Simulated E-hEalth Delivery System (SEEDS): Teaching QSEN Competencies

Judith J. Warren, PhD, RN, BC, FAAN, FACMI
Christine A. Hartley Centennial Professor
Director of SEEDS Program

Director of Nursing Informatics
KU Center for Health Informatics
Challenges from the Institute of Medicine

Explores the issues of quality in health care and recommends the use of patient information systems and technology. One of the recommendations led to establishment of our SEEDS program.

All health professional should be educated to deliver patient-centered care as member of an interdisciplinary team, emphasizing evidence-based practice, quality improvement approaches, and informatics. Led to QSEN Competencies
SEEDS: Simulated E-health Delivery System
SEEDS: Imagine a School Where Faculty...

• Collaborate on teaching students patient-centered care, quality, interprofessional teamwork, patient safety, informatics, and evidence-based practice—QSEN competencies

• Co-develop teaching/learning strategies, share standardized documentation, and demonstrate “Meaningful Use” of electronic health records (EHR)—fulfilling the vision of ARRA.

This occurs every day at the University of Kansas
Recognize the patient or designee as the source of control and full partner in providing compassionate and coordinated care based on respect for patient's preferences, values, and needs.
Teamwork and Collaboration

Function effectively within nursing and inter-professional teams, fostering open communication, mutual respect, and shared decision-making to achieve quality patient care.
Simulations

- Multidisciplinary teams care for virtual patients
- SEEDS/EHR used as communication tool
Evidence-Based Practice

Integrate best current evidence with clinical expertise and patient/family preferences and values for delivery of optimal health care.
Clicking on Link Takes You to PubMed

Results: 1 to 20 of 2594

1. Articular cartilage and subchondral bone in the pathogenesis of osteoarthritis.
   Goldring MB, Goldring SR.
   PMID: 20392241 [PubMed - indexed for MEDLINE]
   Related citations

   Dyke JP, Aaron RK.
   PMID: 20392223 [PubMed - indexed for MEDLINE]
   Related citations

3. Continuous passive motion following total knee arthroplasty in people with arthritis.
   Harvey LA, Brosseau L, Herbert RD.
   PMID: 20238330 [PubMed - indexed for MEDLINE]

Clicking on Link Takes You to PubMed
1. Medication Adherence must be assessed at each encounter and include a number of key elements. These key elements include: health beliefs (perceived barriers and benefits of medications to overall well being), self-care abilities, medication knowledge, skills, confidence/ease, frequency and complexity of medication regimen, medical problems, socioeconomic, cultural/racial factors, cognitive and mental health factors, and factors associated with overall relationship with health care provider experience. Barriers associated with access and costs are also important to determine overall medication compliance.

Assess patient medication management along 5 dimensions:
- Medication Knowledge
- Medication Adherence
- Medication Complexity
- Medication Problems (symptoms and side effects impact on self management)
- Medication Frequency

Rationale:
- Medication adherence has been reported to as a good prognostic for poor health outcomes. Rodgers and Ruffin (1998) reported findings from the Coronary Drug Project Research Group (CDPRG) prospective cohort study of 1,103 men with coronary heart disease that patient non compliant with treatment regimen were 2.6 times more likely to die than those compliant with treatment regimen (p. 59), concluding that non compliance is an independent risk factor for mortality. Eagle et al (2004) in the large community study of patients discharged with acute coronary syndromes reported that non adherence to key medications leads to decreased health condition outcomes and health costs.
- Multiple factors have been associated with non-adherence to treatment regimen and include: age <65 yrs, racially categorized as other, multiple pharmacies, large total number of medications, complex medications regimen, number of meds prescribed and number of meds taken daily, Rodgers and Ruffin (1998), under the care of multiple providers, forgetfulness, lack of cardiology provider, patient isolation, perceived or experienced drug related side effects, lack of knowledge about disease, mental health problems, depression in particular, dementia, residence in a skilled nursing facility, medication availability poor, racial/ethnic minority, lack of patient perceived effective communication with provider (Eagle et al 2004). Additional factors reported include: deficits with complex reasoning, difficulty absorbing information and retaining information and/or recognition that the information is relevant. (Bennett & Sauve 2003, Dunbar-Jacob et al 2000, Lackey 2004)
- According to Dunbar-Jacob et al (2000) and others these factors include the following:
  - Medication Taking:
    - Rate of poor adherence similar across chronic conditions generally considered near 50%. Non-adherence to medication among more common chronic diseases near or significantly below the 50% level.

Evidence Grade: III


Evidence Grade: II


Evidence Grade: II


Evidence Grade: III


Evidence Grade: III


Evidence Grade: III


Evidence Grade: VII


Evidence Grade: III


Evidence Grade: VII

An intervention study to enhance medication compliance in community-dwelling elderly individuals.

Fulmer TT, Feldman PH, Kim TS, Carty B, Beers M, Molina M, Putnam M.
Division of Nursing, New York University, NY 10012, USA.

Abstract

OBJECTIVE: To determine whether daily videotelephone or regular telephone reminders would increase the proportion of prescribed cardiac medications taken in a sample of elderly individuals who have congestive heart failure (CHF). METHODS: The authors recruited community-dwelling individuals age 65 and older who had the primary or secondary diagnosis of CHF into a randomized controlled trial of reminder calls designed to enhance medication compliance. There were three arms: a control group that received usual care; a group that received regular daily telephone call reminders; and a group that received daily videotelephone call reminders. Compliance was defined as the percent of therapeutic coverage as recorded by Medication Event Monitoring System (MEMS) caps. Subjects were recruited from 2 sources: a large urban home health care agency and a large urban ambulatory clinic of a major teaching hospital. Baseline and post-intervention MOS 36-Item Short-Form Health Survey (SF-36) scores and Minnesota Living with Heart Failure (MLHF) scores were obtained. RESULTS: There was a significant time effect during the course of the study from baseline to post-intervention (F[2,34] = 4.08, p < .05). Over time the elderly individuals who were called, either by telephone or videotelephone, showed enhanced medication...
Quality Improvement

Use data to monitor the outcomes of care processes and use improvement methods to design and test changes to continuously improve the quality and safety of health care systems. “
Mrs. Maria Theresa Ruiz, 40-year-old Hispanic woman admitted to the ED in acute pain. Vital signs: Family members are present. Pt placed in semi-fowler’s position.
* Final Report *

Maria Ruiz's Abdominal Sonogram:

Abdominal ultrasonography is performed on this patient complaining of left flank pain. Multiple cross sectional views demonstrate echogenicity consistent with multiple left renal calculi, notably the presence of two echo patterns, demonstrating a classic corona and echogenic shadow. Unable to determine stone size. Image as presented.
### Hematology

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<thead>
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<th>Test</th>
<th>4/6/2007 3:00 PM</th>
<th>4/6/2007 7:30 AM</th>
<th>4/6/2007 7:00 AM</th>
<th>4/6/2007 6:00 AM</th>
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</thead>
<tbody>
<tr>
<td>Uric Acid</td>
<td></td>
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### Routine Chem

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<td>BUN</td>
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<tr>
<td>Calcium Level</td>
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<td><strong>14.0</strong></td>
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<tr>
<td>Chloride</td>
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<tr>
<td>CO2</td>
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<td></td>
<td><strong>23.0</strong></td>
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<tr>
<td>Creatinine</td>
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<td>Glucose Level</td>
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<tr>
<td>Phosphate</td>
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<tr>
<td>Potassium Level</td>
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<tr>
<td>Sodium Level</td>
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### VITAL SIGNS

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<th>4/6/2007 7:00 AM</th>
<th>4/6/2007 6:00 AM</th>
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</thead>
<tbody>
<tr>
<td>Heart Rate</td>
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<tr>
<td>Respiratory Rate</td>
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<td>Systolic Blood Pressure</td>
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<tr>
<td>Diastolic Blood Pressure</td>
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<tr>
<td>Mean Arterial Pressure</td>
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<td>112</td>
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<tr>
<td>Pulse oximetry</td>
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### Pain Assessment

<table>
<thead>
<tr>
<th>Pain Comments</th>
<th>Pain Assessment/Location Grid</th>
<th>Cardiovascular</th>
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<tr>
<td><strong>Pain Comments</strong></td>
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### PowerOrders

#### Orders

<table>
<thead>
<tr>
<th>Order Name</th>
<th>Status</th>
<th>Details</th>
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<tbody>
<tr>
<td><strong>Admission Assessment Adult</strong></td>
<td>Ordered 04/11/07 7:00:00, Once</td>
<td>04/11/07 7:00:00, Once When bed is available, transfer to Medical Surgical floor and admit.</td>
</tr>
<tr>
<td><strong>Intake and Output</strong></td>
<td>Discontinued 04/11/07 7:00:00, 00hr</td>
<td>04/11/07 7:00:00, 00hr Strainer in toilet.</td>
</tr>
<tr>
<td><strong>Dextrose 5% with 0.45% NaCl</strong></td>
<td>Discontinued IV, Routine, 04/11/07 7:00:00, 125 mL/hr, 8 hr, 1000 1000 mL + potassium chloride...</td>
<td></td>
</tr>
<tr>
<td><strong>Medications</strong></td>
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<tr>
<td>naloxone (Narcan)</td>
<td>Ordered 2 mg, IV Push, Once, NPO 04/11/07 8:36:00, Stop date 04/11/07 8:36:00</td>
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</tr>
<tr>
<td>morphine</td>
<td>Ordered 0 mg, IV Push, Once, NPO 04/11/07 8:36:00, Stop date 04/11/07 8:36:00</td>
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</tr>
<tr>
<td>fentanyl</td>
<td>Ordered 25 mg, IV Push, Once, 04/11/07 7:00:00, Stop date 04/11/07 7:00:00</td>
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</tr>
<tr>
<td>ketorolac (Toradol)</td>
<td>Ordered 30 mg, IV Push, Once, 04/11/07 7:00:00, Stop date 04/11/07 7:00:00</td>
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<tr>
<td><strong>Laboratory</strong></td>
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</table>

Displayed: All Active Orders | All Inactive Orders

Show More Orders...
Safety

Minimizes risk of harm to patients and providers through both system effectiveness and individual performance.
Errors (11 total):
- Tinzaparin: IU
- Cimetidine: 300.0 & cc
- Valium: .5
- Morphine: MS04
- Wound Care: QOD
- Blood Glucose: SS
- Insulin: U (3 times)
- Allergic to Morphine
Sim-Man and SEEDS

- Training with simulations and the EHR
- Promotes critical thinking
- Improves patient safety and reduces error
Informatics

Use information and technology to communicate, manage knowledge, mitigate error, and support decision making.
In the digital age there is a fundamental difference in the generation, distribution and consumption of data, information, and knowledge.
**Penicillin G sodium**

**Pharmacology, Warnings, Pregnancy, Lactation, Side Effects, IV Compatibility, Dosage, Additional Dosage**

**Pharmacology[Top]**

Penicillin G potassium, penicillin G sodium, penicillin V potassium, and penicillin G benzathine, natural penicillin, are beta-lactam antibiotics.

Penicillin is bacteriostatic against susceptible microorganisms during active multiplication. It inhibits biosynthesis of cell wall mucopeptide. Penicillin has in vitro activity against most gram-positive and gram-negative aerobic cocci (except penicillinase-producing strains), some gram-positive aerobic and anaerobic bacilli, and most spirochetes. Susceptible organisms include nonpenicillinase-producing staphylococci, streptococci (groups A, C, G, H, I, and M), pneumococci, Bacillus anthracis, Clostridium tetani, Neisseria gonorrhoeae, Listeria monocytogenes, Leptospira species, Erysipelothrix rhinopatiae, Corynebacterium diphtheriae, Pasteurella species, Nocardia asteroides, B. melitensis, Brucella abortus, Streptobacillus moniliformis, Actinomyces species, and Treponema pallidum. Penicillin is inactive against penicillinase-producing bacteria (including many strains of staphylococci, many gram-negative aerobic and anaerobic bacilli, and many yeasts, mycobacteria, mycoplasma, rickettsia, fungi, and viruses). The incidence of penicillin-resistant and non-susceptible S pneumoniae has been increasing in the United States. Staphylococci, enterococci, gonococci, Bacteroides fragilis, and some of the above-mentioned strains are resistant to penicillin. Susceptibility testing is recommended.

Penicillin G potassium and penicillin G sodium are approved by the FDA for use in the treatment of a variety of infections due to susceptible organisms, including streptococcal and nonpenicillinase-producing staphylococcal infections (cellulitis, endocarditis, meningitis, and meningoencephalitis), pneumococcal infections, meningitis, osteomyelitis, clostridial infections (clostridial therapy to botulism, tetanus, gas gangrene, and clostridial therapy to tetanus immune globulin), diphtheria (adjuvantive therapy to antitoxin and prevention of carrier state), erysipelas, endocarditis, fasciitis, streptococcal infections, meningococcal meningitis and meningococcal sepsis, and streptococcal infections (including meningococcal meningitis) and meningococcal meningitis. Although penicillin G is approved for the treatment of staphylococcal, gonococcal, and gram-negative bacillary infections, it is generally no longer used due to resistance. Penicillin G benzathine is approved by the FDA for use in the treatment of mild to moderate upper respiratory tract infections, erythema, yaws, boil, and pustules for prophylaxis in preventing recurrence of rheumatic fever and/or chorea, as well as for prophylactic therapy for rheumatic heart disease and acute glomerulonephritis. Oral penicillin V potassium is approved by the FDA for use in the treatment of mild to moderately severe infections due to susceptible organisms, including streptococcal infections without bacteremia (mild to moderate upper respiratory tract infections, scarlet fever, and mild erysipelas), pneumococcal infections (mild to moderately severe respiratory tract infections), penicillin G-sensitive staphylococcal infections (mild skin and soft tissue infections), and rheumatoid arthritis (Vincristine's glaucoma and pharyngitis). Penicillin V potassium is also indicated for the prevention of recurrence following rheumatic fever and/or chorea. It is not indicated for the treatment of the acute stage of severe pneumonia, pericarditis, meningitis, empyema, arthritis, or bacteraemia.

**Pharmacokinetics**

There are no data on the bioavailability of penicillin. When administered intramuscularly or subcutaneously, aqueous penicillin G is absorbed rapidly. Following parenteral administration, initial blood levels are high but transient. Following intravenous infusion of penicillin G, peak plasma levels (Cmax) are reached immediately following completion of infusion. Aqueous penicillin G reaches Cmax within 15 to 30 minutes after intramuscular administration and concentrations fall by half within 1 hour. Penicillin G benzathine has low solubility and is released slowly after intramuscular injection and is hydrolyzed to penicillin G, resulting in lower but more prolonged serum concentrations than other parenteral penicillins. After intramuscular administration of penicillin G benzathine 300,000 units, concentrations of 0.03 to 0.05 units/ml are maintained for up to 1 or 2 days. Similar blood levels may persist for 10 days after administration of 600,000 units and for 14 days after administration of 1,000,000 units penicillin G benzathine. Penicillin G is not absorbed from the nose or skin and is not absorbed from the internal nose or after parenteral administration.
Informatics

- Accurate patient identification
- Organization of the EHR
- Digital signatures
- Data integrity and completeness
- Confidentiality and security
- Meaningful Use
Documenting the Nursing Process in the EHR

Assessment

Evaluation

Diagnosis and Problem List

Plan and Intervention

Students said SEEDS helped to visualize and learn the nursing process!
### Developing Informatics Skills

<table>
<thead>
<tr>
<th>QSEN Competency</th>
<th>Achieved (yes/no)</th>
<th>Example of achievement</th>
<th>Example of how your poor performance led to difficulty</th>
<th>Strategy to Achieve the competency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluate the strengths and weaknesses of information systems used in patient care</td>
<td></td>
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<tr>
<td>Value the confidentiality and security of all patient records</td>
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<tr>
<td>Search, retrieve, and manage data to make decisions using information and knowledge management systems</td>
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</tbody>
</table>
The Design of SEEDS

• Traditional EHR adapted to support educational activities
• Forms and orders designed for an educational workflow, using learning theories, as opposed to clinical workflow
• Strategies designed for using SEEDS in the classroom and clinical/simulation laboratories
• Student work continues to be available and searchable to support student and curriculum evaluations.
In the Classroom with SEEDS

- Example documentation for lectures
- Homework assignments
  - Reviewing a patient chart
  - Scavenger hunts
    - Medication errors
    - Learning to navigate an EHR
- Integrating information management into student/clinician workflow
### Pain Assessment

<table>
<thead>
<tr>
<th>Location</th>
<th>Quality</th>
<th>Radiation Location</th>
<th>Pain Scale Type</th>
<th>Pain Intensity</th>
<th>Acceptable Intensity</th>
<th>Onset</th>
<th>Duration</th>
<th>Time Pattern</th>
<th>Aggravating Factors</th>
<th>Alleviating Factors</th>
<th>Associated Symptoms</th>
<th>Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;Alpha&gt;</td>
<td>&lt;Alpha&gt;</td>
<td>&lt;Alpha&gt;</td>
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</tbody>
</table>

Right click to add a new row.

### Decision Support

#### CHEOPS Pain Scale

<table>
<thead>
<tr>
<th>Reference</th>
</tr>
</thead>
</table>

- CHEOPS Pain Scale
- Chart guides
- Nurse preparation
- Patient education
- Policy and procedures
- Scheduling information

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### Effect of Pain on Daily Life

<table>
<thead>
<tr>
<th>None</th>
<th>Very Mild</th>
<th>Mild</th>
<th>Moderate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily life</td>
<td>Sleep</td>
<td>Appetite</td>
<td>Relationships</td>
</tr>
<tr>
<td>Work/school</td>
<td>Emotions</td>
<td>Concentration</td>
<td></td>
</tr>
</tbody>
</table>

This pain assessment meets the requirements for the Joint Commission on Accreditation of Healthcare Organizations.

---

### NIPS Scale

- Yes

NIPS Pain Scale used for preterm and full term neonates.

### RIPS Scale

- Yes

RIPS Pain Scale used for children under 3 years of age.

### CHEOPS Scale

- Yes

CHEOPS Pain Scale used for children 1-5 years of age.

Right click on each for reference text.

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**Pain Scale:** Children’s Hospital of Eastern Ontario Pain Scale (CHEOPS)

**Age Range:** Children 1 to 5 years of age

**Scale:** Measures 6 areas: cry, facial, child verbal, torso, touch, legs

1. Observe client and record score for all six parameters based upon the above criteria.

2. Children’s Hospital of Eastern Ontario Pain Scale Score = Sum of scores for all six parameters
   - Minimum Score = 4
   - Maximum Score = 13

3. The higher the score, the more marked the pain

**References:**

Centre for Evidence Based Physiotherapy (2007) Riley Infant Pain Scale. Retrieved on 1/25/07 from [http://www.cebp.nl/media/m333.pdf](http://www.cebp.nl/media/m333.pdf)
Student Work Continues to be Available

- Students are listed by name with an initial for the course
- Placed in a nursing unit assigned to a faculty member
Faculty Feedback
**Weekly Clinical Conclusions**

If **growth indicators are not within normal limits, identify possible causes.** Right click for reference text.

Client has chromosomal abnormalities, < 5 percentile on the growth chart for ht, wt, HC? the percentiles for each would strengthen your documentation-- that makes her unable to grow and develop at the appropriate rate of people her age.

If vital signs are not within normal limits, identify possible causes.

OK! 00PS...I erased your answer accidentally............good conclusion. You told me her DBP was low...........and you said her HR and RR were increased ..........but the RR and HR were in the normal range. Excellent conclusion otherwise!

BP: 83/38, RR 27, HR 135.
Client is on opioid for severe pain and on Ketorolac for R.

What information regarding health history, family, or environment would be helpful and how would you use this information in planning care?

Annabelle is a 15 month old female who was admitted about 2 months prior to surgery for respiratory distress. It was discovered via a CXR, CT, and MRI that she had a lung mass in the right upper lobe. Neuroblastoma was considered due to her genetic defect and she was admitted for workup of this mass.

She was also found to have elevated urine metanephrines. Due to the continued mass in her right upper lobe, it was felt that histology of the mass should be performed or resection.

What part of this child’s care could be delegated to another nursing or multidisciplinary team member? Think...
SEEDS and the Academic Education Solution Consortium

- KU is but one member of a 45+ school consortium that uses the AES
- Schools share the same server and resources
- SEEDS is KU’s implementation of the AES
Cerner’s Academic Education Consortium

Use by Discipline
- Nursing (50%)
- HIM (20%)
- Allied Health (15%)
- Pharmacy (10%)

AES Reference Site
AES Client
Governance Activities and Social Networking Facilitate Collaboration

• All members of the Consortium manage the content and functionality of the domain
  – Approve content for assessment forms, goal statements, and order sets
    • Standardize with evidence
  – Develop reference text to support point of learning moments
  – Create and share case studies
  – Collaborate on developing new educational strategies
  – Schools present and publish together
The Cerner Academic Education Solution (AES) is a fully functional electronic health record suite, which can be populated with simulated patient data. The AES serves as a high-fidelity clinical information system simulator allowing students to learn patient information management concepts, content, and care processes within a controlled academic environment. The AES is implemented collaboratively within a consortium of schools. This group exists to enable collaboration between universities and colleges who are using the AES as an educational strategy. Our mission is to improve health professions education through collaborative use of information technology.

**Owned by:** Murray Phyllis

<table>
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<th>Recent Content</th>
<th>Date</th>
<th>User</th>
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<td>1 day ago</td>
<td>April Roche</td>
</tr>
<tr>
<td>AES Consortium Members</td>
<td>1 week ago</td>
<td>April Roche</td>
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<tr>
<td>AES DBA Team - Patient Assessment Form Modification</td>
<td>2 weeks ago</td>
<td>April Roche</td>
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<td>3 weeks ago</td>
<td>Tammy Toscos</td>
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<td>MGBUs-Rx Station GoLive for CERN_AES &amp; MCC’s Health Sciences Institute</td>
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<td>Foley, Shawn</td>
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</table>
Lessons learned

• A team is more effective than a single person especially if they lead and follow from their expertise
• Use evidence to harmonize and create standards
• We are more together than apart
• Friendships grow from collaboration and create social capitol.
Questions?

• Please contact me if you have more questions.

jwarren2@kumc.edu