












Development and application of quality measures of clinical pharmacist services provided in inpatient/acute care settings

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Abstract

As health care transitions to value-based care, it is more critical than ever to emphasize and quantify the impact on patient outcomes made by inpatient/acute care pharmacists and pharmacist extenders as members of the interprofessional care team. Thus, the American College of Clinical Pharmacy (ACCP) took to task the development of quality measures that were broadly applicable to the diverse inpatient/acute care landscape and important for standardizing practice, measuring impact, contextualizing benefit within the health care landscape, and allowing benchmarking within and between institutions. A framework was established by the writing committee of this paper in order to develop quality measures in a methodical manner. The resulting process led the writing committee to devise 31 foundational quality measures to be used in efforts to champion the pharmacist's role in achieving the quadruple aims in health care. Application and evaluation of quality measure performance as well as limitations and future implications of the measures are addressed to further highlight the evolving role of the inpatient/acute care pharmacist and pharmacist extender.

KEYWORDS

acute care, clinical pharmacist, inpatient, quality measures

1 | INTRODUCTION

In recent years, health care has been evolving from a fee-for-service to a value-based care model, with large payers like the Centers for Medicare & Medicaid Services (CMS) placing greater emphasis on

quality of care.¹ In this evolution, a focus has emerged on interprofessional team-based care with clinical pharmacists increasingly integrated as essential members of the health care team in a variety of clinical disciplines.²⁻⁶ Similarly, within interprofessional teams and health systems, stakeholders increasingly expect pharmacists to be accountable for medication-related outcomes and the medication use system through the provision of clinical pharmacy services, including comprehensive medication management (CMM). Of note, some of the activities required for this accountability are process-related and disconnected from or unrelated to patient outcomes. Regardless, the absence of meaningful patient-related quality metrics for the clinical pharmacist's activities and responsibilities contributes to health care

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administrators' perceptions that the clinical pharmacist is an optional rather than essential member of the interprofessional health care team. Similarly, lack of reimbursement for nondistributive clinical pharmacy activities limits the ability to demonstrate the relationship between the clinical pharmacist's contributions and the financial value and cost savings gained thereby.

Moreover, in a team-based care environment, many of the outcomes are not the sole responsibility of one discipline or one pharmacist's activities but are instead largely attributable to an interprofessional team, leading to the probability of anonymizing a team member's respective work output. Hence, although clinical pharmacist services' positive impact on direct patient care and patient outcomes is well documented in the primary literature, studies have not yet established widely applicable, tangible, and objectively measurable outcomes related to inpatient/acute care pharmacists and pharmacist extender services.⁷ Thus, as health systems evolve around performance measures and incentives for improvement developed by third parties (eg, CMS, National Quality Forum [NQF]), pharmacy departments must focus on efforts that align with these goals. Given these realities, it is important to have meaningful measures that not only highlight the role of the inpatient/acute care clinical pharmacist but also align with the strategic initiatives of the respective health system—keeping in mind that the clinical pharmacist should strive to collect only what is needed and share only what is relevant.⁷

Unfortunately, however, establishing and using well-defined clinical pharmacy quality measures in practice comes with many challenges. Specific to inpatient/acute care clinical pharmacy, variability in acute inpatient site demographics (eg, hospital size, acuity, patient populations served, location), facility type (eg, academic medical center, community hospital, critical access hospital, long-term acute care hospital, cancer hospital), and breadth of clinical pharmacy services offered makes choosing meaningful measures that are applicable across most settings difficult and creates challenges with benchmarking between hospitals and institutions. Moreover, lack of a universally accepted pharmacy practice model has made interhospital comparisons extremely difficult. However, these obstacles should not minimize the necessity and value of establishing and using similar quality measures across the profession of pharmacy.⁸

Integrating perspectives that are important to stakeholders is essential in delivering quality CMM and designing care models that prioritize the activities of perceived value. In fact, with so many perspectives to be considered (health system, payer, patient, quality organization), it is more important than ever to create common measures for inpatient/acute care clinical pharmacists and pharmacist extenders to demonstrate their impact.

2 | PURPOSE

High-performance organizational transformation requires employing continuous process improvement principles through data-driven results to support implementation of a strategic plan that enhances the quality and value of care.⁹ As outlined earlier, inpatient/acute care

clinical pharmacy quality measures are needed that focus on the foundational elements of clinical pharmacy practice in inpatient/acute care settings, are generalizable to all institutions and practice sites, and incorporate aspects of the Institute for Healthcare Improvement (IHI) quadruple aim to optimize health care performance (Figure 1).^{10,11}

The purpose of this paper is to provide foundational clinical pharmacy quality measures that can be used in all inpatient/acute care practice settings. In addition, disease-specific clinical pharmacy quality measures with examples of accompanying process measures and inpatient/acute care activities are provided. Quality measures presented in this paper are from the perspective of the inpatient/acute care clinical pharmacist and pharmacist extender; however, they overlap with the perspectives of payers and other health care providers.

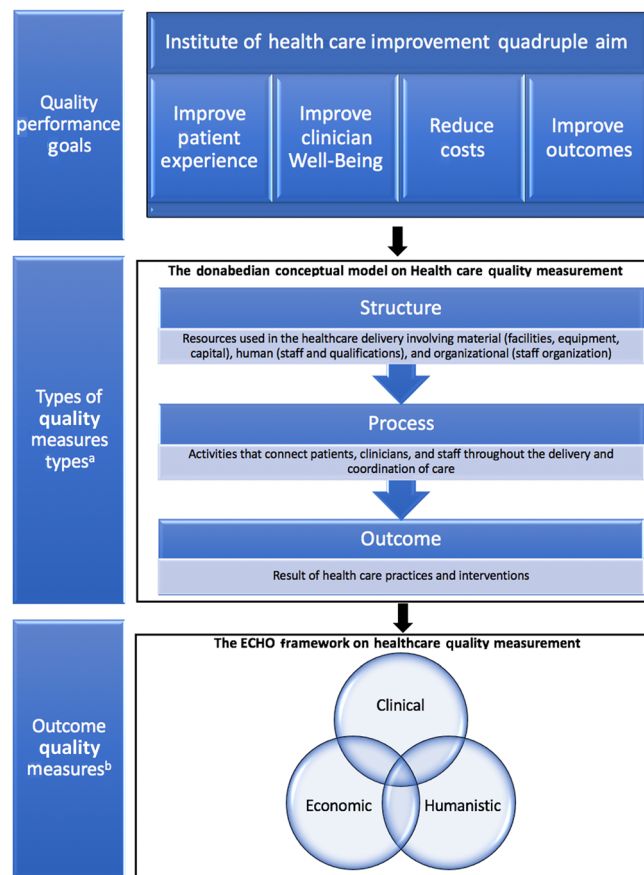


FIGURE 1 Quality health care performance goals and types of quality measure relationship.^{10-12,14,15} ^aSpecific examples of acute care quality measure types may include: (a) structure = pharmacist per patient ratio, patient acuity, case mix index; (b) process = medication management appropriateness consistent with best practices, disease-specific medication administration timeliness, compliance; and (c) outcomes = medication error rates, severity of disease, mortality rates, hospital length of stay, cost per patient case, patient satisfaction score. ^bSpecific examples of acute care quality outcome measures may include: (a) economic = cost-effectiveness, cost-utility, cost-minimization, cost-of-illness; Budget Impact Model; (b) clinical = effectiveness, safety; and (c) humanistic = patient satisfaction, functional status, health-related quality of life. ECHO, Economic, Clinical, and Humanistic Outcomes

Application and evaluation of quality measure performance as well as limitations and future implications of the measures are addressed to further highlight the evolving role of the inpatient/acute care clinical pharmacist and pharmacist extender.

3 | DEFINITIONS

For this paper, the following definitions are used. *Quality measures* are objectively measurable outcomes directly related to patient care, clinical outcomes, or financial benefits that can be adapted and used by inpatient/acute care clinical pharmacists and pharmacy staff. The Donabedian model has served as a systematic, holistic guide to measuring health care quality that encompasses three main types of quality measures: structural characteristics, delivery of care processes, and health care-associated outcomes.¹² A well-developed quality measure must be comprehensive in reflecting foundational and optimal clinical pharmacist or pharmacy staff practices—defining, measuring, and monitoring the structure, process, and outcome (Figure 1).¹³ Although outcome measurement has historically emphasized clinical end points, it is equally important to evaluate economic and humanistic outcomes. Further stratification using the Economic, Clinical, and Humanistic Outcomes (ECHO) framework may aid in the selection of measurable indicators that reflect specific aspects of a process. The ECHO model is a multidimensional approach appealing to various health care stakeholders evaluating performance associated with quality of care and reduction in cost (Figure 1).^{14,15} Finally, quality measures should promote accountability and ownership for improvement in quality of care; be feasibly obtained within the normal flow of clinical care; produce reliable, scientifically sound results; and be readily usable by the intended audience.¹⁶

Metrics are quantitative assessments of quality measures used to track outcomes and benchmark with other organizations. *Pharmacy performance measures* evaluate the quality of pharmacies and assess pharmacist-provided care and pharmacy-based services to determine their contributions toward high-quality, patient-centered care.¹⁷

4 | QUALITY MEASURES AND PERFORMANCE INDICATORS

Although several organizations are geared toward developing quality and performance measures for health care (IHI, LeapFrog, Institute for Safe Medication Practices [ISMP]), few are specific to inpatient pharmacy services (American Society of Health-System Pharmacists [ASHP], Pharmacy Quality Alliance [PQA]). In general, quality measures are derived from evidence and designed to assess care delivery. Development and application of quality measures for inpatient/acute care clinical pharmacy services represents an opportunity to systematically evaluate care provided by clinical pharmacists at a broad level while empowering health systems with the tools to drive performance at the local level. Standardizing quality measures for inpatient/acute care facilitates the design of systems-based

performance improvement models while enabling health care consumers and insurers to make purchasing decisions.

There are three distinct types of quality organizations: (a) independent, (b) regulatory, and (c) governmental. Independent organizations such as the IHI and LeapFrog aim to improve health care delivery and health outcomes by establishing best practices, setting quality benchmarks, and supporting practice implementation. Similarly, the ISMP establishes quality recommendations that specifically pertain to medication safety practices within hospitals and health systems. Regulatory organizations include accrediting bodies (Joint Commission and DNV GL), which serve to evaluate hospitals and health systems for minimal practice standards. Governmental organizations (eg, CMS) function as “aggregators,” performing the functions of both establishing quality standards and providing regulatory oversight. Table 1 presents sample measures and metrics from IHI and LeapFrog related to inpatient/acute care pharmacy.

The ASHP-established Pharmacy Accountability Measures work group, developed in 2014 and updated in 2019, has published recommended inpatient and outpatient quality measures for health-system pharmacy.^{18,19} However, the scope of these measures is limited to safety within six clinical domains (anticoagulant safety, cardiovascular control, glycemic control, antimicrobial stewardship, behavioral health, and pain management), and few are focused on inpatient/acute care clinical pharmacy services.

5 | METHODS FOR QUALITY MEASURE DEVELOPMENT/INCLUSION

With the above-outlined foundational concepts in mind, a framework was established to develop quality measures in a methodical manner. First, the authors performed a comprehensive literature search with a focus on clinical pharmacy outcomes and process measures. Existing measures endorsed by consensus-building organizations like the NQF, CMS, and others were reviewed for their applicability to the inpatient/acute care setting. Resources providing guidance on the development of quality measures in the acute care setting were also used.^{8,20-23} The end result of this review and development process was a list of 137 crude candidate quality measures, some of which were redundant.

In this paper, the authors considered and discussed each candidate outcome and associated measure and determined the necessary key attributes with the following results. An inpatient/acute care clinical pharmacy quality measure must (a) be associated with a relevant impact on clinically important outcomes; (b) reflect the role suited for clinical pharmacists; (c) be attributable to direct patient care; (d) be specific to the pharmacist's patient care process; (e) be aligned with the professional goals, objectives, and practices of clinical pharmacists; (f) consist of an accepted disease-based quality indicator (if applicable); (g) be feasible to measure; (h) be efficient to measure; (i) consist of valuable institutional quality measures related to outcomes, quality, safety, or cost reduction; and (j) be generalizable to all health-system pharmacy types (rural vs urban, community vs teaching) and clinical pharmacists (specialists vs nonspecialists).

TABLE 1 Sample inpatient/acute care quality measures/metrics from stakeholder organizations

Stakeholder	Measure	Metric or standard
IHI ⁴⁸	ADEs	<ul style="list-style-type: none"> • ADEs per 1000 doses • ADEs per 1000 patient-days^a • ADEs per 100 admissions^b • Percentage of admissions with an adverse event^c
IHI	High-alert ADEs	High-alert ADEs per 1000 doses
IHI	Measures to prevent ADEs	<ul style="list-style-type: none"> • Percentage of unreconciled medications • Unreconciled medications per 100 admissions • ADEs per 100 admissions
IHI	Incidence of hypoglycemic episodes	Total number of glucose values ≤ 40 mg/dL per total number of glucose values collected
IHI	Measures to prevent health care-associated infections	<ul style="list-style-type: none"> • Number of methicillin-resistant <i>Staphylococcus aureus</i> infections per 1000 patient-days • Percentage of patients with <i>Clostridium difficile</i>-associated infection
IHI	Prophylactic antibiotic administration	Percentage of surgical patients with on-time prophylactic antibiotic administration
IHI	Appropriate selection of prophylactic administration	Percentage of surgical patients receiving antibiotics consistent with adopted guidelines
IHI	Prophylactic antibiotics continued beyond 24 h	Percentage of surgical patients receiving prophylactic antibiotics who had them discontinued divided by the number of surgical patients who received prophylactic antibiotics
IHI	Ventilator-associated pneumonia	Number of ventilator-associated pneumonias per 1000 ventilator days
LeapFrog	CPOE	Total number of inpatient medication orders entered via a CPOE system divided by the total number of inpatient medication orders
LeapFrog	BCMA	<ul style="list-style-type: none"> • Has implemented BCMA at the bedside in 100% of applicable units • Has achieved at least 95% compliance with scanning patients and medications during administration in applicable units where BCMA is implemented
LeapFrog	Medication reconciliation	<ul style="list-style-type: none"> • Total number of medications obtained by the pharmacist or certified pharmacy technician from the Gold Standard Medication History for adult patients • Total number of unintentional discrepancies in admission and discharge among the gold standard medications identified by the pharmacist • Total number of unintentionally ordered additional medications for the adult patients included in the sample on admission and/or discharge identified by the pharmacist
LeapFrog	Appropriate DVT prophylaxis in women undergoing cesarean delivery	Number of eligible cases who received either fractionated or unfractionated heparin or pneumatic compression devices before surgery divided by the total number of cases undergoing cesarean delivery
AHRQ ⁴⁹	ADE	ADEs per 10 000 stays

Abbreviations: ADE, adverse drug event; AHRQ, Agency for Healthcare Research and Quality; BCMA, barcode medication administration; CMM, comprehensive medication management; CPOE, computerized physician order entry; DVT, deep venous thrombosis; IHI, Institute for Healthcare Improvement.

^aTraditional measure that should be mandatory according to the IHI.

^bNoted by IHI to be a concession to previous Trigger Tool studies. Provides a more easily understood representation of harm for leadership.

^cConvenient way to present the information to lay leadership, though it diminishes the number of events because some patients may have >1 adverse event during a hospital stay.

The authors then used a modified Delphi approach to develop a consensus on 31 quality measures of clinical pharmacy services provided in inpatient/acute care settings.

6 | PROPOSED QUALITY MEASURES AND PERFORMANCE INDICATORS IN INPATIENT/ACUTE CARE CLINICAL PHARMACY PRACTICE

Table 2 presents the 31 core quality measures chosen for clinical pharmacy services in the inpatient/acute care setting. The quality measures chosen followed the universal structure based mathematical percentage, or ratio.²⁴ Each measure consists of a denominator, which is the pool of data to measure, and a numerator, which are the data from the denominator that represent the aspect to be measured. Although not listed, measures should encompass inclusion and exclusion criteria and exceptions to ensure they apply to the appropriate scenario. All of the measures are written to be used for adult or pediatric hospitalized patients and those transitioning into or out of the hospital, including patients presenting to the emergency department (ED) or surgical settings. In addition, the term *pharmacist* is used throughout; however, the activities could be performed by any member of the pharmacy team—pharmacist, pharmacy intern, or other pharmacy support staff or extender as within their scope of practice. The measures also assume that the pharmacist is directly or indirectly involved with the associated care processes. Box 1 provides pharmacist activities and process measures that can affect the 31 core quality measures.

It is important to appreciate that the user can further stratify these measures to evaluate high-risk patient populations (eg, children, older adults), service line, or patient location. This is shown in Table 3, where examples of disease- or specialty-specific measures are annotated and mapped to a core quality measure in Table 2, when appropriate. Although a reduction in indirect costs or cost avoidance may result from the prevention of adverse drug events in some cases, cost was only mapped to the core quality measure if it was associated with a reduction in direct costs.^{25,26} Examples provided in Table 3 are not all-encompassing, are not implied as the most critical or important, and are not intended to supplant previously created collections of activities and measures within specialty areas of practice.^{3,4,23,27}

For context, the term *medication therapy problem (MTP)* is defined as an event or circumstance involving pharmacotherapy that interferes with optimal patient care.²⁸ Further classifications and subclassifications of MTPs are presented in Figure 2.²⁸⁻³¹ Measures related to care coordination are embedded within the 31 core quality measures because care coordination efforts would likely address or prevent several MTPs within the classification. Finally, the authors recognize that quality measure selection will be based on site-specific considerations of practicality and strategic alignment with departmental and institutional goals.

BOX 1 Proposed general pharmacotherapy process measures/pharmacist activities

- Percentage of patients in a facility who receive comprehensive direct patient care from a pharmacist working collaboratively within an interdisciplinary health care team
- Percentage of patients with a daily profile review (active inpatient prescription orders, prior-to-admission prescription and nonprescription medications, and alternative medications such as herbals or supplements)
 - Optimize medication therapy related to efficacy, safety, cost
 - Every medication is clinically indicated
 - Appropriate dose, frequency, duration, route
 - Ensure appropriate documentation of current medications
 - Identify and solve MTPs
 - Identify and solve drug-disease interactions
 - Identify and solve high-risk medication issues in older adult patients for fall and ADE prevention
 - Identify whether any of the patient's current medical problems might be caused by any active or previous medication therapy
 - Identify gaps in therapy; add a medication for an untreated condition or to add further benefit to the regimen
 - Assess the effectiveness of every medication on the basis of clinical and laboratory measures
 - Monitor for adverse effects and toxicities
 - Evaluate total parenteral nutrition and other medications where central line administration is required or recommended for appropriate administration route (central vs peripheral)
 - Evaluate intrathecal administrations for use and documentation of preservative-free products
- Percentage of patients taking medications requiring therapeutic drug monitoring that are evaluated daily (appropriate frequency of monitoring, laboratory timing, interpretation, and medication management changes)
 - Percentage of patients treated by a pharmacokinetic service/patients eligible for pharmacokinetic services
 - Percentage of patients reaching targeted pharmacokinetic goal
- Percentage of patients prescribed a medication with an associated REMS requirement having all REMS components
- Percentage of patients in whom care deviates from medication-related institution protocols/policy

Abbreviations: ADE, adverse drug event; MTP, medication therapy problem; REMS, Risk Evaluation and Mitigation Strategies.

TABLE 2 Quality measures of clinical pharmacy services for the inpatient/acute care setting

Outcome domain	General quality measures	Pharmacy-specific quality measures
Efficacy, safety	Medication therapy review ^a	1. Pharmacist medication review = percentage of patients with a daily pharmacist medication review note/inpatient census 2. Pharmaceutical care plan = percentage of patients with a developed pharmaceutical care plan by a pharmacist/all hospitalized patients
Efficacy, safety	Prevention and mitigation of ADEs/ MTPs related to MEs ^b	3. MTP: indication ^c = percentage of MTPs related to indication resolved by a pharmacist/1000 medication therapy reviews 4. MTP: effectiveness ^c = percentage of MTPs related to effectiveness resolved by a pharmacist/1000 medication therapy reviews 5. MTP: safety ^c = percentage of MTPs related to safety resolved by a pharmacist/1000 medication therapy reviews 6. MTP: adherence ^c = percentage of MTPs related to adherence resolved (with harm prevented) by a pharmacist/1000 medication therapy reviews 7. ME reporting = percentage of MEs reported to an organization's event reporting system or national event reporting (as applicable) by a pharmacist/MEs detected/reported
Efficacy, safety	Reduced VTE ^d	8. DVT/PE chemoprophylaxis = percentage of patients receiving optimal DVT/PE chemoprophylaxis/all hospitalized patients qualifying for DVT/PE chemoprophylaxis
Efficacy, safety	Reduced readmissions	9. Medication coordination = percentage of patients receiving needed high-risk/targeted medications and at the right dose, frequency, duration at care transitions/all patients discharged from an inpatient setting prescribed targeted medications 10. Medication reconciliation = percentage of discharges for whom the discharge medication list was reconciled with the current medication list in the outpatient medical record by a pharmacist/all patients discharged from an inpatient setting 11. Meds-to-beds use = percentage of patients who used the meds-to-beds program at discharge/all patients discharged from an inpatient setting 12. Percentage of medication-related 30-day readmissions ^e /all 30-day readmissions
Efficacy, safety	Preventive/maintenance care	13. Immunization review and administration <ul style="list-style-type: none"> • Percentage of patients receiving an immunization review by a pharmacist/all hospitalized patients • Percentage of patients with appropriately administered immunizations per CDC/ACIP recommendations as indicated/all hospitalized patients identified as needing an immunization 14. Tobacco use treatment provided or offered <ul style="list-style-type: none"> • Percentage of patients screened for tobacco use/all hospitalized patients • Percentage of patients to whom tobacco use treatment was provided, or offered and refused, during hospitalization/patients identified as current tobacco users • Percentage of patients who received tobacco use treatment^f at discharge/patients identified as current tobacco users 15. AUD treatment provided or offered <ul style="list-style-type: none"> • Percentage of patients screened for AUD/all hospitalized patients • Percentage of patients to whom AUD treatment was provided, or offered and refused, during hospitalization/patients identified with an AUD • Percentage of patients who received AUD treatment^g at discharge/patients identified with an AUD 16. OUD treatment provided or offered <ul style="list-style-type: none"> • Percentage of patients screened for an OUD/All hospitalized patients • Percentage of patients with an OUD initiated on medications for opioid use disorder (MOUD), or offered and refused MOUD, during hospitalization/patients identified with an OUD or with a diagnosis of opioid abuse, dependence, or opioid withdrawal at the time of hospitalization not already receiving MOUD • Percentage of patients who received OUD treatment^h at discharge/patients identified with an OUD 17. SUD provided or offered <ul style="list-style-type: none"> • Percentage of patients screened for SUD/all hospitalized patients • Percentage of patients to whom SUD treatment was provided, or offered and refused, during hospitalization/patients identified with a SUD • Percentage of patients who received SUD treatment^g at discharge/patients identified with a SUD 18. Naloxone co-prescribing = percentage of patients prescribed naloxone at discharge/hospitalized patients discharged with an opioid prescription, meeting high-risk criteria for opioid misuse, overdose, or an opioid-associated ADE
Safety		19. Pharmacist introduction/meeting

TABLE 2 (Continued)

Outcome domain	General quality measures	Pharmacy-specific quality measures
	Patient/family-centered engagement	<ul style="list-style-type: none"> Percentage of patients and/or caregivers with a pharmacy introduction/meeting/all hospitalized patients 20. Medication education <ul style="list-style-type: none"> Percentage of patients receiving medication education during hospital stay by a pharmacist/all hospitalized patients Percentage of patients and/or caregivers educated on response to medication therapy or care transitions/all hospitalized patients Percentage of patients receiving medication education at discharge by a pharmacist/All hospitalized patients Median number of patient and/or caregiver meetings with a pharmacist and, as a subset, the length of pharmacist and patient/caregiver meetings/education/All hospitalized patients 21. Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) score = percentage of HCAHPS medication questions ⁱ answered “Always”/“Strongly Agree”/All hospitalized patients
Cost	Medication/pharmacy-specific cost of care to facility margin	22. Mean medication cost per hospitalized patient per day 23. Mean medication cost savings from therapeutic interchange and clinical substitution per day 24. Percentage of medications converted from IV to PO by a pharmacist/Medication orders appropriate for conversion 25. Cost per patient case (eg, length of stay, total patient-days) 26. Reduction in or elimination of regulatory fines or payer holdbacks 27. Reduced inappropriate use of a medication or other therapy ^j 28. Improved facility net direct margin from conversion to agents in the outpatient fee-for-service setting 29. Cost from ADEs thought to cause serious or life-threatening harm and/or escalation of care prevented by pharmacist intervention ^k
Cost	Fiscal improvements	30. Hospital-level, risk-standardized payment associated with a 30-day episode-of-care (relative disease states) 31. Improved MSPB/Medicare beneficiary

Abbreviations: ADR, adverse drug reaction; AUD, alcohol use disorder; CDC/ACIP, Centers for Disease Control and Prevention/Advisory Committee on Immunization Practices; ICU, intensive care unit; IV, intravenous; ME, medication error; MSPB, Medicare spending per beneficiary; MTP, medication therapy problem; OUD, opioid use disorder; PE, pulmonary embolism; PO, oral; QM, quality measure; SUD, substance use disorder; VTE, venous thromboembolism.

^aThese measures can further be stratified according to location or duration of stay (eg, occurrence within 24 hours of admission or any transitions in level of care).

^bCan be described by process: prescribing/dispensing/administration/monitoring.

^cSee Figure 2.

^dThe following are CMS programs related to this measure. Patient Safety and Adverse Events Composite (PSI)—Patient Safety and Adverse Events Composite for Selected Indicators (modified version of PSI 90) is a weighted average of the reliability-adjusted, indirectly standardized, observed-to-expected ratios that include PSI 09 Perioperative Hemorrhage or Hematoma Rate and PSI 12 Perioperative Pulmonary Embolism or Deep Vein Thrombosis Rate; Venous Thromboembolism Measures; Surgical Care Improvement Project (SCIP) Measures.

^eDrug-related hospital or ED readmissions are defined as readmissions potentially resulting from pharmacotherapy. These include readmissions because of MTPs, ADEs, ADRs, and MEs.

^fIncludes referral to outpatient counseling and a prescription for one of the U.S. Food and Drug Administration-approved tobacco cessation medications.

^gIncludes referral to outpatient counseling.

^hIncludes linkage to care and/or a prescription for medications for OUD initiation or continuation after ED or hospital initiation.

ⁱQuestions related to communication about medications on the survey are as follows. (a) Before giving you any new medicine, how often did the hospital staff tell you what the medicine was for? (Never/Sometimes/Usually/Always). (b) Before giving you any new medicine, how often did hospital staff describe possible side effects in a way you could understand? (Never/Sometimes/Usually/Always). (c) When I left the hospital, I clearly understood the purpose of taking each of my medications (Strongly Disagree/Disagree/Agree/Strongly Agree).⁵⁰

^jOffset by the cost of alternative therapy, if any.

^kCost-avoidance method, a formula for calculations, and best practice guidance are published.²⁶

7 | EVALUATION OF CLINICAL PHARMACISTS AND PERFORMANCE OF QUALITY MEASURES

It is imperative that quality metrics accurately tell the story of clinical pharmacists/pharmacy departments and their accountability for

medication management in an organization. Measurement and reporting of quality metrics for clinical pharmacy services using literature-based quality improvement methods are essential to ensure the positive impact of clinical pharmacy programs on reducing the risk of preventable harm and improving medication-related health outcomes.³²⁻³⁴ Although these metrics can be used in evaluating the

TABLE 3 Disease state-specific quality measures and process measures/clinical pharmacist activities

Area of practice	Example disease-specific pharmacy quality measures	Example process measures/clinical pharmacist activities
Anticoagulation	<ul style="list-style-type: none"> Percentage of patients with an anticoagulation-related bleeding event during hospitalization^a (Medication Therapy Problem QM5, Cost of Care QM29) Percentage of patients with an anticoagulation-related new thrombus during hospitalization (as a result of suboptimal therapeutic anticoagulation) (Medication Therapy Problem QM4, Reduced VTE QM8, Cost of Care QM25) 	<ul style="list-style-type: none"> Percentage of patients receiving appropriate anticoagulation therapy (eg, VKAs, DOACs, injectable or IV anticoagulants) (Reduced Venous Thromboembolism QM8, Cost QM27) Percentage of INR time in therapeutic range for patients receiving VKA therapy (Medication Therapy Problem QM4, QM5, Reduced VTE QM8, Cost of Care QM29) Percentage of patients requiring appropriate anticoagulation reversal for elevated INR, bleeding events, or urgent surgery/procedure (Medication Therapy Problem QM3) Percentage of patients with appropriately timed anticoagulation therapy administration in relation to the performance of procedures (eg, epidural) (Medication Therapy Problem QM5, Cost of Care QM29) Percentage of patients with appropriately timed anticoagulation therapy administration when changing from IV to enteral therapy or from enteral to IV (Medication Therapy Problem QM5, Reduced VTE QM8, Cost of Care QM29) Percentage of patients with a new-start anticoagulant counseled before hospital discharge (Medication Therapy Problem QM6, Reduced Readmissions QM12, Patient/Family-Centered Engagement QM20, QM21)
Cardiology	<ul style="list-style-type: none"> Percentage of patients taking >1 QT-prolonging medication with QT prolongation (Medication Therapy Review QM1, Medication Therapy Problem QM5, Cost of Care QM29) Rate of postoperative atrial fibrillation (Cost of Care QM25) 30-Day medication-related risk-standardized readmission rate for patients discharged from the hospital with a principal diagnosis of HF, CABG, and AMI (Reduced Readmissions QM12, Fiscal Improvements QM30) 	<ul style="list-style-type: none"> Percentage of patients undergoing isolated CABG who receive β-blockers within 24 h before surgery (Medication Therapy Review QM1, Medication Therapy Problem QM3, Reduced Readmissions QM9, QM12, Fiscal Improvements QM30) Percentage of patients with AMI prescribed aspirin, β-blocker, ACEI/ARB, and high-intensity statins at hospital discharge⁵¹ (Medication Therapy Review QM1, Medication Therapy Problem QM3, Reduced Readmissions QM9, QM12, Fiscal Improvements QM30) Percentage of patients with HFrEF prescribed an ACEI/ARB/ARNI and β-blocker at hospital discharge (Medication Therapy Review QM1, Medication Therapy Problem QM3, Reduced Readmissions QM9, QM12, Fiscal Improvements QM30) Percentage of patients with atrial fibrillation/flutter receiving antithrombotic therapy for prevention of cardioembolic stroke (Medication Therapy Review QM1, Medication Therapy Problem QM3, Reduced Readmissions QM9, QM12, Fiscal Improvements QM30) Percentage of patients with HF or AMI or initiated on anticoagulation who received discharge counseling by a pharmacist (Medication Therapy Problem QM6, Reduced Readmissions QM12, Patient/Family-Centered Engagement QM20, QM21)
Critical care	<ul style="list-style-type: none"> Percentage of patients meeting sepsis criteria with SEP-1 measures initiated (Medication Therapy Review QM2) Percentage of patients initiated on SEP-1 measures with compliance with the bundle(s)⁵² (Medication Therapy Review QM2) ICU delirium-free days (Medication Therapy Problem QM5, Cost of Care QM25, QM29) ICU length of stay (Cost of Care QM25) 	<ul style="list-style-type: none"> Percentage of patients receiving antibiotics within 60 min from meeting sepsis criteria (Medication Therapy Review QM2) Percentage of patients with acid-suppressive therapy initiated for stress ulcer prophylaxis continued on ICU discharge (Medication Therapy Problem QM3, Cost of Care QM27) Percentage of patients with an antipsychotic medication initiated for ICU delirium continued on ICU discharge (Medication Therapy Problem QM3, Cost of Care QM27) Percentage of mechanically ventilated patients receiving nonbenzodiazepine sedation or analgesation (Medication Therapy Problem QM3, Cost of Care QM25, QM29) Percentage of mechanically ventilated patients with daily evaluation by a pharmacist for wean off opioid or sedative therapy as clinically indicated (Medication Therapy Review QM1, Medication Therapy Problem QM3, Cost of Care QM25, QM29) Percentage of patients with a daily positive delirium screening^b (Cost of Care QM25)

TABLE 3 (Continued)

Area of practice	Example disease-specific pharmacy quality measures	Example process measures/clinical pharmacist activities
Endocrinology	<ul style="list-style-type: none"> • Rate of hypoglycemic events (<40 mg/dL and/or <70 mg/dL) in patients receiving insulin or a PO antidiabetic agent (Medication Therapy Problem QM5, QM7, Cost of Care QM29) • Rate of hyperglycemic events (>200 mg/dL) in patients with a diagnosis of diabetes (Medication Therapy Problem QM5, QM7, Cost of Care QM29) 	<ul style="list-style-type: none"> • Percentage of patients receiving insulin, antidiabetic agents, or corticosteroids receiving a daily medication and blood glucose concentration review (Medication Therapy Review QM1, QM2) • Number of preventable hypo- or hyperglycemic events with a pharmacist intervention related to drug, dose, or monitoring (Medication Therapy Problem QM5, Cost of Care QM29) • Percentage of patients with a new-start insulin or antidiabetic agent counseled before hospital discharge (Medication Therapy Problem QM6, Reduced Readmissions QM12, Patient/Family-Centered Engagement QM20, QM21)
Infectious diseases/antimicrobial stewardship ⁴⁵	<ul style="list-style-type: none"> • Percentage of patients with antimicrobial exposures (Medication Therapy Problem QM3, Cost of Care QM22, QM27) • Percentage of patients with health care facility-associated and hospital-onset <i>C. difficile</i> infection (Medication Therapy Problem QM3, QM5, Cost of Care QM25, QM27, QM29) • Percentage of patients with health care facility-associated and hospital-onset CLABSI (Prevention and Mitigation of ADEs QM3, Cost of Care QM24, QM25, QM29) • Percentage of patients with health care facility-associated and hospital-onset CAUTIs (Cost of Care QM25, QM29) 	<ul style="list-style-type: none"> • Percentage of core elements of antibiotic stewardship achieved—implementation of individual core element met by the institution/organization (evaluated annually) (Medication Therapy Problem QM3, Cost of Care QM27) • Days of antimicrobial therapy for antibacterial agents administered to adult and pediatric patients in medical, surgical, and ICU settings/patient-days in each care location (Medication Therapy Review QM1, QM2, Medication Therapy Problem QM3, QM5, Cost of Care QM27) • Percentage of patients receiving antibiotics for a specific diagnosis (eg, urinary tract infection, pneumonia, skin and soft tissue infection, intra-abdominal, bloodstream, bone and joint) with an appropriate duration of therapy, including inpatient-days of therapy and discharge-days of therapy (if applicable) (Medication Therapy Review QM1, QM2, Medication Therapy Problem QM4, QM5, Cost of Care QM27) • Rate of redundant therapy events and excess exposure (patients simultaneously receiving >1 antimicrobial that has activity against the same type of pathogen) (Medication Therapy Review QM1, Medication Therapy Problem QM3, Cost of Care QM27) • Rate of de-escalation performed with a pharmacist's consultation (Medication Therapy Review QM2, Medication Therapy Problem QM3, QM5, Cost of Care QM27) • Percentage of patients with rhabdomyolysis and/or CPK elevations while receiving daptomycin (Medication Therapy Review QM2, Medication Therapy Problem QM5) • Percentage of patients with appropriate agent/duration for pre- and postsurgical antibiotic use (Medication Therapy Review QM1, QM2, Medication Therapy Problem QM3, QM4, QM5, Cost of Care QM27)
Nephrology	<ul style="list-style-type: none"> • Reduced RBC transfusions in patients receiving erythropoiesis-stimulating agents (Cost of Care QM27) 	<ul style="list-style-type: none"> • Percentage of dose changes in patients receiving erythropoiesis-stimulating agents (eg, epoetin alfa, darbepoetin) identified by a pharmacist (Medication Therapy Review QM1, Medication Therapy Problem QM4, QM5, Cost of Care QM27)
Nephrotoxin stewardship	<ul style="list-style-type: none"> • Proportion of patients with preventable drug-associated AKI related to inappropriate or possibly unnecessary nephrotoxin administration (Medication Therapy Review QM1 and QM2, Medication Therapy Problem QM3, QM5, Cost of Care QM29) • Proportion of patients who have reduced severity or resolution of drug-associated AKI events managed by a pharmacist (Medication Therapy Problem QM5, Cost of Care QM29) • Proportion of patients with drug toxicity associated with inappropriate dosing in 	<ul style="list-style-type: none"> • Number of drugs that require a dose-adjustment review on the basis of kidney function/renal replacement therapy and, as a subset, how many were dosed inappropriately; and separately, how many were identified on the basis of pharmacist review and corrected during consultation (Medication Therapy Review QM1, Medication Therapy Problem QM4, QM5, Cost of Care QM29) • Proportion of patients receiving appropriate pharmacokinetic management dosing and/or monitoring performed by a pharmacist and, as a subset, percentage of patients with nephrotoxicity from drugs requiring pharmacokinetic management (Medication Therapy Review QM2, Medication Therapy Problem QM4, QM5, Cost of Care QM29)

(Continues)

TABLE 3 (Continued)

Area of practice	Example disease-specific pharmacy quality measures	Example process measures/clinical pharmacist activities
	<p>the setting of renal dysfunction or renal replacement therapy (Medication Therapy Review QM1, Medication Therapy Problem QM5 and QM7, Cost of Care QM29)</p>	<ul style="list-style-type: none"> Proportion of patients with kidney function decline or receiving kidney replacement therapy with MEs (Medication Therapy Problem QM5, QM7, Cost of Care QM25) Percentage of patients at high risk of drug-associated AKI in which a pharmacist intervenes for prevention⁵³ (Medication Therapy Review QM1, QM2, Medication Therapy Problem QM3, QM5, Cost of Care QM29)
Neurology	<ul style="list-style-type: none"> Composite stroke medication metrics (all eligible patients who receive all indicated medications) (Medication Therapy Review QM1, Medication Therapy Problem QM3, Reduced Readmissions QM9, QM12, Fiscal Improvements QM30) 	<ul style="list-style-type: none"> Percentage of patients with acute ischemic stroke with a door-to-needle time for tPA therapy ≤ 45 min⁵⁴ (Medication Therapy Review QM2) Percentage of patients with ischemic stroke prescribed statin medication at hospital discharge (Medication Therapy Review QM1, Medication Therapy Problem QM3, Reduced Readmissions QM9, QM12, Fiscal Improvements QM30) Percentage of patients with acute ischemic stroke who received IV thrombolytic therapy who are prescribed aspirin within 24-48 h after stroke onset (Medication Therapy Review QM1, Medication Therapy Problem QM3, Reduced Readmissions QM9, QM12, Fiscal Improvements QM30) Percentage of patients with minor noncardioembolic ischemic stroke (NIHSS score ≤ 3) who did not receive IV thrombolytic therapy who are prescribed dual antiplatelet therapy (aspirin and clopidogrel) within 24 h from symptom onset (Medication Therapy Review QM1, Medication Therapy Problem QM3, Reduced Readmissions QM9, QM12, Fiscal Improvements QM30) Percentage of patients with ischemic stroke with documented atrial fibrillation/flutter who are prescribed antithrombotic therapy at hospital discharge (Medication Therapy Review QM1, Medication Therapy Problem QM3, Reduced Readmissions QM9, QM12, Fiscal Improvements QM30)
Nutrition support	<ul style="list-style-type: none"> Number of days on parenteral nutrition (Medication Therapy Review QM2, Cost of Care QM22, QM25, QM27) Rate of hypo- or hyperglycemic events in patients receiving parenteral nutrition (Medication Therapy Problem QM5, QM7, Cost of Care QM29) Rate of electrolyte abnormalities requiring additional intervention/treatment in patients receiving parenteral nutrition (Medication Therapy Review QM2, Medication Therapy Problem QM3, QM5, Cost of Care QM25, QM29) Percentage of patients receiving parenteral nutrition who develop a central venous catheter infection and/or bacteremia (Medication Therapy Problem QM5, Cost of Care QM25 and QM29) 	<ul style="list-style-type: none"> Percentage of patients with an independent evaluation by a pharmacist on the indication of use, laboratory monitoring, identification of therapy duplication with concomitant medication or fluid administration (eg, potassium chloride, insulin), and therapeutic plan and, as a subset, number of changes identified and addressed by a pharmacist (Medication Therapy Review QM1, QM2, Medication Therapy Problem QM3, QM4, QM5, Cost of Care QM27) Percentage of patients receiving goal macronutrients and/or achieving goal kilocalories (Medication Therapy Review QM1, QM2) Percentage of patients receiving enteral nutrition and medications with drug-drug or drug-nutrient/food interactions identified and addressed by a pharmacist (Medication Therapy Review QM1, Medication Therapy Problem QM4, QM5, Cost of Care QM29)
Oncology ^{23,55}	<ul style="list-style-type: none"> Percentage of patients with chemotherapy-induced adverse events as a result of inappropriately dosed chemotherapy or lack of therapeutic drug monitoring (Medication Therapy Problem QM5, Cost of Care QM29) 	<ul style="list-style-type: none"> Percentage of patients with renal or hepatic dysfunction with chemotherapy dosing adjusted appropriately for renal or hepatic dysfunction (or documentation with rationale for no dose adjustment) (Medication Therapy Problem QM4, QM5, Reduced Readmissions QM9, Cost of Care QM29) Percentage of patients with highly or moderately emetogenic chemotherapy prescribed scheduled and as-needed antiemetic therapies (Medication Therapy Problem QM3, Cost of Care QM29) Percentage of patients counseled on adherence and expected toxicities before start of a PO chemotherapy (Medication Therapy

TABLE 3 (Continued)

Area of practice	Example disease-specific pharmacy quality measures	Example process measures/clinical pharmacist activities
Pain management and opioid stewardship	<ul style="list-style-type: none"> • Percentage of patients with opioid exposures during hospitalization (Medication Therapy Review QM1, Medication Therapy Problem QM3, Preventive/Maintenance Care QM16, Cost of Care QM29) • Total MME exposures per patient during hospitalization (Medication Therapy Problem QM3, QM4, Preventive/Maintenance Care QM16, Cost of Care QM29) • Percentage of patients who were opioid naive at hospital admission discharged from the hospital with an opioid prescription (Medication Therapy Problem QM3, Reduced Readmissions QM9, Cost of Care QM27) • Percentage of patients with acute or postsurgical pain receiving a scheduled multimodal pain management analgesia regimen (Medication Therapy Problem QM3, QM5, Cost of Care QM22, QM25, QM29) • Percentage of patients receiving opioids postoperatively during hospital admission (Medication Therapy Problem QM3, Preventive/Maintenance Care QM16, Cost of Care QM29) • Time to analgesia in patients presenting with acute severe injury or unstable fractures (Medication Therapy Review QM2) • Percentage of patients with administration of naloxone or flumazenil during hospitalization (Medication Therapy Problem QM5, Preventive/Maintenance Care QM18) • Percentage of patients with an opioid-related ileus during hospitalization (Medication Therapy Problem QM5, Cost of Care QM25, QM29) 	<p>Problem QM6, Reduced Readmissions QM12, Patient/Family-Centered Engagement QM20, QM21)</p> <ul style="list-style-type: none"> • Percentage of patients receiving rituximab, obinutuzumab, or ofatumumab with an HBsAg and antibody test completed within 3 mo before initiation of therapy (Medication Therapy Problem QM5, Cost of Care QM29) • Percentage of hospitalized patients with an opioid prescribed in which the opioid order has been evaluated by a pharmacist for appropriateness of indication of use, dosing, and frequency and, as a subset, number of patients with therapy optimized by a pharmacist (Medication Therapy Review QM1, Medication Therapy Problem QM3, QM4, QM5, Cost of Care QM27, QM29) • Percentage of patients initiated on a patient-controlled analgesia regimen with orders reviewed by a pharmacist for appropriateness of basal and bolus dosing and frequency (Medication Therapy Review QM1, Medication Therapy Problem QM4, QM5, Cost of Care QM29) • Percentage of patients with the discharge pain management plan reviewed by a pharmacist to enhance use of multimodal treatment,^c reduce use and duration of opioids, and enhance optimal outpatient pain management and, as a subset, number of patients with therapy optimized by a pharmacist (Medication Therapy Problem QM4, QM5, QM6, Reduced Readmissions QM9, QM12, Cost of Care QM27) • Development of ERAS pathways that optimize nonopioid analgesic therapies and reduce or eliminate opioid use (Medication Therapy Problem QM3, QM4, QM5, Cost of Care QM22, QM25, QM29) • Percentage of patients prescribed an opioid with a concomitant bowel regimen for constipation prevention or treatment (Medication Therapy Problem QM3, QM5, Cost of Care QM25)
Psychiatry	<ul style="list-style-type: none"> • Composite of appropriate laboratory monitoring performed for inpatients receiving lithium/all hospitalized patients receiving lithium (Medication Therapy Review QM2, Medication Therapy Problem QM4, QM5, Cost of Care QM29) • Percentage of patients with schizophrenia or bipolar disorder receiving antipsychotic medication who had a diabetes screening test during the past year (Medication Therapy Review QM2, Medication Therapy Problem QM5, Cost of Care QM29) 	<ul style="list-style-type: none"> • Percentage of patients prescribed lithium with a lithium concentration in the past 6 mo (Medication Therapy Review QM2, Medication Therapy Problem QM4, QM5, Cost of Care QM29) • Percentage of patients prescribed lithium with a serum creatinine concentration in the past 6 mo (Medication Therapy Review QM2, Medication Therapy Problem QM5, Cost of Care QM29) • Percentage of patients prescribed lithium with a thyroid function test in the past 6 mo (Medication Therapy Review QM2, Medication Therapy Problem QM5, Cost of Care QM29)

(Continues)

TABLE 3 (Continued)

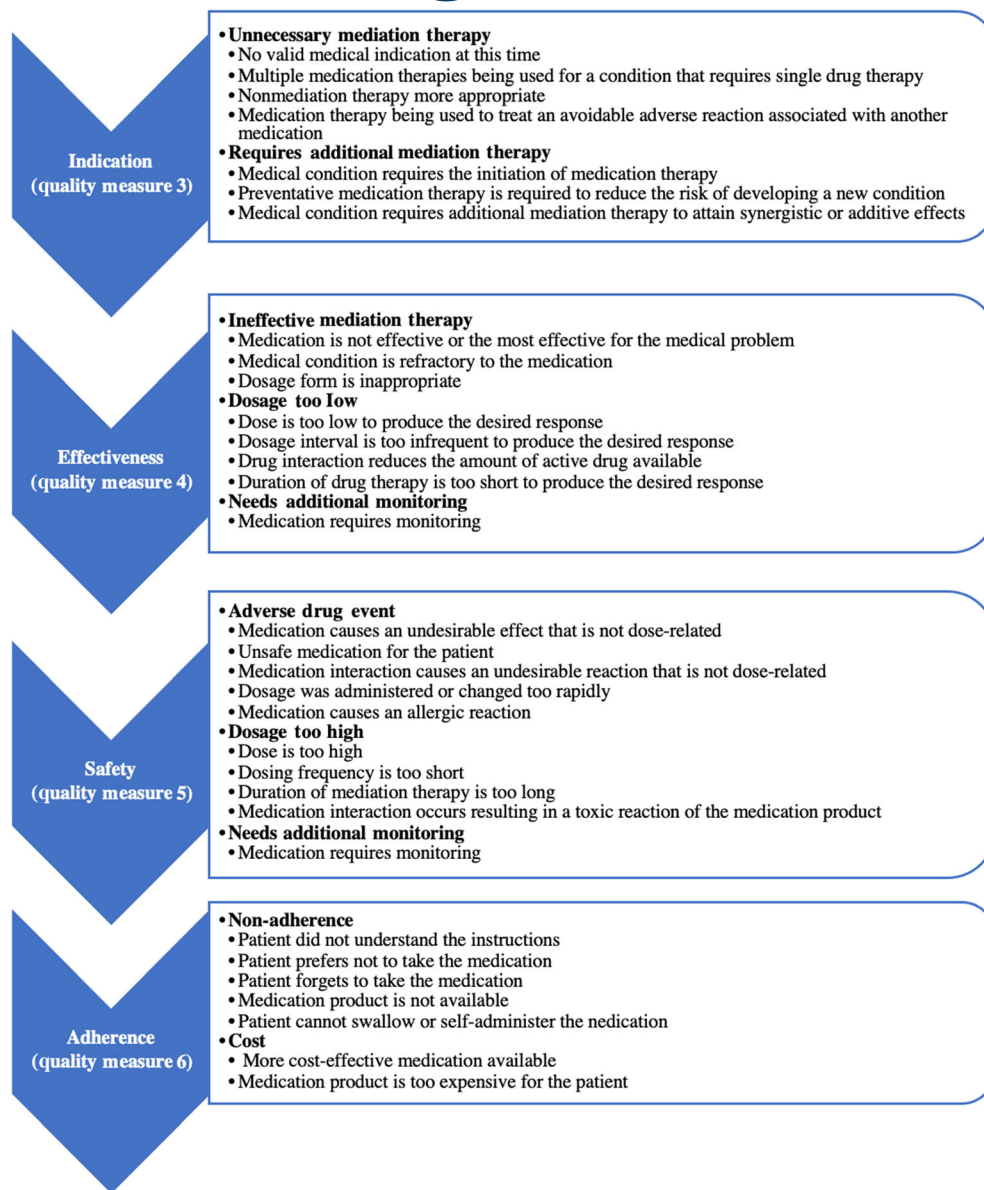
Area of practice	Example disease-specific pharmacy quality measures	Example process measures/clinical pharmacist activities
Pulmonology	<ul style="list-style-type: none"> 30-Day medication-related risk-standardized readmission rate for patients discharged from the hospital with a principal diagnosis of chronic obstructive pulmonary disease (Medication Therapy Review QM1, Medication Therapy Problem QM3, QM6, Reduced Readmissions QM9, QM12, Fiscal Improvements QM30) 	<ul style="list-style-type: none"> Percentage of patients with a new-start inhaler counseled before hospital discharge (Medication Therapy Problem QM6, Reduced Readmissions QM12, Patient/Family-Centered Engagement QM20, QM21)
Preventive/harm reduction/SUD	<ul style="list-style-type: none"> See Table 1 	<ul style="list-style-type: none"> Percentage of inpatients discharged who were screened for influenza vaccine status and were vaccinated before discharge, as indicated (Preventive/Maintenance Care QM13) Percentage of splenectomy or posttransplant inpatient discharges receiving a vaccination review and, as a subset, number of appropriate vaccine administrations (Preventive/Maintenance Care QM13) Percentage of hospitalized patients prescribed an opioid with a concomitant order for as-needed naloxone (Medication Therapy Problem QM3, QM5, Preventive/Maintenance Care QM18, Cost of Care QM29) Percentage of patients on MOUD at hospital admission continued on MOUD without missed doses throughout admission (Medication Therapy Review QM2, Preventive/Maintenance Care QM16, Cost of Care QM25) Percentage of patients receiving a daily evaluation by a pharmacist for AWS with a CIWA-Ar indicating alcohol withdrawal or a PAWSS indicating high risk of moderate or severe AWS as indicated (Medication Therapy Review QM2, Preventive/Maintenance Care QM15, Cost of Care QM25)
Cost of care	<ul style="list-style-type: none"> See Table 1 	<ul style="list-style-type: none"> Pharmacist involvement in inpatient formulary management activities (Cost of Care QM22, QM25, QM27, QM28, Fiscal Improvements QM31) Pharmacist involvement in biosimilar, viscoelastic, and other 340b benefit optimization within the acute care environment (eg, Medicare/340b disproportionate share hospital (DSH), 340b non-DSH class of trade switches with innovator orphan indication) (Cost of Care QM26, QM28) Pharmacist involvement in IV/PO conversions (Medication Therapy Review QM1, Cost of Care QM22, QM23, QM24) Pharmacist involvement in medication stewardship activities (eg, antibiotics, blood factors, opioid) (Medication Therapy Review QM1, Cost of Care QM22, QM23, QM25, QM28, Fiscal Improvements QM31) Use of a similar-cost agent with CMS NTAP status for a hospital inpatient with Medicare vs an agent that does not have CMS NTAP status (Cost of Care QM22, QM23)

Abbreviations: ACEI, angiotensin-converting enzyme inhibitor; AKI, acute kidney injury; AMI, acute myocardial infarction; ARB, angiotensin receptor blocker; ARNI, angiotensin-neprilysin receptor inhibitor; AWS, alcohol withdrawal syndrome; CABG, coronary artery bypass grafting; CAUTI, catheter-associated urinary tract infection; CIWA-Ar, Clinical Institute Withdrawal Assessment for Alcohol-revised; CLABSI, central line-associated bloodstream infection; CPK, creatinine phosphokinase; DOAC, direct oral anticoagulant; ERAS, Enhanced Recovery After Surgery; HBsAg, hepatitis B antigen; HF, heart failure; HFrEF, heart failure with reduced ejection fraction; INR, international normalized ratio; ME, medication error; MME, morphine milligram equivalents; NIHSS, National Institutes of Health Stroke Scale; NTAP, new technology add-on payment; PAWSS, Prediction of Alcohol Withdrawal Severity Scale; SEP-1, sepsis CMS core (measures); SUD, substance use disorder; tPA, tissue plasminogen activator; VKA, vitamin K antagonist.

^aCMS Patient Safety and Adverse Events Composite (PSI)—Patient Safety and Adverse Events Composite for Selected Indicators (modified version of PSI 90) is a weighted average of the reliability-adjusted, indirectly standardized, observed-to-expected ratios that includes PSI 09 Perioperative Hemorrhage or Hematoma Rate and PSI 12 Perioperative Pulmonary Embolism or Deep Vein Thrombosis Rate.

^bConfusion assessment method for the ICU (CAM-ICU) or Intensive Care Delirium Screening Checklist (ICDSC).

^cMultimodal analgesia is the combination of two or more medications and/or nonpharmacologic therapies with different mechanisms for producing analgesia. The goal of multimodal analgesic therapy is to provide greater pain relief, use lower medication doses, use fewer or no opioid analgesics, and have fewer analgesic adverse events.

FIGURE 2 Medication therapy problems^{30,31}


individual clinical pharmacist or pharmacy service, measurement alone is not the end goal but merely a tool for reaching the health system's overall goals.³⁵

Less arduous/less resource-intensive data collection can also produce meaningful observations and lead to significant performance improvement observations. As an example, it is recommended that every patient in an acute care facility receive a thorough medication profile review every day (Figure 3). It is important to evaluate inpatient/acute care quality measures at a cadence that allows for meaningful review and process improvement. This may be continuously, like daily, or quarterly or yearly. Time, resources, and outcome occurrence should be used to determine evaluation frequency. Although the rigors and specific details of each review may be difficult to assess individually, use of clinical decision support tools within the electronic health record (EHR) may guide the clinical pharmacist to document and capture these data with relative ease. As another example,

transition from the ICU is also a prime opportunity for the clinical pharmacist to optimize patient care and capture key quality data (Figure 4). Starting with the end in mind and some advanced reporting capabilities, multiple pharmacy-specific quality outcomes can be generated.

8 | STANDARDIZATION OF CLINICAL PHARMACY PRACTICE IN THE INPATIENT/ACUTE CARE SETTING FOR ACHIEVING OPTIMAL QUALITY AND PERFORMANCE

Standardization reduces unnecessary variation that exists in health care delivery to improve health care quality, increase patient safety, improve the patient experience, and minimize the risk of errors.^{36,37} Lack of standardization and reproducible practice by clinical

1. Alert that fires to the pharmacist's task list:

	TST / 03 / A0	ZZTEST, MALESENIOR	61704493	Overdue	06/09/2021	06:00 CDT	Pharmacy Profile Review Form
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2. Documentation on alert:

*Performed on: 06/09/2021 13:13 CDT

Pharmacy Medication Profile Review Form

Pharmacist profile review completed

No medication-related problems identified

Medication-related problem(s) identified

3. If "Medication-Related Problem(s) Identified" was selected earlier, this screen appears:

Clinical Interventions

Intervention type

Antimicrobial stewardship
 Bedside medication support
 Consult/adjustment
 Dose/Concentration/Regimen adjustment
 Drug interaction question
 Drug misadventure
 Drug-drug interaction
 Formulary therapeutic interchange
 IV to PO conversion (non-antimicrobial)
 Medication adjustment
 Medication discontinuation
 Optimize medication
 Outpatient pharmacy support
 Quality measure
 Reconciliation (admission/admission medication)
 Reconciliation (discharge/discharge medication)
 Regimen adjustment
 Therapeutic substitution
 Therapy ended
 Wrong intervention
 Other

Additional information

Prescriber: [Text Box]

Reasons for prescriber response: [Text Box]

Pharmacist intervention time: < 1 Minute, 1 to 15 Minutes, 15 to 30 Minutes, > 30 Minutes

Associated order(s): [Text Box]

Prescriber response: Accepted, Not accepted

Intervention Specifics

Antimicrobial medication support

Enteric coated/enteric
 Inhalation/PO
 Intracardiac injection
 Severe reactions
 Shake
 Tablets
 Other

Consults/protocols

Aminoglycosides
 Vancomycin
 Teicoplanin
 TRN
 Toxicology
 HIT
 Other

Antibiotic Stewardship

Antimicrobial stewardship

Antibiotic de-escalation
 Antibiotic evolution
 Added antimicrobial agents
 Discontinued antimicrobial agents
 Drug substitutions
 Duration of therapy
 IV to PO conversion
 Cycled/hold/discontinue if agent
 BSI(A2) hold or discontinuation
 Facilitated alternative antibiotic regimen

Antibiotic list for IV to PO

Amoxicillin
 Cephalosporins
 Clindamycin
 Fluoroquinolones
 Levofloxacin
 Linezolid
 Moxifloxacin
 Nafcillin
 Penicillins
 Piperacillin
 Rifampin
 SMO/TMP
 Vancomycin
 Other

Quality

Quality measure

Readmission
 Cardiovascular
 Emergency
 Patient safety and quality outcomes

Patient safety and Quality outcomes

PSI-12 Preventive PE at D/P
 BSA assistance
 CPE encouraged by pharmacist

Incidence

Allergies (ITN) due to send time < 60 minutes
 Septic diagnosis to antibiotic receipt < 60 minutes

Neurology

Allergies (ITN) due to send time < 60 minutes
 STE-1 VTE prophylaxis
 STE-2 Discharged on antimicrobial therapy
 STE-3 Anticoag therapy to start/hold/alter
 STE-5 Antimicrobial therapy by end of hospital day 2
 STE-6 Discharged on stable medication

Cardiovascular

Antibiotic treatment at discharge

FIGURE 3 Elements of a thorough medication profile review

pharmacists has been identified as the "Achilles heel" of the pharmacy discipline.³⁸

Currently available measures have inconsistently been defined, leading to mixed results on measurable effects.²² Reasons for this variability are multifaceted and include lack of clarity in clinical pharmacist interventions/contributions and target patient populations as well as variability in practices across institutions, health systems, and geographic locations. A well-defined and consistently applied patient care process used by clinical pharmacists across all practice settings is an essential component of demonstrating reproducible patient care outcomes.

ASHP launched the Pharmacy Practice Model Initiative (PPMI) in 2011, which provides a vision for safe, effective, efficient, and accountable medication-related care for patients in the hospital and health-system settings.^{39,40}

The PPMI has since been superseded by the ASHP Practice Advancement Initiative, whose objective is to "to significantly advance the health and well-being of patients in hospitals and health systems by developing and disseminating optimal pharmacy practice models that are based on the effective use of pharmacists as direct patient-care providers."^{39,40} The Pharmacists' Patient Care Process established by the Joint Commission of Pharmacy Practitioners, the ACCP Standards of Practice for Clinical Pharmacists, and position papers and guidance documents on foundational pharmacy services in certain practice areas have all been published with the goal of achieving standardization.^{3,4,23,38,41,42} However, much work still needs to be done to implement clinical pharmacy practice standardization within and between institutions and organizations.

Pharmacist Notification-ICU TOC form

*Performed on: 06/09/2021 1107 CDT

Pharmacist Notify

Pharmacist Notification-ICU Care Transition

Pharmacist ICU care transitions review completed

No medication related intervention(s) identified
 Medication related intervention(s) identified

Pharmacist intervention(s) performed under pharmacist's standard scope of practice

<input type="checkbox"/> DC proton pump inhibitor or H2-antagonist-only ICU indicated	<input type="checkbox"/> Modification of enteral medication route / formulation
<input type="checkbox"/> DC chlorhexidine mouth care due to patient being extubated	<input type="checkbox"/> Duplicate medication discontinued
<input type="checkbox"/> DC sedative medications used during mechanical ventilation	<input type="checkbox"/> Order of use clarification on as needed medications
<input type="checkbox"/> DC of Quetiapine if dose 50 mg or less	<input type="checkbox"/> DC meds not allowed to be used in transferred area
<input type="checkbox"/> IV to PO conversion (non-antimicrobial)	<input type="checkbox"/> Pain obs score comments removed from pain meds
<input type="checkbox"/> IV to PO conversion (antimicrobial)	

Other pharmacist intervention(s) performed after discussion with provider

<input type="checkbox"/> Medication discontinued	<input type="checkbox"/> IV fluid adjustment
<input type="checkbox"/> Medication adjusted for renal function	<input type="checkbox"/> Drug-Drug interaction requiring modification
<input type="checkbox"/> Antimicrobial de-escalation	<input type="checkbox"/> Central line discontinuation
<input type="checkbox"/> Antimicrobial escalation	

FIGURE 4 Transition from the ICU

9 | GAPS AND FUTURE DIRECTIONS

To the authors' knowledge, this white paper is the first effort to provide the foundation and scoping for quality measures for inpatient/acute care clinical pharmacy services. The process of developing the quality measures highlighted several major gaps and future directions. First, the authors recognize that efforts will be needed to logistically allow for the collection of these measures and reporting of metrics. For example, one article recommends a framework for defining and documenting MTPs to ensure greater consistency in reporting, tracking, and benchmarking.⁴³

Second, these efforts will need to include, but not be limited to, exploration of current workflows and EHR infrastructure to allow for the efficient but accurate ability to both document measures and collect them (Figures 3 and 4). However, the authors strongly believe these foundational quality measures will push the pharmacy profession toward the goal of being able to accomplish this task. They also recognize that standardized definitions will be necessary to allow for benchmarking between institutions (eg, standardized definition for atrial fibrillation). Moreover, the authors realize testing and research within clinical practice are needed to determine whether the quality measures are truly structurally sound, meet the intended goals, are feasible, and are universally accepted by the pharmacy profession and

the health care community as a whole.^{44,45} One aspect of the IHI quadruple aim not fully addressed is improving provider well-being. Although the authors speculate that improvement in the inpatient/acute care clinical pharmacy quality measures will ultimately improve clinician well-being, they have no specific measure reporting this outcome. However, tools are available that can be used to evaluate and track clinician well-being as it pertains to CMM.^{46,47}

With further research, the authors hope the measures will be dynamic over time, allowing for any natural evolution-based use in research and practice as well as in the context of the changing health care environment. Finally, integrating perspectives that are important to stakeholders is essential in delivering quality clinical pharmacy services and designing care models that prioritize the activities of perceived value. Future iterations should make an effort to engage various stakeholders.

10 | CONCLUSION

As health care continues to transition to value-based care, it is more critical than ever to emphasize and quantify the impact on patient outcomes made by inpatient/acute care clinical pharmacists and pharmacist extenders as members of the interprofessional care team. This

is especially important given that pharmacy services are currently not reimbursed. Development of quality measures that are broadly applicable to the diverse inpatient/acute care landscape is important in standardizing practice, measuring impact, contextualizing the benefit within the health care landscape, and allowing benchmarking within and between institutions. ACCP has sought to develop quality measures of pharmacists to be applied to services provided to patients in inpatient/acute care settings. The writing committee of this paper has devised 31 quality measures to be used in efforts to champion the role of the clinical pharmacist toward achieving the quadruple aims in health care (Figure 1).^{10,11}

CONFLICT OF INTEREST

The authors have no conflict of interest to disclose.

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