Preventing Medication Errors in Pharmacy Practice

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UFHealth Jacksonville

Disclosure

The speakers have nothing to disclose concerning possible financial or personal relationships with commercial entities (or their competitors) that may be referenced in this presentation.

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Learning Objectives

At the conclusion of this activity, participants should be able to:

- Discuss the national medication error data and trends
- Understand the medication error analysis process
- Explain the importance of transitions of care in improving patient safety and reducing medication errors.
- Describe the role of the pharmacist and technician in transitions of care

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Definition

"A medication error is any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer. Such events may be related to professional practice, health care products, procedures, and systems, including prescribing, order communication, product labeling, packaging, and nomenclature, compounding, dispensing, distribution, administration, education, monitoring, and use."

NCCMERP

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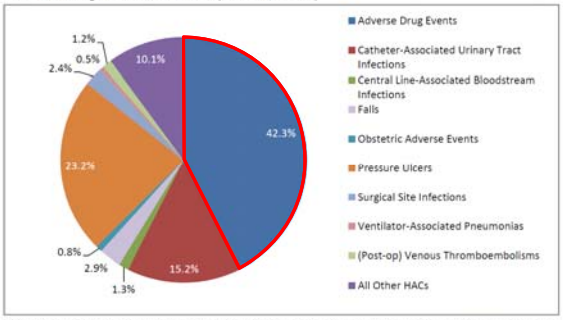
NCCMERP: About Medication Errors 2015

Exhibit 4. Change in HACs, 2011-2015 (Total = 3,097,400)



Source: AHRQ National Scorecard Estimates from Medicare Patient Safety Monitoring System, National Healthcare Safety Network, and Healthcare Cost and Utilization Project.

Top 10 Frequently Reviewed Sentinel Event Types, 2014 to 2Q 2017

The Joint Commission. Sentinel Event Data - Event Type by Year 2017

Root Cause Information for Medication Error Events Reviewed by The Joint Commission

(Resulting in death or permanent loss of function)

2004 through 2Q 2015 (N=452) *The majority of events have multiple root causes*	
Medication Use	393
Leadership	346
Human Factors	339
Communication	328
Assessment	198
Information Management	170
Physical Environment	75
Care Planning	46
Continuum of Care	42
Health Information Technology-related	27

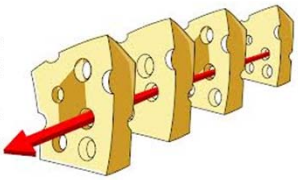
The Joint Commission. Sentinel Event Data Root Causes by Event Type2004 –3Q 2015.

"The Majority of Events Have Multiple Root Causes"

Case 1:

- Patient not re dose/infusion ordered.
- Physician's pre bag
- Nurse questio
- Nurse sets the to set a time limit

Patient r



"Key Elements" of the Medication-Use System

Institute for Safe Medication Practices. Frequently Asked Questions (FAQ) 2015

High-Alert Medications – Acute Care

- adrenergic agonists, IV
- adrenergic antagonists, IV
- anesthetic agents, general, inhaled and IV
- antiarrhythmics, IV
- antithrombotic agents
- cardioplegic solutions
- chemotherapeutic agents
- dextrose, hypertonic
- dialysis solutions
- epidural or intrathecal medications
- hypoglycemics, oral
- inotropic medications, IV

Institute for Safe Medication Practices. List of High-Alert Medications in Acute Care Settings 2014

High-Alert Medications – Acute Care (cont)

- insulin, subcutaneous and IV
- liposomal forms of drugs
- moderate sedation agents, IV
- moderate sedation agents, oral, for children
- narcotics/opioids IV, transdermal, oral
- neuromuscular blocking agents
- parenteral nutrition preparations
- radiocontrast agents, IV
- sterile water for injection, inhalation, and irrigation
- sodium chloride for injection, hypertonic

Institute for Safe Medication Practices. List of High-Alert Medications in Acute Care Settings 2014

High-Alert Medications – Ambulatory

Classes/Categories of Medications	Specific Medications
antiretroviral agents (e.g., efavirenz, lamiVUDine, raltegravir, ritonavir, combination antiretroviral products)	carBAMazepine
chemotherapeutic agents, oral (excluding hormonal agents) (e.g., cyclophosphamide, mercaptopurine, temozolomide)	chloral hydrate liquid, for sedation of children
hypoglycemic agents, oral	heparin, including unfractionated and low molecular weight heparin
immunosuppressant agents (e.g., azaTHIOprine, cycloSPORINE, tacrolimus)	metFORMIN
insulin, all formulations	methotrexate, non-oncologic use
opioids, all formulations	midazolam liquid, for sedation of children
pediatric liquid medications that require measurement	propylthiouracil
pregnancy category X drugs (e.g., bosentan, ISOtretinoin)	warfarin

Institute for Safe Medication Practices. List of High-Alert Medications in Community/Ambulatory Healthcare.

Packaging and Labeling

Lack of Prominence of Vital Information

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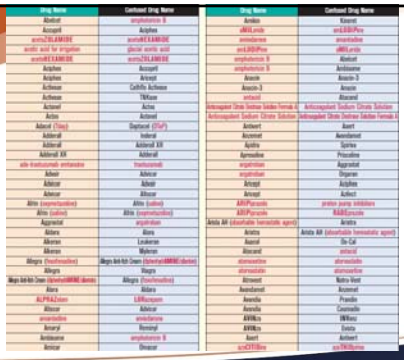

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Institute for Safe Medication Practices. ISMP's List of Confused Drug Names. 2015

Medication Shortages

- SALAD creation (similar packaging)
- Unfamiliarity with substitute product
- Substitute is less effective
- Substitute not in BCMA database, warnings not built, etc.
- Treatment delays
- No alternative treatment available

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Distraction

Case 2

- 56 yo male admitted for replacement of PEG tube, on warfarin PTA 5mg/day for intracardiac mural thrombus. Admission INR 1.4 - dose increased to 10mg per day.
- Day 2, decision to stop the warfarin and do an echo to confirm anticoagulation still needed. Resident started to d/c the order via smartphone, but in the interim received a text about a party.
- Warfarin was not d/c'd, but the team thought it was, so they didn't check INR.

Day 4, pt developed SOB, tachycardia and hypotension. Echo revealed cardiac tamponade; INR found to be 8.5

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Halamaka J. AHRQ Patient Safety Network. WebM&M. December 2011.

Why don't safety mechanisms work?

- Most of the time, they do
- Human nature
- Confirmation bias
- Safety mechanisms defeated due to time priority
- Intimidation
- Alert fatigue
- GIGO (garbage in, garbage out)

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Case 3: 16 yo male with NEMO deficiency syndrome for an elective colonoscopy.

- Patient taking Septra DS 1 tablet BID
- Order entered for Septra DS 38 ½ tablets
- The full dose was administered

The patient had a grand mal seizure, stopped breathing and required resuscitation.

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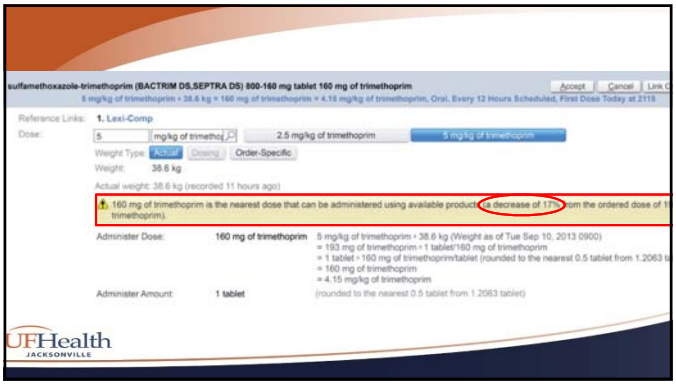
https://medium.com/backchannel/how-technology-led-a-hospital-to-give-a-patient-38-times-his-dosage-ded7b36885588.4kkbryhfa



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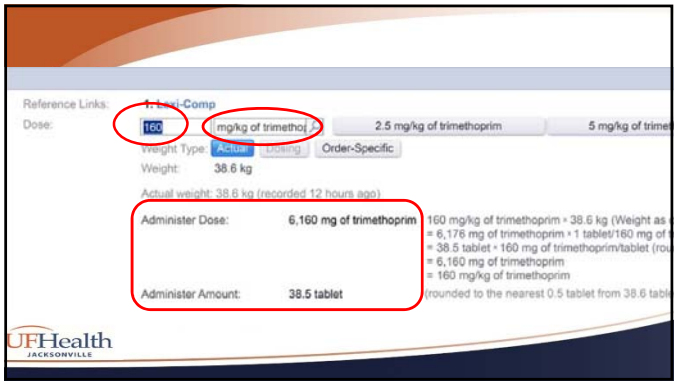

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ALERT FATIGUE

Methods

Prescribers were observed for 102 hours *in situ* as they ordered medications for patients and resolved alerts, then interviewed.

Results

Prescribers: n= 30 Patients: n=146

Alerts: n=320 (2.2/pt)
Alert fatigue: 37/320 (11.6%)

Problems:

- Lack of specificity
- No indication of level of risk
- Poor credibility
- Redundancy

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Russ AL, et al. *International Journal of Medical Informatics*. April 2012; 81(4):232-243.

INTIMIDATION

Survey: 4,884 respondents.
Nurses (68%) pharmacists (14%), > 200 physicians.
Most (66%) staff-level practitioners.

	At Least Once (%)	Often (%)
Assume order is safe because of the stellar reputation of the prescriber	30	2
Felt pressure to accept an order, dispense a product, or administer a drug despite concerns about safety	39	3

Medication Safety Alert! Acute Care Volume 18 Issue 20. ISMP October 3, 2013

HUMANS VS. TECHNOLOGY

Expectations:

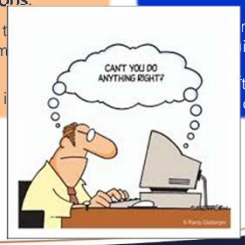
"If I'm not supposed t
will stop m

"Computers are i

Reality:

re programmed and
ined by humans.

ten have unexpected
outcomes



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"…missing special characters such as decimal point, forward slash, or percentage in some records"

Ex: the strength of a drug previously dispensed may be reported as "ramipril 25 mg capsules," when it should have been reported as "ramipril 2.5 mg capsules."

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National Alert Network (NAN), National Coordinating Council for Medication E Reporting and Prevention (NCC MERP) February2014

Failure Modes in the BCMA Process

- Medication does not come packaged as bar-coded unit-dose product
- Pharmacy does not scan products arriving in pharmacy for readability
- Pharmacy applies correct label with bar code to wrong product
- Drugs not available in ready-to-use unit-doses for nurse (e.g., tablets not broken in half)
- Nurse fails to scan patient
- Nurse fails to scan medication
- Bar code on patient and/or medication is unreadable
- Patient wristbands are not on patients but other locations (e.g., clipboards, med rooms)
- Nurse overlooks alert displayed on computer screen
- Nurse overrides alert without investigating its cause

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Pennsylvania Patient Safety Advisory. Pa Patient Saf Advis 2008 Dec;5(4):122-6.

Case 4

Patient weighed 95 lb, but 95 kg entered into the "smart pump"
Order for heparin infusion 15 units/kg/hr
Patient received 1425 units/hr instead of 648 units/hr
Pump is programmed to detect doses over 20 units/kg/hr

BUT it doesn't know how much the patient weighs

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Safety Measures

- Electronic medical record
- Tallman lettering/SALAD warnings
- Bar coded medication administration (BCMA)
- Bar coded/RFI medication dispensing
- Automated sterile product prep/check
- "Smart" infusion pumps
- Medication Reconciliation
- Standardizing concentrations
- Error reporting

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Joint Commission National Patient Safety Goals related to medications

NPSG.01.01.01
Use at least two patient identifiers when providing care, treatment, and services.

NPSG.03.04.01
Label all medications, medication containers, and other solutions on and off the sterile field in perioperative and other procedural settings.

NPSG.03.06.01
Maintain and communicate accurate patient medication information.

NPSG.07.03.01
Implement evidence-based practices to prevent health care–associated infections due to multidrug-resistant organisms in acute care hospitals.

NPSG.07.04.01
Implement evidence-based practices to prevent central line–associated bloodstream infections.

NPSG.07.05.01
Implement evidence-based practices for preventing surgical site infections.

NPSG.07.06.01
Implement evidence-based practices to prevent indwelling catheter-associated urinary tract infections (CAUTI).

https://www.jointcommission.org/assets/1/6/NPSG_Chapter_HAP_Jan2017.pdf

Medication Safety Resources

Institute for Safe Medication Practices (ISMP)
www.ismp.org

The Joint Commission
www.jointcommission.org

United States Food and Drug Administration
www.fda.gov

Institute for Healthcare Improvement (IHI)
www.ihi.org

Agency for Healthcare Research and Quality (AHRQ)
www.psnet.ahrq.gov

American Society of Medication Safety Officers
www.asmso.org

Hospital quality of care
www.hospitalcompare.hhs.gov

National Guideline Clearinghouse
www.guidelines.gov

The Cochrane Collaboration
www.cochrane.org

Centers for Disease Control and Prevention (CDC)
www.cdc.gov

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Summary – Medication Error Trends

Medication use process: complex and many opportunities for errors
The majority of events have multiple root causes

Medication safety tips:

- Double check as much as possible
- Do not rely on the computer system to catch all errors
- Ask questions, and encourage others to ask questions
- Assist with workflow/alert improvement efforts
- Report near misses and errors

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Assessment Question 1

Which of the following statements is FALSE?

A. The majority of events have multiple root causes
B. Known causes of medication errors include: confusing labeling and nomenclature, human and environmental factors and medication shortages
C. Medication safety measures include barcoding, smart pumps, medication reconciliation and pharmacists
D. Medication errors are the most common sentinel event reported.
E. None of the above

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Incident Reporting Systems

MedWatch
The FDA Safety Information and Adverse Event Reporting Program

IDinc

Report Adverse Events & Near Misses
www.aqiairs.org

ISMP
INSTITUTE FOR SAFE MEDICATION PRACTICES

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Reporting Systems

- Automated reporting system built for ADRs, errors, falls, quality incidents
- Needs to provide "a big picture" of events reported with categories
- Needs to explain the event for tracking and trending, but most importantly to prevent recurrence

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Reporting

Is not a tool for getting someone in trouble

Is not a once and done chore

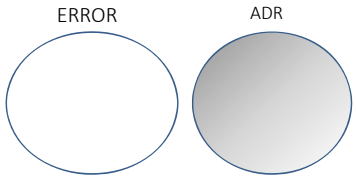
For medication errors include quantity if known, exactly where occurred (which dispensing cabinet etc.), and any other medications associated with error

Does not have to include a specific patient

Can be anonymous, but hard to follow up with if needed

Reporting

ADR vs error



Reporting

- Initial review and assessment by Risk Department
- Task assigned to individual reviewers (usually more than one)
- Inpatient vs outpatient vs North campus vs Oncology satellites
- Tasks are different levels or response
- Risk can amend some elements

Reporting

- Where do issues "go" based on HIPPA regulations?
- If needed- Manager
- If applicable- to pharmacist reporting or managing the patient
- If applicable to prescriber's service reviewer, Nursing, Radiology, etc.
- Department QI meetings
- Medication Safety Team
- APIT and IPIT
- MUA
- P&T

Reporting

- Departments may look for trends or just a singular event for resolution
- Many events have a "rest of the story" that require analysis
- Difficult to make comparisons for trending
- Some issues have too many moving parts
- May trigger a RCA
- May involve the institution's SIP

New RCA

RC_sA^2

Root Cause(s) Analysis and Action

Components of RC_SA^2

Should occur as soon as possible after discovery
Staff directly involved may or may not be included
Risk staff and reviewers
Legal
Administration of departments involved
Sometimes an unattached observer may be utilized

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RC_SA^2

- Managers gather statements from all parties with corroboration if possible
- Review of how event occurred in time-line fashion based on statements
- Review procedures for correct process
- Look for gaps in what actually occurred and what should have occurred

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RC_SA^2

- Gaps may involve communication problem-human error (SALADS)
- Gaps may involve procedure not followed-risk (BCMA override or Epic override of significant allergy)
- Gaps don't usually involve frank disregard-reckless

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RC_SA^2

- Human errors are coached to correct
- Procedures are examined for completeness and accuracy
- Procedures may be modified based on review with other departments to promote cohesive action
- Expectations of follow through for each department are set with time limit

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RC_SA^2

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RC_SA^2

- December 24, 2014
- **Significant Decline in ADEs Bolsters Safety in Hospitals; 50,000 Deaths Averted**
- Washington, D.C.—An estimated 50,000 fewer patients died in U.S. hospitals and about $12 billion in healthcare costs was saved due to the reduction in hospital-acquired conditions from 2010 to 2013, according to a report released by the Department of Health and Human Services (HHS).

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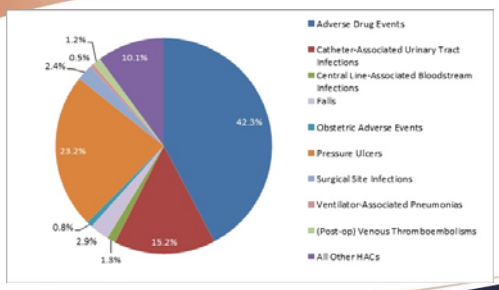
Change in HACs, 2011-2015 (Total = 3,097,400)



Agency for Healthcare Research and Quality. December 2016.

Just Culture

- Idea fostered by Dr. Lucian Leape in the late 1990's
- Designed after other accident conscious businesses-airlines for example
- *"To make no mistakes is not in the power of man; but from their errors and mistakes the wise and good learn wisdom for the future"*

Plutarch

Just Culture

- Where does "Just Culture" fit into medication safety?
- Blame game-who is at fault
- Nobody's fault- It's the system at fault
- Action taken is commensurate with outcome
- Nobody was hurt vs. poor patient response

Just Culture

- Just Culture is none of these
- System to evaluate whether the error was a result of human error vs. risky behavior vs. reckless behavior and apply corrective action to match type of error
- Designed to encourage safety by reporting related event regardless of outcome

Three Human Behaviors

Human error → Risky

↓

Reckless

Human error

- Inadvertent action- slip, lapse, mistake
- Delay
- Misplaced decimal point
- Forgot to renal adjust dose
- Minimize through training, systems, processes

- Console offender

At Risk Behavior

- Choice of action when risk is not recognized or is considered justified
- Procedural rules not followed
- Incentivize following rules/increase redundancy

- Coach offender

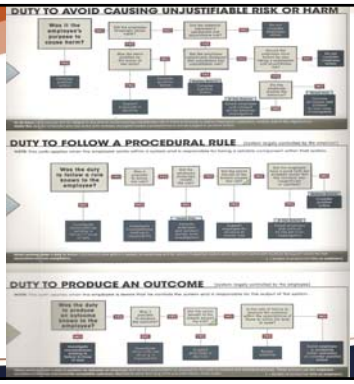
At Risk Behavior?

At Risk behavior

- At risk is usually a result of "drift" from usual process
- Too busy, too comfortable, or find a short cut
- Happens with more experienced staff
- Multi-tasking
- What if there is no procedure to follow?
- There is a "Reasonable Person " Standard

Just Culture

- Evaluation follows an algorithm of yes/no questions
- Duty to produce outcome
- Duty to follow procedure
- Duty to not act with reckless disregard



Duty to Produce an Outcome

- Duty to get to work on time (produce an outcome)
- If outcome not met and yes/no algorithm finds event as human error-Console
- Evaluate system and employee for opportunity to correct
- If repetitive and no system improvement possible-consider punishment

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Duty to Follow Procedural Rule

- Is there a rule to keep children away while feeding a crocodile?
- What if Steve didn't know procedural rule=human error
- Reasonable person standard

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Reckless Behavior

- Did the offender's behavior put a patient or the institution in harm's way?
- Two key questions- Was the behavior justified and was it the choice of the offender to make?
- Action includes-support, console, coach If reasonable answers.
- May require corrective/punitive action if reckless disregard.

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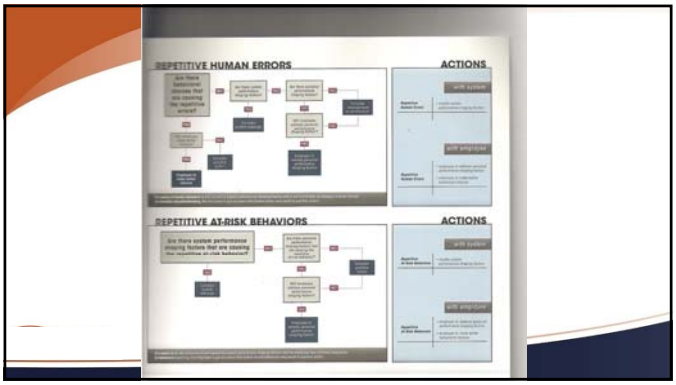

Assessment Question 2

Just Culture is?

A. A series of analytical questions and steps to determine degree of punishment for perpetrator of a medical error.

B. A term that describes formal attempts for prevention of medical errors by focusing on as many opportunities as possible, including misses and near misses in a case-by case algorithm to find and remedy the ultimate cause.

C. A process in which attempts to blame the human responsible for a medical error.

D. A system that attempts to prevent errors by providing "just-in-time" education to health care workers.

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TOC Definition: The National Transitions of Care Coalition

"The movement of patients between health care locations, providers, or different levels of care within the same location as their conditions and care needs change, and frequently involves multiple persons, including the patient, the family member or other caregiver(s), nurse(s), social worker(s), case manager(s), pharmacist(s), physician(s), and other providers."

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http://www.ntocc.org/portals/0/pdf/resources/ntoccissuebriefs.pdf

Can You Count How Many?

An 84 yo M is transferred from the LTCF to the ED for AMS. After initial assessment, he is admitted to the ICU. Three days later, he leaves the ICU and spends 4 days in IM unit. Pt is discharged back to the LTCF today.

A. Two
B. Three
C. Four
D. Five

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Medication Errors

- Inadequate TOC
  - ~60% of all med errors happen during TOC
  - Increased readmissions, increased costs, poor patient outcomes
- Poor communication during TOC
  - 50% of all med errors in hospitals
  - 20% of all ADEs
- Medication reconciliation
  - ↑ TOC and ↓ med errors

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Steeb, et al. J Am Pharm Assoc. 2012;52(4):e43–52.
Levenson et al. J Am Med Dir Assoc. 2007;8(1):55–64.
Kirwin et al. Pharmacotherapy. 2012;32(11):e338–e347.
http://www.allaboutlean.com/what-is-just-in-time/bxp135656/
http://www.ntocc.org/portals/0/pdf/resources/ntoccissuebriefs.pdf.
http://www.jointcommission.org/assets/1/18/hot_topics_transitions_of_care.pdf.

National Patient Safety Goals

- Provided by The Joint Commission
- Identify health care issues, provide solutions = ↑ patient safety
- Medication reconciliation declared a NPSG in 2005

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https://www.jointcommission.org/assets/1/6/2017_NPSG_HAP_ER.pdf
2015 National Patient Safety Goals pg. 32 © Copyright The Joint Commission

National Patient Safety Goals

Hospital
- Correctly identify patients
- Use medicines safely
- Prevent infection
- Prevent surgery mistakes
- Improve staff communication
- Use alarms safely
- Identify patient safety risks

Ambulatory
- Correctly identify patients
- Use medicines safely
- Prevent infection
- Prevent surgery mistakes

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https://www.jointcommission.org/assets/1/6/2017_NPSG_HAP_ER.pdf
https://www.jointcommission.org/assets/1/6/2017_NPSG_AHC_ER.pdf

Use Medicines Safely

- NPSG.03.06.01

"Record and pass along correct information about a patient's medicines. Find out what medicines the patient is taking. Compare those medicines to new medicines given to the patient. Make sure the patient knows which medicines to take when they are at home. Tell the patient it is important to bring their up-to-date list of medicines every time they visit a doctor."

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https://www.jointcommission.org/assets/1/6/2017_NPSG_HAP_ER.pdf
https://www.jointcommission.org/assets/1/6/2017_NPSG_AHC_ER.pdf

Medication Reconciliation- APhA and ASHP

"Comprehensive evaluation of a patient's medication regimen any time there is a change in therapy in an effort to avoid medication errors such as omissions, duplications, dosing errors, or drug interactions, as well as to observe compliance and adherence patterns. This process should include a comparison of the existing and previous medication regimens and should occur at every transition of care in which new medications are ordered, existing orders are rewritten or adjusted, or if the patient has added nonprescription medication to his or her self-care."

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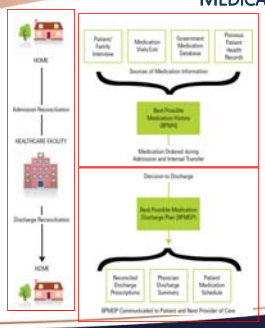
APhA: American Pharmacists Association
ASHP: American Society of Health-System Pharmacists
https://www.jointcommission.org/assets/1/18/SEA_35.PDF

Medication Reconciliation



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Fernandez OA. Pharmacy Practice. 2009;25:2

Joint Commission- Five Step Process

"Process of comparing a patient's medication orders to all of the medications that the patient has been taking"

- Create complete list of current medications
- Review list of medications to be prescribed
- Compare medications on each list
- Make clinical decisions based on results of the comparison
- Create new list for patient, caregivers

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http://www.aselearningcentre.com/our-proces
https://www.jointcommission.org/assets/1/18/SEA_35.PDF

Unintended Discrepancies on Admission

- Study Design
  - Prospective study
  - 1000-bed teaching hospital
  - Internal med unit admission over 3 month period
- Primary Outcome
  - Unintended discrepancies between physician admission medication orders and comprehensive medication review
- Study team- pharmacist, pharmacy student, medical student
- Types of Discrepancies

Class 1	• Unlikely to cause discomfort or clinical deterioration
Class 2	• Moderate discomfort or clinical deterioration
Class 3	• Severe discomfort or clinical deterioration

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Cornish et al. Arch Intern Med. 2005;165:424-429

Unintended Discrepancies on Admission

- Results
  - 151 patients evaluated
    - Median time 24 minutes
  - 81 (53.6%) patients ≥ 1 unintended discrepancy
    - 140 unintended discrepancies identified
    - 0.93 discrepancies per patient
  - Weekend, nighttime, busy periods ≠ ↑ unintended discrepancies

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Cornish et al. Arch Intern Med. 2005;165:424-429

Unintended Discrepancies on Admission

- Types and Severity of Unintended Discrepancies
  - Most discrepancies associated with CV meds (26.6%) and CNS meds (25.9%)

Type of Discrepancy	No.	Class 1	Class 2	Class 3
Drug omission	65	44 (67.7%)	18 (27.7%)	3 (4.5%)
Discrepant dose	35	22 (62.9%)	13 (37.1%)	0
Discrepant frequency	24	15 (62.5%)	8 (33.3%)	1 (4.2%)
Incorrect drug	16	5 (31.3%)	7 (43.8%)	4 (25.0%)
Total	140	86 (61.4%)	46 (32.9%)	8 (5.7%)

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Cornish et al. Arch Intern Med. 2005;165:424-429

Unintended Discontinuation at Discharge

- Objective
  - To assess rates of unintentionally discontinued medications after hospital or ICU admission
- Study Design
  - Population based-cohort study
- Primary Outcome
  - Medication not refilled within 90 days
- Secondary Outcome
  - Composite of death, ED visit, emergent hospitalization day 91 to 365
- Medication Groups
  - Statins
  - Antiplatelet/anticoagulants
  - Levothyroxine
  - Respiratory inhalers
  - Gastric acid-suppressors

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Unintended Discontinuation at Discharge

- Results (Primary Outcome)
  - Medication not refilled within 90 days
  - ↑ risk of unintentional discontinuation after hospital or ICU admission

Medication Discontinued	Control Group	Hospitalized	AOR (95% CI)	ICU Admission	AOR (95% CI)
Statin	11627 (10.7%)	13277 (13.6%)	1.33 (1.29-1.37)	1484 (14.6%)	1.48 (1.39-1.57)
Antiplatelet/anticoagulants	2535 (11.8%)	5564 (19.4%)	1.86 (1.77-1.97)	522 (22.8%)	2.31 (2.07-2.57)
Levothyroxine	7114 (11.0%)	6831 (12.3%)	1.18 (1.14-1.23)	614 (15%)	1.51 (1.38-1.66)
Respiratory inhalers	79 (3.0%)	231 (4.5%)	1.50 (1.15-1.97)	20 (5.4%)	1.84 (1.10-3.08)
Gastric acid-suppressor	4330 (9.4%)	7394 (12.9%)	1.50 (1.43-1.56)	670 (15.4%)	1.87 (1.71-2.05)

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Unintended Discontinuation at Discharge

- Results (Secondary Outcome)
  - Composite of death, ED visit, emergent hospitalization day 91 to 365

Medication Group	Medication Continued	Medication Discontinued	AOR (95% CI)
Statin	30791 (36.5%)	5052 (38.1%)	1.07 (1.03-1.11)
Antiplatelet/anticoagulants	10824 (46.7%)	2692 (48.4%)	1.10 (1.03-1.16)
Levothyroxine	18877 (38.7%)	2607 (38.2%)	0.99 (0.94-1.05)
Respiratory inhalers	2626 (53.4%)	115 (49.8%)	0.87 (0.67-1.14)
Gastric acid-suppressor	21742 (43.7%)	3210 (43.4%)	1.02 (0.97-1.07)

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The Pharmacist Intervention for Low Literacy in Cardiovascular disease (PILL-CVD) Study

- Objective
  - To assess impact of interventions on medication errors post hospital discharge
- Study Design
  - Randomized controlled trial
  - Two academic medical centers (Vanderbilt University Hospital, Brigham and Women's Hospital)
  - Admission for ACS or HF
- Intervention
  - Medication reconciliation
  - Inpatient counseling
  - Low-literacy adherence aids
  - Telephone follow-up after discharge

UFHealth JACKSONVILLE

Kripalani et al. Ann Intern Med. 2012 July 3; 157(1

PILL-CVD Study

- Primary Outcome
  - Number of clinically important med errors per patient 30 days after discharge
- Results
  - 851 patients evaluated
  - 432 (50.8%) patients ≥ 1 clinically important med errors
    - 0.87 per patient in intervention group
    - 0.95 per patient in usual care
    - Difference not significant
      - ≥ 80% had adequate health literacy

Type of Error	No. (%)
Significant	585 (75.2%)
Serious	178 (22.9%)
Life-threatening	14 (1.8%)
Fatal	0 (0.0%)
Total	777

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Kripalani et al. Ann Intern Med. 2012 July 3; 157(1

PILL-CVD Study

- Secondary Outcome
  - Number of ADEs during first 30 days after discharge
- Results
  - 258 (30.3%) patients experienced ADEs
  - 13% of ADEs → ED visit, readmission

Type of ADE	No. (%)
Significant	296 (83.9%)
Serious	48 (13.6%)
Life-threatening	9 (2.5%)
Fatal	0 (0.0%)
Total	353

- Medications associated with ADEs
  - Cardiovascular
  - Diuretics
  - Opioids
  - Lipid-lowering
  - Nutrients (herbs, vitamins, supplements)
  - Hypoglycemic agents
  - Anticoagulants

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Kripalani et al. Ann Intern Med. 2012 July 3; 157(1).

Medication Reconciliation Challenges

- Patient factors
  - Age, language barriers, literacy, multiple meds, comorbidities, prolonged hospital stay
- Provider factors
  - Inadequate medication knowledge, insufficient time
- Information quality
  - GIGO (garbage in, garbage out)
  - Inadequate information
  - Misplaced confidence in accuracy of information

UFHealth JACKSONVILLE

Johnson, et al. Pharm Today. 2015;21(3):79–90.
Steeb, et al. J Am Pharm Assoc. 2012;52(4):e43–52.

Medication Reconciliation Challenges

- Resources
  - Limited staff especially on weekends, holidays, afterhours
- Information technology
  - Health records not available through all spectrums of care
  - Medications documented in various formats
  - Duplicate medical records

UFHealth JACKSONVILLE

Johnson, et al. Pharm Today. 2015;21(3):79–90.
Steeb, et al. J Am Pharm Assoc. 2012;52(4):e43–52.

Good Catch #1

- 60 yo M admitted for chest pain
- PMH: T2DM, CKD, CAD, HTN, OSA, obesity
- PTA med list:
  - ASA 81mg
  - Atorvastatin 40mg
  - Farxiga 10mg
  - Fenofibrate 154 mg
  - Humulin-R U-500 20 units TID
  - Lansoprazole 40mg
  - Losartan 50mg BID
  - Nitrostat 0.4mg SL tabs
  - Oxycodone 10mg Q6H PRN PAIN

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Courtesy of UF Health Jacksonville Pharmacy Transitions of Care Team: 07/2017 Presentation

Good Catch #1

- ED medication review
  - U-500 20 units ordered
- Patient interview during admission
  - "Taking 20 units" TID U-500
  - Using U-100 syringe, draws up to 20 unit mark (0.2 mL)
  - Patient determined insulin need by amount of food ingested and exercise that day
  - Patient did not check blood glucose regularly
- Result
  - Dose corrected in EPIC, med list updated with correct dose
  - Patient received home insulin regimen
  - BG mostly<180 during hospitalization

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Courtesy of UF Health Jacksonville Pharmacy Transitions of Care Team: 07/2017 Presentation

Good Catch #2

- 44 yo M admitted for DKA, prior admission for DKA two weeks prior
- PMH: HIV, T2DM, HLD, HTN, neuropathy, splenectomy, stroke
- Admission Medication Reconciliation
  - Poor medication historian, 8 HIV meds?
  - Insurance issues
    - Patient reported having Medicare but ran out of drug coverage two months ago
    - Medicaid pending

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Courtesy of UF Health Jacksonville Pharmacy Transitions of Care Team: 12/2016 Presentation

Good Catch #2

- First discharge summary
  - Duplicate Lantus directions
  - No directions for Humalog
  - Gemfibrozil + atorvastatin
  - 8 HIV meds
- Second discharge summary
  - Appropriate insulin regimen
  - Gemfibrozil was discontinued
  - Current HAART regimen added to list

Courtesy of UF Health Jacksonville Pharmacy Transitions of Care Team: 12/2016 Presentation

Summary

- Pharmacists play an important role in TOC through medication reconciliation
- Medication reconciliation can improve TOC and decrease medication errors

Assessment Question 3

The Joint Commission Five Step Process for medication reconciliation includes all the following except:

A. Create complete list of current medications
B. Review list of medications to be prescribed
C. Contact prescriber to verify orders C. Compare medications on each list
D. Make clinical decisions based on results of the comparison
E. Create new list for patient, caregivers

Learning Objectives

At the conclusion of this activity, participants should be able to:

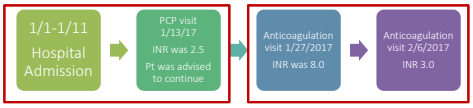
- Discuss the national medication error data and trends
- Understand the medication error analysis process
- Explain the importance of transitions of care in improving patient safety and reducing medication errors.
- Describe the role of the pharmacist and technician in transitions of care

Transition from Clinic to Hospital and to Home

- ML is a 60 yo AA male with PMH: LV mural thrombus (on warfarin), left carotid artery occlusion, ischemic cardiomyopathy, s/p cervical spinal fusion, HTN. Home medications include:
  - Warfarin 7.5mg daily
  - Carvedilol 3.125 mg BID
  - Gabapentin 600 mg 2 tablets TID
  - Lisinopril 10 mg daily
  - Cyclobenzaprine 5 mg TID
- He had a stroke and was admitted to an outside hospital.Upon discharge, his medications include:
  - *Warfarin 10 mg daily*
  - *Gabapentin 400 mg TID*
  - Atorvastatin 80 mg daily
  - Aspirin 81 mg EC daily

Medication Reconciliation with ML's Case

- Patient was taking both strengths of gabapentin (600mg, 400mg)
- Patient presented to Anticoagulation clinic complaining of severe headache that occurred post discharge



- Patient stopped gabapentin 400mg, headaches went away after a few days
- Patient resumed warfarin 7.5mg daily, INR was 3.0 after 10 days

What went wrong with ML's case?

- Patient Factors
  - –Lack of understanding
  - –Forgetfulness
- Lack of records
- Sooner appointment with Anticoagulation Clinic

TOC Models

- **Care Transitions Intervention Program (CTI)® - patients with chronic diseases**
  - – Uses a "transition coach", home visit + three telephone interactions
  - – University of Colorado Denver School of Medicine
- **Transitional Care Model (TCM) – elderly patients**
  - – Nursing-led model, home visits + telephone support for 7 days/week for average of 2 months
  - – University of Pennsylvania
- **Guided Care (GC) Model – patients with chronic diseases**
  - – Uses a trained registered nurse
  - – Johns Hopkins University
- **Project RED**
- **Patient-Centered Medical Home (PCMH)**

Project RED

- Project Re-Engineered Discharge (RED)
  - – Supported by grants from various organizations
  - – AHRQ, NLHBI, BCBS
- Goal: improve patient safety and reduce admission rates
- Primary end point: rate of hospital utilization
- N = 738 patients
- Intervention group had 30% lower rate of re-admission (within the first 30 days after discharge) p = 0.009
- Cost: 0.5 FTE for a nurse and 0.15 FTE Clinical Pharmacist

3 core elements:

- Nurse Discharge Advocates (DA)
- After Hospital Care Plan
- Pharmacist calls patients 2-4 days post discharge

Jack et al. *Ann Intern Med 2009; 150: 178-87.*

Project RED

- **Time spent:**
  - – Post discharge telephone calls: median of 14 minutes (10 – 19 minutes)
  - – 10 minutes of preparation
  - – Attempts: median of 2 (1-3 attempts)
  - – **Median total time spent: 26 minutes (18-36 minutes)**
- **Number of participants per week:**
  - – 14 participants
  - – 6.1 hours or about 0.15 FTE

Jack et al. *Ann Intern Med 2009; 150: 178-87.*

Outcome Cost Analysis

	Usual Care Group	Intervention Group	
Cost of ED visits	$21, 389	$ 11, 285	
Cost of hospital visits	$412, 544	$268, 942	
Cost of outpatient visits over 30 days	$8,906	$12,617	
Cost Savings per participant		$412	33.9% lower observed cost

Jack et al. *Ann Intern Med 2009; 150: 178-87*

12 Components Project RED

1. Ascertain need for and obtain language assistance.
2. Make appointments for follow-up medical appointments and post discharge tests/labs.
3. Plan for the follow-up of results from lab tests/studies that are pending at discharge.
4. Organize post-discharge outpatient services and medical equipment.
5. Identify the correct medicines and a plan for the patient to obtain and take them.
6. Reconcile the discharge plan with national guidelines

Project RED: https://www.bu.edu/famed/projectred/index.html

12 Components Project RED

7. Teach a written discharge plan the patient can understand.
8. Educate the patient about his or her diagnosis.
9. Assess the degree of patient's understanding.
10. Review with the patient what to do if a problem arises.
11. Expedite transmission of the discharge summary to clinicians accepting care of the patient.
12. Provide telephone reinforcement of the discharge plan.

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Project RED: https://www.bu.edu/famed/projectred/index.html

Project RED Tools

- How to Begin the RED Implementation at Your Hospital
- How to Deliver the RED
- How to deliver the RED to Diverse Population
- How to Conduct a Post Discharge Follow-up Phone Call
- How to Monitor RED Implementation and Outcomes
- After Hospital Care Plan (AHCP)

Urban academic center, safety net hospital

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Project RED: https://www.bu.edu/famed/projectred/index.html

Patient Centered Medical Home (PCMH)

Medication Management is an integral component of PCMH: Pharmacist

- Comprehensive Care
- Patient Centered
- Coordinated Care
- Accessible Services
- Quality and Safety

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Patient Centered Medical Home: Pcmh.ahrq.gov

Patient Centered Medical Home (PCMH)

- Pharmacist Developed Clinic Policies
  - Anticoagulation
  - Transitions of Care
- Pharmacist Developed Patient Registries
  - Type 2 Diabetes
  - CV high risk population
  - Anticoagulation

If the primary care practice has pharmacists in their clinic, using pharmacists for TOC would be beneficial

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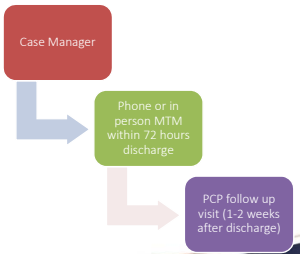
Berdine et al. *The Annals of Pharmacotherapy* 2012 May, Volume 46

Impact of Collaborative Care Services for High-risk Patients after Discharge from a Large Urban Academic Center

- UF Health Jacksonville Total Care Clinic
- N = 166 cases
- Intervention group: 137
- Control group: 29
- Primary outcome: 30 day readmission and/or ED visit rates



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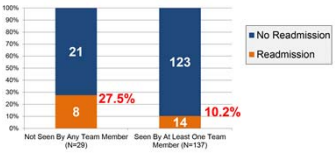
Deberry, et al. Impact of Collaborative Care Services for High-Risk Patients after Discharge from a Large Urban Academic Center. Poster Presentation at FSHP 2013

Impact of Collaborative Care Services for High-risk Patients after Discharge from a Large Urban Academic Center

- Results:
  - 27.5% (8/21) patients were re-admitted to ED/hospital within 30 days with the control group
  - 10.2% (14/123) patients were re-admitted to ED/hospital within 30 days with the intervention group
  - P value of 0.0468



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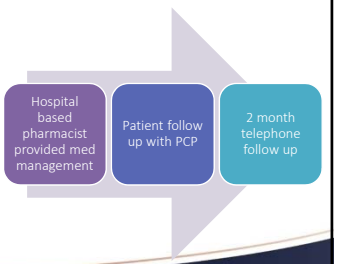
Deberry, et al. Impact of Collaborative Care Services for High-Risk Patients after Discharge from a Large Urban Academic Center. Poster Presentation at FSHP 2013

TOC IN THE ELDERLY – FROM HOSPITAL TO HOME

- Comprehensive pharmacist intervention to reduce morbidity in patients 80 years or older: a randomized clinical trial
- N = 400 (201 in the control group, and 199 in the intervention group)
- Outcomes (186 in control, 182 in intervention group):
  - 16% RRR in all hospital visits
  - 47% RRR in ED visits
  - 80% RRR in drug-related admissions



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Gillespie U, Alassaad A, Henrohn D, et al. *Arch Intern Med 2009; 169:894-900*

TOC IN THE ELDERLY – FROM HOSPITAL TO HOME

- Total cost per patient in the intervention group was $230 lower as compared with the control group
- Cost of implementation
  - 0.5 FTE pharmacist

UFHealth JACKSONVILLE

Gillespie U, Alassaad A, Henrohn D, et al. *Arch Intern Med 2009; 169:894-900*

TOC IN THE ELDERLY – FROM HOSPITAL TO LTCF

- Hospital discharge to first time LTCF
- Community Pharmacist provided medication management within 2 weeks of admission to LTCF
- N = 110 older adults (mean age 82.7)
- 56 patients in the intervention group
- 54 patients in the control group
- Primary outcome: quality of prescribing (Medication Appropriateness Index, MAI)
- MAI was significantly lower at 8 weeks follow up as compared to control group (2.5 vs. 6.5, p = .007)
- No statistical significance with ED/hospital re-admission rates

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Crotty M, Rowett D, Spurling L, et al. *Am J Geriatr Pharmacother 2004; 2:257-64*

NATIONAL INITIATIVES OR RESOURCES

- NTOCC
- BOOST program
- H2H Initiative Project
- IHI STAAR Initiative

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NATIONAL TRANSITIONS OF CARE COALITION (NTOCC)

- NTOCC
  - Established 2006, "dedicated to addressing the serious issues and concerns related with transitions of care" and to "raise awareness about transitions of care among health care professionals, government leaders, patient and care givers to increase the quality of care, reduce medication errors and enhance clinical outcomes."
- Online resources:
  - Improving on Transitions of Care: How to Implement and Evaluate a Plan
  - NTOCC Measures Work Group document

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National Transitions of Care Coalition (NTOCC): www.ntocc.org

BETTER OUTCOMES FOR OLDER ADULTS THROUGH SAFE TRANSITIONS (BOOST) PROGRAM

- 8P's Risk Assessment Tool
  - Problem medications
  - Psychological
  - Principal diagnosis
  - Polypharmacy
  - Poor health literacy
  - Patient support
  - Prior hospitalizations
  - Palliative care
- Usefulness
  - A tool to allow providers to assess the risk of adverse events during TOC
- Disadvantage:
  - Not validated

project BOOST Better Outcomes by Optimizing Safe Transitions

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Project BOOST: Better Outcomes for Older Adults Through Safe Transitions: www.hospitalmedicine.org/boost

Hospital to Home (H2H) Initiative

- Led by American College of Cardiology (ACC) and Institute for Health Care Improvement (IHI)
- Goal: 20% relative reduction in the national CMS 30 day all cause readmission rate
- Tools are available online
- Interested participants may enroll for free online
- Target population: HF and AMI

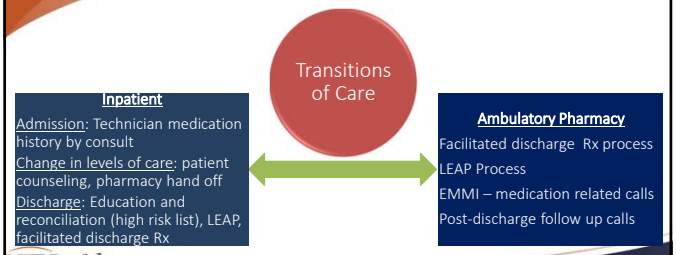
Hospital to Home (H2H) Initiative: https//cvquality.acc.org/InitativesH2H.aspx

IHI State Action on Avoidable Re-hospitalizations (STAAR) Initiative

- May 2009
- "How to guide" on improving transitions from hospital to clinics
  - –Accessible services
  - –Communication among providers
  - –Communication between patients and providers
  - –Medication reconciliation
  - –Online materials available (hospital to HHC, SNF, home)

STAAR Iniative: www.ihi.org

Transitions of Care at UF Health Jacksonville



Courtesy of UF Health Jacksonville Department of Pharmacy Transitions of Care: Pharmacy Collaborative

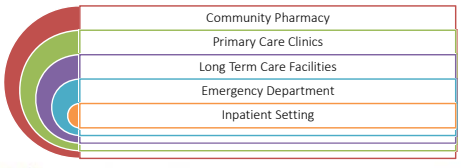
Transitions of Care at UF Health Jacksonville

- Transitions of Care: CFM Clinic
  - –Prevent 30 day re-admissions for Medicare patients
  - –Contact must be initiated within 48 hours of discharge
    - •By licensed clinical staff under supervision of physician
  - –Medication Reconciliation
  - –Face to Face with provider
    - •Within 7 or 14 days (CPT 99496 $220 or CP 99495 $157)
    - •Billable after 30 day with no hospital admissions

Courtesy of UF Health Jacksonville Department of Pharmacy Transitions of Care: Pharmacy Collaborative

Summary

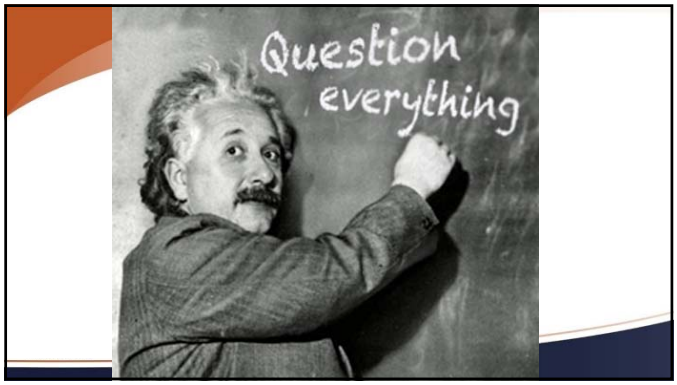
- Pharmacists play a vital role in transitions of care
- There are numerous resources available



Question

Which of the following is considered a transition of care model?

A. Project RED
B. Guided Care Model
C. Patient Centered Medical Home
D. All of the above



References

- NCCMERP. About Medication Errors 2015. http://www.nccmerp.org/about-medication-errors
- Agency for Healthcare Research and Quality. *National Scorecard on Rates of Hospital-Acquired Conditions 2010 to 2015: Interim Data From National Efforts to Make Health Care Safer.* December 2016.
- The Joint Commission. Sentinel Event Data - Event Type by Year 2017. https://www.jointcommission.org/assets/1/18/General_Information_2Q_2017.pdf
- The Joint Commission. Sentinel Event Data Root Causes by Event Type2004 –3Q 2015. http://www.jointcommission.org/assets/1/18/Root_Causes_Event_Type_2004-3Q_2015.pdf
- Institute for Safe Medication Practices. Frequently Asked Questions (FAQ) 2015
- Institute for Safe Medication Practices. List of High-Alert Medications in Acute Care Settings 2014. https://www.ismp.org/tools/highalertmedications.pdf
- Institute for Safe Medication Practices. List of High-Alert Medications in Community/Ambulatory Healthcare 2011. https://www.ismp.org/support/Default.aspx
- Institute for Safe Medication Practices. Changes to heparin vial labels now in circulation. *ISMP Medication Safety Alert.* Volume 18 Issue 20; October 3, 2013
- Institute for Safe Medication Practices. ISMP's List of Confused Drug Names. 2015

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References

- Halamaka J. Order interrupted by text; multitasking mishap. AHRQ Patient Safety Network. *WebM&M.* December 2011. http://webmm.ahrq.gov/case.aspx?caseID=257
- Watcher, Bob (2015, March 30). The Overdose – Harm in a Wired Hospital. https://medium.com/backchannel/how-technology-led-a-hospital-to-give-a-patient-38-times-his-dosage-ded7b3688558#.4kkbryhfa
- Medication Safety Alert, Acute Care Volume 18 Issue 20. *ISMP* October 3, 2013
- Russ AL, et al. Prescribers' interactions with medication alerts at the point of prescribing: A multi-method, *in situ* investigation of the human-computer interaction. *International Journal of Medical Informatics.* April 2012; 81(4):232-243
- Institute for Safe Medication Practices. *ISMP Medication Safety Alert.* March 13, 2014.
- National Alert Network (NAN), National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) http://www.nccmerp.org/sites/default/files/nANAlertFebruary2014.pdf
- Pennsylvania Patient Safety Advisory. Medication Errors Occurring with the Use of Bar-Code Administration Technology. *Pa Patient Saf Advis* 2008 Dec;5(4):122-6.
- The Joint Commission. National Patient Safety Goals – Hospitals 2017. https://www.jointcommission.org/assets/1/6/NPSG_Chapter_HAP_Jan2017.pdf

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References

- RCA Framework [internet]. Oak Brook, Illinois: The Joint Commission. Revised 2/27/2013. Accessed 4/2/2017. Available at: https://www.jointcommission.org/framework_for_conducting_a_root_cause_analysis_and_action_plan/
- The Just Culture Community (US). Just Culture Algorithm v3.2 for Employers. Plano, TX: Outcome Engenuity. 2012.
- Just Culture And Its Critical Link To Patient Safety Part I. ISMP Medication Safety Alert [internet] May 17, 2012, Horsham, PA: Institute for Safe Medication Practices Accessed 4/4/2017 Available at: http://www.ismp.org/newsletters/acutecare/showarticle.aspx?id=22
- Just Culture And its Critical Link To Patient Safety Part II. ISMP Medication Safety Alert [internet] July 12, 2012, Horsham, PA: Institute for Safe Medication Practices. Accessed 4/4/2017 Available at: http://www.ismp.org/newsletters/acutecare/showarticle.aspx?id=26

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References

- National Transitions of Care Coalition. Improving transitions of care: findings and considerations of the "Vision of the National Transitions of Care Coalition." Available at: http://www.ntocc.org/portals/0/pdf/resources/ntocctissuebriefs.pdf. Accessed March 15, 2017.
- Kripalani S, Canales AE, Bentley ML, et al. Process indicators of quality clinical pharmacy services during transitions of care. Pharmacotherapy. 2012;32(11):e338–e347.
- Hot topics in health care transitions of care: the need for a more effective approach to continuing patient care. The Joint Commission website. Available at: http://www.jointcommission.org/assets/1/18/hot_topics_transitions_of_care.pdf. Accessed March 21, 2017.
- Steeb D, Webster L. Improving care transitions: optimizing medication reconciliation. J Am Pharm Assoc. 2012;52(4):e43–52.
- Levenson SA, Saffel DA. The consultant pharmacist and the physician in the nursing home: roles, relationships, and a recipe for success. J Am Med Dir Assoc. 2007;8(1):55–64
- Ambulatory Health Care National Patient Safety Goals 2017. Available at: https://www.jointcommission.org/assets/1/6/2017_NPSG_HAP_ER.pdf. Accessed March 21, 2017.
- Hospital National Patient Safety Goals 2017. Available at: https://www.jointcommission.org/assets/1/6/2017_NPSG_HAP_ER.pdf. Accessed March 21, 2017.
- Fernandes OA. Medication reconciliation. Pharmacy Practice. 2009;25:26.
- Kwan JL, Lo L, Sampson M, at al. Medication reconciliation during transitions of care as a patient safety strategy. Ann Intern Med. 2013;158(5 Pt 2):397–403.
- Cornish PL, Knowles SR, Marchesano R, et al. Unintended medication discrepancies at the time of hospital admission. Arch Intern Med. 2005;165:424–429.
- The Joint Commission. Sentinel Event Alert. Issue 35 January 25, 2006. Available at; https://www.jointcommission.org/assets/1/18/SEA_35.PDF. Accessed March 15, 2017.
- Johnson A, Guirguis E, Grace Yasmin. Preventing medication errors in transitions of care: A patient case approach. Pharm Today. 2015;21(3):79–90.

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References

- Overview of the 100,000 Lives Campaign. Available at: http://www.ihi.org/Engage/Initiatives/Completed/5MillionLivesCampaign/Documents/Overview%20of%20the%20100K%20Campaign.pdf. Accessed March 16, 2017.
- World Health Organization. Action on patient safety- High 5s. Available at: http://www.who.int/patientsafety/implementation/solutions/high5s/en/. Accessed March 16, 2017.
- World Health Organization. High 5s: Action on Patient Safety. High 5s: Action on patient Safety. Available at: http://www.who.int/patientsafety/implementation/solutions/high5s/ps_high5s_project_overview_fs_Oct_2011.pdf?ua=1. Accessed March 16, 2017.
- World Health Organization. High 5s fact sheet. Available at: http://www.who.int/patientsafety/implementation/solutions/high5s/h5s-fact-sheet.pdf?ua=1. Accessed March 16, 2017.
- Duran-Garcia E, Fernandez-Llamazares CM, Calleja-Hernandez MA. Medication reconciliation: passing phase or real need? Int J Clin Pharm. 2012;34(6):797–802.
- Institute for Safe Medication Practices (ISMP). ISMP list of high-alert medications in acute care settings. Available at" https://www.ismp.org/Tools/institutionalhighAlert.asp. Accessed March 16, 2017.
- Institute for Safe Medication Practices (ISMP). ISMP list of high-alert medications in community/ambulatory healthcare. https://www.ismp.org/communityRx/tools/ambulatoryhighalert.asp. Accessed March 16, 2017.
- Bell CM, Brener SS, Gunraj N, et al. Association of ICU or Hospital Admission with unintentional discontinuation of medications for chronic diseases. JAMA. 2011;306(8):840-847.
- Kripalani S, Roumie CL, Dalal AK, et al. Effect of a pharmacist intervention on clinically important medication errors after hospital discharge: a randomized controlled trial. Ann Intern Med. 2012 July 3; 157(1)
- Kwan JL, Lo L, Sampson M, Shojania KG. Medication reconciliation during transitions of care as a patient safety strategy. Ann Intern Med. 2013;158(5 Pt 2):397–403. http://annals.org/aim/article/1656444/medication-reconciliation-during-transitions-care-patient-safety-strategy-systematic-review
- Mallory N, Malcolm K, Brooks S, et al. (2017).Evaluate, develop, and implement medication safety measures using medication error reporting systems and medical records. Unpublished protocol.

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References

- Jack BW, Chetty VK, Anthony D, et al. A Re-engineered Hospital Dsicharge Program to Decrease Re-hospitalization: a Randomized Clinical Trial. *Ann Intern Med 2009; 150: 178-87.*
- Project RED: https://www.bu.edu/famed/projectred/index.html
- Patient Centered Medical Home: Pcmh.ahrq.gov
- Gillespie U, Alassaad A, Henrohn D, et al. A Comprehensive Pharmacist Intervention to Reduce Morbidity in Patients 80 years or Older: A randomized Clinical Trial. *Arch Intern Med 2009; 169:894-900*
- Crotty M, Rowett D, Spurling L, et al. Does the Addition of Pharmacist Transition Coordinator Improve Evidence-Based Medication Management and Health Outcomes in Older Adults Moving from the Hospital to a Longer Term Care Facility? Results of a Randomized Clinical Trial. *Am J Geriatr Pharmacother 2004; 2:257-64*
- Project BOOST: Better Outcomes for Older Adults Through Safe Transitions: www.hospialmedicine.org/boost.
- National Transitions of Care Coalition (NTOCC): www.ntocc.org.
- Hospital to Home (H2H) Initiative: https//cvquality.acc.org/InitativesH2H.aspx
- STAAR Initiative: www.ihi.org
- Medications at Transitions and Clinical Handoffs (MATCH) Tool: https://www.arhq.gov/sites/default/files/publications/files/match.pdf

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References

- Guided Care Model: http://www.guidedcare.org
- Care Transitions Intervention Program: http://caretransitions.org
- Transitional Care Model: https://www.nursing.upenn.edu/ncth/transitional-care-model
- Patient Centered Medical Home: Pcmh.ahrq.gov
- Jack BW, Chetty VK, Anthony D, et al. A Re-engineered Hospital Dsicharge Program to Decrease Re-hospitalization: a Randomized Clinical Trial. *Ann Intern Med 2009; 150: 178-87.*
- Project RED: https://www.bu.edu/famed/projectred/index.html
- Berdine et al. *The Annals of Pharmacotherapy* 2012 May, Volume 46
- Deberry, et al. Impact of Collaborative Care Services for High-Risk Patients after Discharge from a Large Urban Academic Center. Poster Presentation at FSHP 2013.
- Gillespie U, Alassaad A, Henrohn D, et al. A Comprehensive Pharmacist Intervention to Reduce Morbidity in Patients 80 years or Older: A randomized Clinical Trial. *Arch Intern Med 2009; 169:894-900*

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References

- Crotty M, Rowett D, Spurling L, et al. Does the Addition of Pharmacist Transition Coordinator Improve Evidence-Based Medication Management and Health Outcomes in Older Adults Moving from the Hospital to a Longer Term Care Facility? Results of a Randomized Clinical Trial. *Am J Geriatr Pharmacother 2004; 2:257-64*
- Project BOOST: Better Outcomes for Older Adults Through Safe Transitions: www.hospialmedicine.org/boost.
- National Transitions of Care Coalition (NTOCC): www.ntocc.org.
- Hospital to Home (H2H) Initiative: https//cvquality.acc.org/InitativesH2H.aspx
- STAAR Initiative: www.ihi.org
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