

# Creating a Culture of Closure: Implementation of the ICU Medical Chemotherapy Closed System for Antineoplastic Agent Administration

Moore A, Wiley K, Maloney K, Holmes M, Hospital of the University of Pennsylvania

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## PURPOSE

The purpose of this study was to evaluate the effects of implementing the ChemoClave™ closed system transfer device (ICU Medical Inc., San Clemente, CA) at Abramson Cancer Center at the Hospital of the University of Pennsylvania, a recognized leader in solid and liquid cancer care, research, and education. Over 55,000 doses of chemotherapy are delivered per year between Abramson's three inpatient oncology units and outpatient chemotherapy clinics.

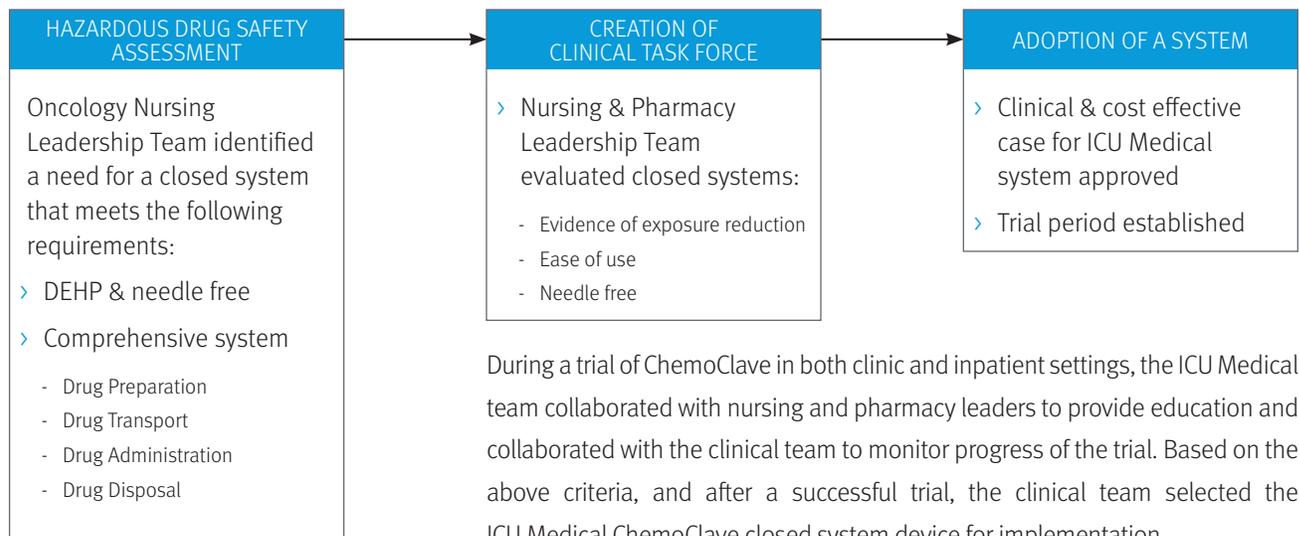
## BACKGROUND

While guidelines for the use of personal protective equipment have been well established in literature for years, the last two decades of research on hazardous drugs has focused on methods of hazardous drug exposure and the associated health risks for health care providers. Several studies have confirmed the presence of hazardous drug surface contamination in both pharmacy and nursing units where drugs are prepared and administered. The use of closed systems has thus emerged as a method to prevent the transfer of environmental contaminants and the escape of drug or vapor.

The implementation of a closed system as defined by NIOSH is essential for the safety of health care providers responsible for preparing, transporting, administering, and disposing of antineoplastic agents.

## MATERIALS AND METHODS

Given the evidence supporting the benefits of using a closed system, a multidisciplinary team, including nursing and pharmacy, developed an implementation process and criteria to objectively determine which closed system should be adopted.



## RESULTS

After converting to the ICU Medical ChemoClave closed system and thoroughly training nursing and pharmacy staff, the following clinical safety and financial benefits were observed.

### Spill Prevention

Before the conversion to ChemoClave, if a chemotherapy line became disconnected from a patient, the IV pump would continue to infuse, thereby leading to a larger spill and significant exposure to the clinician and the patient. With the implementation of the Spiros<sup>®</sup> closed male luer—a self-sealing mechanism that prevents spills and is a component of the ChemoClave system—that risk is eliminated. Spiros' self-sealing closed design will cause an IV pump occlusion alarm to fire if a line were to become disconnected, thereby immediately alerting the RN and eliminating the opportunity for drug leakage and exposure.

In addition to being placed on sets, the Spiros is now being applied to syringes for IVP, subcutaneous, and intramuscular infusions, as well, making the system closed for all routes of administration and preventing any drug leakage with the automatic “self-sealing” technology.

### Cost Effectiveness

Also, prior to the implementation of ChemoClave, primary tubing was discarded with the empty chemotherapy bag every 24 hours in order to stay in compliance with ONS and NIOSH, which prohibit removal of the spike from the bags. The ICU closed system has an adaptor that facilitates primary infusion of chemotherapy and reduces overall costs by allowing primary tubing to stay in place for 24 hours and allows the entire drug to be flushed at the end of infusion.

The ICU Medical secondary sets also provided cost savings, since prior to implementation, every new chemotherapy infusion would require a new secondary set in order to prevent the dry spike from being removed.

## CONCLUSION

The implementation of a closed system as defined by NIOSH is essential for the safety of health care providers preparing, transporting, administering, and disposing of antineoplastic agents. Successful implementation requires approval from administration, collaboration between pharmacy and nursing, and buy-in from clinical staff. Finally, a written set of guidelines for the integration of the closed system into nursing practice is essential to reduce variation in practice and ensure staff safety.

Qualitative reports indicated increased satisfaction and perceptions of safety while preparing and handling antineoplastic agents. To date, none of the nurses have observed any increases in bloodstream infections or air-in-line alarms with the implementation of the ICU Medical ChemoClave system. The nursing staff has reported they feel safer using the product and that overall the system is easy to use. Surface wipe tests are underway to evaluate environmental safety. Preliminary results reveal a reduction in contamination.