As more and more cardiac surgical procedures involve re-do sternotomies and re-operative surgeries, surgical field hemostasis becomes more and more challenging. Reducing or eliminating blood and/or blood component transfusion has been shown to improve patient outcomes and has an added economic benefit. Increasing patient demand for “bloodless” surgical techniques is driven by religious beliefs and increased patient awareness as a result of the internet. The challenge is increased in these re-operative procedures when more and more patients present to the surgeon on aspirin or other platelet-inhibiting drugs, oral anti-coagulants including Coumadin and Factor X antagonists and heparin. As such there is an ever-increasing need for coagulation solutions, whether systemic or topical. Topical hemostatic agents can be a great help to the surgeon in achieving surgical field hemostasis and are increasingly being employed. Our approach, to these difficult patients, includes the systematic and planned use of AristaAH, which is a novel hemostatic agent whose use has proven safe and efficacious in our patient population.

Abstract
Patients undergoing re-operative cardiac surgical procedures present a great challenge with regard to obtaining hemostasis in the surgical field. Adhesions are ever-present and these patients are often on oral anti-coagulants and platelet inhibitors. As part of a well-planned surgical intervention, a systematic approach to hemostasis should be employed to decrease blood transfusion requirement and improve patient outcomes. Topical hemostatic agents can be a great help to the surgeon in achieving surgical field hemostasis and are increasingly being employed. Our approach, to these difficult patients, includes the systematic and planned use of AristaAH, which is a novel hemostatic agent whose use has proven safe and efficacious in our patient population.

Keywords
AristaAH, re-operative, cardiac, surgery, re-do, hemostat, transfusion, safe

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to stop bleeding. We have previously published our approach to cardiac transplant and cardiac assist device patients were AristaAH is an important and necessary agent in our armamentarium for local hemostasis. We do employ the use of surgical sealants in our practice at specific suture lines during the procedure, but also use a broadly dispersible, no preparation needed, easily applied, agent (AristaAH) towards the conclusion of the case in all re-operative cardiac surgical procedures. We have found no better ‘whole field’ agent to ameliorate bleeding from multiple, raw surfaces, than this agent.

Case Studies
Case 1
A 72-year-old male on Coumadin and Plavix underwent a re-do valve replacement following a previous aortic dissection with valve repair two years ago. As expected, during the surgery there were multiple adhesions and the entire surgical field contained raw bleeding surfaces. The valve was replaced with a porcine prosthesis without incident and a surgical sealant was used on the aortic suture lines and cannulation sites. Following protamine administration and weaning from cardiopulmonary bypass, AristaAH was generously applied to the surgical field for topical hemostasis (see Figure 1, before and after). The surgical field bleeding greatly improved and the chest was closed. The patient recovered and was discharged home.

Case 2
A 62-year-old male who had previously undergone mitral valve repair developed severe heart failure. This patient underwent re-do sternotomy and destination left ventricular assist device (LVAD) placement. A surgical sealant was applied to the suture lines. AristaAH, once again a planned application, was liberally applied to the surgical field, light pressure held as appropriate, and improved hemostasis resulted (see Figure 2).

Discussion
Re-operative cardiac surgical procedures will continue to increase in the cardiac surgeon’s everyday practice and more patients will present with compromised coagulation cascades and platelet dysfunction secondary to the increasing use of anticoagulants and anti-platelet agents. Despite blood component transfusions and intravenous factor replacement, local field hemostasis will remain a challenge. Topical hemostatic agents are becoming an important tool in the surgeon’s ‘battle’ for localized hemostasis. In our practice, we use synthetic sealants for anastomotic suture lines and employ the routine use of Arista for ‘whole field’
hemostasis. We have found that ‘prophylactic’ use of this agent has improved our surgical field hemostasis at the end of the procedure, especially in re-operative cases and assist device implantations. Of note, we have also found Arista to be extremely helpful in localizing “problem bleeding areas that may require additional surgical hemostasis” by the visualizing the clumping of blood in these specific areas which easily contrasts with the surrounding white powder areas.

AristaAH (Microporous Polysaccharide Hemospheres) is a novel plant-derived powdered hemostat with a history of use in cardiac surgery. We use this agent in all of our re-do surgical patients, cardiac transplants, and device patients as a planned intervention. As previously mentioned, we apply this agent liberally to the surgical field and we have even started using it on patients with first time cardiac surgical procedures who have disordered hemostatic profiles. This agent provides rapid control of diffuse bleeding and has outstanding safety profile. AristaAH (MPH) is an engineered microsphere formed from cross-linked polysaccharide chains. When applied to a bleeding wound it rapidly absorbs fluid and small molecular weight compounds. Subsequently, a gel is formed which presents a mechanical barrier to bleeding and a fibrin clot rapidly forms. AristaAH is rapidly metabolized by amylase enzymes and is generally cleared in 48 hours and may be used even when cell salvage systems are used as long as a 40 micron filter is used.

**Conclusion**

Patients undergoing re-operative cardiac surgical procedures such as re-do coronary interventions, valve replacement/repair, cardiac transplantation, or assist device implantation will continue to present a challenge to the surgeon to achieve hemostasis and minimize blood product transfusion. We have adapted our practice to utilize synthetic sealants for suture line reinforcement and the planned and liberal use of AristaAH (whole surgical field) hemostasis. AristaAH is a novel polysaccharide hemostat and has an exceptional safety record and we have yet to experience any complications related to its application or presence in the surgical wound. We continue to use it routinely in a planned fashion on all of our patients undergoing redo cardiac surgical procedures.