



## Comparing the Hospital Charges of an Influenza Outbreak to Charges for Influenza Vaccination in Colorado

Mike Rannie, Carl Armon, and Jim Todd



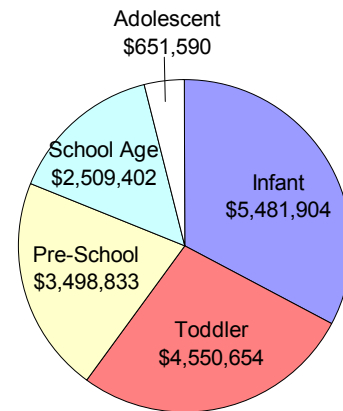
Colorado's flu epidemic caught everyone off guard in the fall of 2003. Clinicians throughout the State were quickly overwhelmed by the sheer number of patients requiring both inpatient and outpatient care. Infants and children were among the hardest age groups hit. Tragically, 13 children died from complications of influenza. The magnitude and severity of the 2003 outbreak was, in part, due to a less-than-optimal match between last year's vaccine strain and the predominant Fujian strain that circulated throughout our State. This "experiment of nature" combined with the widespread use of new point-of-care laboratory tests for influenza provided a unique opportunity to estimate the potential impact of yearly vaccination on influenza outcomes in children – especially the recommendation for implementing a universal influenza vaccination program for Colorado children between the age of 6 months and 23 months.

The exact number of 2003 inpatient pediatric influenza cases is not yet available from the Colorado Health and Hospital Association. These data will be released this coming summer. In the meantime, we have projected these numbers as well as total hospital charges. These projections are based on the proportion of 2002 TCH influenza inpatient cases and charges to the 2002 pediatric state totals. The findings that follow are based on these projections.

Between 2002 and 2003, there was a 396% increase in the number of statewide pediatric hospital admissions due to influenza (Fig. 1). Infants and toddlers made up nearly 58% of

The estimated cost of caring for this influx of patients is staggering. Hospital charges alone for the treatment of inpatients and outpatients are projected to be in excess of 16 million dollars (Fig. 2). Once again, infants and toddlers account for 60% of this total.

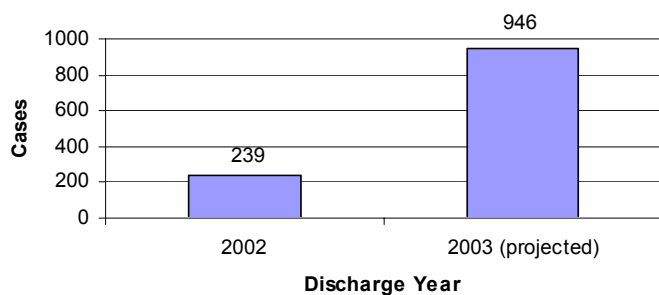
**Fig. 2 - 2003 Projected Charges for Inpatient and Outpatient Influenza Cases: by Age Group**



In contrast to these hospital charges for treating influenza, estimated charges associated with immunizing every infant and toddler aged 6-23 months against influenza are relatively low. Depending on the patient's age, the charge for influenza vaccination is \$30 per dose (\$20 for vaccine and \$10 for administration). Two doses are required for infants and/or children the first time the vaccine is given. Assuming the vaccine is 90% effective the charges for vaccinating infants, toddlers, and preschool children are comparable to the charges associated with the hospital care of an unvaccinated population (Figure 2). Factoring in the order-of-magnitude higher additional costs associated with secondary contact illness (parents, grandparents, siblings, etc), missed workdays, and ill child care, implementing the recommendation for universal influenza vaccination of children 6-23 months of age would be a bargain (Fig. 3).

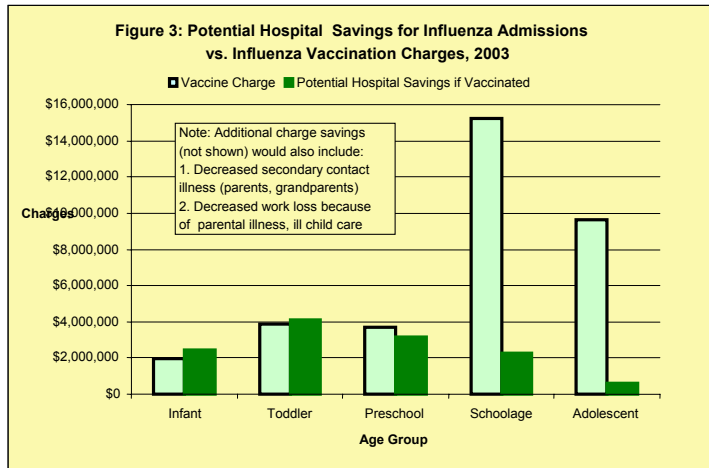
Is this goal realistically attainable? Matt Daley, Steve Berman, Ally Kempe, and colleagues in the Children's Outcomes Research Program at TCH have shown surprisingly high influenza vaccination rates in private practice settings in Colorado (see Abstracts). While parents may initially have concerns based on misinformation they get over the back fence or on the internet, their child's doctor's explanation of the benefits and safety of vaccination is critically important to overcoming any misconceptions about influenza vaccine. Ultimately, their doctor's recommendation to vaccinate is quite

**Fig. 1 - Pediatric Inpatient Influenza Cases by Discharge Year**



the 2003 projected inpatient total. The number of pediatric ED and hospital outpatient influenza visits was estimated to be over 22,820 in 2003. This means that for each patient that was treated as an inpatient, 24 more were treated on an outpatient basis.

persuasive. Reminder recall postcards using the Colorado Immunization Information System (available free for practice use by E-mailing [kellyn.pearson@uchsc.edu](mailto:kellyn.pearson@uchsc.edu)) and offering to vaccinate parents on a fee-for-service basis (see: Schwartz. *Infectious Diseases in Children*, CLINICAL PRACTICE PRIMER, Feb & April 2004 - <http://idinchildren.com>) help to assure complete and cost-effective utilization of vaccine stocks. This is the time to set high practice vaccination targets for 6-23 month olds and to order enough vaccine. The severity of the influenza outbreak in children last year got everyone's attention. Now it's time to do something about it!



**Abstracts (Abbreviated)**

**Can High Rates Of Influenza Immunization Be Achieved In Healthy Young Children? Results Of A Randomized Controlled Trial Using Registry-Based Recall?**

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OBJECTIVES: 1) To assess the maximum flu Iz rate that can be achieved in healthy children 6-21 months in private practice settings and 2) to evaluate the efficacy of registry-based recall for flu.

METHODS: The study was conducted in 5 private pediatric practices in Denver, CO with a common billing system and Iz registry. Healthy children 6-21 months were selected (N=5200) and randomized to an intervention (I; n=2601) group that received up to 3 recall letters or to a control (C; n=2599) group that received usual care. The primary outcome was receipt of one or more flu Iz as noted either in the Iz registry or in billing data.

RESULTS: Iz rates in the I groups in the 5 practices were 75.9%, 75.2%, 67.3%, 54.9% and 44.0% by 1/31/04. Overall, 62.0% of I vs. 57.7% of C were immunized (4.3% absolute increase, p=0.002), with absolute % increases over C ranging by

practice from 1.0% (p=NS, I vs C) to 8.7% (p=0.003, I vs C). However, before the epidemic (publicity beginning 11/15/03) absolute % increases over C ranged from 4.9% to 15.6% and were 9.5% overall (p<0.0001, I vs C). Before 11/15, significant effects of recall were seen both for children 12-21 months (10.2% increase over C, p<0.0001) and 6-11 months (8.1% increase over C, p=<0.001), but by 1/31 significant effects of recall were seen only in the older age group (5.9% increase over C, p<0.001).

CONCLUSIONS: During an epidemic flu year, private practices were able to immunize the majority of children 6-21 months in a timely manner. Although media coverage regarding the epidemic blunted the effect of registry-based recall, it was still effective in raising rates before the epidemic hit, especially for children 1 to 2 years of age.

**Parental Knowledge, Attitudes, and Beliefs (KABs) Regarding Influenza Immunization in Healthy Young Children**

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Pediatric Research 2004;55(4), Part 2 of 2:317A. Objective: Among parents of healthy young children, to determine the KABs that predict parents' intention to immunize their child against influenza.

Design/Methods: The study was conducted in 5 metro Denver pediatric practices. Using random selection, stratified by age and practice, we identified 862 healthy children age 6-21 months seen at any of the 5 practices. Subjects' parents were surveyed by telephone in August-October 2003, with up to 20 survey attempts per family. We used the conceptual framework of the Health Belief Model (eg disease susceptibility, severity, benefits of vaccination, barriers) and sociodemographic factors to predict parental plans to immunize their child. Results: The response rate was 57% (n=482 completed surveys). 36% of respondents were planning to immunize their child against influenza, 32% were undecided, and 32% were planning not to immunize. In multivariate analysis, significant (p<0.05) positive predictors of parental plans to immunize included: belief that the parent's social network (people important to them, other parents) think they should vaccinate their child; belief that their child is more susceptible to influenza than other children the same age; belief that vaccination will decrease school absences; the parent's personal history of ever having been vaccinated against influenza; and the child's doctor having recommended vaccination. Negative predictors included the belief that their child is likely to have a serious reaction to the vaccine and being privately insured vs. publicly insured or uninsured.