Use of defined-daily-doses per 100 bed-days for measuring consumption of antiinfectives in a pediatric hospital

The anatomical therapeutic chemical/defined daily dose (ATC/DDD) classification, using DDD/100 bed-days for hospitalized patients, has been adopted to measure the consumption of different drugs in and among health institutions. However, the application of this method in children is not the approach most frequently indicated, which explains the limited information in the medical literature on the use of DDD in hospitalized children. Therefore, we evaluated whether the use of DDD/100 bed-days at Hospital Infantil de México (HIM), a tertiary health-care-level pediatric hospital, was a useful method for measuring consumption of antimicrobial drugs in children.

The database of each antimicrobial drug administered during 2005 and 2006 was reviewed to calculate the corresponding DDD/100 bed-days for each year. This was performed by adding the total amount (in grams) of each antiinfective drug consumed during one calendar year and dividing the amount by the latest DDD assigned by the World Health Organization. The number of days the patient was administered antimicrobial therapy was obtained through a chart review. All antimicrobial drugs listed under the fifth-level classification were included. Drugs were excluded from the analysis if they were administered to a limited number of patients (or they were not administered at all) or if their DDD was not listed in the ATC/DDD classification.

Total consumption of antimicrobial drugs in DDD/100 bed-days was 89.91 in 2005 and 93.88 in 2006. Beta-lactam antibacterials accounted for the greatest consumption, with a DDD/100 bed-day of 36.0 for 2005 and 30.44 for 2006, followed by the group including macrolides, lincosamides, and streptogramins, with values of 10.94 in 2005 and 19.34 in 2006. Some of the most consumed antimicrobials were cefepime, ceftaxime, meropenem, dicloxacillin, ampicillin, clindamycin, amikacin, vancomycin, voriconazole, and valgancyclovir.

Our analysis demonstrated that the use of DDD/100 bed-days permitted measurement of consumption by therapeutic subgroups, by antimicrobial type, and by year, in addition to identification of most and least consumed drugs. For example, the high consumption of cefepime was attributed to its empirical prescription in children with febrile neutropenia, while meropenem was commonly used for pneumonia or nosocomial sepsis. We identified the need for reevaluating the indications for macrolide prescription because 12–25% of pneumococcal strains are resistant to antimicrobial therapy in Latin America and Mexico. Amikacin consumption was associated with targeting hospital-acquired resistant strains in neonatal sepsis. Vancomycin was the most frequently consumed antibiotic as an empirical treatment and was associated with ceftaxime or ceftriaxone use in children older than one month with culture-negative bacterial meningitis and in penicillin-resistant Streptococcus pneumoniae infections.

Our results were compared with the limited experiences published in other countries, such as Norway, in which total antiinfective drug consumption was 15–30 DDD/100 bed-days, and Russia (28.96–8.3 DDD/100 bed-days). In three of five pediatric hospitals studied in China, consumption figures for 2002 were 105.6, 97.7, and 80.5 DDD/100-bed days, respectively, similar to the results in our study. Although hospitals for adults are not comparable with those for children, it is noteworthy that at least at highly...

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specialized hospitals for adults, the figures range between 80 and 110 DDD/100 bed-days, similar to those found at the HIM. Although this method is not usually recommended for evaluating antimicrobial consumption in children, our results and other publications allow us to consider DDD/100 bed-days a valuable tool for the analysis of antimicrobial drug consumption in tertiary-healthcare-level pediatric hospitals.1,2

Further studies are warranted that directly correlate anti-infective drug consumption with disease types, specific therapeutic indications, bacterial resistance, and compliance with therapeutic diagnostic guides.


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Effect of an educational initiative on physicians’ use of weight-based fosphenytoin loading doses in the emergency department

The American Society of Health-System Pharmacists’ statement on pharmacy services to the emergency department (ED) advocates that hospital pharmacy departments should provide the ED with “the pharmacy services that are necessary for safe and effective patient care” and that such services should be tailored to an institution’s needs and resources.1

We used a strategy of targeted physician education and order sets to improve the use of loading doses of fosphenytoin in our ED. Our ED has approximately 70,000 ED patient visits per year and operates within a 649-bed community academic facility. Educational interventions in the ED are unique in that the care environment focuses heavily on expediency, and tailoring doses to individual patients is not routinely done. We evaluated the effect of an educational intervention on the use of recommended weight-based fosphenytoin doses.

Following institutional review board approval, a postgraduate year 1 pharmacy resident, supervised by a preceptor, conducted an educational session on weight-based fosphenytoin dosing including its use in achieving optimal postloading-dose levels and how to appropriately dose adult patients. The session, conducted during a regularly scheduled grand rounds conference for 15 ED residents and attending physicians, included an explanation of an order set designed for this purpose. An additional session was conducted for 30 ED nurses to help prevent problems related to the change in practice. Pharmacists also received written information on the initiative.

The primary endpoint to assess the effect of the intervention was the number of fosphenytoin doses within the recommended dosage range of 15–20 mg phenytoin sodium equivalents (PE) per kilogram. Preintervention and postintervention doses within the recommended range were compared using chi-square analysis.

A retrospective review of medical records of the 50 adult patients receiving fosphenytoin loading doses from November 2007 to January 2008 was conducted. Following the educational intervention (in January 2008), similar data were collected concurrently on the first 50 adult patients receiving loading doses of fosphenytoin between April 2008 and June 2008. This sample size provided 80.6% power with an effect size of 25%. The a priori level of significance was 0.05.

Forty-nine patients were included in the preintervention analysis—one patient was excluded because of an incomplete medical record—and 50 patients were included in the postintervention data analysis. The mean weight of preintervention and postintervention patients was 72 kg and 73 kg, respectively (p = 0.31). A significant increase in the number of patients receiving loading doses within the target range was observed postintervention (31/50) compared with preintervention (12/49, p < 0.001). The number of doses below the target range was reduced from 29/50 (59%) to 15/50 (30%) (p = 0.01).

The short length of follow-up was a study limitation. Postintervention data were collected over a four-month period, and it is possible that compliance with weight-based dosing declined with time. The study also used a surrogate endpoint, and effects of this intervention on clinical outcomes were unknown.

An educational intervention aimed at ED physicians on fosphenytoin dosing demonstrated an improvement in the use of optimal doses. Targeted physician education is one method to help improve pharmacy services for ED patients.