Mobility throughout hospital lab workflows: improve efficiency and reduce errors with real-time information at the point of work

Challenge: the high cost of lab-related errors

Medical laboratories play a crucial role in the healthcare system. Labs in hospitals and clinics perform over 7 billion tests in the United States alone — and the results of these tests are key in over 70 percent of all medical decisions.[1] Each specimen passes through roughly a dozen steps from collection to the delivery of test results. While safeguards are in place, many of these steps are often performed manually, adding time and risking errors that can compromise patient safety. A study of 71 hospitals in 10 countries reveals frightening statistics: 1 in every 165 blood samples collected were mislabeled, while 1 in every 1,968 samples were collected from the wrong patient.[2] And both types of errors put patients at risk for receiving the wrong diagnosis — and the wrong treatment.

Hospital labs also manage and administer the inventory of blood products. Every item must be trackable, and short shelf lives increase the complexity of managing these life-saving items — while some blood products last a year, others are no longer usable in as few as five days. While transfusions are a common occurrence inside the hospital, a simple keying error anywhere in the process could result in a patient receiving the wrong blood type — a potentially deadly event that is far from uncommon. Studies conducted in different countries found that 1 out of 14,000 to as many as 1 out of 400 transfusion recipients receive the wrong blood.[3] And the errors occur primarily due to mistakes in manual procedures — a blood product is mislabeled or a clinician in a hurry accidentally grabs the wrong blood unit or one that has expired.

In addition, these errors add to mounting healthcare costs in the form of repeat tests and lawsuits — the cost for malpractice suits for lab errors is second only to neurology-related mistakes.[4]

Motorola's healthcare mobility portfolio streamlines and error-proofs the entire end-to-end lab process — from the collection of specimens and administration of blood products at the patient bedside through testing in the lab to the delivery of the diagnosis.

BENEFITS

Specimen collection

- Eliminate specimen labeling errors with just-in-time, real-time labeling that ensures that the right patient receives the right diagnosis and the right treatment

- Enable faster diagnoses and faster treatment by streamlining processes with real-time bar code capture at the point of work

- Improve staff efficiency without adding equipment or staff; increased capacity increases lab-related revenues and lab profitability

Blood product management

- Eliminate transfusion errors with an automated real-time cross-check at the patient's bedside

- Enable track and trace of all blood products, protecting patient safety through rapid responses to recalls

- Gain real-time inventory visibility for better management of blood products — ensures the oldest product is used first to prevent waste; and eliminates low stock situations that can compromise patient safety

The solution: mobile data for real-time error-proof information at the point of work

When you give lab technicians the ability to access information and automate the capture of data in real time, they have the information and tools they need to execute virtually any task, right at the point of work. Lab technicians and nurses no longer need to ask patients to recite their name and other identifying information and double check that verbal information against the written data on the patient wristband and lab order forms. Instead, technicians can scan the bar code on their own badge as well as the patient wristband to display the lab order on the screen of the mobile computer. The press of a button prints a bar coded label for the specimen container that properly identifies the patient and specific information on the test to be performed. In the lab, instead of manually keying bar code label data into a computer, a quick scan accurately captures the bar coded data, ensuring that the right test is performed on the right specimen. Regardless of the volume of work or how tired lab technicians may be, processing time and the opportunity for errors are dramatically reduced, protecting patient safety, improving staff productivity and the quality of care and increasing the revenue capacity of the lab.

Thanks to the anywhere anytime availability of critical information and the automated capture of bar coded data, patients can count on receiving the right test results, the right diagnosis and the right treatment. The time savings means test results are available more rapidly, enabling proper treatment to begin faster. And since cycle times are reduced and accuracy eliminates the need for many repeat tests, lab capacity is increased. The lab can run more tests with the same staff and the same equipment, improving the efficiency and profitability of the lab.

A customizable solution for every step of the workflow process

Whether lab technicians are in a patient's room collecting a specimen or in the lab processing specimens, there is a mobility product in Motorola's healthcare portfolio that is right for the job. Our handheld mobile computers allow clinicians to carry the functionality of a computer, bar code scanner, desk phone and printer to the bedside in a pocketable form factor, providing whatever tools are needed to execute any task quickly and accurately. If computers or workstations on wheels (COWs or WOWs) are in use in your facility, our corded or cordless handheld bar code scanners can capture virtually any bar code, even poorly printed, tiny or curved bar codes, anywhere and anytime. And in the lab, where clinicians are handling specimens and managing inventory, our hybrid presentation scanner delivers the best of both worlds — hands-free and handheld scanning of labels on specimen containers and slides — providing the flexibility to automatically capture data at every step in the process, regardless of the task that is being performed.

Applications: transform the processes in your lab with mobile data

Real-time specimen collection

When it comes to blood, skin, throat swabs and other samples, labeling is critical to successful outcomes and patient safety. If labels are printed and applied to specimen containers anywhere other than at the point the specimen is collected, labeling errors can easily occur. If a technician carrying a batch of pre-printed labels accidentally applies the wrong label to a blood vial, unless the error is caught as the specimen moves through the testing process, that patient will likely receive the wrong diagnosis and the wrong treatment — with potentially grave implications.

Healthcare mobility provides real-time access via the wireless LAN (WLAN) to information in the Laboratory Information System (LIS) and the Hospital Information System (HIS), allowing technicians to ensure that the right test is performed the right way

on the right patient at the right time. With either a handheld mobile computer or a bar code scanner tethered to a COW/WOW, technicians can:

Positively identify patients — every time.
With a quick scan of the bar code on the patient's wristband, the patient's identity is displayed on the screen of the mobile computer or COW/WOW, enabling the technician to double verify the information with the name on the wristband.

Ensure the right specimen is collected — the right way. Along with patient identity, lab technicians can also view specimen orders and any specific instructions on the screen of the mobile computer or COW/WOW. Not only are the right specimens always collected, but also technicians can verify that instructions have been followed prior to specimen collection. For example, if a fasting period is required for a test, technicians can verify that the patient has not had any food or water before collecting the specimen, preventing improper collection procedures that could result in diagnosis errors as well as the cost of repeating the test.

Print labels right at the point of collection — eliminating the opportunity for labeling errors.
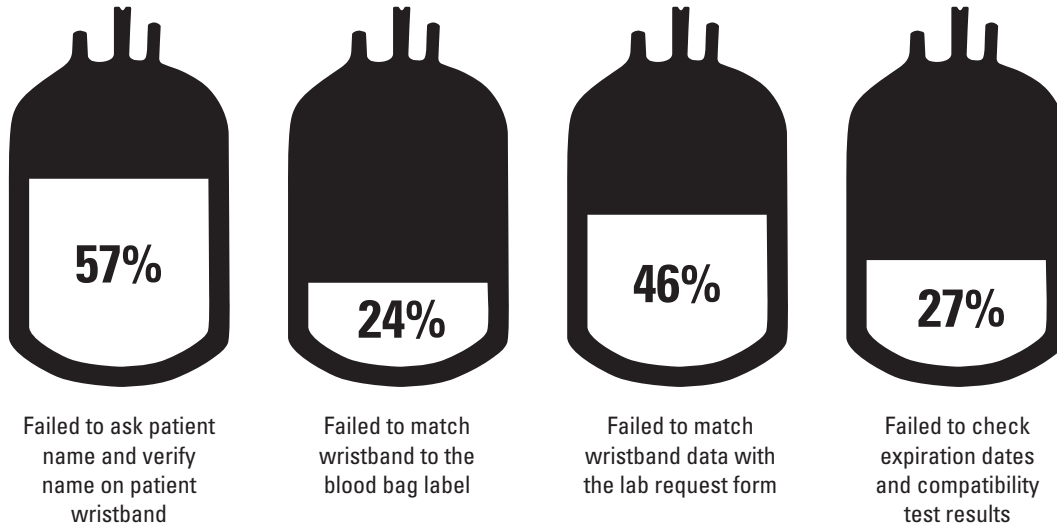With the addition of a compact and lightweight printer that can be worn on a belt, placed on the COW/WOW cart, or positioned in the portable carrying tote, technicians can simply press a button to print a label for the specimen container that identifies the patient, the specimen type and the test to be performed. The label is then applied right at patient bedside for the just-in-time, real-time labeling that ensures the right specimen is always matched to the right patient — no errors.
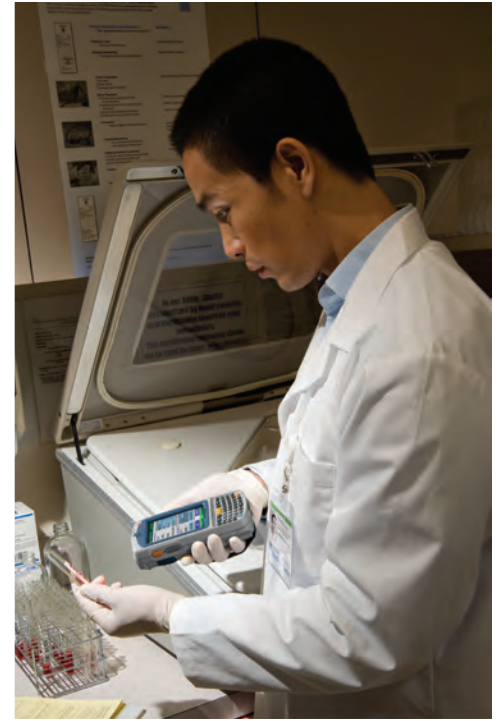
Capture additional information to improve accountability and accuracy. Technicians can scan their own badge to accurately identify and record the worker who collected the specimen in the test record. And when a patient's room number is captured — either with a bar code scan or by entering the number via the keypad — the additional layer of information helps prevent identity errors that could occur if a patient has been recently moved and is no longer in the room number designated in the LIS.

How big of a risk do manual procedures really create?[5]

An audit of transfusion procedures in 660 hospitals in the U.S. and Canada revealed the magnitude of risk when bar code scanning is not implemented. With manual lab processes in place, caregivers:

57%	24%	46%	27%
Failed to ask patient name and verify name on patient wristband	Failed to match wristband to the blood bag label	Failed to match wristband data with the lab request form	Failed to check expiration dates and compatibility test results

Real-time specimen tracking and verification in the lab

Once the specimen is returned to the lab, bar code scanning preserves accuracy throughout the rest of the process, from testing to diagnosis. Instead of typing information into a computer or handwriting information on a slide label, every worker who handles the specimen scans two bar codes — the label on the specimen as well as their own badge. Technicians can verify patient identify, the type of specimen and the test to perform, and then print out an accurate label for a slide or other media with the press of a button. Error-proofing is injected into every stage of laboratory processes — and the hospital is able to easily capture an accurate and complete audit trail from the moment a specimen is collected to the moment the diagnosis is issued.

Real-time track and trace of blood products

Effective inventory management of blood products can be a matter of life and death. Critical information, such as ABO and Rh, expiration date and product description, must be tracked as blood is collected and processed — and clearly understood by the caregiver transfusing the blood. Additionally, given the shortages in global and regional blood supplies, healthcare institutions must maintain an appropriate inventory of blood products to provide timely care for patients.

Error-proof inventory management. The ISBT128 bar code is a unique symbology that ensures the right and accurate information accompanies blood products from the point of draw until the point of administration to a patient. Its four quadrants contain critical information that not only identifies the product, but also provides traceability back to the original source — including the donor, the country, the date and the facility where the blood was collected as well as blood type and expiration date. As blood and blood products arrive at the lab, a scan of this bar code in the receiving area accurately enters the items into inventory, with their associated data. The errors that can occur when this information is manually entered into a computer or handwritten on a label are eliminated. And since inventory is visible in real-time, labs are sure to use the oldest product first, minimizing waste.

As items are removed to either administer to a patient or create a blood product, such as plasma, a quick scan of the bar code provides multiple benefits. Technicians can be absolutely certain they have the right product in hand and can double check the expiration date. And inventory is automatically updated in real time, ensuring orders for replacement product are placed in time to prevent low inventory levels that could impact patient lives.

Real-time transfusion verification at patient bedside. Mobile bar code scanning provides a safety net for patients and licensed caregivers alike to prevent one of the most deadly medical errors — the administration of the wrong blood type. A scan of the bar code on the blood bag and the patient's wristband at patient bedside automates the crosscheck process, allowing a single caregiver to perform a task that previously required two dedicated caregivers. In addition, bar code scanning eliminates the opportunity for error in procedures that require spoken information to be verified against written information. The result is the highly accurate information required to improve patient safety and caregiver productivity as well as an electronic audit trail that increases accountability.

Track and trace. When blood is manufactured into other products, such as plasma, bar code scanning enables the accurate track and trace required to meet government regulations. A scan of the label on the bag of blood utilized to create additional blood products allows technicians to automatically print a bar code label for the new product that identifies all the source materials utilized to create the new product. In the event of a recall, the resulting flawless track and trace information enables technicians to rapidly locate and remove contaminated product from the shelves as quickly as possible, protecting patient safety and health.

## Lab automation: a strategic initiative with a fast payback

The automation of lab processes reduces errors, protecting the safety and lives of the patients who put their trust in your institution. In addition, process automation delivers real financial benefits:

- Reduced costs

    – Shorter specimen collection times increases the capacity of the current staff, allowing hospitals to meet rising demands in the lab without increasing personnel costs.

    – Labeling accuracy eliminates time spent resolving errors.

    – Tighter management of blood products enables use before products expire, reducing waste and inventory costs.

    – Fewer errors reduce litigation and insurance costs.

- Increased profitability

- Shorter cycle times enable the lab to handle more tests, and the increase in capacity in turn improves revenues and lab profitability.

The technology: the Motorola Healthcare Mobility Portfolio

Enable end-to-end mobility in your hospital lab with Motorola's Healthcare Mobility Portfolio. There is a product designed for every task, regardless of whether lab technicians are in the patient room collecting a specimen, in the lab performing tests or managing the inventory of blood products. And whether your clinicians need a fully featured mobile computer or a hands-free bar code scanner, you can count on:

- The durability to withstand all day every day use

- Housings that can be disinfected after every use

- The ability to scan virtually any bar code, allowing your institution to leverage the barcodes that are already in use today, while also offering the intelligence and flexibility to support new bar codes as they are introduced

- Revolutionary bar code scanning performance on both 1D and 2D bar codes includes the ability to scan even damaged bar codes as well as small dense codes on rounded surfaces — from patient wristbands to small vials and test tubes

- Ease of use — omnidirectional scanning provides 'scan and go' simplicity, no need for precise alignment of bar code and scanner window

- Easy centralized remote management

- Motorola's industry leading service plans to protect uptime in this mission critical environment
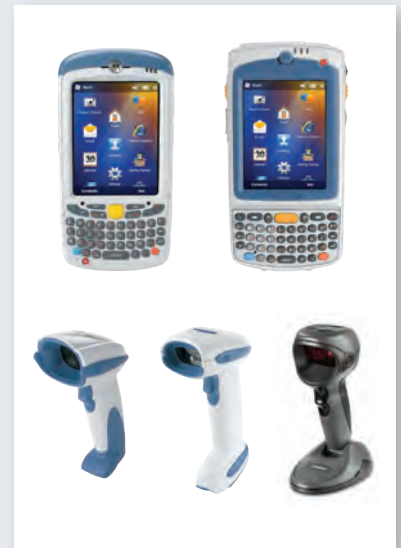
See next page for characteristics.

The Motorola Healthcare Mobility Portfolio

	MC55A0-HC Rugged Mobile Computer	MC75A0-HC Rugged Mobile Computer	DS6878-HC Cordless Handheld 2D Imager
	www.motorola.com/mc55a0hc	www.motorola.com/mc75a0hc	www.motorola.com/ds6878
	All-in-one compact high power platform for desktop-like application performance and comprehensive mobile voice and data in patient-facing colors; Wi-Fi 802.11a/b/g and Bluetooth wireless connectivity	All-in-one high power platform for desktop-like application performance and comprehensive mobile voice and data in patient-facing colors; Wi-Fi 802.11a/b/g and Bluetooth wireless connectivity	Bluetooth cordless freedom in patient-facing colors can be installed in patient rooms; integrated with COWs/WOWs; and placed in lab work stations
USAGE			
Patient room — complete 'in-the-pocket' mobile solution	●	●	
Patient room — COW/WOW integration			●
Patient room — permanent installation			●
Lab workstations			●
DURABILITY			
Drop specification	6 ft./1.8 m	6 ft./1.8 m	6 ft./1.8 m
Tumble specification	1,000 1.6 ft./0.5 m tumbles (equivalent to 2,000 hits) per IEC tumble specifications	1,000 1.6 ft./0.5 m tumbles (equivalent to 2,000 hits) per IEC tumble specifications	N/A
Sealing	IP64	IP54	IP43
Disinfectant ready	●	●	●
DATA CAPTURE			
Bar codes	1D/2D — including healthcare specific GS1 and ISBT 128 codes as well as tiny dense codes on test tube vials		
Scanning performance	Laser-like high performance first-time every time scanning of any bar code — damaged, poorly printed, and scratched		
Omni-directional scanning	●	●	●
Other data capture options	3.2 MP camera to capture bar codes, photos, videos, signatures and documents		Photos, signatures and documents
MANAGEMENT			
Management	MSP		RSM
SERVICE			
Recommended Service	Service from the Start with Comprehensive Coverage (all inclusive) and Commissioning Service/Express Shipping (replacement device with all applications and settings, ready for use out of the box)		Service from the Start with Comprehensive Coverage (all inclusive) and Advance Exchange Support (next day device replacement)
EXTRAS			
Extras	- Native FIPS 140-2 Level 1 certification for easy HIPAA compliance - Additional rugged specifications: patented Monocoque housing improves structural stability; patented industrial grade connector improves durability of the accessory interface; magnesium casing improves shock absorption for sensitive internal electronics; improved construction prevents damage to display - Superior voice collaboration — communicate with different types of devices on different networks, including Motorola's two-way radios - Sensing technology maximizes battery shift times (conserves power automatically when not in use) and screen real-estate (dynamic screen rotation)	- Native FIPS 140-2 Level 1 certification for easy HIPAA compliance - Superior voice collaboration — communicate with different types of devices on different networks, including Motorola's two-way radios - Sensing technology maximizes battery shift times (conserves power automatically when not in use) and screen real-estate (dynamic screen rotation)	

	DS6707-HC Corded Handheld 2D Imager	DS9808 Hybrid Presentation Scanner
	www.motorola.com/ds6707	**www.motorola.com/ds9808**
	Corded scanner in patient-facing colors can be integrated with COWs/WOWs or placed in lab work stations	Offers flexible handheld and hands-free modes with a small footprint for lab workstations; integrated RFID also available to support emerging applications
USAGE		
Patient room — complete 'in-the-pocket' mobile solution		
Patient room — COW/WOW integration	●	
Patient room — permanent installation		
Lab workstations	●	●
DURABILITY		
Drop specification	6 ft./1.8 m	5 ft./1.5 m
Tumble specification	N/A	N/A
Sealing	IP41	N/A
Disinfectant ready	●	
BAR CODE CAPTURE		
Bar codes	1D/2D — including healthcare specific GS1 and ISBT 128 codes as well as tiny dense codes on test tube vials	
Bar code scanning performance	Laser-like high performance first-time every time scanning of any bar code — damaged, poorly printed, and scratched	
Omni-directional scanning	●	●
OTHER DATA CAPTURE		
Other data capture options	Photos, signatures and documents	RFID, photos, signatures and documents
MANAGEMENT		
Management	RSM	
SERVICE		
Recommended Service	Service from the Start with Comprehensive Coverage (all inclusive) and Advance Exchange Support (next day device replacement)	Service from the Start with Comprehensive Coverage (all inclusive) and Advance Exchange Support (next day device replacement)
EXTRAS		
Extras	• Optional Intellistand for presentation scanning • Multiple on-board interfaces for easy integration with host computer	• Configurable audio alert and extra large LED indicator to ensure feedback in both loud and quiet environments; recessed connector minimizes scanner footprint; multiple on-board interfaces for easy integration with host computer

For more information on how you can eliminate errors in your lab and protect the safety of your patients with Motorola's Healthcare Mobility Portfolio, please visit http://www.motorola.com/healthcare

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2. An international study of the performance of sample collection from patients; Dzik WH, Murphy MF, Andreu G, Heddle N, Hogman C, Kekomaki R, Murphy S, Shimizu M, Smit-Sibinga CT; Biomedical Excellence for Safer Transfusion (BEST) Working Party of the International Society for Blood Transfusion; PubMed.gov (U.S. National Library of Medicine/National Institutes of Health); July 2003; http://www.ncbi.nlm.nih.gov/pubmed/12823729

3. Technology for Enhanced Transfusion Safety; Walter H. Dzik, MD, Massachusetts General Hospital; 2005; http://asheducationbook.hematologylibrary.org/cgi/content/full/2005/1/476)

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