A New Approach to the Design of Retractable Needle Technology

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Needlestick injuries (NSIs) have been a serious problem for healthcare workers for decades. A healthcare worker can contract any of over 20 bloodborne diseases, including HIV and hepatitis C, from a contaminated needlestick. Despite a well-intentioned federal Needlestick Safety and Prevention Act (NSPA) signed into law in late 2000, hundreds of thousands of NSIs still occur annually in the United States, due primarily to a lack of innovation among large manufacturers and suppliers.

More than 1.8 billion of the syringes sold each year in the United States are conventional syringes—syringes that have no safety-engineered feature whatsoever.[1] Over half of the needlestick injuries suffered in 2012 occurred when devices were being used that had no injury-prevention feature.[2] A majority of the remaining needlestick injuries resulted from widespread use of ineffective, manually-operated devices that promised safety, but were not designed to deliver it.

DEEPER INSIGHTS

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This article discusses two highly engineered products from Retractable Technologies, Inc. (RTI) that offer real safety for healthcare workers, significantly reducing the number of NSIs. RTI was founded in Texas by Thomas Shaw in 1994 with a goal of

ending preventable illnesses and deaths of healthcare workers. While RTI produces a variety of safety needle products, this article will focus on the VanishPoint safety syringe and the technical advancements of the soon-to-be-released EasyPoint needle.

The VanishPoint Syringe

The design of the VanishPoint syringe, while deceptively simple, results in a precise, reliable and easy to use single-handed syringe with a needle that is retracted from the patient immediately upon depletion of the syringe. This automatic feature locks the used needle within the syringe, preventing it from harming the clinician. RTI implemented this novel design concept into a finely built medical device, manufactured under closely controlled methods using state-of-the-art equipment. This manufacturing approach ensures the consistent high performance demanded by healthcare providers and required by the U.S. Food and Drug Administration (FDA). The VanishPoint syringe is used in the same manner as a traditional syringe, except that continued pressure on the syringe plunger, following discharge of the syringe, causes the needle to irrevocably retract into the syringe, rendering it safely away from the risk of an NSI, and it cannot be reused or reassembled.

The 3mL VanishPoint syringe

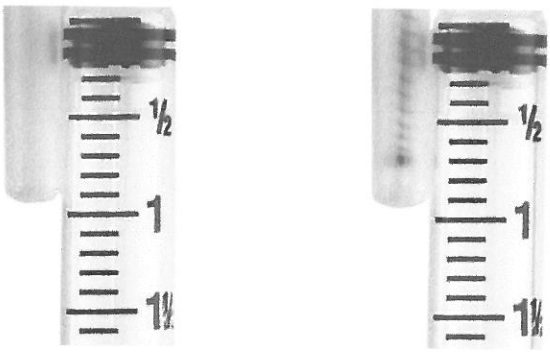
The plunger tip is designed with a mechanical feature that releases the frictionally-held needle hub from the syringe barrel, freeing it to retract into the chamber within the plunger tube. With the plunger now all the way forward and into the syringe, the plunger thumb-plate nests within the collar at the finger-hold end of the syringe barrel, locking the plunger so that it cannot be pulled back out. Because the needle and hub, now separated from the displaced friction-holding ring, are drawn into the plunger chamber and the plunger is confined within the syringe barrel, it is impossible to reuse the syringe. The smooth retraction process is initiated at the end of the injection, while the needle is still in the patient, without requiring any additional action by the clinician

and causing no discernable sensation to the patient. Retractable Technologies was the first company in the world to make a fully functional retractable syringe, and it was largely responsible for the paradigm shift to automated retraction ushered in by the 2000 federal NSPA legislation (when the VanishPoint syringe was used to demonstrate that real safety for injections was finally available).

The manually-operated sheath safety devices sold by the large manufacturers of syringes (then and now) not only fail to reduce NSIs, they frequently cause an increase in the number of needlestick injuries compared with syringes that have no safety features whatsoever because the "safety" features place the users' fingers in close proximity to the needle.[3]

The EasyPoint Needle

At first glance the imminent introduction of the EasyPoint needle to the market appears to be a natural extension of the VanishPoint technology. However, a more careful examination shows that it is yet another paradigm shift in needle safety technology from the same company in less than 20 years. The original VanishPoint technology is frictionally-operated (i.e., the needle is held in place by the friction-holding ring until pushed free) and is the first of its kind. The EasyPoint design places the release button perpendicular to the syringe barrel, so instead of pushing toward the needle tip, your finger pushes toward the syringe barrel, eliminating the forward pushing motion toward the patient. The used needle retracts safely into a chamber alongside the syringe barrel.



The Easypoint needle before and after retraction

There are many benefits of the EasyPoint needle's design. For example, it has less dead space and less residual fluid than even standard syringes; it also seals the syringe as soon as the needle is retracted, preventing both fluid (medication) leakage and air inflow. And for the first time, clinicians will be able to change needles and have the safety of automated needle retraction. The new needle design accommodates the rapidly expanding market for prefilled syringes by requiring no modification to fit on prefilled syringes (whether glass or plastic). It also fits on standard syringes.

Best of all, leveraging years of focused research and experience with safety needle products, RTI has achieved significant cost savings through creative design optimization and an integrated highly efficient manufacturing process, all of which means lower cost to the customers.

References

[1]U.S. Market for Vascular Access Devices and Accessories, iData Research Inc., Report iDATA_USVA14_RPT, Vancouver, British Columbia, Canada, 2014, p. 292.
[2]Syringes (Disposable and Reusable), Global Industry Analysts, Inc., Report MCP-3229, June 2014, p. III-2.
[3]Kathryn Duesman, RN, BSN, and Jean Ross, "Survey of Accidental Needlesticks in 26 Facilities Using VanishPoint@ Automated Retraction Syringe," Journal of Healthcare Safety, Compliance & Infection Control, Vol. 2, No. 2 (March 1998): 11l-l 14.

RELEVANT PRODUCT