

Electronic Communication for Antimicrobial Management

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- **Mechanism - R21**

Introduction & Background

- Computerized provider order entry (CPOE)
 - IOM endorses use of computer systems
 - CPOE can reduce certain types of medication errors
 - Systems with advanced clinical decision support (CDS-CPOE) can help with prescribing decisions and clinical communication
 - Poorly designed systems may facilitate medical errors
 - Rarely studied in NICU

Introduction & Background

- Failure to comply with antibiotic prescribing recommendations can derive from sources such as:
 - Failure to stop when negative cultures obtained
 - Failure to stop surgical prophylaxis
 - Failure to switch when microbiology reports would indicate other antibiotic required
- Providing decision support for these failures may improve prescribing practice

Types Medication-Related Clinical Decision Support

Basic Medication-related CDS	Description
1. Drug-allergy checking	Comparing patient allergy list with new prescription
2. Basic dosing guidance in CPOE	Pre-set dosing limits for medications being ordered
3. Formulary decision support	Using hospital formulary to build medication lists
4. Duplicate therapy checking	Computer program to check if medication is already ordered
5. Drug-drug interaction checking	Computer program to check for untoward drug interactions
Advanced Medication-related CDS	Description
1. Advanced dosing guidance in CPOE	Dosing guidance that takes into account patient information
2. Advanced guidance for medication associated laboratory testing	Medication guidance taking into account laboratory results (e.g., need for adjustments for renal impairment)
3. Advanced checking of drug-disease interactions and contraindications	Decision support for appropriateness of medication given patient diagnosis
4. Advanced drug-pregnancy alerting	Dosing and medication guidance when patient is pregnant

Potential Implications for Decreasing Antimicrobial Resistance/Significance

- Addresses 12 step items:
 - Step 4: Target definitive therapy
 - Step 6: Say NO to Vanco
 - Step 7: Use local data
 - Step 8: Stop treatment when infection cured or unlikely

Aim

- To improve the appropriate and judicious use of antibiotics in the neonatal intensive care unit (NICU) by developing and testing an automated method to remind clinicians to stop or change inappropriate antibiotics.

Specific Aim 1:

- To define the data elements, logic, timing and method for clinical decision support for antibiotic prescribing within the workflow of the NICU and to implement the prototype CDS-CPOE system.

Specific Aim 2:

- To evaluate the CDS-CPOE system for violation of usability principles and to evaluate perceived usefulness, ease of use and intention to use the CDS-CPOE for antibiotic prescribing in two NICUs.

Specific Aim 3:

- To examine the relationships between end-user characteristics and perceived usefulness, perceived ease of use and intention to use the CDS-CPOE for antibiotic prescribing in two NICUs

Hypothesis

- Decision support related to prescribing decisions will improve appropriateness of antibiotic prescribing

Sites

- Neonatal ICUs at
 - Morgan Stanley Children’s Hospital of New York Presbyterian Hospital (MSCH-NYP)
 - Cornell-Weill Medical Center
 - Christiana (Delaware)
 - Children’s Hospital of Philadelphia
- Antibiotics are ordered primarily by Residents and Nurse Practitioners via a computerized order entry system

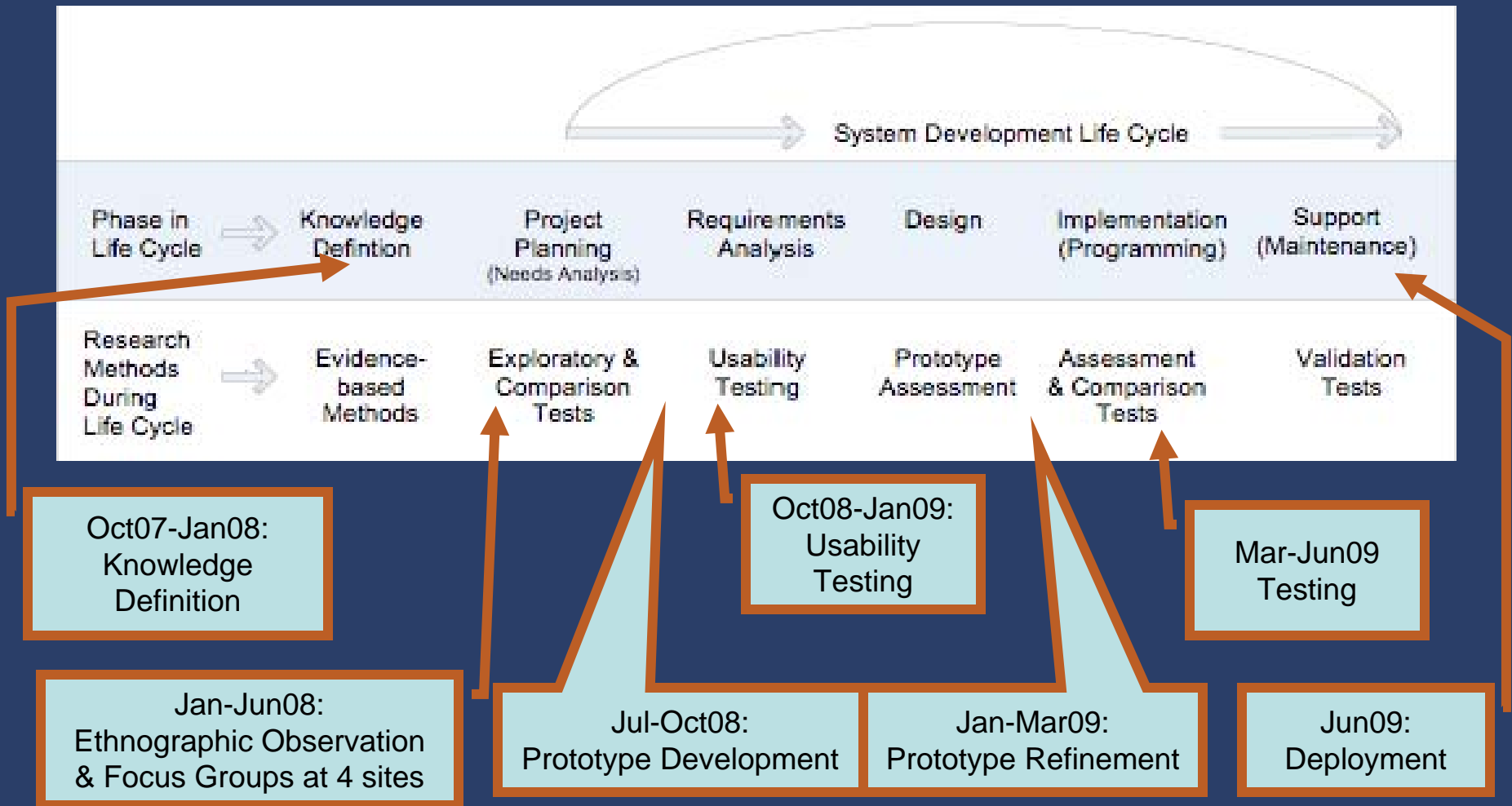
Methods

- Intervention
 - Target three “failures to stop”
 - Stop Vancomycin when negative culture
 - Stop surgical prophylaxis within appropriate time
 - Narrow antibiotic coverage from broad spectrum to more precise (based on micro reports)
 - Guideline logic built into Information System
 - Report or Alert provided to prescriber for use during Rounds (will be defined in year 1)

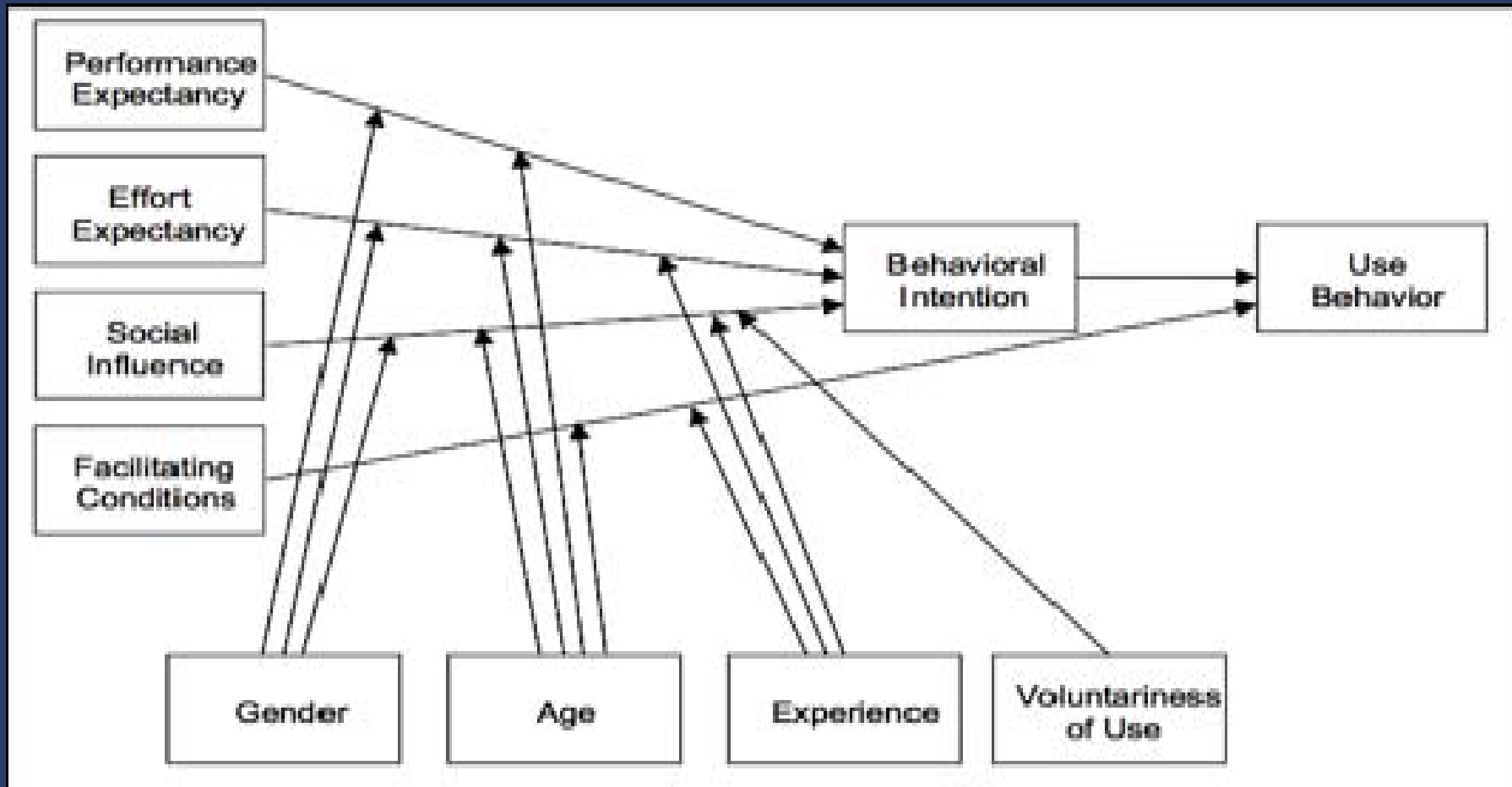
Methods

- Knowledge Development
 - Evidence based protocol definition
- Ethnographic observation
 - Understand workflow and artifacts used
- Focus Groups
 - What functions do you want at what timepoints in workflow?
- Usability Testing
 - UTAUT survey and Nielsen Usability

System Development Life Cycle and Research Methods



Unified Theory of Technology Acceptance



on Antimicrobial Resistance

Nielsen's Heuristics

Usability Principles	Description
Visibility of system status	Use feedback to keep users informed
Match between system and the real world	Default settings should match domain knowledge
User control and freedom	Support undo and redo functions
Consistency and standards	Follow conventions used across the information system
Error prevention	Careful design prevents a problem from occurring
Recognition rather than recall	Make objects, actions, and options visible
Flexibility and efficiency of use	Instructions should be visible
Aesthetic and minimalist design	Do not use information that is irrelevant or rarely needed
Help users recognize and recover from errors	Error messages should suggest a solution
Help and documentation	Help information should be easy to search/task focused

Work-to-date

Center for Interdisciplinary Research
on Antimicrobial Resistance

Knowledge Definition

Step 4: Target definitive therapy

Step 6: Say NO to Vanco

- Decision Time Points
 - ‘Sick Baby’ *without* bacteriology report
 - ‘Sick Baby’ *with* bacteriology report

Knowledge Definition

Step 8: Stop treatment when infection cured or unlikely

- Decision Time Points
 - 48 hours after treatment started
 - 72 hours after treatment started

Knowledge Definition

Step 7: Use local data

- Decision Time Points
 - ‘Sick Kid’ without old bacteriology report
 - ‘Sick Kid’ with old bacteriology report
 - 72 hours after treatment started
- Data elements
 - VS & demographics
 - Age/weight
 - Feeding
 - Labs

Next Steps

- IRBs at all sites
- Work with IT departments