

# Rational Drug Therapy of Common Illnesses in Children

Hyman Shrand, MD  
Cambridge, Massachusetts

Experience with the care of over 7,000 children with acute illnesses has shown that most need either no medication at all or can be adequately managed from a choice of but a handful of drugs precisely prescribed. A knowledge of rational therapeutics can decrease polypharmacy, the high cost of illness, and the risk of iatrogenic disease.

Each year over one billion non-prescription drugs are sold over the counter and an equal number of prescriptions are filled for the "drug happy" American public.<sup>1,2,3</sup> No one will deny the benefits gained by the discovery of useful new drugs, but a large number of drugs on the market are redundant repetitions or fixed combinations with little or no benefit. A well-known "reference" book lists approximately 7,500 brand names.<sup>4</sup> A recent study by the National Academy of Sciences and its National Research Council revealed that of 1,200 combination drugs studied, only 45 were rated effective.<sup>5</sup>

This plethora of proprietaries is not only confusing to the physician and student, but from the patient's point of view many are unnecessary, expensive, useless, or dangerous.<sup>2</sup> Iatrogenic disease is increasing as drugs are being prescribed with toxic effects more serious than the disorder being treated. Drugs are usually given for sound medical reasons, but all too often are not indicated.<sup>1</sup> In some instances addiction to drugs, such as amphetamines, barbiturates, and narcotics can

be blamed on physicians who prescribe pills and cough mixtures without careful consideration.<sup>2</sup> Unused medications left lying around the house are a constant hazard, particularly to children, and poisoning has become a leading cause of illness and death.<sup>6</sup>

The purpose of this paper is to demonstrate that in everyday pediatric practice polypharmacy is unnecessary and that most of the acute episodes of illness in childhood need either no specific treatment or can be managed by one or two medications from a choice of but a handful. The spectrum of common acute illnesses in children will be described and their management will be outlined.

## Study Group and Methods

Over a period of three years the Home Medical Service of Tufts New England Medical Center provided care for over 7,000 acutely ill children in their homes.<sup>7,8</sup> These children had the same variety of disorders seen by family physicians and pediatricians in their daily practice. Table 1 tabulates the frequency of occurrence of acute illnesses seen in this large group of patients.

About 70 percent (almost 5,000) of these children had an acute viral illness for which there is currently no specific treatment. Antibiotics were given to approximately 20 percent of the total group. Table 2 shows the utilization of antibiotics in various age groups. Sub-

sequent to this study, we have shifted to the use of ampicillin for otitis media in infancy and childhood. Tetracyclines were never used.

The full list of drugs used, together with their dosage levels, are shown in Table 3.

## Management of Common Acute Illnesses in Children

### *The Febrile Child*

Most of the children seen in our study had a fever. Fever has frequently been maligned as something that must be eradicated as soon as possible. However, it is the cause of the fever that may need therapy more than the fever itself.

Fever in a child left relatively unclothed seems to cause little discomfort. But if heavily clothed and loss of heat prevented, these children frequently look and feel sick. In our large series of patients, it was unusual to find a child with a febrile convulsion who was not heavily clothed at the time. The usual story was that the mother, noticing the shivering stage of the rigor, would then overdress the child, leaving but the tip of the nose for cutaneous loss of heat. Undressing the child seemed more effective than antipyretics. If the child was uncomfortable or if there was history of febrile convulsions, then tepid bathing or sponging was used. Alcohol sponging is no longer recommended.

Intoxication by aspirin, either doctor prescribed or after accidental ingestion, causes more deaths than antibiotic poisoning.<sup>6</sup> Aspirin is a valuable but toxic drug to be prescribed precisely and only if needed. Aspirin should be avoided in infants under the age of one year and carefully prescribed for older children. In our program, aspirin was not used for every child with fever, but only if the fever was causing discomfort or if the child had a family history or personal previous history of febrile convulsions. Acetaminophen may prove to be less harmful than aspirin, less likely to cause bleeding<sup>9</sup> and oust aspirin as the antipyretic analgesic of choice. There is little evidence that the febrile child need be kept in bed and we leave it to the child to decide whether to be up or down.<sup>10</sup> Phenobarbital should be given orally to the child with a history of febrile convulsions as soon as fever starts.

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**Table 1. Common Pediatric Diseases Seen by the Home Medical Service (1967-1969)**

Disease	Number	Percentage of all Patients Seen
<b>Total Viral Diseases*</b>	<b>4963</b>	<b>70</b>
Upper Respiratory Tract Infections	3819	54.00
**Viral Gastro-enteritis	387	5.30
Varicella	350	5.00
Mumps	126	2.00
Measles	60	.80
Roseola Infantum	50	.70
Rubella	45	.60
Coxsackie Herpangina	35	.40
Herpetic Gingivostomatitis	30	.40
Croup	30	.40
Acute Bronchiolitis	30	.40
<b>Bacterial Diseases</b>	<b>1776</b>	<b>25.40</b>
Otitis Media	702	9.90
Streptococcal Pharyngitis	684	9.80
Conjunctivitis (purulent)	165	2.50
Impetigo Contagiosa	123	1.80
Lobar Pneumonia	36	.50
Scarlet Fever	36	.50
Urinary Tract Infections	30	.40
<b>Other Diseases</b>	<b>351</b>	<b>4.60</b>
Diaper Rash	89	1.10
Asthma	62	.80
Tinea Capitis	36	.50
Moniliasis (Oral and Diaper)	36	.50
Tinea Corporis	30	.40
ALL OTHERS	98	1.30
	<b>7090</b>	<b>100%</b>

\*There were obviously other infections such as viral pneumonia etc seen in lesser numbers.  
 \*\*Non-specific gastro-enteritis presumed viral, but possibly enterotoxic.

**Viral Upper Respiratory Tract Infections**

Viral "URI" was by far the commonest syndrome seen, accounting for the illness of 3,879 children — more than half of all the children in the study group. Viral "URI" was diagnosed by history, clinical examination and exclusion of streptococcal disease. Viral "URI" usually started slowly with nasal discharge, cough (usually worse at night), sore throat and moderate fever responding to antipyretics. The anterior and posterior cervical nodes were often enlarged. Examination of the oropharynx revealed a dusky red throat with or without a greyish exudate on the tonsils. Most of the viral infections could not be specifically diagnosed. If vesicles developed at the back of the throat, coxasackie herpangina was diagnosed. Vesicles on the tongue and front of the mouth were found with Herpetic infections. Streptococcal infection was considered likely in infants if coryza was associated with excoriation under the nares.

There is no specific therapy for

these viral infections and rational symptomatic management is all we can offer. In most instances the presenting symptoms from the mother's point of view were fever and cough. Cough mixtures are traditionally requested and usually prescribed. Sedative cough mixtures containing codeine are probably contra-indicated in pediatric practice. Domestic remedies of honey in warm milk or lemon tea or cough candy drops can be used for older children and give as much relief as more expensive "sophisticated" polypharmaceutical cough syrups.<sup>11</sup>

Removal of nasal mucus by suction or by proper and careful and controlled application of phenylephrine 1/8 percent nose drops is effective in opening up the nasal pathway, allows the infant to breathe through the nose, makes him more comfortable and appears to decrease postnasal drip and the need to cough. Antihistamines should not be used in nose drops mixtures where they add expense but no increase in beneficial effect. Nose drops are more effective and more rapid in onset of action than "oral

decongestants."<sup>12</sup> The mother should be carefully instructed in the use of nose drops, which are ineffective if improperly used. They should be instilled with the infant lying on the mother's lap, head suspended over her knees, with nostrils pointing towards the ceiling and to the side. Nose drops will then run down over the turbinates and not along the floor of the nose into the oropharynx. The infant should be kept in this position for one minute and then turned over allowing the mucus to drain out.

In the older child, a nose-spray is effective and easy to use. Nose drops should not be used for longer than three days. Antihistamines should be used only if nasal allergy is diagnosed. A common cause for cough is irritation of the respiratory tract by the overheated, dry environment often found in apartments and homes. Household humidifiers may be of some value but taking the child into a steamfilled bathroom is often more effective for spasms of coughing.

Fever should be treated as previously outlined. Antibiotics are not needed in viral upper respiratory tract infections and it behooves us to make a more accurate diagnosis of the 15 percent of instances when the "URI" is due to streptococcal infections. The more often throat cultures are taken in the child with URI the greater will be the number found to have streptococcal infection.

**Acute Otitis Media**

This painful illness was recognized in 702 children, about ten percent of all the children in our group. The presenting story was usually a child who had developed coryza and recurrent crying without relief. Most had fever and three had perforated ear drums when seen. No middle ear paracenteses were done.

Bacteriological studies have shown that any red bulging drum either of the pars flaccida or the whole drum is most likely due to a bacterial infection.<sup>4</sup> Furthermore, it has been shown that although the pneumococcus is the commonest offender in all age groups, about one third of the infections seen in children are due to Haemophilus influenzae<sup>13</sup> and about one third of these are resistant to penicillin. The pneumococcal infections are more

likely to be unilateral with high fever and much pain.<sup>13</sup>

All our children were given the benefit of antibiotic treatment. In the early part of the study, oral penicillin and sulfisoxazole were used for the younger group and penicillin only in older children. If the child was sensitive to penicillin, erythromycin with sulfa was used.<sup>14</sup> More recently ampicillin suspension has been shown to be effective against all the common organisms causing otitis media and has become treatment of choice.<sup>15</sup> Its main disadvantage is the frequent drug-induced diarrhea and skin rashes.<sup>16</sup> On these regimes we had only one child who developed a perforation, and this cleared with continued treatment. The children were re-examined during and after treatment and nine children were referred to otologists with "glue-ear." A rash appeared in five percent of the children; in none of them was infectious mononucleosis found, a relationship that is stated to be quite common.<sup>16</sup>

### Streptococcal Pharyngitis

Streptococcal pharyngitis was diagnosed in 684 children by history, clinical appearance, dramatic response to antibiotics and in most instances confirmed by a positive throat culture. Scarlet fever developed in 36 of these children (5.2 percent). Throat cultures were taken from 5,200 children with "URI" and Beta Hemolytic Group A streptococci were found in 15 percent of cases. These children were given a full ten-day course of penicillin. None developed acute haemorrhagic glomerulonephritis or rheumatic fever, although 15 (2.5 percent) developed a transient hematuria.

A "Strep throat" usually starts suddenly with a sore throat aggravated by swallowing, high fever, with or without headache and vomiting. The tonsillar nodes are usually swollen and tender and the oropharynx is scarlet red with or without exudate on the tonsils. Many children have palatal petichiae. There are no vesicles in the mouth. Although streptococcal pharyngitis is uncommon in infants, streptococcal rhinitis is common and usually causes excoriation below the nares.

Each year 10,000 cases of rheu-

	Under 1 yr	1 to 4 yrs	5 to 14 yrs	Over 15 yrs
Penicillin	10%	18%	24%	17%
Penicillin and Sulfa	10%	6%	.5%	-0
Erythromycin	-0	1.4%	1%	-0
No antibiotic	80%	74.6%	74.5%	83%
	<u>100%</u>	<u>100%</u>	<u>100%</u>	<u>100%</u>

matic fever still occur in the USA which could be prevented by adequate treatment of the antecedent streptococcal pharyngitis.<sup>17</sup> Clinically there is still a large error in the diagnosis of streptococcal pharyngitis and routine throat cultures for "URI" seem mandatory.<sup>18,19</sup> The child with signs and symptoms of streptococcal infection who looks ill should have a throat culture taken and be given an antibiotic at once. If the throat culture proves negative, if the child shows no dramatic improvement or if other signs of viral infection develop, the antibiotic should be stopped. If the child is not too ill, one can withhold antibiotics until the results of the throat culture are known. Any child with a positive throat culture, albeit but a few colonies which may reflect a carrier state rather than the causative organisms of the present illness, should be given antibiotic therapy. The antibiotic of choice in our practice is oral penicillin suspension (benzyl or phenoxymethyl penicillin in a dose of 1.2 million units per day for ten days). Injections need not be used except in rare instances when oral medication cannot be taken. A careful explanation should be given to the mother of the need to continue oral penicillin for ten days. The child should be checked again after completion of treatment and a urinalysis done.

A most important responsibility of the family practitioner managing a child with streptococcal infection is the prevention of spread to other members of the family. In most instances prophylactic oral penicillin was prescribed for all members of the family. This was found to be more practical than using throat cultures to detect possible infection in other family members. In our group of 1,500 children treated with penicillin, 24 (1.6 percent) developed a rash which could not be attributed to any other

cause but the penicillin. Erythromycin was used if penicillin allergy was suspected. Tetracyclines should not be used in children because of their teeth staining and other side effects and because many Beta hemolytic streptococci are tetracycline resistant.

### Vomiting and Diarrhea

The management of this common syndrome includes treatment of the cause when possible and the prevention of dehydration. In our series, 603 children had vomiting and diarrhea as their presenting symptoms. Parenteral infection of the middle ear, lung, or urine was found in 216 children and treated accordingly.

In the remaining 387 children, a rectal swab taken in the home and transported in glycerol-saline holding medium grew out shigella in six children and salmonella in another six. In one family, infected turtle water was found and in another, infected pet chickens. The remaining 375 children had non-specific gastroenteritis, a self-limiting disease with normal white blood counts and no blood in the stools.

A practical way to distinguish clinically between common causes of acute diarrhea is presented in Table 4.

A child with non-specific gastroenteritis seen early, usually on the first day, without evidence of dehydration can be managed effectively by stopping all food and milk for 24 hours, maintaining fluid balance by giving small drinks of tap water or ice pop-sicles, and slowly adding rice cereal and diluted milk to the diet on the next day. A child seen on the second day showing minimal signs of dehydration may be given a prepared oral electrolyte solution (oral Pedialyte). It is dangerous to ask the mother to pre-

Table 3. Commonly Used Drugs

Generic	Brand	Dosage
Acetaminophen elixir	Tylenol 1 yr Tempera 1-4 yr 4-8 yr	60 mgm (every 4 hrs for 2 days) 60-120 mgm 120-140 mgm
Acetyl salicylic acid A.S.A.	Aspirin  Baby Aspirin 75 mgm Adult Aspirin 300 mgm	Do not use under 1 year or if bleeding disorder 75 mgm/year/dose every 4 hrs for 1 day
*Ampicillin suspension	Penbritin Omnipen 125 mgm/5 ml 250 mgm/5ml	50-100 mgm/Kg/24 hrs
Chloral hydrate syrup	Noctec	10-20 mgm/Kg/dose
Cyproheptadine	Periactin Syrup 2 mgm/5ml Tab 4 mgm	1-2 mgm t.i.d.
**Erythromycin U.S.P.		50 mgm/Kg/24 hrs
Phenobarbital Elixir 20 mgm/5 ml Tab 15 mgm or 30 mgm		3-6 mgm/Kg/24 hrs
Phenoxymethyl penicillin	V cillin K Pen Vee K Susp. 125 mgm/5ml 250 mgm/5ml	250 mgm t.i.d. (over 1 yr of age)
Sulfisoxazole	Gantrisin susp. 500 mgm/5ml	100 mgm/Kg/24 hrs

\*Amoxicillin drops (50 mgm/cc) are recommended during the first years of life to avoid the diarrhea which might accompany ampicillin.

\*\*Erythromycin Estolate, although associated with a rare case of cholestatic hepatitis in the adult, does not have this complication in childhood and because of its good absorption and acceptance is the recommended erythromycin in this age group.

pare saline and sugar solutions because of the risk that these solutions may be made too concentrated and thus produce hypernatremia in the child with possible serious brain damage.<sup>20</sup> The child showing evidence of moderate dehydration (five percent loss of weight or more) should be managed with intravenous fluid therapy. If dysenteric organisms are found, antibiotics should be used only in the very sick children as they tend to prolong the carrier rate and induce resistant strains.<sup>21</sup> In our series the above simple regimen was adequate. Not one of these children had to be admitted for intravenous therapy. Neither antiemetic nor antidiarrheal agents were found necessary.

### Impetigo

In 123 children with impetigo, cul-

tures revealed streptococci in 37 percent, staphylococci in 24 percent, mixed infection in 24 percent, and no growth in 15 percent. The mothers were taught to cleanse away the crusts with hexachlorophene solution and apply an ointment (neomycin, bacitracin, and polymyxin) twice daily.<sup>22\*</sup> No reactions of sensitization were encountered. Only if hemolytic streptococci were found was a ten-day course of penicillin advised. None of these

children developed hematuria and none developed rheumatic fever which rarely occurs after impetigo.<sup>18</sup> When staphylococci were the only organisms recovered, local cleansing of the lesions with application of ointment was usually adequate unless signs of extension were found, such as cellulitis or lymphadenitis, when an appropriate antibiotic was prescribed.

Streptococcal impetigo has been recognized as a more common precursor of acute glomerulonephritis than streptococcal pharyngitis, particularly if the impetigo is associated with a nephritogenic strain.<sup>18,19</sup> A child with such an infection is at risk and since we do not routinely type streptococci, we were careful to give all children with streptococcal impetigo the benefit of ten days of oral penicillin even though its ultimate value is still to be established.<sup>18,22</sup>

\*The neomycin in neosporin ointment can cause sensitization, and polymyxin-bacitracin or just bacitracin is now being recommended for impetigo. A dextro-methorphan cough syrup is often helpful for the irritable cough.

## Diaper Rashes

Many different rashes occur in the diaper area and correct diagnosis will lead to effective therapy. The most likely cause is a contact dermatitis when the convexities of the buttocks and anterior abdominal wall are involved leaving the perianal area and natal cleft free. Urea in urine is changed into ammonia by B. urease, which is found normally in the stool. A wet diaper in contact with the buttocks produces ammoniacal scalding and is by far the commonest cause of contact dermatitis in this region. This is usually aggravated by the wearing of non-porous rubber or nylon panties. Another cause may be sensitization to the detergent used in the washing of the diapers. When the perianal region and natal cleft are involved, irritation by loose stools, antibiotics (especially ampicillin) and monilial infection are the likely causes. The latter starts in the perianal region and looks like wet blotter paper on a red base. It spreads by satellite colonies to involve the creases in the buttock area and the whole body. If the inguinal creases are involved, monilial infection with or without an underlying eczema is likely. Herpetic infections of the perineum are becoming more common. The infant with ammoniacal dermatitis should be treated by exposing the area, thereby reducing contact with the wet diapers, and eliminating the panties.

Benzyl-Konium chloride ointment (Diaperene) eradicates the B. urease and can be applied after each change of diaper. Mycostatin ointment works dramatically in cases of moniliasis. In this instance, one should search for moniliasis in the baby's mouth; if present, oral mycostatin should be used. The mother must be examined for moniliasis of the fingers and/or vagina since the infant's monilial infection will recur if these are untreated. Moniliasis is easily confirmed by examining a smear on a slide looking for hyphae and yeasts or by culture. If bacterial infection is suspected either primarily or secondarily, cultures should be taken and the infant treated as for impetigo. The routine use of steroid applications in the diaper region is unwarranted. It may help resolve the acute "burn" of severe uninfected ammoniacal dermatitis but as elsewhere "shot gun" therapy may cause more harm than good.

Table 4. Guide to Etiology of Diarrhea

Cause	Fever	Blood in Stools
Dietetic or drug	None	None
Parenteral infection	Present	None
Enteral infection—		
Viral	Possible	Rare
Bacterial	Common	Common

## Conjunctivitis

A yellow discharge from the eyes was the main complaint in 165 children, most of them being associated with positive cultures for pneumococci or staphylococci. They all responded to either neomycin-bacitracin-polymyxin eye ointment or chloramphenicol eye solution. Recurrent conjunctivitis in early infancy is usually associated with a blocked nasolacrimal duct. We had one epidemic of Adeno-pharyngo-conjunctival fever. These children had a viral "URI" and a conjunctivitis which usually became purulent.

## Comment

The science of medical therapeutics is to choose the most effective and specific agent, the one least likely to cause harm and the least expensive. A highly recommended text on this subject is the *Drug Evaluation* by the American Medical Association.<sup>12</sup>

Although modern medicine has made impressive scientific advances, poly-pharmacy is still far too common. In the pre-modern era of medicine many triumphs of healing that really belong to the power of nature were attributed to blood letting, blistering, puking, and purging.<sup>23</sup> Today many of nature's triumphs are falsely attributed to electrolytes, transfusions, ointments, antiemetics, antidiarrhetics, antitussives, antibiotics, and deferescents. The present state of the art leaves room for improvement.

## References

1. Proger S: The Medicated Society. New York, MacMillan, 1968
2. Wolff F: Competitive Problems in the Drug Industry. Hearings Before Subcommittee on Monopoly. US Govt. Printing Office, Part 3, p 633, 1967
3. Burack R: The New Handbook of Prescription Drugs: New York, Pantheon Books, 1970
4. The Physician's Desk Reference. New Jersey, Medical Economics, 1973
5. Bazell RJ: Drug efficacy study: FDA yields on fixed combinations. Science 172: 1013-1015, 1971
6. Accident Facts. Illinois, National Safety Council, 1972
7. Shrand H: Medical students and pediatrics in the community. Pediatrics 47:751-757, 1971
8. Shrand H: A home care program for sick children. Tufts Med Alumni Bull 27:8, 1968
9. Quick AJ: Bleeding Problems in Clinical Medicine. Philadelphia, WB Saunders, 1970
10. Browse NL: The Physiology and Pathology of Bed Rest. Springfield, Ill, Charles C Thomas, 1965
11. British National Formulary, BMA and Pharmaceutical Society of Great Britain, UK, 1966
12. AMA Drug Evaluations. Chicago, AMA, 1971
13. Howie VM, Ploussard JH, Lester RL: Otitis media: A clinical and bacteriological correlation. Pediatrics 45:29-35, 1970
14. Bass JW, Steele RW, Wiebe RA, et al: Erythromycin concentrations in middle ear exudate. Pediatrics 48:417-422, 1971
15. Howie VM, Ploussard JH: The in vivo sensitivity test of middle ear exudate. Pediatrics 44:940-944, 1969
16. Ampicillin rashes. Editorial. Lancet 2:933, 1969
17. Rapkin RH, Eppley ML: The recognition of streptococcal pharyngitis. Clin Pediatr 10:706-710, 1971
18. Wannamaker LW: Differences between streptococcal infections of the throat and skin. N Engl J Med 282:23-31 and 78-85, 1971
19. Wannamaker LW: Perplexity and precision in the diagnosis of streptococcal pharyngitis. Am J Dis Child 124:352-358, 1972
20. McCaulay D, Watson M: Hypernatremia in infants as cause of brain damage. Arch Dis Child 42:485-491, 1967
21. Aserkoff B, Benet JV: Effect of therapy in acute salmonellosis on salmonellae in feces. N Engl J Med 281:636-640, 1969
22. Hall WD, Blumber RW, Moody MD: Studies in children with impetigo. Am J Dis Child 125:800-806, 1973
23. Feinstein AR: What kind of basic science for clinical medicine. N Engl J Med 283:847-852, 1970