

Flow restrictors may reduce young children's accidental ingestion of liquid medications

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In the US, child-resistant packaging for most medications has contributed to the prevention of thousands of pediatric deaths. Nevertheless, over 500,000 calls are made to poison control centers each year after accidental ingestion of medications by young children, and the number of emergency department visits for unsupervised medication ingestions is rising. In a new study scheduled for publication in *The Journal of Pediatrics*, researchers studied whether adding flow restrictors to bottles can limit the amount of liquid medication a child could access even if child-resistant caps are missing or improperly closed.

Standard child-resistant packaging is designed to prevent or delay young children from opening bottles, giving caregivers reasonable time to intervene. However, in order for the packaging to work effectively, "Caregivers must correctly resecure the cap after each and every use. If the cap is not correctly resecured, children can open and drink whatever medication is in the bottle," according to Daniel S. Budnitz, MD, MPH, and colleagues from the Centers for Disease Control and Prevention, Emory University, and the Georgia Poison Center.

To address a potential second line of defense, the researchers studied whether flow restrictors (adapters added to the neck of a bottle to limit the release of liquid) had any effect on the ability of children to remove test liquid, as well as how much they were able to remove in a given amount of time. 110 children, aged 3-4 years, participated in two tests. In one test, the children were given an uncapped medication bottle with a flow restrictor, and in the other test, the children received either a

traditional bottle without a cap or with an incompletely-closed child-resistant cap. For each test, children were given 10 minutes to remove as much test liquid as possible.

Within 2 minutes, 96% of bottles without caps and 82% of bottles with incompletely-closed caps were emptied. In contrast, none of the uncapped bottles with flow restrictors were emptied before 6 minutes, and only 6% of children were able to empty bottles with flow restrictors within the 10-minute test period. Overall, older children were more successful than younger children at removing liquid from the flow-resistant bottles. None of the youngest children (36-41 months) were able to remove 5 mL of test liquid, the amount in a standard dose of acetaminophen for a 2- to 3-year-old child.

Manufacturers voluntarily added flow restrictors to over-the-counter infant acetaminophen in 2011. Based on their effectiveness, the authors suggest that flow restrictors could be added to other liquid medications, especially those harmful in small doses. Importantly, according to study co-author Maribeth C. Lovegrove, MPH, "Flow restrictors are designed as a secondary barrier and caregivers should not rely on flow restrictors alone; adding flow restrictors could complement the safety provided by current child-resistant packaging." Caregiver education should continue to focus on consistently locking child-resistant caps and storing medications away and out of sight of [children](#).

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