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□ Methodological notes in epidemiology

The cost of antibiotic treatment for priority infectious syndromes in Paraguay, 2004

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Antibiotics are essential for the treatment of human infections. In order to respond to the demand, the pharmaceutical industry in Paraguay provides the public with a large variety of commercial brands, both nationally-produced as well as imported. In the private health care sector, the public purchases prepackage antibiotics from pharmacies. Each package may have the exact number of tablets or capsules necessary to complete the treatment regimen indicated. On occasions, there is a remainder of unused tablets that should be discarded to prevent future use without adequate medical supervision. The unused, discarded portion is an economic waste. In public institutions, such as the Social Security Institute (SSI), these products are acquired through a bidding process and the patient is given only the necessary units to complete the treatment regimen in accordance with the medical advice.

Taking into account the importance and economic variability of different antibiotic treatments for common infectious diseases in adult patients in Paraguay and the influence of therapeutic failure for these costs, it is of interest to determine the cost of those interventions for which the Ministry of Health in Paraguay has promoted standard antibiotic treatment protocols. The costs of antibiotics emphasize the differences among them, depending on the brand, the source (national or imported), and whether acquired in the public or private sector.

The syndromes for which the cost of treatment was determined were selected from those that occur more frequently among adult ambulatory patients. The standard protocol (antibiotic, dose, route, interval, and duration) was described in the "Guide for the Treatment of Infectious Diseases" (PAHO).¹ The cost of the drugs is based on the cost of the package or packages necessary to accomplish the treatment regimen for these specific syndromes. The

cost of the unused units was determined by multiplying the cost of each unit in the package by the number of units remaining. In the SSI, the cost refers to the total number of units of the product that are necessary to complete the regimen indicated by the physician. The results, expressed in United States dollars (5,000 Guaranies = US\$1) are shown in Table 1.

Twentyfour drugs were analyzed, some of them in different presentations. It was determined that three were exclusively imports. Similarly, two of the antibiotics of choice are only produced abroad and seven are only produced locally.

The results show that there is a difference in the cost to the public for treating the different syndromes depending on the source of the product (the nationally produced drugs are cheaper), and the brand name; this variation can be as high as 300% for some drugs. The use of alternative treatments represents an additional cost, many times higher than that of first choice drugs. Similarly, it should be noted that the cost for unused units ranges from US\$0.40 to US\$48.00 depending on the product. If one considers that the syndromes and diseases included in the analysis occur most frequently among adults and they represent a significant fraction of hospital diagnoses, the economic impact could be significant. This waste of units, whose cost is absorbed by the patient, could justify the commercial production of some drugs for the therapeutic regimen for some specific diseases in order to prevent financial loss to the public.

The purchase of medicines through the official (SSI) bidding process represents considerable savings. The savings could be even higher if the treatment is dispensed in the exact dosage. This is not only in the pharmacy, but also in the SSI, where the cost of the drug of choice for

the treatment regimen is lower when compared to the alternative treatment. The savings are even greater when there is no treatment failure that justifies the use of more expensive drugs of the second line or last generation.

These findings show the theoretical savings saving of using standard treatment guidelines. In addition, considering that the major part of ambulatory treatment is empirical and

that the use of treatment protocols requires knowledge of the prevalence of the causal pathogens, this work also justifies the implementation of a local surveillance system for resistant strain of antimicrobials.

Kind of treatment / Disease	No. of laboratories		Cost for the public				SSI	
			Treatment		Unused drug in original container		Cost of treatment	
	National	Imported	National	Imported	National	Imported	National	Imported

1. Urinary infection uncomplicated in the woman

- First choice: <i>Trimethoprim - Sulfamethoxazole, 160/800mg q12hrs PO x 3d</i>	12	4	1,65 - 7,00	1,60 - 24,00	0,40 - 4.18	1,90 - 9,70	0,25	-
- Alternative: <i>Nitrofurantoin 100mg, 1 tab q12hrs PO x d</i>	1	-	3,60	-	2,40	-	Producción propia	

If on the 3rd day of treatment symptoms and signs persist, carry out urine culture and administer quinolones

- First choice: <i>Ciprofloxacin 250mg, 1 tab q12hrs PO x 3 d</i>	5	2	7,20 - 10,20	10,90 - 17,90	2,9 - 4.10	4,40 - 7,20	0,26	-
- Alternative: <i>Norfloxacin 400mg 1 tab q12hrs PO x 3 d</i>	2	2	7,80 - 13.30	13,30 - 30,30	3,12 - 8,30	7,60 - 21,00	0,40	-

2. Acute bacterial pharyngoamygdalitis

- First choice: <i>Penicillin benzatin 1,200,000 IU IM single dose</i>	4	-	1,00 - 2,25	-	-	-	0,77	-
- Alternative: <i>Phenoxymethylpenicillin 500mg q8hrs PO x 10 d</i>	-	2	-	3,00 - 30,00	-	0,50 - 5,00	-	-

Choice in patients allergic to betalactamic:

- First choice: <i>Erythromycin 500mg q12hrs PO x 10 d</i>	5	1	3,60 - 12,00	27,40	1,10 - 2,00	-	Producción propia	
- Alternative: <i>Clarithromycin 500mg q12hrs PO x 10 d</i>	-	3	-	25,00 - 130,00	-	4,20 - 48,60	-	26,00

3a. Pneumonia acquired in the community: Without comorbidity

- First choice: <i>Amoxicillin 1g q8hrs PO x 10 d</i>	10	4	15,00 - 28,00	22,00 - 37,00	0,00 - 2,60	0,00 - 2,30	3,00	-
- Alternative: <i>Clarithromycin 500mg q12hrs PO x 10 d</i>	-	3	-	36,50 - 129,60	-	2,10 - 48,60	-	26,00
<i>Azithromycin 500mg qd PO the 1° day, next 250mg qd PO x 4 d</i>	4	1	9,60 - 25,00	18,00	0,00 - 11,84	-	12,00	-

Choice if not responsive to the treatment at the 48h (therapeutic fail)

- First choice: <i>Levofloxacin 500mg q12hrs PO x 10 d</i>	1	4	24,00	19,40 - 76,60	-	10,00 - 21,00	-	-
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Kind of treatment / Disease	No. of laboratories		Cost for the public				SSI	
			Treatment		Unused drug in original container		Cost of treatment	
	National	Imported	National	Imported	National	Imported	National	Imported

3b. Pneumonia acquired in the community: Over 65 years of age or with comorbidity

- First choice: <i>Ceftriaxone 1g x qd IV or IM x 10 d</i>	4	2	74,00 - 120,00	198,00 - 318,00	-	-	-	9,79
+								
<i>Clarithromycin 500mg q12hrs PO x 10 d</i>	-	3	-	36,50 - 129,00	-	21,6 - 27,00	-	52,00

Choice if not responsive (therapeutic fail) and hospitalize

- First choice: <i>Ceftriaxone 2g x qd IV or IM x 10 d</i>	4	2	148,00 - 240,00	396,00 - 635,00	-	-	-	19,60
- Alternative: <i>Levofloxacin 500mg qd IV x 10 d</i>	-	2	-	530,00	-	-	-	-

4. Infection of the urinary tract in man/prostatitis

- First choice: <i>Ciprofloxacin 500mg q12hrs PO x 14 d</i>	5	7	22 - 32	22 - 96	1,50 - 2,16	1,50 - 6,30	1,22	-
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Choice if not responsive to the treatment (therapeutic fail)

- First choice: <i>Ciprofloxacin 500mg q12hrs PO x 30 d</i>	5	7	47 - 64	43 - 189	-	-	2,60	-
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5. Erysipela

- First choice: <i>Phenoxymethylpenicillin 500mg q8hrs PO x 10 d</i>	-	2	-	1 - 10	-	0,5 - 5,00	-	-
- Alternative: <i>Amoxicillin 500mg q8hrs PO x 10 d</i>	10	5	6,6 - 21	7,6 - 21	0,75 - 2,00	1,17 - 5,5	-	-
<i>Erythromycin 500mg q6hrs PO x 10 d</i>	6	1	7,2 - 20	55	0 - 2,19	0	6	1

Choice if not responsive to the treatment at the 48h (therapeutic fail)

- First choice: <i>Penicillin 2,000,000 IU IV q4hrs x 8 d</i>	2	1	85 - 150	83	-	-	9,60	-
- Alternative: <i>Clindamycin 600mg q8hrs IV x 10 d</i>	1	1	292	316	-	-	-	-

6. Cellulitis

- First choice: <i>Cephalexin 500mg q8hrs PO x 10 d</i>	4	1	8,70 - 13,00	21	0,55 - 0,90	1,30	2,25	-
- Alternative: <i>Cefadroxil 500mg q12hrs PO x 10 d</i>	3	-	11,80 - 15,60	-	2,00 - 5,85	-	-	-
<i>Dicloxacillin 500mg q6hrs PO x 10 d</i>	1	-	18	-	4	-	-	-

Choice if not responsive to the treatment at the 48h (therapeutic fail)

- First choice: <i>Cefazoline 1g q8hrs IV x 10 d</i>	4	-	114 - 120	-	-	-	36,00	-
- Alternative: <i>Clindamycin 600mg q8hrs IV x 10 d</i>	1	1	292	316	-	-	-	-
<i>Oxacillin 2g q6hrs IV x 10 d</i>	3	-	368 - 525	-	-	-	-	-

Kind of treatment / Disease	No. of laboratories National Imported		Cost for the public				SSI	
			Treatment National Imported		Unused drug in original container National Imported		Cost of treatment National Imported	

7. Acute pyelonephritis

- First choice:

Ciprofloxacin 500mg q12hrs PO x 14 d

4	6	22,00 - 53,70	23,4 - 94,50	2,16 - 3,00	1,46 - 6,30	1,66	-
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- Alternative:

Norfloxacin 400mg q12hrs PO x 3 d

2	2	7,15 - 7,18	13,30 - 30,00	1,43 - 1,56	1,65 - 6,00	0,40	-
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Choice if not responsive to the treatment at the 48h (therapeutic fail)

- First choice:

Gentamycin 160mg qd IM x d x 10 d

3	2	9,45 - 42,50	6,32	-	-	3,32	-
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- Alternative:

Amikacin 1gr qd IM x d x 10 d

5	1	88,52 - 94,60	94,84	-	-	12,70	-
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Choice if suspect *Enterococcus*:

- First choice:

Ampicillin 2g q6hrs IV x 10 d

4	6	170 - 305	142 - 193	-	-	52,00	-
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8a. Invasive diarrhea

- First choice:

Ciprofloxacin 500mg q12hrs PO x 5 d

4	3	7,40 - 11,20	9,50 - 31,50	-	-	-	0,50
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8b. Presumed salmonellosis (Immunocompromised, intravascular or cardiac prostheses and outbreaks of food poisoning)

- First choice:

Ciprofloxacin 500mg q12hrs PO x 5 d

4	3	7,40 - 11,20	9,50 - 31,50	-	-	-	0,50
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8c. Relapsing diarrhea

- First choice:

Metronidazole 250mg q8hrs PO x 7 d

5	-	3,40 - 16,00	-	3,20 - 16,00	-	-	0,68
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If not responsive to the treatment at the 48h (therapeutic fail)

- First choice:

Vancomycin 125mg q6hrs PO x 10 d

4	3	137 - 182	140 - 180	-	-	-	-
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References:

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Note:

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