Introduction

With the aging of society, the composition of the disease occurs within society changed [1]. It is imperative to obtain diseases trends to better understand health care needs of children under the low birth rate. Because of the vital role of admission in health care, it is important to monitor changes in the inpatients to identify trends or problems for improvement. Few studies focus on trends for children in the hospital use but most in the United States [2-5].

Materials and Methods

Subjects were patients younger than 18 years who were hospitalized at Chang Gung Memorial’s Hospital, a medical center of northern Taiwan, during the 10-years periods from Jan 2003 until Dec 2012. In total, 226,175 inpatients from Chang Gung Memorial’s Hospital Medical Information Database were identified. The study was composed of annual categories about the diagnosis code, age and gender. The following items were examined: 1) gender and age, 2) diagnosis, 3) inpatients number. Diagnoses are defined from the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes. Age-specific and gender-specific population estimates for 2003–2012 were obtained. The age was divided into six groups: aged under 1 month, in 1 - 12 months, in 1 - 2 years, in 2- 6 years, in 6 - 12 years, and in 12 to 18 years referring by hospital medical records. Analyses for types and changes in inpatient diagnosis between 2003 and 2012 were conducted by access the inpatient number and population ratios. We defined the diagnosis with health newborn cases as ICD-9-CM Code V30-V39, condition originating in perinatal period cases as ICD-9-CM Code 764-779, congenital anomalies cases as ICD-9-CM Code 740-759, acute respiratory infection cases as ICD-9-CM Code 460-466, acute gastroenteritis cases as ICD-9-CM Code 555-558 and 001-009, pneumonia cases as ICD-9-CM Code 480-487 , fracture cases as ICD-9-CM Code 810-829 and 800-804, arthropathy cases as ICD-9-CM Code 710-719, and musculoskeletal deformities cases as ICD-9-CM Code 730-739.

Results

Types of disease

There were 128,241 male (56.7%) and 97,934 female (43.2%), with a ratio of males to females of 1.3:1. The largest inpatient
age group was the 6-12 years (25.4%), followed by newborn (21.1%), 1-12 months (14.6%), 2-6 years (14.4%), 12-18 years (12.1%) and 1-2 years (12.1%). Table 1 illustrated the leading diagnosis by age and gender from 2003 to 2012. Children had age differences among hospitalized diagnoses categories. From the 2003 to 2102, health newborn (77.6%), and prematurity or condition from the perinatal periods (15.1%) were the top two significant hospitalized diagnoses categories in newborn. Acute respiratory infection (19.1%) was the major significant diagnoses category aged in 1 to 12 months. Acute gastroenteritis (18%) was the significant top diagnosis in children aged in 1 to 2 years. Pneumonia was the significant leading diagnoses of children aged in 2 to 6 years and 6 to 12 years (20.5% and 15.5 %), respectively. During the adolescents, fracture (6.7%) was the most common inpatients diagnosis. Newborn with congenital anomalies and adolescents aged 12-18 years with fracture or arthropathy had gender difference among the age group.

**Trends over time**

Compared 2003 and 2012, total annual inpatients significantly decreased from 22,403 to 20,875, a decrease of 6.8%. The largest age group with a significant change was the 1 to 12 month age group, with a decline of 25.1%. Table 2 showed the time charts for 3 leading conditions by age group. Among children aged in 1-12 months, congenital anomalies significantly declined (18.8% to 7.3%, \( p < 0.001 \)). Alternatively, by the aged in 1 to 2 year, acute gastroenteritis increase (14.5 % to 19.1%, \( p = 0.008 \)). Pneumonia did not significant decrease among 2- to 6-year-old children (22.6% to 21.0%, \( p = 0.139 \)), but increased among the 6 to 12 age group (11.1% to 18.8%, \( p < 0.001 \)).

### Table 1: Leading Disease by Age and Gender from 2003 to 2012.

| Age Group and Disease Group | Male         | Female        | \( p \)-value |
|-----------------------------|--------------|---------------|---------------|
| Aged under 1 month          |              |               |               |
| Health newborn              | 19563        | 17504         | 0.644         |
| Condition originating in perinatal period | 4164 | 3053 | 0.259 |
| Congenital anomalies        | 433          | 584           | <0.001        |
| Aged 1-12 months            |              |               |               |
| Acute respiratory infection | 4127         | 2191          | 0.201         |
| Acute gastroenteritis       | 2334         | 1639          | 0.209         |
| Congenital anomalies        | 2200         | 1456          | 0.464         |
| Aged 1-2 years              |              |               |               |
| Acute gastroenteritis       | 2838         | 2112          | 0.589         |
| Acute respiratory infection | 2679         | 1618          | 0.21          |
| Pneumonia                   | 1728         | 1277          | 0.631         |
| Aged 2-6 years              |              |               |               |
| Pneumonia                   | 3546         | 3174          | 0.397         |
| Acute gastroenteritis       | 2975         | 2170          | 0.421         |
| Acute respiratory infection | 1827         | 1467          | 0.146         |
| Aged 6-12 years             |              |               |               |
| Pneumonia                   | 4585         | 4347          | 0.149         |
| Acute gastroenteritis       | 2772         | 1936          | 0.33          |
| Acute respiratory infection | 2211         | 1648          | 0.665         |
| Aged 12-18 years            |              |               |               |
| Fracture                    | 1410         | 453           | <0.001        |
| Arthropathy                 | 372          | 781           | <0.001        |
| Musculoskeletal deformities | 566          | 522           | 0.216         |

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Table 2: Leading Diagnoses for Children, 2012 Versus 2003.

| Age group and diagnostic group                       | 2003       | 2012       |
|------------------------------------------------------|------------|------------|
|                                                      | No   | %   | No   | %   |
| Aged under 1 month                                   |       |     |       |     |
| Health newborn                                       | 3749 | 78.7| 4661 | 82.3|
| Condition originating in perinatal period            | 693  | 14.5| 782  | 13.8|
| Congenital anomalies                                 | 119  | 2.4 | 77   | 1.3 |
| Aged 1-12 months                                     |       |     |       |     |
| Acute respiratory infection                          | 795  | 21.2| 497  | 17.6|
| Congenital anomalies                                 | 705  | 18.8| 208  | 7.3 |
| Acute gastroenteritis                                | 369  | 9.8 | 340  | 12  |
| Aged 1-2 years                                       |       |     |       |     |
| Acute respiratory infection                          | 394  | 14.6| 367  | 16.7|
| Acute gastroenteritis                                | 393  | 14.5| 420  | 19.1|
| Pneumonia                                            | 372  | 13.8| 247  | 11.2|
| Aged 2-6 years                                       |       |     |       |     |
| Pneumonia                                            | 725  | 22.6| 572  | 21.0|
| Acute gastroenteritis                                | 401  | 12.5| 451  | 16.5|
| Acute respiratory infection                          | 234  | 7.3 | 266  | 9.7 |
| Aged 6-12 years                                      |       |     |       |     |
| Pneumonia                                            | 625  | 11.1| 920  | 18.8|
| Acute gastroenteritis                                | 290  | 5.1 | 436  | 8.9 |
| Acute respiratory infection                          | 193  | 3.4 | 286  | 5.8 |
| Aged 12-18 years                                     |       |     |       |     |
| Fracture                                             | 200  | 7.7 | 154  | 5.8 |
| Musculoskeletal deformities                          | 121  | 4.7 | 99   | 3.7 |
| Arthropathy                                          | 119  | 4.6 | 99   | 3.7 |

Discussion

This report presents a broad review of trends in hospital care for children during the 10-year period from 2003 to 2012. During this time period, significant decreases in inpatients, mirrored by decreases in children at Taiwan [6]. At neonatal stage, the prematurity or condition from the perinatal periods and congenital anomaly were the top two hospitalized diagnosis categories except the health newborn at our study. The congenital anomaly hospitalization significantly decreased among children, but the prematurity or condition from the perinatal periods did not decrease. The decrease in congenital anomaly may be related to the active screening program or more advanced ultrasound for congenital anomalies in recently [7,8]. In Taiwan, amniocentesis has been encouraged for pregnant women aged ≥ 35 years. When chromosomal anomalies or multiple anomalies have been found, most pregnancies have been terminated [9,10].

In contrast, the newborn with condition originating in perinatal period did not significantly decrease at our study. In our hospital, 18.6% of the inborn infants were born preterm at annual deliveries [11]. Preterm infants are at considerable risk for neonatal mortality and morbidities [12,13]. The incidence of prematurity, which has increased in recent years, is associated with various epidemiological and clinical risk factors [14]. Although the etiology of preterm birth is multi factorial and involves a complex interaction, the health promotion programs and policies should be focused on reducing the risk factors of preterm infants to prevent the sequel and cost associated to prematurity.

Congenital anomaly was the major significant diagnoses category aged in 1 to 12 months. Some of the anomalies are not obvious within a few days of birth, such as congenital cardiovascular diseases, hypertrophic pyloric stenosis, and renal, pelvic or ureter obstruction. The lower rates of these anomalies...
at newborn might be caused by lower detection rates caused by the requirement of early reporting time (within a few days after birth) in Taiwan [9]. Among children aged in 1 to 2 years, acute gastroenteritis was the significant top diagnosis in children. Acute gastroenteritis is one of the most prevalent infectious diseases in the world. Viral infections, primarily from *rotavirus*, cause 75 to 90 percent of infectious diarrhea cases in the industrialized world [15]. *Rotavirus* and *norovirus* were detected in 28.6% patients and 18.1% patients in our hospital, respectively [16]. Most infants acquire *rotavirus* diarrhea early in life; an effective *rotavirus* vaccine would have a major effect on reducing diarrhea mortality [17-24]. The introduction of *rotavirus* vaccines in infants should be considered to reduce severe diarrhea and admission for the disease burden of the major cause of severe childhood gastroenteritis in the past and recent years in our study.

Pneumonia was the significant leading diagnoses of children aged in 2 to 6 years and 6 to 12 years, the largest age group for admission in our study. In Taiwan, pneumonia occurs most frequently below the age of 5 years old, with an annual incidence of hospitalizations of 3,965 episodes per 100,000 children. In our study, we found a significant decreasing trend in annual ratio of hospitalizations for childhood pneumonia aged in the age group in 2012. This may be related to a conjugated pneumococcal vaccine not been introduced in Taiwan till 2005 [25]. Because the most important bacteria pathogen is *S. pneumonia*, vaccinations against the micro-organism may help reduce pneumonia’s disease burden [26].

In contrast, in our study, pneumonia most occurred in inpatients aged in 6 to 12 years in 2012. We found a significant increasing trend in annual ratio of hospitalizations for childhood pneumonia aged in the age group compared with 2003. This may be related to a conjugated pneumococcal vaccine not been included in Taiwan’s National Vaccination Program and are not universally administered to all children especially in children aged over 5 year old till this year.

In conclusion, the characteristics of major health problems were different among age variables in children. Health promotion programs and policies toward newborns should focus on conditions of the perinatal periods. Respective programs for infant, should emphasis on the acute infectious disease and congenital anomaly. Our study highlights the health promotion programs and policies should effectively provide the respective services to improve the outcome efficiently.

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