



A Zebra Technologies White Paper

Patient Wristbanding: The Advantages of Thermal over Laser Solutions



Executive Summary

Bar code systems help hospitals deliver accurate information in a variety of patient care and clinical settings, making them an important component in improving patient safety and process efficiencies. Therefore, these systems should be developed and executed with care, using dedicated printers that are optimized to provide reliable, accurate bar code output.

When hospitals evaluate their patient wristbanding solution, they often consider modifying existing laser printing systems to do the job. While many laser printers are capable of outputting bar codes, dedicated thermal printers are a more reliable, efficient and cost-effective option.

This white paper will explain the differences in thermal versus laser printing for patient wristbanding in hospitals and will provide an overview of the four reasons thermal printing is a better solution, including:

- Enhanced Patient Safety
- Lower Total Cost of Ownership
- Patient Comfort
- Ease of Use

Advantage #1: Enhanced Patient Safety

Bar coded wristbands provide a convenient way to comply with The Joint Commission's National Patient Safety Goal to "improve the accuracy of patient identification" and provide a foundation for other patient safety applications, such as bedside medication administration or specimen collection. Bar coded patient identification wristbands help prevent medical errors by making accurate patient information available at the point of care and enabling caregivers to confirm a correct match between the patient and the treatment provided. As such, it is critical for wristbands to remain readable and scannable throughout the entire patient stay.

Bar Code Image and Wristband Durability

A basic understanding of thermal and laser print technologies is helpful in understanding the variances in bar code quality and image durability. Thermal printing doesn't require toner. Rather, the printhead creates images by burning small squares onto either coated label media (direct thermal) or onto a ribbon (thermal transfer). These squares are then stacked to create the bars that make up the image, resulting in clear, crisp bar codes that can be easily scanned.

Thermal printers are optimally suited to produce 2-D symbols and very small bar codes, and can produce small labels to precise tolerances—a challenge for laser printers. Laser printers produce images by projecting small dots onto the page, which does not allow for the superior edge definition that squares provide. Furthermore, laser output is susceptible to toner flaking and smudging. This can lead to low image quality and repeated scan attempts, which may jeopardize both patient safety and staff productivity.

Thermal wristbands include a special top coat, which provides protection against moisture, chemicals and other conditions encountered in the everyday hospital environment. On the other hand, most laser wristbands require a laminate overlay to withstand typical hospital conditions. If the overlay is not applied correctly, the bands may be prone to condensation, bacterial buildup, or smudged or smeared bar codes.

Utilizing a thermal print solution and coated wristband will help ensure the durability of the wristband throughout the patient's stay. Whereas laser-printed wristbands may require replacement every 2-4 days, thermal printers and wristbands produce smudge-free, highly durable bar codes that are readable for up to 14 days.

In addition to considering bar code print quality, hospitals must carefully evaluate all potential exposures and usage conditions when selecting wristband materials. Water, washes, sanitizers, blood and other liquids, as well as temperature extremes, UV exposure and repeated handling, all have the potential to damage images, dissolve adhesives or destroy the wristband. Output from printers on inappropriate materials may result in fading, smudges, scratches or wrinkles, which will lead to bar code read errors and the need for reprints and replacements. Testing of Zebra's Z-Band® direct thermal wristbands showed they are scannable after repeated exposure to water and common solvents (including isopropyl alcohol and ethyl rubbing alcohol), offer superior tensile strength and are unlikely to cause skin irritation.

It is also important that wristbands incorporate a secure closure. A study by the American College of Pathologists estimates that missing wristbands account for nearly three quarters of all wristband errors, and missing, poor-quality and inaccurate wristbands are a major contributing factor to many adverse events.

Advantage #2: Total Cost of Ownership for Patient Wristbanding

With dozens of printer models available to satisfy different user requirements for producing wristbands, it can be challenging for healthcare organizations to decide which option is the most cost effective over the long term. By taking steps to determine the total cost of ownership before selecting and deploying a print solution, healthcare organizations can create a roadmap for improving workflow processes and enhancing overall productivity.

Hardware Acquisition Costs

The cost of acquiring a wristband printer comprises a significant portion of the overall investment. Since laser printers are typically already in use in admissions departments and nursing stations, a common approach is to add an additional tray to an existing laser printer with the goal of keeping costs low. This approach can be problematic, however, for several reasons. First, the existing printer may have no additional space for a tray or may require an upgrade to accommodate a tray, increasing hardware costs. In addition, adding a tray may not be a viable option in the current setting due to space requirements.

From a cost perspective, a thermal wristband printer is comparable in price to a laser tray and less expensive than purchasing a new laser printer. While initial costs for thermal printers are slightly higher than those for modification of existing laser printers, thermal printers offer a lower total cost of ownership over the life of the wristband solution. Also, since thermal printers are significantly smaller and more lightweight than their laser counterparts, healthcare organizations can reduce the amount of real estate required to house the printer. For example, many organizations utilize two laser printers in the nursing and admitting areas—one to generate wristbands and one to generate documents. The acquisition of a thermal wristband printer would allow them to remove the larger of the two printers and free up a sizable amount of space. Alternatively, thermal printers are small enough to place on an admission clerk's desk, so each clerk could have his or her own wristband printer without having to walk to the centrally located laser printer for the band. This approach enhances workflow and increases overall efficiency.

Wristband Supplies

Supply costs are a key factor in determining the total cost of ownership for a patient wristband print solution. In addition to the actual cost of the wristband, healthcare organizations must determine how wristband assembly, storage and inventory costs, as well as user intervention, impact the overall investment.

Media Matters

When selecting media for thermal bar code printers, it is important to remember that these printers are very sophisticated devices, producing bars and spaces that can be precise down to the thousandths of an inch. Compatible, high-quality label and wristband media should be used with thermal printers to ensure crisp, scannable bar codes of all sizes. “Bargain” labels and wristbands can undermine a hospital’s investment in its bar code systems.

A wristband must remain with the patient and the bar code must remain readable for the duration of the patient stay. Thermal wristbands contain a top coat designed to withstand everyday hospital environments, whereas many laser wristbands require application of a laminate overlay if they are to hold up in the hospital setting—resulting in additional steps and additional expense. This approach can also result in unreadable bar codes due to creasing and wrinkling.

Also, while laser printers must print full or half sheets of wristbands or labels to maintain control of the media, thermal printers provide on-demand printing, allowing users to generate only the wristbands or medical record labels they need. The laser method requires unused wristbands or labels to be thrown away or destroyed by staff in accordance with HIPAA compliance, resulting in costly waste and added admitting time.

When using a laser print solution, wristband adhesives must be carefully selected to ensure stability under the heat and pressure of the fuser. Otherwise, the adhesive may seep onto the printer mechanism, requiring the fuser to be replaced or causing a paper jam. Since thermal printers are designed to accommodate labels and wristbands, they rarely jam from adhesive media.

Toner Expenses

With laser printers, toner costs can skyrocket when printing bar codes instead of typical text. While text printing requires only about 5 percent black toner, bar code needs can exceed 30 percent to ensure proper contrast between dark and light elements. Toner costs alone could be six times higher when printing bar codes rather than text.

In addition to the cost of purchasing toner for laser printers, hospitals must also factor in the expense of maintaining an inventory of toner cartridges and how much space will be required. Additional costs include staff time spent troubleshooting and replacing toner cartridges. Unlike laser, thermal printers do not require users to replace ink or toner or store toner cartridges. With no supplies to replace other than the material to be printed, long-term maintenance costs and total cost of ownership remain low.

Ease of Software Integration

An effective patient wristbanding solution should easily integrate with a hospital’s existing information systems to simplify deployment and ongoing system management. The leading 11 Admission Discharge Transfer (ADT) system providers have authorized Zebra wristband printers to work seamlessly with their software solutions. This designation guarantees that Zebra® printers integrate smoothly with the ADT applications, lowering deployment costs and speeding implementation.

The benefits of using thermal print technology for wristbands are numerous for IT staff who install and support the hardware. Zebra solutions utilize a single, easy-to-use programming language across the entire hospital—whether those printers are used for wristbanding or other applications such as medication or specimen labeling—thus reducing demand on IT resources. Help desk calls and the need for troubleshooting are minimized, which frees up IT staff to focus on more strategic initiatives.

IT Support and Maintenance

Maintenance requirements vary depending on whether a thermal or laser print solution is used. For example, most laser print solution providers recommend preventive maintenance at various milestones, such as at 30,000 or 90,000 pages, and require users to purchase maintenance kits. These kits cost several hundred dollars and are not part of standard warranty and support agreements.

Much of the support for laser printers is associated with the fuser mechanism, which generally needs to be replaced more frequently than a printhead on a thermal printer. In addition, because stored media can get moist, the adhesive can stick to the fuser, which is very time-consuming and expensive to clean. Thermal printers are fairly low-maintenance by comparison and simply require the use of alcohol and a cotton swab to clean the printhead as needed. Warranty costs typically run about one-third to one-half of a typical laser warranty agreement.

It is also important not to overlook the costs associated with help desk calls. When adding the complexity of printing on adhesive stock to a laser printer, help desk calls are likely to increase dramatically. In fact, industry estimates show that anywhere from 10 to 25 percent of help desk calls are print related.

Advantage #3: Patient Comfort

While laser printers cannot produce the Aztec Code 2-D symbology, numerous thermal wristbanding solutions can. Many hospitals that have already implemented bedside scanning for patient safety applications have opted to print Aztec 2-D bar codes on patient wristbands. Aztec Code is an ideal symbology for use in hospitals because it is extremely space efficient and can encode a significant amount of data.

In addition, Aztec Code does not need a quiet zone between symbols like other 2-D symbologies, which means the code can be printed multiple times on the patient's wristband. This ensures that a bar code is always visible and ready to be scanned by medical staff regardless of the wristband's position. As a result, caregivers do not have to move or disturb the patient to get a fast and accurate scan.

To maximize patient comfort, it is also imperative to select a line of wristbands that offers a range of sizes, including infant, pediatric, adult, and bariatric, and is produced using extra soft material. Patients are often experiencing pain during while in a hospital—they don't need a band that adds to that discomfort.

Advantage #4: Ease of Use

Ease of use is a critical factor in ensuring that admissions and nursing staff fully embrace bar coding and the improved processes it enables. The adoption and use of a thermal print solution simplifies the patient wristbanding process, resulting in improved efficiency and workflow. Ideally suited for bar coding applications, thermal print solutions eliminate the need for time-consuming lamination and complicated wristband assembly. This is not the case with most laser solutions. Because the toner used in laser printers is not moisture resistant, staff may have to take several steps to assemble wristbands to ensure protection of the text or bar code printed on the band. This includes printing a sheet of wristbands, tearing out the individual wristband from the sheet, releasing the adhesive, folding over a protective clear coating to secure the image on the wristband and applying it to the patient.

This five-step approach is labor intensive and prone to creating wrinkles or creases on the wristband if not applied precisely. These creases may prevent the bar code symbol from being scanned at the bedside or may create an opening for water and other substances to seep in and damage the wristband, requiring workarounds.

Thermal printers, by contrast, burn the image onto the wristband and do not require a protective overlay to be applied by the user. This means that thermal wristbands can be applied in only two steps—printing the wristband and adhering it around the patient’s wrist. This simplified wristbanding process enables staff to spend less time generating and replacing wristbands, which enhances overall productivity.

The cartridges or rolls of wristbands used by thermal printers are easy to load. And, the printers don’t require toner or ink, so staff members don’t spend valuable time monitoring those supplies, replacing toner cartridges and clearing printer jams. Laser printers are prone to jamming when used to print labels and wristbands because of adhesive buildup. This isn’t a problem for thermal printers, which are specifically designed to print labels and wristbands.

In addition, thermal print solutions provide a dedicated machine for wristbanding, freeing up existing laser printers to focus on what they do best—document-based print jobs. This lessens the burden on laser print systems, reducing wear and tear that could lead to premature repair and replacement. Using dedicated printers for wristband generation also prevents delays and saves labor associated with multi-purpose print operations. If an office laser printer is also tasked to produce labels, label jobs may get stuck in a lengthy print queue while documents and reports are being printed. Furthermore, thermal printers can easily accept and encode variable data without dramatically slowing print speed. Laser printers are not optimized to handle the demands of variable data, which can result in slower processing of print jobs.

In addition to the advantages to admissions and nursing staff, the streamlined efficiency of thermal print solutions translates to fewer help desk calls and less demand on IT resources. Thermal printers provide intuitive interfaces for convenient connection and management in hospital environments and can be easily calibrated to accommodate varying wristband sizes. No special programming or font add-ons are required to produce the bar code formats needed for hospital applications.

All of these advantages simplify the patient wristbanding process, fostering adoption by staff and supporting change management initiatives, as departmental workflow is improved.

Conclusion

Bar coded wristbands enable caregivers to quickly access medical information at the point of care for a variety of patient safety applications, but these benefits can easily be lost if bar code generation is trusted to a general purpose laser printer that lacks the specific features necessary to ensure quality bar code output. The initial capital outlay for a dedicated thermal bar code labeling system will be more than offset by the productivity gains, quality advantages and material savings that it provides when compared to other print technologies, even for users who print wristbands infrequently.

Zebra Technologies is a leading manufacturer of specialty thermal print solutions, including wireless, mobile, high-volume and wristband printers designed to meet the unique needs of the healthcare market. Zebra solutions help healthcare organizations reduce errors and increase productivity while protecting patient safety and privacy. Thermal print solutions from Zebra incorporate text, graphics, bar codes and/or RFID to produce the on-demand labels, tags, ID badges and wristbands at the heart of today's patient safety initiatives. With the broadest product line, largest installed base and highest customer satisfaction ratings, Zebra printers and supplies are the preferred choice.

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