Using Bar Code Verification to Improve Patient Care and Tracking and Traceability

William W. Churchill MS, R.Ph.
Chief of Pharmacy Services
Brigham and Women’s Hospital
The Brigham and Women’s Hospital
Department of Pharmacy

- 787 bed academic tertiary medical center
  - 57,000 annual visits to emergency room
  - 45,000 admissions
- All medical/surgical specialties
  - 156 ICU beds
  - Intermediate Care Units
- 2500 RN’s
- Pharmacy staff 210 FTE’s
  - 98 full-time pharmacists
  - 101 full-time pharmacy techs
  - 11 support staff
- Expense budget $125 mill
- Revenue Budget $410 mill

- Home-grown computer systems until May 31, 2015 when we will go live with Epic.
- Alaris Medley Smart Infusion Pump Technology
- Health Robotics IV Compounding Robotics
- ScriptPro outpatient Robotics
- Omnicell ADM Technology
- Kit Check RFID system
- TheraDoc ADE Surveillance System
Background: Serious Medication Errors

Leape et al, JAMA 1995
Ideal Gold Standard Medication Use Process

High Performance Medicine Team2:
Components of the Ideal Medication Administration System

Health Care Team and System Objectives:
Right Patient, Right Medication, Right Dose and Concentration, Right Route, Right Time

Guiding Principles:
- Auto Identification Of Patient
- Auto Identification Of Staff
- Unit Of Use Bar Code Labeling
- Use Of Secure WIFI Transmission
- Use Of Automation
- Multi-disciplinary Patient Care Teams
- Use Of Smart Infusion Pumps
- Integration Of Information, Work Flow & Patient Care
- Use Of Biometrics
- Use Of RFID
- System-wide Enterprise Process Tracking
Approaches for Improving Inpatient Medication Safety

- Computerized physician order entry (CPOE)
  - Completeness and traceability of orders
  - Decision Support
  - Standardization
- Electronic clinical decision support ADE Surveillance
- Smart Infusion Pump technology
- Closed loop medication use process (MUP)
  - Medication bar code verification
  - Electronic medication administration records (eMAR)
  - Electronic flow sheets
  - RFID Technology
- Comprehensive clinical pharmacy services
- Robotic technology in the pharmacy
  - Inpatient
  - Outpatient
  - Sterile Products Suite
Bar Code Verification
Bar Code Technology

- An effective tool in many non-healthcare industries
- Provides a fail safe automated identification and feedback system in real time
- Does the “five rights” checking in one easy efficient process.
- Facilitates track and trace
- Allows nursing staff to focus more on the patient than checking “To-Do” lists.
- Allows for more effective and efficient use of pharmacy technicians.
- Frees up pharmacists from drug distribution for more patient care related responsibilities.
Format of Bar Code

- Bar codes are available in a variety of one dimensional formats:
  - code 128
  - UPC
  - code 39
- Bar Codes are also available in a variety of two dimensional formats:
  - Code 128 and code 39 are 1 D bar codes
  - stacked RSS is a 2D bar code
  - Data Matrix is a 2 D barcode
- Need capability of de-coding multiple formats, styles and dimensions since there is no industry standard and capability of saving and using the coded data
Two Dimensional Bar codes

- **Advantages**
  - 30 times smaller than a code 39 bar code
  - higher degree of accuracy
    - 1 misread per 10.5 million scans for data matrix
    - 1 misread per 1.7 millions scans for code 39
  - data matrix bar codes that are up to 60% damaged can be easily and accurately read
  - data matrix bar code fonts can be easily printed with standard printers from MS Windows OS

- **Disadvantages**
  - can only be read with specially programmed imager
  - not in widespread use
  - Imagers are more costly.
Drug Dispensing through Automated Dispensing Cabinet Re-stock Process

- Central Pharmacy Automation (WorkflowRx)
- Restocking Using Medication Storage Carousels and Batch Filling Process
WorkflowRx Overview

Ordering/Receiving

Stocking

Picking and dispensing

Reporting, Inventory management, billing, bar-code verification, guiding lights
Pharmacy Workflow

Order

Purchase Order → Distributors

Receive

Invoice

Stock

Items

Zones

Pick

Items

Items
Use of Safety Stock

- Bar code confirmation on:
  - Restock
  - Issue
  - Return
- Restock efficiency and accuracy
- Insure “Right Drug, Right Location”
- Distinguish “look alike/sound alike” medications
Medication Distribution Process

1. Physician enters medication order
2. Pharmacist verifies medication order
3. Medication label prints in pharmacy
4. Pharmacy technician prepares and scans filled medication label
5. Pharmacist reviews, scans and sends filled medication label to the floor
6. Nurse scans medication and patient ID bracelet before administering medication
7. Pharmacy technician prepares and scans filled medication label
Patient Specific Label Prints

```
OETEST, TOM
11489879 #140243 Q24H
Adm:00:00:00
07/11/2007
14:03:10

METHADONE HCL
SODIUM CHLORIDE 0.9%
33 MCG
QS to 3 ML

Infuse Infuse via Peripheral site.
Date/Time Hung:_____ by _______
```

Room: 17A - 118
Scan Patient Label
Verify the Medications
Final Patient Specific Product
Safely Labeled, Prepared and Administered
## Bar Code Track and Trace Capabilities

<table>
<thead>
<tr>
<th>Patient</th>
<th>Session</th>
<th>Approved</th>
<th>Printed</th>
<th>Prepared</th>
<th>Checked</th>
<th>Sent</th>
<th>Deliv'd</th>
</tr>
</thead>
<tbody>
<tr>
<td>R8 74987571</td>
<td>04:42</td>
<td>04:55</td>
<td>04:57</td>
<td>05:24</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>R1 75171869</td>
<td>02:35</td>
<td>03:54</td>
<td>03:56</td>
<td>05:24</td>
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<td></td>
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<tr>
<td>R7 75015949</td>
<td>00:42</td>
<td>01:10</td>
<td>01:13</td>
<td>05:24</td>
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<tr>
<td>R1 75175224</td>
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<td>09:50</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>R1 75172993</td>
<td>04:09</td>
<td>04:44</td>
<td>04:57</td>
<td>05:24</td>
<td></td>
<td></td>
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<tr>
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<td>07:58</td>
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<td></td>
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<tr>
<td>R8 M22083341</td>
<td>04:31</td>
<td>09:23</td>
<td>09:37</td>
<td>09:39</td>
<td></td>
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<tr>
<td>75200253</td>
<td>07:30</td>
<td>07:35</td>
<td>08:36</td>
<td>08:38</td>
<td>08:39</td>
<td></td>
<td></td>
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<tr>
<td>R52 M22103707</td>
<td>07:27</td>
<td>07:36</td>
<td>07:37</td>
<td>07:40</td>
<td></td>
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<tr>
<td>75201789</td>
<td>08:18</td>
<td>08:21</td>
<td>09:31</td>
<td>09:33</td>
<td>09:36</td>
<td></td>
<td></td>
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<tr>
<td>R48 M2210769</td>
<td>07:14</td>
<td>07:39</td>
<td>07:39</td>
<td>07:40</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>XX22107594</td>
<td>07:16</td>
<td>07:46</td>
<td>07:48</td>
<td>07:49</td>
<td></td>
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<tr>
<td>R63 M2206599</td>
<td>06:54</td>
<td>07:34</td>
<td>07:37</td>
<td>07:40</td>
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<tr>
<td>XX19440</td>
<td>08:17</td>
<td>09:26</td>
<td></td>
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<tr>
<td>R6 M22144133</td>
<td>07:41</td>
<td>07:54</td>
<td>07:57</td>
<td>07:57</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>75100877</td>
<td>06:11</td>
<td>06:07</td>
<td>06:11</td>
<td>06:11</td>
<td>06:14</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Bar Code Trace by Individual Patient Order

<table>
<thead>
<tr>
<th>PROCESS</th>
<th>#</th>
<th>QTY</th>
<th>TIME</th>
<th>KEY</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPROVED</td>
<td>0</td>
<td>4</td>
<td>09:57AM</td>
<td>JJYm</td>
</tr>
<tr>
<td>PRINTED</td>
<td>0</td>
<td>4</td>
<td>10:01AM</td>
<td>ISI</td>
</tr>
<tr>
<td>PRINTED</td>
<td>0</td>
<td>4</td>
<td>10:14AM</td>
<td>ISM</td>
</tr>
<tr>
<td>PREPARED</td>
<td>0</td>
<td>4</td>
<td>10:22AM</td>
<td>TWpc</td>
</tr>
<tr>
<td>CHECK</td>
<td>0</td>
<td>4</td>
<td>10:23AM</td>
<td>JHJl</td>
</tr>
<tr>
<td>SENT</td>
<td>0</td>
<td>4</td>
<td>10:24AM</td>
<td>JHJl</td>
</tr>
</tbody>
</table>
Pharmacy Dispensing Process: Ensuring High Reliability with Barcode Technology

Dispensing Errors Uncovered

Medications Filling by Pharmacy Technician → Checking by Staff Pharmacist → Dispensing Error Measured → Medications Sent to Patient Units
Dispensing Errors and Potential ADEs: Before and After Barcode Technology Implementation

Before Period (115164 doses observed)
- Dispensing Error Rate: 0.88%
- Potential ADE Rate: 0.61%

After Period (253984 doses observed)
- Dispensing Error Rate: 0.61%
- Potential ADE Rate: 0.19%

31% reduction

63% reduction*

* p<0.0001 (Chi-squared test)

Effect of Barcode Technology on Target
Potential ADEs

Before Period (115164 doses observed)

After Period (253984 doses observed)

* p<0.001 (Chi-squared test)  
Robots, Robots, Robots!
What’s in these IV Bags?
Rationale for Robotic IV Admixture Preparation

- The medical literature has defined the risks associated with improper preparation of Compounded Sterile Products (CSP) by humans.
- USP <797> requires sterile product preparation to be completed in an appropriate sterile environment.
- The Joint Commission requires all non-emergent IV admixtures to be prepared by the Pharmacy department.
- Need to limit staff exposure to potential carcinogenic and teratogenic medications.
- Need to improve the utilization of limited pharmacy resources.
- Volumetric process is less accurate than Gravimetric process.
Robots Provide Us With:

- Bar code verification
- Specific gravity and gravimetric verification
- Optical scanning
- Central data storage
- High degree of accuracy and precision
- Efficient work flow
- Workload prioritization and tracking
- Interfaces
- Limits human involvement in the compounding process
  
  - NOTE: humans are the primary source of contamination!
Searching for the Gold Standard for a Compounded Sterile Products Service

With permission of Grifols

With permission of Health Robotics
Centralized Electronic Data Storage and Database Management

- We need the capability to electronically store all data associated with the preparation of CSPs.
  - Date/time
  - Source of preparation (Human/Robot)
  - All ingredients with lot numbers and exp. Date
  - Accuracy of final product
  - Production time for efficiency

- We need the capability to analyze and utilize the data to continuously improve the process and staff productivity, efficiency and accuracy.
Central Database Tracking of all Gravimetrically Prepared CSPs - Total Volume

**IVStations Production Report - By Month**
May 2012 to January 2013

<table>
<thead>
<tr>
<th>Status/Name</th>
<th>Completed</th>
<th>Failed</th>
<th>Total by ROWS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job/Start/Year/Month</td>
<td>Request Count</td>
<td>Average Minutes</td>
<td>Request Count</td>
</tr>
<tr>
<td></td>
<td>Value</td>
<td>Percents by ROW</td>
<td>Value</td>
</tr>
<tr>
<td>201301</td>
<td>6262</td>
<td>98%</td>
<td>14,511</td>
</tr>
<tr>
<td>201212</td>
<td>6430</td>
<td>99%</td>
<td>14,496</td>
</tr>
<tr>
<td>201211</td>
<td>6114</td>
<td>97%</td>
<td>14,374</td>
</tr>
<tr>
<td>201210</td>
<td>6624</td>
<td>98%</td>
<td>15,663</td>
</tr>
<tr>
<td>201209</td>
<td>6396</td>
<td>99%</td>
<td>15,910</td>
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<tr>
<td>201208</td>
<td>4977</td>
<td>97%</td>
<td>11,366</td>
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<tr>
<td>201207</td>
<td>5866</td>
<td>96%</td>
<td>13,250</td>
</tr>
<tr>
<td>201206</td>
<td>5409</td>
<td>95%</td>
<td>12,858</td>
</tr>
<tr>
<td>201205</td>
<td>6019</td>
<td>96%</td>
<td>13,724</td>
</tr>
<tr>
<td>Total by COLUMNS</td>
<td>54097</td>
<td>97%</td>
<td>126,153</td>
</tr>
</tbody>
</table>

**Graph:**
Number of Preparations

- **Completed:**
  - 201301: 6262
  - 201212: 6430
  - 201211: 6114
  - 201210: 6624
  - 201209: 6396
  - 201208: 4977
  - 201207: 5866
  - 201206: 5409
  - 201205: 6019

- **Failed:**
  - 201301: 118
  - 201212: 85
  - 201211: 192
  - 201210: 124
  - 201209: 76
  - 201208: 163
  - 201207: 270
  - 201206: 271
  - 201205: 234
Central Database Tracking of all Gravimetrically Prepared CSPs – Total Volume
Workflow Assist Technologies

DoseEdge®

IVsoft Assist®

Phocus RX

BD Cato
Work Flow Assist Technology

- IVSoft Assist (BWH has 4 Devices)
  - Checks human preparation process at each step using gravimetric checking.
  - Fully interfaced via “Worklist”.
  - Efficiency (1.5 – 3.5 minutes per dose).
  - Not as product dependent as robotics.
  - Patient specific doses.
  - Vials/materials that do not meet robot specification.
  - Non-standard, non-premade doses.
Bar Code Med Administration (BCMA)

- Orders flow electronically from CPOE through pharmacy order verification to an electronic medication administration record (eMAR)
  - Eliminates transcription entirely
  - Nurses have laptops or hand held devices with eMAR and use this to track what medications need to be administered

- Nurses use barcode verification of the medication and the patient to verify that the drug they are administering matches the physicians’ orders
  - Right drug, right patient, right dose, right time
  - eMAR alerts if any of these is incorrect
  - Reduces administration errors
Medication Distribution Process

1. Physician enters medication order
2. Pharmacist verifies medication order
3. Medication label prints in pharmacy
4. Pharmacy technician prepares and scans filled medication label
5. Pharmacist reviews, scans and sends filled medication label to the floor
6. Nurse scans medication and patient ID bracelet before administering medication
7. Pharmacy technician prepares and scans filled medication label

Nurse scans medication and patient ID bracelet before administering medication
Impact of Bedside Barcode Verification on Potential Adverse Drug Events of Various Severity

<table>
<thead>
<tr>
<th>Potential Adverse Drug Events</th>
<th>No Barcode Scanning (n=6712)</th>
<th>Barcode Scanning (n=7314)</th>
<th>Relative Reduction (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Adverse Drug Events</td>
<td>3.1%</td>
<td>1.6%</td>
<td>51% (p&lt;0.001)</td>
</tr>
<tr>
<td>Significant</td>
<td>1.82%</td>
<td>0.94%</td>
<td>48% (p&lt;0.001)</td>
</tr>
<tr>
<td>Serious</td>
<td>1.30%</td>
<td>0.60%</td>
<td>54% (p&lt;0.001)</td>
</tr>
<tr>
<td>Life-threatening</td>
<td>0.03%</td>
<td>0.01%</td>
<td>54% (p=0.52)</td>
</tr>
</tbody>
</table>

Impact of Barcode Verification and eMAR on transcription errors

<table>
<thead>
<tr>
<th>Manual Transcription (n=1799)</th>
<th>Automatic Transcription (n=1283)</th>
<th>Relative Reduction (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transcription Errors</td>
<td>6.1%</td>
<td>0%</td>
</tr>
<tr>
<td>Potential Adverse Drug Events due to transcription Errors</td>
<td>3.0%</td>
<td>0%</td>
</tr>
<tr>
<td>Significant</td>
<td>1.6%</td>
<td>0%</td>
</tr>
<tr>
<td>Serious</td>
<td>1.3%</td>
<td>0%</td>
</tr>
<tr>
<td>Life Threatening</td>
<td>0.06%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Potential Medication Safety Impact at a Tertiary Care Teaching Hospital

- The pharmacy barcode verification system currently in use is preventing per year:
  - >13,500 medication dispensing errors (31% reduction)
  - >6,000 errors with potential for harm (63% reduction)

- The eMAR bar code verification system intercepts nearly 7700 potential errors per month:
  - Wrong drug 7107
  - Wrong patient 192
  - Expired med 360
Financial Benefits of Barcode Technology in the Pharmacy

- Medical costs saved through adverse drug event reduction, *per year*
- Increased on-time medication availability on nursing units
- Improved inventory control
- Formal cost benefit analysis showed break-even within first year after go-live
  – 5-year cumulative net benefit = $3.3M

Maviglia, S et al. Archives of Internal Medicine 2007
Bar code Verification is needed everywhere not just for inpatient areas!
Radio Frequency Identification (RFID)

- Form of wireless communication that uses radio waves to identify and track objects
  - Track multiple objects at once
  - Different practice settings
    - Transportation, healthcare, animal tracking

- Components
  - Tag (active vs. passive)
  - Reader
  - Database tracking objects
# Active vs. Passive Tags

<table>
<thead>
<tr>
<th>Tag Type</th>
<th>Active</th>
<th>Passive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Source</td>
<td>Battery operated</td>
<td>Requires energy transfer from reader</td>
</tr>
<tr>
<td>Communication Range</td>
<td>High (&gt;100 M)</td>
<td>Low (10 M)</td>
</tr>
<tr>
<td>Relative Cost</td>
<td>$15.00-100.00</td>
<td>$0.15-$5.00</td>
</tr>
<tr>
<td>Examples at Brigham and Women’s Hospital</td>
<td>Alaris Pump</td>
<td>KitCheck</td>
</tr>
</tbody>
</table>
Active vs. Passive Tags

Active Tag

Passive Tag
Active vs. Passive Tags

Passive Tag

Active Tag
RFID Refrigerator & Passive Tags
Blood Clotting Factors
Enhanced Medication Safety for OR Medication Dispensing - Kit Check RFID Scanning Station

- System uses passive RFID technology with base station reader.
- Checks all contents of our OR medication kits in seconds for:
  - Dating (both outdated and soon to be outdated)
  - Proper quantity
  - Correct medication
  - Missing medications
- Since installation:
  - 1.1 million medications have been scanned for accuracy and expiration checking in kits with zero errors leaving the pharmacy.
Kit Check
Kit Check
Kit Check
Kit Check
Kit Check

Welcome, Audrey!

Use the **Scan** button above to start the scanning process.
Please make sure all items are in the scanning station and the doors are securely closed.

You can set a default start page for Kit Check so that every time you log in, you will see that screen by default. This preference can be changed in the **App** User Settings screen at any time.

**View Inventory**
Understand and manage your inventory by reviewing all barcodes and creating kits and forms for items.

**Print Tags**
Begin the process of tracking your inventory by printing tags for kits and items.

**Run Reports**
Use a wide range of reports to gain better control of your tagged items and operational activity.
Kit Check
Kit Check
Kit Check

You're done! This Kit is complete.

Use the Dispatch Kit button above to put the Kit in use!
Drug Supply Chain Security Act (DSCSA)
Summary Requirements for DSCSA Starting Jan 1, 2015

- DSCSA requires tracing, verifying and identifying products across ALL changes of ownership from Manufacturer to Dispenser

- DSCSA compliance is based on three core regulatory requirements:
  - **Tracing**: Send or receive Transaction History (TH), Transaction Information (TI) and Transaction Statement (TS) on change of ownership
  - **Verification**: Retrieve, analyze, verify and provide TH, TI, TS and serialized identifiers during suspect product investigations and recalls
  - **Serialization**: Serialize drug products at the unique package and case level for originally manufactured and repackaged product

- DSCSA High-level Deadlines

<table>
<thead>
<tr>
<th>2015</th>
<th>2017-20</th>
<th>2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lot-level traceability</td>
<td>Serialization (package, case)</td>
<td>Package-level traceability</td>
</tr>
<tr>
<td>Product and transaction verification</td>
<td>Verification (SNI of package)</td>
<td></td>
</tr>
<tr>
<td>Tracing and Verification archival</td>
<td>Serialization archival</td>
<td></td>
</tr>
</tbody>
</table>

- A company's DSCSA compliance depends on Operations, Transactions, Network Relationships, Products:

<table>
<thead>
<tr>
<th>Manufacture and introduce saleable drugs into commerce</th>
<th>Purchase saleable drugs from another company</th>
<th>Repackage saleable drugs and sell into the supply chain</th>
<th>Sell products to patients outside of the supply chain</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Manufacturer Requirements]</td>
<td>![Wholesaler Requirements]</td>
<td>![Repackager Requirements]</td>
<td>![Dispenser Requirements]</td>
</tr>
</tbody>
</table>
Product Tracing Requirements

- Acquire or provide on each change of ownership:
  - Transaction History + Transaction Information + Transaction Statement
- Starts as a single document from the manufacturer
- Different forms of TH, TI, TS required depending on product source and transaction history
- TH, TI, TS for products purchased or sold must be retained in a record repository for 6 years past date of transaction
- DSCSA DOES NOT DEFINE A SPECIFIC DATA EXCHANGE METHOD

<table>
<thead>
<tr>
<th>Transaction History (TH)</th>
<th>Transaction Information (TI)</th>
<th>Transaction Statement (TS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single document starting with manufacturer</td>
<td>• NDC</td>
<td>Statement attesting that party transferring ownership:</td>
</tr>
<tr>
<td>• Includes Transaction Information for each change of ownership going back to the manufacturer</td>
<td>• Product Name</td>
<td>• Is authorized and registered</td>
</tr>
<tr>
<td>• Special versions of Transaction History created during certain wholesale distribution scenarios</td>
<td>• Strength</td>
<td>• Received product from authorized, registered party</td>
</tr>
<tr>
<td>Electronic or paper (initially)</td>
<td>• Dosage Form</td>
<td>• Received Transaction Information and a Transaction Statement from the prior owner</td>
</tr>
<tr>
<td>• Electronic format at point of manufacture required starting in 2017</td>
<td>• Container Size</td>
<td>• Did not knowingly ship suspect or illegitimate product</td>
</tr>
<tr>
<td></td>
<td>• Number of Containers</td>
<td>• Had systems and processes in place to comply with verification requirements</td>
</tr>
<tr>
<td></td>
<td>• Lot Number (optional in certain scenarios)</td>
<td>• Did not knowingly provide false transaction info</td>
</tr>
<tr>
<td></td>
<td>• Transaction Date (optional in certain scenarios)</td>
<td>• Did not knowingly alter the transaction history</td>
</tr>
<tr>
<td></td>
<td>• Shipment Date (if &gt; 24 hrs. from Trans Date)</td>
<td></td>
</tr>
</tbody>
</table>
**Product and Transaction Verification Requirements**

**Government Officials** (FDA, Federal, State)

- Request for Information
- Verification

**Trading Partner Network** (direct, indirect)

- Notification
- Request for Verification (SNI)

**Verification System**

**Company**

<table>
<thead>
<tr>
<th>Regulation</th>
<th>Date</th>
<th>Requirements</th>
</tr>
</thead>
</table>
| Request for Information | Jan 2015 (M, R, W) July 2015 (Dispenser) | If receive request for information from government official in the event of a recall or suspect product investigation:  
  - Provide TH, TI, TS for requested products in one (1) business day (not to exceed 48 hrs.) [dispensers have 2 business days] |
| Verification | 2015 (all) *2017-2020 (mfg, repack, wholesaler, dispenser) | If receive verification request from govt official in suspect product investigation or if company determines it has suspect product:  
  - Conduct investigation in coordination with trading partners; quarantine such product  
  - Validate TH, TI of identified products  
  - Verify SNI of identified products |
| Request for Verification | 2017 (mfg) 2018 (repack) | If receive request for verification of drug product from supply chain participant (direct, indirect trading partners):  
  - Verify product identifier/SNI of the products queried against product identifier/SNI affixed by manufacturer/repackager  
  - Notify trading partner of results within 24 hours |
| Notification  | 2015 (all) | Notify gov't officials of cleared product subject to investigation  
  Notify FDA and all immediate trading partners if determine a product in their possession or control is illegitimate (within 24 hours)  
  Manufacturers: Notify FDA and immediate trading partners if reason to believe at high risk of possession of illegitimate product  
  Notify trading partners of investigation termination |
| Archive      | 2015 (all) | Archive suspect product investigation and illegitimate product documentation for 6 years past investigation closure |
What’s the Overall Benefit of Medication Safety Technology and Automation?

- Med Ordering Errors (39%)
- CPOE: 55% reduction
- Pharmacist
- Dispensing Errors (11%)
- Pharmacy Barcode Scanning: 67% reduction
- Medication on Wards
- Administration Errors (38%)
- Barcode-eMAR: 51% reduction
- Medication Admin Record
- Transcription
- eMAR: 100% reduction
- RN
- Patient
- Administration

CPOE: 55% reduction
Pharmacy Barcode Scanning: 67% reduction
Barcode-eMAR: 51% reduction
Some Final Thoughts…

✓ Technology can never replace the critical thinking of clinicians but it can serve as a key safety and productivity tool for the staff.

✓ Track and trace capability has the potential to help improve drug preparation, drug distribution, and medication administrations processes based on review of real-time objective data analytics.

✓ Bard code scanning technology is the current benchmark, but RFID technology may be the future of track and trace.