

Volume 10, Issue 1

Spring 2018

**Special points of interest:**

- Rethinking patient identifiers in the US
- Clinical decision support implementation
- Augmented reality
- Interoperability
- Reducing racial/ethnic disparities in care
- Understanding drug-drug interactions
- Recent publications from Center members

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# Center Updates: a seasonal review

## Making Soft Intelligence Hard: A Multi-site Qualitative Study of Challenges relating to Voice about Safety Concerns

Summary by Sarah Rose Slate, Research Assistant

Healthcare organizations have developed systems to identify, prevent, and encourage people to report safety concerns. Clinicians at the sharp end of care can be particularly helpful in identifying safety concerns. However, formal reporting structures sometimes fail to capture this soft intelligence. One reason may be that the formal systems don't consider the cultural, psychological, and social factors that influence whether people speak up about safety concerns. In a recent article published in *BMJ Quality and Safety*, authors Martin et al. propose another possibility: formal incident reporting systems and policies for voicing concerns may actually *discourage* people from speaking out about safety concerns.

The researchers conducted a qualitative study at three healthcare organizations using semi-structured interviews to examine formal channels for safety reporting. Topic guides for interviews included asking questions about how people reported concerns or situations that they thought threatened patient safety.

Five main themes from the interviews were explored in detail. The first theme discussed was the value of raising concerns. Leadership spoke about the importance of reporting problems, and the many ways in place for frontline personnel to do so. However, despite these pathways, participants said that worrisome information did not always reach the managerial level, due to factors such as personal risk associated with voicing issues and criticism over lack of feedback from leadership.

Another theme that many leaders mentioned in interviews was the value of formal systems for reporting concerns. They believed that soft intelligence, or safety concerns, needed to be turned into documented, factual, "hard" evidence. However, the authors discovered that formal systems could also be a deterrent to reporting safety concerns, leading instead to the keeping of secrets, a third theme that emerged from interviews. In addition to worrying about the consequences of implicating

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## Sick Children Crying for Help: Fostering Adverse Event Reports

Summary by Zoe Burns, Project Coordinator

In their publication "Patient Safety Incidents Involving Sick Children in Primary Care in England and Wales: A Mixed Methods Analysis," Philippa Rees et al. seek to evaluate the safety of pediatric primary care in the UK. They offer a retrospective analysis of more than 2,000 pediatric adverse event reports over the span of a decade, concluding that the reported safety issues may be correlated with relatively poor outcome measures in the UK compared to other European nations. In his perspective article, "Sick Children Crying for Help: Fostering Adverse Event Reports" (*PLOS Medicine*), author Gordon Schiff offers his take on Rees and her team's research and findings. While Schiff recognizes the value in analyzing adverse event reports to identify ways of preventing future harm, he cautions the reader to consider what these reports might not

tell us.

Schiff recalls from his own experience that adverse event report rates are not an accurate measure of quality or improvement efforts due to underreporting. The author puts forth two recommendations. His first is the careful and timely review of adverse event report narratives. He recognizes that these reports are an important tool that should be given attention, analyzed, and acted upon. Schiff suspects that too often there lacks the necessary in-depth examination of trends and detailed narratives like that which Rees et al. have performed. Schiff contends that "analysis should breathe additional life into safety reports, rather than simply 'putting them to bed.'" His second recommendation is to consider

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## Has the Time Come for a Unique Patient Identifier for the U.S.?

Summary by Theresa Fuller, Research Assistant

In “Has the Time Come for a Unique Patient Identifier for the U.S.?” Sood et al. describe the absence of unique patient identifiers in the United States’ health-care system, and its disruptive impact. Because each independent institution assigns patients an identifier, there is no easy way to track patients across the health system. This means that our multi-billion-dollar electronic health record (EHR) infrastructure is not being used to its fullest potential. The authors argue that it is time to create a system of unique patient identifiers spanning the health system, and overturn an earlier decision from Congress to ban such a system under belief that it would endanger patient privacy.

The authors list numerous benefits associated with unique identifiers. The key benefit is that clinical information would always be linked to the correct patient. Data access for all health system processes would be improved. It would enable clinicians and ad-

ministrators to access data faster and easier. Research and quality improvement would be simpler. Additionally, many current clinical safety problems (e.g., duplicative testing, medical errors) could be ameliorated. The authors also suggest that a more complete and comprehensive medical record could improve patients’ engagement in their own care.

Current means of patient identification, such as asking for name and date of birth, are rife with potential issues, as they are not always unique between patients. Using these means, the authors state that only 90-95% of records may be linked to the correct individual, because 5-10% of patients share the same identifying information. This margin that cannot be automatically linked must therefore be expensively sorted out in order to identify the patient.

While implementing universal patient identifiers has the potential for positive health system effects, naysayers have concerns

about patient privacy. These concerns were not enough to prevent many countries in Europe from using unique patient identifiers, however. These nations—which among others include Ireland and Sweden—experience an ease of information transfer that does not exist in the U.S., per Sood et al. Promisingly, though, there are signs of change. Two U.S. states (Nevada, Minnesota) have legalized unique patient identifiers. Hopeful that these states can serve as test sites for clinical data transfer, the authors call for federally-sponsored pilots and analyses to understand the impact of these changes.

Sood et al. posit that EHRs are being underutilized, and the best way to improve their impact is with unique patient identifiers. Enacting this form of patient identification, as long as there are firm penalties for breaches, would allow for comprehensive and accurate patient records, to the benefit of patients, providers, and health-care researchers alike.

*Only 90-95% of records may be linked to the correct individual, because 5-10% of patients share the same identifying information.*

Harpreet SS, Bates DW, Halamka JD, Sheikh A. [Has the Time Come for a Unique Patient Identifier for the U.S.?](#) NEJM Catalyst. 2018 Feb 21. Epub 2018 Feb 21.

*Formal incident reporting systems and policies for voicing concerns may actually discourage people from speaking out about safety concerns.*

Martin GP, Aveling EL, Campbell A, Tarrant C, Pronovost PJ, Mitchell I, et al. [Making soft intelligence hard: a multi-site qualitative study of challenges relating to voice about safety concerns.](#) BMJ Qual Saf. 2018 Feb 19. [Epub ahead of print]

## Soft Intelligence

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others for errors, participants displayed reluctance to use formal systems because it meant turning their suspicions into facts that needed evidence. They expressed doubts about whether they could produce the evidence to support their concerns, especially under increased scrutiny, and thus many concerns went unreported.

A fourth topic raised in interviews was informal validation of concerns. Participants were used to addressing concerns among peers informally, and many noted this could lead to tolerance of unacceptable behaviors that should instead be escalated to leadership. The last theme was accessing soft intelligence. Some managers had alternative methods for gathering intelligence, which gave opportunities to speak up without initiating the formal processes for reporting safety issues. Strategies were relational, meaning leaders who made connections with employees were more likely to hear about safety concerns. Opportunities for staff to voice concerns without using formal processes were ultimately perceived as valuable because they allowed staff to feel comfortable discussing issues with managers, while knowing that the concerns would be handled correctly.

This study showed that, while participants acknowledged the importance of raising safety concerns, they also had reservations about the structures in place for reporting them. Formal systems for safety reporting may, contrarily, act as a deterrent for communicating safety issues. Healthcare systems may need to consider other approaches to safety reporting, such as informal peer-to-peer voicing of concerns or opportunities for leaders to listen to concerns outside of formal channels, if they want to gain insights about risks to quality and safety from the sharp end of care.

## Clinical Decision Support Models and Frameworks: Seeking to Address Research Issues Underlying Implementation Successes and Failures

Summary by Jenzel Espares, Research Assistant

Computer-based clinical decision support (CDS) has promised for decades to revolutionize the way that clinicians provide treatment to their patients. CDS is a health information technology tool that assists in supplying the knowledge providers need to make informed healthcare decisions. Through the automated compilation of information on the appropriate diagnostic and therapeutic actions for a specific case, CDS is properly poised to improve healthcare delivery and patient health outcomes. However, despite the potential benefits of CDS, the struggle to achieve widespread adoption and implementation of computer-based clinical decision support systems (CDSSs) persists today. While previous studies have identified certain factors that may contribute to this lack of impact, this commentary for the Journal of Biomedical Informatics suggests the possible blueprints for an expanded framework that could hypothetically address the many pitfalls that exist within CDSSs and CDSS implementation methods. By presenting a more general view as to what a CDS model must encompass, authors Robert A. Greenes et al. hope to positively influence the research, development, and eventual uptake of CDSSs in the healthcare setting.

In this paper, Greenes et al. mention deficiencies of previous CDS interventions that can be attributed to its limited adoption, such as a lack of focus on the care processes and outcomes that the intervention was supposed to target, an inadequate consideration of existing clinical workflows, an insufficient amount of patient specificity, and a difficulty in generalizing and sharing knowledge artifacts for CDS across varying electronic health record (EHR) platforms.

To remedy these shortcomings

identified from past CDS interventions, Greenes et al. then describe specific aspects of CDS which they believe are worth targeting when developing models or frameworks for designing CDSSs, as well as when promoting adoption and spread.

### Integration & Adaptation to Workflow

One reason why CDS fails to achieve seamless integration into the current workflow is poor synchronization of system design and user interface with the CDSS. For CDS interventions to improve targeted care processes and outcomes, the Five Rights must be achieved: it must get the **right** information, to the **right** people, in the **right** formats, through the **right** channels, and at the **right** times. This way, it can further enhance the decisions, actions, and communication that are already present within the existing workflow.

### Construction of CDS Artifacts

Within a CDSS, there is underlying infrastructure, or artifacts, that allows it to obtain and relay appropriate information to the end user. The manner in which these artifacts—such as decision rules, guidelines, order sets, and logic diagrams—are assembled, organized, and integrated into the CDSS can be essential in determining the outcome of a CDS intervention. These artifacts must promote a simpler and faster alternative to the current workflow in order to encourage CDS implementation.

### Knowledge Management, Interoperability, & Sharing

While EHR systems have rapidly evolved in the last few decades, persisting legacy EHR systems (20

to 40 years old), and their rigidity, continue to hinder widespread CDS adoption due to lack of customizability. Limitations in CDS utilization transcend theoretical “key factors,” such as the visible gap between desired CDS use and what is already in place. While these systems desperately need to be updated, new systems must also be developed with space to evolve. As healthcare guidelines change and vary over time, it is essential for CDSSs to have the flexibility to accommodate these new methods and practices.

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Along with these aspects, the paper also mentions the need for support of cognitive tasks and reasoning processes, implementation and adoption paradigms, quality improvement impacts, and proper assessment of the effectiveness of a CDS intervention. Greenes et al. argue that the creation of a CDS framework will ultimately assist in developing best practices and predictive models for the success of an intervention.

Iteratively refining the aspects mentioned above while a CDSS is developed and deployed can gradually move these systems closer to achieving the “quadruple aim” of a more positive patient experience, improved population health, reduced costs, and enhanced work life of healthcare personnel. The goal of a CDS is to make “the right thing the easy thing to do.” If all relevant factors are properly considered and seamless integration is accomplished, there will be potential for a radical paradigm shift in healthcare that will undoubtedly benefit providers and patients alike.

*Despite the potential benefits of CDS, the struggle to achieve widespread adoption and implementation of computer-based clinical decision support systems (CDSSs) persists today.*

Greenes RA, Bates DW, Kawamoto K, Middleton B, Osheroff J, Shahar Y. [Clinical decision support models and frameworks: Seeking to address research issues underlying implementation successes and failures](#). J Biomed Inform. 2018 Feb;78:134-143. Epub 2017 Dec 12.

*By creating new ways for consumers to engage with technology, sedentary activities like watching TV or playing video games can be supplemented with engaging AR solutions that get the participant up and moving.*

*To observe the expected enhancements in health care quality and delivery associated with EHR use, we need to improve interoperability.*

Bates DW, Samal L. [Interoperability: What Is It, How Can We Make It Work for Clinicians, and How Should We Measure It in the Future?](#) Health Serv Res. 2018 Mar 11. [Epub ahead of print]

## **The Obesity Epidemic and the Potential of Augmented Reality**

**Summary by Taylor Christiansen, Research Assistant**

Augmented reality (AR) may be useful in combatting the obesity epidemic among younger populations in the United States. This popular technology, which involves integrating digital information with an individual's environment, provides users with a safe way to partake in physical activity, while also interacting with their surroundings. Two-thirds of adults in the United States, and over one-third of children and adolescents, are considered overweight or obese. This, in part, may be due to more Americans leading sedentary lifestyles. Obesity and sedentary behavior are both linked to serious health problems, like cardiovascular disease. Although it is recommended that adults exercise often, inactivity remains an issue. There are also many costs associated with inactivity and the health issues it causes. In a Letter to the Editor for Applied Clinical Informatics (official eJournal of the American Medical Informatics Association), Michael K. Poku et al. discuss how the alarming trends in obesity and inactivity warrant attention and resources, as well as the important role AR could play in promoting healthy activity in young people.

As the authors explain, AR technology has already sparked an interest in young people, with popular games like Pokémon Go gaining a lot of attention. Developers of AR solutions have the opportunity to drive physical activity in youth, benefitting both societal health and wellbeing. By creating new ways for consumers to engage with technology, sedentary activities like watching TV or playing video games can be supplemented with immersive AR solutions that get the participant up and moving. For instance, popular gaming platforms like Nintendo Wii and Xbox Kinect, which utilize motion-detection technology that requires the participants to move around while they play, are referenced for demonstrating major strides in adapting AR to encourage

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## **Interoperability: What Is It, How Can We Make It Work for Clinicians, and How Should We Measure it in the Future?**

**Summary by Srijesa Khasnabish, Research Assistant**

While electronic health records (EHRs) are used in most hospitals today, it appears that this technology has not yet reached its full potential in terms of improving health care delivery. One reason for this could be poor interoperability, or the capacity for transferring information between two or more different systems and the use of this content. This is distinct from health information exchange (HIE), which refers solely to the sharing of information electronically. Interoperability has an additional level of complexity because it refers to the use of the exchanged information. Such information can be used for both clinical care and for health services research.

In this editorial, Bates and Samal emphasize the importance of testing interoperability in the context used by clinicians. They mention that primary care physicians often use the Summary of Care Record (SCR) to access information on a patient. While SCRs can contain important data, they also exist in various formats, which can pose challenges for interoperability. For instance, the results of one medical test could be entered in a coded format, whereas the discharge summary could be in a free text format. Although the information exists in the SCR, the variety of formats can increase the amount of time needed to perform a data exchange. Bates and Samal cite another issue affecting interoperability: EHRs can be redundant and require extra time on

the physician's part to actively "pull" the specific information they are seeking. This issue persists despite efforts towards standardization of the various types of clinical data. Inpatient EHRs can include up to 5,000 variables, a number which continues to grow today. While standards have been developed for the definition and classification of these numerous variables, their benefits can only be reaped if implemented consistently by users. Overcoming the lack of standardization barrier could improve the clinical benefits of interoperability.

One benefit of interoperability implied by Bates and Samal is that it could allow vendors to selectively "push" a controlled volume of information to clinicians. They suggest this would help deliver selective clinical messages to a targeted person, instead of to multiple people who are less likely to respond to it. Not only would this save clinicians time, but it could also reduce the high volume of messages shown to yield a lower response to the information. Furthermore, increased interoperability may be linked to financial benefits, due to factors such as reduction of redundant tests. A study cited by the authors suggests that the United States could save \$78 billion dollars annually with HIE measures to reduce superfluous tests in place.

A series of studies to evaluate interoperability,

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## The Electronic Health Record and Health IT to Decrease Racial/Ethnic Disparities in Care

Summary by Hilary Stenvig, Research Assistant

In response to a request from Congress in 1999, the Institute of Medicine (IOM) published a groundbreaking report, *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care* in 2003. The IOM committee reviewed over 100 studies that compared the quality of health care provided to different racial and ethnic groups. The results were enormously clear: Minorities consistently receive a lower quality of health care than whites, even when controlling for factors like access to care and ability to pay. Nearly 15 years later, despite some modest efforts and improvements, extreme disparities in quality of care persist.

In a commentary for the *Journal of Health Care for the Poor and Underserved*, Dr. Juliet Rumball-Smith and Dr. David Bates argue that the ongoing uptake and use of Electronic Health Records (EHRs) and Health Information Technologies (HIT) provide a unique opportunity. These new technologies are a prime set of tools that can be used to begin identifying and consequently reducing racial and ethnic disparities in quality of care. The authors suggest using a three-step process to resolve inequities in care. The first step is to simply begin accurately and consistently obtaining race and ethnicity data. The second, to apply an equity lens to health care quality. The third is to then use the imputed data within EHRs and health technology tools to create effective systems for addressing disparities in care.

### Step 1: Collecting Data on Race & Ethnicity

To be effectively utilized, data on race and ethnicity should be purposefully collected. Data on ethnicity should be detailed and flexible, allowing for patients to identify with multiple ethnicities and change their identification over time. There are multiple barriers to the collection of this data, however, involving both the patient and the health care worker. Out of apprehension about discrimination or bias, patients may not feel comfortable answering questions about their race and ethnicity. Health care workers may similarly feel uncomfortable asking such detailed questions, or may choose to prioritize other questions and tasks due to the limited time they have with patients. Dr. Rumball-Smith and Dr. Bates contend that technology can be effectively implemented to avoid these obstructions. Patient-facing digital tools can enable patients to self-identify ethnicity and to edit their identification over time, and the propagation of health data exchange can also minimize the repetition of data collection.

### Step 2: Applying an Equity Lens

After collecting accurate race and ethnicity data, health care organizations can begin examining how, why, and where disparities in quality of care are occurring and monitor forward progress. Systems that monitor differences in health outcomes and access to care are common, but EHR data and HIT tools will allow for a more in-depth examination of differences in process of care indicators like adherence to guidelines, referral rates, and medication regimes. This data will also allow for an analysis of the more deeply entrenched problems resulting in disparities, such as institutional racism, implicit bias, and structural barriers.

### Step 3: Developing & Implementing EHR-based Interventions

Once specific systems and structures that perpetuate discrepancies in quality of care are identified, organizations can begin developing solutions. There will likely need to be a multi-faceted approach with different responses for different groups and individuals. Thoughtfully designed clinical decision support tools and patient portals may be used to target and support those at risk of receiving a lower quality of care. Predictive health care analytics also may, more shrewdly, take race and ethnicity data and the past behavior of clinicians and patients into account, and allow for improved accuracy in precision medicine by removing the potential for human-induced errors.

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The rapid employment of electronic health records and health information technologies offers great potential in many different areas, but Rumball-Smith and Bates heavily emphasize the importance and priority that should be given to addressing disparities in care. Despite attempts to reduce inequities, huge gaps in quality of care persist. It is the responsibility of health care organizations to prioritize identifying and closing these gaps using the tools that are readily available.

Rumball-Smith J, Bates DW. [The Electronic Health Record and Health IT to Decrease Racial/Ethnic Disparities in Care](#). *J Health Care Poor Underserved*. 2018;29(1):58-62.

*Ongoing uptake and use of Electronic Health Records (EHRs) and Health Information Technologies (HIT) provide a unique opportunity. These new technologies are a prime set of tools that can be used to begin identifying and consequently reducing racial and ethnic disparities in quality of care.*

*To improve DDI alert specificity, Cornu et al. used a pre-identified series of significant DDIs to investigate how DDI alerts varied between five international EHRs implemented in the US, UK, Republic of Korea, and Belgium.*

Cornu P, Phansalkar S, Seger DL, Cho I, Pontefract S, Robertson A, et al. [High-priority and low-priority drug-drug interactions in different international electronic health record systems: A comparative study](#). *Int J Med Inform.* 2018 Mar;111:165-171. Epub 2018 Jan 9.

## High-priority and Low-priority Drug-Drug Interactions in Different International Electronic Health Record Systems: A Comparative Study

Summary by Grace Shin, Research Assistant

Today, drug-drug interactions (DDIs) continue to occur frequently and pose threat to patient safety. Although medication-related clinical decision support systems are integrated into electronic health record (EHR) systems and have the capacity to alert prescribers to potentially harmful DDIs, it is not without limitations. The generated alerts can have low specificity, often resulting in high override rates and alert fatigue. To improve DDI alert specificity, Cornu et al. used a pre-identified series of significant DDIs to investigate how DDI alerts varied between five international EHRs implemented in the US, UK, Republic of Korea, and Belgium. DDIs were categorized into 15 'high-priority' groups that warranted interruptive warning, and into 33 'low-priority' groups that did not. There were three objectives for this comparative study: (1) To determine whether alert warnings for high-priority and low-priority DDIs were present in the five international EHRs, (2) to compare the severity level assigned to the DDIs, and (3) to investigate the proportion of overridden alerts.

### High-priority DDIs

Both EHR systems in the US (one system for inpatients and one for outpatients) had alert warnings for all 15 high-priority DDIs classifications. The Korean and UK systems had alert warnings for 11 high-priority DDIs, and the Belgian system had alert warnings for 9 DDIs.

The severity level assigned to these 15 DDIs greatly varied amongst the five EHR systems. In the US inpatient system, 11 of the 15 DDIs had hard stops (cannot override), and the US outpatient system had hard stops for 12. The UK system also had hard stops, but for only 5 DDIs. The Korean and the Belgian systems, however, did not have any hard stops for the 15 high-priority DDIs. Additionally, the type and severity level of specific drug combinations within the high-priority categories varied extensively between the international EHR systems. For example, of the 23 strong CYP3A4 inhibitors that could interact with irinotecan, five were included in the Belgian system, one in both US systems, one in the Korean system, and none in the UK system.

The US outpatient system had the lowest override rate (56.7%) for interruptive alerts. The UK system demonstrated the highest override rate with 83.3%. The override rates for the Belgian, Korean, and US inpatient systems were 74.9%, 76.7%, and 80.2%, respectively.

### Low-priority DDIs

The Korean and UK systems included all 33 low-priority classified DDIs, but no alert warnings existed for them. The Belgian system included 24 out of 33 classified DDIs, but the alerts were not active for any of them either. The US systems included 3 classified DDIs, all with either interruptive or non-interruptive alerts.

Of the three EHRs (US inpatient and outpatient, and Belgian) that had a DDI alert system in place, the US outpatient system had the highest override rate (66.7%) for the interruptive alerts related to low-priority DDIs, then that of the US inpatient system (57.9%), and finally the Belgian system (0%).

The authors found that alerts existed for most of the high-priority classified DDIs in the five EHR systems. However, the override rate was high, suggesting that it was too easy to override the interruptive alerts in these systems. There was great variation in the types of high-priority DDIs included in the EHR systems, as well as in the severity level assigned to each individual drug-drug combination within their high-priority groups. Therefore, there does not seem to be a consistent means of determining the clinical relevance of DDIs across many institutions. The authors suggest that this may be due to the supporting evidence being theoretical and primarily dependent on case reports. This led them to emphasize the need to develop a framework for standardized evaluation of the clinical relevance of DDIs.

Given that only the US systems had alerts for low-priority DDIs, the authors also highlight the safety risk involved in completely turning off the alerts for these DDIs. In order to reduce the alert burden on prescribers, the authors advise using non-interruptive alerts for low-priority DDIs.

As DDIs continue to present risks to patient safety, the authors recommend that future studies should evaluate strategies for improving the clinical relevance of alerts, including context-aware alerting based on individual patient data, and application of human factor principles to reduce alert fatigue among prescribers.

## Augmented Reality

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physical activity. But despite these advancements, and the success of existing products, the authors also caution that there are some risks and challenges to consider alongside the benefits AR solutions facilitate.

One major challenge described by the authors is cost. Existing AR products are effective, but often require consumers to purchase a console and accessories, which can be expensive. Thus, people of lower socioeconomic standing may not be able to afford these technologies. Fortunately, modern AR solutions are being adapted to bring these concepts to technologies that are already available to most, like smartphones and tablets, making them more affordable to consumers. Secondly, it is important to take into account the risk of "screen media exposure" in the pediatric group. The recommendation by the American Academy of Pediatrics is that children have less than one to two hours of screen time per day, and it discourages any screen media exposure in children less than two years of age. Also, there have been reports of motion sickness associated with these kinds of technologies, which could result in injury. Finally, there are some commercial aspects that need to be considered. To maintain the interest of the young consumers who use these AR solutions, health and wellness AR developers will have to make continuous updates and improvements to products.

The authors expect that AR developers will be able to rise to these challenges, and the industry will benefit from these improvements. At the same time, consumers will benefit by partaking in more physical activity, which will lower their risk of acquiring serious health problems.

## Selected Publications by members of the Center

[A Multi-hospital Before-After Observational Study Using a Point-Prevalence Approach with an Infusion Safety Intervention Bundle to Reduce Intravenous Medication Administration Errors.](#) Schnock KO, Dykes PC, Albert J, Ariosto D, Cameron C, Carroll DL, et al. *Drug Saf.* 2018 Feb 6. [Epub ahead of print]

[Improving medication-related clinical decision support.](#) Tolley CL, Slight SP, Husband AK, Watson N, Bates DW. *Am J Health Syst Pharm.* 2018 Feb 15;75(4):239-246.

[Closing the loop with an enhanced referral management system.](#) Ramelson H, Nederlof A, Karmiy S, Neri P, Kiernan D, Krishnamurthy R, et al. *J Am Med Inform Assoc.* 2018 Feb 17. [Epub ahead of print]

[The Impact of Automated Notification on Follow-up of Actionable Tests Pending at Discharge: a Cluster-Randomized Controlled Trial.](#) Dalal AK, Schaffer A, Gershanik EF, Papanna R, Eibensteiner K, Nolido NV, et al. *J Gen Intern Med.* 2018 Mar 12. [Epub ahead of print]

[It's Not Just About How Much You're Paid.](#) Levine DM, Landon BE. *J Gen Intern Med.* 2018 Mar 12.

[Physician and patient tools to improve chronic kidney disease care.](#) Sequist TD, Holliday AM, Orav EJ, Bates DW, Denker BM. *Am J Manag Care.* 2018 Apr 1;24(4):e107-e114.

[Assumptions made when preparing drug exposure data for analysis have an impact on results: An unreported step in pharmacoepidemiology studies.](#) Pye SR, Sheppard T, Joseph RM, Lunt M, Girard N, Haas JS, et al. *Pharmacoepidemiol Drug Saf.* 2018 Apr 17. [Epub ahead of print]

[Applying User-Centered Design Methods to the Development of an mHealth Application for Use in the Hospital Setting by Patients and Care Partners.](#) Couture B, Lilley E, Chang F, DeBord Smith A, Cleveland J, Ergai A, et al. *Appl Clin Inform.* 2018 Apr;9(2):302-312. Epub 2018 May 9.

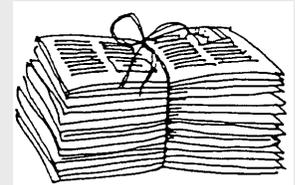
[Characteristics and Disparities among Primary Care Practices in the United States.](#) Levine DM, Linder JA, Landon BE. *J Gen Intern Med.* 2018 Apr;33(4):481-486. Epub 2017 Dec 4.

[Medication-related clinical decision support alert overrides in inpatients.](#) Nanji KC, Seger DL, Slight SP, Amato MG, Beeler PE, Her QL, et al. *J Am Med Inform Assoc.* 2018 May 1;25(5):476-481.

[Improving Adoption of EHRs in Psychiatric Care.](#) Busch AB, Bates DW, Rauch SL. *N Engl J Med.* 2018 May 3;378(18):1665-1667.

[Physician Burnout in the Electronic Health Record Era: Are We Ignoring the Real Cause?.](#) Downing NL, Bates DW, Longhurst CA. *Ann Int Med.* 2018 May 8.

Poku MK, Behkami NA, Bates DW. [The Obesity Epidemic and the Potential of Augmented Reality.](#) *Appl Clin Inform.* 2017 Feb 1;08(02):612-616.



Take a look at some recent publications by members of the Center!



*“Analysis should breathe additional life into safety reports, rather than simply ‘putting them to bed.’”*

## Rees Article:

Rees P, Edwards A, Powell C, Hibbert P, Williams H, Makeham M, et al. [Patient Safety Incidents Involving Sick Children in Primary Care in England and Wales: A Mixed Methods Analysis](#). PLoS Med. 2017;14(1):e1002217.

## Schiff Perspective:

Schiff GD. [Sick Children Crying for Help: Fostering Adverse Event Reports](#). PLoS Med. 2017 Jan 17;14(1):e1002216. eCollection 2017 Jan.

## Adverse Event Reports

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how the event could be avoided in the future. This involves the utilization of quality improvement tools to: a) identify root causes, b) distinguish “special cause” from “common cause” (i.e., unexpected vs. expected variation), c) minimize “tampering,” and d) avoid “suboptimization.” The latter two are both pitfalls of quality improvement that can introduce new, or worsen existing, systematic problems, resulting in more harm than good.

Schiff applauds Rees et al. for their utilization of community pharmacies and telephone triage call centers as novel venues for collecting adverse event reports. Rees and her team identified vulnerabilities of particular importance to the pediatric population, such as dosing and dispensing considerations and delayed recognition of septicemia. They also found diagnostic delays to have the highest burden of harm. Because diagnostic errors are infrequently reported, Schiff notes their findings likely only skim the surface of a larger issue. Schiff contends that despite a lack of resources, receptiveness, and responsibility to learn and improve practices based on incident reports, we owe it to the patients to do better. He advises that institutions should use their event reports to question what, when, and why incidents occur, and how they can be avoided in the future.

## Interoperability

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which used the rate of SCR exchange during transition of care as the primary metric, is also referenced by Bates and Samal. One of these studies found that that government-owned and nonprofit groups outperformed hospitals using Cerner or McKesson in terms of SCR exchange rate during care transitions. Bates and Samal offer criticism to this study, however, as SCR exchange may not be most the ideal metric for evaluating interoperability. They believe this is because SCR exchange depends on whether the data is coded, and coded in a standardized fashion. Furthermore, this metric does not allow us to measure if clinicians could successfully retrieve the information they sought to find in the first place.

To regulate interoperability, Bates and Samal recommend conformance testing. This would involve the use of a third party to validate the transmitted messages, ensuring factors such as accuracy and completeness. Regulation is important because there have been past instances in which vendors “game” the system to load certain codes over others, thus limiting information exchange. Instances of gaming have occurred in other contexts where interoperability is important, such as the automobile industry. Historically, the federal government has been involved in establishing standards to prevent gaming; this makes it a key stakeholder that could help catalyze efforts towards improved EHR interoperability.

To observe the expected enhancements in health care quality and delivery associated with EHR use, Bates and Samal conclude that we need to improve interoperability. Again, this refers not only to the use of electronic health information, but also to the exchange of this content. This exchange needs to be evaluated using better metrics and via the collection of both quantitative data and qualitative data on usability from providers. Bates and Samal suggest the next step would be to conduct a thorough cost savings analysis, as this would facilitate study of the efficiency of care associated with interoperability. With efforts towards standardization of data and metrics for assessment, the authors affirm that interoperability has the potential to improve clinical care, clinical decision support, and performance measurement.

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