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How Useful are Discharge Documents for Care Coordination?

Session 302, March 9, 2018

Erin Sparnon, MEng, Engineering Manager

Polly Tremoulet, PhD, Human Factors Scientist

ENGAGED

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Conflict of Interest

Erin Sparnon, MEng
Polly Tremoulet, PhD

Have no real or apparent conflicts of interest to report.

Agenda

- Introduction
  - Learning Objectives
  - ECRI Institute and its evaluation process
- Motivation
  - Patient discharge documents (PDD)* used for clinical information
- Project goals
- Challenges
- Approach
- Recommendations
- Future research directions

Referred to by many names : discharge instructions, patient instructions, clinical summaries, after visit summaries, summary of care documents

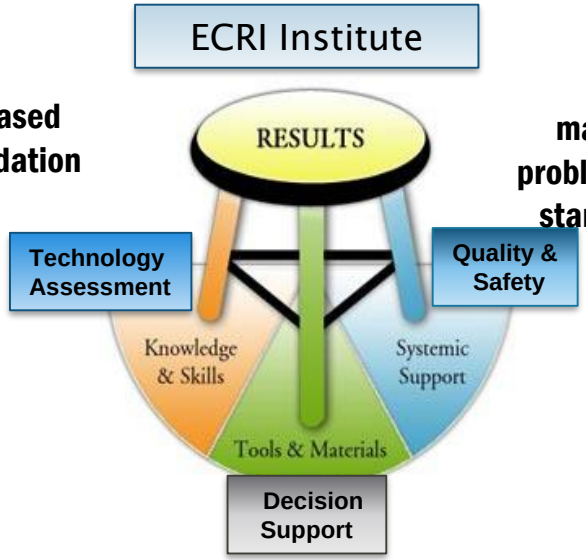
Learning Objectives

1. Identify the Challenges in assessing usability of Electronic Health Record (EHR) systems

2. Describe a novel method for conducting heuristic evaluations of medical documentation

3. Share best practices for improving discharge documents

Evidence based recommendations, and technology planning



Risk management, problem reports, standards, and guidelines

Pricing, performance, market intelligence, and analytics

- Safety
- Quality
- Efficiency
- Effectiveness
- Performance
- Evidence
- Cost

Motivation: Improve information exchange and coordination between hospital and outpatient care providers

Patients are supposed to follow up with outpatient providers after a visit to the hospital- but how do they know what to tell these caregivers?

Auto-generated patient discharge documents (PDDs) aren't very useful right now, either to patients or to the outpatient providers who are trying to use them "off-label" for care coordination.

So how can we fix that?

Why are EHR-generated PDD being used for Care Coordination?

- Physician-facing care coordination documents generated by inpatient providers often do not reach outpatient providers.
  - Poor integration/lack of interoperability
  - Inaccurate or missing contact information
  - No required timeframe for sending them to outpatient physicians, and no confirmation of receipt when sent

- No quick fix in sight
- Outpatient providers are relying on PDD for care coordination as an "off-label" workaround when other CC documents are unavailable
- Gorry, T., *Personal communication with ECRI Institute.* 2017.

Why Study Physician Use of PDD?

- Previous studies have assessed PDD from the perspective of patients and caregivers, but few have considered usability of these documents from the perspective of outpatient providers
- Patient-facing documents used for care coordination more often than inpatient providers realize
- PDD must be improved to better support care coordination AND to be more usable by patients and caregivers
- Evaluations of usability of discharge docs from patient perspective:

- Sarzynski, E., et al., Opportunities to improve clinical summaries for patients at hospital discharge. BMJ Qual Saf, 2016: p. bmjqs-2015-005201.
- Federman, A.D., et al., Patient and clinician perspectives on the outpatient after-visit summary: a qualitative study to inform improvements in visit summary design. Journal of the American Medical Informatics Association, 2017. 24(e1): p. e61-e68.
- Unnewehr, M., et al., Optimizing the quality of hospital discharge summaries–a systematic review and practical tools. Postgraduate medicine, 2015. 127(6): p. 630-639.
- Newnham, H., et al., Discharge communication practices and healthcare provider and patient preferences, satisfaction and comprehension: A systematic review. Int J Qual Health Care, 2017: p. 1-17.

Why didn't we evaluate usability of the whole EHR?*

- Organizational goal was to "assess usability of a Health-IT system"
- EHR/HIT does not lend itself to ECRI's head-to-head evaluation methods for large-scale comparisons
- However, aspects of HIT like individual displays or documents are ripe for comparative analysis
  - Identify and develop solutions for specific problems
  - Publish recommendations and best practice guidelines

*Ratwani, R. M., Hettinger, A. Z., & Fairbanks, R. J. (2016). Barriers to comparing the usability of electronic health records. *Journal of the American Medical Informatics Association*, *24*(e1), e191-e193.

Additional Challenges

- ECRI-specific challenges:
  - No internal access to EHR systems
  - Publication deadlines
- Project-specific challenges:
  - Different templates for producing documentation within facilities- even between care areas
    - Wide variation between different implementations of the same vendor's systems
  - No standard templates (in US)
  - EHR vendor contracts prohibit sharing of EHR output

ECRI team's Novel Approach

1. Test simulated versions of documents that are produced by electronic health record systems, rather than software modules.
2. Develop novel 'medical document usability heuristics' to enable expert reviews of documents produced by EHR systems.
3. Use team-based expert reviews, so that both human factors experts and clinical experts help to assess usability.

Approach: What did we assess?

- Instead of evaluating software, assess quality of documents produced by EHR systems
- Start with a narrow scope as a proof of concept
  - 4 simulated documents: 2 patient encounters x 2 hospitals
  - (out of network) primary care physician perspective

How did we avoid privacy issues?

- Simulated Patients
  - National Institutes of Standards and Technology published standardized test patient use cases created for the purpose of testing HIT usability without involving a real person's data
  - Each one holds a full set of encounter data for a fake patient
- Simulated PDD
  - NIST patient data was placed into the format/template of real patient discharge documents to create high-fidelity mock-ups
    - Kept hospitals anonymous
    - Ensured compliance with EHR vendor contracts

Approach: How did we assess it?

- Heuristic Evaluation: expert reviews

1. Developed ‘medical documentation heuristics’
2. Experts applied heuristics to identify usability issues
3. Consolidated and interpreted results
4. Generated recommendations to improve usability

Heuristic Eval 1: Generating examples

- Created mock ups based on hospital templates/examples from organizations with systems provided by two different (large) EHR vendors
  - IRB exemptions granted at each participating hospital
  - Anonymized mock-ups created to match example discharge documents provided by participating hospitals
  - Populated with a fictitious hospital and NIST pediatric use case data
  - Validated by a physician as representative of the hospital exemplars

Heuristic Eval 2: Defining heuristics

- Reviewed software user interface heuristics
- Assessed medical device usability heuristics and online documentation usability heuristics
  - eliminate those that don't apply (most!)
- Consulted literature on "good" writing
  - Generic guidelines
  - Medical documentation specific guidelines (extensive)
- Extracted relevant recommendations, and nominate as candidate heuristics
- Consolidated candidates

Defining Heuristics, Continued

- Organized candidates into 5 heuristic categories*
  - Readability
  - Minimalism
  - Comprehensibility
  - Content
  - Organization
- Developed positive examples and violation examples for each retained candidate

* Easier to perform evaluations & communicate results

1. Developed 'medical documentation heuristics'

What do Heuristics look like? 3 Examples

Color and Contrast	Does the text have sufficient contrast to ensure easy readability? Examples: 1. Favor black text on white or pale yellow backgrounds. Avoid gray backgrounds.
Layout and Position	Is the layout of the text appealing, clear and consistent across the document? Examples: 1. It is preferable that text and headings have left justification. 2. There should be good balance between use of text, graphics, and clear or "white space". 3. Use right edge "ragged" or unjustified for the best readability.
Font and Capitalization	Is the font and size consistent and readable? Examples: 1. A single material should not have more than 3 different typefaces 2. To the extent possible, avoid underlining or all CAPS. Consider using other forms of emphasis such as italics or bold. 3. Headers and sections may have different fonts and sizes as long as there is consistency among the different headers and different sections within the document

Full set of heuristics being written up for publication

Heuristic Eval, part 3: Recruit experts

- Four teams, each comprised of one clinical one human factors expert, were recruited to conduct the reviews:
  - Clinical experts all experienced as primary care providers
  - Human factors experts all currently working in healthcare
- Human Factors experts introduced heuristics and explained evaluation process to clinical experts
- Clinical experts provided severity ratings for each issue:
  - 1=cosmetic, 2=minor, 3=major, 4=catastrophic

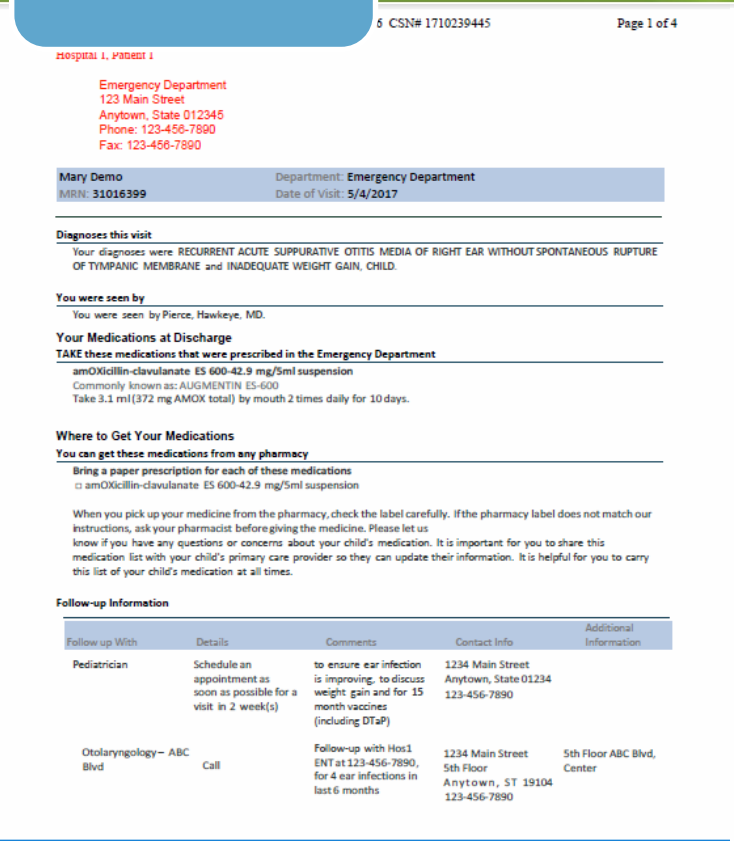
Heuristic Eval, part 4: Review method

- Each expert reviewed all four documents, using heuristics to identify potential usability issues
- HF expert identified issues/problems, then clinical expert provided severity ratings for each issue
- Review teams provided suggestions on how to modify the discharge documents to improve usability

Heuristic Eval, part 5: consolidation and interpretation of experts' data

- Consolidated results from the four teams:
  - categorized issues according to common themes
  - computed average severity ratings for different types of issues
  - compiled suggestions for improvement
- Based on severity ratings and improvement suggestions three sets of general recommendations:
  - For hospitals and other acute care organizations
  - For EHR system vendors
  - For human factors practitioners

3. Consolidated and interpreted results



6 CSN# 1710239445 Page 1 of 4

Hospital 1, Patient 1

Emergency Department
123 Main Street
Anytown, State 012345
Phone: 123-456-7890
Fax: 123-456-7890

Mary Demo — Department: Emergency Department
MRN: 31016399 — Date of Visit: 5/4/2017

Diagnoses this visit

Your diagnoses were RECURRENT ACUTE SUPPURATIVE OTITIS MEDIA OF RIGHT EAR WITHOUT SPONTANEOUS RUPTURE OF TYMPANIC MEMBRANE and INADEQUATE WEIGHT GAIN, CHILD.

You were seen by

You were seen by Pierce, Hawkeye, MD.

Your Medications at Discharge

TAKE these medications that were prescribed in the Emergency Department

amOXicillin-clavulanate ES 600-42.9 mg/5ml suspension
Commonly known as: AUGMENTIN ES-600
Take 3.1 ml (372 mg AMOX total) by mouth 2 times daily for 10 days.

Where to Get Your Medications

You can get these medications from any pharmacy

Bring a paper prescription for each of these medications
□ amOXicillin-clavulanate ES 600-42.9 mg/5ml suspension

When you pick up your medicine from the pharmacy, check the label carefully. If the pharmacy label does not match our instructions, ask your pharmacist before giving the medicine. Please let us know if you have any questions or concerns about your child's medication. It is important for you to share this medication list with your child's primary care provider so they can update their information. It is helpful for you to carry this list of your child's medication at all times.

Follow-up Information

Follow up With	Details	Comments	Contact Info	Additional Information
Pediatrician	Schedule an appointment as soon as possible for a visit in 2 week(s)	to ensure ear infection is improving, to discuss weight gain and for 15 month vaccines (including DTaP)	1234 Main Street Anytown, State 01234 123-456-7890	
Otolaryngology– ABC Blvd	Call	Follow-up with Hos1 ENT at 123-456-7890, for 4 ear infections in last 6 months	1234 Main Street 5th Floor Anytown, ST 19104 123-456-7890	5th Floor ABC Blvd, Center

Demo, Mary (MRN#31016399) DOB 05/02/2016 CSN# 1710239445 Page 4 of 4

MIDDLE EAR INFECTIONS (Acute Otitis Media)

The middle ear is a small air-filled space behind the eardrum. Bacterial germs can get into this cavity and produce an infection known as a "acute otitis media". Fluid and pressure may build up in the middle ear causing ear pain. Occasionally, infected fluid may drain out from an infected ear through a hole in the eardrum. In most cases the hole will heal itself and the drainage will stop in a couple of days.

Middle ear infections are especially common in young children who have a cold. Colds are contagious, but ear infections are not. Colds can be prevented by washing hands carefully after touching a child with a cold. Many children get ear infections over and over again. Allergies and breathing second hand smoke increase the chances of a child getting an ear infection.

What are the symptoms of an ear infection?

Ear infections may cause ear pain or a feeling of fullness in the ear. Small children may be irritable or sleep poorly at night when they have an ear infection. Pulling at the ears may or may not be a sign that a young child has an ear infection. Some, but not all children with ear infections have a fever. Drainage of pus from the ear is sometimes seen in children with ear infections.

What are the risks?

Most ear infections get better over one to two days and do not produce serious problems. Antibiotics help kill the germs that cause ear infections.

1. On rare occasions the germ causing an ear infection can spread to the blood and cause a serious infection in another part of the body.
2. There is a chance the germs will not be killed by the antibiotic. It may be necessary to try another antibiotic if the first choice does not help.
3. Sometimes fluid will remain in the middle ear even after the infection is successfully treated. While the fluid is present your child may not hear as well as usual. If the fluid does not go away after 3 months your doctor may recommend treatment for the fluid.
4. Antibiotics may cause allergic reactions, rashes or diarrhea.

INSTRUCTIONS

1. If an antibiotic is prescribed, make sure to give the proper dosage every day for the full time it is prescribed.
2. You may give acetaminophen (Tylenol) or ibuprofen (Advil) to help ease the pain.
3. If there is creamy material draining from the ear, try to keep the ear clean by gently washing with lukewarm water.
4. Call your doctor if the symptoms do not improve within two or three days
5. **SEE THE DOCTOR IMMEDIATELY** if your child looks sick or develops difficulty breathing, unusual sleepiness, very high fever, stiff neck, frequent vomiting, severe headache or if the outside of the ear becomes red, swollen or painful.

We are pleased to have been able to provide Mary with emergency care. The above instructions explain Mary's diagnosis and how to treat it.

EKGs and X-Rays: If Mary had an EKG or X-Ray today, it will be formally reviewed by a specialist tomorrow. If there is any change from today's Emergency Department reading, you will be notified.

IMPORTANT NOTICE TO ALL PATIENTS: The care Mary received in our Emergency Department has been on an emergency basis only. It is important that you follow-up and receive ongoing care from a primary care provider (doctor or nurse practitioner). A follow-up provider has been designated for you. It is essential that you make arrangements for follow-up care with that physician as instructed. Report any new or remaining problems at that time, because it is impossible to recognize and treat all elements of injury or disease in a single Emergency Department visit. If specialty care has been recommended, you may need a referral and should contact your primary care provider. Significant changes or worsening in your condition may require more immediate attention. The Emergency Department is always open and available if this becomes necessary.

Hospital 1 Name – Printed by Hawkeye Pierce…. at 6/7/17 9:29 a.m. Page 4 of 4

What does PDD look like now?

Simulated discharge document mock-up used for analysis

What was the patient seen for?

Results

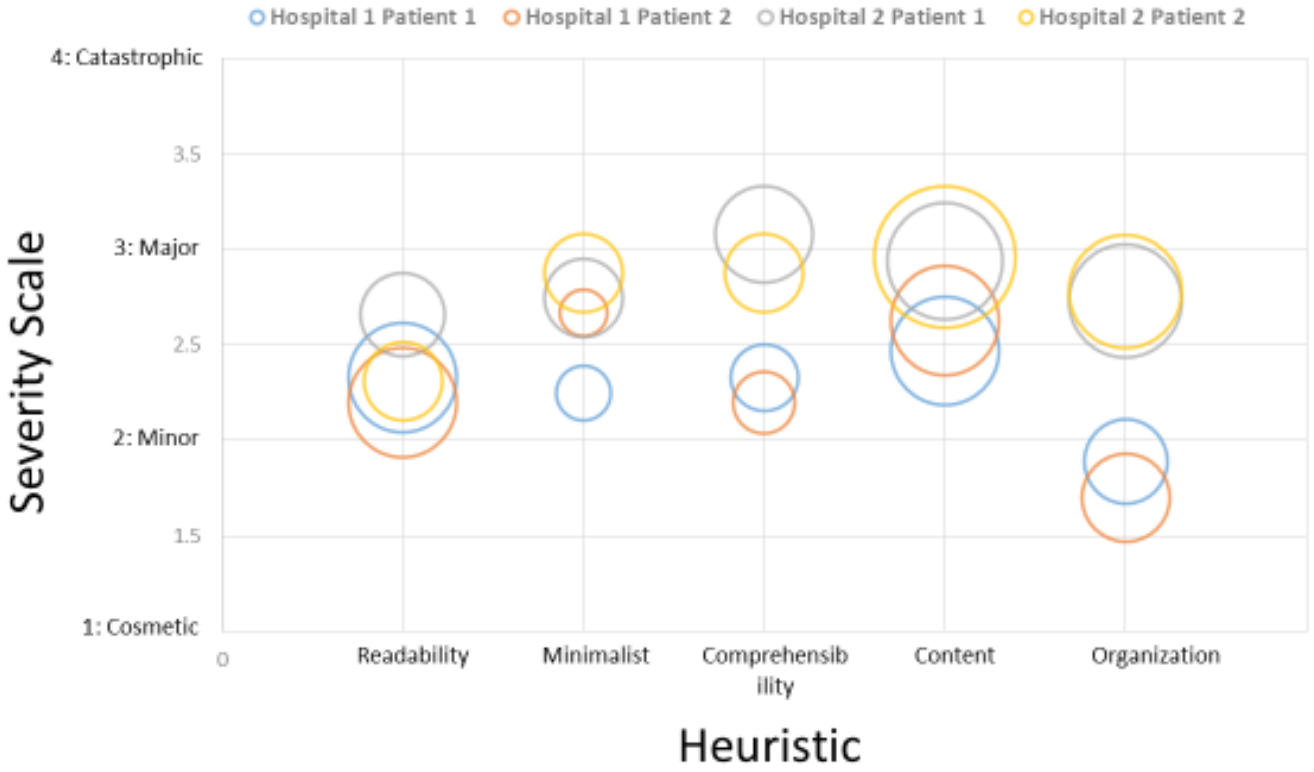
- 224 usability problems were identified across the 4 sample documents.
  - Issues ranged in severity from mild to catastrophic.
  - Average severity rating across all identified issues was 2.57 (between minor and major).
- Most issues identified were evident in both simulated discharge documents from a respective institution.
- Documents generated based on Hospital 1's sample documents had more problems with readability and those from Hospital 2 had more problems with organization.

3. Consolidated and interpreted results

	Hospital 1, Patient 1 (severity)	Hospital 1, Patient 2 (severity)	Hospital 2, Patient 1 (severity)	Hospital 2, Patient 2 (severity)	Total (severity)
Readability	15 (2.33)	15 (2.2)	9 (2.66)	8 (2.31)	47 (1.9)
Minimalist	4 (2.25)	3 (2.67)	8 (2.75)	8 (2.88)	23 (2.11)
Comprehensibility	6 (2.33)	5 (2.2)	12 (3.08)	8 (2.88)	31 (2.1)
Content	15 (2.47)	15 (2.63)	17 (2.94)	25 (2.96)	72 (2.2)
Organization	9 (1.89)	10 (1.7)	16 (2.73)	16 (2.78)	51 (1.82)
TOTAL	49 (2.25)	48 (2.28)	62 (2.83)	65 (2.76)	224 (2.57)

Severity scale: 1 = cosmetic, 2 = minor, 3 = major, 4 = catastrophic

3. Consolidated and interpreted results



How bad were the simulated PDD?

Circle size corresponds to number of problems per document per heuristic

What would PDD with better usability look like?

One of our reviewers mocked up a redesign based on our heuristics

After Visit Summary

Hospital 1, Emergency Department
123 Main Street, Anytown, State 01234
Phone: 123-456-7890, Fax: 123-456-7890

Patient Name: Demo, Mary
MRN: 31016399
Date of Birth: 12/23/2016

Date of Visit: 5/4/2017
Provider: Pierce, Hawkeye, MD

Diagnoses

1. RECURRENT ACUTE SUPPURATIVE OTITIS MEDIA OF RIGHT EAR WITHOUT SPONTANEOUS RUPTURE OF TYMPANIC MEMBRANE
2. INADEQUATE WEIGHT GAIN, CHILD

Discharge Instructions

Overview

Mary was diagnosed with another ear infection. Please follow-up with:

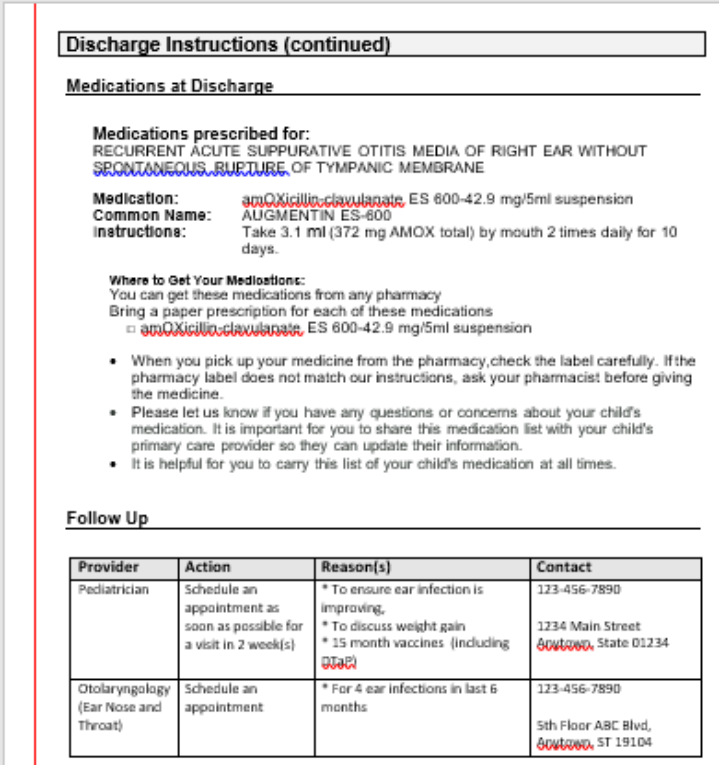
- Her pediatrician in 2 weeks for her 15 month visit.
- Ear, nose and throat specialist as discussed.

In addition, we're worried that Mary's weight gain is slowing down (she has gone from the 25th percentile to the 15th percentile in the last 2 months).

- Please discuss with her pediatrician at the 15th month visit.

In addition, Mary received an extra dose of the DTaP vaccine at 9 months of age, but that will not be enough to properly immunize her. She should still get the vaccine at 15 months

- Please discuss with her pediatrician at the 15th month visit.



Discharge Instructions (continued)

Medications at Discharge

Medications prescribed for:
RECURRENT ACUTE SUPPURATIVE OTITIS MEDIA OF RIGHT EAR WITHOUT SPONTANEOUS RUPTURE OF TYMPANIC MEMBRANE

Medication: amOXicillin-clavulanate ES 600-42.9 mg/5ml suspension
Common Name: AUGMENTIN ES-600
Instructions: Take 3.1 ml (372 mg AMOX total) by mouth 2 times daily for 10 days.

Where to Get Your Medications:
You can get these medications from any pharmacy
Bring a paper prescription for each of these medications
- ☐ amOXicillin-clavulanate ES 600-42.9 mg/5ml suspension

- When you pick up your medicine from the pharmacy, check the label carefully. If the pharmacy label does not match our instructions, ask your pharmacist before giving the medicine.
- Please let us know if you have any questions or concerns about your child's medication. It is important for you to share this medication list with your child's primary care provider so they can update their information.
- It is helpful for you to carry this list of your child's medication at all times.

Follow Up

Provider	Action	Reason(s)	Contact
Pediatrician	Schedule an appointment as soon as possible for a visit in 2 week(s)	* To ensure ear infection is improving, * To discuss weight gain * 15 month vaccines (including DTaP)	123-456-7890 1234 Main Street Anytown, State 01234
Otolaryngology (Ear Nose and Throat)	Schedule an appointment	* For 4 ear infections in last 6 months	123-456-7890 5th Floor ABC Blvd, Anytown, ST 19104

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Best Practice Recommendations

Given that EHR-generated patient discharge documentation is likely to be the primary information source for the outpatient provider, how can we work together to make them more usable and understandable to that provider?

Three categories: hospitals, EHR vendors, and human factors practitioners

What can Hospitals do?

- When possible, modify EHR templates used to generate discharge documents:
  - Establish standardized, logical order and format to present information
    - Important information upfront
    - Get feedback from document recipients
  - Ensure headings and sub headings match the content
  - Consider adding a new section specifically directed towards clinical readers
  - Emphasize important information in each section
- Work with EHR vendors as needed to make modifications

What can EHR vendors do?

- Use our heuristics to guide the (re)design of generic templates used to generate clinical documentation
- Consider the Joint Commission's Standard IM.6.10 when (re)designing medical documentation templates
- Give acute care provider organizations more flexibility
  - Enable users to add supplementary notes or additional content into automatically generated sections

What can Human Factors professionals do?

- Apply our heuristics to improve the quality of physician-facing documentation (especially if EHR-generated)
- Add heuristics based on a patient perspective (e.g. readability scores), then use our method to assess usability from patient perspective
- Consider using our collaborative evaluation method with existing or customized heuristics to assess other aspects of health information technologies

Detailed Recommendations

- Adopt the Joint Commission's Mandate that all hospital discharge summaries should include
  - Reason for Hospitalization
  - Significant Findings
  - Procedure and Treatment provided
  - Patient's discharge condition
  - Patient and family instructions
  - Attending physician's signature

Detailed Recommendations, ct'd

- Establish consensus across stakeholders on standardized presentation order and format
- Ensure any information relevant to outpatient physician and patient follow-up care can be included in document
- Ensure that content matches headings and sub-headings in each section
- Within each section, present discrete ideas and information as separate bullets or paragraphs

Detailed Recommendations, ct'd

- If multiple diagnoses are present, make sure they are clearly defined and differentiated, and that primary diagnosis is explained up front.
- Ensure proper use of medical, nonmedical, and billing terminology
- Emphasize important information in each section
- Present information clearly and concisely
- Use consistent terminology
- Remove irrelevant information

Detailed Recommendations, ct'd

- Explain any abbreviations
- Ensure sufficient and consistent use of color and contrast
- Balance text and white space
- Use consistent font size and type, indents, and spacing throughout document
- Ensure headers and footers contain meaningful information

It's Not Just PDD: Improving CC in the long term

- Establish policies on timeliness of distributing CC documents.
- Configure EHR systems so they provide confirmations or failure notices about delivery of information to outpatient providers.
- Pressure vendors to make systems inter-operable
- Adopt Joint Commission mandate on discharge summary components

Summary

- Spread the word: patient-facing discharge documents are being used for clinical communication
- We offer guidance to improve discharge documents so they support clinical communication AND are easier for patients to use
- Individual organizations can use our heuristics and methodology to improve medical documentation
  - Method is easy to replicate
  - Heuristics may also be used as guidance for redesigning document templates

Conclusions

- Evaluating HIT usability is hard, but not impossible
- Heuristic Evaluation is a quick, inexpensive method that can identify significant problems
  - Also provides ideas about how to resolve them
- Our heuristics are a new tool to assess medical documents
  - particularly EHR-generated documents
- Heuristics can serve as best practice guidelines for creating or modifying medical document templates

Conclusions Continued

- Long term: better EHR interoperability will help improve coordination of care

- Short term, improve discharge documents
  - Make them more usable for both providers and patients

Next Steps: Future Research

- Follow-on studies
  - Expand scope of study
    - Team with Partnership for HIT Patient Safety
    - Care coordination between different types of providers
    - Patient usability of discharge documents
  - Apply our heuristics to assess usability of documents designed to serve as clinical communication
- Usability of other aspects of HIT like decision support systems, medication reconciliation systems, patient handoff tools

Questions

- Erin Sparnon
- Engineering Manager, Health Devices Group
- ECRI Institute
- esparnon@ecri.org

- Please complete online session evaluation

References

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