



The Business Case for Automated Specimen Collection and Transfusion Management Solutions

An ROI White Paper

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Executive Summary

Patient safety is a primary concern to all hospitals and labs. The number of manual steps in specimen collection/testing and blood transfusions, means the chance for human errors and omissions is high. Automating these processes with specimen collection and transfusion management solutions can create closed loop systems that virtually eliminate errors in labeling of specimens, incorrect patient draws, and incorrect transfusions. Automating these processes not only results in a significant improvement in patient safety, they can also drive extensive cost efficiencies, improved quality of care, and increased revenues. Adding specimen collection management and transfusion management solutions to the LIS, in keeping with the Five Rights of Laboratory Testing™, ensures that specimens are collected from the right patient, for the right tests, at the right time, with the right indicators, for the right diagnosis. This paper summarizes the research findings regarding the business opportunity associated with each of these key patient safety issues and the overall ROI implication for the hospitals.

Key patient safety challenges facing labs and hospitals:

- The time and complexity required to ensure the right patient is matched with the right tests, procedures, and products can be extensive and prone to human error.
- The time required to enter test requests into the system, have these requests communicated out to the floors, have the specimens drawn, and receive these into the lab, all without losing or misplacing specimens, is labor intensive and time-consuming.
- Reducing turnaround times (TAT) for labs, emergency departments (EDs), and other areas of the hospital while ensuring that the right results are matched with the right patient and delivered in near real-time so that treatment decisions can be expedited with maximum data.
- Incorrectly administered products or procedures, as a result of lost specimens, mislabeled specimens, or incorrect patient identification, can lead to adverse and/or “never” events which require significant follow-up time and can have a major financial impact.

The value of automated specimen collection and transfusion processes is immediate and demonstrable. A sample hospital with 500K lab tests per month, 1,500 blood transfusions a month, and 80 ED patients a day, can experience over \$1.1 million in increased productivity and cost efficiencies alone. Through increased revenue and improved quality of care and patient safety, annual benefits can reach up to \$2.6 million.

Key patient safety challenges facing labs and hospitals

After interviewing LIS Managers, Lab Directors and Managers, Physicians, Pathologists, and IT Support Managers at 15 hospitals in the U.S. and Canada, four key patient safety challenges were identified:

Challenge 1: The time and complexity required to ensure the right patient is matched with the right tests, procedures, and products can be extensive and prone to human error.

The need for positive patient identification programs is paramount to patient safety, ensuring the right patient is matched to the right tests, procedures and products. When done manually, this process can be time consuming and prone to human error. Patients can become separated from their wristbands or staff may fail to properly conduct all steps of a bedside check, resulting in incorrect or incomplete patient identification. A study of blood transfusion procedures revealed that during bedside identification checks: i) failure to ask patient name and match to wristband occurred 57% of the time; ii) failure to match wristband ID to the blood bag label occurred 24% of the time; iii) failure to match wristband data with the request form occurred 46% of the time; iv) failure to check results of compatibility testing and expiration occurred 27% of the time; and v) failure to do all four of the bedside check steps correctly occurred 75% of the time. (Novis et al. Arch Path Lab Med 2003; 127: 541).

"We definitely had situations where not all of the steps of the bedside check were properly completed. And even in those cases where they were, we still ran into situations where the bar codes swiped did not match any of the possible bar codes that could belong to either a patient or blood unit."

– Lab Director

Challenge 2: The time required to enter test requests into the system, have these requests communicated out to the floors, have the specimens drawn, and receive these into the lab, all without losing or misplacing specimens, is labor intensive and time-consuming.

The manual steps required from test order request to specimen receipt into the lab are many and time consuming. When tests are required, the order is first manually entered into the system, the phlebotomists then travel to the lab to retrieve the orders and the required labels, travel back to the floors to draw the specimens, and then return to the lab where the lab tech manually receives the specimens into the laboratory information system (LIS). The number of manual touch points involved in this process can lead to human error. For example, phlebotomists often travel from the labs with multiple sets of labels for multiple patient draws that need to be made, creating the risk that the wrong labels are affixed to the specimens once drawn. If the patient is not available for a scheduled draw, the phlebotomist must also make a note of this and remember to alert the lab that the draw did not take place and needs to be rescheduled.

"Our analysis showed that 50-60% of phlebotomists' time was spent on non-value added use, mostly just walking from place to place, waiting for elevators, and other fairly non-productive activity."

– Administrative Lab Director

Challenge 3: Reducing turnaround times (TAT) for labs, emergency departments (EDs), and other areas of the hospital while ensuring that the right results are matched with the right patient and delivered in near real-time so that treatment decisions can be expedited with maximum data.

The time required from tests being ordered to results being delivered, can hinder the speed with which the appropriate course of patient treatment can be administered. In addition, the inability to instantly record these results into the patient's electronic medical records (EMR) and consolidate them with the previous patient history can reduce the chances that the most effective course of treatment is delivered, or result in an incorrect course of treatment because a previously existing condition is not known. Lab capacity can also be restricted by long turnaround times, allowing fewer patient results to be delivered at any given time. This is also true of areas like the ED, where long turnaround times can result in fewer patients being seen or longer wait times before medical care can be given.

"The lab's goal was to have STAT samples done within 120 minutes after they are ordered. Before implementing an automated system fewer than 60% of the samples were actually being done within this time"

– Administrative Laboratory Director

Challenge 4: Incorrectly administered products or procedures, as a result of lost specimens, mislabeled specimens, or incorrect patient identification, can lead to adverse and/or "never" events which require significant follow-up time and can have a major financial impact.

Lost/mislabeled specimens or incorrectly administered products or procedures can, at a minimum, result in significant follow-up time to determine why the error occurred and how to prevent it in the future to, in the worst case, serious adverse events. The time and number of staff required to follow-up on specimen collection or incorrect administration errors, can be extensive, averaging anywhere from 2-3 hours to 1-2 weeks, and including phlebotomists, nurses, physicians, lab techs, lab managers, CMO's, safety officers, and legal staff. Additionally, should an adverse event occur as a result of these errors, there can be a significant financial impact, including: i) the lack of reimbursement for added patient care if the error is one of eight identified "never" events; ii) increased insurance premiums; and iii) legal action taken against the facility. One study found that 1 in 18 sample identification errors lead *directly* to an adverse event or Never Event (Archives of Pathology and Laboratory Medicine: Vol. 130, No. 8, pp. 1106–1113).

"We averaged 5 labeling errors/month. The "recovery" time after a mislabeled specimen (investigate, correct if possible, remediate, discipline, communicate, close) is about 2 hours per "minor" incident and can be as high as 12-14 hours for the rare serious event. Persons involved include the staff member collecting the specimen, patient, physician, lab tech, lab supervisor, department manager/director, risk manager, quality manager, as well as potentially other staff if the incident resulted in additional care or patient harm"

– Director of Emergency Services

Key Sources of Value

The value of automated specimen collection and transfusion management solutions is immediate and significant. Based on interviews with administrators and clinicians at a number of U.S. and Canadian hospital labs, the value falls into three main categories:

- Drive Cost Efficiencies
- Improve Quality of Care
- Increase Revenues

Each value area can be further broken down into a set of specific benefits. A sample of the benefits for each are summarized below and will be fully explained and supported in the following section.

VALUE AREA	SPECIFIC BENEFITS
<p>Drive Cost Efficiencies</p>	<ul style="list-style-type: none"> • Decrease insurance and litigation costs • Reduce specimen collection time • Reduce time needed to resolve labeling and transfusion errors • Minimize wasted/unused units of blood • Eliminate need for second independent PPID before administering a blood transfusion
<p>Improve Quality of Care</p>	<ul style="list-style-type: none"> • Reduce adverse events resulting from mislabeled specimens • Reduce adverse events resulting from transfusion errors • Reduce time to record patient information per transfusion
<p>Increase Revenues</p>	<ul style="list-style-type: none"> • Increase lab capacity by reducing TAT • Increase ED capacity by reducing TAT

FIGURE 1: VALUE AND SPECIFIC BENEFITS

The following case study illustrates the potential value of automated specimen collection and transfusion management solutions for each value area based on a sample hospital with the following inputs:

- Number of lab tests per month = 500,000
- Average revenue per lab test = \$40.00
- Time spent on travelling to/from lab and specimen receipt per hour = 25 minutes
- Current turnaround time per specimen = 65 minutes
- Number of ED patients per day = 80
- Average LOS per ED patient = 220 minutes
- Average charges per patient in the ED = \$1,896
- Number of blood transfusions per month = 1,500
- Time spent recording patient vitals per transfusion = 10 minutes
- Time required for positive patient identification per transfusion = 5 minutes (x2 for each of two required independent confirmations)

Value Source 1: Drive Cost Efficiencies

1. **Reduce specimen collection time.** Moving to Sunquest's automated specimen collection solution, Collection Manager (CM), resulted in significant time saving for care providers and lab techs. With Collection Manager, labels can be printed right at the bedside so no time is spent traveling back and forth for labels. It can also immediately notify the care provider when a new test request comes in eliminating the need to check-in with the lab, and once the specimen bar code is recorded in the device the specimen is automatically received into the LIS.

Moving to CM would allow a hospital whose phlebotomists were spending 15 minutes per hour on travel, and whose lab techs were spending 10 minutes per hour on specimen receipt, to reduce these times by 60% and 100% respectively.

"For us the single biggest benefit of Collection Manager was the ability to leave the phlebotomists on the floors. We were able to free up 25-30 minutes per hour, per phlebotomist, that used to be time spent walking back and forth to the labs and label printers, essentially allowing us to double the number of patients that can be seen every hour."

– Laboratory Manager

Impact on sample hospital:

\$415,200 in annual productivity improvements

2. **Reduce time needed to resolve labeling issues.** With CM, the number of labeling errors and the associated follow-up time can be reduced to zero. Labels are generated only when needed and right at bedside, virtually eliminating the risk of mislabeled specimens.

"Prior to implementing CM we averaged 5 labeling errors/month. Now we are at zero errors and saving valuable human resources."

– Director Emergency Services

For a sample hospital that averaged 8-10 labeling errors per month, and 1.5 hours average follow-up time per error, this could be reduced to zero.

Impact on sample hospital:

\$3,400 in annual productivity improvements

3. **Decrease insurance and litigation costs as a result of mislabeled specimens.** Mislabeled specimens that result in adverse events can result in significant financial issues for hospitals, both in terms of increased insurance premiums and the potential for legal actions brought against the facility as the result of an adverse event. CM virtually eliminates the chance that a specimen will be lost or mislabeled thereby eliminating the risk of adverse events, and potential lawsuits.

A sample hospital that incurs even one lawsuit every four years, could save an average of \$200K in litigation costs and \$1.0M in settlement costs.

"We have definitely noticed an increased level of patient confidence when we are at the bedside, wandng them with a bar-code reader. Patients are concerned about safety. By our reading their bar-coded armbands and producing their labels right at bedside, they know their samples are getting correctly labeled."

– Administrative Laboratory Director

Impact on sample hospital:

\$300,000 in annualized cost savings

4. **Reduce time needed to resolve transfusion errors.** Moving to Sunquest's automated transfusion management solution, Transfusion Manager (TM), the number of transfusion errors and the associated follow-up time can be reduced to zero. With TM's bedside patient check to ensure the blood unit and patient are a match, errors are virtually eliminated.

In the sample hospital they were able to reduce transfusion errors from three per year to zero, and eliminate 12-14 hours in follow-up time per error.

Impact on sample hospital:
\$22,800 in annual productivity improvements

"We did not have a lot of actual transfusion errors, 3-5 per year, but we did have more near misses. With Transfusion Manager we were able to completely eliminate both errors and near misses."

– Lab Manager

5. **Minimize wasted/unused units of blood.** With Transfusion Manager both the start and stop time of each bag of transfused blood are recorded as well as where and by whom it was administered, providing confirmation that all units were used and providing the data needed to determine trends in unused units and make positive practice changes.

"We had a number of wasted/unused units every month. With TM we are now able to determine exactly when and why this is happening, as every unit, and who is administering it, is recorded at the beginning and end of being transfused."

– Lab Manager

In the sample hospital they were able to eliminate the 6-8 units of blood, at an average cost of \$300/unit, that were being wasted per month.

Impact on sample hospital:
\$28,800 in annual cost savings

6. **Eliminate the need for second independent confirmation.** Normally, two independent patient ID confirmations are required for every transfusion. With Transfusion Manager, regulatory boards have approved the elimination of the second person, as the patient barcode and the blood unit bar code can now be checked electronically. In addition the time required by the remaining staff member is also reduced as the need to: i) ask the patient for their stated name and match it to the wristband; ii) match the wristband ID to the blood bag label; iii) match the wristband data with the request form; and iv) check the results of compatibility testing and expiration, are all replaced with one swipe of the barcodes on the patient wristband and the unit of blood to be transfused.

In the sample hospital they were able to reduce the time required for PPID from 5 minutes for each to two staff members to just two minutes for one staff member.

Impact on sample hospital:
\$104,200 in annual productivity improvements

"We do about 1,000 transfusions a month and it used to take two people 4-5 minutes each to confirm patient identification. With TM we were able to eliminate one person completely, and re-allocate their time to other patient care needs, and reduce the time of the remaining person by 80%."

– Lab Manager

7. **Decrease insurance and litigation costs as a result of transfusion errors.** Transfusion Manager virtually eliminates the chance that the wrong blood will be administered. Using barcodes it performs a check at bedside right before the blood is administered to confirm it is still a match to the patient.

“Transfusion Manager has provided us with another vital tool in our continued commitment to patient safety, allowing us to track every step of the transfusion from barcoded bedside checks through to disposal of used units, to help provide the highest level of care.”

– Lab Manager

A sample hospital that incurs even one lawsuit every four years, could save an average of \$200K in litigation costs and \$1.0M in settlement costs.

Impact on sample hospital:

\$300,000 in annualized cost savings

Value Source 2: Improve Quality of Care

1. **Reduce adverse events resulting from mislabeled specimens.** Adverse events resulting from mislabeled specimens can mean increased hospital stays for the affected patient, additional procedures and treatment, and added medications. In addition to this sub-standard quality of care, there are also significant costs to the hospital associated with these adverse events. With Collection Manager the patient barcodes are scanned, the required tests are confirmed and matched with the order in the system, the specimen is collected, and a label is immediately printed, all at bedside, virtually eliminating the possibility that a specimen is mislabeled, and thereby eliminating the possibility of an adverse event.

The sample hospital was able to eliminate all adverse events, each of which previously resulted in an average added stay of 9.5 days per patient at a cost of \$1,765 per patient day.

Impact on sample hospital:

\$50,300 in annual cost savings

“Prior to implementing Collection Manager we were averaging 3-5 adverse events per year as a result of mislabeling errors. These have now been eliminated.”

– Lab Director

2. **Reduce time to record patient information per transfusion.** Recording all patient vitals, reactions, and other pertinent details during a transfusion is critical to quality patient care, but could also be time consuming and incomplete as notes would be made by hand on pieces of paper to be entered into the LIS once back at a computer terminal. With Transfusion Manager all vitals, reactions and caregiver instructions can be automatically entered into the handheld device at the bedside and immediately received in the patient’s EMR.

"Prior to moving to Transfusion Manager it would take nurses an average of 10-12 minutes to enter patient transfusion information into the patient's EMR, now it takes just 6-7 as they can enter it right at bedside."

– Lab Manager

The sample hospital was able to improve accuracy of patient records while decreasing the time spent recording patient data by 30%.

Impact on sample hospital:
\$39,100 in annual productivity improvements

3. **Eliminate adverse events resulting from transfusion errors.** In addition to this sub-standard quality of care, there are also significant costs to the hospital associated with these adverse events, especially as preventable transfusion errors have been designated as "never" events and hospitals can no longer be reimbursed for costs associated with the added care resulting from such an event. With TM, the patient barcode and the barcodes on the blood units are scanned right at bedside to confirm the blood to be administered and the patient are a match, virtually eliminating the possibility of a patient getting the incorrect blood, and thereby eliminating the chance of an adverse event occurring.

The sample hospital was able to eliminate all adverse events, each of which previously resulted in an average added stay of 10 days per patient at a cost of \$1,765 per patient day.

Impact on sample hospital:
\$53,000 in annual cost savings

"While we personally had very few errors that led to adverse events, even one could be costly as the follow-up care for that patient would not be reimbursed."

–Lab Manager

Value Source 3: Increase Revenues

1. **Increase lab capacity by reducing TAT.** With Collection Manager the handheld device can signal the need for a specimen collection to a care provider on the floor as soon as it's requested so collection can be done right away. The specimen is then labeled right at bedside and scanned so that it is immediately received into the LIS. All of these steps reduce the turnaround time for test results, freeing up significant lab capacity to take on additional testing, leading to additional revenue.

"We were able to reduce our turnaround time per specimen from 25-30 minutes each to 8-12 minutes with Collection Manager."

– Laboratory Manager

In the sample hospital they were able to reduce TAT from 65 minutes to 46 minutes per test. Taking advantage of even 1% of the added capacity that was created by this time savings, they netted over \$1.0M in added revenue.

Impact on sample hospital:
\$1,028,600 in annual incremental revenue

2. **Increase ED capacity by reducing TAT.** With Collection Manager the staff in the ED can pro-actively collect patient specimens in anticipation of these being needed, as the device can be used to scan a wristband and print a set of labels to identify “draw and hold” collections prior to the order being placed in the LIS. Once the order is placed specimens can quickly be sent to lab, significantly reducing TAT. This reduction in TAT creates added capacity in the ED allowing more patients to be seen per day and thereby driving increased revenues as well.

The sample hospital was able to reduce the LOS per patient in the ED by 10 minutes each. Taking advantage of even 10% of the added capacity created by this time savings netted over \$250K in revenue.

Impact on sample hospital:
\$263,600 in annual incremental revenue

“We were able to reduce result turnaround time to the ED by 10 minutes per patient within just 2.5 weeks of going live.”

– Director Emergency Services

Overall Value

For the sample hospital, the three year investment of \$592K generates a positive return in **9.1 months**. The three year net present value (NPV) and return on investment (ROI) are very strong at **\$3.8M** and **820%**, respectively. The key financial metrics for the sample hospital were calculated by standard methods and are shown below. The NPV calculation assumes a 10% cost of capital.

FINANCIAL METRIC	3-YEAR VALUE
Payback (months)	9.1 months
NPV	\$3,820,604
ROI	820%

FIGURE 2: TABLUAR DISPLAY OF KEY FINANCIAL METRICS

The chart below shows the extent to which each value driver contributes to the total value of the automated specimen collection and transfusion management solutions. For the sample hospital, driving cost efficiencies and increasing revenue represent the majority of the value.

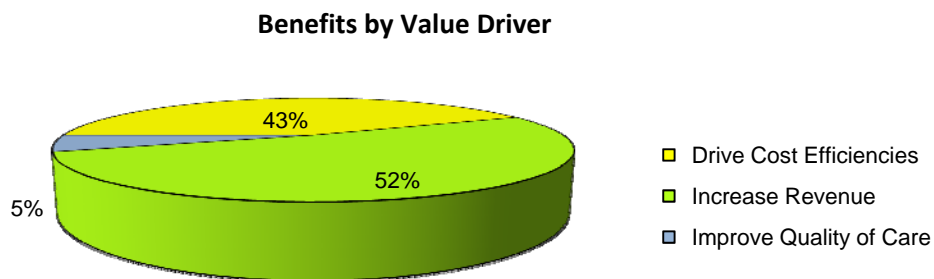


FIGURE 3: PIE CHART DISPLAY OF VALUE DRIVERS

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About Hobson & Company

Hobson & Company helps technology vendors and purchasers uncover, quantify and validate the key sources of value driving the adoption of new and emerging technologies. Our focus on robust validation has helped many technology purchasers more objectively evaluate the underlying business case of a new technology, while better understanding which vendors best deliver against the key value drivers. Our well researched, yet easy-to-use ROI and TCO tools have also helped many technology companies better position and justify their unique value proposition.

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