Medication Errors at Time of Discharge
A Team Learning Exercise

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Objectives:

At the end of this session, participants should be able to:

1. Recognize discharge situations that carry increased risk for adverse outcomes related to medications.
2. Propose strategies to reduce the incidence of discharge-related adverse medication outcomes.

Background:

The learning/teaching structure for this session is derived from formal "Team Learning," an educational strategy that was outlined by Larry K. Michaelson, a business professor at the University of Oklahoma. Descriptions and introductory materials are available at http://atlas.services.ou.edu/idp/teamlearning/index.htm.

The basic principles of this teaching method are the following:

1. Adult learners (really, any learners) learn better when they are actively engaged with the material.
2. Small groups of learners working together effectively teach each other.
3. The application exercise in a Team Learning activity are designed to teach through use of knowledge, often in building a skill.
4. Teams of learners that are functioning well encourage individual accountability and engagement with the learning process. The teams essentially demand involvement from one another.

Team Learning utilizes two types of exercises, a Readiness Assessment Tool (RAT) and an Application Exercise. Below, you will find information on how each of these exercises work and how we have modified them to fit the purpose of teach about medication errors at the time of discharge.

1. Readiness assessment tool.

When team learning is used as the primary instructional method in a longitudinal course, this is a critical component to assuring individual accountability and to encouraging a highly functional team. In formal team learning, the individuals are expected to have done preparation before the session (reading typically). The readiness assessment tool (RAT) generally would consist of 10-20 multiple choice questions that require understanding of the pre-assigned reading. The second component of the RAT is a group RAT in which the team takes the same quiz using a team answer sheet. A functional team works together to answer the questions. Our experience has taught us that teams always outperform individuals. The real power of this activity is that it allows the members of the team to begin teaching each other.

For the Tool Box activity, we will alter the exercise significantly, deleting the individual RAT and assuming no pre-reading. We still expect that the team RAT will promote team interaction. This is essential for optimal performance and learning from the application exercise that follows the RAT. In our exercise:

a. No preparation is required or expected so this exercise is assessing pre-existing knowledge within small groups.
b. No individual RAT is performed, only the group RAT.
c. A series of 5 multiple choice questions are provided which use an IF-AT (scratch off) answer sheet* to provide immediate feedback to the group. *Although use of the IF-AT answer sheet is a way to give immediate feedback to groups, this is not an absolute requirement for the exercise. Feedback can simply be given by the moderator after groups have completed the exercise.*
d. Correct answers need to be well-grounded in evidence.
e. Questions and the knowledge assessed should have direct impact on the application exercise that follows.
f. Moderators may choose to offer a small prize to the winning group.

2. Application Exercise.

The application exercise is the cornerstone for learning in the Team Learning model. Generally, it will take the form of one of the following:

- A series of scenarios or answers (none of which are clearly correct, but each of which has argument for it) that teams are asked to choose one as a "best fit."
- An exercise in which each of a limited number of small groups is asked to prepare an argument from a different perspective.
- An exercise in which each group is asked to prepare a product and prepare to argue the merits of the product to the larger group.

The exercise, in this case, utilizes elements of the first two bulleted designs above:

a. It is a small group activity.
b. Five scenarios are presented for the groups to assess. The group must pick the scenario in which an adverse outcome is most likely to occur. The scenarios have been designed to stimulate a spread in “correct answers” and hopefully a lively large group discussion.
c. Return to large group discussion with simultaneous revelation of the answers by the groups and then discussion.
d. Close the discussion with a large group brainstorm about ways to reduce adverse medication outcomes related to discharge.

Below, you will find copies of the exercises. The first set is for the moderator and includes answers to the RAT and comments about the Application Exercise. The second copy is for use by the participants. Two versions of RATs are provided.

*IF-AT score sheets are available online via Epstein Educations Enterprises www.epsteineducation.com.

Readiness Assessment Tool #1
Moderator's copy

There are five questions constituting this exercise. Using the IF-AT (scratch-off) answer sheet, your group should select the best answer for each question. Scoring is as follows for each question: If correct answer revealed with single scratch: 5 points, two scratches: 3 points; three scratches: 1 point; more than 3 scratches: 0 points. Total possible points: 25.

Note to Moderator: This Readiness Assessment Exercise is constructed for use with IF-AT form Series C, #6565.

Good luck!

1. A medication discrepancy is defined as a lack of agreement between pre-hospital or in hospital medication regimens with discharge regimen. Which of the following conditions would be most likely to be associated with a medication discrepancy that results in an adverse outcome?[1]
    a. Chronic obstructive pulmonary disease
    b. Diabetes mellitus
    c. Coronary artery disease
    d. Congestive heart failure
    e. Peripheral vascular disease

Comments for moderator: Coleman et al, in a study of community-dwelling adults, aged 65 years and older, found that the presence of congestive heart failure was significantly associated with patients experiencing a medication discrepancy (odds ratio, 2.10, 95% confidence interval 1.09-4.03). The other diagnoses listed in this question did not appear to predict medication discrepancies according to the Coleman data.

2. Which of the following system-associated factors is most commonly associated with medication discrepancies?[1]
    a. Discharge instructions incomplete, inaccurate, or illegible
    b. Conflicting information from different informational sources
    c. Confusion between brand and generic names
    d. Cognitive impairment of the patient
    e. Duplication of medications or meds within same class given

Comments for moderator: Coleman et al found that incomplete, inaccurate, or illegible discharge instructions were the most common contributing factors to medication discrepancies. Conflicting information and duplications were the next most common contributors.

3. Among patients who experience a medication discrepancy, what is the probability of readmission to the hospital within 30 days?
    a. Less than 5%
    b. More than 30%
    c. 5-10%
    d. 10-20%
    e. 20-30%

Comment for moderator: Coleman et al found that hospital readmission rates for patients with identified medication discrepancies were 14.3% among the 375 study patients. This contrasted with a 6.1% readmission rate among patients with no identified medication discrepancy.

4. Among drugs prescribed at discharge, which of the following classes of drugs causes the greatest number of adverse drug events?[2]
    a. Analgesics, including opioids
    b. Antibiotics
    c. Anticoagulants
    d. Cardiovascular drugs
    e. Corticosteroids

Comment for moderator: Forster et al found that antibiotics were the most common drugs causing adverse events defined as injury resulting from medical management rather than the underlying disease. Antibiotics accounted for 38% of adverse events, while corticosteroids accounted for 16%, cardiovascular drugs 14%, analgesics including opiates 10%, and anticoagulants 8%.

5. Instituting a program of pharmacist counseling at discharge along with a followup telephone call to the patient within 3-5 days has been shown to:[3]
    a. Reduce the number of preventable adverse drug events.
    b. Improve patient satisfaction with the discharge process
    c. Be a cost effective intervention for patients with multiple medical problems.
    d. Reduce the rate of rehospitalization of patients within 30 days following discharge
    e. Eliminate drug interactions for patients on complex medical regimens.

Comment of moderator: Schnipper et al showed in a randomized trial of 178 patients being discharged home from the general medicine service that pharmacist counseling reduced the number of preventable adverse drug events from 11% in the control group to 1% in the intervention group. Disappointingly, there were no differences between the two groups in the total number of adverse drug events (Control: 16%, intervention: 18%) or in health care utilization or patient satisfaction.

Answers: 1. d; 2. a; 3 d; 4 b; 5 a.

References:

1. Coleman EA, Smith JD, Raha D, Min SJ. Posthospital medication discrepancies: prevalence and contributing factors. *Arch Intern Med.* Sep 12 2005;165(16):1842-1847.
2. Forster AJ, Murff HJ, Peterson JF, Gandhi TK, Bates DW. The incidence and severity of adverse events affecting patients after discharge from the hospital. *Ann Intern Med.* Feb 4 2003;138(3):161-167.
3. Schnipper JL, Kirwin JL, Cotugno MC, et al. Role of pharmacist counseling in preventing adverse drug events after hospitalization. *Arch Intern Med.* Mar 13 2006;166(5):565-571.

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Readiness Assessment Tool #2

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Good luck!

1. Which of the following statements about informing patients at time of discharge about potential adverse drug effects or drug side effects is true?[4]
    a. Discussion of potential side effects of prescribed medications is most appropriately done by the discharge nurse.
    b. Discussing potential side effects of prescribed medications makes it more likely that patients will not fill prescriptions for medications.
    c. Information on potential side effects of prescribed medications increases the likelihood that patients will complain of these side effects.
    d. Instruction about medication side effects has been associated with reduced risk of adverse drug events.
    e. Information about potential adverse drug effects is overwhelming to patients and family members at time of discharge.

Comments for moderator: Forster et al., using a survey of patient recollection of the discharge preparations among 400 discharged patients showed that discussion of potential side effects was associated with a reduction in frequency of adverse drug events (adjusted OR 0.4 [95% CI 0.2 to 0.7]). There was no evidence that these discussions increased the likelihood of reported side effects. Unfortunately, only 62% of patients could recall having been told about potential medication side effects at time of discharge.

2. What is the most common reason for **preventable** adverse drug events among patients discharged from the hospital?[4]
    a. Failure to implement appropriate drug monitoring.
    b. Prescription of 4-6 medications at time of discharge.
    c. Continuation of usual warfarin dosing despite 2 new meds.
    d. Prescription of azithromycin or levofloxacin
    e. Initiation of beta-blockers for a patient with congestive heart failure.

Comments for moderator: The prospective cohort study of 400 discharged patients, among whom 11% developed adverse drug events, showed that failure to implement

appropriate monitoring for drugs that clearly need monitoring (examples: spironolactone, ACEI, warfarin) was the most common cause of preventable adverse events.

3. Which of the following is **least** likely to occur at time of discharge?[4]

    a. General discussion of the medications with a health provider.
    b. Provision of a written list describing medications.
    c. Most patients have no problem obtaining prescribed medications.
    d. Discussion of potential medication side effects.

Comments for moderator: The Forster et al. study showed the following in a recall survey: 83% of patients recalled a general discussion of medications; 90% had been provided with a list of medications; 88% apparently had no difficulty filling their prescriptions; 62% of patients were told about potential side effects of medications before leaving the hospital.

4. Most unintentional overdoses and the majority of hospitalizations for adverse drug events involve a small set of drugs that require periodic monitoring. Which of the following is most commonly associated with unintentional overdoses?[5]

    a. Anticonvulsants
    b. Insulins
    c. Warfarin
    d. Oral diabetic agents
    e. Lithium

Comments for moderator: A study of information from 9 of 64 National Electronic Injury Surveillance System-All Injury Program hospital EDs in mid-2002. There were 598 patients with physician-documented adverse drug events (7 per 1000 visits). It seems likely that this underestimates the true incidence, but there is useful information from this study in any case. 39% of the ADEs were unintentional overdoses with insulin accounting for the greatest number of these events.

5. Adverse drug events include several mechanisms for injury. Which of the following is the most common mechanism of injury among patients with ADEs who seek attention in the Emergency Department?[5]

    a. Unintentional overdoses (toxic effects linked to excess dose or impaired excretion)
    b. Allergic reactions (immunologically mediated effects)
    c. Adverse effects (undesirable pharmacologic effects at recommended dosages)
    d. Secondary effects (Ex: secondary infections, falls, choking)

Comments for moderator: Budnitz et al found the following in their study:

Unintentional overdoses 39% (accounting for 73% of patients hospitalized for ADEs, at a rate of 16.3 per 100 patients), adverse effects 31%, allergic reactions 26%, secondary effects 4%.

Answers: 1. d; 2. a; 3. d; 4. b; 5. a.

References:

1. Forster AJ, Murff HJ, Peterson JF, Gandhi TK, Bates DW. Adverse drug events occurring following hospital discharge. *J Gen Intern Med.* Apr 2005;20(4):317-323.

2. Budnitz DS, Pollock DA, Mendelsohn AB, Weidenbach KN, McDonald AK, Annest JL. Emergency department visits for outpatient adverse drug events: demonstration for a national surveillance system. *Ann Emerg Med.* Feb 2005;45(2):197-206.

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<u>Application Activity</u>
Moderator's Copy

As a small group, you are to answer the following question:

> *Which of the patient situations described below is most likely to result in a* ***serious, potentially life-threatening adverse drug event after discharge?***

As a group, you should be prepared to defend your choice. After a period of 15 minutes for small group discussion, the moderator will call time and on a count of "three," the groups will simultaneously hold up a card disclosing their answer. Discussion and hopefully argument will ensue.

Notes for the moderator:

> *There is no rule about the number of small groups that are required for this exercise, but usually the "spread of answers" among the groups will be greater if there are at least four. This increases the likelihood of a split among team answers and allows for large group discussion.*
>
> *It is possible although not desirable, that all groups will choose the same patient scenario as posing the greatest risk. This would obviously defeat the goal of cross-talk and argument among groups when they are called back to the large group for discussion. If this occurs, for the purposes of this exercise, the facilitator should be prepared to take a contrarian position and force the groups to defend their choice.*
>
> *As the groups pose their arguments, the moderator or an assistant should capture the major learning points in a board list. This allows for summary points at the close of the exercise.*

Patient A.

A 78 y.o. patient with new onset atrial fibrillation presents with mild congestive heart failure. H/O hypertension, diabetes mellitus. Follow-up scheduled for 10 days.

Pre-admission Medication List	**Discharge Medication List**
Hydrochlorothiazide 25 mg daily	Hydrochlorothiazide 25 mg daily
Lisinopril 10 mg BID	Toprol XL 100 mg daily
Glyburide 2.5 mg daily	Glyburide 2.5 mg daily
Aspirin 325 mg daily	Coumadin 7.5 mg daily

Comments for moderator: For this patient, two meds are being changed at discharge, but one of the new meds is Coumadin. Follow-up is not scheduled until 10 days from now which will be problematic for a patient who is just starting Coumadin.

Likely events are major hemorrhage in the setting of over-anticoagulation. This would seem to be a very high risk situation and could be argued vigorously.

Patient B

A 56 y.o. patient with congestive heart failure due to dilated cardiomyopathy (LVEF 21%) admitted because of increasing dyspnea and lower extremity edema. Creatinine 1.4 mg/dL. Treated with IV furosemide 80 mg q 12 hours.

Pre-admission Medication List	Discharge Medication List
Lasix 160 mg BID	Lasix 80 mg BID
Enalapril 20 mg BID	Enalapril 20 mg BID
Carvedilol 12.5 mg BID	Carvedilol 6.25 mg BID
Potassium 40 mEq BID	Spironolactone 50 mg daily
	Metolazone 2.5 mg daily

Comments for moderator: Patients with heart failure are at particularly high risk for complications. There are also two new medications in this patient's regimen. Metolazone is obviously frought with danger of electrolyte abnormality. Probably more pressing, the spironolactone dose exceeds that usually initiated for patients with CHF and given the creatinine of 1.4, this would pose significant risk. No mention is made of follow-up.

Patient C

43 y.o. patient with a seizure disorder controlled with Tegretol that has been taken for years, admitted with RLL pneumonia. Responds quickly to ceftriaxone + azithromycin. Pneumococcus sensitive to macrolides. PMH includes hypertension.

Pre-admission Medication List	Discharge Medication List
Tegretol 200 mg twice daily	Tegretol 200 mg twice daily
Atenolol 50 mg daily	Atenolol 50 mg daily
	Clarithromycin 500 mg BID (Azithromycin is non-formulary)
	Tussend cough syrup as needed

Comments for moderator: Drug-drug interactions are the major issue here. Clarithromycin increases Tegretol levels which is likely to cause significant side effects. The severity of adverse outcome is likely to be lower than the first two scenarios. The relatively young patient is less likely to have difficulty with additional medications, particularly since the course of meds is relatively short.

Patient D

68 y.o. patient with COPD, GERD, hypertension, osteoarthritis, admitted with first episode of diverticulitis. Responds to bowel rest and antibiotics.

Pre-admission Medication List	Discharge Medication List
Combivent inhaler QID	Combivent inhaler QID
Advair Diskhaler 250/50 one puff BID	Advair Diskhaler 250/50 one puff BID
Protonix 40 mg daily	Nexium 40 mg daily
Lisinopril 20 mg daily	Enalapril 20 mg daily
“another blue pill for my heart”	HCTZ 25 mg daily
Acetaminophen 1000 mg QID	Acetaminophen 1000 mg QID
	Metronidazole 500 mg TID
	Bactrim DS one tab BID

Comments for moderator: There are multiple sources for adverse drug event in this scenario. Two meds are simply replaced by first cousins (Nexium and enalapril), but this increases the chances that the patient will inadvertently take two drugs that do the same thing, or will become confused on return home and take too little medication. There are five new meds total which exceeds the threshold for increased likelihood of adverse events. However, it seems unlikely that these will cause serious adverse event unless excessive ACEI is taken.

Patient E

An 86 y.o. patient who underwent an ORIF for left hip fracture one week ago. Known to have systolic hypertension and hypercholesterolemia, but no other major medical problems prior to this admission. Found to have glucoses consistently greater than 200 during hospital stay.

Pre-admission Medication List	Discharge Medication List
Multivitamin one daily	Metformin 500 mg BID
Calcium 500 mg TID	Alendronate 10 mg daily
HCTZ 25 mg daily	Lisinopril 10 mg BID
Colace 100 mg BID	Percocet one every four hours as needed
Zocor 20 mg daily	Zocor 40 mg daily
	Fragmin 2500 units SC daily

Comments for moderator: Age is the first red flag which is associated with a greater risk of adverse drug event. Anticoagulants increase risk of major adverse event. All meds but one (Zocor) will be different upon returning home, but even the dose of the Zocor is increased. Chance for error is dramatically increased by the number of drugs this patient has been given.

Narcotic analgesics increase risk of fall. Alendronate may be difficult to take properly, increasing risk of esophagitis until the patient is fully active. Hypoglycemia is unlikely with metformin, but new diabetes meds always raise this risk for patients.

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