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Telehealth Centers of Excellence

Demonstrating the Value of Virtual Nursing

Measurement Framework and Toolkit for Health Systems



In collaboration with

manatt

The purpose of this report is to provide hospital leaders with a practical approach to measure and showcase the value of virtual nursing programs.



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SECTION 2

About the Organizations

About MUSC Telehealth Center of Excellence

The Telehealth Centers of Excellence program supports academic medical centers in implementing and evaluating innovative telehealth solutions in rural and medically underserved communities. These centers serve as national models by testing concepts and developing proven, scalable approaches that expand access to care and improve health outcomes. The Medical University of South Carolina (MUSC) Center for Telehealth was designated a Telehealth Center of Excellence (COE) by HRSA in 2017. As an academic medical center, MUSC leverages its research, clinical, and educational strengths to rigorously evaluate and disseminate innovative telehealth initiatives and promising practices. This designation reflects MUSC's demonstrated experience and capacity, including high program volumes, substantial service to rural and medically underserved communities, and demonstrated financial sustainability. With nearly 20 years of experience, the MUSC Center for Telehealth currently offers more than 100 unique telehealth services reaching nearly 350 sites across South Carolina and directly to patients' homes. For more information, visit <https://telehealthcoe.org>.

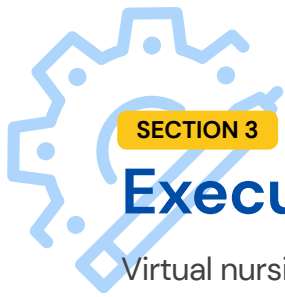
About Manatt Health

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SECTION 3

Executive Summary

Virtual nursing offers the promise of improving nurse satisfaction and workforce resiliency, better managing rising patient acuity, and reducing the administrative burdens of bedside care delivery. While early programs were often targeted at staffing relief, mature implementations demonstrate that virtual nursing is a care redesign strategy capable of delivering measurable impact across workforce stability, patient experience, quality outcomes, and cost performance.

Despite growing adoption, health systems have struggled to consistently measure the value of virtual nursing programs. Virtual nursing influences multiple aspects of care delivery simultaneously, and its impact is diffused across roles, units, and time horizons in ways that resist clean attribution through traditional performance metrics. As a result, many organizations lack a practical framework for evaluating these programs in a structured and credible way.

This report addresses these challenges in measuring the impact of virtual nursing programs. It provides:

- + **A value framework** organized around the Quadruple Aim—care team experience, patient experience, population health, and health care costs—with example key performance indicators (KPIs) for each domain.
- + **A measurement toolkit** with step-by-step guidance on selecting KPIs, designing evaluation approaches, navigating data challenges, and using measured outcomes to drive program improvement.
- + **A measurement compendium** ([Appendix](#)) of potential KPIs with recommended measurement approach to support programs at any stage of maturity.

The framework and toolkit are grounded in the implementation experience of the Medical University of South Carolina (MUSC), a leading academic health system with extensive experience deploying virtual nursing across multiple hospital settings. The framework was further refined through structured discussions with nursing leaders and telehealth experts at peer academic medical centers to ensure the Quadruple Aim framework and related metrics reflect real-world implementation considerations across health systems.

This report is designed for health system leaders across acute care, multi-site, and emerging virtual workforce settings seeking to move beyond anecdotal evidence of virtual nursing's value toward structured evaluation that can justify investment, guide program refinement, and support scaling to new units and care settings.





SECTION 4

Background

Virtual Nursing Context

Demand for virtual nursing has grown as the nursing workforce comes under increasing strain:

- + **Workforce attrition remains unsustainable.** National registered nurse (RN) turnover reached 16.4% in 2024, with high-acuity specialties losing nurses at even higher rates.¹² Nearly 40% of registered nurses (RNs) report plans to leave the profession by 2029.³
- + **Contract labor costs have escalated.** Contract nurse utilization in hospitals increased 133% between 2019 and 2022, driving a 260% increase in total agency labor costs.⁴ While utilization of contracted staff has declined since the COVID-19 pandemic, it remains higher than pre-pandemic average in select care settings.⁵
- + **Patient acuity and documentation burden are compressing bedside capacity.** Hospitalized patient acuity rose 3% between 2019 and 2024,⁶ and nurses spend approximately 40% of their shifts on documentation rather than direct patient care.⁷
- + **Throughput bottlenecks are worsening.** Among older adults, emergency department (ED) boarding times exceeding three hours rose from 22% of encounters in 2017 to 36% in 2024; at academic hospitals, the rate climbed from 31% to 45%.⁸
- + **Payment is increasingly tied to nursing-sensitive outcomes.**⁹ For example, under the CMS Hospital Value-Based Purchasing Program, approximately 75% of the Total Performance Score is weighted on domains directly influenced by nursing care (i.e., Safety, Person and Community Engagement, and Clinical Outcomes) out of four equally weighted domains.¹⁰ Similarly, in the Centers for Medicare and Medicaid Services (CMS) Hospital-Acquired Condition Reduction Program, hospitals are financially penalized if they are low performing on indicators directly influenced by nurse staffing including hospital-acquired infections, pressure injuries, and falls with injury.¹¹

In response, health systems are turning to virtual nursing models that extend the reach of experienced nurses, reduce reliance on high-cost contract labor, and uphold quality and regulatory standards in an increasingly resource-constrained environment.

Program Design Shapes Program Measurement

There is no single model for virtual nursing programs. Every program reflects a series of design decisions that shape its scope, operating model, and expected outcomes. These include the program's primary value hypothesis, the level of clinical involvement expected of virtual nurses, staffing structure, and the degree of technology integration.



Common Virtual Nursing Functions

While the field has not yet converged on a unified typology, the most cited virtual nursing functions across the literature include:^{12,13,14}

- + **Admission activities.** The virtual nurse leads admission intake, including history-taking, medication reconciliation, and completion of admission orders, offloading time-intensive tasks from bedside staff.
- + **Discharge activities.** The virtual nurse conducts 1:1 discharge education, coordinates post-acute placement, and reviews discharge instructions with patients and families, with evidence linking this role to reduced readmissions.
- + **Patient education.** The virtual nurse delivers structured patient and family education on diagnoses, medications, and self-management, dedicating uninterrupted time that bedside nurses cannot consistently provide.
- + **Staff mentoring and education.** The virtual nurse, typically an experienced clinician, provides real-time coaching, clinical decision support, and procedural guidance to novice bedside nurses, supporting workforce development and retention.
- + **Quality and patient safety surveillance.** The virtual nurse remotely monitors electronic health record (EHR) triggers, conducts chart audits, and oversees high-acuity patients, acting as a second set of eyes to catch safety risks and quality gaps.
- + **Physician rounding.** The virtual nurse joins physician rounds remotely to capture orders, clarify the plan of care, and ensure continuity between the medical team and bedside nursing.

Most programs implement a subset of these functions rather than all six, and the specific combination shapes which outcomes the program can credibly be expected to influence.

A virtual nursing program designed primarily for workforce stabilization through task offloading will look and perform differently than one built around real-time clinical surveillance or throughput optimization, for example. Similarly, a program centered on nurse mentorship—leveraging experienced virtual nurses to coach and support newer bedside staff—may strengthen retention and professional development but is unlikely on its own to move throughput or cost metrics in the near term. These design choices directly determine which outcomes a program can credibly be expected to influence, and therefore which metrics are appropriate to track. Without clarity on program design, measurement efforts risk evaluating the wrong outcomes or holding a program accountable for impact it was never structured to deliver.

Looking Ahead: Artificial Intelligence (AI) and Virtual Nursing

As virtual nursing programs mature, advances in AI are expanding what virtual nurses can do. AI-powered tools for ambient documentation, predictive deterioration monitoring, and intelligent workflow routing can amplify the capacity of virtual nursing teams to oversee larger patient populations without sacrificing care quality. Health systems designing virtual nursing programs today should consider how their technology infrastructure and governance frameworks will need to evolve to support AI capabilities as they mature.¹⁵

The Challenge of Demonstrating Value

As virtual nursing programs move from pilot to enterprise strategy, a critical gap has emerged: most health systems lack a structured approach to measuring the value of these programs as innovative care delivery models. This reflects structural barriers to measurement that are inherent to how virtual nursing operates within care delivery:

- + **Nursing is a cost center, not a direct revenue driver.** Unlike procedural or professional services, nursing does not generate discrete billable revenue. Virtual nursing's financial impact is realized through avoided costs, improved efficiency, and retained capacity.
- + **Impact is diffuse by design.** Virtual nursing interventions redistribute workload across bedside staff, virtual staff, case management, and quality functions, making it difficult to attribute improvements to any single role or intervention.
- + **Leading and lagging indicators operate on different timelines.** Workflow changes like *time returned to bedside* or *virtual admission completion rates* are observable within weeks. However, the outcomes that matter most to leadership (e.g., reduced turnover, reduced contract labor costs, improved retention, and employee engagement) can take months to materialize. Programs that only measure leading indicators may struggle to demonstrate strategic value, while programs that only measure lagging indicators risk being defunded before impact can be quantified.
- + **Confounding factors are unavoidable.** Staffing mix, census volatility, patient acuity shifts, and concurrent initiatives (e.g., quality improvement programs, throughput initiatives, staff retention programs) all influence the same outcomes as virtual nursing targets. Many of these initiatives are broader than, and often independent of, virtual nursing, with accountability structures already owned by chief nursing officers (CNOs), nursing directors, and unit leaders. Causal attribution to virtual nursing alone is rarely possible; complementary contribution to shared goals remains meaningful and should be measured as such.

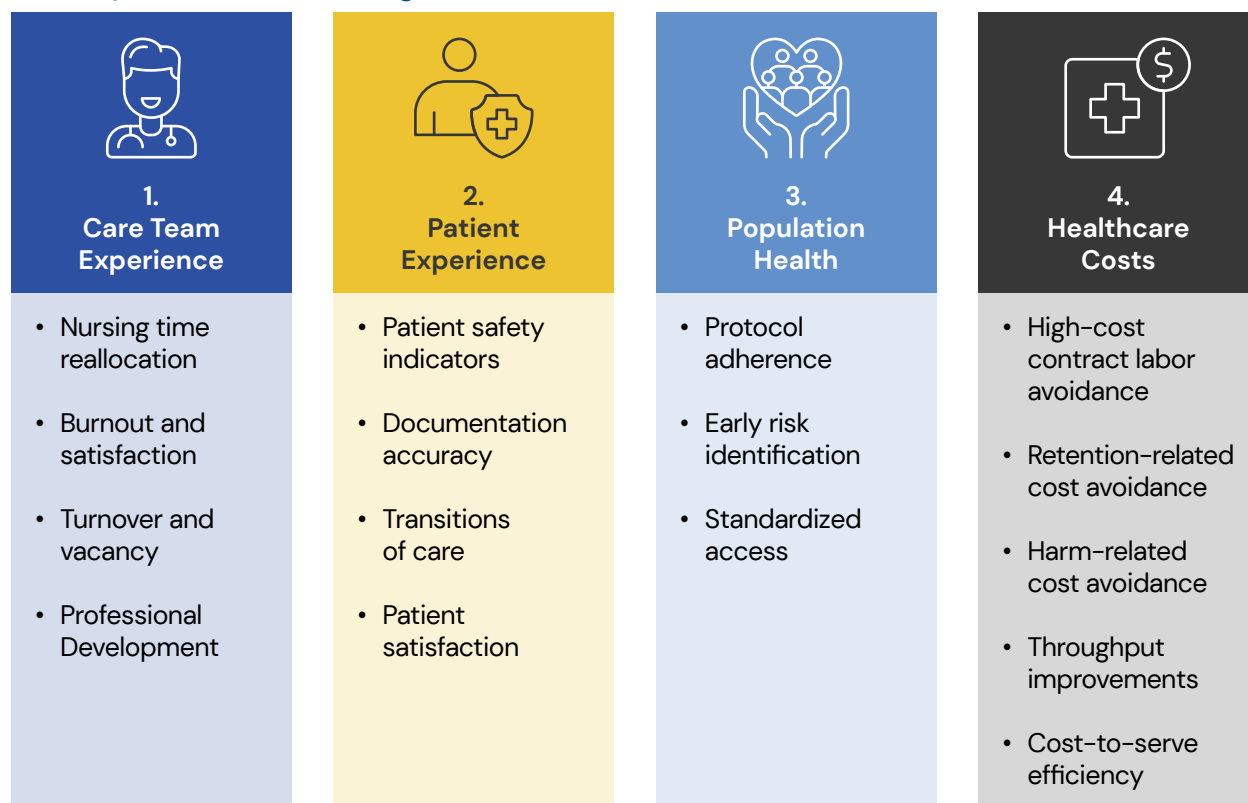
The result is a measurement environment where clinical and operational benefits may be clearly observable on the ground but difficult to quantify in ways that satisfy executive decision-making, justify continued investment, or support scaling to new

units and care settings. Without a structured measurement approach, health systems risk scaling programs that underperform, missing opportunities to optimize existing initiatives, or failing to build the evidence base needed to sustain virtual nursing as a long-term care delivery strategy.

Measuring the Value of Virtual Nursing Programs

This report proposes a value framework for virtual nursing organized around the Quadruple Aim. The Quadruple Aim is a widely used framework for evaluating health care system performance across four interconnected domains: care team experience, patient experience, population health, and health care costs.^{16,17,18} It provides a natural organizing structure for virtual nursing evaluation because it aligns program measurement with the system-level priorities health system leaders already use to assess operational performance, creating a common language across clinical, operational, and executive stakeholders.

Quadruple Aim Virtual Nursing Framework



The following sections describe each Quadruple Aim domain, its relevance to virtual nursing, and example Key Performance Indicator (KPI) categories for program evaluation. Each domain includes a brief example from the Medical University of South Carolina's (MUSC) implementation experience to illustrate how these metrics operate in practice. Because virtual nursing impacts multiple domains simultaneously, many KPIs influence more than one domain (e.g., throughput, turnover, and safety events). For clarity, each is categorized where its primary impact is most directly realized.

MUSC's Virtual Nursing Program

The Medical University of South Carolina (MUSC) launched its virtual nursing program in November 2023 on five medical-surgical units across three system hospitals, supported by centralized staffing, technology infrastructure, and analytic capabilities through MUSC's Center for Telehealth. Over two and a half years, the program expanded to 57 units across four regions statewide, spanning medical-surgical, behavioral health, pediatric, emergency, and rural hospital settings. South Carolina faces the second-highest projected nursing shortage in the country, making MUSC's rapid, system-wide deployment both a strategic workforce response and a test case for scalable virtual care delivery.^{19,20,21,22}

Domain 1: Care Team Experience

Restoring meaningful nursing practice and reducing avoidable burden

Virtual nursing supports a model of care that reduces administrative friction and enables nurses to focus on high-value clinical work and meaningful interactions with patients and families. The goal is to return time and attention to the aspects of practice that drive professional purpose and engagement.

Key Performance Indicators

- + **Nursing time reallocation:** Shift in bedside nursing time from administrative tasks toward direct patient care
- + **Burnout and satisfaction:** Reduction in reported burnout rates and improvement in nurse engagement and satisfaction survey scores
- + **Turnover and vacancy:** Reduction in nursing turnover and vacancy rates; improvement in time-to-fill for open positions on units with virtual nursing support
- + **Professional development:** Retention of experienced nurses through role diversification into virtual positions; participation in mentorship and preceptorship programs facilitated by virtual nursing

MUSC's Experience

Following MUSC's launch of its virtual nursing program, the health system saw the following outcomes:^{23,24,25,26,27,28}

Nursing time reallocation: An internally developed, electronic survey was developed to capture bedside and virtual nurses' perceived values and attitudes towards virtual nursing following its pilot implementation and rapid expansion to 32 units systemwide. The survey was distributed, via REDCap links delivered to each nurses' email address, from May to September 2025 (N=142 completed; 17.3% [N=114] and 69% [N=30] response rates for bedside and virtual nurses, respectively). Notably, the survey was only distributed to full-time staff within the health system and those who were part-time or had contracted positions were excluded. When asked to select key benefits of the virtual nursing program from a provided list, 76% of bedside nurses reported spending less time on electronic health record (EHR) documentation for admissions and discharges, and 68% reported having more time to round on patients. Additionally, 27% of nurses indicated that patients experienced better care with virtual nursing as a key program benefit. Further, 87% of nurses reported a perceived slight or significant decrease in overall workload. Ongoing efforts are evaluating opportunities to measure efficiency of the virtual nursing program and to manage and prioritize the queue of virtual nursing activities.

Burnout and satisfaction: Bedside nurse satisfaction with virtual nursing averaged 4.41 out of 5 in that same survey. Separately, annual employee engagement scores on Charleston units with nine or more months of program exposure improved year over year; for example, one unit increased from 3.83 to 4.18 (+9.1%).

Professional development: In the previously mentioned virtual nursing survey, 100% of virtual nurses reported being satisfied or very satisfied with the program, with many describing the team-based model as "the future" of nursing and crediting it with allowing them to "stay in the field that [they] love." Bedside nurses in that same study reported that the team-based approach "restored their faith in bedside nursing."

Domain 2: Patient Experience

Delivering safer, more reliable, and more human-centered care

Virtual nursing strengthens the patient experience by enabling real-time surveillance and early identification of risks such as falls, pressure injuries, and hospital-acquired infections. It also improves communication consistency, reinforces education, and supports smoother care transitions. By increasing total nursing capacity and standardizing key interactions such as admissions and discharges, the model enhances safety, clarity, responsiveness, and reliability.

Key Performance Indicators

- + **Patient safety indicators:** Reduction in falls, hospital-acquired pressure injuries (HAPI), catheter-associated urinary tract infections (CAUTI), and central line-associated bloodstream infections (CLABSI); improvement in sepsis bundle compliance
- + **Documentation accuracy:** Improvement in documentation completeness and accuracy for continuity of care, regulatory compliance, and value-based care payments
- + **Transitions of care:** Reduction in admission and discharge cycle times; improvement in handoff quality between care settings
- + **Patient satisfaction:** Improvement in Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) scores across nursing-sensitive domains, including Communication with Nurses, Communication about Medicines, Discharge Information, and Care Coordination.²⁹

MUSC's Experience

Following the launch of MUSC's virtual nursing program, leadership emphasized evaluation of patient-centered outcomes to understand the program's impact.

Patient safety indicators: Virtual nurses conduct real-time surveillance of nursing-sensitive safety measures for every monitored patient. This process identified patients with pressure injuries who were missing wound care orders or specialty bed interventions, flagged Foley catheter patients with incomplete CAUTI prevention documentation, and caught gaps in CLABSI bundle adherence for patients with central lines, each representing an individual patient safety risk that was identified and addressed before a potential harm event.

Transitions of care: When discharge-related HCAHPS scores in one unit at a MUSC regional campus showed an opportunity for improvement, the team deployed a standardized virtual nursing discharge teaching intervention. Beginning in March 2025, virtual nurses assumed responsibility for discharge education on that unit, reaching approximately 72% of discharges (248 of 346) by July 2025—demonstrating how virtual nursing enables rapid, targeted responses to unit-level gaps without adding bedside workload.

Patient satisfaction: HCAHPS results for the virtual nursing unit cohorts are being tracked against all inpatient units as a comparison group, providing an ongoing basis for evaluating the program's impact on nursing-sensitive patient experience domains. In one regional campus, virtual nursing units have held relatively steady on several nursing-sensitive measures amid broader system-wide fluctuations, with modest improvements in Willingness to Recommend. Continued tracking will be needed to isolate virtual nursing's contribution as the program matures.

Domain 3: Population Health

Standardizing care across units and populations

Virtual nursing enables system-wide standardization of care processes through centralized surveillance, protocol-driven workflows, and scalable quality oversight. Rather than relying on individual unit culture or shift-level staffing to drive consistency, the model creates a centralized layer of oversight that can monitor and reinforce evidence-based practices across units, facilities, and patient populations. This is particularly valuable for under-resourced units or off-peak shifts where experienced nursing capacity may be limited.

Key Performance Indicators

- + **Protocol adherence:** Improvement in compliance with evidence-based care bundles and protocols across units, shifts, and facilities
- + **Early risk identification:** Reduction in failure-to-rescue events through centralized monitoring and early intervention for deteriorating patients
- + **Standardized access:** Reduction in variation in nursing-sensitive care quality metrics across virtual nursing supported units, including rural facilities, under-resourced units, and off-peak shifts that historically experienced greater variability in care delivery.

MUSC's Experience

MUSC's virtual nursing program was intended to reduce variations in care across the health system. To measure this impact, the program team focused on:

Protocol adherence: Virtual nurses continuously review monitored patients for compliance with evidence-based care bundles and activate protocolized interventions as warranted. Quality surveillance reviews conducted across the virtual nursing units revealed patterns of incomplete bundle documentation for CAUTI, CLABSI, and pressure injury prevention. This volume of centralized review would be difficult to sustain through unit-level processes alone, and enables leadership to identify systematic compliance gaps, not just individual misses, across units and shifts.

Standardized access: The program has been deployed across diverse settings—including rural hospitals, behavioral health units, pediatric units, and units serving incarcerated patients—and as of early 2026 now covers 57 units across four regions statewide. This centralized model provides a consistent layer of quality oversight that does not depend on individual unit staffing levels or shift-to-shift variation, extending experienced nursing capacity to under-resourced and off-peak environments.

Domain 4: Health Care Costs

Stabilizing labor economics and reducing avoidable expenses

Nursing functions as an operating expense within hospital financial models, even though it underpins all hospital revenue generation. Virtual nursing does not change this fundamental dynamic. Its financial value is realized primarily through cost stabilization, avoided expense, and throughput-enabled capacity rather than discrete revenue attribution. These KPIs are deliberately structured around avoidance and efficiency because that is how nursing economics operate, and because these pathways represent the most credible and measurable financial impact virtual nursing can deliver. As with any program investment, value should be assessed as net impact, accounting for program operating costs including technology infrastructure, virtual nurse staffing, and training.

Key Performance Indicators

- + **High-cost contract labor avoidance:** Reduction in agency, travel nurse, and overtime spending
- + **Retention-related cost avoidance:** Reduction in costs associated with nurse turnover, including recruitment, onboarding, orientation, and productivity loss during ramp-up
- + **Harm-related cost avoidance:** Reduction in costs from preventable adverse events, including extended length of stay, readmissions, and complications that are non-reimbursable under CMS payment programs
- + **Throughput improvements:** Reduction in ED boarding hours, improvement in discharge timeliness, and decrease in overall length of stay, unlocking bed capacity without additional capital or staffing investment
- + **Cost-to-serve efficiency:** Improvement in labor cost per patient day or per unit of service

MUSC's Experience

MUSC's preliminary analyses of the virtual nursing program's financial impact at a systems-level has focused on the measurement and analysis of retention-related savings, labor efficiency, and perceived impact on throughput.

Retention-related cost avoidance: On early-adopter units, year-over-year turnover declined substantially in a one-year period. For example, one unit dropped from 150% in FY24 to 40% in FY25, and overall turnover across adopter units decreased from 47% in FY24 to 30% in FY25. MUSC estimates savings from reduced turnover in early-adopter units to be near \$2.4M based on national estimates of workforce replacement costs.³⁰

Cost-to-serve efficiency: Costing analysis of 2024 data found that 23,516 virtual nursing visits, with a mean visit length of 36.8 minutes, delivered care equivalent to approximately 10.2 full-time nursing positions. "Decrease labor cost per unit of service" is a stated program objective, and formal financial impact analyses are currently underway.

Throughput improvements: In a 2025 survey of nursing perspectives of the virtual nursing program, 62% of bedside nurses reported improved throughput for admissions and discharges with virtual nursing support. Operational throughput metrics such as discharge timeliness are tracked as program KPIs, showing average time to discharge has decreased from 2.8 hours in July 2025 to 2.7 hours in April 2026.³¹

The framework above defines what to measure across each Quadruple Aim domain. The following toolkit provides step-by-step guidance on how to select, evaluate, and operationalize these metrics within the realities of health system data infrastructure and decision-making.

Measurement Toolkit

Virtual nursing programs succeed when measurement is intentional, tied to direct program activities, disciplined, and aligned to clearly defined value hypotheses. Programs that build measurement into their design from the outset are far better positioned to demonstrate value, secure continued investment, and adapt to changing conditions. This toolkit provides step-by-step guidance for health systems seeking to evaluate, refine, and scale their virtual nursing programs.

The toolkit is organized around four steps:

- + **Step 1: Selecting Key Performance Indicators.** Align virtual nursing objectives to organizational priorities and identify the right mix of leading and lagging indicators for which data are already collected and readily available.
- + **Step 2: Designing an Evaluation Approach.** Establish a credible comparison strategy, account for confounding factors, and match evaluation rigor to the decision at hand.
- + **Step 3: Accessing and Validating Data.** Identify data sources, enable structured data capture, and address the data silos and alignment challenges that commonly undermine measurement efforts.
- + **Step 4: Interpreting and Using Results.** Translate findings into audience-appropriate reporting, define decision thresholds, and use results to drive continuous program improvement.

Step 1: Selecting Key Performance Indicators to Measure

Begin by understanding organizational priorities and aligning virtual nursing objectives to those priorities. Virtual nursing can influence outcomes across all four Quadruple Aim domains, but no program can maximize all outcomes simultaneously in early phases. Leadership must define:

- + **What problem are we solving first?** Identify the most urgent or visible pain point the program should address, and consider if a potential solution is scalable and has broad applicability (e.g., to other units, departments).
- + **What does success look like in the near-term and long-term?** Select metrics that will demonstrate early traction within 6–12 months while identifying longer-term indicators that reflect mature program impact over a 2–3 year horizon.
- + **Who is the audience?** Virtual nursing programs serve multiple leader audiences (e.g., nursing, quality, finance, and human resources [HR]), each with distinct priorities. Select a mix of KPIs that speaks to each, recognizing that a metric compelling to a CNO may not resonate with a Chief Finance Officer, and vice versa. Programs that report only to one audience risk losing support from the others.



Examples of Strategic Priority Alignment

Organizational Priority	Example KPIs
Workforce stabilization	Turnover trends, vacancy rates, contract labor utilization
Throughput improvement	Timely discharge, admission cycle time, ED boarding hours
Quality improvement	HAPI, CAUTI, CLABSI rates; sepsis bundle compliance
Financial performance	Labor cost per unit of service, avoided harm costs, agency spend reduction

A comprehensive inventory of potential KPIs by Quadruple Aim domain, including recommended measurement frequency and typical source systems, is included in the [Appendix](#).

Select a focused set of KPIs that align with organizational priorities and are credible to stakeholders. Key considerations include:

- + Distinguish leading from lagging indicators.** Leading indicators (e.g., nursing time returned to bedside, virtual admission completion rate) demonstrate early workflow impact and are typically observable within weeks of implementation. Lagging indicators (e.g., turnover reduction, HCAHPS improvement, cost stabilization) validate sustained value over time but may take 6–12 months or longer to materialize. Leading indicators build early confidence and support continued investment; lagging indicators demonstrate the strategic outcomes that justify program scale.
- + Conduct an early feasibility check.** Assess data availability, data quality, and burden of collection before committing to specific metrics. A KPI that cannot be reliably measured will undermine, rather than support, the program’s credibility. If a high-priority metric is not currently captured in existing systems, determine whether workflow or documentation changes can enable structured data collection before launch.
- + Identify access and attribution constraints.** Some metrics present challenges beyond data availability. HR data such as salary information and individual satisfaction scores may be subject to privacy restrictions that limit reporting granularity. Patient experience data such as HCAHPS scores are typically reported at the unit or facility level and cannot easily be disaggregated to distinguish patients who received virtual nursing support from those who did not. These limitations should be identified early and factored into evaluation design.

MUSC's Experience

MUSC's initial KPI selection was driven by two questions: what does leadership care most about right now, and where can the virtual nursing team credibly move the needle? At the time, the answer to both pointed to workforce economics (particularly in the context of the nursing shortage) and quality of care outcomes aligned with existing organizational pillar goals.

Two early challenges required stakeholder engagement to overcome:

- + **HR data access:** Workforce metrics like salary information and engagement scores reside in HR systems outside the clinical data infrastructure, and are subject to privacy restrictions that limit reporting granularity. Securing access to this data required building relationships with HR leadership and establishing data-sharing agreements that addressed governance concerns.
- + **HCAHPS attribution:** Patient experience scores are reported at the unit level, not the individual patient level, making it difficult to disaggregate results for patients who received virtual nursing support versus those who did not. The team worked with quality and survey stakeholders to establish unit-level cohort comparisons as a credible alternative.

Step 2: Designing an evaluation approach

Once KPIs are selected, the next step is designing a credible evaluation strategy. The goal is not necessarily to achieve academic-grade causal evidence, but to produce sufficiently rigorous and defensible results to inform operational and strategic decisions.

Define the Comparison Strategy

Select the approach best suited to the program's design and available data. Programs with phased rollout plans or matched comparison units will support stronger evaluation designs; programs launching system-wide may need to rely more heavily on pre-post or benchmarking approaches.

- + **Pre-post implementation:** Compare outcomes before and after program launch on the same units
- + **Phased rollout:** Leverage staggered implementation across units to create natural comparison groups
- + **Matched units:** Compare participating units to similar non-participating units controlling for key characteristics
- + **Directional benchmarking:** Use industry benchmarks or published literature to contextualize results where internal controls are unavailable

Account for Confounding Factors

Virtual nursing programs operate within complex, dynamic environments. Evaluation designs must account for factors that could otherwise distort interpretation. These factors cannot be fully eliminated, but they should be documented and considered when interpreting results.

- + Staffing mix changes (e.g., shift in agency vs. permanent staff)
- + Census volatility and seasonal patterns
- + Concurrent quality, throughput, workforce or information technology initiatives
- + Patient population and case mix index variation
- + Unit type differences (e.g., medical-surgical vs. step-down)

Set Expectations for Attribution

Be explicit about what the evaluation can and cannot demonstrate. In most operational contexts, directional evidence of impact, supported by a plausible causal pathway, is sufficient for decision-making. Full causal attribution typically requires controlled study designs that are impractical in live clinical environments.

Where quantitative attribution is difficult to establish, qualitative evidence can play an important supplementary role. Documented examples of clinical “great catches,” patient experience stories, and frontline staff feedback can help illustrate program value in ways that resonate with leadership and build the narrative case alongside quantitative metrics.

Align Rigor to Decision Stakes

The level of evaluation rigor should match the decision at hand:

- + **Pilot continuation:** Directional trends and qualitative feedback may suffice
- + **Enterprise scaling:** Requires more robust quantitative evidence across multiple units or facilities
- + **Academic publication or external reporting:** Demands formal study design, statistical analysis, and peer review

From MUSC's Experience

MUSC's phased rollout—from five units in late 2023 to 57 units across four regions by April 2026—created a natural quasi-experimental structure, but the team learned that evaluation design needs to evolve alongside the program:

- + In the early phases, pre-post comparisons on pilot units were sufficient to show directional trends in turnover and engagement. This level of evidence was credible enough to support continued investment and expansion decisions without requiring formal controls.
- + As the program expanded across units and regions on different timelines, the staggered implementation created natural comparison groups—later-adopting units served as contemporaneous benchmarks for early adopters, even though the phased rollout was driven by operational priorities rather than evaluation design.
- + As the program matured and the evidence base needed to support enterprise-level decisions grew, the research team began introducing formal control groups and more in-depth analyses. Attempting this level of rigor during the pilot phase would have been impractical and unnecessary for the decisions at hand.

Step 3: Accessing and Validating Data

Virtual nursing metrics span multiple source systems, each with different structures, refresh cadences, and ownership. Establishing clear data access and validation practices is essential to producing credible results.

Identify Data Sources

Virtual nursing performance data typically reside across several systems:

- + **HR systems:** Turnover, vacancy, agency and traveler spend
- + **Electronic Health Records (EHR):** Documentation quality, bundle compliance, discharge timing, virtual encounter records, throughput metrics, ED boarding
- + **Staffing systems:** Nurse-to-patient ratios, shift coverage, scheduling data
- + **Operational program data:** Completed virtual nursing tasks, time spent on tasks, documentation audit results
- + **Survey platforms:** HCAHPS, nurse engagement and satisfaction surveys

Create a Data Inventory

For each metric, document the source system, data owner, data format, refresh cadence, and known limitations. This inventory becomes a critical reference for troubleshooting data quality issues and planning dashboard development.

Example Data Inventory Template

Element	Description
Metric	The specific KPI being tracked
Source System	Where the data originate (e.g., EHR, HR system, REDCap)
Data Owner	Individual responsible for data accuracy within the source system
Refresh Cadence	How frequently data are updated (weekly, monthly, quarterly)
Known Limitations	Data quality issues, gaps, or caveats affecting interpretation

Enable Structured Data Capture

Wherever possible, design workflows that produce structured, automated data rather than relying on manual abstraction. Examples include:

- + Smart data elements embedded in virtual nurse documentation templates
- + Standardized handoff templates from virtual to bedside nurses
- + Discrete fields identifying virtual nurse involvement in admissions and discharges
- + Automatic flags in EHRs identifying virtual nurse involvement in patient care
- + Privacy-protected supplemental databases (e.g., Research Electronic Data Capture [REDCap]) when EHR modification is not feasible³²

Address Data Silos and Alignment Challenges

Different source systems often use different unit identifiers. For example, HR data may roll up by cost center, EHR data may be organized by clinical unit, and market-level reporting may use geographic divisions. Before merging datasets across systems:

- + Confirm alignment of unit definitions across sources
- + Validate roll-up logic and aggregation levels
- + Document all assumptions and known discrepancies

In many cases, it is cleaner to evaluate KPIs within a single system rather than merge datasets that introduce alignment risk. When cross-system merging is necessary, ensure consistent granularity across all sources.

MUSC's Experience

Three factors proved essential in building a reliable measurement infrastructure across multiple data systems:

- + **Dedicated analytic ownership:** A data analyst within MUSC's Center for Telehealth worked closely with the nurse leader champion who developed the program, owning the measurement process, from creating metric definitions, determining numerators and denominators, extracting and merging cross-system data, validating results, and building visualizations for stakeholders.
- + **Leadership buy-in for data access:** As noted above, workforce and financial data required leadership support to unlock access. Beyond obtaining permission, the team invested time understanding how each source system collected and aggregated its data so that cross-system merges could produce meaningful and accurate results. As the program scaled, leadership alignment was also critical to engage the nursing informatics team and secure the resources needed to build virtual nursing workflows into the EHR.
- + **Supplemental data capture during the pilot:** As with most health systems, EHR builds take time and MUSC's information system resources are in high demand. Rather than wait for a full workflow build, MUSC developed a dedicated REDCap database for virtual nurses to capture service units, service unit type, time per activity, and patients and units supported. The team also fielded periodic surveys of both bedside and virtual nurses to gather feedback on the program. These early data were critical for understanding program operations and building leadership confidence to support expansion.

Establish Data Governance

Clear data governance ensures accountability, consistency, and trust in reported results. Designate an owner for the overall measurement effort and for each individual metric, establish a defined refresh cadence, and implement a validation process including spot checks and reconciliation procedures. Without explicit ownership, measurement efforts tend to degrade over time as competing priorities draw attention away from data quality.

Step 4: Interpreting and Using Results

The ultimate purpose of measurement is to inform decisions. Results should drive program improvement, stakeholder communication, and strategic investment.

Align Interpretation to Appropriate Time Horizons

Different metrics operate on different timelines. Workflow efficiency gains may be observable within weeks, while retention, quality and satisfaction improvements typically require 6–12 months of sustained program operation. Setting realistic expectations for when specific outcomes will materialize prevents premature conclusions. A program showing no turnover improvement at three months is not failing; it is operating within the expected timeline for that metric. Establishing these expectations with leadership upfront protects programs from being judged against unrealistic benchmarks.

Tailor Reporting to the Audience

Effective communication requires audience-appropriate framing:

- + **Executive leadership:** Focus on trend lines, strategic risk mitigation, and investment-level decisions. Emphasize the connection between virtual nursing outcomes and organizational priorities.
- + **Nursing and operational leadership:** Provide operational detail on workload shifts, coverage patterns, throughput impacts, and unit-level quality trends.
- + **Frontline staff:** Share tangible examples of impact, such as time returned to patient care, reduction in specific burdens, and recognition of program contributions.

Where possible, invest in dashboards that make program performance visible and accessible on an ongoing basis. Dashboard development should begin during program design, not after results start coming in, so that reporting infrastructure is ready to capture impact from day one. Dashboards should be tailored to audience needs: executive-level views focused on trend lines and KPI summaries, and operational views with unit-level detail that supports real-time decision-making. Automated dashboards

connected to source systems reduce manual reporting burden and improve the timeliness and consistency of results.

Define Decision Thresholds and Action Triggers

Establish in advance the conditions under which specific actions will be taken based on program data:

- + **Expansion triggers:** Define the performance benchmarks that justify expanding virtual nursing to additional units or facilities (e.g., sustained reduction in agency utilization or consistent improvement in discharge timeliness over two or more quarters).
- + **Redesign triggers:** Identify indicators that signal the need for workflow adjustment or scope refinement, such as declining virtual admission completion rates or widening gaps between leading and lagging indicators.
- + **Scaling back triggers:** Establish thresholds that warrant reducing or sunseting specific virtual nursing functions that are not demonstrating measurable contribution to priority outcomes.

Defining these thresholds in advance prevents decisions from being made reactively and ensures that program evolution is driven by evidence rather than anecdote.

Use Results to Iterate and Sustain

Measurement should drive a continuous improvement cycle. Use results to adjust scope, workflows, coverage ratios, technology configurations, and governance structures. Program iteration should always be anchored to the original value hypothesis: changes that move the program closer to its defined objectives should be prioritized, while additions that do not clearly contribute to priority outcomes should be scrutinized.

As virtual nursing programs mature, there is a natural tendency to expand the virtual nurse role into adjacent tasks. Incremental workflow additions should be evaluated against their measurable contribution to priority outcomes. Diffusion into one-off or low-impact tasks introduces dilution risk and erodes return on investment over time.

Programs that treat measurement as an ongoing strategic function, rather than a one-time evaluation exercise, are best positioned to sustain impact, adapt to changing conditions, and secure long-term institutional support.

MUSC's Experience

MUSC invested in making program performance visible, accessible, and tied to action:

- + **Dashboard integration:** The dedicated data analyst built a Tableau dashboard within the same environment where executive leaders already access health system KPIs. This meant virtual nursing metrics sat alongside the operational data leadership was already reviewing, reinforcing virtual nursing as an integral part of system performance.
- + **Regular executive reporting:** The nurse leader champion for the program presented virtual nursing metrics at quarterly C-suite leadership meetings. This cadence kept the program visible at the highest levels of the organization, created a recurring forum for discussing results, and ensured that expansion and refinement decisions were informed by data rather than anecdote.
- + **Using results to refine and focus the program:** By tracking how bedside nurses actually used the service and where outcomes shifted, MUSC identified admissions support, discharge teaching, and documentation compliance as the highest-impact use cases. This informed how the program prioritized resources and communicated its value to leadership. When unit-level HCAHPS data revealed underperformance in discharge education, the team was able to respond with a targeted virtual nursing protocol on the affected unit.
- + **Frontline feedback mechanisms:** MUSC launched an internal portal for frontline ideas on virtual nursing. Submissions are evaluated against established performance measures, and only ideas that align with pre-determined KPIs, are scalable, and can generate system-level value move forward.

Conclusion

Virtual nursing is a catalyst to transforming the nursing workforce, requiring attention to program design, implementation, and measurement to capitalize on the dynamic opportunity it presents to revamp how care is delivered. When grounded in a clear value hypothesis and evaluated through a structured measurement framework, virtual nursing is a care redesign strategy capable of delivering measurable impact across workforce stability, patient experience, population health outcomes, and cost performance.

The value framework and measurement toolkit presented in this report are designed to help health systems move from anecdotal evidence of virtual nursing's benefits toward structured, credible evaluation that can justify continued investment, guide program refinement, and support scaling to new units and care settings. Programs that define their value hypothesis upfront, select credible KPIs, and build measurement into their design from the outset are far better positioned to demonstrate impact and sustain institutional support over time.

As virtual nursing programs mature, they will also serve as the operational foundation for integrating emerging capabilities, including AI-enabled documentation, predictive monitoring, and intelligent workflow routing, that can further extend the reach and impact of centralized nursing teams. Health systems investing in virtual nursing infrastructure today are not only addressing immediate workforce and quality challenges but building the care delivery architecture for what comes next.



Appendix & References

Appendix: Measurement Compendium

The following compendium provides an illustrative inventory of potential KPIs organized by Quadruple Aim domain. It intentionally includes metrics beyond what most programs would track in early phases, to support programs at different stages of maturity. Health systems should select from this inventory based on their strategic priorities, data availability, and program design, not attempt to track all measures simultaneously.

	Frequency	Typical Source
Provider Experience KPI		
RN turnover rate	Monthly/Quarterly	HR system
RN vacancy rate	Monthly	HR system
Agency/traveler FTE utilization	Monthly	HR system/Finance
Nurse engagement survey scores	Annual/Biannual	Survey platform
Burnout screening results	Annual/Biannual	Survey platform
Time allocation (bedside vs. admin)	Periodic sampling	Time study/EHR
Virtual mentorship session volume	Monthly	EHR/Scheduling
Retention rate for new graduate nurses	Quarterly	HR system
Career progression into virtual nursing roles	Annual	HR system



	Frequency	Typical Source
Patient Experience KPI		
Fall rate (per 1,000 patient days)	Monthly	EHR/Quality
HAPI incidence rate	Monthly	EHR/Quality
CAUTI rate	Monthly	EHR/Infection prevention
CLABSI rate	Monthly	EHR/Infection prevention
Sepsis bundle compliance	Monthly	EHR/Quality
Medication error rate	Monthly	EHR/Quality
Admission cycle time	Monthly	EHR/Operations dashboard
Discharge cycle time	Monthly	EHR/Operations dashboard
HCAHPS composite scores	Quarterly	Survey vendor
Documentation completeness rate	Monthly	HER
Population Health KPI		
Protocol compliance rate	Monthly	EHR/Quality
Early warning score escalation rate	Monthly	EHR
Rapid response team activation rate	Monthly	EHR/Quality
Sitter utilization hours	Monthly	Staffing system
Specialty consult efficiency	Monthly	EHR
Variation in quality indicators across units and shifts	Quarterly	Quality audit
Readmission rate (30-day)	Monthly	EHR/Claims

	Frequency	Typical Source
Healthcare Costs KPI		
Agency/traveler spend	Monthly	Finance/HR system
Overtime hours and spend	Monthly	HR system/ Payroll
Retention-related cost avoidance (cost of turnover per nurse)	Quarterly	Finance/HR system
Labor cost per patient day	Monthly	Finance
Cost per unit of service	Monthly	Finance
Avoided harm costs (estimate)	Quarterly	Quality/Finance
ED boarding hours	Monthly	Operations dashboard
Average length of stay	Monthly	EHR/Operations dashboard
Bed capacity utilization	Monthly	Operations dashboard
Discharge before noon rate	Monthly	EHR/Operations dashboard

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