Pediatric Ambulatory Safety:
Engaging Patients and Families to Reduce Medication Errors

Center For Health Services and Outcomes Research
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About Me

• Associate Vice Chair of Ambulatory Quality and Safety
• Co-Director, Armstrong Institute Patient Safety and Quality Leadership Academy
• Core Faculty, Armstrong Institute
• Assistant Professor, Pediatrics
• Interests: Pediatric Quality and Safety, Patient and Family Engagement, Medication Safety, Ambulatory Quality and Safety
Objectives

1. To describe key concepts in pediatric ambulatory safety and highlight unique challenges.
2. To discuss strategies for patient and family engagement
3. To apply lessons learned from inpatient medication safety initiatives to outpatient settings
4. To present and obtain feedback on current research on “A human factors approach to pediatric ambulatory medication safety”.
Ambulatory Patient Safety: Increased Potential for Errors

• High volumes of outpatient care
• Need for collaboration and communication across the continuum for care
• Inpatient solutions not always applicable to outpatient
• Fewer resources, less infrastructure for patient safety
• Not prioritized by regulatory and accreditation agencies
• Not much is known; emerging priority in patient safety

Bates and Singh. Two decades since To Err is Human: An assessment of progress and emerging priorities in patient safety. Health Affairs, 2018.
Ambulatory Patient Safety: 4 Domains and Goals

- Missed, delayed, incorrect diagnosis
  - Accurate diagnosis and testing

- Delay in proper treatment or preventive services
  - Appropriate treatment

- Medication errors, preventable adverse drug events
  - Safe med prescribing
  - Safe med use

- Communication, information flow, and coordination of care
  - Coordinated care, timely referrals and test results, safe transitions

Important Differences in Adult and Child Health and Health care systems: The 4 D’s

- **Development**
  - Stages of Development in Children
  - Changing longitudinal care needs
  - Chronic illness more dynamic in childhood
  - Interactions of treatment and development
  - Life-course effects - cumulative effects of tx on physical, cognitive, emotional development

- **Differential Epidemiology**
  - Unique and changing pattern of health needs and challenges in each phase of childhood
  - Type, prevalence, severity of illness in children
  - Increasing chronic childhood illness: behavioral, developmental, emotional (ADHD, obesity)

- **Dependency**
  - Dependent on adults for health, welfare needs, access to care, appropriate management
    - Often cannot speak for themselves, relay information
    - Decisions about management/treatment depend on adult caregivers and their values, preferences, risk tolerance, which may differ from the child
    - Family structure (multiple homes, caregivers)

- **Demographics**
  - Children are disproportionately poor, more ethnically and racially diverse, more likely to live in families with LEP (2/5 minority group, 1/5 live in poverty)
  - Health care quality differs by race, ethnicity, and income.
Pediatric Ambulatory Safety

Medication errors – most commonly reported preventable error in pediatrics

- Prescribing, dispensing, administering
- Rapid, accurate weight-based dosing calculations (CPOE can cause errors!)
- Communication between providers, caregivers, pharmacy
- Dependence on others and cooperation from parents and children to administer meds
- Need for appropriate measuring devices for liquid and specially compounded formulations

What patient and family engagement strategies improve medication safety?
Evaluation of Patient and Family Engagement Strategies to Improve Medication Safety

Julia M. Kim¹ · Catalina Suarez-Cuervo¹ · Zackary Berger¹ · Joy Lee¹ · Jessica Gayleard¹ · Carol Rosenberg¹ · Natalia Nagy¹ · Kristina Weeks¹ · Sydney Dy¹
Definitions

• Patient and Family Engagement (PFE) Strategies:
  • Interventions that promote active partnerships between patients and their families and health professionals.
  • Encourage active participation, such as the use of a patient portal to review and edit a medication list, or
  • Promote active engagement by patients with their health care providers, such as an educational session encouraging patients to ask their providers about their medications.

• Medication Safety Outcomes:
  • Medication errors, adverse events, medication list accuracy, inappropriate medication use, perceptions of safety, and knowledge of medications related to safety and side effects.

• Implementation Outcomes:
  • Reflecting the quality of implementation and how the intervention was used or implemented. The four implementation outcomes, based on the Consolidated Framework for Implementation Research, included use of the strategy, patient engagement, satisfaction, and knowledge about the strategy.
Ladder of Patient and Family Engagement

Description and Examples of Engagement Strategies

Integrate
Integrates patients and families as full team members in care; supports patient-driven goals in and out of the healthcare setting. Patient and family involvement on care team transforms healthcare.

Partner
Partners with patients to become collaborators and consultants in their care. Patients are involved in decision making. Patient input impacts care.
- e.g. Patients manage medication lists, collaborate with clinicians through portals; partner on use of patient-generated data in electronic health records (adverse event reporting, patient reported outcomes); use transition coaches

Empower
Empowers patients with skills and tools to communicate and engage with their care team.
- e.g. Patients provide feedback to clinicians through portals; programs build communication skills to discuss meds with pharmacist

Inform about Engagement
Encourages patients to engage and communicate with their health care team. Patients are informed about their health care and encouraged to ask questions.
- e.g. Patients are given handouts, booklets, computer programs about communicating with clinicians and error prevention.

Inform about Healthcare
Provides patients with information about medications. Patients are informed of health care but not about ways to become more involved.
- e.g. Patients are given handouts, booklets, computer programs about medications

Adapted from the Healthcare Information and Management Systems Society (HIMSS) Patient Engagement Framework
Methods

Inclusion:
• Studies promoting PFE and medication safety
• No age limits
• +/- comparator group
• Medication safety outcome reported
• Any setting
• Original data
• English language
• Level 2 PFE or higher

Cochrane Risk of Bias Tool
QI Minimum Quality Criteria Set Tool
Level of Patient Engagement
Results

• 2 themes identified:
  • Patient Education (n=9)
    • Nine patient education interventions actively promoted engagement and implemented educational strategies (booklet, learning module, training program) to promote and educate patients about engagement.
  • Medication Reconciliation (n=10)
    • Ten studies focused on medication reconciliation strategies, such as the use of medication reconciliation cards and bringing medications to office visits, electronic medication records for feedback and communication, and involvement of pharmacists and nurses.
  • Subtheme: Patient portals (n=6)
    • 6 used health information technology (HIT) or patient portals as a tool to provide patient education [29 ] or to perform medication reconciliation

• Heterogeneity of interventions and outcomes
<table>
<thead>
<tr>
<th>Study, year (country)</th>
<th>Study design</th>
<th>Population characteristics</th>
<th>Primary objectives</th>
<th>Description of intervention</th>
<th>Medication safety outcomes</th>
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</thead>
<tbody>
<tr>
<td><strong>Patient education</strong></td>
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<td><strong>Level of engagement 2</strong></td>
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<tr>
<td>Tannenbaum et al., 2014 [34] (Canada)</td>
<td>Experimental RCT</td>
<td>Home, adults ≥65 years receiving long-term benzodiazepine therapy</td>
<td>To compare effect of patient education on benzodiazepine therapy discontinuation (EMPOWER study)</td>
<td>Empowerment booklet on benzodiazepine risks mailed to patients, alternative meds, request to discuss with provider</td>
<td>Decreased inappropriate medication use&lt;sup&gt;c&lt;/sup&gt; Reported adverse events</td>
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<tr>
<td></td>
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<td>I: 15 pharmacies, 148 participants</td>
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<tr>
<td></td>
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<td>C: 15 pharmacies, 155 participants</td>
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<td><strong>Level of engagement 3</strong></td>
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<tr>
<td>Pereles et al., 1996 [33] (Canada)</td>
<td>Experimental RCT</td>
<td>Inpatient, geriatric rehabilitation unit, elderly adults</td>
<td>To determine effect of self-medication program on patient knowledge</td>
<td>Three-stage inpatient program with counseling, increased patient responsibility</td>
<td>Decreased errors&lt;sup&gt;c&lt;/sup&gt; No difference in medication safety knowledge</td>
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<td></td>
<td></td>
<td>I: 51</td>
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<td>C: 56</td>
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<td><strong>Level of engagement 4</strong></td>
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<tr>
<td>Coleman et al., 2004 [22], USA</td>
<td>Quasi-experimental</td>
<td>Inpatient to home, adults ≥65 years of age, chronic conditions</td>
<td>To improve care transitions by providing patients tools to actively participate</td>
<td>Use of a personal health record and transition coach (follow-up visits, phone calls)</td>
<td>Reported knowledge of medication safety</td>
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<tr>
<td></td>
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<td>I: 158 patients</td>
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<td></td>
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<td>C: 135 patients</td>
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<tr>
<td><strong>Medication reconciliation</strong></td>
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<td><strong>Level of engagement 2</strong></td>
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<tr>
<td>Weingart et al., 2004 [30], (USA)</td>
<td>Experimental RCT</td>
<td>Inpatient adults</td>
<td>To examine the impact of patient partnership intervention to prevent adverse drug events</td>
<td>Patients received current medication list and drug safety information</td>
<td>No difference in rate of adverse events and med safety perception</td>
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<td>I: 107</td>
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<td>C: 102</td>
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<td><strong>Level of engagement 3</strong></td>
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<tr>
<td>De Jong et al., 2016 [37] (Netherlands)</td>
<td>Quasi-experimental</td>
<td>Home, adults, 5 or more medications</td>
<td>To investigate the effects of patient participation in med rec process using eMAR-PCT</td>
<td>Patients can see eMAR, notify pharmacist of errors, email questions, add OTC meds</td>
<td>No change in medication accuracy Increased self-efficacy&lt;sup&gt;c&lt;/sup&gt; Reported medication error</td>
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<td></td>
<td></td>
<td>I: 78 users</td>
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<td>C: 74 non-users</td>
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<tr>
<td>Kelly et al., 2016 [25] (USA)</td>
<td>Observational, cross-sectional</td>
<td>Inpatient, parents of pediatric patients &lt;12 years</td>
<td>To assess parents’ use and perceptions of inpatient portal using a tablet</td>
<td>Tablet with portal link to EHR gave parents information on child’s hospital stay</td>
<td>Reported medication error</td>
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<td></td>
<td></td>
<td>I: 296</td>
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<td>C: none</td>
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<td><strong>Level of engagement 4</strong></td>
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<tr>
<td>Weingart et al., 2008 [31] (USA)</td>
<td>Observational, descriptive</td>
<td>Outpatient, adults</td>
<td>To learn if electronic message improves communication about meds, identifies ADEs</td>
<td>Med safety application within a portal sent messages to patients, asked about meds</td>
<td>Reported adverse events</td>
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</tbody>
</table>
## Results

### Table 2: Summary of implementation and medication safety outcomes, by type of intervention, level of engagement and study design

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Level of engagement</th>
<th>Implementation outcomes</th>
<th>Medication safety outcomes</th>
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</thead>
<tbody>
<tr>
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<td>Use</td>
<td>Patient engagement</td>
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<td>Patient education</td>
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<td>Tannenbaum et al. [34]</td>
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<td>Miller et al. [28]</td>
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<td>Edworthy et al. [32]</td>
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<td>OLeary et al. [29]*</td>
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<td>Schwappach et al. [40]</td>
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<td>Schwappach et al. [39]</td>
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<td>Pereles et al. [33]</td>
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<td>Martin et al. [27]</td>
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<td>Coleman et al. [22]</td>
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<tr>
<td>Medication reconciliation</td>
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<td>Weingart et al. [30]</td>
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<td>Atkin et al. [35]</td>
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<tr>
<td>Karapinar-Carkit et al. [38]</td>
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<td>Lesseloth et al. [26]</td>
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<tr>
<td>De Jong et al. [37]*</td>
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<tr>
<td>Lingaratnam et al. [36]</td>
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<tr>
<td>Dullabh et al. [23]*</td>
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<tr>
<td>Heyworth et al. [24]*</td>
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<td>Kelly et al [25]*</td>
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<td>Weingart et al. [31]*</td>
<td>4</td>
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* Patient portal intervention

-medication, ● indicates outcome and numbers reported; no comparative statistics reported, ↑ indicates statistically significant increase between comparator groups, ↓ indicates statistically significant decrease between comparator groups, ↔ indicates no statistically significant difference between comparator groups
Conclusions

- More research is needed: developing and measuring PFE, evaluating associations between type and level of PFE strategies and medication safety outcomes.
- Evaluation of implementation outcomes, clear definitions of medication safety, and use of validated medication safety outcomes are needed to compare effectiveness of strategies and potential usefulness for dissemination.
- Very few pediatric studies.

**Key Points for Decision Makers**

Patient engagement strategies impacting medication safety can be classified as patient education or medication reconciliation, and often involve patient portal use.

Interventions for patient engagement should not just inform but should incorporate higher levels of empowering patients, partnering with patients in care, with a goal of integration as full care team members.
Rev

• Review of 52 review articles. + self-mgmt anticoagulation meds, +/- medication and chronic disease self management, adverse event reporting, medical record accuracy. Promising modes of patient engagement, such as anticoag mgmt and patient portal access are not widely implemented.
What can we learn and apply from the inpatient to outpatient setting?
Automated E-mail Reminders Linked to Electronic Health Records to Improve Medication Reconciliation on Admission

Kristen Johnson, MD*; Gregory S. Burkett, BS†; Daniel Nelson, BS†; Allen R. Chen, MD, PhD, MHS‡; Carol Matlin, RN, MS§; Cathy Garger, RN§; Steven McMahan, RPh∥; Helen Hughes, MD, MPH∥; Marlene Miller, MD, MSc**; Julia M. Kim, MD, MPH∥**
Automated Reminders for Medication Reconciliation

In 2005, the Joint Commission on Accreditation of Health-care Organizations identified medication reconciliation as a National Patient Safety Goal. Health care organizations were subsequently tasked with implementing a medication reconciliation process that ensured an accurate list of home medications upon admission and all subsequent transitions of care.

In 2014, the Johns Hopkins Hospital adopted Sunrise Prescription Writer (RxWriter) (Allscripts Healthcare Solutions, Chicago, Ill.), a software program compatible with Allscripts Sunrise Clinical Manager electronic health record (EHR) system to facilitate EHR documentation of medication reconciliation on admission, transfer, and discharge. The adoption of this new software program was driven by Centers for Medicare and Medicaid meaningful use incentives for EHR systems to capture a codified medication list to improve medication safety. Postimplementation surveillance by a committee of physician faculty, residents, nurses, and pharmacists raised concerns that medication reconciliation documentation through RxWriter was not routinely and properly taking place, with potential risks for medication errors. A quality improvement team aimed to improve medication reconciliation on hospital admission for general pediatric patients cared for by pediatric residents.
Methods

• Lean sigma approach
• Process mapping
• Fishbone
• Statistical Process Control
Fig. 1. Swim lane process map defining the process of home medication reconciliation and roles of patient, nurse, resident, and pharmacist. H&P, history and physical; MAR, medication administration record; OMR, outpatient medication review; OP, outpatient; PACU, postanesthesia care unit; POE, provider order entry.
Fig. 2. Ishikawa cause and effect diagram for incomplete home medication reconciliation on hospital admission.
Fig. 4. SPC chart of the daily proportion of patients admitted to general pediatric units without documentation of home medication reconciliation in RxWriter after 24 hours of admission. LCL, lower control limit; UCL, upper control limit.
Johns Hopkins – Ambulatory Q&S:
How does ambulatory medication safety link to operational priorities at JHM?

• Safety*
• Quality
• Patient Experience*
• Value
• Equity
Current research:

A human factors approach to improving ambulatory pediatric medication review and reconciliation in children with medical complexity

Johns Hopkins Primary Care Consortium
Thank you!

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