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**Annotated Bibliography: Understanding Ambulatory Care Practices in the Context of Patient Safety and Quality Improvement**

Maria F. Montano, MPH<sup>1</sup>

Harshal Mehdi, MD, MBA<sup>2</sup>

David B. Nash, MD, MBA<sup>3</sup>

<sup>1</sup>Sidney Kimmel Medical College, Philadelphia, Pennsylvania

<sup>2</sup>Thomas Jefferson University Hospital, Philadelphia, Pennsylvania

<sup>3</sup>Thomas Jefferson University, College of Population Health, Philadelphia, Pennsylvania

**Corresponding author:**

David B. Nash, MD, MBA

Jefferson College of Population Health, 901 Walnut St, 10<sup>th</sup> Floor, Philadelphia, PA 19107

E-mail: [David.nash@jefferson.edu](mailto:David.nash@jefferson.edu)

Phone: (215) 503-0174

Fax: (215) 923-7583

**Coauthor email addresses:**

Montano: [maria.montano@jefferson.edu](mailto:maria.montano@jefferson.edu)

Mehdi: [hmehti85@gmail.com](mailto:hmehti85@gmail.com)

The ambulatory care setting is an increasingly important component of the patient safety conversation. Inpatient safety is the primary focus of the vast majority of safety research and interventions, but the ambulatory setting is actually where most medical care is administered. Recent attention has shifted toward examining ambulatory care in order to implement better health care quality and safety practices. Outpatient care has a unique set of challenges, including medical system problems, which can possibly lead to poor patient health outcomes. Furthermore, the movement toward value-based payments has tied financial incentives and punishments to quality measures. The Medicare Access and CHIP Reauthorization Act of 2015 forces health care providers to assess the outcomes of their health care organizations and the means by which they can improve it.

Hatoun et al illustrate the importance of a systemic review of the current literature in their recent publication.<sup>1</sup> The authors conducted a focused review of patient safety measures applicable in the adult primary care setting. They concluded that, compared to the plethora of patient safety measures in the inpatient setting, ambulatory care safety measures were not as numerous even though the numbers of patient encounters were far greater. This annotated bibliography, which builds on a previous annotated bibliography by Moskowitz and Nash,<sup>2</sup> was created to analyze and augment the current literature on ambulatory care practices in regard to patient safety and quality improvement. By providing a thorough examination of current practices, potential improvement strategies in ambulatory care health care settings can be suggested. A better understanding of the myriad factors that influence delivery of patient care will catalyze future health care system development and implementation in the ambulatory setting.

## **METHODS**

References were collected through a review of the MEDLINE and CINAHL literature databases from 2009 to the present. Subject headings and keywords used in the searches included ambulatory care, patient safety, medical errors, measurement, evaluation, and quality control. The search methodology utilized is further outlined in online Supplemental Table 1 (available at **SAGE PLEASE INSERT THE ADDRESS OF THE SUPPLEMENTAL TABLE HERE**). The following research questions helped to

direct the literature search: In an ambulatory health care environment, how is patient safety measured? In this particular setting, how can these quality measurements be improved on? The literature was narrowed down to a collection of 62 articles that provided an overview of quality and safety of patient care in the ambulatory setting. Papers were excluded if published prior to 2009 or research centered on national health care systems, such as the Veterans Health Administration. Such exclusion criteria were used to further focus the scope of research.

Based on common patient safety practices themes, the articles are organized into structured, meaningful categories. These themes were inspired by the Agency for Healthcare Research and Quality (AHRQ) in its latest Technical Brief through the Evidence-based Practice Centers. AHRQ outlined 28 patient safety practices relevant to the ambulatory care setting, from which the 10 categories were developed and restructured: Overview of Safety Issues in the Ambulatory Setting (15 papers), Safety Culture (6 papers), Quality & Safety Measurements (5 papers), Team Training in Health Care (2 papers), Patient-Centered Care: Engagement & Satisfaction (7 papers), Care Coordination & Continuity of Care (8 papers), Medication Safety & Electronic Prescribing (9 papers), Diagnostic Test Result Management & Reporting Medical Errors (3 papers), Diagnostic Errors (6 papers), and Simulation Exercises in Patient Safety Efforts (1 paper).

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## **ANNOTATIONS**

### **Overview of Safety Issues in the Ambulatory Setting**

1. Chang JE, Brundage SC, Chokshi DA. Convenient ambulatory care--promise, pitfalls, and policy. *N Engl J Med.* 2015;373:382-388.
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15. Wynia MK, Classen DC. Improving ambulatory patient safety: learning from the last decade, moving ahead in the next. *JAMA*. 2011;306:2504-2505.

The ambulatory care setting is an increasingly critically important component of the patient safety conversation. In order to better appreciate the scope of this importance, this section provides an overview of the key aspects and evidence-based practices surrounding patient safety in the ambulatory setting. These 15 references, in alphabetical order, are analyzed, including study design parameters and appropriate end points, to evaluate potential patient safety frameworks and interventions.

Chang et al examine and characterize the convenience of care in an ambulatory setting while balancing challenges, including but not limited to: cost, quality, access, patient navigation, and continuity of care. Their assessment suggests that conveniently provided ambulatory care and patient safety practices will require continued policy and regulatory efforts to navigate this balance.

Farley and Battles provide a specific evaluation of the AHRQ patient safety initiative in terms of the framework and approach. The patient safety initiative was AHRQ's response to the recognition of patient safety as a priority. The initiative involved expanding patient safety practices, knowledge, and tools through research and funding. Specific elements of the organization's strategy included: "identifying threats to patient safety; identifying and evaluating effective patient safety practices; teaching, disseminating, and implementing effective patient safety practices; and maintaining vigilance." An evaluation of the expanse of activities the organization performed required multiple methods of data collection and further subdivision of context, process, and product evaluation. Overall, Farley and Battles illustrated how the patient safety initiative matured through effective research, dissemination of information, and implementation of health care practices. In continuation, Farley and Damberg synthesized the overall evaluation findings of the evolving AHRQ patient safety initiative. They concluded that although AHRQ has developed extensive knowledge of effective practices and epidemiology regarding patient safety, dissemination and usage of this knowledge in building health care practice infrastructure still requires work.

Hayes et al describe the importance and efficiency of a logical model as a potential tool for the development, implementation, and subsequent evaluation of a primary care research network. Two important outcomes of the logic model include improved patient health outcomes and recognition of leaders that drove quality improvement to promote meaningful engagement. The authors hypothesize that this framework functions as an essential “project management resource” for implementation of successful patient safety practices.

Jha et al present a comprehensive overview of patient safety research from a global evidence perspective in order to better understand both the scope and nature of unsafe health care practices. These unsafe practices, including the ambulatory setting, are estimated to cause morbidity and mortality on a global scale and most are preventable. A critical component in the delivery of quality health care is the aspect of patient safety. Therefore, the authors divided the major topic of patient safety into 3 quality domains: structure (including accountability and safety culture), errors in process of care (including misdiagnosis, poor test follow-up), and outcomes (including adverse events and patient safety concerns). The authors summarize that avoidable harm can be reduced with “targeted, well-designed, and appropriately managed research to gain greater understanding of its causes and contributing factors.”

Leape et al identify 5 fundamental concepts as critical components for the transformation and improvement of health care safety practices, and suggest a vision of health care that encompasses transparency, integration of care, patient engagement, restoration of meaningful work, and reform of medical education. These 5 transformative principles provide a foundation for significant change in the implementation and culture of the current health care system.

Lorinez et al review ambulatory patient safety research conducted between 2000 and 2010. The authors comment on how the majority of research focuses on understanding factors influencing patient safety in the ambulatory setting while intervention research has been less well studied. Such studies of interventions to improve ambulatory care safety are a critical research component that needs to be strengthened.

Nelson et al analyze the synergistic role of ethics and quality of care concerns in driving health care organizations to improve patient outcomes. System redesign focused on aligning ethical principles (autonomy, beneficence, nonmaleficence, and justice) and the Institute of Medicine quality aims (patient-centered, effective, safe, equitable, and timely care) are necessary to improve health care quality. The benefits include organizational change that augments shared values of patient safety and collaboration in order to increase effectiveness of quality improvement measures in a clinical setting.

Pronovost et al argue that a framework is necessary to organize research and improvement strategies in future patient safety research. The framework presented includes 5 domains: “evaluating progress in patient safety; translating evidence into practice; measuring and improving culture; identifying and mitigating hazards; evaluating the association between organizational characteristics and outcomes.” The authors also highlight potential challenges encountered in improvement effort such as research capacity, creating an organizational infrastructure, and analyzing the cost–benefit ratio. The authors acknowledge that despite efforts to improve patient safety, an appropriate model will augment future efforts while mitigating potential challenges encountered.

A few years later, Provonost and Wachter examine how patient safety progressed and state that safety and quality are indeed improving. A number of patient-centered safety practices have been shown to effectively reduce rates of adverse patient outcomes. For example, interventions that have improved care quality and safety can be attributed to teamwork training and culture change.

Shekelle et al report on the challenges faced by patient safety researchers and recommend the increased use of logic models to improve development and dissemination of successful practices. Evaluation issues of patient safety practices addressed by the authors include (1) an analysis of the rationale behind the chosen intervention, (2) a description of the issue in enough detail for future replication, (3) a detailed explanation of the implementation process of the chosen practice, and finally (4) an assessment of the outcomes measured to determine risks vs benefits and effectiveness. Success of these factors is influenced by the context. Therefore, the authors explain that an intervention’s success depends

on the setting of its implementation. High-priority contexts outlined by the authors include teamwork, leadership, and the culture surrounding patient safety. Additional considerations include external factors, organization-specific characteristics, and management approaches. In a later article, Shekelle et al review patient safety practices for strength of evidence regarding effectiveness, implementation, and acceptance. Ultimately, the authors conclude that evidence supporting the effectiveness of practices improved more than evidence that supports implementation and context. This analysis of the literature provides feedback on current progress and highlights the continued importance of expanding and refining research approaches.

Wachter concludes that the limited ability to measure a health care system's progress in patient safety continues to impede research. The author grants an overall B- grade, an improvement compared to a grade of C+ in 2004. Incremental progress of the complex health care field is moving in the right direction and will take advantage of valuable lessons and explore areas previously not thoroughly researched. The massive health care field will build on the current progress of prioritized research involving patient safety and quality interventions. Wachter et al later outline the evidence of progress in the field of patient safety. During the past decade, evidence focused on effectiveness, interventions, and implementation has expanded steadily. Health care organizations now work to improve patient safety utilizing evidence-based strategies. Systems can learn from gaps in the evidence base while action on intervention can be utilized for interdisciplinary patient-centered safety strategies.

Wynia and Classen describe past, present, and future efforts in research aimed at increasing safety and quality in the ambulatory care setting. Recent focus on outpatient settings, compared to inpatient environments, started with epidemiological data collection and building public support. The authors suggest 5 core aims to address improving patient care: (1) collection of health care data concerning adverse patient health outcomes in the ambulatory setting, (2) identification of achievable milestones and quality measures, (3) patient-centered care and engagement, (4) linking patient safety in ambulatory settings to other health care initiatives such as improved transitions of care and medication reconciliation,

and (5) improved research infrastructure and support to address issues. Public awareness has pushed health care systems to provide greater research on implementation and effectiveness of patient safety and quality measures in ambulatory practice. The scope of the issues in the ambulatory settings poses challenges in improving patient care but provides direction and potential for the patient safety research agenda to improve health outcomes in the right direction.

### **Safety Culture**

1. de Wet C, Johnson P, Mash R, McConnachie A, Bowie P. Measuring perceptions of safety climate in primary care: a cross-sectional study. *J Eval Clin Pract.* 2012;18:135-142.
2. Gehring K, Schwappach DL, Battaglia M, et al. Safety climate and its association with office type and team involvement in primary care. *Int J Qual Health Care.* 2013; 25:394-402.
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6. Weaver SJ, Lubomksi LH, Wilson RF, Pfoh ER, Martinez KA, Dy SM. Promoting a culture of safety as a patient safety strategy: a systematic review. *Ann Intern Med.* 2013;158(5 pt 2):369-374.

The development of a positive cultural mind-set focused on patient safety is a prime objective of health care systems and an essential component for achieving increased patient safety. De Wet et al highlight how building a strong safety culture must include measuring individual perceptions of health



care workers. Measuring perceptions of safety culture in a primary care setting can increase awareness and allow opportunity for practices to effectively learn from and adapt to any pitfalls or challenges to providing quality care. In order to improve patient safety and health care quality, health care workers must be in alignment for safety culture mentality to prevail. Increasing awareness should contribute to implementing initiatives to build stronger safety culture by identifying and improving on current strengths and weaknesses.

Safety culture has been described by Gehring et al as the culmination of “values, attitudes, perceptions, competencies, and patterns of behavior” at both the personal and systems level. The culture surrounding patient safety initiatives is a fundamental characteristic for promoting patient safety within an organization. Gehring et al establish that frequent interdisciplinary team meetings strengthen safety culture and promote evaluation of error prevention strategies. However, further research is needed to provide evidence that safety climate correlates with improved clinical outcomes.

In addition, Hickner et al examine how perceptions of patient safety culture differ among different levels of an ambulatory health care practice. The perspectives of professionals in 6 different job positions (physicians, management personnel, nurse practitioners/physician assistants, nurses, support staff, and administrative staff) were analyzed regarding perceptions of issues surrounding patient safety. Management and physicians had more positive patient safety culture perceptions than those in other job positions surveyed. This discrepancy illustrates a stronger belief in an organization’s patient safety culture than is actually present. This organizational culture dynamic must be addressed in order to align and strengthen perceptions that are fundamental to providing quality, safe care to patient populations.

Utilizing a framework to help intellectualize the abstract, dynamic concept of a culture of patient safety promotes understanding and team-based discussions. Because of the complexity and multidimensionality of patient safety culture, Reiman et al also propose a theoretical framework for the concept. Their framework includes mindfulness of both the social and psychological processes involved, in addition to the organizational dimensions. Such an essential tool provides a means to bridge the gap

between understanding the importance of safety culture and building these perceptions into actual practice.

For example, The Proactive Reduction of Outpatient Malpractice: Improving Safety, Efficiency, and Satisfaction (PROMISES) Project was an AHRQ-funded study by Singer et al that examined patient safety in the ambulatory setting within the context of malpractice reform. By focusing on 3 “failure-prone processes” (ie, referral management, test result management, medication management), the authors discussed redesigning components of the health care delivery system in order to ensure issues are addressed. Through survey data collection and analysis, the results showed potential areas of improvement, such as increased communication among providers and establishing a strong sense of patient safety culture within an ambulatory system.

Weaver et al further review interventions used to foster a culture of safety and improve perceptions of the safety culture in ambulatory care. Safety culture is examined as an essential foundational component in systems designed to promote improved patient safety and quality care. A strong culture of safety can influence how care is delivered and subsequent outcomes. Three interventions were identified that improved implementation and perception of safety culture, including: “team training and team communication tools, executive walk rounds and interdisciplinary rounding, and the Comprehensive Unit-Based Safety Program (CUSP).”

### **Quality & Safety Measurements**

1. Bell BG, Spencer R, Avery AJ, Campbell SM. Tools for measuring patient safety in primary care settings using the RAND/UCLA appropriateness method. *BMC Fam Pract.* 2014;15:110.
2. Chassin MR, Loeb JM, Schmaltz SP, Wachter RM. Accountability measures--using measurement to promote quality improvement. *N Engl J Med.* 2010;363:683-688.

3. Lamb GC, Smith MA, Weeks WB, Queram C. Publicly reported quality-of-care measures influenced Wisconsin physician groups to improve performance. *Health Aff (Millwood)*. 2013;32:536-543.
4. Merrill DG, Laur JJ. Management by outcomes: efficiency and operational success in the ambulatory surgery center. *Anesthesiol Clin*. 2010;28:329-351.
5. Romano P, Hussey P, Ritley D. *Selecting Quality and Resource Use Measures: A Decision Guide for Community Quality Collaboratives*. AHRQ publication No. 09(10)-0073. Rockville, MD: Agency for Healthcare Research and Quality; 2010.

Although quality and safety are essential components of patient care, systemic measurement of these factors is also necessary to help improve patient experience in the health care system. Such measures have implications for research and intervention implementation. Bell et al developed a “toolkit” of patient safety measures and indicators for use in ambulatory practices. The authors utilized the RAND/UCLA Appropriateness Method exercise with an expert panel to identify items included in the toolkit. This toolkit will expand on current understanding of the epidemiology of patient safety in acute outpatient settings. Measuring and quantifying existing levels of safety will allow for interventions to improve outcomes.

The utilization of health care quality measurements to promote improvements is further examined by Chassin et al. Quality measures serve to advance the clinical care delivery process. The authors discuss quality measurements in terms of both process and outcomes in acute patient care settings. Ultimately, in order to improve patient health outcomes, assessment of quality and safety measures will precede improvements in the clinical process.

One means to improve physician performance in the clinical setting is to report measures of quality in care delivery. Lamb et al present an example of how public reporting of quality can positively influence the quality of care delivered to patients. Engagement in efforts centered on quality improvement was measurable when outcomes were reported. Public data analysis and a survey component were used to

support the idea that public reporting on quality measures is a motivational factor in quality improvement efforts.

Merrill and Laur report methods of standard approaches to patient care delivery in an ambulatory surgery center that support continued quality improvement. The authors outline how effective management and leadership emphasizing patient-centered quality care is necessary for interventions to be effective and long term. Process and outcome assessments, team empowerment, and the creation of standardized processes of care delivery are all functional options to improve patient outcomes. Implementation of quality and safety measurements itself is not sufficient. Publication of results and discussion of findings for educational purposes are quintessential feedback mechanisms required for sustainability.

Selecting and implementing quality measures can be a daunting task for health care systems attempting to ensure quality care for their patients. Romano et al designed a decision-making guide to assist organizations in choosing appropriate quality of care measures from a breadth of application options. The guide is organized into 5 sections: “Introduction to performance data, Introduction to measures of quality, Introduction of resource use/efficiency measures, Selecting quality and resource use measures, and lastly, Interpreting quality and resource use measures.” By providing a range of approaches and implementation considerations, health care organizations can adapt and apply their approaches based on individualized concerns about care quality. Overall, in order to improve safety in ambulatory settings, it is important to utilize tools and indicators in order to measure and, consequently, improve patient safety outcomes.

### **Team Training in Health Care**

1. Bunnell CA, Gross AH, Weingart SN, et al. High performance teamwork training and systems redesign in outpatient oncology. *BMJ Qual Saf.* 2013;22:405-413.

2. Hoffmann B, Muller V, Rochon J, et al. Effects of a team-based assessment and intervention on patient safety culture in general practice: an open randomised controlled trial. *BMJ Qual Saf.* 2014;23:35-46.

Patient care requires complex care coordination between multiple teams in order to deliver quality and reliable diagnostic and therapeutic options. Bunnell et al developed and implemented a team training initiative within oncology care at an outpatient cancer center. The concept of crew resource management is utilized in other high-risk industries such as aviation and nuclear power. The authors focused their pilot on 4 interventions deemed to be the highest risk to patient outcomes: miscommunication of treatment orders, missing orders, poor follow-up regarding patient concerns, and conflict between team members. Addressing team members' "roles, responsibilities, and behaviors" in protocols allowed for clear definition of each member's contribution. Overall, team training improved quality and safety of patient care delivery by improving communication and task coordination among team members. A limitation included the study being confined to a specific patient population at a single care center, making reproducibility of results uncertain. The concepts and methods of team training were demonstrated to be applicable in an ambulatory setting, but the measurable aspects of benefit in clinical outcomes of the interventions remain challenging.

Hoffmann et al illustrated the impact that team-based safety culture assessments could potentially have on ambulatory practice interventions. The authors conducted an open randomized controlled trial that included 60 general practices and utilized the Frankfurt Patient Safety Matrix (FraTriX) aims to assess organizational safety culture. The 9 dimensions of the FraTriX were: "overall commitment to quality, priority given to patient safety, perception of critical incidents and their causes, analysis of critical incidents, learning from critical incidents, communication as it relates to patient safety, personnel management as it relates to patient safety, staff education and training as they relate to patient safety, and teamwork as it relates to patient safety." The rationale was that team-focused analysis of their organization's safety culture would lead to implementation of specific measures to improve safety and,

therefore, quality care. Two methods of measurement used were (1) indicators of structure and processes and (2) reporting of patient safety incidents. After 12 months, no differences in patient safety culture indicators were shown, but there was better reporting of patient safety events in terms of number and quality. Self-assessment and interventions to improve safety culture from a team-based standpoint provide one methodology to improve processes affecting patient care.

### **Patient-Centered Care: Engagement & Satisfaction**

1. Farber J. Measuring and improving ambulatory surgery patients' satisfaction. *AORN J.* 2010;92:313-321.
2. Fiddes PJ, Brooks PM, Komesaroff P. The patient is the teacher: ambulatory patient-centred student-based interprofessional education where the patient is the teacher who improves patient care outcomes. *Intern Med J.* 2013;43:747-750.
3. Kaushal R, Edwards A, Kern LM. Association between the patient-centered medical home and healthcare utilization. *Am J Manag Care.* 2015;21:378-386.
4. Moffatt-Bruce S, Hefner JL, McAlearney AS. Facing the tension between quality measures and patient satisfaction. *Am J Med Qual.* 2015;30:489-490.
5. Neeman N, Sehgal NL. Improving the ambulatory patient experience within an academic department of medicine. *Am J Med Qual.* 2014;31:203-208.
6. Stein SM, Day M, Karia R, Hutzler L, Bosco JA. Patients' perceptions of care are associated with quality of hospital care: a survey of 4605 hospitals. *Am J Med Qual.* 2015;30:382-388.
7. Zuckerman KE, Wong A, Teleki S, Edgman-Levitan S. Patient experience of care in the safety net: current efforts and challenges. *J Ambul Care Manage.* 2012;35:138-148.

Health care organizations are constantly challenged to improve on their delivery of quality patient-centered care. Therefore, measurement and subsequent augmentation of patients' satisfaction is an

important aspect of overall improvement in quality care delivery in the outpatient setting. Farber analyzed patient satisfaction within a network of ambulatory health care providers in Pennsylvania. Press Ganey (PG) was contracted as a consulting service to process survey results and provided reports to the organizations, which focused on areas of potential improvement for change implementation. In one study, patients evaluated their experience based on “interpersonal relations and interactions with staff members, including staff members’ responsiveness, courtesy, competence, and communication.” Top 10 priorities were identified: “information about delays, response to concerns/complaints, attractiveness of the center, waiting time, comfort of room/resting area, degree pain was controlled, information on day of surgery, cleanliness of the center, staff’s concern for comfort, and ease of scheduling an appointment.” This report provided ample opportunities for improvement based on addressing these specific areas of concern. These quality care initiatives succeeded in measurably improving patient satisfaction scores within the ambulatory care setting.

Fiddes et al approach improving patient-centered care delivery and outcomes through the lens of the “patient is the teacher.” The authors discuss evidence that this approach within the context of interprofessional education leads to measurable improvements in patient care outcomes. This centralized role of patients can be extended beyond their own health care delivery to include the teaching process in medical education. By increasing patients’ involvement in more interactive ways, they can contribute to and supplement interprofessional learning and modification of organizational practices and behaviors. This dynamic relationship is mutually beneficial to health care providers and patients while also improving care delivery and outcomes. Viewing education as an integrated key component of clinical care is a framework that can be used to implement patient-centered approaches in the ambulatory care setting.

Kaushal et al examine the association between the model of patient centered medical homes (PCMHs) and care outcomes, including health care utilization, through a longitudinal, prospective cohort study. Three study groups were included: physicians who use PCMHs with electronic health records

(EHRs), PCMHs with paper medical records, and physicians who use EHRs without the PCMH structure. The transformation process to a PCMH included: “changing the culture toward population management, building a team with clearly defining roles and responsibilities, and becoming accountable for performance.” The authors describe how the implementation and utilization of PCMHs by primary care providers significantly decreased specialist visits by patients within one year. These results demonstrate one example of how the balance between costs and quality can be obtained in health care.

Improving patient care quality while simultaneously improving patient satisfaction is a complicated balancing act. Health care systems are constantly challenged to manage these priorities as discussed by Moffatt-Bruce et al. The interplay between providing safe, efficient, quality care while also ensuring patients are satisfied with their care delivery is a pressure chronically felt by health care providers. Implementing a patient-centered care model demonstrates improved clinical outcomes, which incentivizes providers to undergo an internal cultural shift.

Neeman and Sehgal describe how academic medical departments can contribute to improving patient satisfaction by applying knowledge and continued engagement in measuring outcomes. Developing and establishing a Patient Experience Working Group (PEWG) at UCSF School of Medicine served as a means to drive improvement in health care delivery from the Department of Medicine. PEWG created a collaborative model for disseminating best practices while setting goals for improvement. Implementation of PEWG-created performance initiatives showed measurably positive results at both the level of local ambulatory practices and across medical departments. Some examples are the peer observations program, patient-centered rounding, patient experience dashboards, and development of an improvement initiatives portfolio. The authors acknowledge that shared goal setting across different levels of organizational leadership was key in this model’s success in improving patient experience.

Proposed critical components of the patient-centered medical care model include positive patient experiences and low complication rates. Stein et al report that patients’ positive perceptions of their care, a key metric for evaluation of performance in the health care setting, is correlated to the quality of care



patients received. In this retrospective review study, the authors use data measured by the Hospital Consumer Assessment of Healthcare Providers and Systems scores on patient satisfaction and the Hospital Compare database, which consists of information on 4605 hospitals. One limitation of note is that because of the nature of the study design, causation cannot be established between the quality of care indicators and patient perception of care delivery. However, an established negative correlation of patient experience and complication rates illustrates a focal intervention point within health care delivery systems to increase overall quality.

Zuckerman et al also provide evidence that measuring patient experience of care (PEC) augments health care delivery, safety, and quality. Gathering PEC data is an essential component when evaluating health care systems for development of quality improvement initiatives. The authors conducted a qualitative, interview-based study of health care leaders in California safety net organizations to determine how PEC data were collected, analyzed, and lastly, utilized to improve care. Barriers to PEC data collection and use also were collected. Examples included: “(1) lack of financial and staff resources, (2) lack of knowledge about PEC measurement, (3) unmet needs for PEC survey and quality improvement resources, and (4) challenges related directly to the safety net patient population.” Possible interventions include educational campaigns about valid methods of data collection and analysis, tools to better understand and meet the needs of specific patient populations, and financial assistance. Overall, the authors conclude that although organizations are committed to improving PEC, there are substantial barriers that need to be addressed.

### **Care Coordination & Continuity of Care**

1. Beaussier M, Marchand-Maillet F, Dufeu N, Sciard D. Organizational aspects to optimize patient’s ambulatory pathway. *Curr Opin Anesthesiol.* 2015; 28:636-641.

2. Bell CM, Schnipper JL, Auerbach AD, et al. Association of communication between hospital-based physicians and primary care providers with patient outcomes. *J Gen Intern Med.* 2009;24:381-386.
3. Friedberg MW, Rosenthal MB, Werner RM, Volpp KG, Schneider EC. Effects of a medical home and shared savings intervention on quality and utilization of care. *JAMA Intern Med.* 2015;175:1362-1368.
4. Hesselink G, Schoonhoven L, Barach P, et al. Improving patient handovers from hospital to primary care: a systematic review. *Ann Intern Med.* 2012;157:417-428.
5. Rhoades R, Dietsche C, Jaffe R, et al. Use of a transition of care coordinator to improve ambulatory follow-up after hospital discharge. *Am J Med Qual.* 2015;30:291.
6. Sarkar U, Handley MA, Gupta R, et al. What happens between visits? Adverse and potential adverse events among a low-income, urban, ambulatory population with diabetes. *Qual Saf Health Care.* 2010;19:223-228.
7. Schiff G, Griswold P, Ellis BR, et al. Doing right by our patients when things go wrong in the ambulatory setting. *Jt Comm J Qual Patient Saf.* 2014;40:91-96.
8. Tapp H, Phillips SE, Waxman D, Alexander M, Brown R, Hall M. Multidisciplinary team approach to improved chronic care management for diabetic patients in an urban safety net ambulatory care clinic. *J Am Board Fam Med.* 2012;25:245-246.

Beaussier et al discuss the pros and cons of 2 types of ambulatory surgical units. The first type is a “free-standing unit,” in which the center is independent of a major facility and is dedicated only to elective procedures. “Integrated centers,” on the other hand, are ambulatory-based units that operate within a conventional surgical suite, such as within a hospital. Regardless of the type of unit, the authors lay out management frameworks to improve them. These include forward flow to ensure that patients spend only the time necessary at each step of the surgical pathway; an ambulatory map that works with the anesthesiologist consultation to help avoid patient mistakes that delay surgeries and also familiarize

patients with the surgical pathway; optimal operating room utilization to reduce overcrowding and underutilization; home monitoring to allow for quicker and easier postsurgical discharge; and development of better communication systems to be in touch with the patient as presurgical communication improves efficiency.

The transformation of internal medicine physicians from dual inpatient and outpatient providers to either primarily hospitalists (inpatient) or outpatient physicians only has created gaps in follow-up after hospital discharge. Bell et al compared discharged patient adverse event rates with those who saw primary care physicians who had communicated with the hospital team and those who had not received any sort of correspondence. No relationship was discovered between correspondence of inpatient and outpatient provider and patient outcome.

The medical home concept was designed to improve cost-effectiveness and outcomes, yet many early studies showed mixed results. Friedberg et al theorized that this may have been because of a lack of financial incentives to reduce costs and also the inexperience of those involved with utilizing medical homes. They analyzed medical claims and outcomes for medical homes under the Pennsylvania Chronic Care Initiative, which was one of the first areas to offer shared savings and technical assistance. Although the study was limited by an uneven distribution between pilot and comparison practices, there were statistically significant lower rates of all-cause hospitalizations, all-cause emergency department visits, higher rates of ambulatory visits, and improvement on measures such as diabetes control and breast cancer screening from the pilot studies.

Improper communication after discharge from the hospital can lead to poor outcomes after hospitalizations; 1 in 5 patients is reported to have an adverse event following discharge from the hospital. Hesselink et al evaluated randomized controlled trials with regard to interventions designed to improve handoff from the hospital to primary care providers. They did not find any evidence that a single intervention was effective at improving measured outcomes such as rehospitalization or repeat emergency

department visits. However, multicomponent interventions with a specific purpose (such as medication reconciliation following discharge obviously improved medicine reconciliation) seemed effective in improving outcomes almost universally. The wide variety of interventions studied along with nebulous patient outcomes limit the studies as the authors had difficulty defining the underlying mechanisms that actually improved discharge outcomes.

Rhoades et al studied the use of a transition of care coordinator to improve discharge outcomes with regard to general well-being and readmission rates. These coordinators identify patients' primary care physicians (PCPs) as well as assist those without proper PCP coverage. They arranged the necessary follow-up and facilitated medical record communication to PCPs. They also used follow-up calls to assist patients with unforeseen complications and questions. These coordinators were able to correct more than 40% of incorrect documentation and ensured higher rates of follow-up with PCPs. On the other hand, the investigators did not see a statistically significant improvement in 30-day readmission rates for those in the intervention portion of the trial.

Sarkar et al wanted to better understand adverse events that occur between physician visits for those with chronic diseases. Because diabetes is such a complex chronic disease that requires constant management as well as significant health literacy for those that it affects, the investigators used an automated telephone self-management support program (ATSM). The ATSM works by automating phone weekly calls that gather data based on patient responses. A nurse coordinator reviews the data and follows up with these patients based on response criteria that automatically trigger a callback. Results were tabulated in different self-management domains, as the investigators were looking for adverse events and also potential adverse events. They found multiple roots for each issue, from pharmaceutical use to monitoring, but there were common themes, such as low level of health literacy, causing issues at every level. The largest number of adverse events occur with medication safety and monitoring, which the authors suggest should receive the most attention for patients with chronic illnesses. In addition, the

majority of these events stemmed from patient action and inaction, suggesting that efforts to improve self-management are key.

As part of the PROMISES project group, Schiff et al created a monograph that essentially identified an outpatient version of “When Things Go Wrong,” a document about dealing with adverse events and disclosing them to family members. Salient points of this study include acknowledging such events quickly, working collaboratively with patients in the aftermath, providing appropriate follow-through that includes an understanding of not only why something happened but how the practice will prevent it from happening again, and creating a blame-free office environment. The document also addresses ways to improve communication with patients when discussing these adverse events.

Tapp et al describe a multidisciplinary approach toward addressing a multitude of issues for their patients with diabetes in Charlotte, North Carolina. For patients with HbA1c >9, they employed a health questionnaire to evaluate for depression as a comorbidity, had a pharmacist provide education sessions and tailor medication regimens, and had a social worker assist with obtaining medications and improving access to appointments. No results were offered as to the effects of this intervention.

### **Medication Safety & Electronic Prescribing**

1. Brummel A, Lustig A, Westrich K, et al. Best practices: Improving patient outcomes and costs in an ACO through comprehensive medication therapy management. *J Manag Care Spec Pharm.* 2014;20:1152-1158.
2. Dainty KN, Adhikari NK, Kiss A, Quan S, Zwarenstein M. Electronic prescribing in an ambulatory care setting: a cluster randomized trial. *J Eval Clin Pract.* 2012;18:761-767.

3. Devine EB, Hansen RN, Wilson-Norton JL, et al. The impact of computerized provider order entry on medication errors in a multispecialty group practice. *J Am Med Inform Assoc.* 2010;17:78-84.
4. Forrester SH, Hepp Z, Roth JA, Wirtz HS, Devine EB. Cost-effectiveness of a computerized provider order entry system in improving medication safety ambulatory care. *Value Health.* 2014;17:340-349.
5. Overhage JM, Gandhi TK, Hope C, et al. Ambulatory computerized prescribing and preventable adverse drug events. *J Patient Saf.* 2015;12:68-74.
6. Porterfield A, Engelbert K, Coustasse A. Electronic prescribing: improving the efficiency and accuracy of prescribing in the ambulatory care setting. *Perspect Health Inf Manag.* 2014;11:1g. PMID: PMC3995494.
7. Robbins CM, Stillwell T, Johnson D, Wilson S, Fitzgerald L. Integrating patient safety and clinical pharmacy services into the care of a high-risk, ambulatory population: a collaborative approach. *J Patient Saf.* 2013; 9:110-117.
8. Sorensen AV, Bernard SL. Strategies for safe medication use in ambulatory care settings in the United States. *J Patient Saf.* 2009;5:160-167.
9. Tedesco GW, McConaha JL, Skomo ML, Higginbotham SK. A pharmacist's impact on 30-day readmission rates when compared to the current standard of care within a patient-centered medical home: a pilot study. *J Pharm Pract.* 2016;29:368-373.

Brummel et al focus on different clinical practices within a Medication Therapy Management (MTM) program as a means to utilize the services of pharmacists in order to improve patient outcomes while reducing costs at the same time. This would be especially important in an Accountable Care Organization system. MTM includes medication reviews, anticoagulation checks, and pharmacy consults, among other services. An overview of the pioneering MTM program in Minneapolis demonstrates significantly higher optimal medication management for patients with chronic issues such as diabetes, as well as a positive

return on investment in both the short and long term. Some practices that were highlighted include targeting patients who are just discharged from the hospital, using electronic health record (EHR) data to seek out patients who could benefit from the program rather than just rely on physician referrals, incorporating direct interaction between patient and pharmacist, and quickly communicating any recommended change in medication regimens from pharmacist to physician.

Dainty et al performed a cluster randomized controlled trial with academic ambulatory clinics to evaluate an electronic prescribing system's effect on total prescription error ratio. Prescription errors included a wide range of problems, from illegibility of the prescription to dosing errors to drug interactions. They used pharmacy callbacks to physicians as an informal way to gauge prescription errors. Their results demonstrated no effect of EHRs on prescription errors; in fact, they could increase the number of callbacks to physicians. The study was limited by an extremely low adoption of the EHR system by the subjects of the study.

Devine et al conducted a pretest-posttest study to evaluate the effect of computerized order entry systems on medication errors and their adverse drug events. The study was quasi-experimental and based in a multispecialty non-academic-affiliated ambulatory clinic in Washington. Frequency of errors decreased from 18.2% to 8.2% after the computerized order entry system was adopted. The most striking improvements were in prescription illegibility, inappropriate abbreviations, and areas such as drug interactions, despite the system not having clinical decision-support alerts.

Although meaningful use has been designed as an incentive for utilizing EHRs, cost savings of such programs need further study in the ambulatory setting to help convince physicians to use them. Forrester et al created a decision-analytic model to gauge cost-effectiveness of a computerized order entry system in a 5-year time span for more than 400 providers. They used a model incorporated within a computerized order entry system to run simulations for cost savings based on implementation and maintenance costs, administrative costs, and prescribing costs. The simulations showed significant savings for the

computerized order entry system that were proportional to the amount of paper records eliminated and chart pulls for such purposes as prescription refills. Increasing numbers with these factors reduced savings significantly.

Overhage et al performed a study to evaluate the effectiveness of computerized prescribing on preventable and potential adverse drug events (ADEs) in the ambulatory setting. They evaluated 2 outpatient settings: one in Indiana and the other in Boston, Massachusetts. In Indiana, the intervention was associated with an 85% reduction in preventable ADEs and a 71% reduction in potential ADEs whereas in Boston it was associated with a 105% increase in both preventable and potential ADEs. The authors ascribe these findings to the differences in computer systems between both sites, with the Indianapolis settings offering more user support for areas such as drug dosing, drug interactions, and patient education.

Porterfield et al performed a systematic review to assess the benefits to E-prescribing and barriers to its utilization. Studies demonstrated that E-prescribing helped reduce medication errors and ADEs on its own. When combined with a medical decision-support system there was little added benefit. E-prescribing improved efficiency by reducing the need to clarify prescriptions. Studies showed the potential for significant savings through improved patient medication adherence and reduced adverse events. Studies also demonstrated that financial support was a major barrier to adopting the electronic system and that more incentives would be needed to help adoption and utilization rates. In addition, there was a potential for increased errors depending on design flaws within particular electronic systems.

As the population of patients with chronic conditions continues to increase, so will the number of people with complex medication regimens, thus exposing more people to the risk of medication error. Robbins et al describe the process and outcomes from integrating evidence-based pharmacy practices into a multidisciplinary health center. Processes include creating education reconciliation guidelines and performing medication reconciliation whenever there are regimen changes or transitions of care. These



were coordinated with full integration of the pharmacy staff into the electronic database so that they could access all provider data and also communicate with providers more easily. Results were positive as ADEs declined and outcomes improved (eg, obesity screening).

Sorensen et al performed case studies on more than 30 organizations, more than half of which were safety net providers, to delineate strategies for safe medication use practices in the ambulatory setting with particular focus on pharmaceutical services. Integrating pharmacy staff worked better if done gradually, with the utilization of a pilot program that focused on only a small segment of the sickest patients and then gradually expanding the staff's reach. In addition, promoting safe culture practices required effective integration of pharmacy staff into provider teams by giving them similar data access and even smaller details such as close proximity of pharmacist offices to medical providers. In addition, including pharmacy staff in leadership roles also helped organizational culture focus on patient safety practices.

The Affordable Care Act required hospitals to institute programs to reduce readmission rates. Tedesco et al analyzed the effects a pilot program that utilized pharmacists by having them contact all patients who were discharged from a hospital and performing medication reconciliation and counseling. In addition, when possible these patients met with the pharmacist for 30 minutes prior to their appointment with the primary care physician (usually within 1-2 weeks of discharge date). Readmission rate within a 30-day period was 26.7% for the control group and 14.7% for the intervention group. Small sample size and uneven distribution between control and intervention groups meant these results were not statistically significant, but they did at least show a favorable trend.

### **Diagnostic Test Result Management & Reporting Medical Errors**

1. Callen JL, Westbrook JI, Georgiou A, Li J. Failure to follow-up test results for ambulatory patients: a systematic review. *J Gen Intern Med.* 2012;27:1334-1348.

2. Casalino LP, Dunham D, Chin MH, et al. Frequency of failure to inform patients of clinically significant outpatient test results. *Arch Intern Med.* 2009;169:1123-1129.
3. Schnall R, Bakken S. Reporting of hazards and near-misses in the ambulatory care setting. *J Nurs Care Qual.* 2011;26:328-334.

Callen et al performed a systematic review to analyze an important safety issue in the ambulatory setting: failure to follow up test results. This is because of the numerous personnel involved in the ordering, collection, and analysis of such data as well as a variety of systems involved that may or may not use the same electronic health record system or paper-based system. These missed test results can have impacts ranging from missed cancer diagnosis to insufficient thyroid supplementation for patients with hypothyroidism. Review of the studies involved demonstrated a wide variability of missed lab tests results (6.8%-62%) and missed radiology results (1%-35%); this is likely secondary to the structural systems in place at the site of the studies conducted. Information and communication technology did show a favorable trend toward reducing these errors, but did not come close to eradicating it completely, highlighting the complexity of this situation. In particular, the blurred lines about responsibility for test results was particularly problematic. One study that used a double-alert system (both hospitalist and primary care provider were notified of test results ordered in the hospital) actually increased the odds that the test results would not be followed up and acted on. Radiologist communication of test results greatly helped with proper follow-up although the authors acknowledge this may be because radiologists are likely to call for life-threatening findings. The impact of patient receipt of results outside their doctor's office also was analyzed but there currently is no consensus among data or providers as it is highly variable depending on the mode of delivery (mail vs electronic vs verbal) and other factors such as the health literacy of the person involved.

Casalino et al performed a retrospective study to gauge how often physicians do not inform patients of significant test results, and to make comparisons of this error rate between those with "good processes" and those without as well as those with electronic medical records and those who do not use them. Failure

to inform rate was 7.1%; practices with higher rated “processes” scores had lower failure rates. Electronic medical records showed mixed results and often aligned with whether or not the practice already had a good process score.

Schnall et al monitored reported safety errors and adverse events by nursing students in their rotations at one school in New York over 4 years. They wanted to see if people not yet entrenched in health care culture would identify different types of safety issues than are normally reported. They also emphasized a “Just Culture” in the school, which allows people to recognize self-errors while at the same time realizing that many of these errors stem from systemic issues; this culture is designed to encourage frequency of safety error reporting. Infections and medications were the 2 categories most likely to result in hazards or near misses.

### **Diagnostic Errors**

1. Ball JR, Balogh E. Improving diagnosis in health care: highlights of a report from the national academies of sciences, engineering, and medicine. *Ann Intern Med.* 2015;164:59-61.
2. Graber ML, Wachter RM, Cassel CK. Bringing diagnosis into the quality and safety equations. *JAMA.* 2012;308:1211-1212.
3. Newman-Toker DE, Pronovost PJ. Diagnostic errors--the next frontier for patient safety. *JAMA.* 2009;301:1060-1062.
4. Schnall R, Larson E, Stone PW, John RM, Bakken S. Advanced practice nursing students' identification of patient safety issues in ambulatory care. *J Nurs Care Qual.* 2013;28:169-175.
5. Singh H, Graber ML. Improving diagnosis in health care - the next imperative for patient safety. *N Engl J Med.* 2015;373:2493-2495.
6. Singh H, Meyer AN, Thomas EJ. The frequency of diagnostic errors in outpatient care: estimations from three large observational studies involving US adult populations. *BMJ Qual Saf.* 2014;23:727-731.

Ball et al wrote an editorial discussing the Institute of Medicine's report *Improving Diagnosis in Health Care*. They discuss several themes regarding diagnostic error, which they feel has been an underrepresented issue in the field of patient safety. First, regarding why it receives so little attention: data are hard to collect and usually can only be gathered in retrospect. Second, patients are a central component of this issue and their understanding and communication is vital to reduce diagnostic errors. Third, diagnostics have changed to usually requiring multidisciplinary assessment. Health care professionals are still not receiving training for this increasingly common wrinkle in medicine (ie, teamwork, communication ability). The authors highlight several areas they wish had been addressed, such as the impact of different payment systems on diagnostics and whether or not these data should be made public.

Diagnostic errors can occur with common conditions as easily as they can with rare pathology and from multiple process points such as the radiologist read or the differential of the primary care physician. Graber et al write a perspective piece outlining the importance of recognizing diagnostic errors. They are dismayed at the paucity of integration of diagnostic errors into safety equations. The lack of data on diagnostics has translated into lack of interest in preventing diagnostic errors. Reducing diagnostic errors is vital to both preventing harm and reducing costs. Retooling education is key to improving this area in the future. Education right now is focused on treatment and transitional methods of diagnosis (such as having a lengthy differential diagnosis) and instead should have extra emphasis on the diagnostic portion as well as using modern tools such as Internet skills.

Newman-Toker et al provided commentary on diagnostic errors, which they state are responsible for about 40,000 to 80,000 deaths in US hospitals per year. Although other patient safety fields have attracted more attention, it is actually more likely that a physician error is diagnosis-related rather than drug related, and their effects are more likely to be debilitating. They offer several suggestions to reduce diagnostic errors such as using systemic changes to address "cognitive" errors (they lament the idea that diagnostic errors are seen as failures of cognition), focusing on cost-effectiveness, emphasizing

misdiagnosis–related harm as a way of more easily measuring and monitoring diagnostic errors, and pilot testing solutions for reducing diagnostic error that deliberately keep workflow in mind as many of the solutions so far have been impractical.

Because of the physician shortage and the increasing number of patients in both the hospital and ambulatory settings, advanced practice nurses (APNs) are increasingly being utilized as clinical providers. Schnall et al sought to understand the type of adverse events and errors that APNs experience and commit, and what structural issues mitigate or exacerbate the frequency of these events. They administered self-questionnaires to APNs still in an educational program within one school in New York. Interestingly, diagnostic errors ranged only from 5% (for “simple” patients) to 17% (for complex patients), which falls under the reported ranges for physicians in such studies. Most mistakes were attributed to structural issues such as inadequate time per patient, being interrupted during service, and other management-related items such as lack of appropriate equipment. This could be related to the narrower scope of health issues that APNs see in their practice compared to physicians. Electronic health records also were evaluated for impact, but no significant relationship was found between the electronic health record use and reduction in patient safety issues.

Diagnostic errors including wrong diagnosis and delayed diagnosis can affect up to 12 million adults per year. Singh et al offer a perspective piece based on the Institute of Medicine’s report on diagnostic errors. They applaud the analysis that the definition of diagnosis now includes the patient’s role, as inappropriate communication and timing of diagnosis explanations are vital aspects of diagnostic errors. Beyond the Institute of Medicine’s recommendations, they offer several necessary steps to reducing diagnostic errors. One is to develop resources to help clinicians identify and evaluate diagnostic errors as it is a notoriously difficult safety event to profile. They also encourage the frontline physician to employ a more reflective type of practice pattern than incorporates the patient’s point of view and uses their feedback as a means to reduce diagnostic errors. They also highlight the potential problems of electronic

health records, as they may improve aspects of communication but also can distance people who need to work with each other (ie, reducing thorough and detailed communication).

Although diagnostic errors are an important part of patient safety, they have traditionally been difficult to gauge. Singh et al synthesized data from 3 clinic-based studies to estimate the frequency of diagnostic errors. The studies involved use electronic triggers to detect abnormal primary care follow-up patterns or lack of follow-up for abnormal findings. Combining the statistics from these studies yielded an estimated outpatient diagnostic error rate of 5.08% each year, which is equivalent to about 12 million US adults a year. The authors had previously believed about half of these errors could potentially cause severe harm, thus about 6 millions adults in the country could be severely affected by these types of errors.

### **Simulation Exercises in Patient Safety Efforts**

Prakash V, Koczmar C, Savage P, et al. Mitigating errors caused by interruptions during medication verification and administration: interventions in a simulated ambulatory chemotherapy setting. *BMJ Qual Saf.* 2014;23:884-892.

Simulation exercises are used in a wide variety of clinical situations, usually to replicate in-hospital emergencies, but one area where they have not been utilized commonly is the ambulatory setting. Prakash et al designed a series of drug delivery simulations utilized by nurses in order to better understand how interruptions affect patient safety when it comes to administration of medications as well as to gain further insight into ways to reduce these types of errors. Their simulations reflected the process of a medication being ordered to its final delivery into the patient. Areas where nurses committed significantly more errors were usually with intravenous pump programming and push delivery as well as several vital areas of medication verification. Interventions included a visual timer, barrier zones where nurses would not be interrupted while verifying medications and drawing them up, and even speaking protocols aloud (where nurses had to say aloud what they were doing at certain phases) were found to reduce errors in

these simulation exercises. Although interruptions cause patient safety errors and are likely to be somewhat unavoidable in the real world, the authors are optimistic that these types of simple interventions would help mitigate their negative effect.

## **CONCLUSION**

Less than 2 decades ago the Institute of Medicine shined a spotlight on medical errors and the need for overall quality measures. In addition, the transformation from a fee-for-service model to a value-based payment structure has only underscored the importance of quality and safety measures as a means to improve health care efficiency and outcomes for patients. Research in this area has grown; however, most of it takes place in inpatient settings. Yet, the majority of medical care actually takes place in the ambulatory setting. Therefore, it is important to have evidence about which metrics actually matter and the structural changes that reliably produce results in those areas. The literature collected in this paper demonstrates that the heterogeneity of American health organizations can be a blessing, as it allows for researchers to examine a variety of means by which we can both improve the quality of health care and conversely diminish it. Important trends were noted in this collection of these papers, such as the failure of the electronic medical record per se to improve safety and/or working only when structured in certain ways (eg, to facilitate communication by health care workers). These types of findings make it imperative for structural changes to be based on evidence as strong as the kind that propels clinical changes. The quantity and variety of ambulatory safety research seen in this paper is hopefully a sign of progress in this important aspect of health care reform.

**Conflict of Interest**

The authors declare that there are no conflicts of interest.

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