Reduction in Central Venous Catheter Infections and Occlusions: Examining the Clinical Impact of a Pressure Activated Anti-Reflux Connector

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BACKGROUND

With approximately seven million midline, PICC, and CVC catheters placed in the US every year, catheter occlusion is one of the most common IV complications[1]. Occluded catheters have been identified as a major risk factor for central line blood-stream infections (CLABSIs). CLABSI rates have an enormous impact on CMS reimbursements, cost of patient care, as well as overall patient outcomes. The CDC estimated that each occurrence of CLABSI costs between $34,000 and $54,000.[4] BSI have a mortality rate between 12% and 25%.[4] It has been estimated that 58% of these occlusions are of thrombotic origin, i.e. caused by blood refluxing into the catheter[5]. Blood reflux related to vascular access devices (VAD) is defined as the unintentional movement of blood in and out of a catheter caused by internal pressure changes in the patient's vasculature and external mechanical changes due to connection and disconnection, flushing syringe manipulations, low KVO rates and the mechanical pressure changes associated with ventilators and IV pumps. In 2007, Hartford Hospital formed a BSI Steering Sub-committee and set a goal to achieve a zero CLABSI rate. This multidisciplinary team began by setting specific goals to evaluate infection prevention practices to assist the clinician in the care and maintenance of CVCs. Their strategies have yielded a significant decrease in catheter occlusions as well as CLABSI rates.

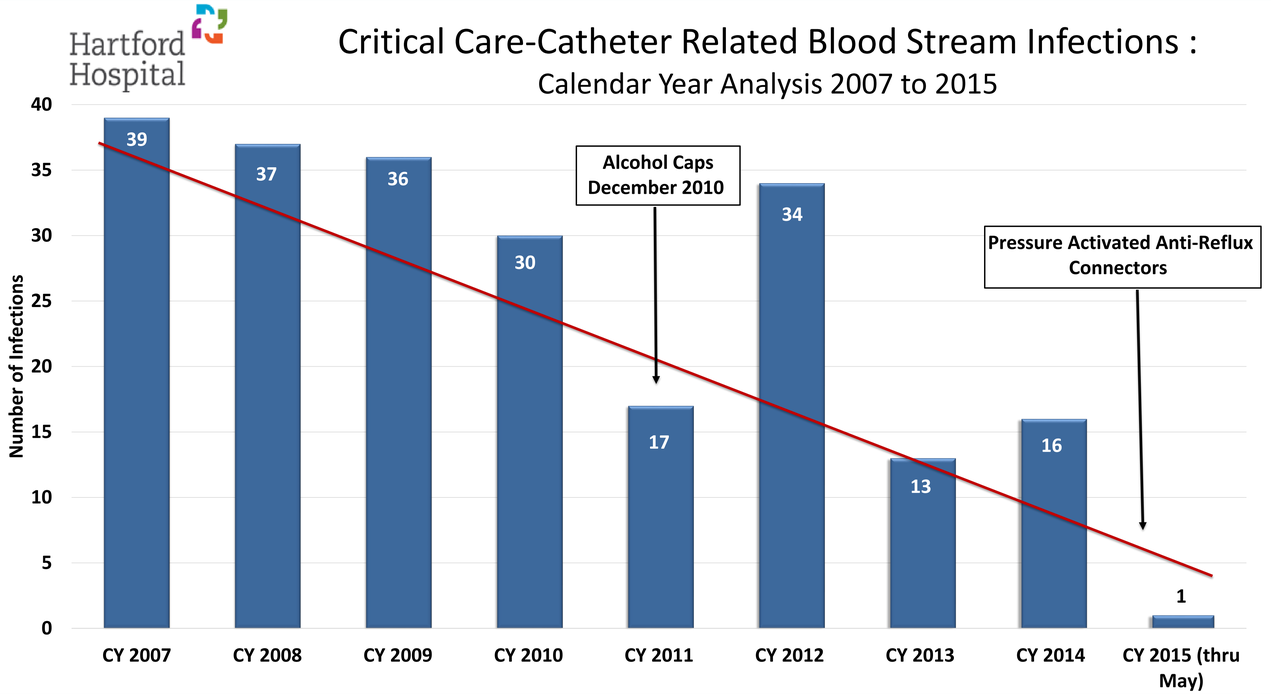
PURPOSE

The purpose of this retrospective study is to evaluate the clinical and financial impacts of a new Pressure Activated Anti-Reflux connector. Our goals were to further reduce our CLABSI's rates, reduce our medical and pharmacy supply cost, improve overall patient outcomes and provide a failsafe automatic clamping solution for our clinician which was not dependent on a particular clamping sequence or practice to prevent unintentional blood reflux into our IV catheter.

METHODS

In November of 2014, our hospital implemented a new needleless connector which uses an innovative Pressure Activated Anti-Reflux technology. The hospital's CQVA committee approved the transition after a successful 3- month product trial which demonstrated strong clinical and financial outcomes. The trial consisted of placing a Nexus TKO-6P Pressure activated Anti-Reflux needleless connector on all CVCs in Hartford Hospital's 5 ICU's; which had a total bed count of 78. During the trial, heparin flushing orders were stopped, while saline flushing continued. From the first day of the evaluation, every dose of tPA given was tracked daily; chart reviews and discussions were shared with the nursing teams. Data collection of CLABSI and tPA doses and tPA cost in these ICU's were already in place prior to the switch to the new connector. This retrospective examination of the data highlights the impact of the new Pressure Activated Anti-Reflux connector and the resulting decrease in CLABSI rates as well as the reduction in tPA usage and overall tPA costs.

CLABSI RESULTS



CLABSI CONCLUSIONS

The efforts of the Hartford Hospital BSI Steering Sub-committee to combat CLABSI have resulted in gradual CLABSI decline since the committee inception in 2007. Two notable decreases were shown after implementing alcohol caps and then also after implementing of the Nexus TKO-6P Anti-Reflux technology. As noted on the next page, CVC occlusion and the corresponding tPA usage also decreased significantly after implementing the Pressure Activated Anti-Reflux Connector. Occluded catheters have been identified as a major risk factor for central line associated blood-stream infections (CLABSIs) [2,3]. This tPA reduction during the same time period as the corresponding decrease in CLABSI, supports earlier research showing the direct relationship between thrombosis and blood stream infection [9,10]. Please note the CY2012 CLABSI increase was attributed to an elimination of quality monitoring and larger focus on VAP . Upon noting the CLABSI increase, monitoring was reinitiated and CLABSI results again dropped.

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CLINICAL OBSERVATIONS

Average monthly tPA consumption ranged from 117 to 121 doses per month with routine Heparin flushing while using ICU Medical Clave Connectors. Upon implementation of the Nexus TKO, the number of doses of tPA used dropped by 62 per month or a 52% decrease. Upon closer patient assessments by the IV Team, tPA was found to have been misused in cases where catheters were kinked, malpositioned, or had non-thrombotic occlusions. Based upon these findings, the hospital's Pharmacy and Therapeutics committee made the decision to place the IV Team in charge of all tPA pharmacy orders. The conversion to the IV Team's new CVC occlusion assessments program is showing further reduction in tPA consumption with a goal set of achieving a greater then 80% reduction when appropriately used in conjunction with the Pressure Activated Anti-Reflux connector. Another positive outcome of the CVC occlusion assessments program was the IV Team's development of a detailed trouble-shooting algorithm for properly assessing all CVC occlusions before tPA therapy is ordered.

FINANCIAL RESULTS

Based upon the 52% reduction in tPA as well as the elimination of Heparin flushing syringes, the hospital has reduced pharmacy supply spend by $115,920 annually. Based upon the performance of the TKO connector, fewer devices are used per month compared to the Clave connector. Overall needleless connector consumption is down 28% or 34,750 fewer devices used per year.

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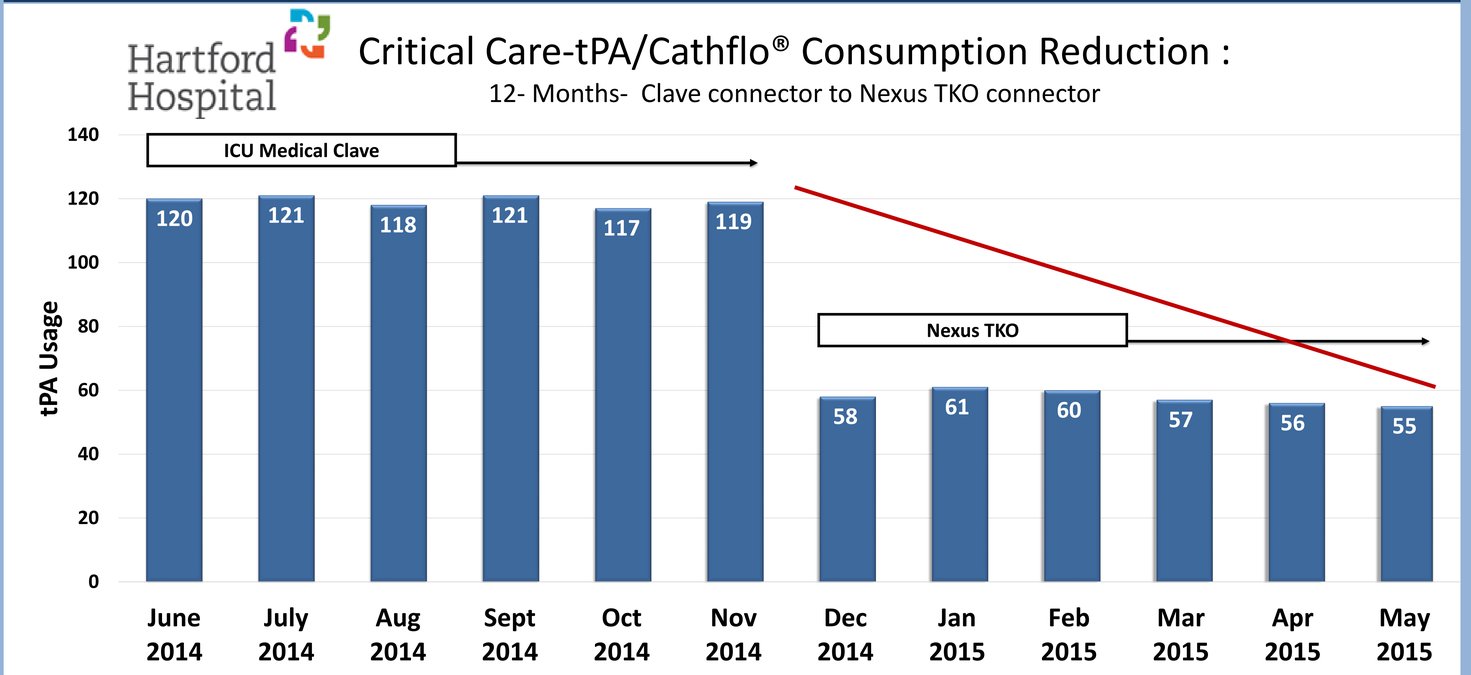
CATHETER OCCLUSION RESULTS



CATHETER OCCLUSION CONCLUSIONS

The usage of an Pressure Activated Anti-Reflux connector technology has proven to significantly reduce occlusions (52%) while simultaneously eliminating Heparin flushing protocols. The correlation of this decrease in CVC occlusion with a corresponding decrease in CLABSI, supports the hypothesis that reducing unintentional blood reflux into the lumen of catheter tip will decrease the thrombotic material which is proven to be associated with an increase in central line associated blood stream infection [2,3]. More research is needed to fully support this hypothesis as well as the overall financial saving associated with this new needleless connector product category called Pressure Activated Anti-Reflux.