Current Status of Prospective Drug Utilization Review

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ABSTRACT

BACKGROUND: The Omnibus Budget Reconciliation Act of 1990 offered the promise that prospective drug utilization review (pDUR) systems would improve the quality of drug prescribing and patient drug use. There is little evidence that this promise has been fulfilled. To the contrary, there is growing evidence that suboptimal use of drugs (in terms of preventable drug-related morbidity) is at least as costly as the prescription drugs themselves. Online computerized pDUR has been the subject of numerous critical examinations in the pharmacy and medical literature. Recent publications have sought to illustrate perceived shortcomings in the DUR systems currently in use.

OBJECTIVE: We focus on the state of the art with regard to pDUR, what is known about its effectiveness, and how emerging technologies may change pDUR and consider the work that may be needed to establish its effectiveness.

SUMMARY: A growing body of literature documents numerous problems and concerns with respect to the quality of DUR criteria, DUR alerts, and the response of health care professionals to these alerts. Problems with the current pDUR “system” can be grouped into those involving technical aspects (e.g., duplicate messaging from in-store and online systems, or message text limitations) and into those involving human aspects, specifically how pharmacists and other health care providers interpret and respond to potential drug therapy problem alerts generated by the electronic systems.

CONCLUSION: DUR is a quality assurance system that holds promise as a tool that, if implemented effectively, could enhance appropriate drug use. We believe a more systematic approach to DUR is needed. Evaluation and management of public and private pDUR systems must link documentation of processes of care, such as pharmacists’ cognitive services, patient interventions, etc. To address technical aspects, we strongly recommend (a) a national effort to validate DUR screen criteria relying upon evidence-based studies and (b) adoption of a minimal set of “critical” pDUR screen criteria by pharmacy service providers and third-party intermediaries, including pharmacy benefit managers. To address the human component of pDUR systems, we advocate (a) adoption of performance standards for pharmacists and (b) explicit remuneration for time spent identifying and responding to drug therapy problems.

KEYWORDS: Pharmacy practice, Prospective drug utilization review, Critical review, DUR, Drug therapy management, Pharmacy payment, Pharmacy claims processing systems

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D rug utilization review (DUR) has been undertaken for as long as pharmacists have been practicing their profession. Pharmacy education has traditionally stressed the importance of the 3 Rs (right drug, right dose, right time). Several factors are different today, such as an immense and rapidly growing body of knowledge, the incorporation of some of this knowledge into criteria for appropriate and inappropriate drug use, and the potential application of support technologies. The advent of point-of-service prescription claims processing and pharmacy benefit management (PBM) services ushered in the promise of a new tool to supplement the skills of the practitioner by allowing real-time, comprehensive, and automated review of prescription medications. DUR promised to reduce or eliminate serious preventable drug-related morbidity, but it has yet to reach its full potential.

Two approaches to DUR are generally recognized: prospective (also known as concurrent) DUR (pDUR) and retrospective DUR (rDUR). Prospective DUR involves reviewing each prescription for an individual patient before it is dispensed to identify drug-related problems such as drug-drug interactions (DDIs) or drug-disease contraindications (when disease information is available or using surrogate indicators), therapeutic duplication, or other potential adverse drug events.1 Retrospective DUR occurs after the prescriptions have been dispensed and “uses practice pattern analysis to identify the use of high-cost drugs, to compare particular classes of drug use by different facilities or providers, or to monitor adherence to pharmacotherapy recommendations from practice pattern guidelines for the treatment of particular diseases.”1

Since its widespread dissemination after the passage of the Omnibus Budget Reconciliation Act of 1990 (OBRA ’90), online computerized pDUR has been the subject of critical examinations in the pharmacy and medical literature.2,3 Articles in this Journal and in others have sought to illustrate both the perceived shortcomings and the opportunities in the DUR systems currently in use.4-6 These research reports raise important questions about the gap between current practice and potential gains from drug utilization review. Some suggest that important potential drug interactions were not detected by pDUR systems.4 Others contend that current DUR systems fail to “promote [the] appropriate use of medications without having to remove useful but clinically interacting agents from the market.”6

In this article, we focus on the state of the art of pDUR, review what is known about its effectiveness, suggest how emerging technologies may change it, and consider what work may be needed to enhance its utility. Other articles have undertaken a similar task focusing on rDUR. For example, Peng et al. described a method used by a PBM to qualify suspected

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DDIs through the application of electronic filters and clinical pharmacist evaluation, reducing the number of suspected serious DDIs by 94%.5

### The Health Care Environment
Managing the ever-increasing prescription drug volumes and expenditures is an ongoing challenge for health care providers, payers, and patients alike. In 2002, drug expenditures increased 13%, culminating the eighth year of double-digit increases.6 Expenditures for prescription drugs have been increasing faster than other components of health expenditures. The 3 principal factors contributing to this trend include utilization (the number of prescriptions dispensed), changes in the mix of new versus older products, and manufacturer price increases. Between 1997 and 2000, increased utilization accounted for 32% of increased expenditures, with changes in product mix and price increases accounting for 46% and 22%, respectively.6

There is also growing evidence that suboptimal use of drugs, including preventable drug-related morbidity (PDRM) and mortality, is at least as costly as the prescription drugs themselves. Two studies, based on decision-analytic models, one published in 19957 and the other in 2001,8 suggest that between $76 and $177 billion dollars could be involved in the suboptimal use of drugs. Most of these costs were attributed to additional hospital and nursing home admissions.

DUR holds the promise that, if implemented effectively, it could partially address this problem by enhancing the appropriate use of drugs. Improved safe and effective drug use may restrain rising drug expenditures and, by reducing PDRM, reduce hospital admissions and other avoidable health care costs.

### Fundamental Elements of Drug Utilization Review
DUR is a technique used by prescription drug program administrators and PBMs to manage drug utilization. DUR is “a process used to assess the appropriateness of drug therapy by engaging in the evaluation of data on drug use in a given health care environment against predetermined criteria and standards. If therapy is determined to be inappropriate, interventions may be needed with specific patients or providers to optimize drug therapy.”12 Appropriately selected criteria for medication use are “predetermined elements of drug use supported by labeling approved by the U.S. Food and Drug Administration, compendia, and peer-reviewed literature, developed by qualified health professionals against which aspects of quality, medical necessity, cost-effectiveness, and clinical outcomes of drug use may be compared.”12

DUR can be performed either prospectively or retrospectively, and the focus of each approach is quite different. RDUR examines drug use after the drug has been dispensed and often occurs after the drug has been consumed. The principal aim of rDUR is to discern patterns of inappropriate or suboptimal drug use, which may result in PDRM, and engage in interventions with providers to prevent future unfavorable or undesirable outcomes. Because of its retrospective nature, this form of DUR is less well-suited to alert practitioners to prevent potentially avoidable problems in current patients. While rDUR interventions can be used to influence the use of drugs in current patients, the majority of the value of rDUR lies in identification of patterns of prescribing or drug use that may lead to future PDRM. Additionally, rDUR aids in formulation of effective intervention strategies and in assessing intervention results. RDUR analyses may involve profiling the use of high-cost drugs, comparing the use of classes of drugs (e.g., sedatives and hypnotics in nursing home residents), or reviewing the lack of prescribing of particular classes of drugs to treat a given disease (e.g., beta-blocker therapy after myocardial infarction).

Ambulatory pDUR is performed when a drug is dispensed to a patient. Reviews are typically conducted electronically during the claims adjudication process before the product is dispensed. This review is designed to identify potential problems such as DDIs, therapeutic duplication, inappropriate dosage, or duration of therapy. When the pharmacist is alerted to one or more of these potential problems, he or she is expected to use professional judgment to determine an appropriate intervention, which may include counseling the patient or alerting the prescriber. Interventions may result in the prescription being dispensed as written, changed, or not filled.

Most pharmacy practice computer systems include pDUR software that checks all drug history and selected medical information (allergies, adverse effects, etc.) that may be available. However, this information may not be complete, since many patients obtain pharmacy services from more than one pharmacy. Third-party payers or PBMs therefore typically perform pDUR as part of their claim administration services. This computerized pDUR has access to the patient’s entire history of pharmacy (and sometimes medical) claims, thereby allowing for more comprehensive review.

### Evolution of Drug Utilization Review
DUR has undergone extensive technological evolution. The HEW Task Force on Prescription Drugs first identified DUR in 1968 as a process both to improve the quality of care and to reduce avoidable expenses.13 Originally, ambulatory pDUR was primarily a paper system relying only on patient and drug reference information available at a specific pharmacy. Now it is a computer-based system that has the potential to integrate patient data across treatment sites and provide evidence-based decision support algorithms for pharmacotherapy decisions.

DUR under government and private sector programs developed different emphases. In a review of 16 private sector programs, Kralewski et al.14 concluded in 1994 that “the magnitude of drug utilization problems may be vastly underestimated. Clinical issues are substantial; however, most private programs focused on matters of contractual adherence and payment arrangements under a patient’s insurance policy.” According to
Kralewski, insurance plans were reluctant to risk adverse patient or physician reactions by intruding into the drug therapy process. Consequently, minimal efforts in private sector DUR activity were devoted to drug therapy or interventions to improve appropriate use of drugs. Kralewski also reported in 1994 that “most programs focus on cost issues and devote only minimal effort to corrective action, toward the least powerful stakeholder in the field, the pharmacist.”

Within the public sector, federal legislation hastened widespread adoption of DUR for government-sponsored programs. Both pDUR and rDUR have been required for state Medicaid programs since January 1993 under language contained in the OBRA ’90 legislation. The focus of the OBRA ’90 requirement was therapeutic appropriateness. Specific objectives were to (1) detect and prevent fraud and abuse, (2) reduce medication-related hospitalizations, and (3) prevent patient exposure to known drug, food, or disease interactions or contraindications. OBRA ’90 rapidly expanded the practice—and awareness—of DUR in all 50 states.

### Problems With Drug Utilization Review

As pharmacists developed experience with the electronic technology supporting computer-assisted, in-pharmacy and online pDUR, researchers gained a better understanding of the limitations of these systems. However, systematic, comprehensive, and thorough evaluations of DUR systems have been slow to evolve. Soumerai and Lipton1 noted in a 1995 commentary: “Although computer-based drug utilization review has been mandated for nationwide use in the public sector and is popular in the private sector, there are no valid scientific data to support its claimed benefit.”

More recently, Chrischilles et al.3 conducted a MEDLINE review of the published evidence of the effectiveness of “computer-aided drug utilization review.” The review included 1 randomized controlled study and 4 nonrandomized studies. In the authors’ assessment, the implications from this small number of studies was that the evidence was inconclusive. The nonrandomized studies included a single group posttest, a prospective case series, a pretest/posttest study without a comparison group, and a limited number of observational studies from which only 2 were conducted within community settings.

In the randomized controlled trial, both the study and control groups of pharmacists received alerts from their in-pharmacy system, but the study group also received online pDUR alerts from the payer at the time of claim adjudication. The primary study variable was the incremental difference between groups in the effect of online pDUR on drug therapy changes and health outcomes. The data showed no difference between the groups, partly because pharmacists in the control group took action even though they received no online alerts. The conclusion from this study is that the evidence for online pDUR is too limited to judge its value.

### Prospective Drug Utilization Review Criteria

Adequacy of the screen criteria that provide the logic for pDUR systems has been and continues to be a major concern. For example, commonly used compendia do not agree on the amount of risk inherent within specific drug-drug combinations. Fulda et al.16 reported discrepancies in the listing and clinical significance ratings for DDIs involving angiotensin-converting enzyme inhibitors, beta-blockers, benzodiazepines, calcium channel blockers, and nonsteroidal anti-inflammatory drugs in 5 widely used information sources. These sources included U.S. Pharmacopeia Drug Information, American Hospital Formulary Service Drug Information, Hansten and Horn’s Drug Interaction Analysis and Management, Drug Interaction Facts (Facts and Comparisons), and the Micromedex DRUG REAX system. For the drug classes studied, it was more likely that any particular DDI would be listed in only 1 or 2 of the information sources than it would be listed in 4 or 5 of the reference sources. Agreement on the clinical significance rating among information sources generally decreased as the number of information sources listing the same interaction increased.

These specific DDIs are not probabilistic, random observations; rather, they are the result of expert opinions based on the best available evidence. Consequently, it is reasonable to expect convergence on what are and are not significant interactions as more experts are consulted. Collectively, the result of evaluation of the specific DDIs suggest the need for further research and improvement in the scientific evidence supporting DUR criteria. Strengthening the scientific base for DUR criteria could reduce variation in pharmacotherapy and contribute to greater confidence that DUR criteria focus on significant, preventable problems.17

Adequacy of clinical significance rating scales for drug interactions was the subject of research by Roberts et al. in 1996. A panel of 63 practicing pharmacists judged the severity and documentation dimensions used to characterize potential drug interactions used by one reference (Drug Interaction Facts). One of the findings demonstrated substantial variation between pharmacists’ judgments of clinical significance and the ratings cited by the reference. The authors speculated that this inconsistent view may influence the behavior of pharmacists in their reaction or lack thereof to pDUR alerts.18

Another concern regarding pDUR criteria is the lack of consistency in the adoption of criteria obtained from vendors. A study published in 1992 compared 55 digoxin DDI criteria from 7 vendors used in 16 state Medicaid programs. The results of that study showed that among vendors addressing a particular prescribing problem, 50% differed in the way they implemented criteria in the content of the computer algorithms.19 For example, 20 DDI criteria involving digoxin and interacting drugs known to increase serum concentration were common across vendors and reflected in DUR criteria and reference texts. Eleven other digoxin criteria from vendors were not found in references, and 18 DDI mentioned in reference texts were
omitted from DUR criteria. Similar inconsistencies between DUR criteria and reference texts have been observed with hydrochlorothiazide, psychoactive drugs, and antiulcer drugs.37 Questionable adequacy of the evidence supporting pDUR screen criteria and variation in vendors’ adoption of such criteria leaves open the issues of how many and which criteria should be included in pDUR software. For example, an interaction that may be extremely uncommon may be a cause for legal challenge when a patient who had not been warned experiences the consequences of the interaction. In this sense, including all possible interactions can be viewed as “exculatory inclusion” from the vendor’s perspective. According to Chrischilles et al., some “argue for the inclusion of all possible criteria, in part out of concerns about litigation, and . . . others . . . argue for the inclusion of only those criteria with the highest quality of evidence linking criteria violation to serious health outcomes.”38 Unfortunately, the quality of the evidence to determine whether violation of a particular criterion is associated with subsequent serious health outcomes is weak for most criteria and, at present, “this literature is not currently compiled and evaluated in any one place.”39

Quality of Computer-Generated Prospective DUR Alerts

In the current environment, the quality of pDUR alerts seen at the pharmacy is suboptimal for several reasons:

1. Clinical data are not incorporated in screen criteria. Pharmacy has excelled in automating the prescription claims processing system and has built pDUR edits using data elements from prescription claims. Edits can be based on the dose (high or low), DDIs, and sequencing edits based on the date on which a drug is being added to an existing drug regimen. However, electronic edits are not designed to integrate clinical data and evaluate the safety and clinical appropriateness of pharmacotherapy. For example, the optimal choice of drug used to treat a patient with a high low-density lipoprotein cholesterol is different from the optimal drug used to raise high-density lipoprotein cholesterol.

2. The patient database used to screen a prescription is limited. Edits for drug appropriateness are usually limited to a database consisting of historical as well as current drug-use data from the prescription claim itself (drug, strength, quantity), limited patient data (gender, age), an incomplete drug database (minimum and maximum dose, DDIs), limited (typically unedited) prescriber identification, and minimal, if any, clinical data specific to the patient.

3. Data fields are incomplete. Data fields are notoriously incomplete, with inaccurate or missing data about the prescriber (e.g., medical specialty) and clinical data on patients such as diagnoses, drug allergies, laboratory values, and notes from recent medical care encounters.

4. A patient’s complete patient prescription drug-use profile may be incomplete due to “carve-outs” or discontinuous enrollment of members. Patients with certain diseases (e.g., behavioral health, AIDS) are sometimes “carved out” of the traditional payment systems, and patient confidentiality protections may restrict access to what is deemed “sensitive information.” Such carve-outs may fragment pharmacy data from other relevant data required for effective DUR. The resulting “dis-integration” of pharmacy claims data raises the possibility for potentially preventable adverse outcomes. Another example is OBRA ’90’s exemption of health maintenance organizations (HMOs) from state oversight of their DUR practices. Since the early 1990s, large numbers of Medicaid beneficiaries have been shifted into managed care plans. These plans perform pDUR in a manner similar to state systems using the same computer systems used for their commercial clients. When Medicaid beneficiaries are moved from the traditional fee-for-service Medicaid system to a capitated or carved-out managed care plan, pDUR performance may be hampered by the loss of prescription claim history. Disenrollment in managed care plans is also a common phenomenon that can lead to gaps in prescription drug claims history. When health plan members change enrollment, their prescription drug and medical claims history is not transferred to the new health plan. Additional data limitations result from the current payment methodology for medical claims. Since most medical claims are not paid in a point-of-service environment, gaps are created between the actual date of service and date of payment and entry into a database. This information gap presents a systematic opportunity for unintended exposure to drugs that may have a substantial drug-drug or drug-condition contraindication. Additionally, the authors are unaware of any published research investigating this potential problem and its consequences.

Some of the above problems with existing outpatient pDUR systems have been described by researchers. Chui and Rupp19 conducted an observational study of 41 pharmacies in Indiana and determined that 10.3% of third-party prescription drug claims resulted in a pDUR alert. Therapeutic duplication, drug-drug interactions, and high or low dosage accounted for 760 of 1,340 alerts (56.7%). Of the DUR alerts received, pharmacy personnel override 88.1%. The most frequent reasons given for the overrides were that pharmacy personnel were aware of the problem (34.2%) or believed that the problem either did not exist (33.6%) or was clinically insignificant (27.3%). Analysis of redundancy between in-pharmacy and online pDUR alerts was beyond the scope of this study.

Hazlett et al.20 assessed the ability of pharmacy computer systems used in chain and HMO pharmacies in Washington state to accurately detect clinically important DDIs. Pharmacy chains and HMOs with at least 7 practice sites were selected for study. A total of 516 community pharmacies that collectively used 9 different software applications for pDUR processing were included in the study sample. Their goal was to assess the sensitivity and specificity of the software in detecting 16 well-documented DDIs. The computer systems failed to detect the
documented DDIs one third of the time. Sensitivity (ability to correctly identify DDI pairs defined as clinically important) ranged from 0.44 to 0.88 (with 1.0 being perfect). Specificity (ability to ignore interactions that were not defined as clinically important) ranged from 0.71 to 1.00.

The authors noted that all pharmacy vendors used the same data source vendor (MediSpan/First DataBank) but speculated that the software installed on pharmacy computers in Washington state interpreted the data variably among and even within software programs. Overall, pharmacies used 12 unique software packages—some from commercial software vendors and some developed for a particular chain or HMO. The authors suggest, “programming deficiencies (referring to the algorithms for labeling overlapping drug therapy as a drug problem alert) are preventing the detection of substantial numbers of known clinically important drug-drug interactions.”

Pharmacists’ Performance
Assessing the impact of pDUR on the work performed in community pharmacies has been the subject of some research, but the findings have been neither conclusive nor encouraging. Chui and Rupp20 reported a 10.3% alert rate in the study previously discussed. A total of 88.1% of these alerts were overridden at the pharmacy and the remaining 11.9% (n = 159) of these alerts generated a consultative intervention with the patient, a third-party payer, a physician, or a case worker. Armstrong and Denemark21 performed a comprehensive analysis of all patient prescription drug claims and DUR alerts in the Delaware Medicaid program spanning the period from July 1, 1995, through June 30, 1996. They reported a 9.1% rate for pDUR alerts in the Medicaid program in Delaware. Alerts resulted in 20.9% of prescriptions not being dispensed, 17.7% dispensed after contacting the prescriber, 20.6% dispensed after the pharmacist talked with the patient, and 37.2% dispensed after the pharmacist consulted available reference materials.

Armstrong and Markson22 used a commercial database to identify a random sample of 1,500 community pharmacies that would be representative of all the community pharmacies in the United States. They conducted a survey to assess community pharmacists’ attitudes toward online DUR messages and actions taken in response to them. Of the 427 pharmacists who responded (28.9% response rate), most found DUR messages somewhat useful to very useful. DDIs, therapeutic duplication, and high-dose alerts were seen as the most useful of the 8 types of alert messages considered. Pharmacists responding to the survey indicated that they called physicians 1 to 6 times a week and talked with patients 6 to 10 times a week. The findings of these studies appear contradictory. Pharmacists in the first study20 had a high level of overrides (81.1%) and expressed dissatisfaction with alert messages, while in 2 other studies,21,22 pharmacists found certain alert messages useful and took action as a result of the messages.

Chui and Rupp20 also suggest that both acting on a pDUR alert and overriding the alert message have economic consequences. They reported that each pDUR alert required 2.89 minutes of pharmacy time, valued at $1.36 (in 2000 dollars). Overrides to pDUR alerts incurred a cost of $1.20 per DUR alert, measured in personnel costs alone, and alerts not overridden cost $2.83 to $3.00 each, depending on whether the claim was resubmitted. The authors did not provide information on whether prescription volume affects these costs in different pharmacies.

The studies cited above that assessed pharmacist professional activities focused on the pharmacists’ performance in response to computer-generated alerts. Other work has investigated pharmacists’ performance in detecting and resolving problems. A few studies have addressed potential drug therapy problems at the time of dispensing, irrespective of whether such actions were prompted by a computer-generated message. These studies have documented a problem detection and intervention rate of between 1% and 5% of all prescriptions dispensed, with changes in drug therapy occurring 40% or more of the time.23,24

In one long-term OBRA ‘90 demonstration study, Christensen et al.25 documented pharmacist cognitive services over a 20-month period. The most common type of drug problem intervention involved patient-specific understanding of instructions for use and medication compliance rather than problems with the drug or drug regimen itself. Approximately one half of the documented medication problems would not have been detected by computer-generated alerts available at that time. This suggests that pDUR systems can assist pharmacists but cannot identify all of the problems that must be addressed to assure appropriate drug use.

An unpublished review of the federal fiscal year 1999 state Medicaid DUR Annual Reports found inadequate data on which specific pDUR alerts occurred (e.g., totals could be found for DDIs but frequently not for specific drug interaction pairs). Similarly, data linking interventions (what the pharmacist did) and outcomes (e.g., whether the prescription was not dispensed or was changed) from the alert messages were often absent. Finally, coordination between rDUR and pDUR was undertaken by only a few Medicaid programs.26

In summary, there are significant concerns regarding pDUR systems currently in use and much work remains to be done to improve them. Evaluation and management of public and private pDUR systems must move from documenting processes to demonstrating outcomes.

Obstacles to Change
Lack of Standardization
OBRA ‘90 and its Medicaid DUR mandate created a vast array of separate and distinct pDUR systems, criteria sets, and practices in each state. Additionally, in the private sector, each of the major PBMs has its own proprietary pDUR system, while pharmacy practice systems have built-in pDUR modules. The
sheer number and diversity of these current electronic systems can produce substantial variation in the application of criteria used in pDUR screens. As we have suggested, agreement on an evidence-based approach to identify clinically significant preventable problems would limit this diversity in the application of criteria. The Centers for Education and Research in Therapeutics proposed by Woosley,27 for which funds were included in the Food and Drug Administration Modernization Act of 1997,28 provide a mechanism to translate the best clinical evidence regarding a particular disease state into best practices.

Developing the evidence will not by itself resolve practice variations. The lack of standardization reflects disagreement on the application of that knowledge to real-world systems and methods. A better approach would involve first rating the “evidence” by degree of quality and reliability. The scored evidence could then be used to develop the most clinically meaningful criteria and circumstances that should generate an alert message. Once these standards are developed, the second step is to facilitate their application to community practice systems and methods.

Pharmacists’ Response

Even the most sophisticated pDUR system will not achieve its goal if health care personnel do not see or evaluate the alerts. Many pharmacists see pDUR as a nuisance rather than a valuable tool.24 Current in-pharmacy computer systems are designed primarily for efficient point-of-service claims processing, not pDUR. DUR alerts (informational messages) and rejections (payment denials) are additions to what is primarily an administrative system. In many electronic systems, pDUR alerts are not presented on the primary processing screen, but several screens (layers) deep into the system. Advisory DUR alerts can easily be ignored by anyone signed onto the system, usually with a single keystroke. This no doubt contributes to the high override rate reported by Chui and Rupp.19 Online pDUR systems provided by PBMs or third-party payers may add redundant or conflicting messages to those generated by in-pharmacy systems leading to confusion or frustration with pDUR in general. Numerous pDUR messages arising from trivial or false positive alerts add to an already heavy workload. “Alert fatigue” may result, causing the pharmacist to ignore all alerts, thereby missing even the clinically significant ones.

Competitive Environment

Information systems serving the health care industry are becoming a major force in the medication use environment. Many of these systems utilize proprietary computer systems, criteria sets, and clinical rules. Competitive business forces inhibit cooperation among vendors and can be an obstacle to the formation of a comprehensive and cooperative pDUR system.30 In a recent commentary, Schiff suggests that this problem is having an impact on computerized prescription-order entry (CPOE) systems as well. He notes the phenomenon of hospitals using the same information systems but refusing to share their rules with competitors.31 Schiff discusses the need to link CPOE to critical information and knowledge and suggests that the rules and logic of these linkages “need to be standardized, tested, shared, and continuously updated.”

Who Will Pay?

Hepler recounts the unwillingness of “corporate pharmacy” to pay for quality improvement initiatives that would potentially produce cost savings to third-party health care payers but be unrecoverable from those payers.30 This issue of a “quality tax,” as Hepler labeled it, may be the single biggest obstacle to implementing effective pDUR systems. No profession can survive economically if it performs valuable services but does not receive adequate compensation. However, there are several examples in the literature where health care payers were willing to fund pharmacist interventions that resulted in successful outcomes.32,33 A demonstration project authorized under OBRA ’90 addressed the issue of what happens when pharmacists are compensated for real-time identification and resolution of drug therapy problems. The authors concluded that it would be relatively easy to successfully implement a financial incentive system for documentation and payment of pharmacists’ cognitive services to Medicaid recipients. Further, the authors noted that such a system was associated with significantly more and different types of cognitive service performed by pharmacists.34 Moreover, such a system was at least cost neutral, if not cost effective, from a payer perspective.35 The state of Wisconsin Medicaid program has launched such a system, and an evaluation of pharmacist performance is underway.

Next Steps for Quality Improvement in Prospective DUR

Ambulatory pDUR has face validity—it is more than a technology, it is a quality improvement process that makes sense. When a person with preexisting conditions or prior pharmaceutical use receives another prescription, it is prudent to identify and resolve drug therapy problems. The authors concluded that it would be relatively easy to successfully implement a financial incentive system for documentation and payment of pharmacists’ cognitive services to Medicaid recipients. Further, the authors noted that such a system was associated with significantly more and different types of cognitive service performed by pharmacists.34 Moreover, such a system was at least cost neutral, if not cost effective, from a payer perspective.35 The state of Wisconsin Medicaid program has launched such a system, and an evaluation of pharmacist performance is underway.

1. Provide essential information at the point of the prescribing decision. The ideal time for provider intervention is at the point of prescribing. The landmark Institute of Medicine report, To Err Is Human—Building a Safer Health System, focused attention on the need for a systems approach to safe and effective drug use.36 This ideal is far from the reality of current pDUR systems. Clinical alerts are typically received by the pharmacist at the time of dispensing, which generally occurs long after the prescriber has made his or her decision. In many instances, the pharmacist never sees or heeds the alert for a variety of reasons.18,21 Safe and effective pharmacotherapy occurs in the context of a medication use system with predictable results.30 The hallmarks of
such a system include a high degree of coordination and cooperation among the persons involved: patient, caregiver, prescriber, pharmacist, and nurse. Operating in the current environment, these persons may individually contribute to PDRM rather than prevent it. However, when the actions of these same persons are bounded by a systematic medication use system, improved patient outcomes and reduced PDRM are the result. ³⁰

CPOE has been proposed as a way to reduce medication errors by eliminating handwritten prescriptions, improving adherence to a formulary, and/or coordinating billing and eligibility information. ³¹ CPOE has also been offered as one solution to the problem of PDRM. In the absence of a computerized medical record, it is likely that the alerts generated for the CPOE system would be as incomplete as those sent to pharmacies by existing pDUR systems. Schiff suggests, however, that the most important role of CPOE is not the elimination of handwritten prescriptions. Rather, the implementation of CPOE will result in a restructuring of the medical information system. This highly integrated system will link a specific patient's history and clinical status as contained in an electronic medical record with therapeutic alternatives available to the prescriber at the time a prescribing decision is made. These linkages have only recently begun to be available on commercial prescribing systems. ³²

Personal digital assistants (PDAs) are becoming a pervasive technology, particularly in outpatient health care settings, for reasons similar to why CPOE is gaining adherents in hospitals and managed care settings. Their expanding capabilities, such as wireless access, ease of use, larger memory, and clearer screens, are now providing key elements for an electronic prescription process, sometimes referred to as “e-prescribing.” PDA-related products are generally of 2 types: one provides information (diagnostic and/or drug information references), and the other provides software that allows drug prescribing and documentation of patient encounters. Lowry et al. subjectively analyzed and evaluated 10 drug information databases from information they obtained from the product and vendor Web sites and from their experience using the software. ³³ Several other representative commercial products for PDAs, among the many on the market, are listed below:

- ePocrates, which features a drug database, alternative medicines, clinical tables and guidelines, math/calculations, formulary information, and auto-updates³⁴
- iScribe, which features patient management on the Web³⁵

Use of PDAs in doctors’ offices grew from 15% in 1999 to 26% in 2001. ³⁶ Current restrictions on expansion of PDA use emanate from concerns regarding data transmission security and the lack of a widely available infrastructure necessary to transmit electronic prescriptions. Applying existing DUR screens to hand-held PDAs in the outpatient environment would make many, but not all, problem alerts available to the prescriber at the time of the prescribing decisions. In 2001, 3 PBM companies (AdvancePCS, Express Scripts, and Medco Health Solution) created Rx Hub (www.rxhub.net) to “create a universal, standardized, communication framework that links prescribers, pharmacies, PBMs, and benefit plans for the purpose of sharing prescription benefit information electronically.” In March 2004, Rx Hub expanded to include drug benefit and formulary data from health plans who are members of the Council for Affordable Quality Healthcare. ³⁷ In the same vein, the National Community Pharmacists Association and the National Association of Chain Drug Stores created SureScripts Systems to establish connectivity standards. According to SureScripts press information, 50% of retail pharmacies have certified their computer systems, making them eligible to exchange prescription information electronically via the SureScripts Messenger Services system. Pilot programs currently exist in Rhode Island, Virginia, Maryland, and California, where pharmacies are able to exchange prescription information with physician offices. ³⁸

2. Provide user-friendly screen information more efficiently at the point of dispensing. Seven national organizations have responded to the challenge by forming a broadly representative national coalition focused on refining the amount and frequency of drug-drug interaction warnings, thereby increasing the value of the messages to community pharmacists and improving patient safety by lessening the chances of a missed clinically significant drug interaction. A steering committee consisting of the Academy of Managed Care Pharmacy, the American Pharmacists Association, the American Society for Automation in Pharmacy, the National Association of Chain Drug Stores, the National Community Pharmacists Association, the Pharmaceutical Care Management Association, and the U.S. Pharmacopeia (USP) was assembled to define the scope of the project. As a first step, the Steering Committee partnered with the USP Therapeutic Decision Making (TDM) Expert Committee to develop an evidence-based methodology for identifying and classifying drug-drug and drug-class interactions that pose the greatest risk of serious and/or life-threatening drug-induced illness for patients.

This collaborative initiative is designed to improve the effectiveness of pDUR systems, make these systems more practical and helpful to pharmacists and other health care professionals and decision makers, and reduce medication errors at the point of dispensing and prescribing. Specifically, the initiative focuses on developing a methodology to be used to define significant DDIs. This new methodology will ensure that systems’ users will be able to identify those evidence-based alerts that indicate the potential of a “significant clinical interaction.”

The USP TDM Expert Committee has formulated a methodology to establish a hierarchy of evidence that defines DDIs and to decide what types of evidence to consider with regard to such interactions. The committee has based the methodology on a conceptual framework and has focused on those interactions that could result in harm. The overall purpose of this effort is to identify evidence-based DDIs for which the risk for harm is greatest. The methodology is based on the assumption that resolving questions
about the evidence supporting the clinical significance of DDIs would increase the efficiency and effectiveness of pDUR systems.

Other topics being addressed include developing a system that would allow payers the ability to control the “level” of DUR rejects that would be messaged and/or rejected and address potential liability concerns inherent in any changed pDUR system that may report alerts selectively rather than comprehensively.

3. Provide aids and incentives to pharmacists in responding to alert screens. Any electronic alert system will be functionally effective only if pharmacists are provided information on how to handle or process an alert for a potential drug therapy problem and if incentives are offered (or disincentives removed) to provide the service. Printed reference guides are available to assist the pharmacist in managing DDIs; however, these problem management guides are not typically part of a pDUR alert system. Additionally, we believe pharmacists need 2 types of incentives: (1) specific professional performance expectations elucidated by management and (2) specific consideration and compensation for the extra time involved in managing drug therapy problems. Some limited examples of compensation systems exist in the private and public sector.

Meeting the Challenge

There are several challenges in implementing the above recommendations for making pDUR systems more useful. These can be grouped into those involving (a) the technical aspects of these systems and (b) how health care providers, particularly pharmacists, interpret and respond to potential drug therapy problem alerts generated by the systems.

Technical Problems

We have noted that many significant technical problems associated with pDUR screen criteria exist in the current environment. These systems fail to identify clinically significant preventable problems for a variety of reasons. Screen criteria are not comprehensive for major DDIs (leading to false negative signals), are imprecise (leading to false positive signals), or are inadequate. Data necessary to identify certain types of drug-related problems (i.e., disease diagnosis as a screen criterion) may be absent. Inconsistent application of screen criteria across pharmacy computer systems can occur. For example, Chrischilles et al. noted that for 3 of 8 types of drug therapy problems (untreated indication, failure to receive drug, and drug use without indication) no pDUR alerts are available in existing systems.4 We strongly recommend a national effort to validate screen criteria using evidence-based studies and encourage adoption of a minimal set of “critical” pDUR screen criteria by pharmacy service providers.

Health Providers’ Response to Prospective DUR System Alerts

Pharmacists are an essential human component of pDUR systems. A well-trained and capable practitioner can discover drug-related problems and act on them. Pharmacists are the last line of defense against inappropriate prescribing and drug use in the ambulatory setting. We have presented reports that suggest that pharmacist performance is suboptimal due to heavy workloads, imprecise pDUR messaging, and systems that do not adequately identify clinically significant preventable problems. It should not be a surprise then that high volumes of alert message are overridden.

The fee-for-service reimbursement system presently compensates pharmacies solely on the basis of prescriptions dispensed. Historically, the move away from pharmacists’ compensation calculated as a percentage mark-up of the drug cost arose from the Task Force on Prescription Drugs (1968).13 The intent of this shift in compensation method was to identify and reward the pharmacists’ professional service component. However, low dispensing fees currently fail to reflect the time and cost of the pharmacists’ expertise. In the current payment environment, the average wholesale price discount reimbursement rates plus dispensing fees are viewed by many pharmacy providers as barely adequate reimbursement for the drug product alone, much less any additional services. There are, therefore, economic incentives to dispense prescriptions rapidly and disincentives to provide time-consuming quality assurance activities beyond those required by regulation, particularly if it takes time away from dispensing the next prescription. A 2-pronged approach is necessary to solve this problem. One involves adoption of performance standards (and penalties) for pharmacists when responding to drug therapy problems. The other involves providing explicit remuneration for pharmacist time spent identifying and responding to drug therapy problems. We believe that such a compensation policy is both feasible and practical.

Summary and Conclusion

Despite its noble purpose, a growing body of literature documents numerous problems and concerns with respect to the quality of DUR criteria, DUR alerts, and the response of health care professionals to these alerts. Problems with the current pDUR “system” can be grouped into those involving technical aspects (e.g., duplicate messaging from in-store and online systems, or message text limitations) and those involving human aspects, specifically how pharmacists and other health care providers interpret and respond to potential drug therapy problem alerts generated by the electronic systems.

DUR is a quality assurance tool that holds promise as a means to enhance appropriate drug use, when implemented effectively. A more systematic approach to DUR is needed. Evaluation and management of public and private pDUR systems must link documentation of processes of care such as the pharmacists’ cognitive services, patient interventions, etc., to outcomes. To address technical aspects, we strongly recommend (a) a national effort to validate DUR screen criteria, relying upon evidence-based studies, and (b) adoption of a
minimal set of “critical” pDUR screen criteria by pharmacy service providers and third-party intermediaries (PBMs). To address the human component of pDUR systems, we advocate (a) adoption of performance standards for pharmacists and (b) explicit remuneration for time spent identifying and responding to drug therapy problems.

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