

HOW MUCH DO LAB TESTS COST?

ANALYSIS OF LACOR HOSPITAL LABORATORY SERVICES

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Abstract

An analysis of the laboratory activity costs was done in the Laboratory Department of Lacor Hospital in order to calculate the global cost of each test and to evaluate the cost effectiveness of the service. The study is a retrospective analysis on the data related to the financial year 2002-2003. The costs that have been considered are: materials, salaries, equipment and general costs. A table has been outlined with the total cost of each test. The biggest contribution to the laboratory activity cost is given by general costs, which account for 45% of the total, followed by the materials (21%), and then by the salaries and equipment which contribute for 17% each. Most of the tests belong to the medium cost level, that is between 1000 and 2500 USH.

Introduction

The analysis of the hospital costs has become more and more important in the last time and it is even more essential in developing countries where the limited resources impose considerable efforts in order to get a good quality of the health care service. St. Mary's Hospital Lacor, in Uganda, was the object of a study conducted by a team from Ngozi University in the financial year 2001-2002. The study identified several cost centres in the hospital and calculated the respective costs by computing all the expenditures for each of them. The Laboratory Department was considered among the ancillary cost centres.

The aim of the present analysis is to estimate the burden of the Laboratory costs for each test done.

A better knowledge of the actual costs is required for "the promotion of more rational utilization and better appreciation of health laboratory services by medical and public health workers" (Barker and Houang, 1983) (1).

Materials and methods

The analysed costs are referred to the tests performed in Lacor Hospital's Laboratory in the financial year 2002-2003, excluding the Health Centres of Pabo and Opit. These costs can be fixed or variable: salaries, materials and consumables are here referred to as variable costs, while equipment and general costs are referred to as fixed costs. The fixed costs were extracted from the Ngozi study concerning the financial year 2001-2002, by assuming that these figures cannot change so much after one year.(2)

Salaries: This figure was given by the Personnel Office. It represents the total sum paid by the Hospital for the salaries of technical and auxiliary staff working in the Laboratory and Blood Bank. In this amount also the NSSF and the insurance costs are included. The evaluation of the personnel cost for each test was done through the LWU (Laboratory Workload Unit), an index that has been elaborated by Houang L. for laboratories in developing countries (3). One of these units is equal to 1 minute of technical, clerical and aide time. The LWU counts the time from the reception of the specimen to the issuing of the results but it doesn't consider incubation and waiting time.

A LWU value was assigned to each type of test. By knowing the number of tests done in the year, the yearly workload was calculated, first for each test, then for the whole activity of the year (4). The monetary value of each LWU came out by dividing the total expenditure for salaries by the total number of LWU. At the end, multiplying this monetary value by the number of the LWU needed for each test we got the cost of the test in terms of personnel.

Materials: To calculate this value, the cost of the materials needed to perform each laboratory test has been computed. The following materials have been considered: diagnostic kits, plastic-ware, glassware, staining reagents, chemical products, culture media. Some items, which are recycled, were considered as 10% of their original value.

At the end, the cost of each test was multiplied by the number of test run in the year. An increment of 20% was added to the materials cost for all the tests as rate of reagents "misused" by the students of Lab. Assistant Training course for their practical education. An

alternative method to get this cost could have been by summing the amount of the invoices for the Laboratory during the analysed year, but not all the invoices were available and, in addition, some items used in this year were bought in the previous one.

Equipment: The expenditure for equipment and for general cost came from the Ngozi's study and it is related to the financial year 2001-2002. This data represents the depreciation of equipment, assuming that they can last five years as internationally recommended for medical equipment, though our equipment lasts much longer. The Ngozi team calculated the annualised value basing on an updated inventory. This amount doesn't include the costs for maintenance and repairing equipment, which was included under "Maintenance", in "General costs". We had to find a way to establish the burden of equipment for the different tests, as some of them are very simple, others require very expensive equipment. We assigned an index to each instrument, derived from its current cost and its depreciation, as it is showed in Tab.1.

Tab.1- Equipment index

Equipment	Value in USH	Depreciation rate	Index
microscope	3.000.000	600.000	6
cell-dyne	45.000.000	9.000.000	90
incubator	3.000.000	600.000	6
centrifuge	4.000.000	800.000	8
photometer	5.000.000	1.000.000	10
refrigerator	1.000.000	200.000	2
mixer	1.000.000	200.000	2
chiron	15.000.000	3.000.000	30
oven	3.000.000	600.000	6
safety cabinet	5.000.000	1.000.000	10
autoclave	2.000.000	400.000	4
water bath	1.500.000	300000	3

The following method was used in calculating the equipment use index for each test on the basis of the instruments used to perform it, by summing their related indexes. Successively we got the total equipment use index for all the tests run in the year. The yearly expenditure for maintenance was divided by this total index in order to get the monetary value for one unit of this equipment index. The cost of each test in terms of equipment was found by multiplying the monetary value by the equipment use index of that test (Tab.5).

General costs: Under "General costs", the following have been included: administrative costs, security, buildings, maintenance, and pharmacy. The administrative cost is made up of the expenditure for administration management, transport, stationery, guesthouse and it was allocated to the Laboratory for the 7% of the total, according to the number of personnel. Security consists of the annualised cost of the perimeter fencing assigned to the Laboratory for 5% of the total, according to the occupied area. Buildings were computed as annualised value of the premises assuming that they would last for 30 years and they include the lagoon and the incinerator for the management of solid and liquid waste. Under "Maintenance" the costs of electricity, gas and water supply were computed, besides the cost of spare parts and repairing interventions. This cost was allocated to the Laboratory for 5.6% of the total. Pharmacy includes sundries, gloves, needles, syringes, and other disposable items, but not reagents.

Results

The yearly expenditures for the analysed factors, related to the year 2002-2003 are shown in Tab.2.

Tab.2 - Laboratory outputs

	OUTPUT	%. ESTIMATED FOR THE LAB.	AMOUNT	COST/LWU
General costs	Administration	7	91.919.308	
	Security	5.2%	1.386.269	
	Maintenance	5.6%	19.696.148	
	Buildings	4.3%	35.107.143	
	Pharmacy	8%	11.595.524	
	Sub.Total		159.704.392	88,38
Equipment			61.366.413	
Materials			77.140.204	
Salaries			61.931.960	34,27

All the calculations were made on the statistic of the laboratory activity of the same year.

The number of tests done in that period was 191.148, with an increment of 23% compared with the previous year. The LWU value for each test is listed in the attached table n.3. The cost of each LWU was found to be 34 USH. The same table reports the cost of each test in terms of personnel and in terms of general costs. The burden of the general costs was divided up among

the tests on the basis of LWU needed for each test; each LWU was given a value of 88 USH in terms of general costs and a value of 34 USH in terms of salaries. For the estimation of the equipment cost, we calculated the monetary value of one unit of the equipment index which was found to be 27 USH. The cost of each test for what the equipment is concerning is listed in the attached table n.4. At the end the contribution of each factor was computed and the total cost for each test was listed in the attached table n.5.

Tab.3 - LWU and general cost for each test

TESTS	N./year	LWU/test	tot LWU	personnel cost/test	general cost/test
Urine	10696	12	128,352	411	1060
Stool parasites	13508	8	108,064	274	706
Preg test	902	3	2,706	103	265
Vag/Uret smear	1230	8	9,840	274	706
Aspirate	383	15	5,745	514	1325
CSF	1981	20	39,620	685	1766
Sputum-Zn	8246	18	148,428	617	1589
W.B.C.count T+D	6928	17	117,776	583	1501
Full hemogr.	4692	2	9,384	69	177
HB	18135	4	72,540	137	353
Retic	76	10	760	343	883
Plalet	88	10	880	343	883
Clotting time	70	4	280	137	353
Bleeding time	70	4	280	137	353
E:S:R	1181	5	5,905	171	442
Sickling test	575	12	6,900	411	1060
Malaria	64384	10	643,840	343	883
Filaria	17	15	255	514	1325
Trypansoma	12	15	180	514	1325
Blood Group	9750	8	78,000	274	706
Crossmach	6479	12	77,748	411	1060
Blood Urea	3432	8	27,456	274	706
Blood Sugar	4454	7	31,178	240	618
Total protein	419	8	3,352	274	706
GOT	1749	9	15,741	308	795
GPT	1749	9	15,741	308	795
Bilirubin T/D	1134	13	14,742	446	1148
Creatinine	3458	9	31,122	308	795
Electr. Na/ K	700	5	3,500	171	442
VDRL	7149	4	28,596	137	353
TPHA	121	7	847	240	618
HIV Capillus	10335	5	51,675	171	442
BIOPSY	839	18	15,102	617	1589
PostMortem	4	18	72	617	1589
IMPRINTSmear	223	7	1,561	240	618
Direct culture	3627	25	90,675	857	2208
Sensitivity	1013	8	8,104	274	706
Hepatitis B Surface -Ag	77	3	231	103	265
Albumin	747	7	5,229	240	618
Occult blood	15	18	270	617	1589
Brucella	17	3	51	103	265
Rheuma F.	7	3	21	103	265
Uric acid	30	7	210	240	618
Alk.Phosph.	446	9	4,014	308	795
Total	191,148.00		1,806,973		
cost of 1 LWU (in USH) = 34.27					

Tab.4 Equipment cost test

TESTS	Num./year	Equipment index	Year equipm. index	equip.cost/test
Albumin	747	20	14940	549
Alk.Phosphatase	446	20	8920	549
Aspirate	383	29	11107	797
Bilirubine T/D	1134	20	22680	549
Biopsy	839	6	5034	165
Bleeding time	70	1	70	27
Blood Urea	3432	23	78936	632
Blood Grouping	9750	2	19500	55
Blood Sugar	4454	23	102442	632
Brucella	17	2	34	55
Clotting time	70	1	70	27
Creatinine	3458	20	69160	549
Cross matching	6479	8	51832	220
CSF	1981	29	57449	797
Direct culture	3627	20	72540	549
E.S.R.	1181	1	1181	27
Electrolytes Na/ K	700	30	21000	824
Filaria	17	6	102	165
Full haemogramm	4692	90	422280	2473
GOT/AST	1749	20	34980	549
GPT/ALT	1749	20	34980	549
HB	18135	10	181350	275
HBsAg	77	2	154	55
HIV Capillus	10335	10	103350	275
Imprint smear	223	6	1338	165
Malaria	64384	6	386304	165
Occult blood	15	16	240	440
Platelets	88	6	528	165
Post mortem	4	6	24	165
Pregnancy test	902	2	1804	55
Reticulocytes	76	6	456	165
Rheuma Factor	7	2	14	55
Sensitivity	1013	14	14182	385
Sickling test	575	12	6900	330
Sputum-Zn	8246	16	131936	440
Stool-x-parasites	13508	6	81048	165
Total protein	419	20	8380	549
TPHA	121	10	1210	275
Trypanosoma	12	6	72	165
Uric acid	30	20	600	549
Urine	3759	14	52626	385
VDRL	7149	12	85788	330
Vagin./urethral smear	1230	6	7380	165
W.B.C. T+D	6928	6	41568	165
TOTAL			2,233,607	
Cost of 1 equipm unit	27.47 USH			

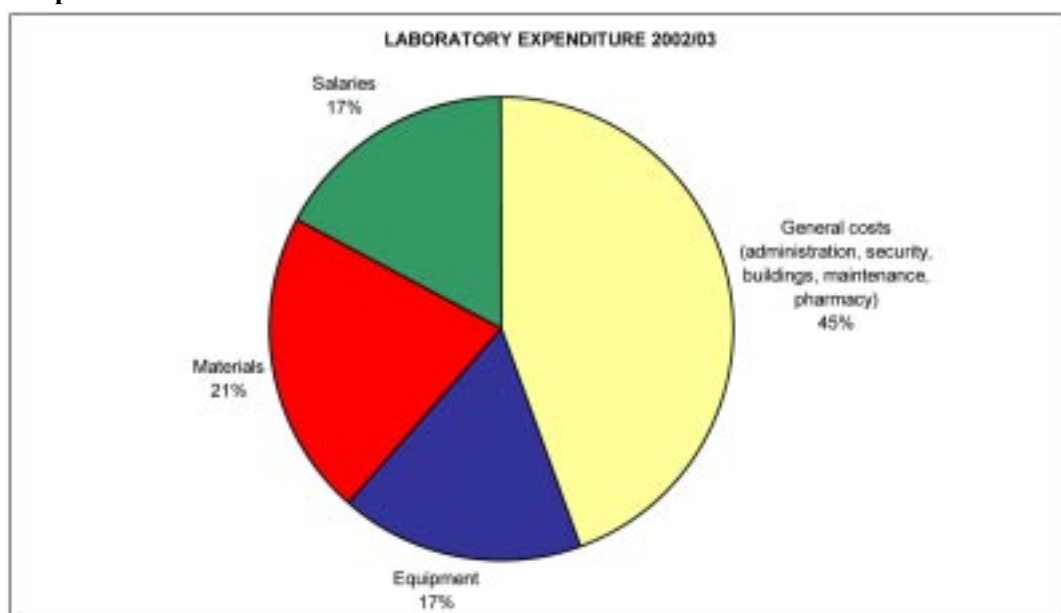
Tab.5 Total tests cost list

TESTS	Equipment	Personnel cost/test	Materials	General costs*	Total
Clotting time	27	137	6	353	523
Bleeding time	27	137	6	353	523
Brucella	55	103	133	265	556
E:S:R	27	171	5	442	645
Rheuma F.	55	103	347	265	770
HB	275	137	85	353	850
VDRL *	330	137	37	353	857
Preg test	55	103	634	265	1057
Blood Group	55	274	182	706	1217
Stool parasites/ Rectal snip	165	274	85	706	1230
Malaria	165	343	13	883	1404
Reticulocytes	165	343	16	883	1407
Plalets	165	343	16	883	1407
ImprintTsmear	165	240	480	618	1423
Vag /Uret smear	165	274	426	706	1571
Albumin	549	240	208	618	1615
TPHA *	275	240	588	618	1721
Crossmacthing	220	411	24	1060	1715
Sickling test	330	411	13	1060	1814
Total protein	549	274	377	706	1906
Blood Sugar	632	240	462	618	1952
Blood Urea	632	274	359	706	1971
GPT	549	308	398	795	2050
GOT	549	308	431	795	2083
Urine 3 par	385	411	217	1060	2073
Filaria	165	514	137	1325	2141
Trypansoma	165	514	137	1325	2141
Urine 9 P	385	411	371	1060	2227
Creatinine	549	308	730	795	2382
W.B.C. count T+D	165	583	28	1501	2277
Hepatitis B Surface -AG	55	103	1900	265	2323
Sensitivity	385	274	1380	706	2745
Biopsy	165	617	200	1589	2571
Post Mortem	165	617	300	1589	2671
Sputum-Zn	440	617	215	1589	2861
Occult blood	440	617	288	1589	2886
Aspirate	797	514	480	1325	3116
Alk.Phosph.	549	308	1672	795	3324
Uric acid	549	240	2016	618	3423
Bilirubin T/D	549	446	1204	1148	3347
Electr. Na/ K	824	171	2400	442	3837
HIV Capillus *	275	171	3240	442	4128
CSF	797	685	600	1766	3848
Full hemogr.	2473	69	2082	177	4801
HIV Serocard*	275	231	4000	618	5124
Direct culture	549	857	2040	2208	5654

The global contribution of each factor to the laboratory tests is better shown by the graph.1 . The bigger expenditure is due to the general costs which account for 45% of the total. This is followed by the materials,

which contributes for 21% of the total and then the costs of personnel and equipment which have the same burden, 17% of the total.

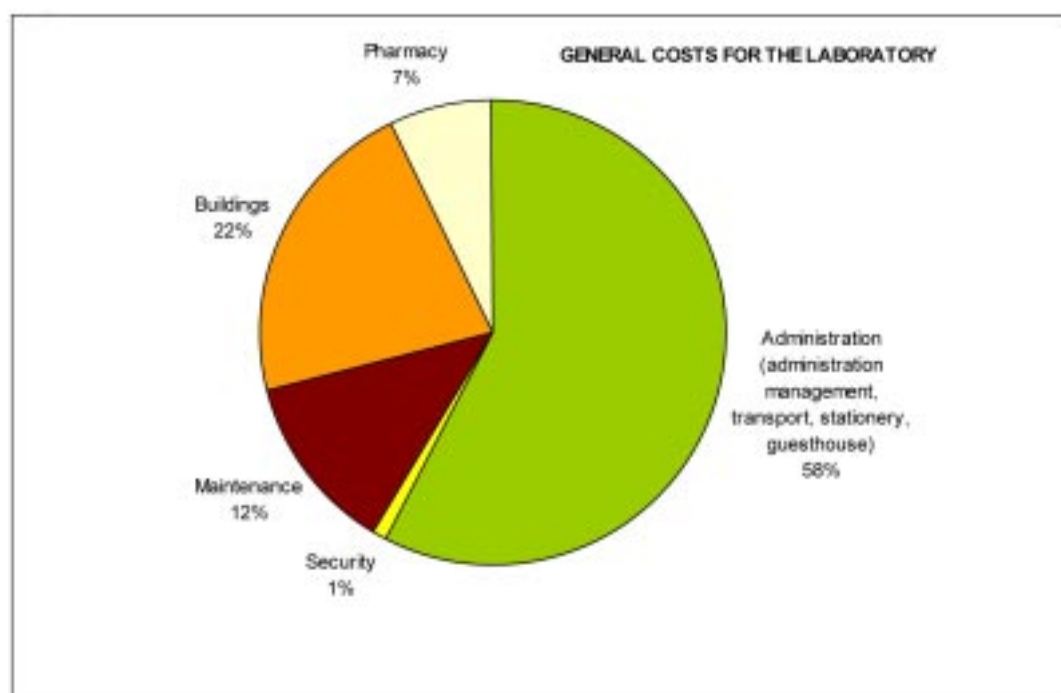
Graph.1



The general cost, however, includes many elements and all its components are represented in graph.2. The administration costs accounts for 58% of the total. The incidence of buildings is estimated for 22%, followed by maintenance expenditure for the 12% and by the costs of pharmacy for 7% of the total. Security depreciation accounts for 1%.

According to their total cost, the laboratory tests can be grouped in four cost levels (Tab. 6): < 1000 USH, 1000-2000 USH, 2500-4000 USH, >4000 USH. Most of the tests belong to the intermediate level (1000-2500)

Graph.2



Tab.6- Cost levels

<1000 ush	1000-2500 ush	2500-4000 ush	>4000 ush
Clotting time	Preg test	Culture/sensitivity	Full hemogr.
Bleeding time	Blood Group	BIOPSY	HIV Serocard*
Brucella	Stool parasites	POSTMORTEM	Direct culture
E:S:R	Malaria	Sputum-Zn	
Rheuma F.	Reticulocytes	Occult blood	
HB	Plalets	Aspirate	
VDRL	IMPRINTsmear	Alk.Phosph.	
	Vag /Uret smear	Uric acid	
	Albumin	Bilirubin T/D	
	TPHA *	Electr. Na/ K	
	Crossmacthing	HIV Capillus *	
	Sickling test	CSF	
	Total protein		
	Blood Sugar		
	Blood Urea		
	GPT		
	GOT		
	Urine 3 par		
	Filaria		
	Trypanosoma		
	Urine 9 P		
	Creatinine		
	W.B.C. count T+D		

CONCLUSIONS

The present analysis is conceived to be a tool of monitoring yearly laboratory expenditure and, consequently, its cost effectiveness. It shows that a relevant part of the laboratory tests costs is due to general costs that represent 45% of the total. This is a common finding also in western hospitals. The cost of each LWU is lower than the one found in the previous year. This is due to the increment in the number of tests and, at the same time, to the reduction of personnel. The Laboratory Department is running a School for Laboratory Assistants, and the running cost for the School have been roughly considered in the current analysis. Because of scarcity of such analysis there is no opportunity to compare the cost of individual laboratory test in Lacor Hospital with the same test in other hospitals in Uganda.

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