

## 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.

### REA 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

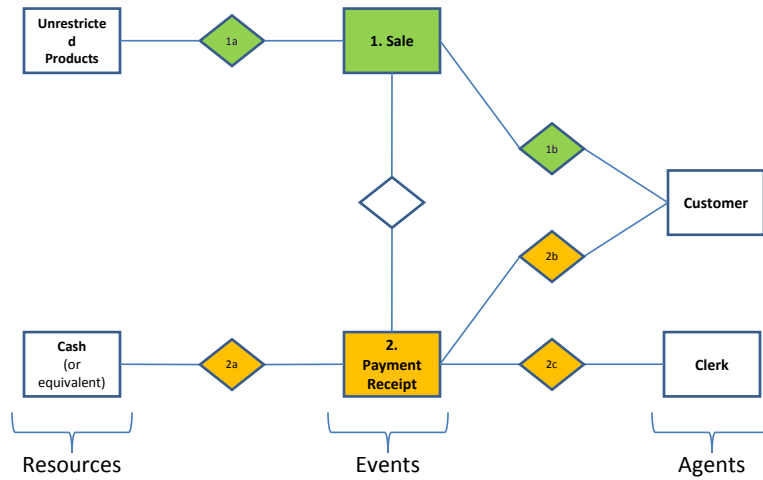


Figure 2. Restricted sale example

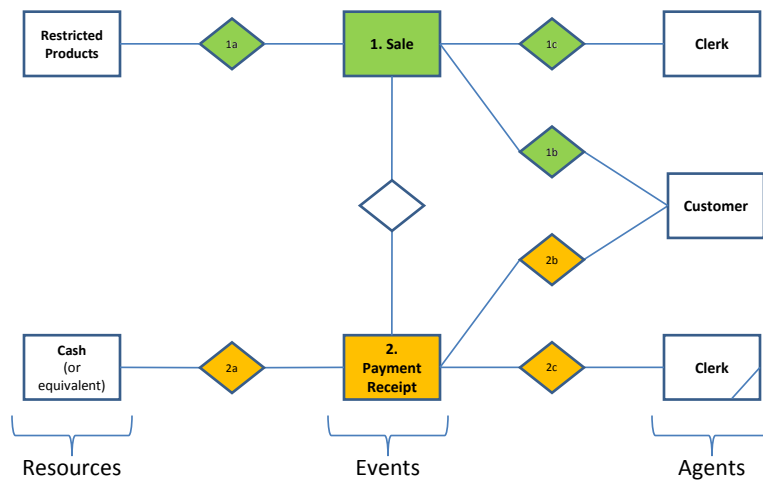
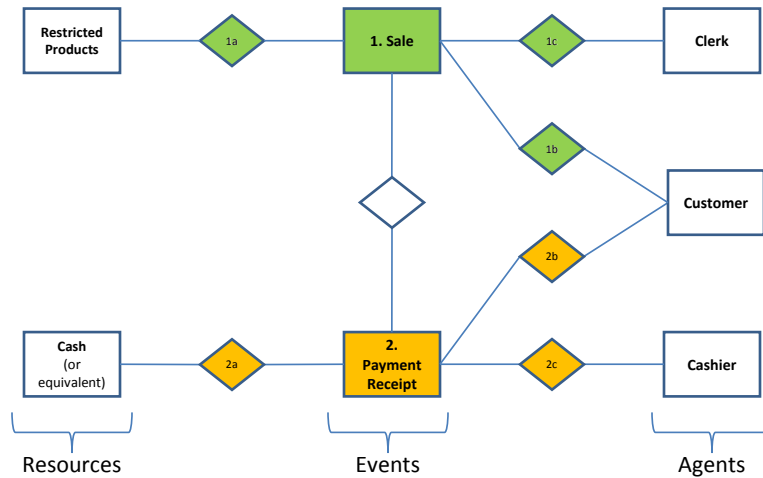


Figure 3. Manual separation of duties



### 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

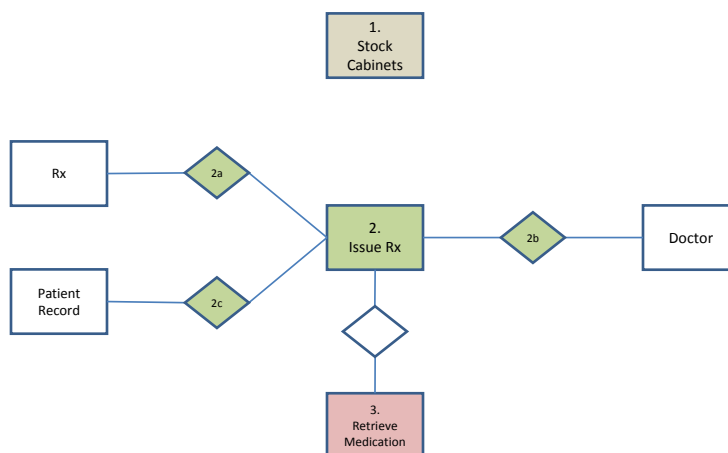


Figure 6 Retrieve and administer medication

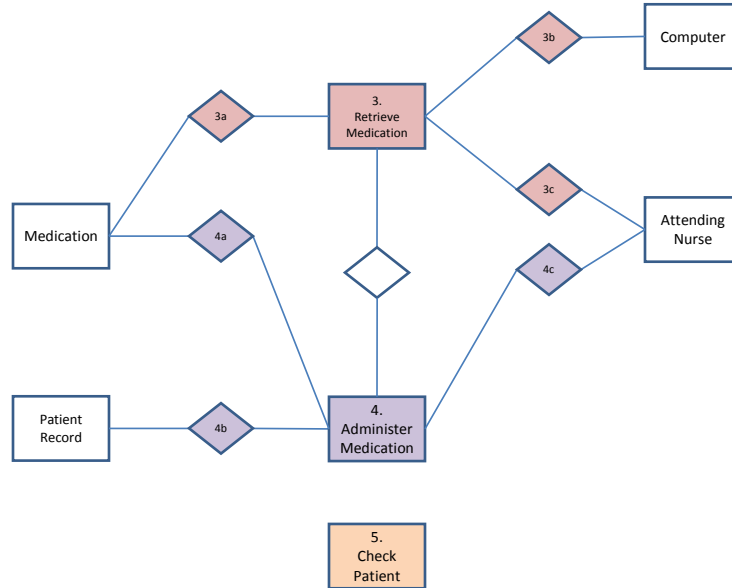


Figure 7, Further tests and treatment

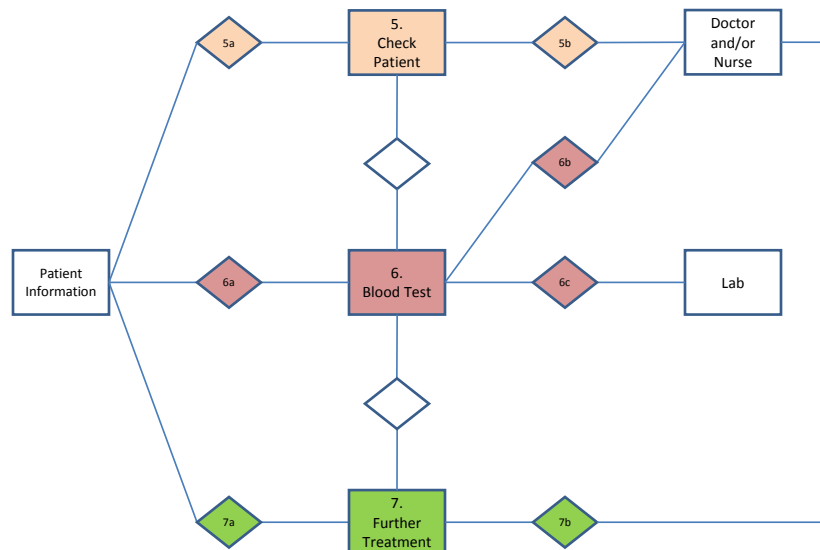


Figure 8 Stock cabinets: segregation of duties

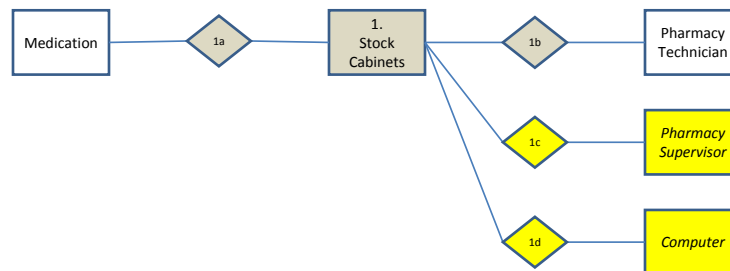


Figure 9 ePrescribing with control

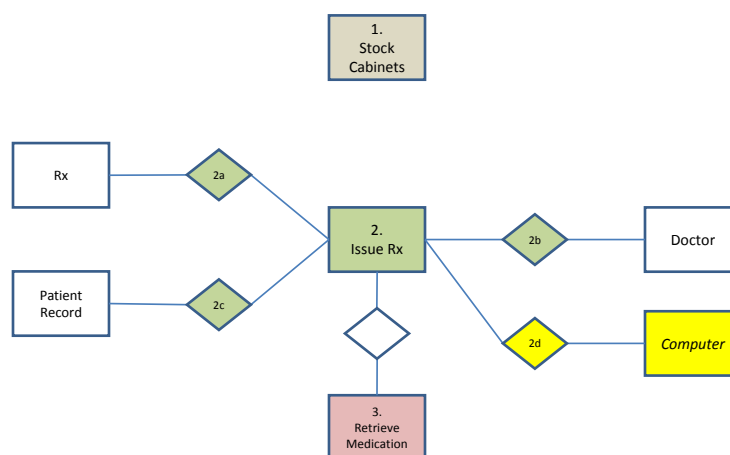
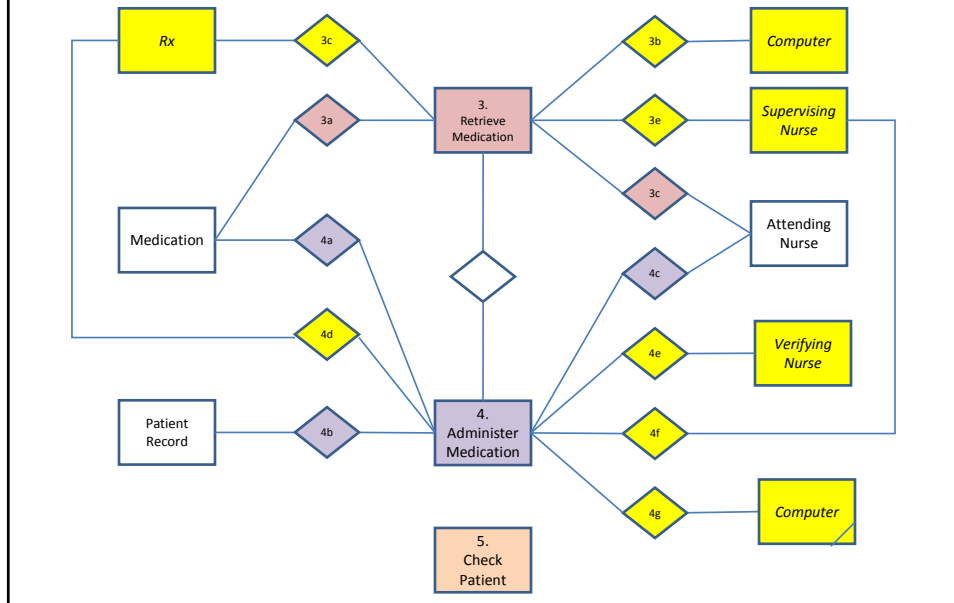




Figure 10 Retrieve and administer medication



## 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.

