Veterans Health Administration
Bar Code Medication Administration

Chris L. Tucker, RPh
Director, Bar Code Resource Office
Chief Health Informatics Office
Veterans Health Administration
"Oh, that. That's part of our new billing system."
Medication Error Prevention

- Design the healthcare delivery system at all levels to make it safer
- Build safety into the processes of care
- Make the right thing the easiest thing to do
- Reduce the number of handoffs-human interventions
- Be proactive vs. reactive in response to errors
Veterans Health Administration
Electronic Health Record

• History
  – 1982- VHA began building DHCP its electronic health care architecture
  – 1990- VHA upgraded computer capacity to implement software at a national scale to support integrated health care delivery
  – 1996- VHA introduced VistA to support day-to-day operations at local VA MCs and provide links to allow for COTS products
Computerized Patient Record System (CPRS)

• Released in 1997
  – Single interface to VistA for health care providers
  – Flexible enough to be implemented in a variety of health care settings
  – Presents organized relevant data to directly support clinical decision making
  – Includes:
    • Provider Order Entry
    • Real-time Order Checking
    • Clinical Alerts Notification System
    • Patient Posting System
    • Clinical Reminder System
    • Remote Date Views
Veterans Health Administration
EHR Statistics through Dec’06

• Orders
  – > 1.6 Billion total orders processed
  – > 955,000 orders processed daily

• Imaging
  – > 590M total images processed
  – > 884,000 images processed daily

• Vital Signs
  – > 1 Billion vital sign entries
  – > 729,000 vital signs entered daily
History of Bar Code Medication Administration in VA

• 1994
  – VA was one of the first medical organizations to pilot and develop Bar Code Medication Administration technology by field staff at the Topeka Veterans Affairs Medical Center

• 1999
  – roll out to all VA Medical Centers (60,000 beds)

• 2003
  – 100% of all VA wards documenting medication administration using BCMA

• 2007
  – >850M doses administered since inception
  – >600,000 medication administrations each day
Bar Coding Challenges in Health Care

- Business Process Re-Engineering
- *Bar Code Quality Assurance*
- Balancing Ergonomics with Equipment and Systems
- Equipment Interoperability
- Data Standardization
- Data Privacy and Security
Pharmacy Bar Code Labeling

• When you’re in the bar code printing business you need to measure bar code quality
  – Why won’t this label scan?
  – Is it the scanner, the bar code, the label, or the printer?
  – Are the bar codes you’re printing fostering software workaround?
Bar Code Quality Programs in VA

- Sept 2004
  - Developed Closed Loop verification procedures for all VA facilities
- Oct 2004
  - Established Bar Code verification labs
- Feb 2005
  - BCMA Coordinators at each VA medical center
- Mar 2005
  - Bar Code Quality Clause added to VA contract vehicles
- May 2005
  - Wristband Verification Testing conducted for all VHA Wristband Printer & Print Media Combinations
- Mar 2006
  - Bar Code Quality Directive distributed
- Dec 2006
  - All scanners, printers, and print media must be tested and purchased from the Bar Code Resource Office approved list
Closed Loop Verification Procedure

- Results are communicated to the facility, contracting authorities, manufacturers, FDA through MedWatch

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Bar Code Quality Directive - Performance Management

• Validating field improvements through evidence based practice

• Bar Code Quality Directive requires quarterly monitors for 6 areas:
  – Controlled Substances
  – Manufacturer Packaging
  – IV Labels
  – Automated Packaging
  – Pharmacy Re-labeling
  – End User

• > 1,000,000 bar codes were scanned in 1 year of data collection through direct observation
Performance Management Results

Directive Monitor Enterprise Comparison to Baseline

<table>
<thead>
<tr>
<th>Monitor</th>
<th>Baseline fy'06</th>
<th>2nd qtr fy'07</th>
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<tr>
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Percentage Success Rate

86.0% to 100.0%
Performance Management Results

 Directive Monitor Enterprise Comparison to Baseline

- 7% Improvement in scan success for Controlled Substances

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Performance Management Results

Directive Monitor Enterprise Comparison to Baseline

- 6% Improvement in scan success for Manufacturer Packaging

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Performance Management Results

Directive Monitor Enterprise Comparison to Baseline

- 4% Improvement in End User scan success

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Performance Management Results

Directive Monitor Enterprise Comparison to Baseline

- 4% Improvement in overall scan success

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Interpretation of Results

• 600,000 medications administered per day

<table>
<thead>
<tr>
<th>Year</th>
<th>% Scan Success</th>
<th>Successful Scans per Day</th>
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<tr>
<td>2006</td>
<td>93.3%</td>
<td>559,800</td>
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<td>2007</td>
<td>97.4%</td>
<td>584,400</td>
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</table>

• While 24,600 more products consistently scan there are 15,600 (2.6%) that remain problematic each day
Equipment Evaluations - Scanner

- 136 Evaluation Criteria
  - Security of Wireless Communication
  - Characteristics of Scan Reader
  - Ease of Set-Up
  - Physical Characteristics
  - Usability / Human Technology Interface
  - Symbology Readability
  - Customer Service
  - Battery Maintenance
  - User Satisfaction
Wristband Testing Outcomes

Wristband Verification Testing Outcomes
(185 wristbands tested)

- ANSI Grade A: 22
- ANSI Grade B: 33
- ANSI Grade C: 50
- ANSI Grade D: 63
- ANSI Grade F: 100

Verification Grade
(Target Grade C or better)

# Wristbands

Cumulative % Wristbands Tested
Verification Grade Wristband Printer

Top 4 Based on Volume Tested-185 Wristbands

Verification Grade
(Target Grade C or better)

# Wristbands

ANSI Grade A  | ANSI Grade B  | ANSI Grade C  | ANSI Grade D  | ANSI Grade F
Printers:
- Printer Model #1
- Printer Model #2
- Printer Model #3
- Printer Model #4

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Equipment Evaluations- Wristband Printers

• 63 Evaluation Criteria
  – Bar Code Verification
  – Ease of Set-Up
  – Usability / Human Technology Interface
  – Customer Service
  – Print Formatting
Equipment Evaluations – Wristband Printers

Wristband Printer Performance Criteria Score

![Graph showing Wristband Printer Performance Criteria Score with UCL, CL, and LCL levels.](image_url)

- **UCL**: 70.2
- **CL**: 64.6
- **LCL**: 58.9

<table>
<thead>
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<th>Printer #1</th>
<th>Printer #2</th>
<th>Printer #3</th>
<th>Printer #4</th>
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<td>Total Score</td>
<td>UCL</td>
<td>+2 Sigma</td>
<td>+1 Sigma</td>
<td>Average</td>
<td>-1 Sigma</td>
<td>-2 Sigma</td>
<td>LCL</td>
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Wristband Print Media

Verification Grade Wristband Print Media
Top 4 Based on Volume Tested-185 Wristbands

Verification Grade
(Target Grade C or better)

- ANSI Grade A
- ANSI Grade B
- ANSI Grade C
- ANSI Grade D
- ANSI Grade F

# Wristbands

Print Media #1
Print Media #2
Print Media #3
Print Media #4

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Equipment Evaluations – Wristband Print Media

• 60 Evaluation Criteria
  – Bar Code Verification
  – Longevity
  – Usability/Human Technology Interface
  – Wearer Satisfaction
Equipment Evaluations – Wristband Print Media

Wristband Printer Medium Performance Criteria Scores

- Total Score
- UCL
- +2 Sigma
- +1 Sigma
- Average
- -1 Sigma
- -2 Sigma
- LCL

Graph showing the performance criteria scores for different media types.
Ongoing Issues

• Supplier / Packager
  – Lack of universal verification practices
  – Verification not consistently conducted on the actual finished packaging
  – Verification not conducted on unit of administration
  – Lot number and Expiration Date-no standard formatting of data
  – Multiple barcodes placed in close proximity making it difficult to scan the ‘right barcode’
  – Bar codes on packaging that are NOT unique product identifiers

• Enterprise
  – Multiple linear symbologies resulting in scanner reprogramming
  – Wristband manipulation
  – Durability of bar codes on multiple use containers
  – Recognition of unique bar code product identifier
Questions?