

VIZIENT WORKGROUP SERIES:

# Key performance indicators for the management of drug shortages



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# Executive summary

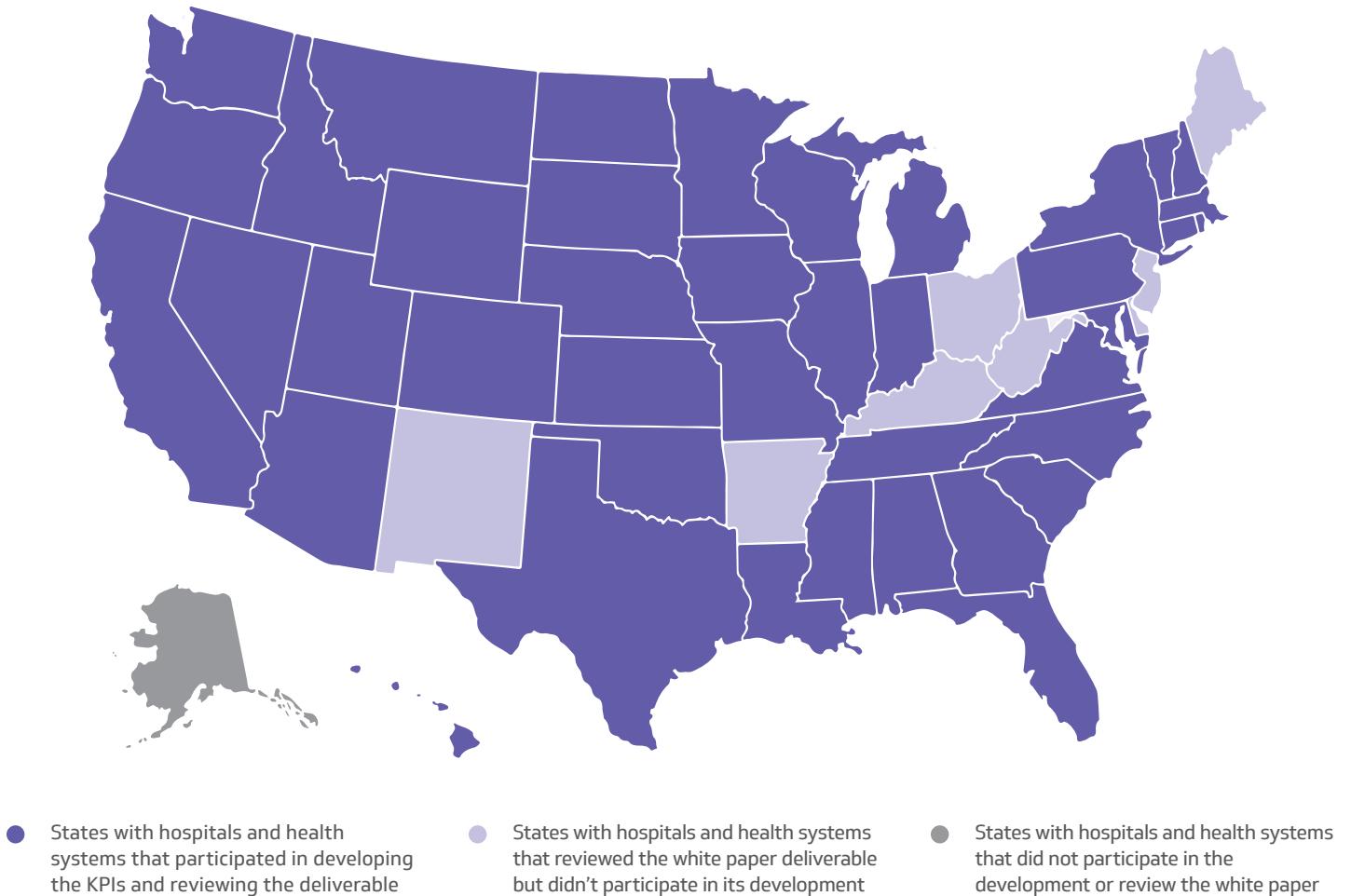
Active drug shortages in the U.S. reached an all-time high in 2024, as reported by the American Society of Health-System Pharmacists.<sup>1</sup> In the Food and Drug Administration's Report to Congress Drug Shortages CY 2023, the agency reported working with manufacturers to successfully prevent 236 drug shortages, while noting pharmaceutical manufacturers continue to experience quality issues and production capacity constraints.<sup>2</sup> Drug shortages impact the ability to provide critical patient care. In a 2023 survey, 24% of respondents were aware of at least one medical or medication error related

to a drug, supply or device shortage.<sup>3</sup> Additionally, drug shortages have negative operational, financial and workforce effects. In 2023, drug shortages were estimated to increase pharmacy budgets by 5% to 20%, including both labor and pharmaceutical purchases.<sup>4</sup>

To help empower and guide hospitals and health systems in the management of drug shortages, several leading practice documents and guidelines have been published over the last several years with varying degrees of adoption.<sup>5-9</sup> However, in review, there are no nationally published metrics or key performance indicators (KPIs) currently available, so hospitals and health systems are unable to consider their performance in the context of similar organizations.

With the goal of developing national KPIs to measure the effectiveness of drug shortage management strategies at the organizational level, Vizient® convened a workgroup that included 49 drug shortage experts, representing 40 hospitals and health systems. Output from the workgroup was reviewed by 18 representatives from an additional 16 hospitals and health systems, thereby representing 49 U.S. states (Figure 1).

Figure 1. National representation of the workgroup series



The workgroup was directed by four common areas of strategic organizational focus related to effective management of drug shortages for hospitals regardless of institution size or care acuity: clinical, financial, operational and workforce. These four strategic organizational focus areas were further defined to better identify unique financial and patient burdens in each. Through participant surveys and virtual meetings, the workgroup developed 16 specific drug shortage KPIs across four categories (Table 1):

- **Inventory:** Adjustments to inventory practices required to manage drug shortages
- **Labor:** Personnel resources required for the day-to-day management of drug shortages
- **Patient safety:** Prioritizing patient care through selection of appropriate alternatives and avoidance of medication errors

- **Stress and burnout of frontline staff:** Ensuring appropriate actions and communications to limit the uncertainty to frontline staff

Drug shortages require a large amount of time and expertise to manage. Many institutions have started to hire positions dedicated to managing the clinical and operational aspects of drug shortages—as of now, they are in the minority. Through the implementation of drug shortage KPIs, the financial, operational, clinical and workforce aspects of drug shortages and the gaps in current practices can be better understood. KPI data may help to develop a business case for drug shortage-specific pharmacy positions and investments in shortage software, and the impact of such investments can be actively monitored.

**Table 1. Identified drug shortage key performance indicators**

Key Performance Indicator <sup>a</sup>	Strategic organizational focus	Internal reporting cadence
<b>Inventory</b>		
Number of periodic automatic replenishment (PAR) adjustments, evaluations and assessments for drugs in shortage (i.e., central pharmacy and automatic dispensing inventory)	Operational	Monthly
Number of medications on formulary being tracked as backorders	Operational	Monthly
Difference in cost of purchasing non-preferred items for drugs in shortage (i.e., wholesale acquisition cost (WAC), non-group purchasing organization (GPO) account, 503B) vs. cost of purchasing preferred items (i.e., 340B, GPO)	Financial	Monthly
<b>Labor</b>		
Hours per shortage spent by shortage groups or committees managing drugs in shortage	Operational	Monthly
Hours per shortage spent moving inventory of drugs in shortage	Operational	Monthly
Hours per shortage spent making information technology (IT) and electronic medical record (EMR) changes to drugs in shortage	Operational	Monthly
Hours per shortage spent compounding and repackaging alternatives of drugs in shortage	Operational	Monthly
Hours per shortage spent by pharmacy buyer investigating or acquiring supply of drugs in shortage	Operational	Monthly
Percentage of pharmacy full-time equivalent (FTE) hours managing drugs in shortage	Operational	Monthly
Number of EMR changes related to drugs in shortage	Operational	Monthly
<b>Patient safety</b>		
Percentage of medication errors due to drugs in shortage or the strategies implemented for managing the drug in shortage	Clinical	Monthly
Percentage of drugs in shortage that lead to alterations to treatment plans (i.e., use of alternative medications, delayed or omitted doses)	Clinical	Monthly
<b>Stress and burnout of frontline staff</b>		
Total number of drugs in shortage with active pharmacy intervention (i.e., compounding, repackaging, adjustments to inventory, clinical criteria for alternatives, etc.)	Operational	Monthly
Percentage of drugs in shortage requiring education to frontline staff (excluding standardized communications and weekly reports)	Workforce	Monthly
Percentage of staff on shortage management team that report burnout or stress due to drugs in shortage	Workforce	Annually
Percentage of frontline staff that report burnout or stress due to drugs in shortage	Workforce	Annually

<sup>a</sup>Drugs in shortage are defined as the medications which have been identified and are being followed as shortages at each institution or system

# Introduction

## Key performance indicators

Healthcare KPIs are defined as quantifiable measures of quality used to track progress with specific, essential processes and outcomes.<sup>10</sup> More simply, KPIs are the measurement units of activities performed to achieve strategic goals. These insights are important as they allow for measurement of performance, align daily activities with strategic goals, provide data to facilitate decision-making, motivate frontline staff as an objective measure of success and allow for identification of further opportunities.<sup>11</sup> The specifics of strategic organizational focuses may differ between institutions but can generally be captured in the following categories.

### Strategic organizational focus areas

- **Clinical:** Quality of patient care
- **Financial:** Cost reduction and revenue enhancement
- **Operational:** Alignment of resources for daily activities
- **Workforce:** Employee retention and alignment with patient needs

An important distinction in understanding KPIs is how they differ from and are similar to metrics. **Metrics** are used to track and assess specific processes, whereas **KPIs** are metrics that provide insight into progress toward strategic organizational goals. In this sense, all KPIs are metrics, but not all metrics are KPIs. Only those metrics that can be “tied” to or provide insight into the progress of strategic goals are considered KPIs. Additionally, suitable KPIs must fit a certain set of criteria, thoughtfully referred to as “SMART”— Specific, Measurable, Attainable, Realistic and Time-bound. Suitable KPIs are clear and focused, quantifiable, reasonable and achievable, directly correlated to the work and are measured in a specific time period.<sup>12,13</sup>

### Metrics vs. KPIs

Metrics are used to track and assess specific processes, whereas KPIs are metrics that provide insight into progress toward strategic organizational goals.



## Background

Consecutive years of record highs in active shortages have led to an increased focus on quantifying the effectiveness of leading practices for the management and mitigation of drug shortages. Vizion provider customers have expressed the need for KPIs specific to drug shortage management to demonstrate their success in managing shortages and to allow them to benchmark themselves to their peers. More importantly — “How do we tell our story to pharmacy leadership and the C-Suite?”

The intent of benchmarking for purposes of drug shortage KPIs is to identify potential gaps in practice or areas for improvement at individual organizations. No recommendation has been made for reporting of shortage KPIs to governmental bodies, as these KPIs haven’t been validated and may vary significantly between organizations of differing sizes and levels of care.

By defining and measuring KPIs for drug shortage management, the outcome will be two-fold:

- Recognition of the resources, including time and clinical expertise, required to manage the day-to-day aspects of shortages
- Objective data to advocate for financial resources to further develop shortage management at institutions

With this in mind, Vizion convened a workgroup series with subject matter expert representation across the country to develop drug shortage KPIs. For this effort, **Drug Shortage KPIs** are defined as those that measure the overall effectiveness of a pharmacy in handling drug shortages, in alignment with strategic organizational priorities.

The overarching goals for pharmacy in the management of drug shortages are: (1) quality of care and (2) fiscal responsibility. In short, the right patient must receive the right drug at the right time. Simultaneously, the drug must be procured, stored, prepared and administered in an affordable and fiscally responsible manner.

The workgroup series, conducted in April 2024, included 49 participants, with various roles throughout the pharmacy department, representing 40 hospitals and health systems (Figure 2). KPI categories for the workgroups were identified based on the financial and quality of care burdens of drug shortages. The four KPI categories, outlined below, included inventory, labor, patient safety and stress and burnout of frontline staff.

- **Inventory burden** is increased when hospitals and health systems implement protective purchasing in anticipation of, or during a shortage, as well as when off-contract (e.g., not via a GPO contract) purchases are required to maintain adequate inventory.

- **Labor burden** associated with shortages can be large. A 2024 Vizient survey identified an additional \$894 million in costs to hospitals and health systems in the management of drug shortages.<sup>14</sup> Labor burden includes weekly meetings to identify and act on shortages, repackaging and compounding alternatives to shortages, implementing IT and EMR changes in guiding frontline staff to select the appropriate alternative, staff resources to physically move inventory throughout the hospital and time spent by pharmacy buyers to identify, investigate and address drug shortages.
- **Patient safety burden** includes medication errors or alterations to treatment plans associated with drug shortages.
- **Stress and burnout of frontline staff burden** include added workload and the uncertainty of adding another variable into already complex patient care.

Figure 2. Roles of the workgroup series participants

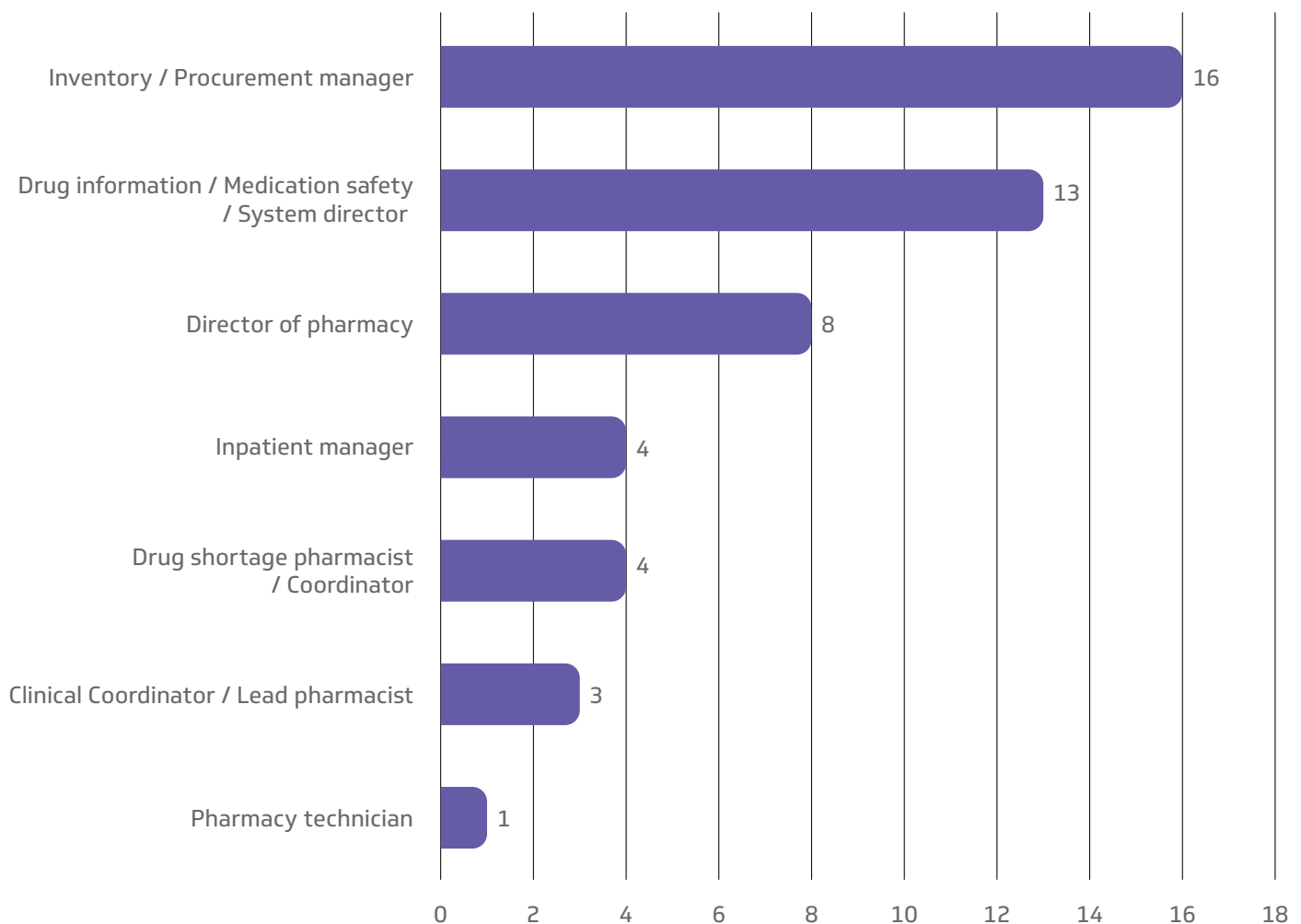


Figure 2 represents the roles within the hospital or health system of each of the workgroup series participants.

From these four primary burden categories, the workgroup's topics were selected. The general structure of the workgroup series is highlighted in Figure 3, and the detailed workgroup series methodology is reviewed in Appendix A. Pre-meeting surveys were used to identify thematic areas for discussion during workgroup virtual meetings. The goal of each meeting was to identify a list of candidate KPIs along with their supporting strategic organizational focus to include in the post-meeting survey. The post-meeting survey was utilized to determine

consensus, 60% approval, for inclusion of the proposed KPI in the final recommendations.

At the start of each workgroup, participants were instructed that they didn't need to identify the leading practices or processes to measure the KPIs, and that the KPIs didn't need to be bound to current technology and data constraints. Participants, however, were encouraged to consider what would be the most meaningful KPIs in the ideal state (i.e., adequate resources and data).

Figure 3. Workgroup series structure

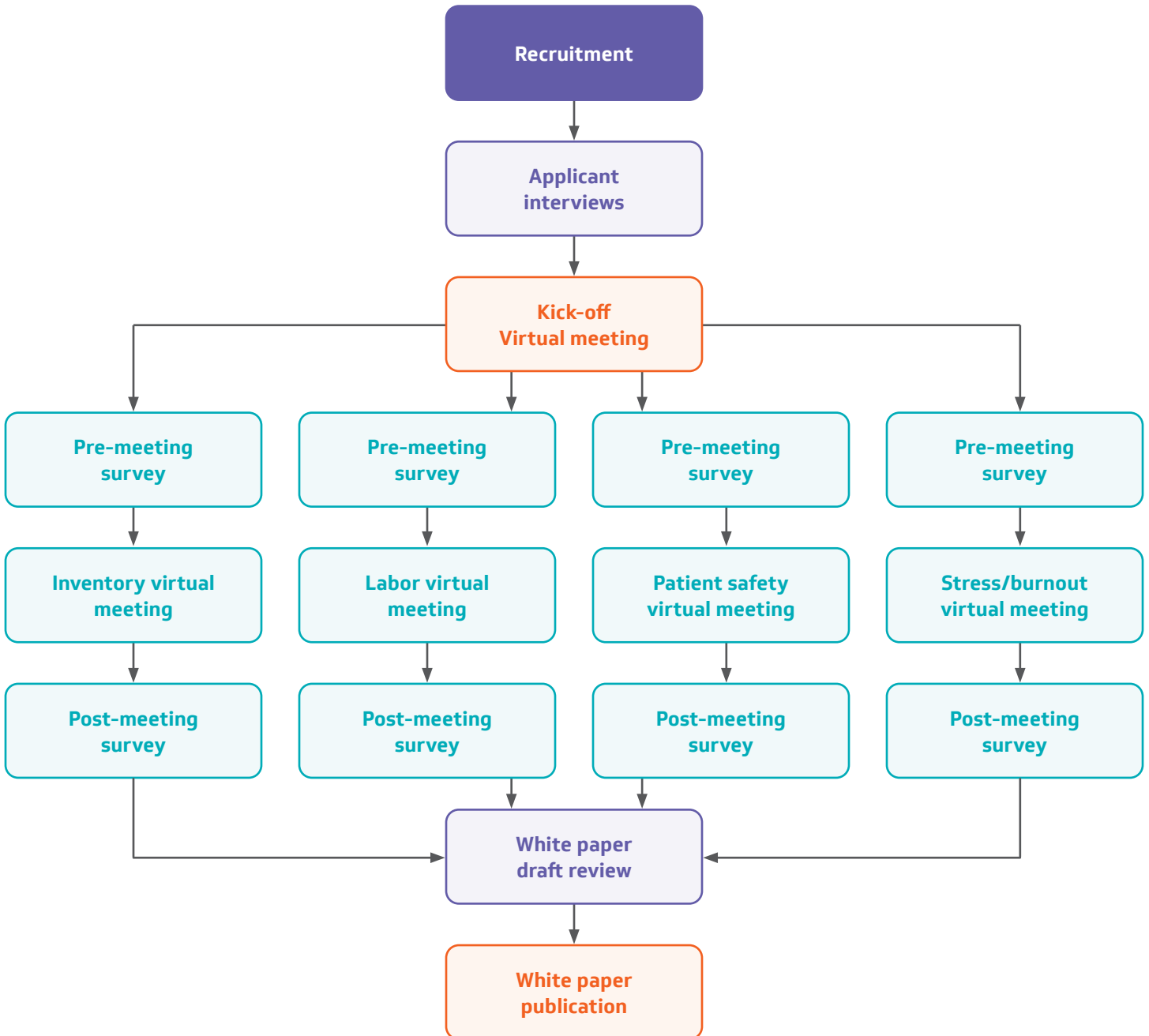


Figure 3 represents the general workgroup structure utilized for development of the KPIs and output.

# Workgroup series findings

Throughout the discussions and referenced in the KPIs is the phrase, 'drugs in shortage,' which is defined as the medications which have been identified and are being followed as shortages at each institution or system.

The full list of KPIs and how each relate to strategic organizational focuses, including the numerator and denominator components, along with the internal reporting cadence of each can be found in [Appendix D](#).

## Inventory workgroup

The inventory KPI workgroup focused on the adjustments to inventory practices that are required to manage drug shortages. The thematic areas identified through review of proposed KPIs submitted by participants included backorders, budgetary impact, days on-hand, expiration, inventory maintenance, PAR adjustments, shortages tracked and stock outs.

The first KPI focuses on adjustments to inventory levels (i.e., PARs) required to maintain and manage inventory during acute shortages. While inventory levels at institutions are generally consistent, in shortage situations, the ability to quickly adjust inventory levels, such as transferring stock to high-utilization locations, pulling back stock to the central pharmacy or increasing PAR levels, can mean the difference between a patient receiving or not receiving the medication.

The second KPI focuses on the number of backorders in place at an institution. Tracking backorders serves two functions – it provides a surrogate measure for the number



of drug shortages an institution is actively experiencing and provides a check to ensure backorders for shortage items are placed. Placement of backorders ensures that the institution receives product from the wholesalers or manufacturers once batches are released. Failure to submit backorders on time can lead to further delays in resupplying, and in the worst-case scenario, a medication may not be available for administration to a patient. Workgroup participants recognized the importance of adjusting PAR levels and tracking backorders as key aspects of the 'operational' strategic focus of an organization.

## Inventory KPIs

1. Number of PAR adjustments, evaluations and assessments for drugs in shortage (i.e., central pharmacy and automatic dispensing inventory), reported monthly
2. Number of medications on formulary being tracked as backorders, reported monthly
3. Difference in cost of purchasing non-preferred items for drugs in shortage (i.e., WAC, non-GPO account, 503B) vs. cost of purchasing preferred items (i.e., 340B, GPO), reported monthly

# Hours per shortage = hours of time spent / number of drugs in shortage

The final inventory KPI centers on the 'financial' strategic organizational focus, or cost differences in purchasing non-preferred products, such as off-contract products or presentations, for drugs in shortage. Purchasing non-preferred items can increase drug acquisition costs. This KPI helps to quantify additional costs for pharmacy and hospital leadership.

The workgroup determined that PARs and medications on backorder should be represented numerically versus by percentage to enable comparison to like institutions for benchmarking purposes. However, for national evaluation, across varying institutional sizes, a percentage is a more useful measure for these two KPIs.

Several KPIs proposed during the virtual meeting were later re-categorized as supporting metrics by workgroup participants on the post-meeting survey. While supporting metrics aren't KPIs, they're necessary to report or calculate the KPI. The required supporting metrics for these KPIs include inventory days-on-hand, number of drug shortages, specific metrics centered on inventory maintenance and number of stockouts.

## Labor workgroup

The labor KPI workgroup focused on the pharmacy personnel resources required for the day-to-day management of drug shortages. The thematic areas identified included the compounding and repackaging of alternatives, IT and EMR changes, physical movement or redistribution of inventory

and staff resources allocated to drug shortage management. The initial discussion during the labor workgroup focused on how additional time required to manage shortages should be captured or recorded for development of KPIs. The options proposed were total hours and hours per shortage. The workgroup selected hours per shortage as the most appropriate unit of measure to capture the additional time required to manage drug shortages. Utilization of hours per shortage enables hospitals and health systems of various sizes to benchmark.

The labor workgroup developed five KPIs to measure the time spent (e.g., hours) managing shortages, inclusive of activities such as participation in shortage groups or committees, physical movement of inventory, IT and EMR changes, compounding and repackaging and pharmacy buyer activities.

Documenting the time dedicated to these five areas of shortage management provides the metrics for the KPI focused on the percentage of pharmacy full-time equivalent (FTE) involved in managing drug shortages to be calculated. This KPI is crucial for justifying the need for additional FTEs to handle drug shortages. Capturing the number of EMR changes related to drugs in shortage is the seventh KPI relating to labor.

The workgroup participants identified the 'operational' strategic organizational focus as the one to which all seven KPIs can be linked.

## Labor KPIs

1. Hours per shortage spent by shortage groups or committees managing drugs in shortage, reported monthly
2. Hours per shortage spent moving inventory of drugs in shortage, reported monthly
3. Hours per shortage spent making IT and EMR changes to drugs in shortage, reported monthly
4. Hours per shortage spent compounding and repackaging alternatives of drugs in shortage, reported monthly
5. Hours per shortage spent by pharmacy buyer investigating or acquiring supply of drugs in shortage, reported monthly
6. Percent pharmacy FTE hours managing drugs in shortage, reported monthly
7. Number of EMR changes related to drugs in shortage, reported monthly



## Patient safety workgroup

The patient safety KPI workgroup focused on ensuring high-quality patient care through selection of appropriate alternatives and avoidance of medication errors. The thematic area identified was quality of patient care. Much of the workgroup's discussion focused on the best methods for integrating medication error tracking and examining how changes in therapy resulting from drug shortages can affect patient treatment plans.

Reporting medication errors is dependent on frontline staff and culture; therefore, medication error reporting rates vary among institutions. Workgroup participants discussed how to ensure a medication error secondary to a drug shortage is captured, such as dosing error versus dosing

error related to a change in formulation following a shortage. Recommendations from the group included adding a shortage-specific category to safety reporting portals, along with stratification for medication error types specific to a shortage (e.g., dosing error, incorrect medication or formulation, delay in care, etc.). For alterations to treatment plans, utilizing EMR alerts to capture alterations along with identifying treatment delays or dose omissions was a suggestion proposed by the workgroup. Hospitals and health systems will need to invest in, and further analyze, their ongoing safety reporting processes to properly identify and record medication errors and changes to treatment plans.

The workgroup identified 'clinical' as the strategic organizational focus for the patient safety KPIs.

## Patient safety KPIs

1. Percentage of medication errors due to drugs in shortage or the strategies implemented for managing the drug in shortage, reported monthly
2. Percentage of drugs in shortage that lead to alterations to treatment plans (i.e., use of alternative medications, delayed or omitted dose), reported monthly



## Stress and burnout of frontline staff workgroup

The workgroup dedicated to the stress and burnout of frontline staff KPIs concentrated on implementing suitable measures and communications to reduce uncertainty for frontline workers. The thematic areas identified were increased workload, communication to frontline staff and stress on the frontline. Discussions within the workgroup centered on the most effective ways to quantitatively assess the additional workload on frontline staff and qualitatively gauge the impact of shortages on each member of the frontline staff.

Four KPIs reached consensus for inclusion, and of those, the total number of drugs in shortage with active pharmacy intervention KPI was identified as being tied to the 'operational' strategic organizational focus, while the three remaining KPIs were tied to 'workforce.'

The KPI related to active pharmacy intervention includes any changes or adjustments to the typical process of selection, preparation and administration of a drug that's in shortage. The workgroup determined that this KPI should be represented numerically. In the setting of comparison to like institutions, with a comparable benchmarking group, numerically is a valuable measure. For national evaluation, across varying institutional sizes, a percentage is a more useful measure for this KPI.

In parallel with the development of the KPIs, the workgroup identified the need for a standard questionnaire to determine the impact of shortages on frontline staff across various organizations. The following are examples of questions that may be incorporated into annual staff surveys to assess staff burnout.

- I feel stressed and overwhelmed with how drug shortages affect my day-to-day responsibilities.
  - Response options will be assessed by a Likert scale (i.e., Strongly agree, Agree, Neither agree or disagree, Disagree or Strongly disagree).
- I know which drugs are in shortage at my institution or where to access resources about which drugs are in shortage at my institution.
  - Response options will be Yes or No.
- For drugs in shortage at my institution, the appropriate stakeholders communicate mitigation strategies and alternative plans, in addition to resolution of shortages, clearly and timely.
  - Response options will be on Likert scale (i.e., Strongly agree, Agree, Neither agree or disagree, Disagree or Strongly disagree).

## Stress and burnout of frontline staff KPIs

1. Total number of drugs in shortage with active pharmacy intervention (i.e., compounding, repackaging, adjustments to inventory, clinical criteria for alternatives, etc.), reported monthly
2. Percentage of drugs in shortage requiring education to frontline staff (excluding standardized communications and weekly reports), reported monthly
3. Percentage of staff on the shortage management team that reported burnout or stress due to drugs in shortage, reported annually
4. Percentage of frontline staff that reported burnout or stress due to drugs in shortage, reported annually

# Discussion

## Next steps

Hospital and health system pharmacists have been managing drug shortages for decades. These KPIs are the first step to the development of national benchmark data to refine and further understand the impact of drug shortages on those facilities whose primary responsibility is caring for patients in their communities (Figure 4). The intent of benchmarking for purposes of drug shortage KPIs is to identify potential gaps in current practice or areas for improvement at individual organizations. It is not for reporting purposes to governmental bodies, as these KPIs haven't been validated and may vary significantly between organizations of differing sizes and levels of care.

Vizient encourages hospitals and health systems to begin collecting their institution's drug shortage KPI data. Operationalization of these KPIs can be complex and challenging given variations in EMRs and will require a

focused effort by pharmacy leadership and stakeholders for implementation. Vizient also recognizes that many of these KPIs can't be collected efficiently in the current state at many institutions and calls on third parties to develop reporting tools that enable institutions to collect drug shortage KPIs without additional burden. Publication of drug shortage KPI data is the next step to benchmarking drug shortage management practices across the nation.

## Forward-thinking initiatives

The drug shortage KPI workgroup series is one of many drug shortage-centric initiatives that Vizient is developing. Vizient has introduced two key concepts to the national conversation on drug shortage management: drug shortage stewardship and protective purchasing.

**Drug shortage stewardship** involves a coordinated effort to implement strategies that reduce the national impact of drug shortages by managing local inventory and other mitigation practices.<sup>15,16</sup> At the facility level, drug shortage stewardship may include the establishment or enhancement of a drug shortage committee, the creation and implementation of mitigation strategies regardless of their impact on the institution, and the use of regional networks to ensure patient access to medications. This approach also encourages the evaluation of the use of essential medications, including those where cost isn't a primary concern, and aims to improve overall medication usage and accessibility.<sup>15,17</sup>

Figure 4. A stepwise approach to developing benchmarking

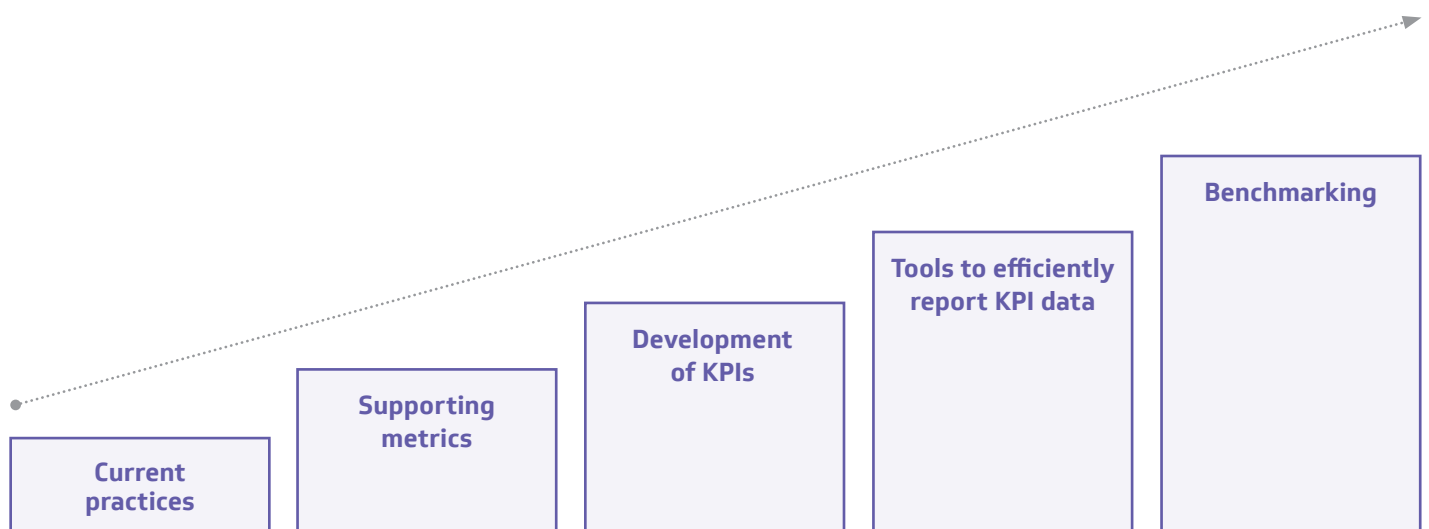


Figure 4 represents the steps to development of benchmarking data. Prior to this publication, only best practices and supporting metrics were available nationally. Following the development and rollout of drug shortage KPIs nationally, benchmarking data can be reported.

**Protective purchasing** involves hospitals or health systems acquiring drugs in quantities that exceed normal usage due to current or anticipated shortages to help ensure their patients continue to receive necessary treatments, but doing so in a manner which doesn't limit the ability of other institutions to access product.<sup>15,18</sup> It's important to recognize that there are appropriate and inappropriate methods of protective purchasing, which vary by hospital or health system. For example, some institutions have implemented an ethical cap on inventory on-hand during a shortage to ensure appropriate protective purchasing and prevent excessive over purchasing or inappropriate protective purchasing. In doing so, the response of these institutions allows for an increase in inventory on-hand of an affected drug on shortage but does so in a way that doesn't prevent other institutions from accessing product.

Regardless of the stability or abundance of supply, when a shortage prompts excessive demand due to inappropriate protective purchasing, the supply chain challenge will be exacerbated, resulting in prolonged and severe shortages. The significance of drug shortage stewardship and protective purchasing is underscored in Figure 5. Theoretically, the proper application of drug shortage stewardship principles and judicious protective purchasing can help the national supply recover and stabilize from shortages, thereby reducing their duration and severity.

An additional principle recommended for drug shortage stewardship is the broad implementation, reporting and eventual benchmarking of these KPIs by hospitals and health systems. Again, the intent of benchmarking is to identify potential gaps in current practice or areas for improvement at individual organizations.

Figure 5. Example of a drug shortage leading to a large increase in demand nationally

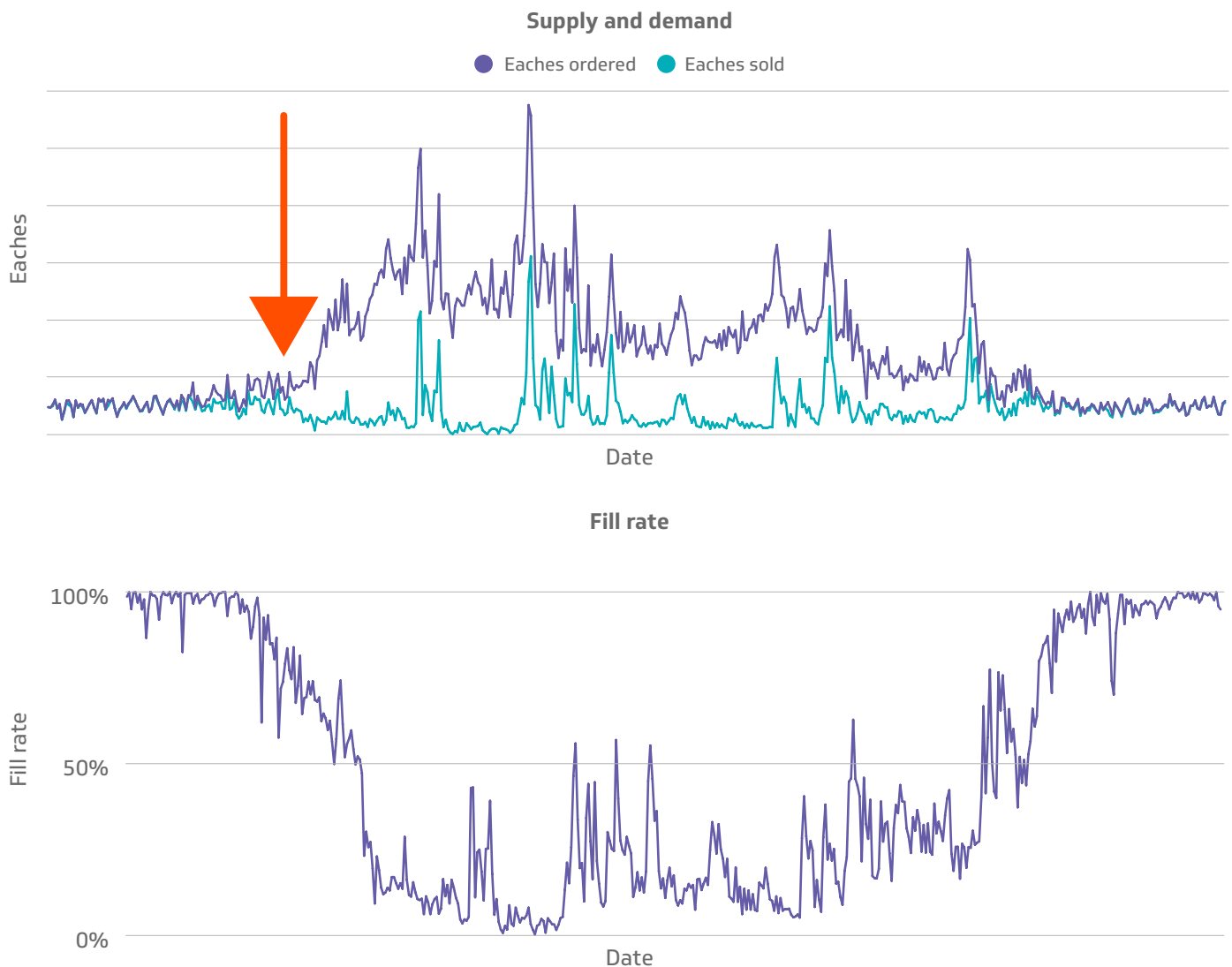


Figure 5 represents a 2-year period where a shortage of a critical life-saving medication was followed by a large increase in ordering, which led to a severe, extended-duration drug shortage. The orange arrow indicates the initial divergence in supply and demand.



## Conclusion

The aim of this workgroup series was to objectively convey the story of drug shortage management to pharmacy leaders and the C-suite by creating KPIs. The goal is to measure the time, resources and clinical expertise needed to handle the daily challenges of shortages that impact providers and patients nationwide. By illustrating the situation with objective data and benchmarks, pharmacy leaders can obtain the necessary evidence to secure financial support for developing and maintaining drug shortage management programs within their organizations. Managing drug shortages demands considerable time and expertise. Increasingly, institutions are employing professionals specifically to handle the clinical and operational aspects, although they still represent a small fraction of all institutions.

Through implementation of these 16-drug shortage KPIs, the financial, operational, clinical and workforce aspects of drug shortages and the gaps in current practices can be better understood. The data gathered from KPIs provides leverage to justify drug shortage-specific pharmacy positions and investments in shortage software and can enable the active monitoring of the impact of such investments. To ensure the highest quality of patient care, benchmarking the management of disease states across institutions is standard practice. Similarly, the same should be done for the management of drug shortages.

# Subject matter experts

## Workgroup participants

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# Endorsements

## Vizient Member Drug Shortage Mitigation Group

The findings from the workgroup series have been endorsed by the Vizient Member Drug Shortage Mitigation Group. The Group comprises pharmacist representation from 11 organizations across the nation who provide guidance and advisement to Vizient concerning drug shortages affecting the membership and the associated mitigation strategies to address impactful shortages.

## Vizient Supply Chain Optimization Committee

The Vizient Supply Chain Optimization Committee also endorsed the findings from the workgroup series. The Committee comprises pharmacist representation from 47 organizations across the nation who provide the Vizient Pharmacy Network with information on new and innovative practices related to optimization of the procurement, cost management, and distribution of medications. The Committee also acts as a communication link to the Vizient pharmacy sourcing program.

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## Appendix A. Workgroup series methodology



Drug shortage pharmacists, medication safety pharmacists, clinical managers or coordinators, inventory managers, and pharmacy technicians or buyers who have oversight or participate in drug shortage management, were recruited to participate through the Vizient Member Networks. Additionally, Vizient solicited participants through its monthly pharmacy newsletter, which is circulated to more than 30,000 individuals. Initially, the workgroup series was planned for 10 to 15 participants, but over the course of the recruitment period, applications were received from over 50 potential participants. All respondents who submitted a curriculum vitae were subsequently interviewed to assess their understanding and experience with shortage management. Based on the strong response to the call for volunteers, Vizient adjusted the format of the workgroup series to allow for participation of all those who applied.

The workgroup series included five virtual meetings — an initial kick-off meeting, an inventory KPI workgroup, a labor KPI workgroup, a patient safety KPI workgroup and a stress and burnout of frontline staff KPI workgroup. To accommodate the large number of participants, a survey was distributed before the kick-off meeting, requesting participants to select up to two KPI workgroups where they felt their experience and insights would be most valuable (Appendix B). A recording and copy of the kick-off meeting slides were sent to all participants with an attached KPI participant guide to reference throughout the virtual meetings (Appendix C).

Once the participants for each workgroup were established, a pre-meeting survey was sent to the participants prior to each of the scheduled virtual meetings. In the pre-meeting survey, participants were asked to answer several questions covering topics such as candidate KPIs for discussion, the strategic organizational goals related to the proposed KPIs, the specific pharmacy interventions and outcomes linked to these KPIs and any supporting leading practices or metrics needed to report on the candidate KPIs.

Vizient staff then reviewed the survey results to identify thematic areas (e.g., quality of patient care, budgetary impact, etc.) to guide discussion during the virtual meetings. Before the virtual meetings, Vizient provided participants with the identified thematic areas, allowing them to familiarize themselves with content that would be the focus of the workgroup meeting. The distribution of participants was as follows: 30 attended the virtual meeting on inventory, 15 focused on labor issues, 18 discussed patient safety and another 15 addressed the stress and burnout affecting frontline staff. This structured approach ensured that each critical area received dedicated attention and discussion, facilitating targeted solutions and strategies.

Each virtual meeting was scheduled for 1.5 hours, with the first 10 minutes scheduled for welcome and introductory remarks, followed by a 45-minute breakout session to discuss and develop candidate KPIs. In the final 35 minutes, the breakout groups reconvened to discuss and finalize the list of candidate KPIs to be included in the post-meeting survey. A post-meeting survey consensus of 60% of participants was required for inclusion of the candidate KPI in the final deliverable. The strategic organizational focus for each KPI was based on the majority of responses gathered in the post-meeting surveys. Only participants able to attend the specific workgroup's virtual meeting were allowed to vote in the post-meeting survey for that KPI category. After each of the four virtual meetings, a post-meeting survey was distributed to the respective workgroup participants. The results from each post-meeting survey were collated and the KPIs that achieved consensus were subsequently reported in this white paper.

### Our approach

The strategic organizational focus for each KPI was based on the majority of responses gathered in the post-meeting surveys.

## Appendix B. Participant guide for the workgroups

### Background of drug shortage KPI workgroups

Vizient has identified four major categories or workgroups for shortage-related KPIs. These workgroups are based on the burden of shortages, both quality of patient care and financially, on hospitals and health systems. Each of the virtual meetings following the kick-off call will focus on a specific workgroup. These meetings will focus on identification of KPIs that can be tied to commonly reported strategic goals of healthcare organizations, including clinical, financial, operational and workforce goals. Additional context for each of the workgroups is provided below; however, please note, the examples aren't all encompassing and will be further explored at each workgroup meeting.

We have included suggested roles for participation, but please don't forgo participation in a specific workgroup based on our suggestions. Selection is entirely at the discretion of each participant.

#### Inventory

The inventory workgroup will focus on inventory-related KPIs, specifically the adjustments to inventory practices required to manage drug shortages (e.g., inventory reporting, off-contract purchasing, 503B utilization, budgetary implications, etc.).

Suggested participants are inventory or procurement managers and pharmacy technician buyers.

#### Labor

The labor workgroup will focus on labor-related KPIs, specifically the personnel resources required for the day-to-day management of drug shortages (e.g., compounding, movement of inventory, packaging, shortage meetings, mitigation strategy development, etc.).

Suggested participants include clinical coordinators, inpatient managers, directors of pharmacy and leadership and/or management roles.

#### Patient safety

The patient safety workgroup will focus on patient-safety-related KPIs, specifically how to ensure patient care through selection of appropriate alternatives and avoidance of medication errors.

Suggested participants include drug information, medication safety, drug use policy pharmacists and clinical coordinators.

#### Stress and burnout of frontline staff

The stress and burnout of frontline staff workgroup will focus on how pharmacy actions and communications of shortages affect the daily activities of frontline staff and how to incorporate them into KPIs. In discussions with provider customers, stress and burnout of frontline staff has been a commonly reported negative outcome associated with drug shortages. Shortages impact not only the pharmacy, but the entirety of the multidisciplinary system within a healthcare organization.

Suggested participants include roles responsible for communication of shortages and leadership and/or management roles.



## Appendix C. KPI explainer document for participants

### Key performance indicators

#### Definition

Healthcare related key performance indicators (KPIs) are quantifiable measures of quality used to track an organization's progress with specific, essential processes and outcomes. More simply, KPIs are the measurement units of activities performed to achieve strategic organizational goals.

#### Why are KPIs important?

- Allow for measurement of performance
- Align daily activities with strategic organizational goals
- Provide data to facilitate decision-making
- Motivate frontline staff as an objective measure of success
- Allow for identification of further opportunities for improved performance

#### What makes a good KPI?

- **S**pecific – clear and focused
- **M**easurable – quantifiable
- **A**ttainable – reasonable and achievable
- **R**ealistic – directly correlated to the work
- **T**ime-bound – measured in a given time period

#### Metric vs. KPI

- All KPIs are metrics, but not all metrics are KPIs
- Metrics are used to track and assess specific processes
- KPIs are metrics that provide insight into progress toward strategic organizational goals

### Drug shortage KPIs

The overarching goals for pharmacy in the management of drug shortages are two-fold, quality of care and fiscal responsibility. The right patient must receive the right drug at the right time. Simultaneously, the drug must be acquired, stored, prepared and administered in the most affordable and cost-conscious manner as possible. The purpose of developing drug shortage KPIs is to be able to demonstrate the value of shortage management roles to C-suite leadership.

### Drug shortage KPI categories

- **Inventory:** Adjustments to inventory practices required to manage drug shortages
- **Labor:** Personnel resources required for the day-to-day management of drug shortages

- **Patient safety:** Prioritizing patient care through selection of appropriate alternatives and avoidance of medication errors
- **Stress and burnout of frontline staff:** Ensuring appropriate actions and communications to limit the uncertainty to frontline staff

### Strategic organizational goals

For a metric to be considered a KPI, it must be “tied to” or provide insight into the progress of a strategic organizational goal. The specifics of each organizational goal may differ between institutions but can generally be captured in one of the four following categories: clinical, financial, operational and workforce.

Strategic organizational focus areas

- **Clinical:** Quality of patient care
- **Financial:** Cost reduction and revenue enhancement
- **Operational:** Alignment of resources for daily activities
- **Workforce:** Employee retention and alignment with patient needs

### Development of KPIs

#### How to think through the development of a meaningful drug shortage KPI

Development of meaningful drug shortage KPIs requires assessment of pharmacy actions in a structured step-by-step process. Use the below guided questions to fill in [Table C1](#).

1. Which category of drug shortage KPIs is the workgroup discussing?
2. Which of the four strategic organizational focuses can the category be “tied to”?
3. What pharmacy-specific intervention is made proactively or in response to a drug shortage?
4. What is the outcome of the intervention?
5. What is the proposed KPI and what measures (i.e., numerator and denominator) are used to calculate the KPI?
6. What are potential supporting metrics required to report the KPI (e.g., medication errors are a supporting metric because if not tracking them, can't measure how many are associated with or related to drug shortages)?
7. Does it meet the criteria of a good KPI (i.e., specific, measurable, attainable, realistic and time-bound)?

Table C1. Structured guidance for KPI development

Workgroup	Strategic organizational focus	Intervention	Outcome	KPI (numerator / denominator)	Supporting metric(s)
Inventory	Clinical / Financial / Operational / Workforce				
Labor	Clinical / Financial / Operational / Workforce				
Patient safety	Clinical / Financial / Operational / Workforce				
Stress and burnout of frontline staff	Clinical / Financial / Operational / Workforce				

## Examples for reference (Metric vs. KPI)

### Metric

#### 1. Days of inventory on-hand

*Metric vs. KPI reasoning:* Although important and necessary information to track, this metric isn't tied to a strategic organizational goal and isn't a KPI

#### 2. Medication errors reported at the institution

*Metric vs. KPI reasoning:* If the metric ties into the KPI, it's considered a supporting metric. For this example, if medication errors aren't tracked, then the errors associated with or related to drug shortages can't be evaluated

### Drug shortage KPI

#### 1. Medication errors associated with or related to drug shortages each month (represented as %)

*KPI vs. Metric reasoning:* This metric fits the criteria of a good KPI (i.e., SMART), and tracks the progress of the strategic organizational goal of high-quality clinical care as it relates to drug shortages specifically

Table C2. Drug shortage KPI example for patient safety

Workgroup	Strategic organizational focus	Intervention	Outcome	KPI (numerator / denominator)	Supporting metric(s)
Patient safety	Clinical	The appropriate clinical alternatives are implemented, and staff are educated on the administration specifics of the clinical alternative	Fewer medication errors and administration errors	% medication errors associated with drug shortages  (Number of medication errors associated with or related to drug shortages each month / Number of total medication errors at the institution each month)	<ul style="list-style-type: none"> <li>Number of total medication errors at the institution each month</li> <li>Number of drug shortages being tracked each month</li> </ul>

## Appendix D. Drug shortage KPIs

Strategic organizational focus	KPI	Numerator	Denominator	Reporting cadence
<b>Inventory workgroup</b>				
Operational	Number of PAR adjustments, evaluations and assessments for drugs in shortage (i.e., central pharmacy and automatic dispensing inventory)	Number of PAR adjustments, evaluations and assessments for drugs in shortage	N/A	Monthly
Operational	Number of medications on formulary being tracked as backorders	Number of medications on formulary being tracked as backorders	N/A	Monthly
Financial	Difference in cost of purchasing non-preferred items for drugs in shortage (i.e., WAC, non-GPO account, 503B) vs cost of purchasing preferred items (i.e., 340b, GPO)	N/A	N/A	Monthly
<b>Labor workgroup</b>				
Operational	Hours per shortage spent by shortage groups or committees managing drugs in shortage	Hours spent by shortage group or committees managing drugs in shortage	Number of drugs in shortage at each institution or system	Monthly
Operational	Hours per shortage spent moving inventory of drugs in shortage	Hours spent moving inventory of drugs in shortage	Number of drugs in shortage at each institution or system	Monthly
Operational	Hours per shortage spent making IT and EMR changes to drugs in shortage	Hours spent making IT and EMR changes to drugs in shortage	Number of drugs in shortage at each institution or system	Monthly
Operational	Hours per shortage spent compounding and repackaging alternatives of drugs in shortage	Hours spent compounding and repackaging alternatives	Number of drugs in shortage at each institution or system	Monthly
Operational	Hours per shortage spent by pharmacy buyer investigating or acquiring supply of drugs in shortage	Hours spent by pharmacy buyer investigating or acquiring supply of drugs in shortage	Number of drugs in shortage at each institution or system	Monthly
Operational	Percentage of pharmacy FTE hours managing drugs in shortage	Total pharmacy FTE hours spent managing drugs in shortage	Total pharmacy department FTE hours	Monthly
Operational	Number of EMR changes related to drugs in shortage	Number of EMR changes related to drugs in shortage	N/A	Monthly

Strategic organizational focus	KPI	Numerator	Denominator	Reporting cadence
<b>Patient safety</b>				
Clinical	Percentage of medication errors due to drugs in shortage or the strategies implemented for managing the drug in shortage	Number of medication errors due to drugs in shortage or the strategies implemented for managing the drug in shortage	Number of total medication errors	Monthly
Clinical	Percentage of drugs in shortage that led to alterations to treatment plans (i.e., use of alternative medications, delayed or omitted doses)	Number of drugs in shortage that lead to alterations to treatment plans (i.e., use of alternative medications, delayed or omitted doses)	Number of drugs in shortage at each institution or system	Monthly
<b>Stress and burnout of frontline staff</b>				
Operational	Total number of drugs in shortage with active pharmacy intervention (i.e., compounding, repackaging, adjustments to inventory, clinical criteria for alternatives, etc.)	Total number of drugs in shortage with active pharmacy intervention (i.e., compounding, repackaging, adjustments to inventory, clinical criteria for alternatives, etc.)	N/A	Monthly
Workforce	Percentage of drugs in shortage requiring education to frontline staff (excluding standardized communications and weekly reports)	Number of drugs in shortage requiring education to frontline staff (excluding standardized communications and weekly reports)	Number of drugs in shortage at each individual institution or system	Monthly
Workforce	Percentage of staff on shortage management team that reported burnout or stress due to drugs in shortage	Number of staff on shortage management team that reported burnout or stress due to drugs in shortage	Total number of frontline staff on shortage management team who completed the survey	Annually
Workforce	Percentage of frontline staff that reported burnout or stress due to drugs in shortage	Number of frontline staff that reported burnout or stress due to drugs in shortage	Total number of frontline staff who completed the survey	Annually



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