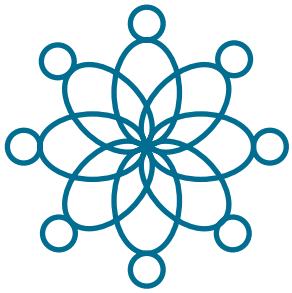
Any pair of phases amplifies the consequences (see graphs above). In addition, those involving assessment had greater odds of high-severity injury. However, no single pair of phases changed the odds of payment more than any other.

BREAKDOWNS IN ALL THREE PHASES

ODDS RATIOS compared to no phase failures	HIGH-SEVERITY INJURY[4]	CLOSING WITH PAYMENT[5]
breakdown in one phase	1.99	4.32
breakdown in any two phases	3.42	7.26
breakdown in all three phases	5.13	9.33

Any breakdown in the diagnostic process of care increases the odds for negative outcomes, both clinical and financial. When errors occur in all three phases, the odds are greatly magnified. Error reduction in any phase can contribute to an overall amelioration of risk.

Controlled for: 1. service and phase 2. severity, service, and phase 3. service and phase pairs 4. service and number of phases 5. severity, service, and number of phases



Safety in Numbers

MPL Data Accelerate Practical Solutions

MPL data are employed as evidence supporting risk reduction efforts for both the insurance and health care delivery industry. A small set of department or specialty-level cases can raise awareness about very specific risks. Analyses of an organization's total MPL experience help leadership understand with precision what went wrong and why. The ability to tap into the analytic power of hundreds of thousands of cases from across the country—including open cases and cases closed without a payment—gives business leaders unprecedented views into trends and emerging risks that will shape the future.

CBS data regularly serve as the underpinning of strategic initiatives to improve patient safety and reduce the likelihood of malpractice allegations. Some notable examples are outlined below.

CONSTELLATION

CONCERN: Underlying factors for missed or delayed diagnoses

FINDING: Outpatient diagnosis cases had the most breakdowns in the assessment phase (58%), along with 35% during the testing phase, and 45% during follow up.

ACTIONS:
- web-based suite of bundled solutions for preventing diagnostic error
- clinic risk reports that highlight key vulnerabilities in outpatient practices
- individualized tracks for policyholders for preventing diagnostic error

FOJP/HOSPITALS INSURANCE COMPANY

CONCERN: Permanent injuries and MPL cases related to shoulder dystocia

FINDING: While clinical judgment factors were trending downward in Labor & Delivery cases, technical issues were trending upward.

ACTIONS:
- teamwork training
- simulation course

CRICO

CONCERN: Anesthesia MPL cases occurring in endoscopy units

FINDING: Of malpractice cases involving anesthesia, 19% providers were associated with ERCP; 91% of those cases resulted in a payment.

THE DOCTORS COMPANY

CONCERN: Events that place cardiologists and their patients at risk

FINDING: Patient assessment issues are the most frequent cause of patient injury for cardiologists, especially failing to establish a differential diagnosis or ignoring available clinical information.

ACTIONS:
- specialty-specific site assessments with study findings incorporated
- on-demand education featuring lessons from the analysis

MEDSTAR

CONCERN: Misdiagnosed spinal injuries in the Emergency Department

FINDING: The misdiagnoses of injuries from atraumatic spinal cord compression were traced to communication challenges between ED physicians and the MRI suite.

ACTIONS:

- system-wide interventions to support clinical judgment and improve communication
- web-based learning program to enhance diagnostic accuracy
- clinical pathway triggered in EHR when preliminary assessment suggests spinal cord compression

THE DOCTORS COMPANY

CONCERN: Undetected cardiac issues in the primary care setting

FINDING: Misdiagnosis of cardiovascular issues in outpatient general medicine predominantly involve patients with typical cardiac risk factors, rather than low-risk patients.

CRICO

CONCERN: Efficacy of simulation training aimed at reducing cast-saw injuries.

FINDING: The anticipated savings from averted cast-saw injuries and associated medicolegal payments in the 2.5 years post-simulation is an 11-to-1 return on investment.

MEDPRO GROUP

CONCERN: Unique contributing issues to ED claims

FINDING: 55% of ED triage cases (versus 37% of non-triage-related ED cases) involve a communication failure, with 80% resulting in high-severity injuries.

ACTIONS:

- focused data analysis published

Large cases have always been a major driver of our system, but in recent years we've had an increase in severity. One or two catastrophic cases every 5–6 years can extract a tremendous cost and threaten the availability of excess insurance. Hospitals operate on small margins; an eight figure exposure can affect overall organizational financial success.

Our focus on quality and safety must more fully engage our finance, audit, administrative, and Board leadership in the finances of our MPL program.

The plaintiff bar has retooled to routinely produce $20M–50M life care plans. Along with the disruption, potential adverse publicity, and reputational issues caused by MPL cases, we now have to consider potential balance sheet impact: how many big hits can we absorb before it would impact financial viability?

The frequency of catastrophic losses across the country has caused organizations to view their MPL program as one of the critical issues to consider when assessing their financial success.

LARRY SMITH
VICE PRESIDENT
RISK MANAGEMENT
MEDSTAR HEALTH

As a tool to improve health care, MPL data has two key values: qualitative details and financial context.

The clinical and systemic factors that can be extracted from malpractice cases are far more actionable, than when you look at incidents that don't become cases.

Documents (e.g., medical records, depositions) accessible via an MPL investigation offer insight into what individuals were thinking, how they were communicating, and what else was going on relative to the care in question. To get buy-in from providers on efforts to improve care—to prevent the recurrence of a bad outcome—such insight is crucial.

The financial context (often really big numbers) makes it easier to find support for spending organizational resources on fixing the specific problems behind large payouts. A colleague labeled initiatives based on use of MPL data as pay-for-performance on steroids.

Demonstrating that we've spent millions on cases related to a given problem over the last five years, makes it easier when asking that we spend one-tenth of that to fix it.

DAVID L. FELDMAN, MD
SENIOR VP AND CMO
FOJP/HOSPITALS INSURANCE COMPANY

Our Data

CBS

The Comparative Benchmarking System (CBS) receives medical professional liability (MPL) cases from 18 MPL insurers including open cases and cases closed without an indemnity payment. Each case is coded under a common (proprietary) taxonomy by clinical coding experts who receive ongoing training and auditing to ensure consistency and currency. The clinical coders have access to all records and documents produced for the management of the case, including medical records, expert review, depositions, and court proceedings. The CBS database contains cases from all 50 U.S. states and several territories (representing 30% of U.S. MPL cases) and adds roughly 9,000 new cases per year.

THIS REPORT

Cases with claim-made dates or indemnity close dates from January 1, 2007 through December 31, 2016 were included.

The analyses in this Report were based on 123,512 partially or fully coded MPL cases.

Selected analyses were based on subsets of the primary study group, including:

- 101,752 claims made
  - of which 61,862 are fully coded
- 102,017 closed cases

Glossary

Ambulatory cases constitute non-emergency care provided to patients without a hospital admission.

Asserted cases includes both open and closed cases, selected by claim-made date.

Case refers to a claim or a suit, comprising all named defendants.

Case disposition can either be closed with pay (settlements and plaintiff verdicts via trial or arbitration) or closed without pay (cases dropped, denied, dismissed, and trials or arbitrations resulting in a defense verdict).

Case duration is measured from the date a claim or suit is made to the date that case is closed.

Case rates are calculated as the number of cases asserted per 100 physician coverage years (PCY), unless otherwise specified. PCY accounts for the length of time a physician is covered in one year: e.g., two MDs, each covered for six months, equal one PCY.

Case type is determined by the coding specialists, who review the claimant's allegation and the available facts.

Contributing factors are based on aspects of care that directly or indirectly impacted the care in question. There is no limit to the number of contributing factors that may be coded for a single case (the average is 3.3).

Defendants include organizations/entities, licensed clinicians, and non-licensed employees.

Emergency Department cases constitute care provided within the ED setting prior to discharge or admission to the hospital.

Expenses represent non-indemnity costs, including legal fees, expert reviews, testimony, jury studies, mock trials, and defendant support services.

Frequency is based on cases asserted per year.

Fully-coded cases have all legal, financial, and clinical components coded.

Indemnity payments are exclusive of case management expenses. They are based on the total amount paid to a plaintiff, regardless of reinsurance caps.

Inflation calculations are based on the general U.S. consumer price index (16% increase from 2007–2016). In the same time period, the medical care inflation rate rose 32% and the legal services inflation rate rose 29%. Inflation data sourced from the U.S. Bureau of Labor Statistics at www.bls.gov.

Injury severity coding is based on a scale originated by the National Association of Insurance Commissioners.

Inpatient cases constitute care rendered during admission to a hospital or other overnight care facility.

An **odds ratio** represents the odds that an outcome will occur given a particular exposure, compared to the odds of the outcome occurring in the absence of that exposure. An odds ratio less than 1.0 indicates lower odds of an outcome for one group compared to another group; a ratio above 1.0 indicates higher odds. The odds ratios included in the Report are statistically significant at $p<0.05$ level. The exception is "assessment & testing vs. testing & follow up" (p 22) for a high-severity outcome, where the $p=0.0548$.

Patient age is recorded as of the loss date, i.e., when the event(s) triggering an MPL case occurred.

Responsible service is determined by the coding specialist as the clinical service primarily responsible for the patient when the event(s) triggering an MPL case occurred.

crico | strategies

There's safety in numbers.

CRICO Strategies' CBS Dashboard

Our goal is to unite the medical and insurance communities into a single voice with reliable and actionable data as our shared language. Let's work together to advance your business and protect your stakeholders. Partner with CRICO Strategies and we'll strengthen your organization's ability to reduce medical malpractice risks with:

- **Powerful Analytics**
  Strategies manages a rich "learning engine" of more than 400,000 cases of harm and loss.
- **Expertise**
  Our data help target expertise and enable precision interventions.
- **Results**
  Working together, we can address your biggest challenges and toughest questions.

To join our community, contact Michael Paskavitz at mpaskavitz@rmf.harvard.edu or 617.450.5500

crico | strategies

A division of The Risk Management Foundation
of the Harvard Medical Institutions Incorporated

1325 Boylston Street • Boston, MA 02215
617.450.5500 • www.rmf.harvard.edu

facebook.com/cricostrategies

twitter.com/cricostrategies

Editor: Gretchen Ruoff

Primary Data Analyst: Jillian Skillings

Writer: Jock Hoffman

Design and Data Visualization: Alison Anderson

Contributors:
Astrid Babayan, Penny Greenberg, Mark E. Reynolds, Adam Schaffer, Dana Siegal, Bessie Manley Szum, Fangyu Wang, Winnie Yu

Advisors:
Jonathan Einbinder, Carol Keohane, Missy Padoll, Michael Paskavitz, Heather Riah, Luke Sato, Ellen Varney

Photography:
cover Thomas Barwick/Getty Images, interior Alison Anderson