For at least three decades, health professionals have documented that undertreatment of pain is pervasive, occurring with one-half to one-third of hospitalized patients. Various measures have been tried to correct this problem, including development of national guidelines by governmental agencies, professional group associations, and international organizations. Yet the problem persists. Recently, the Joint Commission on Accreditation of Healthcare Organizations (Oakbrook Terrace, Ill) has specified comprehensive pain management standards. One requirement is that the organization include a statement regarding its commitment to pain control in its mission statement, policy manual, and/or bill of rights. The Joint Commission specifies patient rights and responsibilities and gives specific directives for caregivers; it also requires incorporation of pain assessment as the fifth vital sign and use of a consistent rating scale. Why has this area of clinical excellence been so difficult to achieve? Will standards and requirements at long last ameliorate this problem?

In this article, we propose an adjunctive model to be used as organizations try to bring about change in the clinical culture and in the behavior of caregivers and patients/families. In recent years, the health professions have taken significant steps in declaring their intent to openly examine and confront medical errors occurring in the process of delivering care. The health care professions have examined theories about why errors occur and the experiences of other industries. The conclusion has been that many errors in health care are likely the result of system failures rather than of isolated actions of practitioners. Investigators have used this approach to document the system errors that

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**Patient Safety**

**Identifying and Addressing Medical Errors in Pain Mismanagement**

**Patricia L. Starck, DSN, RN**
**Gwen D. Sherwood, PhD, RN**
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**Eric J. Thomas, MD**

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lead to various adverse events\textsuperscript{6,10} and to design interventions to prevent these errors\textsuperscript{11-13}.

The Institute of Medicine’s report To Err Is Human: Building a Safer Health System\textsuperscript{14} has captured the attention of the public and professionals alike. It defines error as “the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim.”\textsuperscript{9,10} The report documents the incidence of errors in health care delivery and the high price of adverse events in human and economic terms. In essence it calls for a systems approach to preventing errors and advocates four broad approaches, including bringing national attention to the problem, identifying and learning from errors, raising standards and expectations, and creating safety systems in health care organizations.

The original work on error in human systems and the development of a model by James Reason\textsuperscript{8} formed the basis for the pain management framework presented in this article. Reason made distinctions between slips and lapses (skill-based problems) and mistakes (rule-based and knowledge-based errors). Skill-based performance problems are classified as either inattention or overattention (for example, making an attentional check at an inappropriate point). Rule-based performance errors are caused by either misapplication of good rules or application of bad rules. Finally, knowledge-based errors arise from incomplete or incorrect knowledge. Among the types of knowledge-based errors are overconfidence (in evaluating the correctness of one’s knowledge), confirmation bias (a plan put in motion resists change, even in the face of new information; looking for confirming versus disconfirming evidence), illusory correlation (performing poorly at detecting covariation), halo effects (showing a predilection for single orderings and an aversion to discrepant orderings), and problems with causality (tendency to oversimplify causality). Causality problems include thematic vagabonding (treating an issue superficially when having difficulty dealing with a topic; leaving it alone so as not to face one’s helplessness) and encysting (disregarding some issues and focusing on others for success in a desire to escape one’s inadequacies). In Table 1 (p 193) pain management errors in the acute care setting are presented according to Reason’s types of errors.

Helmreich and other researchers\textsuperscript{15-17} have used a systems approach to error in the airline industry. In recent years, these researchers\textsuperscript{18,19} have reported using this same approach in studying teamwork and system errors in the operating room.

One lesson learned from the aviation safety experience is that communication and teamwork are important factors. Hierarchies in status affect communication; if junior people are not free to question senior people, communication that might prevent errors can be hampered. If senior members do not encourage feedback from junior team members, valuable safety checks may be lost.\textsuperscript{16} Similar communication problems among providers and patients may impede adequate pain control. The following anecdote from clinical practice illustrates this point.

A patient was admitted to the emergency room with an open fracture of an extremity. The patient was
in obvious pain. The physician examined the patient and wrote orders, including a stat x-ray. Noting that the physician had not left an order for pain medication, the nurse followed the physician out of the examining room and asked, “What can he have for pain?” The physician replied, “Get the x-ray first,” indicating that his orders as written were not to be questioned.

The concept of medical errors has primarily been concerned with adverse events, and rightly so; however, it is not unreasonable to argue that mismanagement of pain should also be classified as a medical error. Doing so may reveal system problems, such as the communication and teamwork issues noted in the anecdote, that may be corrected at the systems level. While death or serious injury may not occur, inadequate pain control results in unnecessary pain and suffering. Furthermore, mismanagement of pain has negative physiologic, psychologic, and financial consequences. Ferrell20 cited slowed healing, higher complication rates, anxiety, sleep disturbance, and lowered quality of life as results of poorly managed pain. Unscheduled readmissions for pain control, delayed return to work, and longer periods of poor role function/performance compound the problem, resulting in a substantial economic impact.21

The compilation of research regarding pain management suggests that, for the most part, the science is known and evidence regarding best practice is clear. However, behavior in adhering to existing guidelines is problematic. Therefore, developing a new model for this problem would begin with the goal of optimal pain relief for all patients. Systems would then be designed that make it impossible or extremely difficult not to attend to the patient’s pain. An analogy from the automobile industry might illustrate this point. In the past, cars would lurch forward when gears were shifted improperly. Now newer cars require that the driver have a foot on the brake before gears can be shifted from the park to the drive mode, thus preventing an adverse event.

Undertreatment is believed to be associated with physician fear of being accused of abusive use of narcotics, but also it is believed that undertreatment is related to other factors. A medical board recently disciplined a physician for the undertreatment of pain,22 which illustrates the prevailing practice of finding fault, blaming, and punishing individuals. A newer approach based on the lessons learned from the aviation safety model would be to address this problem at a systems level.

The Errors of Pain Management
Reason8 defined error as “the failure of intended actions to achieve their desired consequences.”3(p 7) What then are the errors in pain management? A classification of pain management errors is presented in Table 2 (p 194). Within each of three main categories, errors may be skill-, rule-, and/or knowledge-based. This classification is based on widespread evidence of mismanagement in various aspects of the pain management process as found in the literature. Findings continue to reveal that far too many patients are undertreated for pain.23–25 Starck et al.,24 in a study of hospitalized patients, found that 11% of patients reported asking for pain medication and never receiving any. McNeill et al,25 in a study of hospitalized patients in a rural area, found that one-third of patients were inadequately

<table>
<thead>
<tr>
<th>Table 1. Reason’s Categories of Human Error as Applied to Examples of Errors in Pain Management*</th>
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</thead>
<tbody>
<tr>
<td><strong>Skill-Based Errors</strong></td>
</tr>
<tr>
<td>- A patient who isn’t complaining of pain is not in pain. (inattention)</td>
</tr>
<tr>
<td>- It is difficult to explain pain management to patients with language problems. (inattention)</td>
</tr>
<tr>
<td>- Care providers fail to check pain level after medication is given. (inattention)</td>
</tr>
<tr>
<td><strong>Rule-Based Errors</strong></td>
</tr>
<tr>
<td>- When pm medication orders are for every 3–4 hours, medication should not be given before 3 hours and preferably 4. (application of bad rule)</td>
</tr>
<tr>
<td>- Intramuscular injections give faster medication delivery than do oral medications. (misapplication of good rule)</td>
</tr>
<tr>
<td>- Patients with a history of drug abuse should be treated sparingly with narcotics. (application of bad rule)</td>
</tr>
<tr>
<td><strong>Knowledge-Based Errors</strong></td>
</tr>
<tr>
<td>- Pain is to be expected in the elderly. (inadequate knowledge)</td>
</tr>
<tr>
<td>- Pain is normal after surgery. (inadequate knowledge)</td>
</tr>
<tr>
<td>- Patient satisfaction is a good measure of effective pain management. (incorrect knowledge)</td>
</tr>
</tbody>
</table>

* pm, as needed.
Table 2. Classification of Pain Management Errors

<table>
<thead>
<tr>
<th>I. Errors in Assessment and Documentation</th>
<th>II. Errors in Treatment and Management</th>
<th>III. Errors in Patient Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Discrepancy by age</td>
<td>A. Scheduling</td>
<td>A. Patient/family education</td>
</tr>
<tr>
<td>B. Discrepancy by sex</td>
<td>B. Analgesic choice</td>
<td>B. Patient satisfaction</td>
</tr>
<tr>
<td>C. Discrepancy by ethnicity</td>
<td>C. Route choice</td>
<td>C. Beliefs/myths</td>
</tr>
<tr>
<td>D. Documentation failures</td>
<td>D. Inadequate use of adjuncts</td>
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 Errors in Assessment and Documentation

Discrepancy by age. The elderly and other vulnerable groups are at greater risk than others for poor pain management. Clarke et al. found significant differences in pain management between elderly and nonelderly hospitalized patients. They reported a significant negative correlation (r = -.30; p = .002) between age and the PMI treatment score (defined as the patient’s worst pain score compared with the most potent analgesic), indicating less effective pain management for elderly patients. Further analysis demonstrated that 35% of older patients with medical conditions and 26% of older patients who had surgery were inadequately treated for pain. Wynne et al. called for new strategies to assess pain in the elderly, especially the cognitively impaired elderly, for whom a combination of instruments was recommended.

Discrepancy by ethnicity. Members of ethnic minority groups may be as much as two or three times as likely as others to be undertreated for pain. Cleeland et al. found that 74% of such patients were inadequately managed for cancer pain and that such patients were three times more likely to have inadequate pain management than were other patients. Ng et al. found significant differences in analgesic administration by ethnic groups in patients treated surgically for limb fracture. Whites received 22 mg per day of morphine equivalents versus 16 mg for blacks and 13 mg for for hispanics. Todd et al. also found ethnicity to be a risk factor in pain management in emergency care.

Documentation failures. In a chart review of various clinical hospital units, Clarke et al. indicated that 76% of the charts showed no evidence of nurses’ use of a patient self-assessment tool for pain. However, descriptions other than patient self-assessment were found in 79% of nurses’ notes and 51% of physicians’ notes. The review also revealed gaps in documentation, such as the administration of pain medication without written documentation of pain. Notes were also found such as “pain better,” with no previous documentation of pain assessment or intervention.

Errors in Treatment and Management

Errors in the treatment and management of pain are also frequently reported; most of the errors seem to be knowledge based.
Scheduling. Agency for Health Care Policy and Research (AHCPR) guidelines clearly advocate administering analgesics on a regular schedule when pain is to be expected, for example, the first 36 to 48 hours after surgery. When medication is given on a prn, or “as-needed,” basis, unnecessary delays may occur and patients may experience peaks and troughs of pain and pain relief. Scheduling medications helps to promote a constant blood level of analgesia. Jairath and Kowal found that 68% of patients anticipating major surgery identified scheduled medication as the most effective treatment approach. These authors recommended mandated time-contingent dosing for the early postsurgical period.

Analgesic choice. The use of meperidine is problematic for several reasons. First, the medication produces clinical analgesia for only 2.5 to 3.5 hours but is usually ordered every 4 hours or as needed. Second, the commonly ordered dose of 75 mg is equal to only 5 mg to 7.5 mg of morphine. For the patient to receive the analgesic effect of 10 mg of morphine, the meperidine dosage would need to be 100 mg to 150 mg every 3 hours. Third, meperidine can be toxic for patients with impaired renal function and may create drug-interaction problems. Yet it continues to be used in the clinical area for postoperative pain.

The World Health Organization classified analgesics into three levels, from weakest to most potent—that is, nonsteroidal, anti-inflammatory agent (such as Tylenol); weak opioid (such as codeine); and strong opioid (such as morphine). A choice of using Tylenol to alleviate severe cancer-related pain is an example of an error in analgesic choice.

Route choice. McNeill et al reported that medications are often administered intramuscularly despite the AHCPR's recommendation to use the oral or intravenous route. As postsurgical patients constituted a large proportion of the patients in both studies (68% and 80%), it could be assumed that intravenous access was frequently in place, which would have lessened the need for intramuscular injections and the associated discomfort. Technologic advances, such as patient-controlled analgesia (PCA) pumps or epidural catheters, for example, were rarely used.

Inadequate use of adjuncts. Nonpharmacologic approaches are often not a part of the plan of pain management, although their effectiveness and patient preferences have been documented. Ferrell, Torry, and Glick found that massage therapy significantly reduced levels of pain and anxiety, and it enhanced feelings of relaxation, by an average of 58% in hospitalized cancer patients. Furthermore, all physiologic measures (heart rate, respiration, and blood pressure) tended to decrease from baseline for patients receiving massage therapy.

In a chart review of various hospital clinical units, Clarke et al found that documentation for use of nonpharmacologic treatments was minimal to nonexistent. Consistent with the findings from McNeill et al, in a follow-up study involving a predominantly Hispanic population, patients ranked prayer as the most frequent nondrug form of pain control. Furthermore, there was little use of noninvasive therapies, such as relaxation and distraction, although a somewhat higher proportion of Hispanic patients reported using these approaches than did white patients. Neglecting the powerful value of adjuncts such as relaxation and distraction is a disservice to patients of all ethnic groups.

Errors in Patient Education

Many errors in pain management can be traced to information deficits (knowledge based) and miscommunication with the patient and family (skills and/or rule based). The most troublesome are discussed here.

Patient/family education. Yeager et al demonstrated that patients with cancer-related pain seen in outpatient settings and their family caregivers lacked knowledge regarding addiction, tolerance, and side effects of medication. Patients and their family caregivers should receive proper information about patient goals and rights to effective pain management, as well as the importance of pain management and its role in the recovery/treatment process. This instruction is especially important with patients/families who wish to please and not complain. They should also receive information of side effects of pain medication and how these side effects can be addressed. Instruction should include debunking commonly held myths about the danger of too much pain medication. Such information given on admission should also be repeated and reinforced periodically as needed. In an urban setting only 67% of patients recalled a caregiver's informing them that pain management was a
priority in their care; other studies report similar rates regarding provision of this information.37,38

AH CPR has developed both clinician and lay versions of the pain management guidelines that can be used in educating patients and families.1

Von Roenn et al39 found that 86% of physicians who treat cancer patients believed that poor pain assessment was the single most important barrier to adequate pain management. To improve assessment, patient/family education must emphasize the importance of reporting pain soon after its onset.

**Patient satisfaction.** Evaluation of patient satisfaction with care received is an important measure of the quality of care. However, in the area of pain management, there are confusing issues. Patients may indicate satisfaction with nurses’ and physicians’ pain management yet still be in pain or report high intensity of pain.24,25,40 Patient satisfaction in spite of poor pain management has been a baffling phenomenon to researchers and clinicians alike. Furthermore, it is not clear what factors influence patients when in pain to decline more medication for pain relief.

Ward and Gordon40 and Miaskowski et al37 proposed that perhaps patients are satisfied when they feel that their care providers attempt to manage their pain. Moreover, Ward and Gordon40 suggested that patients may anticipate the peaks and troughs of the pain experience and thus are not dissatisfied when pain occurs. The cycle of increased pain, administration of a prn analgesic, and pain relief is perhaps an expected occurrence, particularly for postoperative patients.

McNeill et al24-25 reported similar findings yet found a significant inverse correlation between patient satisfaction and current pain intensity (r = -.25; p = .02 in an urban patient population and r = .49, p = .001 in a rural patient population). This inverse correlation was also found between patient satisfaction and general level of pain in the past 24 hours (r = -.28; p = .01; r = -.30; p = .003, respectively).

**Beliefs/myths.** McNeill et al24 found that on written questionnaires patients had little agreement with myths and false beliefs regarding pain management, such as “taking medication for pain leads to addiction.” Mean scores on seven statements ranged from 1.10 to 2.74 (0–5 scale; 0 = not agreeing with false belief). Similar results were found with a primarily Hispanic population.23 For both studies, neither patient satisfaction nor agreement with the myths and false beliefs correlated significantly with patients’ desire for additional medication when in pain. Patients’ responses to an open-ended question regarding their reason for declining more medication indicated that several of these misconceptions about pain or its management influenced their decisions. They make statements such as “I don’t want to be all doped up” and “I don’t want to get addicted.”46 Even though patients identified the fear of becoming addicted as an untrue statement on a research questionnaire, they acted as if it were true in their individual situations.

**Root Causes of Pain Management Errors**

An examination of the root causes of medical errors that is based on the Classification of Pain Management Errors can be used to detect system failures. The actors and their roles are depicted in Figure 1 (p 197); they are primarily nurses, physicians, and patients, although others may also be involved and might contribute to the problem at each level. At least ten steps can be identified in the process of pain management in the acute care setting, starting with admission (Figure 2, p 198), and errors can potentially occur at any step. These ten steps represent a systematized approach in common use at several hospitals where research was conducted during the past five years.24-26,41 A redesigned system could help improve error rates by incorporating use of skills, rules, and knowledge for effective management. Requiring pain levels to be assessed and charted as the fifth vital sign is a systems approach that is rule based. Other components of the system would need to be redesigned to eliminate most, if not all, errors in pain management. A new model for pain management would need to address each category of the mismanagement of pain and involve attention to the various steps in the process.

**Summary and Conclusions**

A proposed new approach to the unsolved problem of pain management in acute care settings uses the concept of mismanagement as system error. The approach would follow that used in the aviation industry and, more recently, the health care industry for adverse events. Reason’s model of errors as being skill-, rule-, and/or knowledge based can be found in pain management examples. The three classifications of error in pain management are proposed as errors of assessment and documentation, errors of treatment and manage-
Analysis of Poor Pain Management in Acute Care Settings

<table>
<thead>
<tr>
<th>Type of Error</th>
<th>Primary Responsible Party</th>
<th>Description of Error</th>
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</thead>
<tbody>
<tr>
<td>Assessment and</td>
<td>Nurse</td>
<td>Not specifically and systematically assessed</td>
</tr>
<tr>
<td>Documentation</td>
<td></td>
<td>Not recorded/documented</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Discrepancies by age, sex, and ethnicity</td>
</tr>
<tr>
<td>Treatment and</td>
<td>Physician</td>
<td>Incorrect choice of analgesic, route, dose, schedule</td>
</tr>
<tr>
<td>Management</td>
<td></td>
<td>Inadequate use of adjuncts</td>
</tr>
<tr>
<td></td>
<td>Nurse</td>
<td>Gives less dosage or less frequently if a range is</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ordered</td>
</tr>
<tr>
<td>Patient Education</td>
<td>Patient</td>
<td>Not requested or declined when requested</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unaware of goal/rights</td>
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<td></td>
<td></td>
<td>Fear side effects</td>
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<tr>
<td></td>
<td></td>
<td>“Need to save for when really needed”</td>
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<tr>
<td></td>
<td></td>
<td>Fear of addiction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fear of losing awareness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Desire to please</td>
</tr>
</tbody>
</table>

Figure 1. The analysis of pain management errors in acute care settings is examined by type of error, the primary person who is responsible, and a description of the error.

References

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Steps in the Process of Acute Care Pain Management from Admission

Figure 2. The ten steps in the process of acute care pain management begin with recognizing people as being at risk. The type of orders physicians give starts the process of management in motion. This flowchart identifies various paths of action thereafter. The “scheduled” pathway leads to quicker and more positive responses, prn, as needed.
Table 3. Questions for a New Research Agenda

1. What are the root causes of unresolved problems in patients who have pain, in each type of setting—that is, acute care, rehabilitation, home health, and so on?

2. Does the Classification of Pain Management Errors serve to capture all types of errors in pain management?

3. What are the patterns of communication between physician and nurse team members regarding unresolved pain? Do nurses perceive that they should not question the physician orders when those orders do not comply with national guidelines or with the nurse’s own knowledge base?

4. Do physicians encourage feedback about the patient’s pain in rounds or at other opportunities? This analysis of team communication could offer new insights into this unexplored dimension of pain management.

5. What do physicians/nurses/patients perceive to be barriers to achieving effective pain management? Can these barriers be classified as errors that were knowledge, skill, or rule based?

6. What are the classifications of pain management errors according to Reason’s model of skill-based, rule-based, and knowledge-based errors? For example, failing to give the oral dose equivalent to the injectable dose is a knowledge-based error; routinely using prn instead of scheduled dosing is a rule-based error; and ineffective communication with the patient to overcome fear of addiction is a skill-based error.

7. What system-level change would prevent errors in assessment and documentation, treatment and management, and patient education? Will the institution of pain as the fifth vital sign improve assessment?

8. What system-level changes could relieve physician anxiety about perceptions of sanctions for abusive use of prescription narcotics?

9. What improvements would be documented with system-wide improvement in pain management?

References (continued)


