

Miles (Mike) M. Weinberger, MD: A Personal Tribute

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Dr Miles M. Weinberger, early physician supporter of Pediatric Clinical Pharmacy, passes away at age 87.

I have known Dr Weinberger since 1975 when he was recruited to the University of Iowa to establish a Pediatric Allergy Program. He was my mentor for asthma, allergies, and clinical research, and we collaborated on scientific publications for almost 50 years. Dr Weinberger has provided sustained leadership in improving the outcome of children with asthma through innovative clinical care, clinical research, and collaboration with clinical pharmacists. He was the second recipient of the Pediatric Pharmacy Association's Sumner J. Yaffe Lifetime Achievement Award in Pediatric Pharmacology and Therapeutics.

When he was a practicing allergist, prior to his Clinical Pharmacology Fellowship at the National Jewish Hospital and Research Center, the standard therapy for patients with asthma was a fixed dose combination of theophylline with ephedrine and a sedative sold as either Tedral or Marax given PRN for symptoms or 4 times a day as maintenance therapy. As one of his projects for his fellowship, he challenged that dogma with a double-blind, randomized, placebo-controlled trial in children with severe asthma. The results demonstrated that individualized doses of theophylline alone, based on serum concentration measurements, were more effective in controlling asthma than the fixed dose combination.¹ In a subsequent randomized controlled trial, he demonstrated that ephedrine increased theophylline toxicity without enhancing efficacy.² Ultimately these studies and his subsequent work at the University of Iowa created a paradigm shift in how children with asthma were treated around the world. Because theophylline was metabolized faster in children than adults, the mean mg/kg/day dose required to achieve a therapeutic concentration was much higher than in adults. However, because of large variability in rate of metabolism, the dose had to be individualized to achieve both efficacy and safety. Monotherapy with theophylline became the standard of care not only in the United States but in many other countries as well, until inhaled corticosteroids became widely available.



As a result of his publications, he was invited to give lectures not only around the United States but also in Europe, Asia, and Australia.

Because of the rapid metabolism of theophylline, on average, the conventional rapid released liquid and tablet products required dosing 4 times a day, which was both inconvenient and difficult for most families. Consequently, he led the investigation into the rate and extent of absorption of slow-release products to find one that would provide less fluctuation in blood concentrations with twice daily dosing. This resulted in a seminal publication in the *New England Journal of Medicine*³ and several drug companies subsequently developed slow-release products.

When Dr Weinberger began the Pediatric Allergy Clinic at the University of Iowa, acute asthma exacerbations in children were dealt with by sending the patient to the nearest emergency department. Most children

were treated with either injectable epinephrine or nebulized beta agonist, an oral corticosteroid, and then discharged to home. Dr Weinberger reasoned why not teach the parents how to institute these interventions at home. As a result of the combination of appropriate maintenance medication and early treatment with an inhaled beta-agonist, and oral corticosteroids at home, he was able to improve the outcomes of pediatric asthma throughout Iowa and beyond. An observational study of 119 patients under the care of the Iowa Clinic demonstrated that 735 acute care visits for asthma were reduced to 47 and 99 hospitalizations were decreased to 10 in addition to other markers of improved disease control.⁴ Moreover, the fact that he convinced the Chair of Pediatrics to require a rotation in the Allergy Clinic for all resident physicians, there was adoption of these home interventions as residents graduated from the University of Iowa and went into practice across the state.

In the early 1980s, Dr Weinberger took a course in bronchoscopy, taught himself pediatric pulmonology, developed the first state-wide cystic fibrosis clinic and organized the Iowa-Nebraska-South Dakota Cystic Fibrosis Consortium. He became certified in pediatric pulmonology in 1986. Subsequently, all the fellows at Iowa were trained in both allergy and pulmonology.

He was the first physician at the University of Iowa Hospitals and Clinics to collaborate with academic pharmacists in clinical practice.⁵ Beginning in 1975, fifth-year pharmacy students began serving a 1-month clinical clerkship in the Pediatric Allergy Clinic. They interviewed patients to obtain an accurate medication history and taught parents and patients the home management Asthma Action Plan prescribed by the physician, including how to use the inhaled devices to deliver medications (nebulizers and metered-dose inhalers). Also, they assisted in calculating theophylline dosage changes in response to serum concentration measurements and contacted the parents and hometown pharmacies to make the necessary changes approved by the patient's physician. When I left Iowa in 1980 for a position at the University of Florida, Gary Milavetz, PharmD, now Executive Associate Dean of the University of Iowa College of Pharmacy, took over supervising pharmacy clerkship students and collaborated in several clinical studies with Dr Weinberger.

Dr Weinberger participated in supervising several graduate pharmacy students and fellows both in the clinic as well as in clinical research projects and on publications.

Looking at his CV, I am listed on 68 of 262 manuscripts and 20 of 47 book chapters. Interestingly, in the late 1970s, Dr Robert J. Roberts, pediatric clinical pharmacologist-toxicologist, and head of the Iowa Poison Control Center, was so impressed with our scholarly productivity, he went to the dean of the College of Pharmacy and requested that a clinical pharmacist

faculty member be assigned to work with his group. The dean assigned Richard Leff, PharmD to work with them and one of the outcomes of this collaboration was the US Food and Drug Administration approval of caffeine citrate for apnea of prematurity.⁶ Dr Reynold Spector, Director of the Clinical Pharmacology Division in the Department of Medicine, similarly requested and obtained approval for another faculty clinical pharmacist to work with him. Also, Mary Teresi, PharmD currently directs the Pulmonary Clinical Trials Program started by Dr Ahrens in the UI Pediatric Department. These are but a few examples of how Dr Weinberger has either facilitated or inspired physician-pharmacist collaboration that has resulted in benefits to pediatric patients.

Lastly, after 40 years of service, he retired from the University of Iowa in 2016 and moved to San Diego where he was a Visiting Clinical Professor of Pediatrics at UC San Diego and attended weekly conferences at Rady Children's Hospital, as well as being a Professor Emeritus at the University of Iowa. He has continued to educate health care providers on managing habit cough in children⁷ and evaluating and managing exercise-induced dyspnea in healthy adolescents and young adults.⁸

When a colleague of his posted on the Pediatric Pulmonary Listserv that he passed away, tributes were posted from Pediatric Pulmonologists from around the world.

I will miss Captain Theophylline.

Editor's Note

Dr Hendeles is a longtime member of the JPPT International Editorial Board. He is an accomplished academician-clinician who dedicated his career to the improvement of pediatric health care, particularly for those with asthma and other lung disorders, and pharmacy education. His creative, insightful, paradigm-shifting teachings in the classroom and clinic have had an immense impact on current and future pharmacy practitioners.

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