

## **The financial burden and complications of nephrotic syndrome**

An estimated 26 million American adults are believed to have some degree of impaired kidney function<sup>1</sup> and more than a half million Americans were receiving kidney dialysis or were living with a kidney transplant at the end of 2006<sup>2</sup>. The nephrotic syndrome (NS) disease group, a form of Chronic Kidney Disease (CKD) is estimated to account for 12% of prevalent end stage renal disease (ESRD) cases at an annual cost in the US of more than \$3 billion.

NS occurs in the functional units of the kidney called nephrons. Within each nephron is a glomerulus (plural: glomeruli) a tiny blood vessel that functions in the filtration of blood. These filters process blood that contains toxins, waste products and excess water, all of which is transformed into urine. NS is not a disease but a collection of signs and symptoms occurring when glomeruli are damaged. Damage results in poor filtration and allows vital proteins to leak into the urine (proteinuria). These important proteins normally help build cells, fight infection, promote clotting and soak up excess water. When the blood has too little of these proteins excess water seeps from the blood into the tissues and causes swelling (edema)<sup>3</sup>.

NS is common in childhood and characterized by edema, low levels of the protein albumin in the blood and proteinuria<sup>4</sup>. Typically chronic and characterized by multiple relapses, there is a potential for the development of steroid dependence and resistance in these patients. Both the disease and the available treatments can result in complications ranging from mild to life threatening<sup>5</sup>. Children with NS are at increased risk for complications resulting in an increase in length of hospital stay and associated hospital costs<sup>4</sup>.

Hains and colleagues analyzed the characteristics of hospitalizations of all children in the US in the year 2000 with a diagnosis of NS. In 2000 alone, the healthcare expenses were a staggering \$76 million for 4530 children hospitalized with a diagnosis of NS. Surprisingly, when the cost of healthcare for NS was compared with the five most common hospital diagnoses in children, NS had a 2-3 fold higher total mean charge. Upon further analysis, the authors determined that 24% of admissions were to General Hospitals as opposed to Children's Hospitals or Children's units. While the mean length of stay was considerably shorter in General Hospitals (3.88 days compared to 5.52 in Children's Units and 5.15 days



in Children's Hospitals) and the daily cost in provided care was lower in General Hospitals at \$2,652/day (compared to Children's Units/Hospitals \$2,856 and \$3,198/day), Children's Hospitals/Units only had a 1% transfer out rate compared to 7% in General Hospitals. Interestingly, the authors also found that the mortality rate was highest in the General Hospital (0.82%) compared to Children's Units/Hospitals (0.64%) <sup>4</sup>.

Wei and colleagues further analyzed the incidence of complications and costs among children diagnosed with NS in US hospitals. They found that in 2006, 4584 children with NS were admitted to hospitals at a rate of 17 cases per 10,000 hospitalized children. The authors also noted an increasing trend in the incidence of complications in NS. In 2000 the incidence of complications was found to be 20.42% and in 2006 was 25.76%. Whether due to the increasing incidence of complications in children with NS or otherwise, there is evidence that the mean length of hospital stay and mean costs have been increasing as well<sup>5</sup>.

The mean length of hospital stay for the years 2000, 2003 and 2006 were 5.02, 5.06 and 5.89 days respectively and mean costs for those years were \$31,462, \$40,405, and \$55,389 respectively, indicating a fairly large increase in cost. Finally, when comparing the age groups of these children, the mean length of stay and mean costs were 4 times greater in children less than one year of age than the total average (54 days and \$212,919 vs. 11.1 days and \$55,389). Thus, an increase was observed in the incidence of complications and hospital costs among children admitted with NS from 2000 to 2006<sup>5</sup>.

The question arises as to how this compares with the adult population. According to the Healthcare Cost and Utilization Project Kids Inpatient Database, in the US, the average total charge for hospital stays for children is half that of adult stays. The average daily hospital charge for a child's stay is about 30% of the daily charge for adults. Care for children and adolescents accounts for 18% of all hospital stays and 9% of total hospital charges. In total, children use 10 to 20 percent of all hospital resources compared to the 80 to 90 percent used by adults<sup>6</sup>.

As the incidence of NS grows in the US we are sure to see an increase in the costs of healthcare associated with NS. For this reason, analysis of the costs and clinical effectiveness of NS care should continue in the future.



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