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Pediatric Patients Have Shorter Lansoprazole Half-Life Than Previously Reported

Jeffrey O. Phillips, PharmD∗, Jane E. Burnett, Shan H. Siddiqi, Marcella R. Bothwell, MD. Surgery – Applied Research, University of Missouri School of Medicine, Columbia, MO and Rady Children's Hospital, San Diego, CA.

Purpose: Traditional pharmacokinetic teaching suggests that the elimination rate (half-life) of drugs is related to patient age. However, the package insert for lansoprazole, a common proton-pump inhibitor (PPI) drug, reports that its "pharmacokinetics in pediatric patients aged 1 to 17 years [are] similar to those observed in healthy adult subjects." Numerous recent articles, in contrast, suggest that higher dosages are needed for children, although these articles establish no definite pharmacokinetic relationship between patient age and drug half-life. Establishing the correct half-life is important for appropriate dosage regimen development for PPI drugs.
Methods: Evaluation of previously published literature reveals an unusually large degree of variability in most studies. This variation can be caused by: (1) rapid versus slow metabolizer status based on genetic variation in Cytochrome P450, (2) immature hepatic function, (3) hepatic dysfunction, and (4) errors related to timing of blood draws with enteric-coated products. Meanwhile, when the ages of the patients in the same studies are plotted against the respective half-lives of lansoprazole, an increase in half-life with age is observable. After removing data involving patients with immature hepatic function and eliminating outlying points by using statistically acceptable methods, the relationship between age and half-life becomes even more evident. To further investigate this relationship between age and half-life, a single dose of buffered lansoprazole suspension was administered to six children and pharmacokinetics were evaluated by standard methods. The drug was delivered in CaraCream, a flavored suspension that is buffered with sodium bicarbonate (which causes immediate release of lansoprazole into the bloodstream and, therefore, the elimination phase is discrete from the absorption phase and timing of blood draws is much simpler).
Results: The half-life of the drug in each of the six patients was much lower than in other studies involving adults; furthermore, almost no variability was evident. When this data is compared with previously published data in pediatrics, it becomes clear that lansoprazole half-life increases with age.
Conclusion: These results explain why many clinicians find a need for larger daily doses of PPIs in children and the consideration of such factors is critical in the effort to control gastroesophageal reflux disease in children.