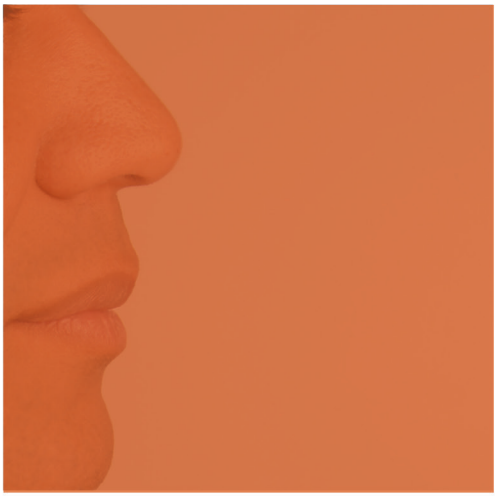
mastisol®
LIQUID ADHESIVE

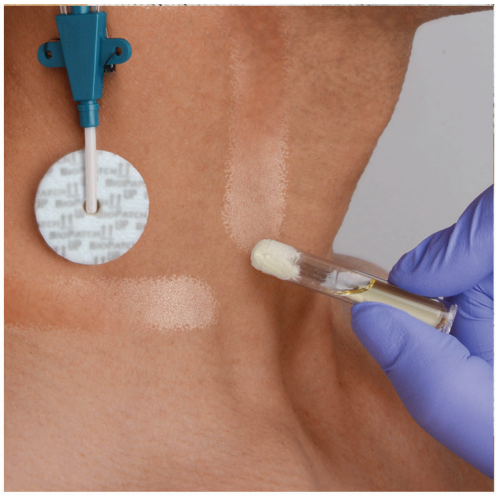
Evidence-Based White Paper











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EXECUTIVE SUMMARY

The United States (US) health care system is undergoing a significant shift from pay for reporting to pay for performance. Topics such as value-based purchasing and patient satisfaction are discussed every day, but the evidence-based decision-making model has not changed. Evidence-based decision making requires the health care provider to consider the individual patient's clinical circumstances and the state of the science to select the best choice.

The goal of this white paper is to present the quantitative and qualitative evidence associated with Mastisol® Liquid Adhesive and its indirect benefits for decreasing the risk of hospital-acquired infection by enhancing adherence to evidence-based interventions, along with the value added regarding increased patient safety, improved caregiver and patient satisfaction, and decreased costs.



HOSPITAL-ACQUIRED INFECTIONS: CATHETER-RELATED BLOODSTREAM INFECTIONS

Definitions

In 2011, the Centers for Disease Control and Prevention (CDC) published evidence-based guidelines regarding the prevention of catheter-related bloodstream infections (CRBSIs).[1] The guidelines highlighted the fact that terminology associated with different types of bloodstream infections can be confusing because CRBSIs and central line–associated bloodstream infections (CLABSIs) have often been used interchangeably; however, their definitions are different.[1] A CRBSI is a clinical definition requiring confirmation by laboratory testing, whereas the definition associated with CLABSIs is most often used for surveillance.[1]

The National Healthcare Safety Network (NHSN) defines an incidence of CLABSI as "a laboratory confirmed bloodstream infection (LCBI) where an eligible bloodstream infection organism is identified and an eligible central line is present on the LCBI day of event or the day before."[2]

Public Health Burden

The public health burden associated with hospital-acquired infections is substantial and includes increased morbidity and mortality, increased length of hospital stay, and increased costs. It is well known that CRBSIs are associated with increased morbidity and mortality. Raad et al published an attributable mortality rate of 12% to 25% in the critical care patient population that experiences catheter-related bacteremia,[3] and the CDC has estimated approximately 71,900 CLABSIs occur in the US each year.[4] Another study reported that nearly 80,000 CLABSIs occur in the US annually, with approximately 25,000 CLABSI-related intensive care unit (ICU) deaths.[5] The excess costs associated with each incidence of CLABSI ranges up to $46,685.[6] Additional estimates place the total economic burden of CLABSIs in the US at approximately $2 billion.[5]

The NHSN reported between 2008 and 2014, there was a 50% decrease in CLABSI incidence, due to evidence-based bundle implementation, but the public health burden remains high for patients who develop an infection.[7]

EVIDENCE-BASED PREVENTION OF CRBSI

The development of CRBSI takes place by contamination of the catheter in 1 of 4 separate ways either intraluminally or extraluminally, with the majority being extraluminal.[1,8]

1. "Migration of skin organisms at the insertion site into the cutaneous catheter tract and along the surface of the catheter with colonization of the tip
2. Direct contamination of the catheter or hub by hand contact or contaminated fluids/devices
3. Hematogenous seeding from another focus of infection
4. Infusate contamination (rare)"

Published guidance for preventing CRBSIs recommends a bundled approach for eliminating known risks.[1,9] Multiple organizations, including the CDC, have published evidence-based guidelines for preventing CRBSIs, and among multiple recommendations, the CDC stated that prevention of catheter migration or dislodgement may help prevent CRBSIs.[1] The Joint Commission requires accredited hospitals to adhere to published best practices as part of National Patient Safety Goal #07.04.01 to prevent CLABSI.[10]

The evidence-based guidelines for prevention of CRBSI address multiple elements, from educational to methodologic interventions. Reports show hospitals have been able to reduce CLABSI incidence up to 70% by adhering to evidence-based interventions.[7] The evidence–based role of Mastisol® Liquid Adhesive is centered on effective securement of the device dressing once the device is inserted.

MASTISOL® LIQUID ADHESIVE EVIDENCE

Efficacy

Mastisol® Liquid Adhesive is a liquid medical adhesive used to secure dressings, tapes, and certain medical devices to ensure secure placement over an extended period of time. Mastisol® Liquid Adhesive is non–water soluble and comprises the following ingredients:

- Gum mastic
- Styrax
- Alcohol (SDA-23)
- Methyl salicylate

Adherence to Evidence-Based Guidelines

Evidence-based guidelines have been published for the prevention of CRBSIs, and in 2011, recommendations published by the CDC led to a paradigm shift in the approach to catheter management.[1] This paradigm shift resulted from Category 1B CDC recommendations that stated, "Do not routinely replace central venous catheters (CVCs), peripherally inserted central catheters (PICCs), hemodialysis catheters, or pulmonary artery catheters to prevent catheter-related infections…and…Replace dressings used on short-term CVC sites at least every 7 days for transparent dressings, except in those pediatric patients in which the risk for dislodging the catheter may outweigh the benefit of changing the dressing."[1] Another Category 1B recommendation from the same document states, "Replace catheter site dressing if the dressing becomes damp, loosened, or visibly soiled."[1]

The paradigm shift was a clinical transition for standard of care, which shifted from routine and scheduled replacement of catheters and dressings to replacement only when clinically indicated up to every 7 days.[1] In keeping with best practices, Infusion Therapy Standards of Practice published standard #41 suggesting, "Site care, including skin antisepsis and dressings are performed immediately if the dressing becomes damp, loosened or visibly soiled. Avoid the use of tape in reinforcing the dressing because rolls of non-sterile tape can be contaminated with bacteria."[11]

Mastisol® Liquid Adhesive may help caregivers adhere to these best-practice recommendations by preventing the loosening of dressings for up to 7 days, with enhanced securement and a non–water soluble composition, which in turn may prevent catheter insertion-site exposure and catheter dislodgement.

In addition, recent laboratory testing has confirmed that Mastisol® Liquid Adhesive is compatible with chlorhexidine gluconate (CHG).[12] This compatibility is important from an adherence perspective because CHG skin preparation and CHG-impregnated dressings are recommended to reduce the risk of CRBSI,[1] and the documented compatibility of Mastisol® Liquid Adhesive with CHG ensures that application of Mastisol® Liquid Adhesive to enhance adhesion of CHG-impregnated dressings will not affect the effectiveness of the antimicrobial agent.[12]

Decreased Risk

The prevalence of dressing disruptions in the ICU population has not been studied in depth;[13] however, prevalence has been reported to be 42% in a hematologic population[14] and other prevalence reports have indicated that dressing nonadherence occurs in 11% to 57% of dressings.[13,15,16] Chan et al reported, "The most common failure type (6% of all PICCs) was dislodgement, confirming that this is an ongoing significant problem and that PICC dressing and securement is a priority area for improvement."[17]

The importance of dressing disruptions was highlighted in a multicenter randomized study conducted by Timsit et al.[13] A total of 1419 patients were analyzed, and of 11,036 dressing changes, 67% (n = 7347) were changed before the planned date because of dressing disruption or soiling.[13] This study conducted well-designed multivariate logistic regression analyses and found that dressing disruption was related to the risk of CRBSI and colonization as follows[13]:

- The number of dressing disruptions was significantly associated with colonization of the skin around the catheter on removal ($P < 0.0001$).
- There was a 3-fold increased risk of major catheter-related infection and CRBSI after the second dressing disruption.
- There was a 12-fold increased risk of major catheter-related infection and catheter colonization after the final dressing disruption.

A study found that 4 commercially available central venous catheter dressings had surprisingly limited durability.[18] A total of 75% of the dressings lasted less than 48 hours, and only 3% of dressings lasted a full 7 days.[18]

Extensive research has been conducted on the effectiveness of Mastisol® Liquid Adhesive compared to tincture of benzoin, and Mastisol® Liquid Adhesive has been shown to result in fewer incidents of allergic dermatitis[19,20] and to be superior in ensuring the adherence of different types of tapes and dressings.[20-22] As a result, the risk of skin or catheter colonization or CRBSI related to dressing disruption may be reduced with the use of Mastisol® Liquid Adhesive.



A quality improvement initiative took place on a Hematology/Oncology & Bone Marrow Transplant Unit to reduce central-line dressing disruptions and resulted in a 76% reduction in CLABSI rates from a baseline peak rate of 2.9 per 1000 device-days to 0.7.[24]

CASE STUDY

In 2014, Florida Hospital conducted a before/after quality improvement study to determine the effectiveness of Mastisol® Liquid Adhesive and determined that the use of Mastisol® Liquid Adhesive was associated with fewer disrupted dressings compared to standard of care (Figure 1).[23]

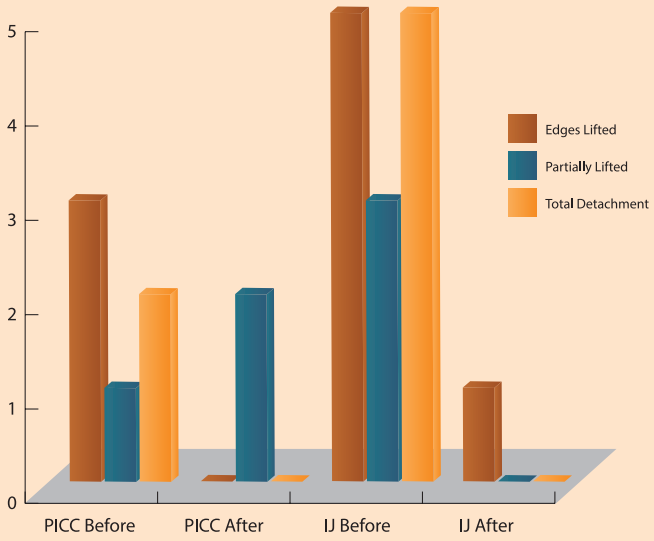


Figure 1

CASE STUDY

A dressing bundle with gum mastic and adhesive remover was implemented at a Methodist facility in 2017 to improve dressing integrity.[25] Over 8,000 peripheral intravenous sites were assessed. The authors reported dressing integrity was improved and no dressing-related skin injuries were reported based on continuous consultation with wound nurses.[25]



CASE STUDY

In 2016, a quality improvement initiative was conducted on a Hematology/Oncology & Bone Marrow Transplant Unit to reduce central-line dressing disruptions. This quality initiative reported the following[24]:

- A 76% reduction in CLABSI rates from a baseline peak rate of 2.9 per 1000 device-days to 0.7.
- Staff satisfaction surveys documented that staff felt the intervention was easy to implement.

Figure 1. Sum of before and after dressing assessments: intact vs. nonintact

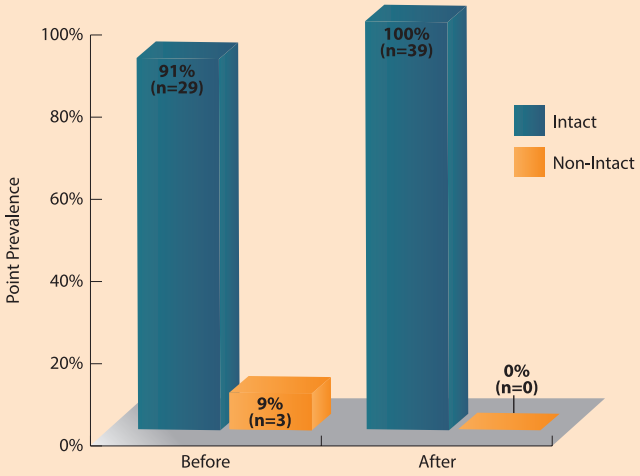
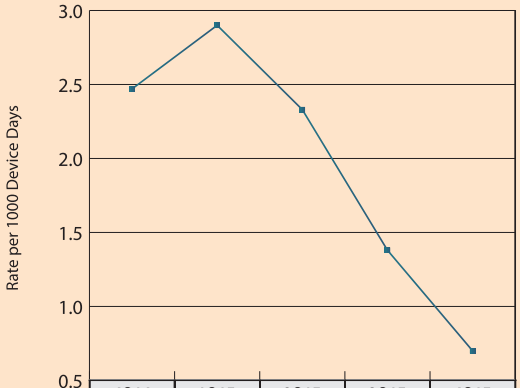


Figure 2. CLABSI – LCBI NHSN health-care acquired rate per 1000 device-days



	4Q14	1Q15	2Q15	3Q15	4Q15
Rate	2.47	2.9	2.33	1.38	0.7
CL Days	1619	1722	1715	1453	1427
# of LCBI	4	5	4	2	1
# of MBI	5	2	3	5	2

LCBI: Laboratory-confirmed bloodstream infection - MBI: Mucosal barrier injury

Improved Satisfaction

Procedure-related pain leads to patient dissatisfaction, often with negative emotional and psychologic implications.[26] Needle phobia, referred to as belonephobia, affects approximately 3.5% of the population, and the median age for developing this fear is 5.5 years.[27] Needle phobia is associated with anxiety, fear, and behavioral distress in patients, their families, and caregivers conducting the procedure.[26-28] In many cases, needle phobia is associated with a vasovagal response, which can lead to loss of consciousness.[28]

The use of Mastisol® Liquid Adhesive is proven to enhance the adherence of dressings and reduce the risk of catheter dislodgement.[29] An important study by Bloc et al assessed 60 patients undergoing insertion of peripheral nerve catheters for pain relief and found that Mastisol® Liquid Adhesive ensured secure fixation in 94% of these patients.[29] Another study by Patel et al assessed the force necessary to dislodge angiocatheters and reported that Mastisol® Liquid Adhesive enhanced adhesive properties of multiple tapes, leading to a reduced risk of catheter dislodgement.[30]

The afforementioned studies demonstrate that Mastisol® Liquid Adhesive can help avoid unnecessary procedures associated with catheter reinsertion, which is particularly important for patients with needle phobia.

Interventions for improving patient satisfaction are an important focus in today's health care environment. As hospitals have shifted to the pay-for-performance model, the total performance score associated with value-based performance has become essential for hospital reimbursement.[31] The total performance score is based on quality criteria set by the Centers for Medicare and Medicaid Services (CMS) each fiscal year, which are centered on clinical criteria and patient experience criteria.[31] The patient experience criteria assess patient satisfaction on multiple levels including pain management and overall rating of perception of care.[31] Mastisol® Liquid Adhesive is one of the evidence-based interventions available to help prevent unnecessary procedures due to dressing loosening or accidental dislodgement and may have a direct effect on patient perception of care.

Safety

Mastisol® Liquid Adhesive has been found to be safe and effective compared to tincture of benzoin in patients. Observations in multiple patients who have received application of Mastisol® Liquid Adhesive have revealed a low incidence of allergic reactions, increased dressing/device integrity, and product compatibility with the antimicrobial agent CHG.[12,19,20] Proper securement of critical devices is essential for patient safety. Critical devices include vascular access devices, endotracheal tubes, nasogastric tubes, and indwelling urinary catheters.[32]

Decreased Costs

The cost savings of Mastisol® Liquid Adhesive result from improved patient outcomes, reduced risk of hospital-acquired infections owing to device loosening/dislodgment, and the potential for improved patient satisfaction, which may positively impact the value-based purchasing model and total performance score.

The CDC published a report on economic outcomes and discussed direct, indirect, and intangible outcomes associated with hospital-acquired infections.[33] It is difficult to measure indirect and intangible cost savings as a result of preventing unnecessary procedures, but these should be taken into consideration when factoring in patient satisfaction. Cost avoidance associated with Mastisol® Liquid Adhesive can include the following:

- Minimizing costs associated with premature dressing changes (evidence-based estimates range from $5.00 to $9.50 per dressing)[13]
- Reduction in CLABSI excess costs ranging from $29,156[33] to $46,685[6]
- Time savings due to fewer dressing disruptions, with mean time to complete a dressing change reported to be 13.5 minutes[18]
- Improved patient satisfaction by avoiding unnecessary procedures, potentially impacting the total performance score[31]
  Intangible savings via psychologic cost savings[33]
  - › Reduced patient anxiety by avoiding unnecessary procedures
  - › Reduced pain and suffering by avoiding unnecessary procedures

CONCLUSIONS

This white paper has presented quantitative and qualitative evidence associated with the benefits of Mastisol® Liquid Adhesive. The safety and efficacy of Mastisol® Liquid Adhesive has been well documented, and it should be considered an evidence-based tool for reducing the risk of CRBSI and for the prevention of unnecessary procedures. Use of Mastisol® Liquid Adhesive may help enhance adherence to evidence-based best practices. The adherence to best practices for prevention of hospital-acquired infections has multiple benefits, including improved patient safety, satisfaction, and value of care.

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Mastisol is an essential product in the Eloquest Healthcare® portfolio.

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