To Outsource or Not?
A Correlative Study of In-Hospital Dialysis Outcomes and Costs

Overview

Caring for patients requiring inpatient dialysis poses significant challenges for hospitals and health systems. These patients are among the most medically complex, often presenting with multiple comorbidities such as cardiovascular disease, diabetes and infection, which demand specialized and resource-intensive care. With inpatient discharges expected to rise by 3% and inpatient stays projected to grow by 9% over the next 10 years (according to the Sg2 Impact of Change® forecast), hospitals face mounting pressure to manage rising patient volumes. Patients who require dialysis already require higher ICU utilization and longer hospital stays, which will put additional strain on staffing, bed capacity and overall operational workflows as these trends continue.

A recent Sg2 analysis, detailed below, suggests that for some hospitals that currently self-operate dialysis services, outsourcing may offer clinical, operational and financial benefits. However, the decision to outsource requires careful consideration of the hospital's unique patient population, operational needs and financial priorities to ensure alignment with organizational goals and market realities.

This paper examines the differences in clinical, quality and financial outcomes between outsourced and in-house inpatient dialysis models—highlighting potential benefits and considerations to help hospital leaders evaluate the optimal care delivery model for their specific circumstances.

Evaluating the Decision to Outsource Inpatient Dialysis: Summary

- Patients requiring dialysis are a disproportionately resource-intensive population, with higher ICU utilization, longer lengths of stay and greater costs compared to non-dialysis patients, particularly for cases involving an acute kidney injury (AKI) diagnosis.
- Analysis suggests high-acuity facilities (such as comprehensive academic medical centers [AMCs]) that outsource dialysis services may see superior patient outcomes, streamlined operations and lower costs compared to similar hospitals that self-operate dialysis services.
- By leveraging outsourcing models at appropriate hospitals, health systems may be able to improve care distribution, reduce unnecessary transfers to high-acuity centers and enhance access for complex cases. Additionally, this enhanced access may deliver a margin benefit by improving resource efficiency and freeing capacity for high-revenue procedures.
- Hospitals and health systems should benchmark their inpatient dialysis performance by conducting a gap analysis. If the organization appears to be struggling with areas such as dialysis patient lengths of stay, treatment costs, ICU utilization and access at system tertiary/quaternary care facilities, it should carefully evaluate whether outsourcing is an appropriate model to address these issues.

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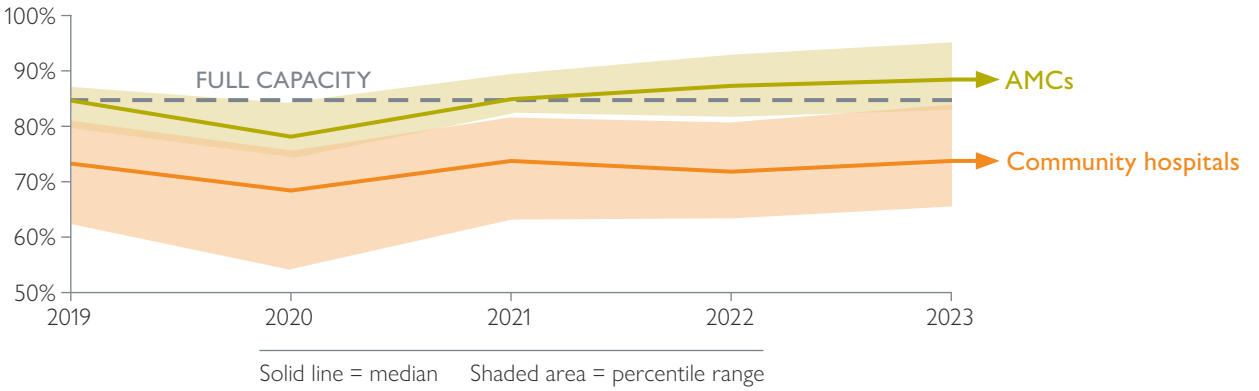
Evolving Challenges of Inpatient Care

Hospitals and health systems nationwide are grappling with transformative challenges, including rising patient acuity, longer lengths of stay, growing inpatient volumes, escalating care delivery costs and persistent capacity constraints. Between 2019 and 2024, average patient acuity increased by 3%, driven by a growing proportion of patients with chronic conditions and multiple comorbidities who require more intensive and specialized care. This rise in acuity has contributed to a nearly 24% increase in average LOS between 2019 and 2022, with an additional 9% growth in inpatient days projected over the next decade.

These trends have placed unprecedented demands on hospital infrastructure. AMCs, which are dedicated to managing high-acuity care, face particularly acute capacity challenges due to the growing demand for intensive services (see Figure 1). As hospitals consolidate into larger health systems (or integrated delivery networks), the need to balance operational efficiency, financial sustainability and rising expectations for quality care has intensified.

FIGURE 1. CAPACITY CRUNCH LIMITS AMC AMBITIONS; COMPETITION CAPITALIZES

Equivalent occupancy comparisons, Vizient Operational Data Base, 25th to 75th percentiles, 2019–2023*



*2023 data are through Q2. **Note:** Analysis excludes 0–17 age group and includes COVID-19 admissions. Community hospital and AMC cohorts are Vizient-defined.
Sources: Operational Data Base ALOS Occupancy and Financial Benchmarks. Vizient® Operational Data Base, Q1 2019–Q2 2023. Irving, TX: Vizient, Inc.; 2023. https://www.vizientinc.com; Data from Vizient Operational Data Base used with permission of Vizient, Inc. All rights reserved; Sg2 Analysis, 2024.

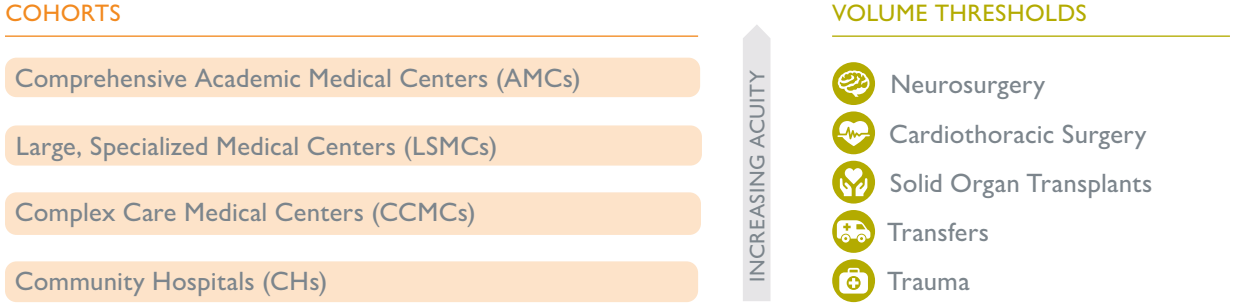
Summary of Methodology

Recently, Sg2 conducted a novel analysis of the Vizient® Clinical Data Base (CDB) to assess the clinical, financial and operational implications of inpatient dialysis care delivery, with a focus on evaluating outsourced vs in-house models. The Vizient CDB, which includes data from over 1,300 US facilities—encompassing 97% of academic medical centers—offers robust clinical benchmarks and resource utilization insights. See the appendix for more information.

For this analysis, hospitals were segmented into four distinct cohorts based on the acuity of care delivery, providing a clearer understanding of performance variations across facility types (see Figure 2 and the appendix for details). Additionally, each hospital cohort was further assigned an “outsourced” or “in-house” designation. The analysis focused on adult inpatient dialysis patients discharged between Q3 2023 and Q2 2024. Inpatient dialysis was defined based on the presence of revenue codes 801 through 809.

The outcomes reported in this study represent correlative relationships, not causality. Where possible, Sg2 sought to normalize for differences in case mix index (CMI), which is a metric that reflects the diversity, complexity and severity of the patients treated at a hospital and is based on the average MS-DRG weight for a population of patients.

FIGURE 2. HOSPITAL COHORTS USED IN Sg2 ANALYSIS



Complexity of Inpatient Dialysis Care

Inpatient dialysis is one of the most resource-intensive services hospitals provide due to the complexity of the patients and the logistical challenges of its delivery. Two main conditions drive inpatient dialysis: end-stage renal disease (ESRD) and AKI. These conditions are not mutually exclusive, as some ESRD patients receiving dialysis in the hospital may also have an AKI. ESRD accounts for more than 90% of the inpatient dialysis population. AKI diagnoses, representing nearly 30% of inpatient dialysis cases, are rising and require intensive interventions due to their higher complexity and reliance on critical care.

Inpatient dialysis patients require complex and resource-intensive care, as evidenced by significantly higher CMI and utilization metrics compared to the general inpatient population. On average, dialysis patients have nearly twice the ICU utilization rate (31.9% vs 15.4%), stay five days longer in the hospital (LOS 10.70 days vs 5.61), and experience 30-day readmission rates that are twice as high (24.7% vs 12.7%). Dialysis patients also incur average direct hospitalization costs that are 2.5 times greater ($27,471 vs $11,554). Such metrics highlight the intensive demands of managing this patient population, requiring specialized resources and multidisciplinary care coordination.

Dialysis cases with an AKI diagnosis contribute significantly to hospital workloads and resource utilization. As shown in Table 1, compared to patients diagnosed with chronic kidney disease (CKD) or ESRD alone, AKI patients receiving inpatient dialysis demonstrate significantly higher case-mix indices, ICU utilization and mean direct costs. After adjusting for CMI, AKI patients still incur higher direct costs and length of stay, reflecting their reliance on critical care services and specialized nephrology expertise.

TABLE 1. COMPARISON OF DIALYSIS CASES BY DIAGNOSIS CATEGORY

Diagnosis Category	% of the Inpatient Dialysis Population	CMI	LOS	CMI-Adjusted LOS	% With ICU Stay	Mean Direct Costs	CMI-Adjusted Direct Cost
CKD/ESRD Only	71.5%	2.36	7.29	3.08	21.0%	$16,008	$6,774
AKI Only	7.0%	6.20	19.72	3.18	77.9%	$69,603	$11,230
AKI and CKD/ESRD	21.5%	4.34	19.06	4.40	53.0%	$51,639	$11,908

Source: Data from the Vizient® Clinical Data Base used with permission of Vizient, Inc. All rights reserved. Q3 2023–Q2 2024. Adult inpatient cases only. Limited to dialysis cases as defined by revenue codes.

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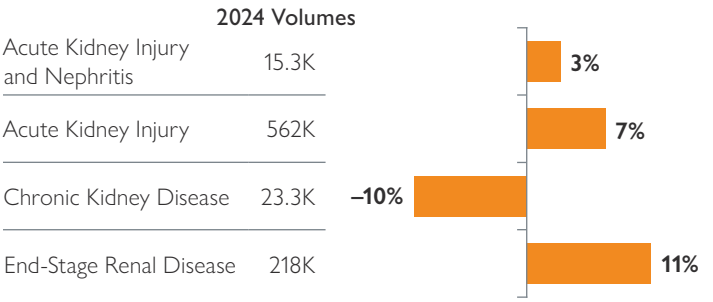
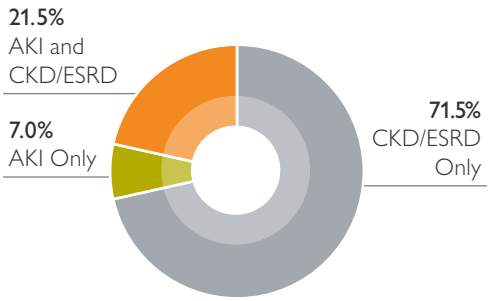
According to the Sg2 Impact of Change forecast, inpatient discharges for patients primarily diagnosed with AKI and ESRD are projected to increase by 7% and 11%, respectively, by 2034, reaching nearly 850,000 discharges annually, driven by factors such as an aging population and the rising prevalence of comorbidities like diabetes and hypertension. (See Figure 3. See the appendix for more information on the Sg2 Impact of Change forecast.) In other words, the challenges highlighted above will only become more pressing in the future.

FIGURE 3. Sg2 IMPACT OF CHANGE NEPHROLOGY FORECAST AND INPATIENT DIALYSIS DISTRIBUTION

Inpatient Nephrology Forecast
US Market, 2024–2034



Inpatient Dialysis Distribution by Diagnosis



Note: Analysis excludes 0–17 age group. **Sources:** Impact of Change®, 2024; HCUP National Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP) 2019. Agency for Healthcare Research and Quality, Rockville, MD; Proprietary Sg2 All-Payer Claims Data Set, 2022; The following 2022 CMS Limited Data Sets (LDS): Carrier, Denominator, Home Health Agency, Hospice, Outpatient, Skilled Nursing Facility; Claritas Pop-Facts®, 2024; Sg2 Analysis, 2024.

Comparing Patient Outcomes: In-house vs Outsourced Inpatient Dialysis

Notes on the Analysis Approach

Analysis of the Vizient CDB reveals that the observed correlative benefits of outsourcing inpatient dialysis are most evident in high-acuity facilities, particularly AMCs and large, specialized medical centers (LSMCs). These institutions frequently manage complex cases involving elevated CMIs, higher rates of AKI and substantial interhospital transfers.

For low-acuity facilities, such as community hospitals (CHs) and complex care medical centers (CCMCs), the analysis shows less pronounced differences in outcomes between in-house and outsourced dialysis models. Notably, in the Vizient CDB data set, a plurality of CHs and CCMCs providing inpatient dialysis have already outsourced these services, making direct comparisons challenging.

While the analysis sought to account for differences in CMI by hospital cohort where possible, it is important to note that CMI for in-house programs reflects the increased complexity and severity of patients included in this cohort. The increased CMI may be a contributing factor to the observed increase in resource utilization.

While these findings illustrate the potential cost and quality advantages of outsourcing, further research is necessary to isolate the specific impact of outsourcing from the confounding effects of variables such as patient demographics, patient complexity, case severity and other hospital-specific factors.

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TABLE 2. OUTSOURCED VS IN-HOUSE HOSPITAL DIALYSIS IN AMCS: OBSERVED DIFFERENCES IN CLINICAL AND FINANCIAL METRICS

Comparison of Performance Between Outsourced and In-house Dialysis Services at AMCs

Dialysis Model	Cases	CMI	Mean LOS Obs	CMI-Adjusted* LOS	% 30-Day Readmits	HAC-07 (Per 10,000 Encounters)	HAC-14 (Per 10,000 Encounters)	Mean Direct Costs	CMI-Adjusted* Direct Costs	Mean Dialysis Costs
Outsourced	56,437	3.67	13.04	3.56	24.7%	44.83	15.24	$37,893	$10,334	$2,095
In-House	85,835	3.82	13.70	3.59	25.6%	47.18	17.01	$41,853	$10,953	$2,181

*Note that CMI-adjusted metrics reflect the cohort's original metric divided by the cohort's CMI. Obs = observed; HAC = hospital-acquired condition.
Source: Data from the Vizient® Clinical Data Base used with permission of Vizient, Inc. All rights reserved.

Sg2 analysis shown in Table 2 revealed that AMCs with outsourced dialysis services outperform those with in-house programs on several clinical metrics. Outsourced facilities demonstrated shorter length of stay, slightly shorter CMI-adjusted length of stay and lower 30-day readmission rates. Quality metrics also favored outsourcing, with fewer vascular catheter-associated infections (HAC-07) reported, highlighting potential improvements in procedural consistency and infection control practices.

The clinical advantages observed in outsourced models also drive financial benefits. AMCs with outsourced dialysis services reported lower CMI-adjusted direct costs and reduced mean dialysis-specific costs. Collectively, these results suggest that outsourcing dialysis services may enable some AMCs to deliver more efficient care (compared to in-house programs) while optimizing resource utilization and financial sustainability.

TABLE 3. ICU PATIENTS: OUTSOURCING DIALYSIS SHOWS A MORE PRONOUNCED IMPACT

Comparison Between Outsourced and In-house Dialysis Services: ICU Cases at High-Acuity (AMCs and LSMCs) Facilities

Dialysis Model	Cases	CMI	Mean LOS Obs	CMI-Adjusted* LOS	Mean ICU Days	% 30-Day Readmits	Mean Direct Costs	CMI-Adjusted* Direct Costs	Mean Dialysis Units	Mean Dialysis Costs
Outsourced	36,859	5.11	18.65	3.65	8.64	24.2%	$57,898	$11,326	7.60	$2,948
In-House	45,263	5.48	20.56	3.75	9.76	25.2%	$67,558	$12,322	8.26	$3,114

*Note that CMI-adjusted metrics reflect the cohort's original metric divided by the cohort's CMI. **Source:** Data from the Vizient® Clinical Data Base used with permission of Vizient, Inc. All rights reserved.

For dialysis patients requiring ICU care, the reported differences in financial and operational performance between in-house and outsourced dialysis models were even more significant at a broader set of high-acuity facilities. AMCs and LSMCs with outsourced services report lower direct costs and lower CMI-adjusted costs for ICU dialysis cases.

The reported cost savings are partially driven by a reduction in mean ICU days, with outsourced programs averaging 8.64 days compared to 9.76 days for in-house models. This reduction of over a full day in ICU care may reflect the ability of the outsourcing model to drive operational efficiency for complex dialysis cases. While utilization metrics such as CMI-adjusted length of stay and dialysis-specific costs remain similar between the two models, the lower overall CMI-adjusted costs in outsourced facilities suggest an ability to streamline resource use without compromising patient outcomes.

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TABLE 4. BENEFITS OF OUTSOURCING DIALYSIS FOR AKI PATIENTS AT HIGH-ACUITY HOSPITALS

Dialysis Model	Cases	CMI	Mean LOS Obs	CMI-Adjusted* LOS	Mean ICU Days	% 30-Day Readmits	Mean Direct Costs	CMI-Adjusted* Direct Costs	Mean Dialysis Costs
Outsourced	8,767	6.41	19.82	3.09	12.06	21.2%	$69,954	$10,917	$2,597
In-House	11,172	6.89	21.85	3.17	13.10	22.9%	$82,273	$11,940	$2,792

*Note that CMI-adjusted metrics reflect the cohort's original metric divided by the cohort's CMI. **Source:** Data from the Vizient® Clinical Data Base used with permission of Vizient, Inc. All rights reserved.

Sg2's analysis illustrates that the benefits of outsourcing dialysis extend to dialysis patients diagnosed with AKI. (See Table 4.) When treating AKI patients specifically, high-acuity facilities (such as AMCs and LSMCs) with outsourced services reported lower CMI-adjusted direct costs and mean dialysis costs, as well as shorter observed LOS. When combined with insights from the ICU patient analysis, these findings underscore the potential dual advantage of outsourcing: enhancing cost efficiency while optimizing care delivery for the most resource-intensive dialysis patients.

TAKEAWAY

The analysis suggests outsourced dialysis services at high-acuity facilities outperform in-house models across clinical and financial metrics, including shorter lengths of stay, lower infection rates and reduced direct costs. These advantages are even more pronounced in ICU and AKI cases, where outsourcing may achieve notable cost savings and operational efficiencies while maintaining comparable or superior patient outcomes.

Strategic Questions to Consider for Hospital and Health System Leaders

- How do our dialysis clinical outcomes and costs compare to benchmarks at peer institutions?
  - If we are performing poorly in these benchmarks, how can we change our strategy to address this performance?
- How do our inpatient dialysis services integrate into the goals of the overall system and align with the long-term needs of patients on dialysis?
- What specific inefficiencies in our dialysis care delivery contribute to longer lengths of stay or higher ICU utilization, and how can these be addressed?
- What opportunities exist to optimize resource utilization given widely reported staffing and labor challenges?
  - How can internal and external resources/partners be best leveraged?
- Can we scale our current dialysis services to meet growing or changing patient demands?
  - If not, can external dialysis partners support scaling dialysis services?
- How adaptable is our current dialysis model to emerging technologies or regulatory changes?

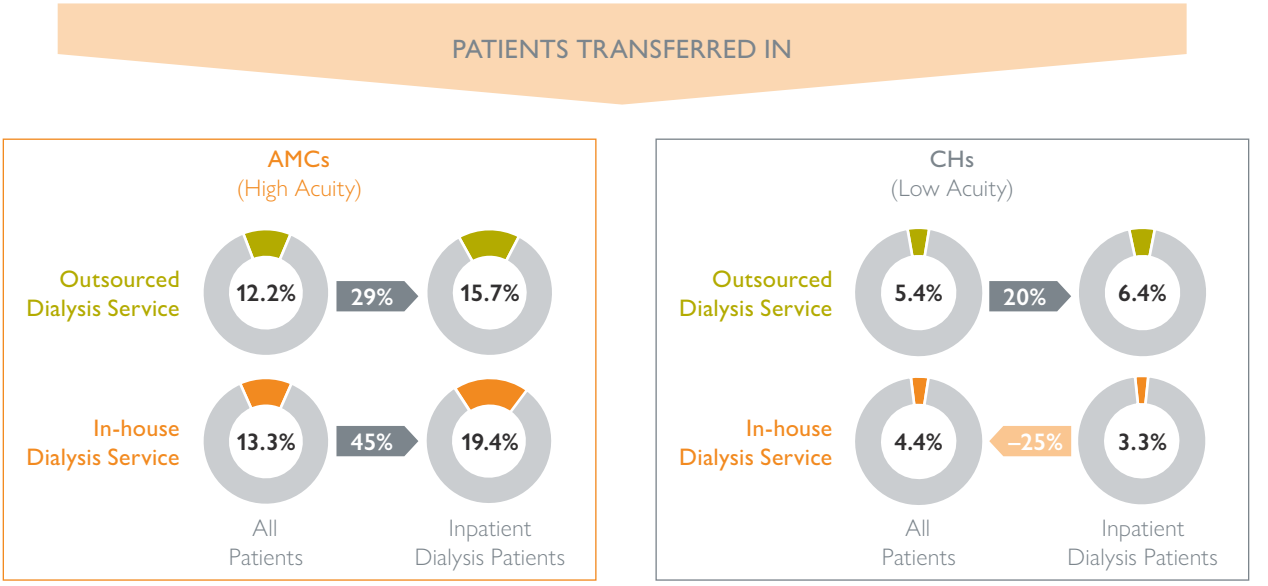
Evaluating Outsourced Dialysis Model: Impact on Systemness in Care Delivery

Dialysis Transfer Patients: A Comparison Between High- and Low-Acuity Facilities With Outsourced vs In-house Dialysis Models

An analysis of incoming dialysis transfer patients reveals notable differences between outsourced dialysis and in-house programs across both high-acuity and low-acuity facilities (see Figure 4).

Let's start with an exploration of high-acuity hospital transfer patient populations. AMCs with in-house dialysis report a dialysis-specific incoming transfer patient prevalence of 19.4% (ie, out of all inpatient dialysis patients), compared to an overall incoming transfer patient prevalence of 13.3% (ie, out of all inpatient cases total)—a 45% difference. In contrast, AMCs that outsource dialysis show a narrower gap, with a dialysis-specific incoming transfer patient prevalence of 15.7% versus an overall transfer patient prevalence of 12.2%—a 29% difference. This disparity in dialysis transfer patient prevalence versus overall transfer patient prevalence shows high-acuity hospitals with in-house dialysis are more burdened by incoming dialysis patients (relative to other transfer patients), compared to their outsourced counterparts. This suggests that high-acuity hospitals with in-house dialysis may be in health systems or geographies that do not have sufficient dialysis capabilities at low-acuity facilities (hence the higher relative transfer populations). More on this below.

FIGURE 4. OUTSOURCED DIALYSIS VS IN-HOUSE PROGRAMS IN HIGH-ACUITY AND LOW-ACUITY FACILITIES



Note: Transfer rate disparities between all patients and dialysis patients are shown in arrows. **Source:** Data from the Vizient® Clinical Data Base used with permission of Vizient, Inc. All rights reserved. Q3 2023–Q2 2024. Adult inpatient cases only. Limited to dialysis cases as defined by revenue codes.

The previous insight is evident when looking at transfer dynamics in low-acuity facilities. CHs with in-house dialysis have a dialysis-specific transfer patient prevalence of 3.3%, compared to an overall transfer patient prevalence of 4.4%—a –25% difference. In contrast, CHs that outsource dialysis show the opposite, with a dialysis-specific incoming transfer patient prevalence of 6.4% versus an overall transfer patient prevalence of 5.4%—a 20% difference. This pattern suggests that low-acuity hospitals with in-house dialysis may be passed over in favor of high-acuity facilities more frequently than their outsourced counterparts. While low-acuity hospitals appropriately accept fewer transfers than tertiary centers, this disparity could indicate missed opportunities to support dialysis care for appropriate transfer patients.

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Strategic Implications of Transfer Rates on Systemness

For health systems, understanding and managing transfer dynamics can improve patient flow and optimize system-wide access and service distribution. The above analysis suggests potential inefficient access and service distribution for health systems that have in-house dialysis programs.

High-acuity hospitals in these in-house systems likely are relied upon too much for treating dialysis transfer patients, while low-acuity hospitals in these systems likely aren't relied upon enough to treat high-complexity dialysis patients. As a result, and as shown above, these high-acuity hospitals see a disproportionately higher share of transfer patients who require dialysis, relative to all transfer patients. At the same time, low-acuity hospitals see a disproportionately lower share of dialysis transfer patients relative to all transfer patients. These dynamics paint a picture of an overutilized tertiary/quaternary hospital that may be losing out on revenue and margin opportunity due to constrained capacity, while low-acuity hospitals in the system go underutilized in treating high-complexity dialysis patients.

Outsourcing hospital dialysis services may enhance system efficiency by redistributing care more effectively across facilities. By equipping low-acuity hospitals with specialized dialysis expertise (eg, from an outsourcing partner), these facilities may be able to better retain and manage dialysis patients locally. This reduces the need for unnecessary transfers to AMCs, which are already resource-constrained, allowing these high-acuity centers to focus on managing the most complex cases (and realizing the associated revenue and margin benefits).

TAKEAWAY

Outsourcing dialysis can improve transfer dynamics by enabling low-acuity hospitals to retain and manage more dialysis patients locally, which in turn alleviates pressure on high-acuity facilities. This balanced approach may allow high-acuity centers to dedicate their resources to managing the most complex cases, enhancing overall system efficiency.

Strategic Questions to Consider for Hospital and Health System Leaders

- How capacity constrained are the high-acuity facilities in my health system?
  - What is the impact of dialysis patient transfers on capacity at these facilities?
- What revenue or margin are we missing out on as a result of the flagship hospital(s) in our system being capacity constrained?
  - How does this revenue or margin compare to potential investments in dialysis capabilities for hospitals in our system that send high volumes of dialysis patients to our flagship hospital(s)?
- Are we unintentionally overburdening our tertiary and quaternary facilities by failing to equip low-acuity hospitals to manage dialysis patients locally?
- How can our health system better leverage low-acuity hospitals to retain and manage appropriate dialysis patients while preserving capacity at high-acuity care facilities?
  - How may external dialysis partners be able to support strategic deployment of dialysis program expertise and resources?

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Next Steps: Assess Challenges, Needs and Goals and Harness Opportunities

This paper highlights the growing challenges of inpatient dialysis care and provides an analysis of the potential benefits of outsourcing dialysis services. As hospitals face rising patient acuity, longer lengths of stay, and increased operational and financial pressures, outsourcing dialysis services may help mitigate some of these challenges.

The analysis suggests that outsourcing dialysis may have clinical and financial advantages, particularly in high-acuity settings like AMCs and LSMCs. In these settings, benefits of outsourcing may include:

- **Improved Clinical Metrics:** Outsourced dialysis services are associated with shorter lengths of stay, lower readmission rates and fewer vascular catheter-associated infections. These improvements underscore the ability of external providers to maintain procedural consistency and enhance infection control practices.
- **Cost Efficiency:** Outsourced models report lower CMI-adjusted direct costs and dialysis-specific costs, suggesting optimized resource utilization without compromising patient outcomes. These cost savings are especially pronounced in ICU settings and among patients with AKIs.
- **Enhanced System-Wide Resource Allocation:** Outsourcing may allow low-acuity facilities to manage a broader range of dialysis patients locally, reducing unnecessary transfers to high-acuity centers. This redistribution of care may alleviate pressure on resource-constrained tertiary and quaternary facilities, enabling them to focus on the most complex cases and enhancing system-wide efficiency.

It is important to note that further research is necessary to isolate the specific impact of outsourcing from the confounding effects of variables such as patient demographics, patient complexity, case severity and other hospital-specific factors.

Outsourcing dialysis services may be an opportunity for hospitals to enhance care delivery, improve financial sustainability and optimize system-wide resource utilization. Hospitals considering outsourcing should carefully assess their unique strategic, clinical, operational and financial needs to determine whether this model aligns with their institutional goals.

Sources: American Hospital Association. *New Analysis Shows Hospitals Improving Performance on Key Patient Safety Measures Surpassing Pre-pandemic Levels.* 2024; Cristales E et al. From every angle: capacity. Vizient. August 20, 2024; Vizient. *Measuring Care Utilization and Quality for Those with Chronic Kidney Disease by Payer and Community Vulnerability.* August 3, 2023; Giese C et al. 2024 Impact of Change forecast highlights. Sg2. Presented May 15, 2024; Impact of Change®, 2024; HCUP National Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP) 2019. Agency for Healthcare Research and Quality, Rockville, MD; Proprietary Sg2 All-Payer Claims Data Set, 2022; The following 2022 CMS Limited Data Sets (LDS): Carrier, Denominator, Home Health Agency, Hospice, Outpatient, Skilled Nursing Facility; Claritas Pop-Facts®, 2024; Sg2 Analysis, 2024.

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APPENDIX

The Vizient® Clinical Data Base (CDB) is the definitive health care analytics platform for performance improvement. The CDB provides high-quality, accurate and transparent data on patient outcomes— such as mortality, length of stay, complication and readmission rates, and hospital-acquired conditions—that enable hospitals to benchmark against peers; identify, accelerate and sustain improvements; reduce variation; and expedite data collection to fulfill agency reporting requirements. Clinical benchmarking tools such as dashboards, simulation calculators, and templated and customizable reports enable users to quickly identify improvement opportunities and their potential impact.

Sg2's Impact of Change® model forecasts demand for health care services over the next decade, examining the cumulative effects and interdependencies of key impact factors driving change in utilization. Using both disease-based and DRG-based analyses, the forecast provides a comprehensive picture of how patients will access inpatient and outpatient services along the continuum of care.

Sg2 hospital types are defined as follows:

- **Comprehensive academic medical centers (AMCs)** are facilities that perform at least 25 solid organ transplants annually, at least 600 trauma service line cases or 1,500 acute transfers annually, and at least 125 combined cases of neurosurgery and cardiothoracic surgery annually. This analysis included 103 unique AMCs.
- **Large, specialized medical centers (LSMCs)** are facilities that perform at least 75 combined cardiothoracic and neurosurgery cases, at least 25 solid organ transplants, and 75 combined cardiothoracic and neurosurgery cases or 600 trauma and 75 combined cardiothoracic and neurosurgery cases or 1,500 acute transfers in from another acute facility and 75 combined cardiothoracic and neurosurgery cases. This analysis included 135 unique LSMCs.
- **Complex care medical centers (CCMCs)** are facilities that are not in the comprehensive academic medical center category or large, specialized complex care category and perform at least 25 combined neurosurgery and cardiothoracic surgery cases annually. This analysis included 141 unique CCMCs.
- **Community hospitals (CHs)** are facilities not described in the previously described categories, excluding critical access and specialty hospitals. This analysis included 167 unique CHs.