Can Accountants Help Reduce Medication Errors?

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Medication Errors ➔ Adverse Events

- In 1994 Boston Globe’s Betsy Lehman dies
  — Dosage 4X higher than prescribed
- In 2006 three Indiana infants die and in 2007 Dennis Quaid’s twins narrowly escape harm
  — Adult Heparin instead of Pediatric Hep-Lock
- Institute of Medicine: 400,000 preventable medication-related injuries/year
Proposal:
Accountants can help clinicians

• Accountants help assure information quality in financial systems and business processes.

• **Validity**: The record describes a transaction which was authorized and actually occurred.

• **Accuracy**: The record contains a correct description of the transaction.

• **Completeness**: A record is kept of every authorized transaction.

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REAs Modeling

• One way to document business processes.
  – Others: system flow charts, DFDs, BPMN, etc.
  – REA Advantage: simplicity, ease of training

• Key elements:
  – **Resources** (cash, inventory)
  – **Events** (sale, purchase, payment, etc.)
  – **Agents** (employee, computer)
  – **Relationships/Dependencies**
Figure 1. Self-service sales example

Figure 2. Restricted sale example
Figure 3. Manual separation of duties

Questions auditors ask about process issues and information quality

- Have all reasonable threats to validity, accuracy and completeness been identified?
- Is there a reasonable balance?
  - **Preventive**: Ensure that processes and related data won’t be invalid, inaccurate, or incomplete.
  - **Detective**: If a transaction or related data is invalid, inaccurate, or incomplete, we’ll find out.
  - **Corrective**: When a problem is detected, we have a plan to fix the data and the problems it caused.
Auditor’s view of manual and computerized controls

• Humans make more errors than computers, but exercise better judgment.
  – Where is judgment really needed/desired?
• Cost-effective control redundancy is desired.
  – Control is not free, but no single control is perfect.
• All controls are tested and validated.
  – Functional tests: unit, integration, end-to-end
  – Other tests: capacity/volume, security, usability
  – Compliance must be verified.

A clinical scenario:
Pediatric intensive care

• Infant admitted for treatment of a staph infection with IV antibiotics. MD prescribes pediatric Hep-Lock but the baby gets adult Heparin.

• Interlinked processes and actors:
  – stock medications: pharmacist, pharmacy tech
  – prescribe medications: doctor, computer
  – administer medications: nurse or doctor
  – check patient condition: nurse, doctor, computer, lab
  – decide appropriate corrective clinical action: doctor
Figure 4 Stock Cabinets

Figure 5 Prescribe Medication
Figure 6 Retrieve and administer medication

1. Retrieve Medication
2. Administration
3. Check Patient

Figure 7, Further tests and treatment

1. Blood Test
2. Check Patient
3. Further Treatment

Patient Information
Doctor and/or Nurse
Lab
Figure 8 Stock cabinets: segregation of duties

Medication

1. Stock Cabinets

1a

Pharmacy Technician

2c

Pharmacy Supervisor

1b

Computer

Figure 9 ePrescribing with control

Rx

Patient Record

1. Stock Cabinets

2a

2c

2b

2d

2. Issue Rx

Doctor

Computer

3. Retrieve Medication

3. Retrieve Medication
Observations

REA models:

• do reveal opportunities to add controls that improve validity, accuracy, and completeness in clinical processes.

• do reveal opportunities to improve the mix of preventive, detective, and corrective controls.

• do not reveal an optimal mix of controls or optimal level of control redundancy.
  – Other techniques are used by auditors for this.
eXtensible Markup Language (XML)

Example XML tags that could be attached to each prescription:

<table>
<thead>
<tr>
<th>Event</th>
<th>By Whom?</th>
<th>Date?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug Interaction Check Performed?</td>
<td></td>
<td>Check Date?</td>
</tr>
<tr>
<td>Prescription Filled?</td>
<td></td>
<td>Filled Date?</td>
</tr>
<tr>
<td>Prescription Checked?</td>
<td></td>
<td>Checked Date?</td>
</tr>
<tr>
<td>Drug Transferred to Nurse?</td>
<td></td>
<td>Transfer Date?</td>
</tr>
<tr>
<td>Nurse Received Drug?</td>
<td></td>
<td>Received Date?</td>
</tr>
<tr>
<td>Drug Administered to Patient?</td>
<td></td>
<td>Administration Date?</td>
</tr>
<tr>
<td>Drug Administration Verified?</td>
<td></td>
<td>Verified Date?</td>
</tr>
</tbody>
</table>