Interprofessional Collaboration Improves Antibiotic Stewardship

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Background

The challenge to improve effective and safe of antibiotics in post-acute and long-term care settings (PALTC) is a national focus of great importance. The goals of the national antibiotic stewardship initiative are to reduce the emergence of multi-drug resistant organisms, antibiotic adverse drug events (AADEs), and unnecessary cost.[1] The Centers for Disease Control and Prevention (CDC) suggest AADE monitoring as one of several appropriate resident outcome measures for antibiotic stewardship programs.[2] Processes for AADE identification, documentation, monitoring and reporting vary substantially among PALTC facilities.

Objectives

Our aim was to develop a standardized AADE clinical decision support tool to be embedded electronically into PALTC workflow.

- Educate clinicians about AADEs, their frequency, timing, manifestations and outcomes
- Provide an algorithmic approach for evaluation of possible AADEs
- Develop consistent workflow for evaluating if AADEs have occurred
- Accurately document and report AADEs and their outcome
- Ultimately, reduce antibiotic harm

Quality Improvement Methods

The Maryland Antimicrobial Stewardship Collaborative, funded by the CDC and the Maryland Department of Health:

- is led by The Peter Lamy Center on Drug Therapy and Aging;
- includes geriatricians, infectious diseases physicians and pharmacists, geriatrics nurses, geriatric pharmacotherapists, public health and CDC representatives as well as Think Research team members;
- met biweekly from March 2018 – November 2018 to plan educational opportunities for LTC staff, then monthly thereafter through Jun 2018; and
- developed an AADE template and elicited interprofessional feedback during a live Antimicrobial Summit (Table 1); and
- interviewed key LTC stakeholders (Table 1) to further refine the AADE tool.

Following integration of the feedback, the revised AADE template was transformed, by Think Research, into a prototype for integration into electronic health records (EHR). Interviews with participants revealed wide variability in access to laboratory integration, data sources, and workflows.

Table 1: Interprofessional Collaboration

Summit Participants	Number
Physicians	11
Nurses/Nurse Practitioners	40
Pharmacists	35
Infection Control/Epidemiologists	7
Quality Assurance Managers	4
Administrators	2
Other	11

Key Stakeholder Interviews	Number
Medical Directors	2
LTC Pharmacy Providers	3
Nursing Home Clinical Managers/VPs	2

Results

Common AADEs were characterized by signs and symptoms into gastrointestinal, renal, cardiovascular, hematologic, hepatic, skin, anaphylaxis, myositis/tendinitis, and neurologic AADEs.

- In a recent publication a retrospective review of antibiotic therapy in 1,488 hospitalized adults (mean age 59 years, 51% female) provides insights regarding the prevalence and timing of antibiotic ADEs.[3]

Prevalence

- Twenty percent of antibiotic-treated patients experienced at least one ADE. For every additional 10 antibiotic days of therapy an additional 3% increased risk of an ADE was conferred. The prevalence and timing of each ADE category is shown in Table 1.

Timing

- The median time to development of an ADE was 5 days (range, 3 – 8 days). Most (73%) ADEs occurred during the hospital stay; 27% were identified after hospital discharge.

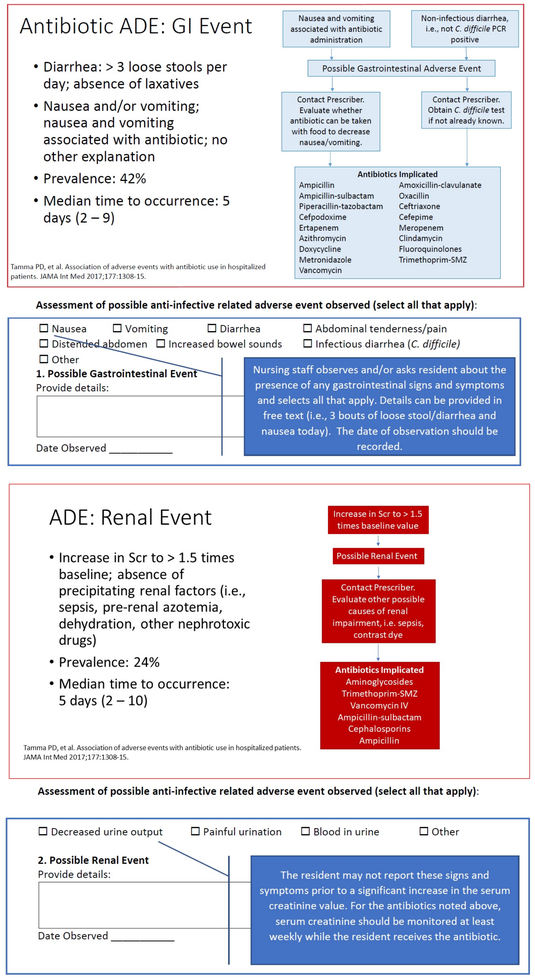
Results (continued)

Table 2: Characterization of Antibiotic Adverse Drug Events[3]

Classification	Prevalence	Median Time (days)	Time Interquartile Range (days)	Criteria
Gastrointestinal	78 (42%)	5	2 - 9	Diarrhea: > 3 loose stools /day N/V: associated with antibiotic
Renal	45 (24%)	5	2 - 10	Increase Scr to > 1.5 x baseline
Hematologic (Blood)	28 (15%)	12	6 - 24	Anemia: Hgb < 10 g/dL Leukopenia: WBC < 4500 cells/µL Thrombocytopenia: platelets < 150 x 10^3/µL
Hepatobiliary (Liver)	13 (7%)	8	4 - 12	Total bilirubin > 3 mg/dL, ALT/AST > 3 x baseline
Neurologic	13 (7%)	3	2 - 4	Altered mental status, peripheral neuropathy, or seizures
Cardiac (Arrhythmia)	2 (1%)	11	4 - 18	QTc > 440 msec in females QTc > 460 msec in males
Myositis (Muscle)	2 (1%)	NA	NA	Increase in creatine phosphokinase > 5 x baseline
Dermatologic (Skin)	2 (1%)	minutes to days	NA	Rash, hives, non-hive rashes, red man syndrome associated with non-vancomycin antibiotic
Anaphylaxis	1 (0.007%)	minutes	NA	Acute respiratory compromise, hypotension, or end-organ dysfunction within minutes of starting antibiotic

Where: ALT/AST=alanine aminotransferase/aspartate aminotransferase; Hgb=hemoglobin; N/V=nausea/vomiting; QTc=corrected QT interval; Scr=serum creatinine; WBC=white blood cell count

Figure 1: Algorithms, Characteristics, and Causes of Gastrointestinal (GI) and Renal AADEs



Clinical algorithms identify antibiotics most commonly associated with signs and symptoms, median occurrence time post-antimicrobial initiation, and suggested laboratory monitoring. An exception-based logic was employed in the AADE template design to minimize required nursing documentation (Figure 3).

Results (continued)

Figure 2: Components of the AADE Template

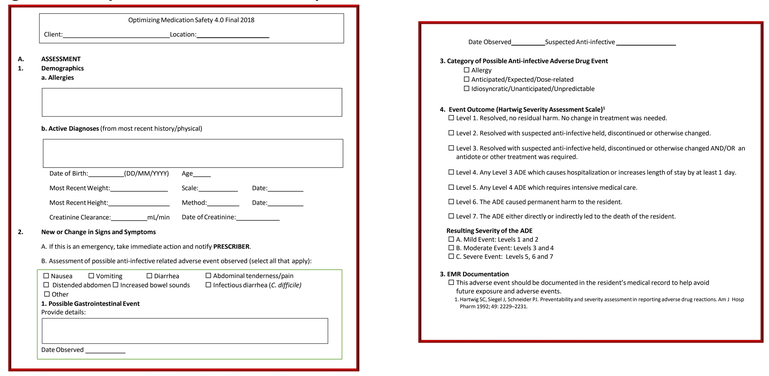
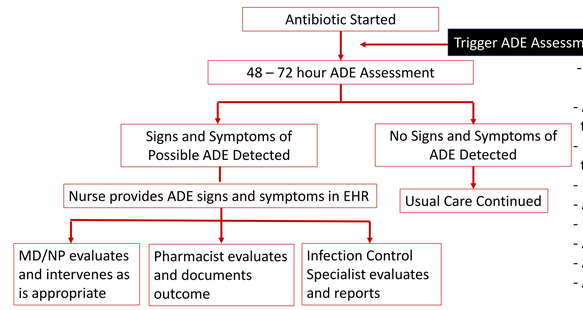


Figure 3: Proposed Antibiotic Adverse Drug Event Workflow



Discussion

- Through interprofessional collaboration an AADE tool was developed, refined, and integrated as a prototype into PALTC EHRs to facilitate identification, documentation, and trending of AADEs
- Stakeholder mapping is being conducted to identify accountabilities for antibiotic prescribing, monitoring, and reporting
- AADE drug, type, number, and outcome can be trended with other antibiotic stewardship metrics
- Alignment with clinical care is needed to support AADE[4] reporting
- Further testing and validation pilots are underway

References

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Disclosures

Dr. Zarowitz is a strategic advisor to Think Research, Toronto, Canada. All other authors have stated there are no disclosures to be made that are pertinent to this work.