EPIDEMIOLOGY OF ACUTE RESPIRATORY DISEASE AT THE PEDIATRIC EMERGENCY ROOM OF THE SOCIAL SECURITY MEDICAL CENTER IN PANAMA CITY, PANAMA[1]

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Within Latin America, longitudinal hospital surveillance studies of acute childhood respiratory diseases are very rare. This article reports the results of one such study conducted at the pediatric emergency ward of the Social Security Hospital in Panama City from March through December 1983. In all, 340 children with lower respiratory tract diseases (primary admission diagnoses of asthma, bronchiolitis, obstructive reversible bronchitis, or pneumonia) were included in the study.

Introduction

Acute respiratory disease (ARD) is a major public health problem throughout Middle America, being a particularly important problem for young children. More specifically, it is typically among the first three causes of infant mortality in every country of the region *(1)*. For example, data for Mexico in 1976 show that 27% of all infant deaths in Mexico were attributed to ARD, the resulting apparent mortality being 15 deaths per thousand live births. Data available for Panama in 1978 show a lesser but still marked effect, ARD being held responsible for 10% of all recorded infant deaths (2.2 deaths per thousand live births) *(2)*. ARD is also an important cause of overall mortality. For instance, ARD was named on 6% of all certified deaths in Panama in 1978, being responsible for 26 deaths per hundred thousand population *(2)*. This death rate is similar to ARD mortality elsewhere in Central America.

In general, pneumonia and other lower respiratory diseases are the most important contributors to respiratory disease mortality; indeed, data available for the middle and later 1970s show that diseases diagnosed as influenza or pneumonia together tended to constitute the fourth or fifth leading cause of mortality (usually being held responsible for 3% to 8% of all deaths) in most Central American countries. One noteworthy exception to this pattern was Guatemala, where data for 1978 indicate "pneumonia and influenza" accounted for 14% of all deaths (134.5 deaths per 100,000 population) *(1)*. In Panama, pneumonia was the sixth leading cause of death between 1974 and 1978 *(2)*.

Such data demonstrating excess mortality show only part of the burden ARD imposes. In 1978, for instance, 24,000 Panamanian children younger than 15 were admitted to public hospitals *(3)*, and 24% of all pediatric hospital admissions were for treatment of ARD. This latter rate is far higher than the admission rate for trauma, the second most frequent pediatric hospital discharge diagnosis, which accounted for 14% of all pediatric hospitalizations. Likewise, during 1980 ARD was the most common reason for pediatric hospitalization in the Panama City Metropolitan Area, accounting for 33% of all admissions to the Children's Hospital *(Hospital del Niño) (3)* and 34% of all pediatric admissions to the Social Security Metropolitan Medical Center *(4)*. Overall, 57% of the hospitalized ARD cases were diagnosed as "pneumonia," 26% as "bronchitis-emphysema-asthma," and 17% as "other acute respiratory infections"; children hospitalized for ARD generally spent between 3.9 and 7.3 days as inpatients *(3-5)*. Even more striking, at least 55% of all visits to pediatric emergency rooms in Panama City were for ARD.

Panama's Social Security System provides complete health care for employed and retired Panamanians and their dependents. A modern Social Security Medical Center (CHM-CSS) serves the Panama City Metropolitan Area and is responsible for all pediatric inpatient services. Between 1977 and 1979 the CHM-CSS Pediatric Emergency Room attended 236,948 patients, of whom 11,345 (5%) were admitted to the medical center's hospital. In total, 34% of all CHM-CSS pediatric admissions were for ARD *(4)*. The five most common diagnoses were pneumonia (15% of the admissions), diarrhea (12%), bronchial asthma (12%), dehydration (10%), and bronchiolitis (7%). A recent review article by our group indicated that this general pattern continued through 1982 and 1983 *(5)*.

In order to better understand the clinical epidemiology of ARD at the CHM-CSS Pediatric Emergency Room, we initiated a detailed hospital surveillance study in March 1983. This article reports results of that surveillance program through December 1983. The program's specific objectives were: (1) to describe clinical syndromes accounting for ARD in children admitted to the CHM-CSS emergency room; (2) to define populations at high risk for specific ARD syndromes; (3) to define risk factors for specific ARD syndromes as well as factors likely to enhance the severity of various syndromes; and (4) to define the etiologic agents responsible for ARD syndromes. To accomplish these objectives, the study recorded summary information on all children with ARD who were seen at the emergency room and collected detailed epidemiologic, clinical, and laboratory data on children who required hospital admission for ARD.

Materials and Methods

Study Population

The eligible study population included all children below 15 years of age with ARD of less than five days duration who were admitted to the social security hospital beginning on 17 March 1983. All these children were admitted to the pediatric emergency room observation ward and then, if necessary, were transferred to the general hospital pediatric service.

Gorgas Memorial Laboratory (GML) epidemiology staff members were present at the emergency room between 0730 and 2300 hours Monday through Friday. In consultation with emergency room staff members, they identified eligible patients. If an eligible child was present during this time period, and if the child's parents agreed to participate, the patient was included in the study.

Clinical Data

Patient evaluation and decisions concerning admission and treatment were accomplished according to established CSS pediatric emergency room procedures. The parents, guardians, or other legal representatives of the children involved gave informed consent for each child's admission and work-up, as well as for any invasive diagnostic procedures. The GML epidemiology staff reviewed each patient's chart and abstracted data to an "admission clinical record

form." At discharge, the chart was again reviewed and the data were abstracted to a "discharge form." Each discharged patient was given a follow-up appointment at the emergency room clinic two weeks after discharge for the purpose of collecting a specimen of convalescent blood.

Epidemiologic Data

GML epidemiology staff members interviewed the parents or guardians of ARD patients who were admitted to the study and recorded information on a standardized epidemiology form. They also helped the emergency room medical staff collect diagnostic specimens and ensured that the specimens were properly maintained and were sent to the appropriate laboratory.

Clinical Specimens

Each study patient provided an acute blood specimen at admission and a convalescent blood specimen two weeks following discharge for the purpose of serologic testing. We also collected four nasopharyngeal swab specimens, one each for viruses, *Chlamydia, Mycoplasma,* and other bacteria. In addition, a tracheal aspirate was obtained, using either a DeLee or Lukens trap, and was processed for the same agents. Each tracheal aspirate was examined microscopically, using standard criteria, to assure that the specimen was adequate *(6);* if necessary, a repeat tracheal aspirate was obtained.

Laboratory Methods

Virology. All specimens intended for viral isolation were held on wet ice and inoculated on the day of collection into tube cultures of Vero, HEp-2, and FT cells *(7).* The Vero and HEp-2 cultures were maintained stationary and at 35°C, while the FT cultures were placed in a roller apparatus and kept at 33°C. All the cultures were observed twice weekly for cytopathic effects; negative cultures were discarded at 14 days. Vero cultures with no evidence of cytopathic

effects were hemadsorbed with guinea pig red blood cells at days 5-7 and 12-14 to detect parainfluenza virus growth *(7).* Viral isolates were identified using standard methods *(7, 8).* In order to detect influenza viruses, all specimens were also inoculated into the allantoic and amniotic cavities of embryonated chicken eggs and processed according to standard methods *(7).*

Chlamydia *and* Mycoplasma. Swabs for *Chlamydia* and *Mycoplasma* isolation were frozen at -70°C until processing, which was done twice-weekly. *Chlamydia* were assayed using a microtest procedure that involved centrifugation of specimens onto microplate cultures of IUDR-treated McCoy cells, routine blind passage, and examination after iodine staining *(9). Mycoplasma* cultures were done in both PPLO agar and PPLO broth according to standard methods *(7).*

Bacteria. Specimens for bacterial isolation were collected using Culturettes®, were transported to the hospital's clinical laboratory, and were inoculated onto blood agar, chocolate agar (for incubation in 5% CO_2), and MacConkey agar. Isolates were identified using standard methods.

Data Processing

All the data forms obtained were checked and coded at the GML Division of Epidemiology according to standard procedures. All clinical, interview, and laboratory information was key-punched, verified, and entered into the GML computer. Files were managed utilizing the CCSS data processing system to maintain, update, and analyze patient data *(10).*

Results

During the first calendar year of the study (17 March—31 December 1983), a total of 383 eligible children were enrolled; 358 (93%) of these had a primary clinical admission diagnosis of ARD. This article, however, is limited to the 340 children (89% of the total) with a primary clinical admission diagnosis of lower respiratory

tract disease (LRD); clinical diagnoses included bronchiolitis, obstructive reversible bronchitis, pneumonia, and asthma.

Between 60% and 74% of these LRD patients had a single clinical admission diagnosis of bronchiolitis (17 of 27 with bronchiolitis, or 63%), obstructive reversible bronchitis (21 of 28 with obstructive reversible bronchitis, or 71%), pneumonia (37 of 62 with pneumonia, or 60%), or asthma (164 of 223 with asthma, or 74%), the remainder having secondary clinical admission diagnoses. The secondary admission diagnoses included the following: (1) another lower respiratory tract disease—bronchitis, bronchiolitis, obstructive reversible bronchitis, pneumonia, or asthma; (2) upper respiratory tract disease—nasopharyngitis, pharyngitis, tonsillitis, or disease at multiple sites; (3) major complications of severe lower respiratory tract disease—circulatory or pulmonary failure and dehydration; (4) assorted complications involving sickle cell disease, febrile seizure, or purine reactions; and (5) unrelated diseases—diarrhea, congenital heart disease, etc. In general, the proportion of patients with multiple clinical admission diagnoses was roughly the same in each of the four primary diagnostic categories.

As Table 1 shows, most of the patients in each major admission diagnosis category were discharged with the same primary diagnosis as the one with which they were admitted. There was particularly close agreement between the admission and discharge diagnoses for patients with a single admission diagnosis, and most asthma and pneumonia patients with a secondary admission diagnosis were also given a discharge diagnosis of asthma or pneumonia. However, four of the 10 children (40%) admitted with bronchiolitis and a secondary clinical diagnosis had a discharge diagnosis of pneumonia, and two of the six children (33%) admitted with obstructive reversible bronchitis and a secondary clinical diagnosis were given a discharge diagnosis of bronchiolitis. As Table 2 indicates, admission chest X-ray findings were consistent with this overall pattern.

The distribution of clinical signs and symptoms on admission was compatible with the various diagnostic categories. For example, 62% of the asthma patients and 59% of the obstructive reversible bronchitis patients presented to the hospital with moderate or severe respiratory distress, as compared to 45% of the bronchiolitis patients and 34% of the pneumonia patients.

Table 1. A comparison of admission diagnoses and discharge diagnoses of study children with primary clinical admission diagnoses of lower respiratory tract disease.

Primary discharge diagnosis	Primary admission diagnosis															
	Bronchiolitis in children with:				Obstructive reversible bronchitis in children with.				Pneumonia in children with:				Asthma in children with:			
	A single admission diagnosis		Primary and secondary admission diagnoses		A single admission diagnosis		Primary and secondary admission diagnoses		A single admission diagnosis		Primary and secondary admission diagnoses		A single admission diagnosis		Primary and secondary admission diagnoses	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No	(%)	No	(%)	No.	(%)
Bronchiolitis	**13**	**(76)**	**4**	**(40)**	2	(11)	2	(33)	3	(8)	0	–	0	–	0	–
Obstructive reversible bronchitis	2	(12)	1	(10)	**16**	**(84)**	**3**	**(50)**	1	(3)	1	(4)	1	(1)	2	(3)
Pneumonia	1	(6)	4	(40)	1	(5)	0	–	**28**	**(78)**	17	(68)	2	(1)	10	(17)
Asthma	0	–	1	(10)	0	–	1	(17)	3	(8)	4	(16)	**161**	**(98)**	**46**	**(79)**
Other	1	(6)	0	–	0	–	0	–	1	(3)	3	(12)	0	–	0	–
Total	17	(100)	10	(100)	19[a]	(100)	6[a]	(100)	36[a]	(100)	25	(100)	164	(100)	58[a]	(100)

[a]The totals shown differ from those indicated in the text because they only include patients for whom discharge diagnoses were recorded. Recorded discharge diagnoses were not available for five patients.

Table 2. Admission chest X-ray findings for children with primary admission diagnoses of lower respiratory tract disease, by type of diagnosis.

Radiologic interpretation	Primary admission diagnosis							
	Bronchiolitis		Obstructive reversible bronchitis		Pneumonia		Asthma	
	No. of children	(%)	No. of children	(%)	No. of children	(%)	No. of children	(%)
Normal	1	(4)	0	–	0	–	11	(5)
Alveolar infiltrate	3	(11)	4	(16)	44	(71)	11	(5)
Interstitial infiltrate	2	(7)	1	(4)	2	(3)	2	(1)
Consolidation	0	–	0	–	7	(11)	1	(0.5)
Trapped air	8	(30)	4	(16)	1	(2)	47	(23)
Trapped air plus secretions	7	(26)	9	(36)	1	(2)	80	(39)
Increased secretions	5	(18)	4	(16)	5	(8)	33	(16)
Other	1	(4)	3	(12)	2	(3)	21	(10)
Total	27	(100)	25[a]	(100)	62	(100)	206[a]	(100)

[a]The totals shown differ from those indicated in the text because 20 of the patients (three with a primary admission diagnosis of obstructive reversible bronchitis and 17 with a primary admission diagnosis of asthma) did not have an admission chest X-ray.

Similarly, 62% of the pneumonia patients and 37% of the bronchiolitis patients had admission temperatures in excess of 38°C, as compared to only 22% of the asthma or obstructive reversible bronchitis patients.

There were striking differences in the clinical severity of the patients' conditions in different diagnostic categories, and this was reflected in the patients' course within the hospital. That is, 23 (37%) of the 62 pneumonia patients and seven (26%) of the 27 bronchiolitis patients required transfer from the emergency room to the pediatrics ward, as compared to only two (7%) of the 28 children with obstructive reversible bronchitis and 12 (5%) of the 223 children with asthma. As would be expected, treatment received in the hospital also varied according to the problem's diagnostic category and clinical severity. This variation was most evident with regard to the antibiotic therapy provided for different patients. As shown in Table 3, nearly all the pneumonia patients received antibiotics; for patients in other categories, antibiotic therapy was more commonly provided to patients with multiple admission diagnoses.

There was a higher proportion of boys than girls in all diagnostic categories. Specifically, boys accounted for 59% of the bronchiolitis patients, 61% of the obstructive reversible bronchitis patients, 53% of the pneumonia patients, and 68% of the asthma patients. It should also be noted that the age distributions of the patients differed markedly in the four different diagnostic categories, as shown in Table 4. However, the patients' distribution by race was similar in the four diagnostic categories. Overall, 76% of the patients were classified as mestizo, 14% as white, 9% as black, and 1% as belonging to other racial groups.

A variety of socioeconomic indicators were obtained by interviewing the childrens' parents (Table 5). All of these indicators showed that the children with obstructive reversible bronchitis and pneumonia tended to live in poorer conditions than did the children with bronchiolitis or asthma. For example, 44 (51%) of the 86 children with obstructive reversible bronchitis or pneumonia, as compared to 64 (27%) of the 234 children with bronchiolitis or asthma, came from families whose average monthly income

**Table 3. A comparison of the proportion of children in each diagnostic category
who received antibiotic therapy while hospitalized.**

	Primary admission diagnosis							
	Bronchiolitis		Obstructive reversible bronchitis		Pneumonia		Asthma	
	No. receiving/No. antibiotics/admitted (%)		No receiving/No antibiotics/admitted (%)		No receiving/No antibiotics/admitted (%)		No. receiving/No antibiotics/admitted (%)	
Patients with one admission diagnosis	2/17	(12)	3/21	(14)	35/37	(95)	8/164	(5)
Patients with more than one admission diagnosis	6/10	(60)	2/7	(29)	24/25	(96)	32/59	(54)

Table 4. The ages of the 340 study children, grouped according to primary admission diagnosis.

	Primary admission diagnosis							
	Bronchiolitis		Obstructive reversible bronchitis		Pneumonia		Asthma	
Age group	No. of patients	(%)	No. of patients	(%)	No. of patients	(%)	No. of patients	(%)
0-5 months	15	(55)	2	(7)	9	(14)	1	(0.5)
6-11 months	8	(30)	9	(32)	12	(19)	4	(2)
1 year	3	(11)	11	(39)	9	(14)	21	(9)
2 years	1	(4)	2	(7)	14	(23)	35	(16)
3 years	0	—	1	(4)	8	(13)	21	(9)
4 years	0	—	2	(7)	3	(5)	28	(13)
5-9 years	0	—	1	(4)	6	(10)	90	(40)
≥10 years	0	—	0	—	1	(2)	23	(10)
Total	27	(100)	28	(100)	62	(100)	223	(100)

was US$200 or less. This difference is statistically significant ($X^2 = 16.85$; p<.001). Similarly, 59% of the children with obstructive reversible bronchitis or pneumonia, as compared to 45% of those with bronchiolitis or asthma, lived in homes where four or more people shared one bedroom ($X^2 = 5.20$; p<.025); 81% as compared to 90% came from homes served by city water ($X^2 = 4.90$; p<.05); and 35% as compared to 56% lived in homes with private flush toilets ($X^2 = 11.5$; p<.001).

Family composition was similar in all four diagnostic categories. That is, 79% of the study children came from two-parent families, and most of the rest (17%) came from families with a female head of household. Only 20% of the study subjects were only children, and the percentage of only children was similar in all diagnostic categories. Likewise, the ages of the patients' siblings did not appear to differ significantly from one diagnostic category to another.

The study subjects' prior medical histories,

Table 5. Socioeconomic data on the 340 study subjects' families—including average monthly household income, the average number of people living in each room of the family dwelling, the source of household water, and the nature of available toilet facilities.

| | Primary admission diagnosis | | | | | | | |
| | Bronchiolitis | | Obstructive reversible bronchitis | | Pneumonia | | Asthma | |
	No. of children	(%)	No. of children	(%)	No. of children	(%)	No. of children	(%)
Average monthly household income for 340 children, in US$:[a]								
<75	1	(4)	1	(3)	3	(5)	2	(1)
75-200	5	(19)	15	(54)	25	(43)	56	(27)
201-500	15	(58)	8	(29)	19	(33)	97	(47)
501-1,000	2	(8)	3	(11)	10	(17)	36	(17)
>1,000	3	(11)	1	(3)	1	(2)	17	(8)
Total[a]	26	(100)	28	(100)	58	(100)	208	(100)
No. of people per room in the family dwelling[b]								
1	0	–	0	–	0	–	2	(1)
2	6	(22)	6	(22)	8	(13)	56	(27)
3	7	(26)	7	(26)	14	(24)	60	(28)
4	8	(30)	5	(19)	14	(24)	37	(17)
≥ 5	6	(22)	9	(33)	23	(39)	56	(27)
Total[b]	27	(100)	27	(100)	59	(100)	211	(100)
Source of household water:[c]								
Private source in home	16	(59)	11	(39)	28	(46)	140	(66)
Private source outdoors	9	(33)	11	(39)	22	(36)	51	(24)
Communal city source	1	(4)	4	(14)	10	(16)	18	(8)
Spring or well	1	(4)	2	(7)	1	(2)	4	(2)
Total[c]	27	(100)	28	(100)	61	(100)	213	(100)
Household sanitary facilities:[d]								
Private flush toilet	15	(56)	7	(25)	24	(39)	119	(56)
Private latrine	9	(33)	16	(57)	31	(51)	71	(33)
Communal flush toilet	3	(11)	4	(14)	6	(10)	18	(8)
Communal latrine	0	–	1	(4)	0	–	5	(2)
Total[d]	27	(100)	28	(100)	61	(100)	213	(100)

[a]Average monthly household income unknown in 20 cases.
[b]Occupancy level (people per room) unknown in 16 cases.
[c]Type of household water source unknown in 11 cases.
[d]Type of household sanitary facility unknown in 11 cases.

grouped according to the four categories of admission diagnosis, fell into a highly consistent pattern (Table 6). In order to minimize variability, the data presented in the table were limited to patients with just one admission diagnosis. These data indicate that most patients with asthma (91%), obstructive reversible bronchitis (76%), or pneumonia (78%) had consulted a physician previously because of acute respiratory disease, but only 29% of the bronchiolitis patients had ever visited a physician for this reason. It is also noteworthy that nearly a quarter

of the asthma patients had been hospitalized within the preceding three months because of acute respiratory disease.

Both these patterns of previous illness and the nature of the primary diseases involved were reflected in the length of time that symptoms persisted before study subjects consulted the CHM-CSS pediatric emergency room. As Table 7 shows, children with acute obstructive airway diseases (asthma and obstructive reversible

bronchitis) tended to seek medical care relatively early, while 33% and 40% of those with pneumonia and bronchiolitis, respectively, came to the emergency room after two or more days of illness.

In addition, there was a significant association between antibiotic treatment prior to admission and the admission diagnosis. Specifically, three (11%) of the 27 subjects with bronchiolitis, two (7%) of the 28 with obstructive reversible bronchitis, 10 (17%) of the 60 with pneumonia, and

Table 6. Past histories of acute respiratory disease among those 225 study subjects with only one admission diagnosis for whom past histories were available.[a]

Prior medical attention for acute respiratory disease[a]	Admission diagnosis							
	17 patients with bronchiolitis		16 patients with obstructive reversible bronchitis		28 patients with pneumonia		164 patients with asthma	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Child previously visited a physician for acute respiratory disease	5	(29)	16	(76)	28	(78)	145	(91)
Child was hospitalized more than three months previously for acute respiratory disease	1	(6)	6	(29)	16	(44)	109	(68)
Child was hospitalized within the last three months for acute respiratory disease	1	(6)	4	(19)	9	(25)	39	(24)

[a]Prior medical attention was unknown for 14 of the 239 children with a single admission diagnosis.
[b]The items listed are not mutually exclusive; for example, the same child with chronic or recurrent disease could have received all three types of care listed.

Table 7. The duration of acute respiratory disease symptoms experienced by the 340 study subjects before arrival at the CHM-CSS Pediatric Emergency Room.

Radiologic interpretation	Primary admission diagnosis							
	Bronchiolitis		Obstructive reversible bronchitis		Pneumonia		Asthma	
	No. of children	(%)	No. of children	(%)	No. of children	(%)	No. of children	(%)
<12 hours	7	(26)	9	(32)	17	(27)	105	(47)
12-13 "	8	(30)	11	(39)	14	(23)	84	(38)
24-47 "	3	(11)	3	(11)	6	(10)	22	(10)
≥ 48	9	(33)	5	(18)	25	(40)	12	(5)
Total	27	(100)	28	(100)	62	(100)	223	(100)

Table 8. Viral, mycoplasmal, and chlamydial isolates obtained from cultures of swab and aspirate specimens provided by the study subjects.

	Primary admission diagnosis															
	Bronchiolitis				Obstructive reversible bronchitis				Pneumonia				Asthma			
	Swab cultures		Aspirate cultures		Swab cultures		Aspirate cultures		Swab cultures		Aspirate cultures		Swab cultures		Aspirate cultures	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Virus isolates:																
Negative	22	(85)	11	(61)	24	(86)	16	(89)	55	(89)	22	(79)	211	(91)	113	(87)
Herpesvirus (HSV)	0	–	0	–	0	–	0	–	1	(2)	1	(4)	4	(2)	2	(2)
Cytomegalovirus (CMV)	3	(12)	5	(28)	1	(4)	2	(11)	2	(3)	3	(11)	6	(3)	7	(5)
Enterovirus	0	–	0	–	0	–	0	–	0	–	0	–	2	(1)	0	–
Respiratory syncytial virus	0	–	1	(6)	2	(7)	0	–	3	(5)	2	(7)	7	(3)	6	(5)
Adenovirus	1	(4)	1	(6)	1	(4)	0	–	1	(2)	0	–	1	(1)	1	(1)
HSV and CMV	0	–	0	–	0	–	0	–	0	–	0	–	0	–	1	(1)
Subtotal	26	(100)	18	(100)	28	(100)	18	(100)	62	(100)	28	(100)	231	(100)	130	(100)
Mycoplasma *isolates:*																
Negative	27	(100)	18	(95)	28	(100)	21	(100)	59	(100)	30	(91)	211	(97)	129	(89)
Positive	0	–	1	(5)	0	–	0	–	0	–	3	(9)	7	(3)	16	(11)
Subtotal	27	(100)	19	(100)	28	(100)	21	(100)	59	(100)	33	(100)	218	(100)	145	(100)
Chlamydia *isolates:*																
Negative	20	(100)	16	(100)	23	(96)	19	(100)	45	(100)	26	(100)	202	(99.5)	120	(100)
Positive	0	–	0	–	1	(4)	0	–	0	–	0	–	1	(0.5)	0	–
Subtotal	20	(100)	16	(100)	24	(100)	19	(100)	45	(100)	26	(100)	203	(100)	120	(100)

six (3%) of the 218 with asthma were treated with antibiotics prior to consulting the emergency room ($X_3^2 = 16.64$; p<.001).

As Table 8 shows, viral, chlamydial, and mycoplasmal isolation rates were low in all diagnostic categories. We did not isolate influenza or parainfluenza viruses from any study patient. Isolation of bacteria did not fit any logical picture either with respect to pathogenic agents or clinical syndromes. We have modified our bacteriologic criteria for the remainder of the study, and serologic studies for viral agents are not yet completed. Respiratory syncytial virus occurred equally in all clinical syndromes, but the agent was only isolated between June and November with most of the isolations occurring in August,

September, and October (Table 9). *Mycoplasma,* as the table also shows, was isolated primarily from asthma patients.

Discussion and Conclusions

This is one of the first detailed, longitudinal hospital surveillance studies of acute respiratory disease (ARD) reported from Latin America. In all, 89% of the children admitted to the CHM-CSS pediatric emergency ward with ARD during the study period had a primary clinical diagnosis of bronchiolitis, obstructive reversible bronchitis, pneumonia, or asthma. This finding is similar to that of our previous analysis of CHM-CSS ARD admission between 1977-1979 *(5)* and is also

Table 9. Respiratory syncytial virus (RSV) and *Mycoplasma* isolates, by month of isolation and the patient's diagnostic category.

	Primary admission diagnosis							
	Bronchiolitis		Pneumonia		Asthma		Total	
	No. of/No. isolates/tested	(%)	No. of/No. isolates/tested	(%)	No. of/No. isolates/tested	(%)	No. of/No. isolates/tested	(%)
RSV isolations in:								
Mar	0/1	—	0/5	—	0/12	—	0/18	—
Apr	0/4	—	0/8	—	0/26	—	0/42	—
May	0/10	—	0/13	—	0/31	—	0/63	—
Jun	0/4	—	0/14	—	5/30	(17)	5/54	(9)
Jul	0/9	—	0/6	—	0/31	—	0/47	—
Aug	1/8	(13)	1/3	(33)	3/25	(12)	5/38	(13)
Sep	1/7	(14)	2/4	(50)	1/18	(6)	4/31	(13)
Oct	1/5	(20)	0/3	—	1/12	(8)	2/20	(10)
Nov	1/4	(25)	0/1	—	0/8	—	1/14	(7)
Dec	0/6	—	0/3	—	0/26	—	0/36	—
Mycoplasma *isolations in:*								
Mar	0/1	—	0/5	—	0/12	—	0/18	—
Apr	0/4	—	0/8	—	2/27	(7)	2/44	(5)
May	0/10	—	0/14	—	5/31	(16)	5/64	(8)
Jun	0/4	—	2/14	(14)	5/31	(16)	7/55	(13)
Jul	0/9	—	1/6	(17)	3/31	(10)	4/47	(9)
Aug	0/8	—	0/3	—	4/25	(16)	4/38	(11)
Sep	1/7	(14)	0/4	—	3/18	(17)	4/31	(13)
Oct	0/5	—	0/3	—	0/12	—	0/20	—
Nov	0/4	—	0/1	—	2/8	(25)	2/14	(14)
Dec	0/6	—	0/3	—	0/26	—	0/36	—

similar to the experience of others *(11)*. The fact that clinical diagnostic standards were consistent was indicated by the close correlation between admission and discharge diagnoses (Table 1). Most of the patients had a single clinical admission diagnosis, and of these 92% were discharged with the same diagnosis. A quarter of the children had a secondary admission diagnosis; of these, 79% of the asthma patients with a secondary admission diagnosis were discharged as asthma patients, and 68% of the pneumonia patients with a secondary admission diagnosis were discharged as pneumonia patients. As Table 1 shows, however, four (16%) of the pneumonia patients with a secondary admission diagnosis were discharged as asthma patients; and 10 (17%) of the asthma patients with a secondary diagnosis were discharged as pneumonia patients. Regarding these latter changes, it should be noted that serial chest films following adequate rehydration and adrenalin treatment are often needed to distinguish pneumonia from asthma in children who present with fever and dehydration *(12)*.

The correlation between admission and discharge diagnoses was somewhat more disparate for patients admitted with a primary diagnosis of bronchiolitis or obstructive reversible bronchitis who also had a secondary admission diagnosis. Four (40%) of the bronchiolitis patients in this category were discharged as pneumonia patients; two (33%) of the obstructive reversible bronchitis patients in this category were discharged as bronchiolitis patients; and one (17%) of the bronchiolitis patients in this category was discharged as an asthma patient. Most of the patients involved were children less than one year old who arrived with fever and dehydration, and for whom a clear clinical and radiologic diagnosis was developed after their initial treatment and stabilization in the emergency room.

The hospital treatment provided was consistent with the admission diagnoses. The majority of children with reversible obstructive airway disease were successfully treated in the emergency room. In contrast, 26% of the bronchiolitis patients and 37% of the pneumonia patients required admission to the pediatrics ward for two or more days. In most clinical settings children

with pneumonia receive antibiotic therapy, as they did during this study, because bacterial disease cannot be ruled out with certainty *(13)*. For other syndromes, antibiotic treatment (see Table 3) varied significantly for patients with one admission diagnosis as compared to those with multiple admission diagnoses. Only 5% to 14% of the children with a single uncomplicated admission diagnosis of asthma, bronchiolitis, or obstructive reversible bronchitis received antibiotic therapy while at the hospital. Ine contrast, 54% of the patients with asthma and a secondary admission diagnosis received antibiotics, as did six (60%) of the patients with bronchiolitis and a secondary admission diagnosis.

In the United States bronchiolitis is almost always a viral disease *(14)*. It is uncertain, however, whether or not this is true in Panama or other tropical areas. In very young children the clinical and radiologic picture may suggest possible pneumonia, and the leukocyte count may be elevated. Such children may have a secondary differential diagnosis and may receive antibiotic therapy to cover possible bacterial pneumonia.

The age distribution of patients in this study was consistent with their clinical diagnoses. Bronchiolitis is an acute nonrecurrent disease of infancy, with the peak incidence occurring among patients less than six months old. Infants with repeat occurrences of bronchiolitis-like syndromes are more appropriately diagnosed as having obstructive reversible bronchitis *(14)*. A variable proportion of children with obstructive reversible bronchitis continue as asthmatics *(14, 15)*. Pneumonia, in contrast, encompasses all pediatric age groups and in many cases is a complication of the other clinical entities *(16)*.

Our finding that children with bronchiolitis and asthma were from significantly higher socioeconomic backgrounds is an important new finding that should be explored in greater detail. (It is unlikely that within the population eligible for care at the social security hospital the parents of children with pneumonia and obstructive reversible bronchitis would preferentially seek private medical care.) Previous studies have indicated that children with pneumonia are typically from lower-class families *(17)*, but studies such

as ours, conducted within a single hospital setting, have not previously been published. Also, we are unaware of other studies indicating that children with obstructive reversible bronchitis typically come from socioeconomic backgrounds similar to those of children with pneumonia.

Obstructive reversible bronchitis may reflect an asthmatic respiratory response to common infection by the same viral agents that cause pneumonia *(14),* and such an infectious etiology might be more common in crowded lower-class conditions. On the other hand, asthma is clearly an allergic phenomenon that, like some other allergic disorders, could be more common among children who are socioeconomically better off. Bronchiolitis is almost exclusively a problem of infancy, and its incidence patterns could reflect relative degrees of parental concern rather than clinical severity.

In addition to socioeconomic risk factors, many of the children with asthma, pneumonia, and obstructive reversible bronchitis had previous histories of acute respiratory disease. More than 75% of the children with these diagnoses had received formal medical care for ARD in the past, and approximately 25% had been hospitalized for ARD during the three months preceding the hospitalization studied. In thus appears that if these patients could be identified and followed more closely after the first hospital discharge, subsequent admissions might be avoided.

In this regard, the study children with pneumonia offer a particularly appropriate example. Forty per cent of the pneumonia patients in this study waited more than 48 hours before being taken to seek medical treatment, and 17% received home antibiotic treatment before going to the CHM-CSS pediatric emergency room. If these children had been singled out and identified for prompt intervention at the neighborhood health center, perhaps much of the excess proportion of pneumonia patients requiring hospitalization would have been avoided.

Finally, brief mention should be made of our attempts to isolate etiologic agents from these patients. Up to now, no consistent pattern of bacterial isolation has become apparent. Difficulty using noninvasive techniques to isolate bacteria from children with pneumonia is a common problem *(18),* and the role of bacteria as etiologic agents of pediatric lower respiratory disease is controversial *(11, 16).* A significant proportion of our study patients were treated with antibiotics before admission, and this may have contributed to low bacterial isolation rates. Most acute respiratory tract specimens yielded negative virus cultures, and we have yet to isolate influenza or parainfluenza viruses from any study patient. In other studies of pediatric ARD, parainfluenza virus was an important etiologic agent *(15, 19).* We have not yet screened paired sera, and so the overall pattern of viral infection is unknown. However, respiratory syncytial virus (RSV) was the most commonly isolated single virus, a finding in keeping with findings of other studies *(14, 15, 19, 20).* Also, as Table 9 shows, RSV was isolated most consistently from children with bronchiolitis and showed a definite seasonal pattern, being isolated most commonly between August and November. Consultations for influenza-like illness at Health Ministry health centers also peaked during these months; in the United States, RSV is most common during these same months *(16, 21).*

Mycoplasma, which is isolated throughout the year in the United States *(21),* did not show a clear seasonal pattern in our study. However, *Mycoplasma* was more frequently isolated from children with asthma than from children with other diagnoses, a finding that needs to be explored in more detail.

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SUMMARY

Acute respiratory disease (ARD) accounts for approximately one-third of all pediatric hospital admissions in the metropolitan area of Panama City, Panama. In order to describe the epidemiology of ARD and define risk factors, a surveillance study was initiated at the Pediatric Emergency Room of the Social Security Metropolitan Medical Center in Panama City. Between March and December 1983, 383 children were admitted to the emergency room because of ARD and were enrolled in the study; 340 (89%) had a primary clinical diagnosis of bronchiolitis, obstructive reversible bronchitis, pneumonia, or asthma.

Overall, 60% of the asthma and obstructive reversible bronchitis patients presented with moderate to severe respiratory distress, but only 6% required hospitalization for more than 48 hours. In contrast, 30% of the bronchiolitis or pneumonia patients were hospitalized for more than two days. Regarding socioeco-nomic status, significantly more of the obstructive reversible bronchitis and pneumonia patients (as compared to the asthma and bronchiolitis patients) came from families living in relatively poor socioeconomic conditions.

The study children's antecedent medical histories covaried with their diagnostic categories. Among other things, approximately 25% of the pneumonia and asthma patients had been admitted to the hospital for ARD in the three months preceding their enrollment in the study.

Regarding viral and bacterial disease agents, respiratory syncytial virus was the virus most frequently isolated from the study subjects, with most of the isolations occurring between August and November. *Mycoplasma,* which was also found frequently, was isolated from approximately 11% of all the asthma patients.

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