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The promise of health systems: Right care, right place, right time

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Introduction

Mergers and acquisitions continue to be the primary growth strategy among health care providers. The value of system formation to health care providers includes economies of scale and standardization of care processes, both of which eliminate avoidable variation to improve quality and reduce unnecessary spending. System formation can also provide access to capital, strengthen referral relationships, and improve reimbursement rates for physicians and hospitals. In addition to creating provider value, health system formation includes a promise of value to patients often explicitly stated as a promise to deliver the "**right care at the right place at the right time**."

At the height of the COVID-19 pandemic, provider attention was focused on crisis management but as we emerge, health systems may now be able to focus again on strategic issues. Despite the pause or slowdown of many typical health care activities including elective surgeries and non-emergent visits, a significant number of hospital mergers and acquisitions still occurred in 2020. According to a recent report by Kaufmann Hall, nearly 80 hospital mergers and acquisitions took place in 2020. This was down from 92 in 2019 but still was within the historic range of activity observed over the last decade. Given the significant financial losses that many hospitals and health systems have incurred because of the pandemic, there is speculation that merger and acquisition activity may accelerate in the future.

Over the last five years, the Vizient Research Institute™ has assessed health system formation and our work has focused mainly on assessing the "right care" aspect of the health system value promise. In 2016 and 2019, we analyzed five marker events identified by clinical experts from Vizient members including post-acute care (PAC) utilization following an uncomplicated joint replacement, the use of major imaging for ED patients who present with back pain, incidence of repeat imaging within 90 days, cancer decedents who had less than three days of hospice, and intensive care unit (ICU) utilization within the last 30 days of life. Each marker event is a category of discretionary utilization that merits attention if wide variation in use rates is observed. Health systems that effectively standardize care processes and reduce avoidable utilization would be expected to exhibit far lower intrasystem variation in marker event occurrence.

Our earlier study findings identified significant variation in utilization between health systems and even more variation within an individual health system.[1] Across most of the marker events studied, utilization rates at one hospital were often three to four times higher than other hospitals within the same system. A comparison of performance across the same health systems between 2016 and 2019 showed an increase in intrasystem variation across most of the health systems for each of the marker events with the exception of PAC utilization.[2] We concluded that most health systems have fallen short in meeting the value promise.

Given the continued interest and possible acceleration of health system formation following the pandemic, the Vizient Research Institute expanded its original scope of work to assess health systems and their pursuit to deliver on all three aspects of the value promise: **the right care at the right place at the right time.**

Approach

System and Hospital Inclusion Criteria

Health care organizations included in our study were defined as a "health system" if they had three or more acute care hospitals as part of their system where each affiliate was performing sufficient volumes to evaluate performance for a particular metric. For the two cardiac metrics, multiregional systems were limited to the market with the most affiliated hospitals to prevent overstating variation. Given Vizient's robust data assets, we leveraged multiple data sources to conduct our analyses including Medicare enrollment and claims files, the Vizient Clinical Data Base (CDB), and several state inpatient databases. For each measure, we set a minimum volume threshold by hospital and only those hospitals with sufficient volumes were included in each specific analyses. Therefore, the number of hospitals and health systems included in our analyses varied measure to measure. Additional information about our data sources and methodologies can be found in the Appendix.

Right Care

To assess health systems achievement of delivering the **right care** across their system, we explored several analyses within oncology and cardiology specifically. Following the Choosing Wisely recommendations, the Vizient Research Institute analyzed Medicare claims data between 2017 and 2019 to assess the use of surveillance imaging (including CT scan, PET scan or nuclear medicine test) between 61 and 365 days after the initial biopsy for patients diagnosed with breast cancer.[3] Within cardiology, we analyzed the percentage of outpatient cardiac catheterizations that were interventional (PCI) or resulted in coronary artery bypass graft (CABG) surgery within 90 days. Using the same Medicare data set, we also assessed the percentage of outpatient ED patients presenting with chest pain who received non-standardized diagnostic modalities. These are defined as receiving any combination of non-coronary computed tomography angiography (CTA) scan, stress

test, stress echocardiogram or a standard echocardiogram. The definition was created in response to observing standardization in use of clinical modalities such as troponin lab, chest x-ray and electrocardiogram (EKG).[4,5]

Right Place

As part of the Vizient Research Institute's 2020 economic research study, entitled "Defying Gravity: What if not Everything Returns to Normal?", we expanded our scope of study focused on health system formation to assess delivering care at the **right place**. As the country begins to emerge from the pandemic, we suggested a number of opportunistic changes for health care organizations to consider including clinical consolidation. There are at least three reasons for a health system to engage in clinical program consolidation: proficiency, capacity management and efficiency as illustrated in Figure 1. The most compelling reason for clinical consolidation is to do it for proficiency reasons and there is significant research regarding the relationship between surgical volumes and patient outcomes. Organizations that conduct higher volumes of high-risk surgeries have been found to have better patient outcomes (e.g., lower mortality and complication rates) compared to low volume surgical programs.[6] As part of our 2020 study, we explored measures focused on delivering care at the right place and challenged health systems to be accountable for minimum hospital volume standards known to improve the odds of a safer surgery for patients. To evaluate health systems' achievement in delivering care at the right place, we measured the prevalence of high-risk surgeries taking place at organizations that do not meet the minimum volume thresholds according to published guidelines.[7] Specifically, we assessed lung resection and mitral valve replacement surgical volumes both within specific markets and within individual health systems. To review volumes across markets, we accessed several state inpatient databases for 2019. To identify low volume surgical programs within individual health systems, we accessed data from 2019 within the CDB.

Right Time

There is a growing body of research related to the timing of services/treatments and the impact on patient outcomes. Based on a study published in JAMA Oncology in March 2016, patients with stage 1 or 2 breast cancer experienced lower overall survival as time-to-treatment increased (as expressed in 30-day intervals). To assess health systems achievement in delivering care at the **right time**, the Vizient Research Institute explored the timing from a biopsy to lumpectomy or mastectomy for breast cancer patients across hospitals within the same system using the CDB between 2017 and 2019. Eliminating delays in treatments from the time of diagnosis is desirable to both reduce anxiety for the patient and lower mortality risk.

Figure 1: Reasons for health system consolidation

	Proficiency	Capacity management	Efficiency
Rationale	Patient safety	Highest/best use	Cost reduction
Trigger	Volume < threshold	Limited capacity	Price compression
Threat	Decertification	Loss of market share	Eroding margins
Motivation	Because we should	Because we want to	Because we have to

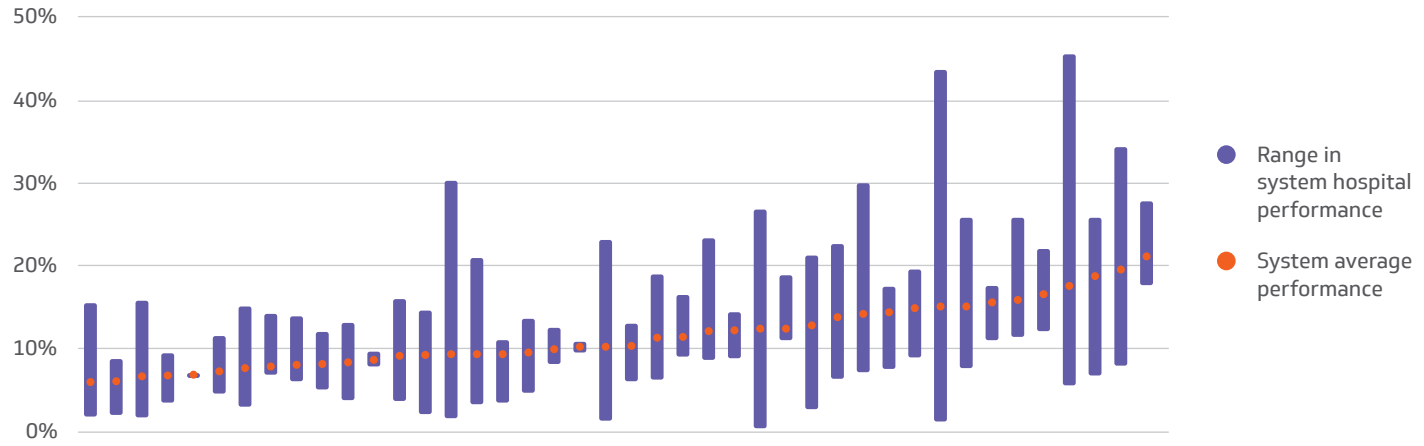
Findings

Right Care

Similar to our earlier study findings, our new analyses identified persistent variation not only across health systems but within health systems. To assess health systems' promise in delivering the **right care**, Figure 2 shows most health systems still have work to do in reducing variations in care across their systems. Among 42 health systems with at least three hospitals meeting minimum volume requirements, the system percentage of breast cancer patients with surveillance imaging between 61 and 365 days following a biopsy ranged from 6% to 21%. In addition to wide variation across the health systems, it was common for systems to have one hospital performing surveillance imaging at three times the rate of another system-affiliated hospital.

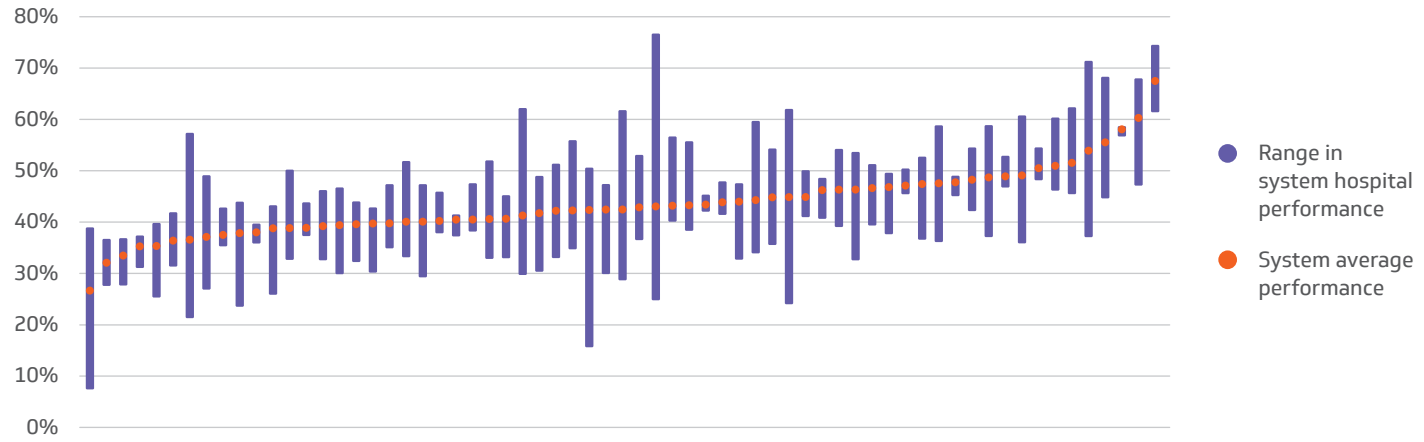
We also assessed the percentage of outpatient cardiac catheterization that were interventional (PCI) or resulted in coronary artery bypass graft (CABG) surgery within 90 days (Figure 3). Two-fold variation or more was commonly observed across and within most health systems studied. However, for some health systems, there appeared to be focused efforts on reducing variation as there were 18 health systems for which we observed very little intrasystem variation (10 percentage points or less).

Figure 2: Percentage of breast cancer patients with CT scan, PET scan, or nuclear medicine within 61 and 365 days after biopsy by health system



Note: Includes health systems with ≥ 3 hospitals with ≥ 60 denominator cases per hospital over 2-year period.
Source: Vizient Research Institute, analysis of Medicare claims, Q4 2016 - 2019.

Figure 3: Percentage of outpatient cardiac catheterizations with percutaneous coronary intervention or resulting in coronary artery bypass graft (within 90 days) by health system

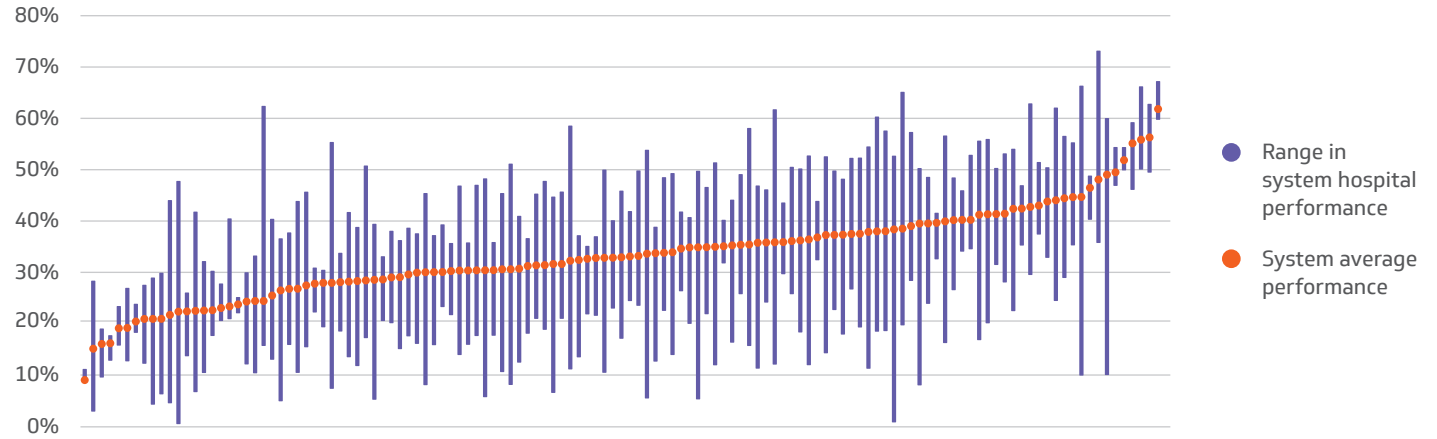


Note: Includes health systems with ≥ 3 hospitals and ≥ 300 denominator cases per hospital over 3-year period.
Source: Vizient Research Institute, analysis of Medicare claims, Q4 2016 - 2019.

Considering the sheer volume of patients with chest pain presenting in the ED, one might expect a standardized approach to care. While virtually all patients receive a troponin lab test, EKG, and chest X-ray, the standardization ends there. As shown in Figure 4, we observed a 5-fold variation in the utilization of non-standardized diagnostic modalities (including non-coronary CTA, stress test, stress echocardiogram or standard echocardiogram) in the ED for patients who present with chest pain across 127 health systems. Equally concerning was the two to three-fold variation in the utilization of these diagnostic modalities observed between hospitals in the same system.

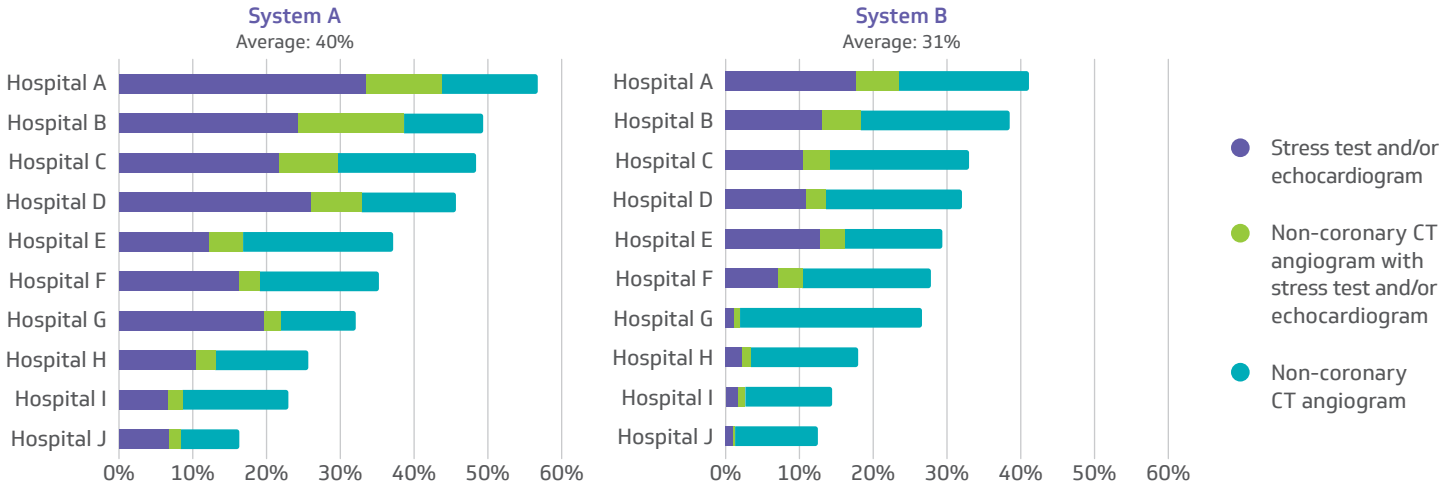
Given the wide variation in the use of non-standardized diagnostic modalities in the ED, we conducted additional analyses to see what might be driving the variation in utilization within the same health system. Figure 5 compares the incidence of different diagnostic modalities across two different health systems. For ED patients who present with chest pain, we compared the use of non-coronary CTAs only to the use of a stress test, stress echocardiogram and/or standard echocardiogram with and without a non-coronary CTA and found wide variation across the health systems as well as by hospitals within the same health system. The primary driver of the variation observed is the utilization of stress tests, followed by non-coronary CTAs.

Figure 4: Percentage of ED patients presenting with chest pain who received non-standardized diagnostic modalities by health system (excludes inpatient admissions)



Note: Includes health systems with ≥ 3 hospitals and ≥ 300 denominator cases per hospital over 3-year period.
Source: Vizient Research Institute, analysis of Medicare claims, 2017-2019.

Figure 5: Percentage of ED patients presenting with chest pain who received non-standardized diagnostic modalities by health system (excludes inpatient admissions)

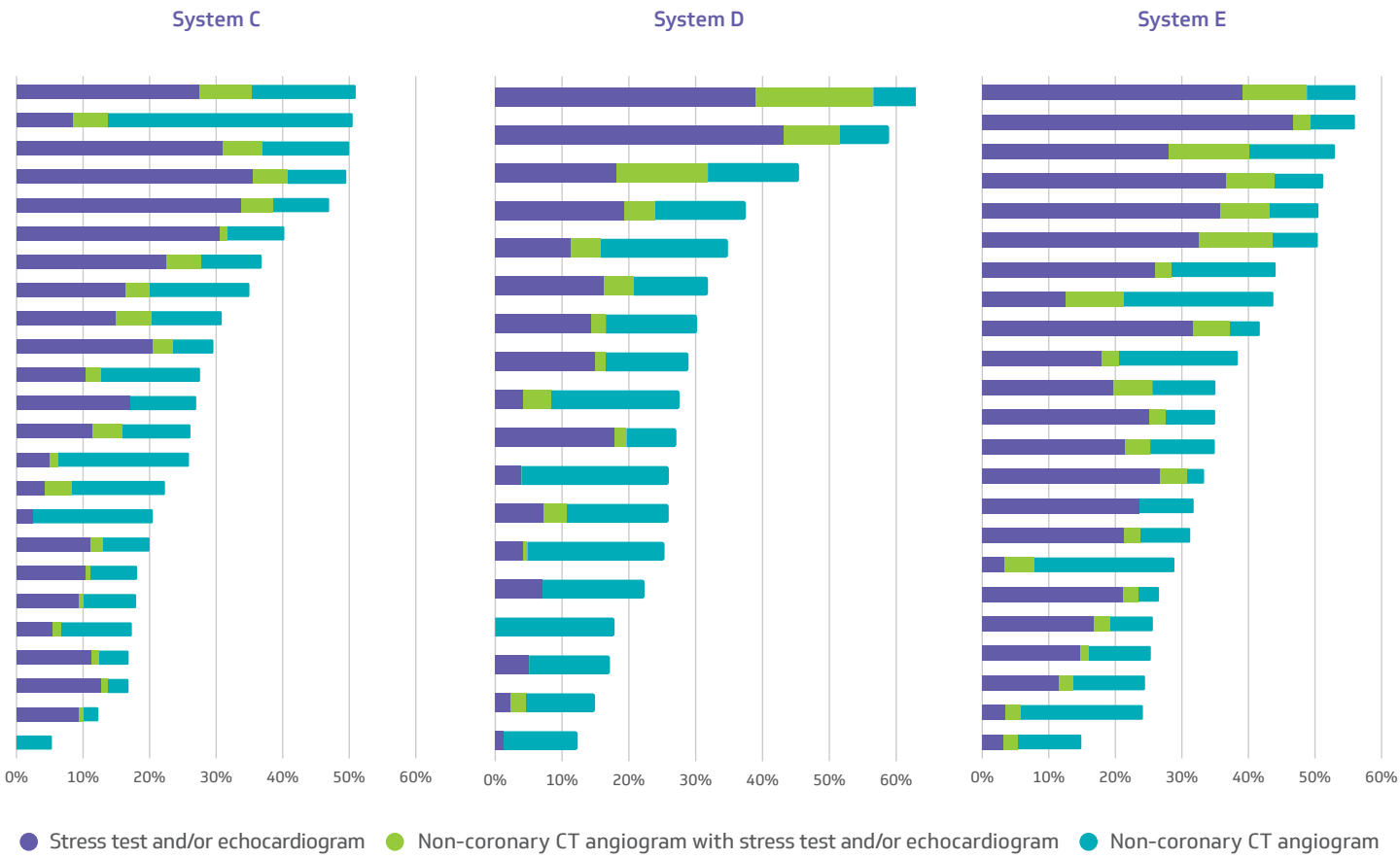


Note: Includes health systems with ≥ 3 hospitals and ≥ 300 denominator cases per hospital over 3-year period.
Source: Vizient Research Institute, analysis of Medicare claims, 2017-2019.

Within System A, Hospital I and Hospital J both performed stress tests, stress echocardiograms (shown in purple in Figure 5) on 5% of ED chest pain patients whereas Hospital A performed these tests over 30% of the time. At System B, all hospitals performed stress tests, stress echocardiograms and/or standard echocardiograms less than 20% of the time but ranged from 1% to 18% across the different hospitals within the system. We also observed wide variation in the use of these tests with non-coronary CTAs (shown in green in Figure 5) within and across systems. Hospitals in System A. conducted more overall stress tests, stress echocardiograms and/or standard echocardiograms with non-coronary CTAs than hospitals in System B. Utilization of stress tests, stress echocardiograms and/or standard echocardiograms with non-coronary CTAs ranged from 2% to 14% within System A hospitals while among System B hospitals utilization ranged from 0% to 6%.

We also assessed intrasystem variation by attending physician and again observed wide variation in the use of diagnostic testing as show in Figure 6. In System C, one attending physician used CTs, stress tests and echocardiograms in the ED for chest pain patients 5% of the time whereas another attending physician in the same system performed these tests 51% of the time. We observed similar variation across attending physicians within System D with the utilization of advanced diagnostic testing for ED chest pain patients ranging from 12% to 63%. Within System E, some attending physicians performed these advanced diagnostic tests on ED chest pain patients 15% of the time whereas other attending physicians performed them over 50% of the time. We concluded that patients presenting in the ED with chest pain are likely to receive very different care depending on not only which hospital they entered within a health system but also which attending physician was overseeing their care that day. Non-standardized use of testing poses as a concern for patient care quality and contributes to unnecessary costs for the health system.

Figure 6: Percentage of ED patients presenting with chest pain who received non-standardized diagnostic modalities by attending physician (excludes inpatient admissions)

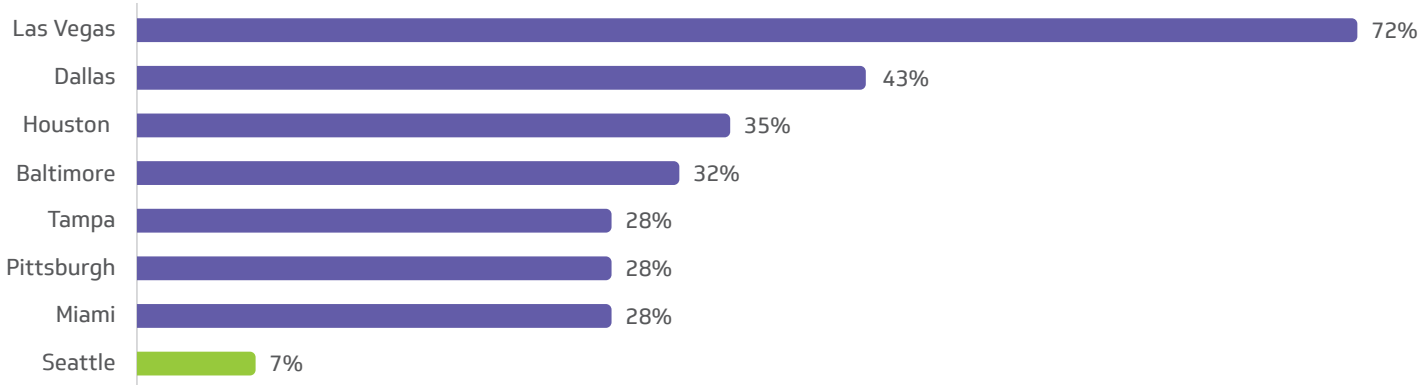


Note: Includes attending physicians with ≥ 75 denominator cases over 3-year period.
Source: Vizient Research Institute, analysis of Medicare claims, 2017 – 2019.

Right Place

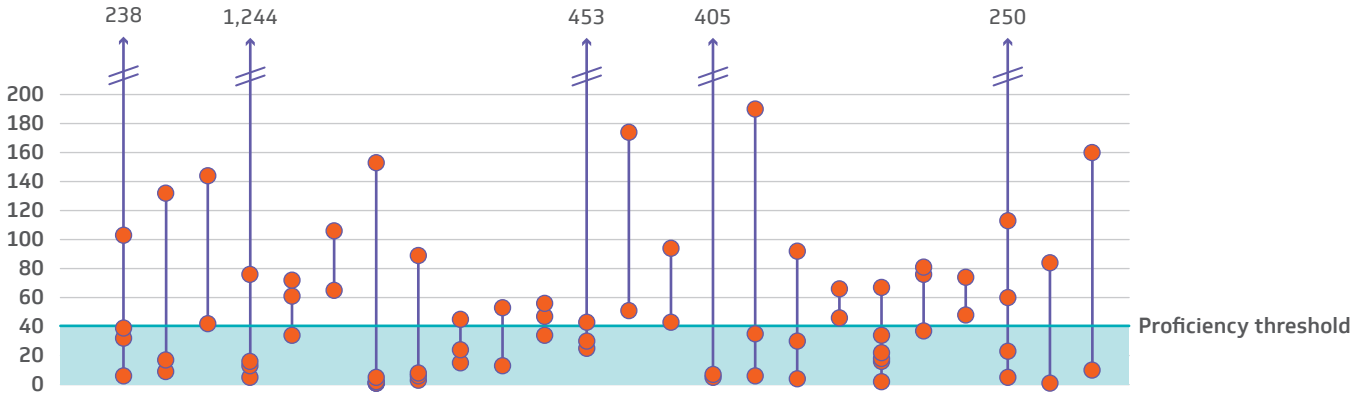
Figures 7 and 8 illustrate the variability across and within health systems in delivering care in the **right place**. Despite the evidence linking volume to outcomes, our study found a significant percentage of surgical cases in large metropolitan markets occurring in programs with volumes below published proficiency thresholds (we excluded rural markets where an argument can be made that low-volume programs are better than no surgical availability at all). Figure 7 shows the percentage of cancer-related lung resections that occurred in programs with volumes below proficiency thresholds across eight large urban markets, where high-volume alternatives are readily available. It is common to see one in four procedures occurring in low-volume surgical programs. Of note is Seattle, WA where the proportions of cases in low-volume programs are much lower, indicating that it is possible to limit the phenomenon to levels much lower than those observed elsewhere. The issue of low-volume surgical programs is not limited to local competitors within urban markets. Figure 8 shows even wider variation in scheduled mitral valve replacement surgeries among hospitals within the same health system. Nearly half of systems studied have surgical programs operating below published proficiency thresholds, and in every case, there is an alternative within the same system that is operating above the threshold. Only 8 of 35 health systems studied had consolidated mitral valve procedures at a single location. The majority of health systems we studied failed to deliver on the promise of providing care at the right place as they failed to demonstrate efforts underway to ensure high-risk surgical procedures were occurring at high-volume sites within their systems.

Figure 7: Percentage of adult oncology patients undergoing non-emergent lung resection in programs with surgical volumes below proficiency thresholds in 8 urban markets



Source: Vizient Research Institute, analysis of state inpatient data, 2019. Results based on Vizient analysis of limited data sets supplied by the following state agencies, which are not responsible for the analysis, interpretations, or conclusions contained herein: State of Florida Agency for Health Care Administration, Florida Center for Health Information and Transparency; Maryland Health Services Cost Review Commission; Pennsylvania Health Care Cost Containment Council; State of Washington Department of Health, Comprehensive Hospital Abstract Reporting System; Texas Hospital Inpatient Discharge Public Use Data File, 2019Q1-2019Q4, Texas Department of State Health Services, Austin, Texas; Las Vegas results based on records of the Nevada DHCFP and was released through the CHIA, of the University of Nevada, Las Vegas. Authorization to release this information does not imply endorsement of this study or its findings by either DHCFP or CHIA.

Figure 8: Intrasystem variation in surgical volume by site (scheduled mitral valve replacement)



Note: This figure is from the VRI 2020 economic research study publication March 2021-Figure 12.
Sources: Vizient Research Institute analysis of member hospital data in the Vizient Clinical Data Base, 2019; 2020 Surgical Volume-Appropriateness Fact Sheet.pdf (leapfroggroup.org).

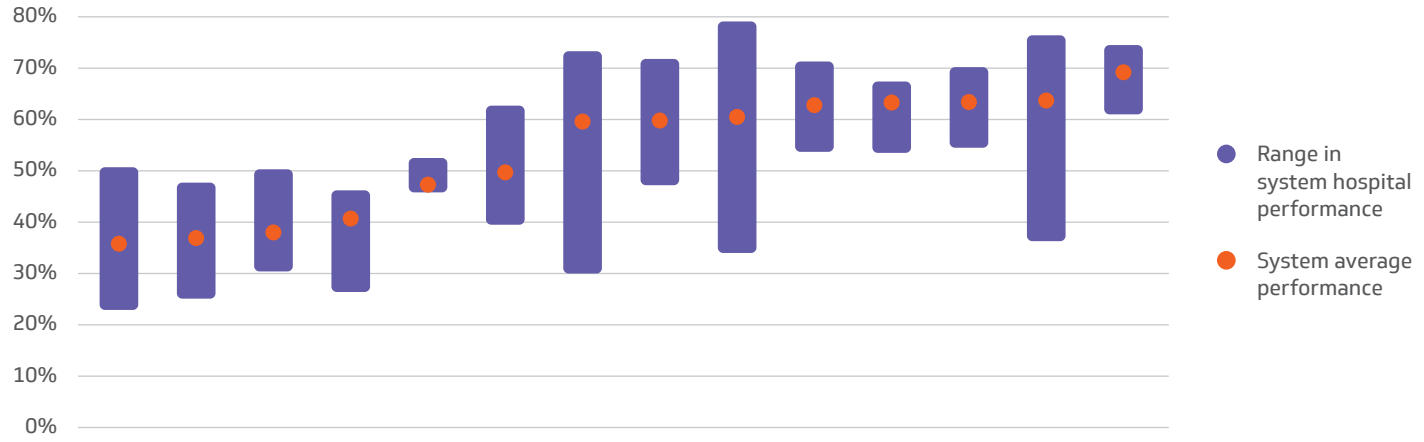
Right Time

To assess health systems' performance in delivering care at the **right time**, we measured the time from biopsy to surgery for patients who were diagnosed with breast cancer. Specifically, we assessed how often patients with a breast cancer diagnosis underwent a mastectomy or lumpectomy greater than 30 days from the initial biopsy. Amongst select health systems that met our volume threshold over the 3-year period, we observed two-fold variation in the time from biopsy to surgery across the health systems. Figure 9 illustrates the timing of delivering necessary care for breast cancer patients across health systems ranging from 36% to 69% of breast cancer patients receiving a mastectomy/lumpectomy greater than 30 days after a biopsy.

Within the same health system we also observed wide variation in the timing of surgery following a biopsy from one hospital to another. As shown in Figure 9, the range in system hospital performance varied between 7% and 45% within the health systems. At the extreme, we found 34% of breast cancer patients treated at one hospital having surgery more than 30 days after a biopsy while another hospital in the same system had 79% of breast cancer patients having surgery greater than 30 days after a biopsy.

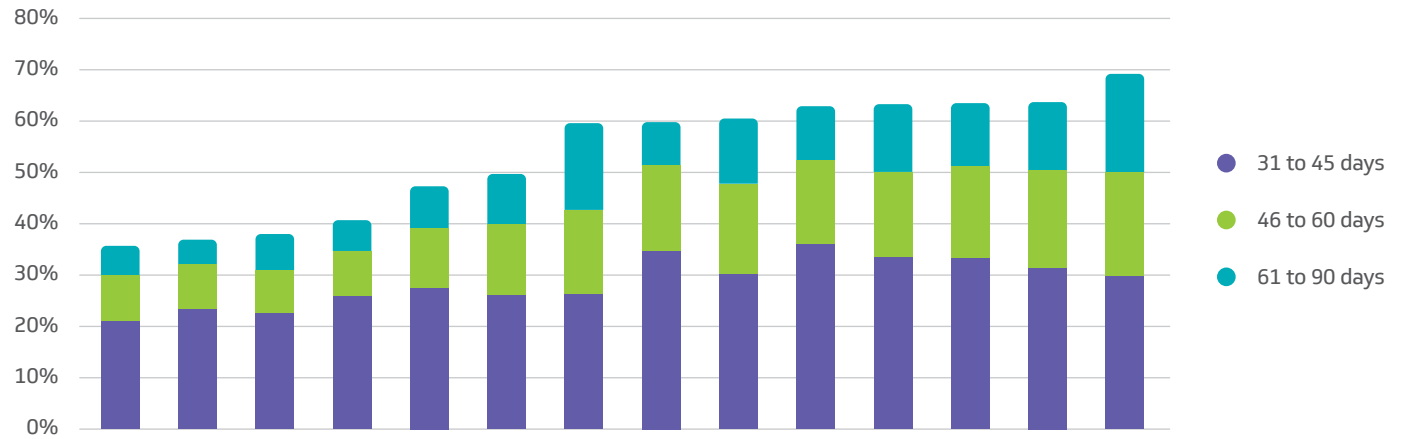
Given the variation observed for mastectomies/lumpectomies occurring more than 30 days after a biopsy, we were interested in assessing the distribution of cases and their actual wait times beyond the 30-day period. Rather than a disproportionate share of cases occurring just after the 30-day benchmark, we observed wide variation across health systems in the timing of surgeries following a biopsy between 31 and 90 days. As shown in Figure 10, we found that for most health systems studied between 20% and 30% of breast cancer patients had

Figure 9: Percentage of breast cancer patients where time from biopsy to surgery is greater than 30 days by health system



Note: Includes health systems with ≥ 3 hospitals with ≥ 100 denominator cases per hospital over 3-year period.
Source: Vizient Research Institute, analysis of Vizient Clinical Data Base, Q4 2016 - 2019.

Figure 10: Percentage of breast cancer patients where time from biopsy to surgery is greater than 30 days by health system



Note: Includes health systems with ≥ 3 hospitals with ≥ 100 denominator cases per hospital over 3-year period.
Source: Vizient Research Institute, analysis of Vizient Clinical Data Base, Q4 2016 - 2019.

surgery between 31 and 45 days after the biopsy. We observed between 8% and 20% of breast cancer patients receiving surgery 46-60 days following a biopsy and a similar distribution of 5% and 20% of patients having a mastectomy/lumpectomy 61-90 days after initial biopsy.

Overall, we found nearly a two-fold variation between health systems in the timing between biopsy and surgery greater than 30 days ranging from 35% for some systems to nearly 70% for others.

Based on the growing body of research, the length of time between biopsy and surgery could negatively impact patient survival. We concluded from this analysis that most health systems have opportunity to improve in delivering care at the right time especially related to the treatment of breast cancer.

Conclusion

The Vizient Research Institute's latest study findings focused on health system variation mirror our study findings from the past. There is significant variation in the way care is delivered to patients not only across health systems but more importantly with the same health system. Despite efforts underway, most health systems continue to fall short on their value promise in delivering the right care in the right place at the right time.

As we emerge from the pandemic, it will be interesting to see how the trend in health system formation continues.

Forming health systems to achieve economies of scale (via centralizing administrative functions and consolidating overlapping clinical programs) and to standardize care delivery to eliminate variation, improve quality and reduce unnecessary spending are critical strategies for health care providers now more than ever. For some providers, it may be a necessary strategy to remain viable as an organization while for others it may continue to be a primary growth strategy. Regardless of the trend, it is important that health systems deliver on their value promise that they set out to achieve in forming a system.

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Appendix

Health System Definition

Health care organizations included in our study were defined as a "health system" if they had three or more acute care hospitals as part of their system where each affiliate was performing sufficient volumes to evaluate performance for a particular metric. For the two cardiac metrics, multiregional systems were limited to the market with the most affiliated hospitals to prevent overstating variation.

Data Sources

A variety of data sources were used to conduct our analyses including Medicare enrollment and claims files, Vizient's Clinical Data Base (CDB) and state inpatient data from select states. Below are specific details about the data sources we used for each analysis.

Medicare Claims Data – Medicare fee-for-service (FFS) enrollees include those individuals who are 65 years and older. Vizient had access to annual enrollment data on the entire Medicare population along with 100% of inpatient and outpatient hospital claims, 100% of skilled nursing facility and home health agency claims, 100% of hospice claims and 5% of physician and durable medical equipment claims. Prescription drugs claims were not included in the analysis. Calendar year 2016 through 2019 data was used for analyses leveraging the Medicare claims files.

Vizient Clinical Data Base (CDB) – The Vizient Clinical Data Base is the definitive health care analytics platform for performance improvement. The CDB includes patient-level encounter data for inpatient and hospital outpatient services and provides high-quality, accurate and transparent data on patient outcomes — such as mortality, length of stay, complication and readmission rates and hospital-acquired conditions. Calendar year 2019 data was used for study analyses leveraging leveraging the CDB.

State Inpatient Databases – Several state inpatient data sets containing inpatient hospital encounter-level data for 2019 were used for specific analyses by the Vizient Research Institute. The limited data sets were provided by agencies in the following states: Florida, Maryland, Pennsylvania, Washington, Texas and Nevada. For further information about the state inpatient data uses and restrictions, please refer to note in Figure 7.

Description of Measures

Please find below the data source and methodology for calculating the denominator and numerator for each measure included in Vizient Research Institute's study findings above.

1. Percentage of breast cancer patients with CT scan, PET scan or nuclear medicine within 61 and 365 days after biopsy.
   a. **Data source:** Medicare claims
   b. **Denominator population:** Denominator limited to Medicare FFS patients with both 1) a hospital outpatient claim for a percutaneous breast biopsy and 2) a hospital outpatient claim for a lumpectomy or mastectomy that occurred between 1/1/2017 and 12/31/2018.
   c. **Numerator population:** Numerator limited to any hospital outpatient claim with both 1) a CPT code associated with CT, PET or nuclear medicine that occurred between 61 and 365 days after individual's first percutaneous breast biopsy and 2) a principal diagnosis code associated with breast cancer, chemotherapy, or radiotherapy.
   d. **Minimum volume threshold:** At least 60 cases or more per hospital over a 2-year period.

2. Percentage of outpatient cardiac catheterizations with percutaneous coronary intervention (PCI) or resulted in coronary artery bypass graft (CABG) surgery within 90 days.
    a. **Data source:** Medicare claims
    b. **Denominator population:** The number of FFS Medicare patients who underwent an outpatient cardiac catherization between Q4 2016 and 2019.
    c. **Numerator population:** The number of denominator patients who either had a concurrent PCI or a CABG within 90 days of the outpatient cardiac catheterization.
    d. **Minimum volume threshold:** At least 300 or more denominator cases per hospital over a 3-year period.
3. Percentage of ED patients presenting with chest pain who received non-standardized diagnostic modalities (excludes inpatient admissions).
    a. **Data source:** Medicare claims
    b. **Denominator population:** The number of FFS Medicare patients who presented in the ED with chest pain and were not admitted between 2017 and 2019.
    c. **Numerator population:** The number of denominator patients who had a non-coronary CT angiogram, stress test, stress echocardiogram, or standard echocardiogram.
    d. **Minimum volume threshold:** At least 300 or more denominator cases per hospital over a 3-year period.
4. Percentage of lung cancer patients who had lung resection surgery at a hospital with lung resection surgical volumes below proficiency thresholds.
    a. **Data source:** State inpatient data
    b. **Denominator population:** The number of patients 18 years and older who had a lung cancer diagnosis and lung resection procedure coded on the same encounter in 2019.
    c. **Numerator population:** The number of denominator patients who underwent lung resection surgery at a hospital where total case volumes for lung resection surgery were below 40 cases per year.
5. Percentage of breast cancer patients where time from biopsy to surgery is greater than 30 days.
    a. **Data source:** Vizient Clinical Data Base (CDB)
    b. **Denominator population:** Denominator limited to patients with 1) a lumpectomy or mastectomy between 1/1/2017 and 12/31/2019 and 2) a percutaneous breast biopsy between 1-90 days prior to the surgery.
    c. **Numerator population:** The number of denominator patients who had a lumpectomy and/or mastectomy greater than 30 days after biopsy.
    d. **Minimum volume threshold:** At least 100 or more denominator cases per hospital over a 3-year period.

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