

Evaluating Needle-free Systems

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The first protective I.V. device (click lock) was introduced in the early 1980s. This system has a positive locking mechanism that protects the patient from accidental disconnections and contamination by eliminating the use of unsterile tape.^{1,2}

Accidental needle-stick injuries are also eliminated because the steel needle is well recessed in a plastic housing.

Progressing onwards from this was the introduction of I.V. systems that use blunt plastic needles (cannulas) to access ports which were introduced in the late 1980s. However, this transition from metal to plastic blunt needles has two major drawbacks¹, i.e.

1. multiple exposed blunt plastic needles are required to access ports and as a result these systems are subjected to direct contact and airborne contamination and may still expose healthcare workers to accidental needle-stick injuries, and
2. blunt plastic needle I.V. systems necessitate the connection and use of multiple components. Consequently, there is a greater risk of contamination and more time is demanded of healthcare workers in order to use this system. There is also more medical waste disposal in hospitals.

The newest I.V. device to come on the Irish market is the Clave Connector and is designed to deliver I.V. therapy in a simple and safe way. The "Clave Connector" appears also to have many other versatile uses. When seeking a cost-effective replacement for an existing product or if introducing new technology,

product evaluations by clinical users are an important step in the successful selection and acceptance of these new products. Nurses are now turning their extensive day-to-day experiences working with the high-tech tools of care into product-purchasing decisions. The evaluation and selection of new products varies from hospital to hospital, but three areas are common to all:

- (i) Identifying the problem to be addressed via the new product.
- (ii) Specifying the criteria the product must meet to be acceptable.
- (iii) Evaluation in clinical trials.

In Intensive Care at University College Hospital, Galway, the nursing staff decided to examine some of the many products that have recently been marketed to reduce the risk of needle-stick injuries. The impetus for this evaluation was the continuous rising global costs of needle-stick injuries evident in the different journals. This reason alone should be enough to spur Irish hospitals towards the pursuit of safer needle systems. In the United States, one of the tactics proposed to pressurise hospitals to use needle-free systems is the introduction of tax on conventional hypodermic needles³. In December 1993, California Congressman Deta Start stated "If the bottom line is the primary concern, Congress can even the playing field". His statement followed the death of a 29-year-old nurse who contracted A.I.D.S. through a needle-stick injury. Stark subsequently sponsored a bill designed to raise the cost of non-safety needles. The

occurrence of such a tragedy should provide the necessary stimulus for all hospitals in the country to seek safer needle-free I.V. systems.

Our evaluation consisted of "trials" of four needle-free systems. These included "Interlink" (Baxter Health Care), "Safesite" (Braun), "Smartsite" (Oxygencare), and "Clave Connector" (Technopharm Ltd.). The objective was to implement the most favourable in terms of safety and cost-effectiveness. Each "trial" lasted six weeks. One system, "Interlink", consisted of a plastic needle, while the other three systems were needle-free. All four systems were generally well accepted by the staff, scoring an approximate 80%-90% satisfaction rate. However, "Clave Connector" scored a 99% overall satisfaction. "Interlink" scored the least satisfaction rate, the main problems identified being the requirement of multiple exposed blunt plastic needles and the use of multiple parts. Fears of skin scratches or indeed punctures persisted among some of the staff, especially when administering to confused or unco-operative patients. Specific objections to "Safesite" or "Smartsite" were not actually identified. The following were the main reasons for the high satisfaction ratings in the Clave Connector:

- (i) It is expedient and safe in peripheral and central lines as well as in drawing blood from arterial lines, or drawing medications from a vial.
- (ii) Solution and Blood Administration sets can all connect directly on to the clave injection site without the

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- need for special connectors.
- (iii) Clave needle-free allows such practice in areas of blood sampling, peripheral, central and arterial administration, and is suitable for single and multiple drug reconstitutions.
 - (iv) "Clave Connector" flow rates are significantly higher than other needle-free systems. The average flow rates of the clave injection site is 186mls per minute, making it suitable for critical cuff pressure infusion and avoids the need to prime the system. This is ideally suited to the critically ill or shocked patient where "time is of the essence". Upon disconnection of a leur syringe the connector only displaces 0.02ml and the dead space in the injection site is only 0.06ml. (Ref: Technopharm Ltd.) This is particularly suited for paediatric and fluid restricted patients.
 - (v) It has a luminescent roller that glows in the dark for easier access during the night hours.
 - (vi) Colour co-ordination is also available. Blue colour to match venous circulation and a red colour to match arterial circulation.

Other reasons why "Clave Connector" is deemed to be the superior product are cited in a number of literature reports:

- (i) Experimental microbiological challenge of the "Clave Connector" proved its ability to maintain a sterile barrier when challenged by a 1.0×10^4 ml suspension of *Pseudomonas aeruginosa* over 72 hours. This study by Brown *et al* (1997)⁵ states that the potential for contamination during the use of "Clave Connector" with either peripheral or central venous catheters is extremely low – being less than 2%. This offers the advantage over other methods of making intravenous connections, such as leur ports, which have a proven contamination rate of the order of 23%⁶.

- (ii) Cost Comparison study from 1,000 bed Tampa General Hospital, Florida, comparing three systems: Interlink, Safesite and Clave Connector. "Clave Connector" proved to be 30% more cost-effective because of the major component reduction, no caps, no bare cannulas, no special connections for administration sets⁵. Three months after the implementation of "Clave", needle-stick injuries decreased by 75%⁶.
- (iii) A comparison of flow rates of "Clave Connector" versus an 18-gauge B&D needle proved that the "Clave Connector" has a significantly superior flow rate over the 18-gauge needle. Comparison flow graphs of "Smartsite" and "Clave" were recorded using two independent variables:
 - (a) packed red blood cells, and;
 - (b) 5% dextrose/normal saline⁷.
- (iv) A clotting Assessment Comparative Study of the "Clave Connector" versus an 18-gauge needle showed that no significant haemolysis occurred when delivering blood through either system⁸.

On June 1st 1997, "Clave Connector's" needle-free system was introduced in the I.C.U. at University College Hospital, Galway, but formal approval from hospital management is still awaited. Before implementation the pharmacy converted all medications in minijets on the crash trolley: i.e. adrenaline, atropine, lignocaine, calcium, etc., to be compatible with the new system: i.e. to be needle-free.

Obtaining a customised I.V. delivery system is an important component in reducing I.V. needle-stick injuries. "Clave Connector" delivery system is totally needle free. The development of this system demonstrates the effectiveness of nursing innovation when paired with a responsive medical supplier to meet the needs of an ever-changing complex healthcare delivery system.

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References

1. Sherman, J.E., Sherman, R.H. (1989), "I.V. Therapy That Clicks". *Nursing*, May, pp 550-51.
2. Gilbilisco, P.A., Lopez, G.L., Appleman, M.D., *et al* (1986) "In Vitro Contamination of Piggy Back/Heparin Lock Assemblies". Prevention of contamination with a closed positive locking device (click lock) *J.P.E.N.* 10 pp 431-434.
3. "Headlines" (1993) *Legislives, American Journal of Nursing*, March, p 1.
4. Gilbilisco, P.A. (1996) "Experimental Microbiological Challenge and Decontamination of Clave Connectors". Issued by – Technopharm Ltd., Dublin.
5. Brown, J.D., Moss, H.A., Elliott, T.S., "The Potential for Catheter Microbial Contamination From A Needleless Connector". *Journal of Hospital Infection*, 36, pp 181-189.
6. Summers L., Knight, M.A., (1994) "Needleless I.V. Therapy, Comparing Three Systems For Safety". *Nursing Management* Springhouse, Springhouse Corporation, PA, 19477, pp 3-4.
7. Gilbilisco, M.P. (1996) "Comparison of Flow Rates of Clave Connector Versus 18 Gauge Needle". Issued by Technopharm Ltd., Dublin.
8. Magnifico, M.D., Gilbilisco, P.A. (1994) "Transfusion of Packed Red Blood Cells Using an 18 Gauge Needle Versus a Clave Connector". Issued by Technopharm Ltd., Dublin.