A Novel Device That May Lower the Incidence of Injectable Medication Errors

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Background: Medication errors injure at least 1.5 million patients per year, increase hospital costs of approximately $4700 per admission and result in excess costs of over 2 billion dollars every year in the US.[1, 2]

As many as 81% of medication errors occur in the operating rooms and the post-anesthesia care units as these are the most medication intensive areas with high-potency medications.[3] Anesthesia providers select, calculate and administer medications, monitor patients and equipment while dealing with distractions, fatigue and productivity pressures.[4]

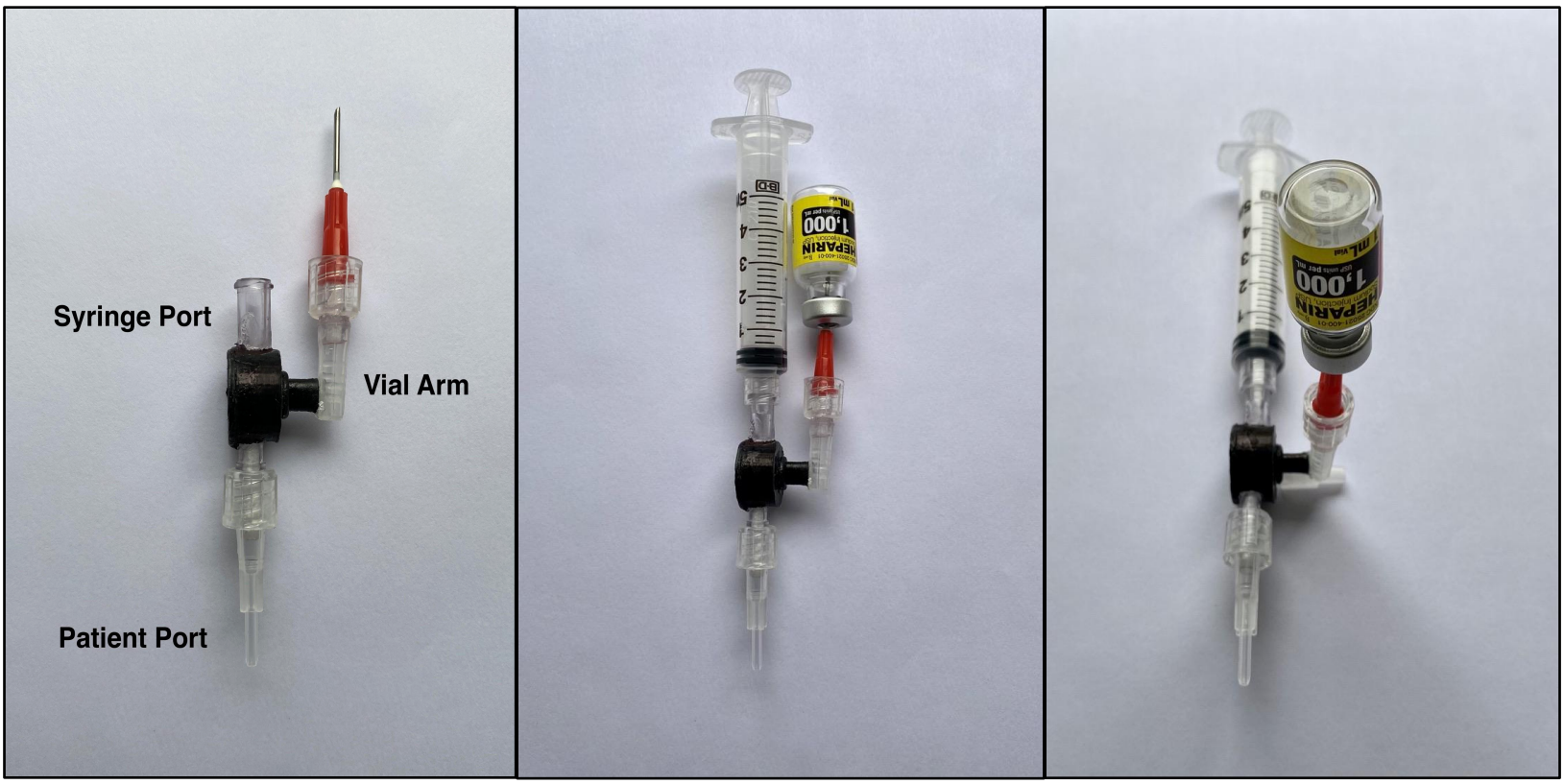
In 2004 the FDA mandated the use of barcodes on all medications however, the goal of a 50% error reduction has not been achieved.[5] A recently published prospective study found 1 in 20 perioperative medication administration resulted in a medication error even though the hospital in the study often used a barcode-assisted syringe labeling system.[6]

The most common errors are associated with absent or incorrect labeling, wrong doses and wrong medications.[7] Common causes leading to these errors are unlabeled syringes, similar looking drug vials, vials sitting in wrong drawers, drug shortages leading to unfamiliar vials by a different provider, manually creating a label or picking up the wrong syringe.

Methods: Following the concept and a working prototype, a functioning device was manufactured at the medical engineering lab at Tufts Medical Center. Drug vial is loaded on the vial-arm and medication is drawn in a syringe. Injecting the medication will flush it back into the drug vial. In order to inject into the patient, the vial-arm is rotated 90 degrees which closes the vial-channel and opens the patient-channel.

The device reliably creates a system where the medication is interacted with twice - initially when a medication vial is picked up and finally, prior to injecting into the patient. A final verification is performed before surgeries and invasive procedures to prevent patient injuries. While it is common to discard medication vials once the medication is drawn up, this device allows the final verification against the used-vial addressing wrong medication or wrong dose errors associated with mislabeled or unlabeled syringes.

Discussion: The device is relatively inexpensive to manufacture and once a vial is loaded, the second verification cannot be bypassed, ensuring improved safety-compliance and could play a role in lowering the incidence of the injectable medication errors.



Left, device components explained. Center, drug vial is connected using the vial-arm needle and medication is drawn up in the syringe. Injecting the medication flushes it back into the vial. Right, the vial-arm must be rotated 90-degrees to open the patient-channel before the patient can receive the medication.

References:

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