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Technical Note

Staffing benchmarks for histology laboratories

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Abstract This article summarizes annual workloads for staff positions and work flow productivity (WFP) values from 247 human pathology, 31 veterinary, and 35 forensic histology laboratories (histolabs). There are single summaries for veterinary and forensic histolabs, but the data from human pathology are divided into 2 groups because of statistically significant differences between those from Spain and 6 Hispano American countries (SpHA) and the rest from the United States and 17 other countries. The differences reflect the way the work is organized, but the histotechnicians and histotechnologists (histotechs) from SpHA have the same task productivity levels as those from any other country (Buesa RJ. Productivity standards for histology laboratories. [YADPA 50 552]). The information is also segregated by groups of histolabs with increasing workloads; this aspect also showed statistical differences. The information from human pathology histolabs other than those from SpHA were used to calculate staffing annual benchmarks for pathologists (from 3700 to 6500 cases depending on the histolab annual workload), pathology assistants (20 000 cases), staff histotechs (9900 blocks), cutting histotechs (15 000 blocks), histotechs doing special procedures (9500 slides if done manually or 15 000 slides with autostainers), dieners (100 autopsies), laboratory aides and transcriptionists (15 000 cases each), and secretaries (20 000 cases). There are also recommendations about workload limits for supervisory staff (lead techs and supervisors) and when neither is required. Each benchmark was related with the productivity of the different tasks they include (Buesa RJ. Productivity standards for histology laboratories. [YADPA 50 552]) to calculate the hours per year required to complete them. The relationship between workload and benchmarks allows the director of pathology to determine the staff needed for the efficient operation of the histolab.

Keywords: Annual workload; Workflow productivity; Benchmark

1. Introduction

The pathologist's mission is complex ranging from the microscopic diagnosis of a lesion to the assessment of prognosis and recommendations for the optimum treatment for the patient.

The diagnostic phase depends on the preparation of tissue sections of high quality, stained with different routine and/or special procedures and placed on slides produced by histotechs in the histolab.

Pathologists and histotechs have an inextricable and mutually dependent relationship. The pathologist depends on the slides produced by the histotech and the latter depends on the pathologist's requests for additional procedures and the feedback as to the quality of the slides produced.

In anatomical pathology (AP) practice, the patient is the pathologist's client, and the pathologist is the histotech's and the histolab's client. The pathologist is pressured to complete the diagnosis within certain period known as turnaround time (TAT). The TAT for the histolab is even shorter because the pathologist needs the slides to be ready soon enough to satisfy the diagnosis TAT.

These time constrains determine that the pathologists, the histotechs, and the histolab as a whole have to complete their corresponding tasks with the required quality within specific time limits. This translates into productivity levels for the different tasks during the workflow between the moment the patient's tissue sample is received at the histolab, to the diagnosis issued by the pathologist. Besides operating within acceptable productivity levels, an efficient organization of the histolab also is required.

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These requirements determine that the individual tasks and staff positions have to be evaluated as to their productivity and the histolab's whole operation be optimized. It has been shown that how the work is organized is more important than the productivity of the individual tasks and staff positions and that the best indicator for the histolab operation is its gross work flow productivity (WFP) [1].

The histolab as a whole has a total workload of cases, and depending on the task, each staff position has a corresponding workload. Those staff workloads constitute the staffing benchmarks that in the case of the histolab have been essentially undefined.

In 2004, the National Society for Histotechnology (NSH) published the results of a productivity survey [2] that included the benchmark for the supervisor position. In 2005, a study about staffing benchmarks for clinical laboratories [3] included a benchmark for staff histotechs. Finally, in 2006, the result of another productivity survey [4] included work load benchmarks for 10 AP staff positions, but besides these 3 sources, there are no other published histolab benchmarks.

This article summarizes all the available information along with the results of a recent survey [1] to define thresholds for the histolab staff positions as benchmarks.

2. Materials and methods

The staff and workload information summarized in this article correspond to a total of 313 pathology facilities, divided into 247 human, 31 veterinary, and 35 forensic.

Of the histolabs dedicated to human pathology, 154 are located in the United States and 93 in other countries. The veterinary histolabs information comes from 23 in the United States and 8 in other countries. Staff information from medical examiner (ME) offices corresponds to 34 in the United States and 1 in South Africa. The data from veterinary and ME facilities predominantly refer to their staffs levels with little information about workflow tasks.

The data from United States total to 211 histolabs, divided in 154 human, 23 veterinary, and 34 forensic facilities. The data from the 247 human histolabs have several sources, including the original spreadsheet from the NSH survey published in 2004 [2] provided by one of the authors (MLaF) with data from 10 US and 2 Canadian histolabs.

Staff and task information from 38 US histolabs detailed in 10 special surveys conducted by the Associations of Directors of Anatomic Pathology (http://adasp.org/Surveys/hotline.htm) are also included. Some staff information sporadically posted in HistoNet (http://www.histonet.org) accounts for 23 additional histolabs.

Between November 2005 and February 2006, this author conducted an online survey published in 2006 [5] that added 20 more histolabs to the US total and 19 to that of other countries.

In addition, between April and August 2009, this author conducted another online survey adding 63 more histolabs to the US and 57 to other countries' total. The final data also include information from a survey conducted and published in Mexico in 2008 [6].

The US histolabs are located in 42 states and the District of Columbia. The other histolabs are in 24 countries (16 in Mexico; 13 in the Russian Federation; 10 in Canada; 7 each in Argentina, Colombia, Spain, and Venezuela; 6 in the PR of China; 5 in Australia; 4 each in South Africa and the UK; 3 in Ecuador; 2 each in Austria, the Philippines, and United Arab Emirates; and 1 each in Germany, India, Malaysia, New Zealand, Pakistan, Poland, Saudi Arabia, Switzerland, and Uruguay).

The productivity study [1] showed that there were statistically significant differences between histolabs from the United States and other countries due to the values from SpHA histolabs, so it was decided to study potential workload differences between those 2 groups.

The overall workload of all the sampled histolabs ranges from 600 to 116 000 cases per year with differences between United States and other countries. The range for 92 non-US histolabs is from 600 to 45 000 cases annually, plus one Venezuelan histolab with 62 000 cases. Thus, it was decided to compare only the range from 600 to 45 000 annual cases common to both groups because there are 18 histolabs between 45 000 and 62 000 cases in the United States and only one in the other group. Not limiting the tests to 45 000 or less annual cases would have invalidated the comparisons.

The analytical tests used were the 1-tail "Student *t*" to compare 2 sets of data and the analysis of variance or "F" test to compare several series simultaneously, followed by the Tukey test for significant differences, with the provisions discussed elsewhere [1].

The Excel 2003 and Gnumeric programs, and the online statistical resources of Vassar University (http://faculty.vassar.edu/lowry/anova1u.html), were used with a minimal accepted significant level of $P \leq .05$ with α-type error, always with the null hypothesis.

The routine gross WFP is calculated as follows: adding up the total number of blocks cut annually, including those cut for the first time and all others cut for special diagnostic procedures such as histochemistry (HC), immunohistochemistry (IHC), or in situ hybridizations (ISHs) and for any other requests including deeper sections and recuts of blocks. This total is the annual workload in blocks.

Adding up all the staff histotechs (all HTs), pathology assistants (PAs), and laboratory aides (LAs) working in the histolab and multiplying that sum by 2080 h/y that is the total time assigned for each full time equivalent (FTE) position annually (52 wk/y × 5 d/wk × 8 h/d = 2080 h/y). This is the total time available in hours.

The value of the gross WFP is obtained by dividing the annual workload (blocks per year) by the total available time the staff has to complete all the tasks (hours per year). The result is the gross WFP for the whole histolab in blocks per

hour that depends only on the workload and the time available to complete it, being independent of the number of steps in the workflow.

Histolabs with a very productive and small staff will have a greater gross WFP (more blocks per hour) than those using a larger or less productive staff to complete the same workload. This fact underscores the importance of a well-managed histolab [1].

The calculated benchmarks correspond to the average value for human pathology histolabs where each task is completed by a single staff member (one FTE) always compared with the average value for the task from all histolabs other than those from SpHA for reasons discussed further ahead in this article.

It is worth noting that the information from each histolab corresponds to annual totals not discriminated as to the types of cases or the histolab specialty. This determines the observed ranges per task and the fact that some histolabs can operate at levels below or above the benchmarks mostly depending on the prevalent type of case.

It is necessary to point out that any annual workload value is a productivity level where the time component is one year. In this way, the annual workload divided by the task productivity [1] permits to calculate the number of hours required to complete it. This value is important for determining the staff required by the histolab to complete its total workload in cases per year.

Staff values of less than 1 represent the corresponding fraction of the total annual work time of 2080 hours dedicated to the task. Because not all histolabs participating in the surveys answered the questionnaires fully, some headings include less histolabs than the total.

All the findings are summarized in 5 workloads and staff tables for the 3 types of histolabs (human, veterinary, and forensic). For brevity's sake only those headings considered more important are discussed.

The workload tables present each heading's range of values for the benefit of any reader wanting to compare them with those from any particular histolab. The comparison will determine if that histolab's values are near any extreme, the average, or the median (50 percentile) value. The comparison will justify developing a plan of action in case the particular histolab's figures are closer to the lower end of the range, and an improvement is desired. A final table includes the benchmarks for human pathology staff workloads.

3. Results

3.1. Human pathology histolabs

The existence of a significant difference in the total workload (cases per year) between United States and other countries is irrelevant because smaller histolabs are more frequent in the latter group resulting in lower averages. The interesting aspects to compare are the different staff workloads and, among them that of cases per pathologist (cases/PT) is particularly interesting.

The average number of cases per PT in the United States is significantly higher ($P < .05$; $df = 202$) to that in other countries because of the values from SpHA ($P < .0006$; $df = 116$). The differences between US and non-US histolabs excluding SpHA are not statistically significant.

Other workloads, such as blocks cut by all HTs, present similar significant differences between the US and SpHA ($P < .003$; $df = 75$) and between the rest of non-US and SpHA histolabs ($P < .03$; $df = 82$).

The workload of blocks by mostly cutting histotech (HT) (cut HT) is also different between SpHA histolabs and those from the US ($P < .0002$; $df = 87$) and from the rest of non-US histolabs ($P < .005$; $df = 82$).

The way the work is organized in SpHA histolabs is different to others and is caused by long-term held customs about how the working time is administered and other cultural factors discussed elsewhere [1].

The results of the statistical tests permit to conclude that the productivity of histolabs is essentially uniform around the world except for those in SpHA because they are organized differently.

The significant differences found do not allow calculating a general average for all human pathology histolabs but require segregating the information into 2 groups, one for all histolabs excluding those from SpHA and another for this latter group (Table 1).

Table 1 also shows productivity and staff differences between both groups for many total workloads, staff positions, and staff workloads, usually significantly lower in the SpHA group. The overall lower productivity is more evident when the gross WFPs are compared, with a general value of 2.5 blocks per hour for SpHA and 4.0 blocks per hour for the rest of histolabs.

Because there are also differences in all averages as the annual workload in cases per histolab increase, it is not very useful to compare the values from any given histolab with the general averages in Table 1. The solution is to present average values for histolabs grouped in classes of increasing annual workloads.

Table 2 presents such information excluding the SpHA histolabs, divided in 5 increasingly larger classes of cases per year, each one showing different values for staff workloads and some relative indices.

The slides per block are quite similar, but blocks per case are higher in the 20 000 to less than 30 000-case groups that includes teaching hospitals and is smaller in the last where reference (commercial) histolabs are concentrated.

The staffing level, as expected in an essentially manual operation as histology, increases proportionally with the total workload, as has been pointed out elsewhere [1,3-6].

A different issue is staff productivity. The pathologists' annual workload (cases/PT) is statistically different ($P < .0001$; $df = 4$; 136) because that in histolabs with less than 10 000 cases per year are lower than those with 30 000 or

Table 1
Human pathology—workloads and staff

Workload/staff	Total excluding SpHA			Spain and Hispano America (SpHA)		
	Range/average	Median	n	Range/average	Median	n
Workloads						
Cases/y (×1000)	0.6-116.0/24.0	20.0	203	0.6-62.0/11.4	8.4	44
Blocks/y (×1000)	0.6-338.0/69.0	52.0	155	0.8-104.0/27.9	18.0	37
Blocks/case	1-11.3/3.3	3.0	159	1-5.4/2.8	2.7	38
Slides/block	1-22.0/1.7	1.4	122	1-19/1.6	1.0	37
HC: slides/y (×1000)	Ø-67.6/6.4	3.5	130	Ø-6.5/1.5	0.8	31
IHC: slides/y (×1000)	Ø-105.0/17.1	10.4	120	Ø-21.9/4.6	2.3	26
Autopsies/y	1-2100/166	78	112	1-673/106	35	23
Staff positions						
PT	1-75/7.0	6.0	181	1-17/4.9	4.0	44
PR[a]	1-26/13.9	5.0	45	1-31/5.9	3.3	10
Histolabs with PR	25%			23%		
PA[a]	0.5-6/2.1	2.0	72	1-8/2.0	1.0	13
Histolabs with PA	82%			30%		
All histotechs (all HT)	1-24/7.0	5.5	203	1-18/4.9	3.0	44
Cutting HT (cut HT)[a]	0.5-15/5.2	2.0	90	1-7/4.7	2.0	19
Other tasks HT (o.t. HT)[a]	0.3-15/2.6	3.5	99	1-7/1.1	1.0	19
Ratio all HT/PT	0.2-4/1.2	1.0	175	0.3-2.3/1.0	1.0	44
Dieners[a]	0.5-5/1.7	1.0	64	1-11/3.0	2.0	10
Histolabs with dieners	73%			23%		
LA[a]	0.1-15/3.1	2.0	107	1-13/2.4	2.0	24
Histolabs with aides	70%			55%		
Staff workloads						
Cases/PT (×1000)	0.2-17.0/3.7	3.0	160	0.2-8.1/2.3	2.1	44
Cases/PA (×1000)	4.8-45.0/14.5	12.1	88	0.8-65.0/12.4	4.9	13
Cases/all HT (×1000)	0.2-9.2/3.0	2.7	156	0.2-9.2/2.7	2.0	37
Cases/cut HT (×1000)	0.2-11.5/4.5	3.9	146	0.3-15.5/3.1	2.3	19
Blocks/all HT (×1000)	0.6-30.0/9.6	8.7	156	0.8-30.0/7.1	5.2	44
Blocks/cut HT (×1000)	0.6-37.5/14.7	12.6	146	0.8-30.0/8.9	6.5	39
HC and IHC/o.t. HT	9471 slides/y			7450 slides/y		
Autopsies/diener	5-486/103	60	67	3-337/54	10	10
Gross WFP (blocks/h)	1.2-14.6/4.0	3.7	154	0.6-7.2/2.5	2.1	44

Ø indicates less than 100; n, number of histolabs.
[a] Histolabs with the staff member.

more (fourth and fifth classes). This means that the PTs sign more cases annually the larger the histolab's workload.

The annual number of blocks cut per staff histotech (blocks/all HT) shows a significant difference ($P < .0001$; $df = 4$; 143) because those in the first class cut less (6700 blocks/HT) than in classes with 20 000 or more (third to fifth classes). In the first class, there are fewer LAs forcing the HTs to handle many other tasks and thus have less available time for cutting sections.

The mostly cutting HTs (blocks/cut HT) also present a significant difference ($P < .0001$; $df = 4$; 129) between the first class (8800 blocks/HT per year) and the third to fifth classes, which are not statistically different between them.

These findings indicate that in histolabs with more cases and blocks per year the histotechs can handle larger workloads because there are LAs and automated instruments completing auxiliary tasks allowing them to cut more blocks annually.

Among the different classes of histolabs, the third (from 20 000 to <30 000 cases) is the most productive. This class has a smaller staff increment from the second than from it to the fourth classes as reflected by the gross WFP being only slightly smaller than in the fifth (50 000 and more cases) class where more automated instruments exist [1].

Table 3 presents a comparison between SpHA histolabs and those from all the other countries also divided by classes. The fifth class in Table 2 (50 000 and more cases annually) has been omitted because it would have included only 1 Venezuelan histolab with 62 000 cases and 18 from the rest that would have invalidated that class comparison.

The total averages for histolabs excluding SpHA in Table 3 are different from those in Table 2 because of the 18 non-SpHA histolabs in the fifth class not included in the calculations.

The second class of non-SpHA histolabs groups about one third of all, but almost two thirds of SpHA histolabs belong to the first class.

With the exception of the number of PAs per histolab, all other workloads, staff, and staff workload (annual productivity) figures are lower in the SpHA histolabs explaining the statistical differences between both groups of histolabs found earlier.

Table 2
Workloads and staff averages by classes (SpHA histolabs excluded)

Workload/Staff	Classes of histolabs by cases/y (×1000)					Total
	<10	10 to <20	20 to <30	30 to <50	≥50	
n laboratories in the class	41	61	47	40	18	207
Workloads						
Cases/y (×1000)	5.3	14.7	22.9	38.3	71.1	24.2
Blocks/y (×1000)	19.0	43.0	85.7	125.8	164.5	69.0
Blocks/case	3.4	3.0	3.7	3.2	2.4	3.3
Slides/block	2.3	1.6	1.5	1.5	1.7	1.7
HC: slides/y (×1000)	2.6	4.0	7.9	13.2	14.2	6.4
IHC: slides/y (×1000)	5.0	8.2	18.7	26.1	47.2	17.1
Autopsies/y	119	126	218	226	92	166
Staff positions						
PT	3.5	5.2	7.1	11.4	16.5	7.0
PR	3.8	13.1	16.2	20.0	13.0	13.9
Histolabs with PR	20%	11%	26%	15%	6%	22%
PA	1.0	1.3	2.2	3.0	3.5	2.1
Histolabs with PA	64%	75%	88%	93%	100%	82%
All histotechs (all HT)	2.8	5.4	7.9	12.2	13.5	7.0
Cutting HT (cut HT)	2.0	4.0	5.0	7.8	10.0	4.4
HT doing other tasks (o.t. HT)	0.8	1.4	2.9	4.4	3.5	2.6
Ratio all HT/PT	1.2	1.2	1.1	1.3	1.1	1.2
Dieners	1.5	1.4	2.0	1.9	1.8	1.7
Histolabs with Dieners	85%	75%	71%	79%	50%	73%
LA	1.3	2.0	3.4	4.3	6.2	3.1
Histolabs with aides	46%	80%	78%	78%	63%	70%
Staff workloads						
Cases/PT (×1000)	2.7	3.5	3.5	4.6	6.3	3.7
Cases/PA (×1000)	10.6	11.6	13.2	20.8	26.6	14.5
Cases/all HT (×1000)	2.3	3.3	3.5	3.3	6.0	2.7
Cases/cut HT (×1000)	2.7	4.6	4.6	4.9	7.1	4.5
Blocks/all HT (×1000)	6.7	9.1	12.2	10.4	11.7	9.6
Blocks/cut HT (×1000)	8.8	10.8	20.5	17.7	17.8	14.7
HC and IHC/o.t. HT[a] (×1000)	9.5	8.7	9.2	8.9	17.6	9.1
Autopsies/diener	121	90	130	82	70	103
Gross WFP (blocks/h)	3.4	3.7	4.5	4.0	4.7	4.0

[a] Slides per year.

Within the SpHA histolabs, the annual cases per PT are not statistically different between the 4 classes, but the annual number of blocks for all HT are ($P < .009$; $df = 3$; 38) and that of blocks for cutting HT per year ($P < .002$; $df = 2$; 34) also because the values in the fourth class (30 000 to <50 000 cases per year) are greater to those in the other three.

That fourth class includes a histolab with 30 000 blocks, and if it is eliminated from this small sample of only 3 histolabs, both workloads per HT lose their statistical significance.

The best indicator of the productivity differences between both groups of human pathology histolabs is reflected by the gross WFP (blocks per hour) always smaller in those from SpHA when compared with the rest of histolabs.

3.2. Veterinary pathology histolabs

The 23 veterinary US histolabs are located in 11 states. The 8 from other countries are located in Argentina and Australia (2 in each) and 1 each in India, the United Kingdom, Uruguay, and Venezuela.

Veterinary histolabs are similarly organized as those for human pathology with similar tasks and staff members, the difference is in the total and staff workloads that are usually smaller.

The information in Table 4 shows a similar number of PTs, with all other staff positions, except PAs and dieners, in lower numbers than in human pathology histolabs.

The median values are 3.0 PT every 1.0 HT with an HT/PT ratio of 0.5 that is twice that of forensic and half of human pathology histolabs.

Except for higher averages of blocks per case, slides per block, and annual necropsies, the remaining workloads are lower in veterinary histolabs.

Table 3
Workloads and staff averages by classes and histolabs groups

Data per group	Group	Classes of histolabs by cases/y (×1000)				
		<10	10 to <20	20 to <30	30 to <50	TOTAL
No. of histolabs	All-SpHA	41	61	47	40	189
per class	SpHA	27	10	3	3	43
% of histolabs	All-SpHA	22	32	25	21	100
in each class	SpHA	63	23	7	7	100
Cases/y	All-SpHA	5.3	14.7	22.9	38.3	19.7
(×1000)	SpHA	4.6	12.4	27.0	35.3	8.4
blocks/y	All-SpHA	19.0	43.0	85.7	125.8	58.9
(×1000)	SpHA	12.2	24.8	42.7	81.3	19.6
PT	All-SpHA	3.5	5.2	7.1	11.4	6.0
	SpHA	2.7	6.0	14.3	9.3	4.0
PA	All-SpHA	1.0	1.3	2.2	3.0	1.9
	SpHA	1.7	1.0	8.0	2.7	2.2
All histotechs	All-SpHA	2.8	5.4	7.9	12.2	6.5
(all HT)	SpHA	2.5	6.5	16.0	11.3	3.0
Cutting HTs	All-SpHA	2.0	4.0	5.0	7.8	3.8
(cut HT)	SpHA	1.8	2.6	10.0	4.2	3.0
LA	All-SpHA	1.3	2.0	3.4	4.3	2.6
	SpHA	2.0	1.6	13.0	2.0	2.0
Cases/PT	All-SpHA	2.7	3.5	3.5	4.6	3.4
(×1000)	SpHA	2.0	2.2	1.9	3.9	2.2
Cases/PA	All-SpHA	10.6	11.6	13.2	20.8	13.5
(×1000)	SpHA	3.0	10.0	3.1	10.1	3.8
Blocks/all HT	All-SpHA	6.7	9.1	12.2	10.4	9.4
(×1000)	SpHA	5.9	8.3	2.7	18.5	6.8
Blocks/cut HT	All-SpHA	8.8	10.8	20.5	17.7	14.3
(×1000)	SpHA	7.0	9.5	5.6	19.6	8.2
Gross WFP	All-SpHA	3.4	3.7	4.5	4.0	3.9
(blocks/h)	SpHA	2.1	2.7	1.6	3.5	2.1

All indicates total histolabs sampled; All-SpHA, all excluding SpHA.

Table 4
Veterinary pathology—workloads and staff

Workload/staff	Total		
	Range/average	Median	n
Workloads			
Cases/y (×1000)	Ø-9.7/1.6	0.8	16
Blocks/y (×1000)	0.5-117.0/39.2	12.5	17
Blocks/case	3.3-120.0/36.0	8.5	15
Slides/block	1-7.5/3.3	1.2	15
HC: slides/y (×1000)	Ø-5.2/1.6	0.5	16
IHC: slides/y (×1000)	Ø-26.0/3.7	1.4	12
Necropsies/y	26-9300/1441	175	10
Staff positions			
PT	1-39/6.5	3.0	31
PR	1-6/4.7	6.0	3
Histolabs with PR	15%		
PA	1-6/4.7	6.0	3
Histolabs with PA	15%		
All histotechs (all HT)	1-7/2.5	1.0	26
Cutting HT (cut HT)	1-7/4.2	2.0	17
HT doing other tasks (o.t. HT)	0-3/0.4	1.0	11
Ratio all HT/PT	0.03-3.5/0.7	0.5	26
Dieners	1-4/4.4	4.0	5
Histolabs with dieners	25%		
LA	0.3-3.3/2.7	1.0	7
Histolabs with aides	35%		
Staff workloads			
Cases/PT (×1000)	Ø-1.0/0.3	0.2	17
Cases/PA (×1000)	0.5-1.6/0.7	0.2	3
Cases/all HT (×1000)	Ø-3.1/1.0	0.6	15
Cases/cut HT (×1000)	Ø-3.1/1.6	0.6	11
Blocks/all HT (×1000)	0.1-16.7/5.8	3.5	20
Blocks/cut HT (×1000)	0.1-19.9/6.4	4.6	17
HC and IHC/o.t. HT	13 195 slides/y		
Autopsies/diener	50-4650/650	83	5
Gross WFP (blocks/h)	0.1-8.2/3.1	2.4	21

Ø indicates less than 100; n, number of histolabs.

The only staff workload values higher in veterinary are the HC + IHC slides by HT doing other tasks, and the necropsies per diener. The number of PRs, PAs, dieners, and LAs per histolab is also lower in veterinary histolabs.

Pharmaceutical research facilities, because they use animals in their work, fall within the veterinary category, and the variety of antibodies they used is greater than in human pathology histolabs. At present, the online consults posted in HistoNet mostly come from researchers working in veterinary histolabs.

3.3. Forensic pathology histolabs

Although all autopsies require a histologic report, the budget priorities in forensic pathology are usually focused on ME reports other than histology.

This explains why only 34 of 104 ME offices surveyed [7] had histology personnel to process the tissues, and the rest send their specimens to hospitals or even commercial histolabs in their localities.

The ME offices doing their own histology work represent 35% of those surveyed and 66% of the 53 ME offices accredited by the National Association of Medical Examiners [7].

The information (Table 5) fundamentally refers to staff numbers (PTs and HTs) with task data from only 2 (1 in Hawaii and another in South Africa) that is not valid for statistical comparisons. Anecdotally, the gross WFP of those 2 ME histolabs (1.4 and 6.9) fall within the range of human pathology facilities.

The total number of HTs per ME office has a median value of 1, and the ratio HT/PT has the lowest average value (0.25) of all studied histolabs.

The annual number of autopsies from 8 US ME offices situated in 7 states and 1 in South Africa is statistically different to that of human pathology histolabs ($P < 3.3 \times 10^{-8}$; $df = 135$) but not to veterinary necropsies per year.

4. Staff benchmarks

The benchmarks for staff positions represent the annual average workload when there is just 1 FTE for each.

The information from all human pathology histolabs, excluding those from SpHA, has been used to calculate the benchmarks. The staff workloads from the SpHA histolabs, essentially lower than from the rest, are caused only by the way the work is organized.

All the calculated benchmarks fall within the SpHA tasks ranges (Table 1) meaning that their staffs are capable of performing at the same level as any other human histolab staff member. Any SpHA histolab wanting to increase their overall productivity can use the presented benchmarks as their goals.

The veterinary and forensic facilities have particular work characteristics resulting in staff workloads being different to that of human pathology histolabs, but their staff members are equally capable of performing at the same benchmark levels when the workloads allow it.

Table 5
Forensic pathology—workloads and staff

Workload/staff	Total		
	Range/average	Median	n
Workloads			
Cases/y	14-3540/1777	1777	2
HC: slides/y	53-1300/677	677	2
Autopsies/y	426-7325/2185	1500	9
Staff positions			
Forensic PT	2-14/6.1	5.0	26
HT[a]	0.2-2.5/1.4	1.0	35
ME offices with HT	34%		
Ratio HT/PT	0.04-0.5/0.25	0.25	19
Staff workload			
Autopsies/PT (ME)	174-916/413	300	7
Gross WFP	1.4-6.9/4.2	4.2	2

n indicates number of ME services.
[a] Medical examiner services with HT.

4.1. Pathologist

The PT is the key member of the staff and the histolab's client. Not only it is the PT's mission to produce the histopathology diagnoses, but also in the AP service, they oversee the different areas of the medical laboratory.

In the 18% of histolabs without PAs, the PT describes and grosses the specimens and participates in the autopsies. In large hospitals, PTs are on weekend on call to do frozen section (FS) from emergency surgeries.

The PT also has a teaching role in pathology residence programs and is ultimately responsible for supervision of the histolab, occasionally delegating the supervision of the daily operations to some staff HT.

The annual number of cases per histolab determines both the number of staff PTs ($R^2 = 0.99$; $P < .00001$) and their productivity in cases per PT ($R^2 = 0.99$; $P < .0001$).

The PT's individual productivity (annual cases per PT) has a benchmark of 3700 cases workloads between 10,000 and <50,000 cases, and 6500 cases for histolabs with >50,000 cases year (Table 6).

This benchmark is slightly higher than the previous of 6000 cases, obtained from a smaller sample [4] and is affected by the type of case prevalent in the histolab. This will be lower where complex cases are prevalent and higher when simple cases and biopsies are the norm.

4.2. Pathology residents

Pathology residents (PRs) are not staff members, but in AP services with training programs, they take care of grossing and sometimes of the autopsies, representing a costs savings for the operation of the histolab.

They also learn how to do FS, but unfortunately, few learn how to embed, section, or do other histology tasks. If all PRs trained in histology procedures, they not only would learn its theory and practice but also would become more appreciative of the histology work and knowledgeable of the time required to complete the tasks.

There are PRs in histolabs of all sizes, with 94% in those with less than 50 000 cases per year. Their numbers are significantly correlated ($R^2 = 0.84$; $P < .03$) with the annual number of cases. Their numbers diminish in histolabs with more than 50 000 cases because this group includes reference facilities that usually do not participate in training programs.

About 90% train in histolabs with workloads between 10 000 and less than 50 000 (average of 25 000) cases per year with a 0.9 PR/PT ratio. This trainee-to-teacher (PR/PT) ratio is uniform worldwide as evidenced by the same 0.9 ratio in SpHA histolabs that, with an average workload of 12 175 cases annually, had training programs.

Because they are not staff members, there are no records kept about their activities except those included in a survey

Table 6
Benchmarks for human pathology staff positions

Staff numbers per histolab and annual workloads	Range		Average	No. of laboratories	1 FTE annual benchmark
	From	To			
PT	1	75	7.0	181	3700 cases[a] to 6500 cases[b]
(cases ×1000)	0.2	17.0	3.7	160	
PA	0.5	6	2.1	88	
(cases ×1000)	4.8	45.0	14.5		20 000 cases
Total HT	1	27	7.0	212	
(cases ×1000)	0.2	9.2	3.0	156	3000 cases
(blocks ×1000)	0.6	30.0	9.6		9900 blocks
Cutting HT	0.5	15	5.2	90	
(cases ×1000)	0.2	11.5	4.5	146	4500 cases
(blocks ×1000)	0.6	37.5	14.7		15 000 blocks
HTs doing other tasks	0.3	15	2.6	99	Manual: 9500 slides
HC + IHC slides (×1000)	0.2	78.3	9.5		Automated: 15 000 slides
Dieners	0.5	5	1.7	64	
(autopsies)	5	486	103		100 autopsies
LA	0.1	15	3.1	107	
(cases ×1000)	2.0	49.9	14.7		15 000 cases
No supervision (cases ×1000)	0.6	55.0	8.3	37	<7000 cases
Lead tech[c] (cases ×1000)	4.0	35.0	13.6	23	≥13 000 cases
Supervisor[d] (cases ×1000)	2.0	116.0	31.2	99	≥25 000 cases
Transcriptionists	0.5	10	3.3	47	
(cases ×1000)	1.6	67.3	13.2		15 000 cases
Secretaries	0.5	10	3.0	30	
(cases ×1000)	2.2	38.9	17.0		20 000 cases

[a] For histolabs with 10 000 to less than 50 000 cases per year.
[b] For histolabs with 50 000 or more cases per year.
[c] Lead techs always have bench duties.
[d] Some supervisors have bench duties, but in histolabs with 40 000 or more cases per year, they usually do not.

about "Surgical Pathology Resident Workload" commissioned by Associations of Directors of Anatomic Pathology in 1993 to evaluate 11 resident training programs (http://adasp.org/surveys/Hotline/resident_workload.htm).

The PRs in that survey read from 1100 to 4130 (average of 2287) cases or about 62% of the PT's annual benchmark. They made from 100 to 1275 (average of 427) FS annually, but neither figure can be used as a benchmark because training programs are not uniformly implemented.

4.3. Pathology assistants

With numbers between 0.5 and 6 per histolab, they are staff members in 82% of all histolabs and their numbers (R^2 = 0.98; P < .001) and productivity (R^2 = 0.88; P < .01) are directly correlated with the annual number of cases, which is the same type of relation for the PTs.

Their benchmark (from 72 histolabs) is 20 000 cases per year that is the same as the previous survey from a smaller sample (35 histolabs) [4].

The range in the pathology assistant (PA) annual workload varies in the same way as that of the PT and for the same reasons as to the complexity of the cases.

4.4. Total histotechs (all HT)

The HT is the staff member responsible for the manual preparation of the slides for the PT, being essential for the operation of the histolab. Their average relation (HT-to-PT ratio) is 1.2 in human pathology settings.

In veterinary and forensic facilities, the ratio is lower, with a value of 0.7 HT per PT in veterinary, and even lower (0.25 HT per PT) in ME offices. Those ratios below 1 are caused by smaller histology workloads in both.

In large histolabs, their tasks are diversified. From the practical point of view, the HTs are divided into those doing all tasks (all HT); those specialized in embedding and cutting, or just cutting (cut HT); and those doing "other tasks" (o.t. HT), fundamentally HC, IHC, and ISH tests.

The average number of HTs increases with the average number of cases (R^2 = 0.95; P < .001) and of blocks per year (R^2 = 0.95; P < .001) per classes.

On the other hand, their average productivity is independent of cases (R^2 = 0.47; P < .13) and of annual blocks (R^2 = 0.61; P < .07) because the productivity levels from the third to the fifth classes are not statistically different, as pointed out earlier (Table 2).

That the average productivity is independent of increasing workloads means that there is a physical limit to their manual activities and that the only way by which histolabs can compensate for total workload increments is by increasing their number of HTs, as has been discussed elsewhere [3,4].

For HTs doing all tasks, their benchmarks are 3000 cases or 9900 blocks annually from a sample of 193 histolabs, which is likely to be more representative than previous benchmarks of 2300 cases or 8600 blocks per year per HT from a smaller sample [4].

Although the benchmarks for HTs have been offered in cases and slides per year also, the more significant benchmark is in blocks annually because the block is the natural work unit for the staff HT.

The College of American Pathologists offered an annual benchmark of 12 000 slides [8] that is 29% smaller than the almost 17 000 slides corresponding to the benchmark of 9900 blocks annually from the present study.

The information in the spreadsheet of the NSH survey [2] allows calculating annual benchmarks of 2549 cases and 8398 blocks per HT. Another study with data from 116 US histolabs not included in the present total of 154 US histolabs, offered a benchmark of 8223 blocks per year per staff HT [3].

4.5. Mostly cutting histotechs (cut HT)

As the annual number of cases and blocks per histolab increase, the pressure of the TAT determines that some HTs are essentially dedicated to embedding and cutting, or to cutting only.

The numbers of cutting HTs increase with the annual number of cases (R^2 =0.94; P < .001) but not their productivity (R^2 = 0.39; P < .19) in histolabs with 20 000 or more cases per year (third to fifth classes).

Similarly, their number also increase with the annual number of blocks (R^2 = 0.95; P < .001) but not their productivity (R^2 = 0.60; P < .07) in the same third to fifth classes, which is consistent with the behavior of total HTs for similar workload increments. Physiologic limits to manual embedding and sectioning is again the reason.

The benchmarks for cutting HTs are 4500 cases or 15 000 blocks per year, both higher than the previous benchmarks of 3700 cases or 13 800 blocks per embedding and cutting HT [4].

4.6. Histotechs doing other tasks (o.t. HT)

The increment of annual cases also determines more special procedures, especially more HC and IHC tests, and others such as immunofluorescence direct and indirect, ISH standard or fluorescent, and even transmitted electron microscopy.

The increased volume of tests and the need to finish them within the PT's diagnosis TAT determine that some histotechs will be solely dedicated to their completion.

The increasing number of annual cases per histolab and the combined number of HC + IHC tests correlate significantly (R^2 = 0.97; P < .0003), but the number of o.t. HTs show a special relation with that combined total.

If the 5 classes of histolabs in Table 2 are considered, the correlation is not significant (R^2 = 0.66; P < .06) because in the fifth class (with 61 400 HC + IHC slides annually) there is an average of 3.5 o.t. HTs, which is less than the 4.4 o.t. HTs in the previous fourth class with less slides annually (39 300 HC + IHC).

If the fifth class is eliminated, the correlation becomes significant (R^2 = 0.99; P < .00001) and raises the question of why this change?

The answer is simply because the last class has a daily average of 236 slides requiring the automation of at least the IHC tests. A total of 48 histolabs using IHC automated stainers have an average daily workload of 110 IHC slides (28 600 slides annually) that is close to the IHC average in the fourth class.

The introduction of IHC automated stainers determines that there have to be 2 annual benchmarks for o.t. HTs: one of 9500 slides (37 slides per day) when the procedures are completed manually, and another of 15 000 slides (58 slides daily) when using autostainers.

It can also be said that 15 000 IHC slides annually becomes the threshold for the purchase of an autostainer with the investment paid with less o.t. HT completing these tests and being diverted to do other tasks.

4.7. Dieners

There are usually less than 2 dieners per histolab, and their numbers are independent of the annual number of cases ($R^2 = 0.44$; $P < .15$). Hiring a diener is a decision usually based on having somebody available to help PTs and PRs when doing autopsies.

Their benchmark of 100 autopsies annually from 64 human histolabs is lower than the previous of 120 autopsies from13 histolabs [4].

The number of necropsies per diener in veterinary, and of autopsies per ME, are significantly higher (650 and 413, respectively) than in human pathology ($P < .0001$) [1].

4.8. Laboratory aides

Their numbers are significantly correlated with the annual number of cases ($R^2 = 0.98$; $P < .001$) and blocks ($R^2 = 0.98$; $P < .0002$) increasing proportionally with both.

Hiring LAs is a wise decision for any histolab needing to offset increasing workloads because they can take care of all nontechnical tasks making the HTs almost twice more productive [1].

The laboratory aide LA benchmark is set at 15 000 cases per year (about 50 000 blocks annually) from a sample of 83 histolabs, which is higher than the previous of 10 000 cases annually from a 48 histolabs sample [4].

4.9. Supervisory personnel

Delegating the PT's daily supervisory responsibility to a staff histotech is always a particular decision without set rules, showing no correlation between the annual number of cases and the existence of supervisory staff.

From a total of 159 human pathology facilities with workloads between 600 and 55 000 cases, 23% do not have any staff member in supervisory position.

Another group of histolabs with 4000 to 30 000 cases annually (14% of the total), well within the range of the previous group, all have lead techs.

Determining benchmarks for this position or its absence is meaningless but could be a useful guideline in the decision-making process, like a precedent that could be followed by the director of pathology.

Generally speaking, histolabs with less than 7000 cases annually do not have any staff member with supervisory responsibility, and many with more than 13 000 usually settle for a lead tech always with bench tasks also.

The sometimes unrewarding supervisor position is essentially left to the discretion of the director of pathology and explains why 63% of histolabs with workloads from 2000 to 116 000 cases have supervisors. The benchmark to this position could be set at 25 000 or more cases per year that is lower than a previous of about 29 000 cases per year [4] but coincides with the one for nonbench supervisor in the NSH report [2].

Supervisors in histolabs with 25 000 or more cases per year should not have bench work responsibilities; otherwise, they will be inefficient as histotechs and as supervisors.

Having no supervisory personnel occurs in 35% of SpHA histolabs and in 23% of the rest of histolabs. lead techs are more frequent in SpHA histolabs (44%) than in the rest (14%), but there are 3 times more supervisors in non-SpHA facilities (63%) than in SpHA (21%) pointing out again to intrinsic differences in work organization between both groups.

Only 3 US veterinary histolabs (14% of total) with an average of 6.8 HTs have supervisors; the rest, with an average of 1.8 HT per histolab, do not have supervisory staff. None of the forensic histolabs in our sample has supervisory staff.

4.10. Pathology office staff

The development of increasingly sophisticated Laboratory Information Systems (LIS), allowing the PTs to sign their cases electronically, as well as better voice recognition software for grossing, determines that the office staff will experience drastic modifications as these new methods are perfected and implemented.

Having said that, for most pathology offices in small and older histolabs still using more conventional methods, it is always useful to have some reference benchmarks.

The 47 histolabs reporting office staff have from 0.5 to 10 (average of 3.3) transcriptionists and an average workload of 30 000 cases. The benchmark is 15 000 cases (Table 6) that is higher than the previous of 9000 cases [4].

The 30 pathology offices with staff secretaries have an average workload of 35 000 cases per year. Their numbers also range from 0.5 to 10 (average of 3.0) for a benchmark of 20 000 cases annually, slightly higher than the previous [4]. In larger offices one of the staff secretaries usually acts as office supervisor or manager.

The pathology departments with staff secretaries have an average of 12 PTs, which means that there is 1 secretary every 4 PTs, although this number is likely to be reduced with new work practices.

5. Discussion

This discussion aims to answer one question: is there enough time in 1 year to accomplish the benchmarks?

First, it is necessary to define the time available in 1 year because one thing is the total physical time and another that available per FTE. Depending on the histolab, some work 5, others 6, and even 7 days weekly but that is not the time each FTE works.

Histolabs working 6 days usually have a reduced staff on Saturdays and Mondays in a way that each FTE is scheduled to work only 40 hours weekly. Histolabs working continuously (even 24 hours daily) hire additional FTEs to cover all the scheduled time always on a 40 h/wk basis trying to avoid paying overtime.

However, this does not mean that each FTE will work 40 hours each of the 52 weeks per year (or 2080 hours annually) because each usually has 2-weeks vacation, 1 allotted week of sick time, and at least 5 holidays annually.

This total 20 days annually are equivalent to 4 weeks of 5 days each or a reduction of 160 hours for a total scheduled time of 1920 hours or 48 weeks annually.

This also means that for every 12 FTEs there has to be one additional staff member just to cover for the scheduled time off in the roster.

The second aspect needed to answer the aforementioned question is the productivity level for each task, as summarized elsewhere [1].

Dividing the benchmark (units per year) between each task's productivity (units per hour) will determine the number of hours per year for the benchmark to be compared with the total 1920 hours available per FTE annually.

It is also worth noting that each staff position presents a range of annual productivity values (Table 1) and that the benchmarks refer to averages.

Any annual workload value in the range higher than the average is attainable in 1 year with the corresponding above average productivity, determining a greater work output during the same amount of time.

5.1. Pathologists

The benchmark of 6500 cases per year represents the average for the largest histolabs or when there is only 1 PT available. To be completed in 48 weeks, the PT has to diagnose 27 cases daily or about 3.4 cases hourly.

Not all the cases require the same time, and not all PTs are equally capable, but this figure of 27 cases per day does not seem to be very far-fetched.

The general average productivity of 3700 cases per year is equivalent to 15.4 cases per day or about 2 per hour that, by any standards, is a very comfortable and feasible workload, to be combined with external cases received as consults not included in the benchmark.

In SpHA, the average productivity is 2100 cases per PT, but it is very likely that each PT will end with more cases annually than the average in the rest of countries because, especially in HA histolabs, PTs usually work in more than one histolab due to economic imperatives [1].

5.2. Pathology assistants

With a grossing productivity of 14 cases per hour [1], the benchmark of 20 000 cases can be completed in 1429 hours annually or 6.0 hours daily, equivalent to 75% of the available time per PA.

5.3. Histotech

The staff HT's duty is the preparation of the finished slides for the PT, and in histolabs with only 1 or 2 HTs, they have to take care of all the tasks without auxiliary personnel.

Their annual benchmarks are 3000 cases, equivalent to 9900 blocks with 16 830 slides, and the productivity of the included tasks determine the following times for each [1]: specimens transport to the laboratory (1.4 minutes per case), cassetting (1.1 minutes per block), cassettes in and out of the tissue processor (0.01 minutes per cassette), casting the blocks (1.2 minutes per block), label the slides against the embedding logs (0.33 minutes per slide), prepare blocks to cut (0.38 minutes per block), trim blocks (0.42 minutes per block), cut and pick up the section on the slide (2.5 minutes per block); routine H&E stain (1.2 minutes per slide), coverslip (0.75 minutes per slide), collate slides with paper work and deliver to the PT (2.5 minutes per case), and file cut blocks (0.43 minutes per block) and dispose of tissue samples (0.53 minutes per case).

Completing all those tasks require a total of 1857.8 hours annually, equivalent to 7.7 h/d or 97% of the time available for each staff HT.

The staff HT also completes other tasks such as changing reagents in the automated instruments, waste disposal, recycling, and cleaning-disinfecting the work stations.

Doing intraoperative FS requires an average of 15 minutes each [1] and takes away the HT from other duties. All these additional tasks are squeezed in the daily schedule that is usually different during the days of the week.

As the number of cases per year for the histolab increases, auxiliary staff is employed allowing the HTs to concentrate on demanding technical tasks, such as special diagnostic tests.

5.4. Cutting HTs

The task that first becomes segregated from all is sectioning or cutting, and usually those HTs with greater productivity are assigned to be assured of meeting the histolab TAT.

Cutting HTs usually only cut, whereas other HTs embed (cast the wax blocks), stain, and coverslip. With annual benchmarks of 4500 cases or 15 000 blocks with 25 500 slides and using the same productivity levels as before, their tasks are limited to label the slides, prepare the blocks to cut,

trim and cut the blocks, and pick up the sections, requiring 1794 hours annually or 7.5 hours daily, equivalent to 93% of the available time.

The slides they produce annually will require 510 hours to stain and 319 hours to coverslip, for a total of 829 hours (0.43 HT) if done manually.

If those same tasks are automated, the time will be reduced to 412 hours, divided in 340 hours to stain and 72 hours to cover, but that is the time the slides will be held before being able to be released to the PT.

With automated staining and coverslipping, the real time of human intervention is reduced to only 7 hours annually (equivalent to 0.004 FTE) needed to move the slides in and out of the automated instruments.

Similarly, if numbering the slides is automated, the time will be reduced from 140 hours (0.1 FTE) to just 61 work flow hours and less than 6 hours of real time needed to feed and retrieve the slides in and out the etcher or printer.

Automated instruments determine total workflow time reductions of about 54%, but the staff time reductions are much greater (about 99%).

Having LAs to take care of all automated and nontechnical tasks allow the HTs to complete technical tasks only, emphasizing that automating tasks and how the resources, the work, and the staff are organized is essential for the overall productivity of the histolab.

5.5. Histotechs doing other tasks

This group of HTs includes those doing any special procedure but especially HC and IHC tests with benchmarks depending on the automation level.

Generally speaking for every 100 slides for special procedures, 27 are HC tests divided in 16 to detect the presence of organisms in tissues and 11 to identify the characteristics of tissue components. The other 73 slides are IHC tests to detect and evaluate epitopes.

The benchmark is 9500 slides annually if completed manually, divided in 1539 HC slides for organisms (3.4 minutes per slide in 10 slides batches), 1026 HC slides for tissue components (6.0 minutes per slide in 10 slides batches), and 6935 IHC slides (14 minutes per slide in 30 slides batches) for a total of 1808 hours annually.

This manual benchmark requires 7.5 hours daily or 94% of the available time, although it could require more time if the HC and IHC batches are smaller, as it happens occasionally.

If only the IHC tests are automated, the overall benchmark is increased to 15 000 slides annually of which 2550 are HC tests for organisms in tissues and 1500 for tissue components requiring 295 hours of manual work annually.

The remaining 10 950 are automated IHC tests that will need 6 minutes per slide in 48 slide batches, requiring 1095 hours. Added to those for HC tests make a total of 1390 hours annually or 6 hours daily (75% of the available time).

The 25% of the time not accounted for in this benchmark is usually used in completing other tests, such as Her2Neu, ISH, fluorescent in situ hybridization, and immunofluorescence direct and indirect frequent in histolabs with 20 000 or more cases annually and usually done manually.

5.6. Dieners

As discussed before, this staff position exists in 73% of histolabs and is usually a helping hand when doing autopsies, especially in teaching hospitals to alleviate the PRs' work.

Dieners' workloads vary greatly (5-486 autopsies annually), and in histolabs with only few autopsies per year, sometimes, there is a diener "on call" who is not a staff member.

Depending on the type, an autopsy can take from 2 to 4 hours, and the benchmark of 100 autopsies annually can be completed in about 20% of the annual time available.

To cover the remaining time, staff dieners usually take care of disposing of waste or superfluous tissues (instead of the HTs), keeping specimen study collections, helping in gross photography, and other tasks.

They also prepare all the postmortem documentation, reconstruct bodies before release to the funeral home, save and store limbs until their disposal or release to authorized parties, and keep temperature records of refrigerated areas.

They also collect specimens for special studies, such as brains for Alzheimer's disease studies and corneas in hospitals participating in these programs.

5.7. Laboratory aides

Laboratory aides exist in histolabs of any size and work from only a few hours daily to full-time positions. Although their average workload is about 8000 cases, their annual benchmark is 15 000 cases or 49 500 blocks with 84 150 slides. Any histolab meeting the benchmark is considerably better off by employing at least 1 LA to improve their HTs' productivity.

The LA's tasks include transport and dispose specimens, operate automated instruments (slide/cassette labeler, routine stainer, and coverslipper), sort labeled slides/cassettes, organize blocks to cut, collate slides and paper work to distribute to the PTs, and archive blocks and slides.

Completing those tasks amount to 1915 h/y (7.98 hours per day) almost doubling the HTs' productivity.

5.8. Supervisor

There is one when the chief of pathology decides to delegate the immediate supervisory duties to some member of the histolab staff.

Their duties cover a wide range of tasks requiring considerable time in histolabs with 25 000 or more cases per year. They take care of staff scheduling and attendance, trouble shooting, implementing new procedures, quality control and performance improvement programs, budgeting and variance reports, ordering supplies, safety programs, and customer services issues, just to mention a few.

In histolabs with large workloads and operating more than 16 hours daily, sometimes, a Lead HT is in charge of addressing processing and work flow problems when the supervisor is not present, usually during the night shift.

5.9. Transcriptionists

With a benchmark of 15 000 cases annually, their fundamental tasks are accessioning (1.6 minutes per case), transcribing gross descriptions (2.3 minutes per case) and cases diagnoses (3.0 minutes per case), and preparing an average of 5% of send out cases and consults (5.0 minutes per case) for a total of 1788 h/y (7.5 h/d) for a 94% of time use.

The transcriptionists' productivity depends not only on their personal dexterity and speed but also in the LIS used. The rest of the time is principally used in clarifications about gross descriptions dictations and other minor functions.

5.10. Secretaries

Secretaries also take part in accessioning specimens; recording patients' demographics, procedures, and outstanding tests; taking insurance information, as well as coding, billing, and collection tasks.

They review transcriptions for accuracy, transcribe FS reports, compile conferences materials, act as receptionists and answer the telephones, deal with computer maintenance, test LIS upgrades, reboot servers, and maintain the office quality control and performance improvement records.

With 1 every 4 PTs, they complete tasks assigned by the PTs along with other tasks including updating the physician dictionary, mailing or faxing reports hard copies, sending out and keeping track of patients and legal slides requests, and similar duties.

6. Conclusions

The 2 principal tasks of the histolab are embedding and sectioning, and provided that the histotechs have adequate instruments, they are equally productive regardless of the country or the histolab specialty [1].

Another issue is the annual task productivities because how the work is organized determines statistically significant differences between SpHA histolabs and those from the rest of the countries studied.

These 2 facts determine that only the information from human pathology histolabs excluding those from SpHA were used to calculate the benchmarks, with the caveat that any histotech, regardless of where they are from or where they work, is capable of performing those same standards and is aware of what is expected in each.

Around 40% of histolabs will have some productivity standard higher than some benchmark, but it is difficult that any single histolab will exceed them all. This means that comparisons with the benchmarks will always be beneficial.

This is of special value for the director of pathology enabling them to calculate the staff required for the present and projected histolab annual workload, by dividing it between the benchmarks for each position or task.

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References

[1] Buesa RJ. Productivity standards for histology laboratories. [YADPA 50 552].
[2] LaFriniere M, Lewis S, Sheppard B, Carson F. A report from the National Society of Histotechnology productivity task force. J Histotechnol 2004;27(4):293-2954.
[3] Valenstein PN, Souers R, Wilkinson DS. Staffing benchmarks for clinical laboratories. A College of American Pathologists Q-Probes study of staffing at 151 institutions. Arch Pathol Lab Med 2005;129(4): 467-73.
[4] Buesa RJ. A Puzzling, Perplexing problem [staffing in the histology laboratory]. Advance MLP, 2006; 18(20):22-24; 27
[5] Buesa RJ. Removing the stumbling blocks [Productivity in the histology laboratory]. Advance MLP, 2006; 18(14):18-20; 29
[6] Buesa RJ. Características del trabajo de los laboratorios de patología en México. Patología 2008;46(4):318-26.
[7] Buesa RJ. Histology aging work force and what to do about it. Ann Diag Pathol 2009;13(3):176-84.
[8] Brown RW. How many cassettes should be processed by a histotechnologist during an eight-hour shift? CAP Today 2002 Questions and Answers.