

Canadian Association of Pathologists Guidelines for Measurement of Pathologist Workload

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ABSTRACT

The level 4 equivalent (L4E) system of workload measurement in anatomical pathology has been endorsed by the Canadian Association of Pathologists. This system is applicable to general anatomical pathology practice and may be adapted to include some aspects of clinical pathology. The L4E system is primarily based on specimen complexity and clinical significance. This article details the general rules for application of the system.

RÉSUMÉ

L'Association canadienne des pathologistes a adopté la méthode L4E (level 4 equivalent) de détermination de la charge de travail en anatomopathologie. Cette méthode, qui s'applique en anatomopathologie générale, peut être adaptée à l'anatomopathologie clinique. La méthode L4E tient compte principalement de la complexité des cas et de leur importance clinique. L'article précise les règles générales d'application de la méthode.

The Honorable Mr. Justice Paul S. Creaghan, in his report on the Commission of Inquiry into Pathology Services at the Miramichi Regional Health Authority, commented that “medicine has for too long perhaps been a rather hierarchical profession and I have some suspicion that pathologists have been near the bottom of the ‘pecking order.’”¹ This attitude toward laboratory services and its needs has resulted in chronic underfunding in terms of equipment and technical and professional resources in Canada and in other countries.²⁻⁴ The fact that most pathologists are on salary or contract payments may also have contributed to the chronic understaffing of pathology departments. Only imprecise information on how to properly staff a pathology department has been available,⁵⁻⁷ and most of this was obtained before current guidelines for the detailed reporting of cancer specimens^{8,9} and quality assurance were established.^{1,10-12}

There have been recent attempts to capture anatomical

pathology workload by various authors and institutions,^{2,13-15} and the Canadian Association of Pathologists (CAP-ACP) is committed to developing guidelines that are fair to pathologists, institutions, health authorities, and provincial governments, as well as the public. These guidelines will allow pathologist workforce planning and benchmarks to be established for a reasonable, practical, and safe workload. Only in this way will the pathology information needed for proper patient care be provided.

Previous studies have shown the following:

- Population-based benchmarks have a role in pathologist workforce planning but do not constitute a workload measurement system.²
- A workload measurement system must take into account case complexity. Workload measurements based simply on case accessions or specimen counts are inadequate.^{2,13-15}
- Workload measurement systems designed for

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This article was peer reviewed.

Competing interests: None declared

anatomical pathology, although not ideal for clinical laboratory disciplines, can be adapted to measure a pathologist's workload related to direct patient care in the laboratory specialties of hematopathology, clinical chemistry, and medical microbiology (unpublished studies Provincial Workload Advisory Committee of British Columbia).¹⁶

- Pathologist workload measurement should encompass the direct clinical care involved in generating a pathology report, and include other patient care-related activities, for example, consultation, clinical rounds, and quality assurance.^{2,13}
- Pathologists with university academic appointments and an expectation of academic productivity should have a portion of their time contractually assigned to these activities. Their service commitment should be reduced to reflect these academic commitments.¹³
- Workload benchmarks must consider that pathologists require additional time for administrative functions, system management, and continuing professional development.¹³

CAP-ACP recommends the use of complexity-weighted workload measurement and endorses a modified level 4 equivalent (L4E) system to measure workload in anatomical pathology, with modifications for clinical laboratory disciplines. The L4E system is designed for general anatomical pathology practice and is not directly applicable to specialized practice such as neuropathology or pediatric pathology.

The Level 4 Equivalent System

The L4E system assigns consensus-based relative workload units to diagnostic pathology, taking into account time required, medical value to clinicians and patients, clinical urgency, and medicolegal responsibility. Recommended annual L4E workload is applicable to an average pathologist performing direct patient care duties, including quality assurance activities and professional development. The system does not include academic (research and teaching) or administrative activities.

The key component of the L4E system is weighting of different specimen types and pathologist activities relative

Table 1. L4E Relative Weighting of Pathologist Workload Activities

	Work Activity	Relative Value (L4E)
Surgical pathology*	Level 1	0.15
	Level 2	0.33
	Level 3	0.5
	Level 4	1
	Level 5	5
	Level 6	15
	Special stains and IHC (≥ 4 per case); if ≤ 3 , considered part of the case workup	+1 L4E to the case
	Immunofluorescence	+ 0.5 L4E to the case
	Intraoperative consultation	3
	Each additional intraoperative consultation on same case	2
Cytopathology	Exfoliative cytology (urine and sputum) including Papanicolaou's smears that are reviewed and reported by pathologists	1
	All other non-gynecological cytology	2
	Performed FNA biopsy	3
	Performed FNA biopsy with immediate review	5
Autopsy pathology	Routine full autopsy (adult and pediatrics)	24
	Complex full autopsy (medicolegal and hospital)	48
	Limited autopsy	18
	External only autopsy	10
Consultations (second opinion)	Brain and/or spinal cord, full neuropathology	18
	Internal consultation (for each case although multiple pathologists may have seen the case)	1 L4E
	Complex case consultation	Original level $\times 1.5$
	Case review (e.g., cancer centre, external request)	Original level $\times 0.75$

FNA = fine-needle aspiration; IHC = immunohistochemistry; L4E = level 4 equivalent.

*Details of surgical pathology complexity levels are shown in Table 3.

to level 4 surgical pathology specimens (reviewed in Maung²). This approach allows for a flexible system adaptable to changes in pathology practice and work complexity.

The recent application of the original L4E system to workload measurement in British Columbia, Alberta,¹⁴ and Manitoba¹⁵ demonstrated that although relative weighting assigned to less complicated specimens (levels 1–3) is appropriate, complex specimens warrant higher relative workload values, as do autopsies, frozen sections (intraoperative consultations), and cytopathology cases. The recommended weighting system is a consensus of the different systems (Table 1).

Despite the potential advantages of using more than six complexity levels, six levels are currently used in British Columbia, Alberta, and Ontario, and in current procedural terminology (CPT) coding in the United States. The retention of six complexity levels for the L4E system is advisable.

Using the L4E system, in most instances each specimen (but not each case) is assigned a complexity level based on the final pathological diagnosis. However, for more complicated cases, including all level 6 and some level 5 cases, the appropriate complexity level is assigned to an entire case, not each individual specimen. The L4E system assumes that the pathologist is totally responsible for gross examination, microscopic examination, and final reporting on every case.

Workload Recommendations

Based on regression analysis of original survey data,² with the modifications noted above (i.e. changes in weighting of level 5 and 6 cases, autopsies, intraoperative consultations, and cytopathology cases), the recommended workload per pathologist full-time equivalent (FTE) is 5,453 L4E per year

(range 5,277–5,640; approximately ± 3.5%). To account for minor adjustments in specimen categorization and for the inclusion of four or more immunohistochemical stains per case, there is a positive bias of 2.5%, giving a mean of 5,589 L4E per FTE. Internal and external consultations are an integral part of the diagnostic evaluation of many cases, but the associated workload is not adequately measured in most institutions. Since such consultations are an important part of professional quality assurance, it is appropriate that they be integrated into the L4E system.

The productivity of a pathologist depends to some extent on the pattern of practice and on factors such as adequate technical, secretarial, and information technology support. Anatomical pathology can be divided into three practice patterns with somewhat different productivity:

1. Specialized: pure anatomical pathology practice
2. Independent: general anatomical/general pathology practice with in-house immunohistochemistry and an adequate number of colleagues for intradepartmental consultation
3. Rural: group of one to three pathologists with no in-house immunohistochemistry and insufficient colleagues for intradepartmental consultation

In these different practices, it is reasonable to expect the average workloads to be slightly different within the modified L4E system (Table 2).

Categorization of Anatomical Pathology Specimens

The general rules for the application of the L4E system are set out in Table 3. The complexity associated with individual specimens (level) and procedures (L4E) is shown in Table 4.

Table 2. Recommended Annual Average Workload per Pathologist (Modified L4E)

	Rural	Independent	Specialized
Mean	5,589	6,316	7,043
Lower limit (–3.5%)*	5,393	6,095	6,797
Upper limit (+3.5%)*	5,784	6,537	7,290

L4E = level 4 equivalent.

*The regression analysis in the original study indicated that 3.5% represents one standard deviation.²

Table 3. General Rules for Categorization of Surgical Specimens* to Reflect the Degree of Difficulty and Effort

	Description	Level	Comment
Rule 1	Biopsies other than skin (gastrointestinal, genitourinary, etc.), e.g., screening biopsies for IBD are given level 4 or 5 depending on total number of tissue biopsy fragments irrespective of the number of containers they are submitted in	4	1–4 biopsy fragments for same diagnostic purpose
		5	5 or more biopsy fragments for same diagnostic purpose
Rule 2	Core biopsies (prostate, breast, etc.), e.g.: • 2 breast core biopsies from right upper + 2 core biopsies from right lower lesion = level 4 x 2 • 4 breast core biopsies from single lesion = level 4 x 1 • 5 breast core biopsies from single lesion = level 5 x 1	4	1–4 core for same diagnostic purpose
		5	5–20 cores for same diagnostic purpose
		6	≥21 cores for same diagnostic purpose
Rule 3	Curettings and tissue fragments (uterine curettings, bladder, TURP, etc.)	4	1–4 blocks for same diagnostic purpose
		5	5 or more blocks
Rule 4	Small organs and surgical excisions, benign or malignant (e.g., lumpectomy, hysterectomy ± SO, adrenalectomy, thymectomy, thyroid resections, etc.)	4	1–4 blocks
		5	5–25 blocks
		6	26 or more blocks
	Immunohistochemistry – if 3 or fewer stains considered part of the case†	0 L4E	
	Immunohistochemistry – if 4 or more stains, 1 L4E added to the case	+1 L4E	

IBD = inflammatory bowel disease; L4E = level 4 equivalent; SO = salpingo-oophorectomy; TURP = transurethral resection of the prostate.

*A specimen is defined as the content of a single container received from a particular patient.

†A case includes all containers received from the same operation under one accession number.

Table 4. Assignment of Relative Complexity to Specimens and Procedures

System	Description	Complexity (Level or L4E)	Comment
Autopsy	Brain and/or spinal cord, full neuropathology	18 L4E	
Autopsy	Complex – medicolegal and hospital	48 L4E	
Autopsy	External only	10 L4E	
Autopsy	Full pediatric	24 L4E	
Autopsy	Full uncomplicated autopsy	24 L4E	
Autopsy	Partial	18 L4E	
Breast	Implant capsules, gross and micro	3	
Breast	Implant capsules, gross only	1	
Breast	Lumpectomies alone, benign or malignant, (includes gynecomastia)	4/5/6	Rule 4
Breast	Mastectomy partial/full, with/without nodes, for malignancy; sentinel nodes included	6	Sentinel nodes not categorized separately
Breast	Needle core biopsy	4/5/6	Rule 2
Breast	Reduction mammoplasty	4	
Consult	For difficult cases	150% of original level	

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Table 4. Assignment of Relative Complexity to Specimens and Procedures (cont)

System	Description	Complexity (Level or L4E)	Comment
Consult	Internal	4	Whether examined by one or multiple pathologists
Consult	Routine review for cancer clinic	75% of original level	No gross done
CVS	Aneurysm contents – gross and micro	2	
CVS	Aneurysm contents, thrombus, hematoma, atheromatous plaque – gross only	1	
CVS	Artery – biopsy	4	
CVS	Atheromatous plaque – gross and micro	2	
CVS	Cardiac, explant	6	
CVS	Cardiac, myocardial biopsy without EM, includes transplant	5	
CVS	Heart valve – gross and micro	3	
CVS	Heart valve – gross only	1	
CVS	Hematoma – gross and micro	3	
CVS	Pericardial biopsy	4	
CVS	Ventricle heart, aneurysm, atrium partial resection	4	
CVS	Vessels, vein – varicose veins, gross and micro	2	
CVS	Vessels, vein – varicose veins, gross only	1	
Cytology	Fluids and FNA	2 L4E	
Cytology	Pap smears, urine and sputum	1 L4E	
EM	Any biopsy	6	Any specimen that includes EM is upgraded to level 6 (not an additional level 6)
Endocrine	Adrenal resection	4/5/6	Rule 4
Endocrine	Parathyroid – biopsy	4/5/6	Rule 4
Endocrine	Pituitary biopsy/resection	5	
Endocrine	Thyroid – lobectomy or total thyroidectomy	4/5/6	Rule 4
Endocrine	Thyroid – thyroidectomy with neck dissection, malignant	6	
Eye	Conjunctiva – biopsy, benign, includes pterygium	3	
Eye	Conjunctiva – biopsy, premalignant or malignant	4	
Eye	Cornea, benign	3	
Eye	Cornea, premalignant or malignant	4	
Eye	Enucleation, benign	5	
Eye	Enucleation, malignant	6	
Eye	Evisceration	4	
Eye	Orbital exenteration	6	
Eye	Orbital biopsy	4	
Frozen	For immunofluorescence	3	
GIT	Gallbladder, benign	3	
GIT	Gallbladder, malignant	4/5/6	Rule 4
GIT	Fissure/fistula in ano	3	
GIT	Mouth to anus – biopsy	4/5	Rule 1
GIT	Mouth to anus – resection with node dissection, malignant	6	
GIT	Mouth oral to anus – resection, benign	4/5/6	Rule 4
GIT	Polyps, mouth to anus	4	For each separate/discrete polyp identified

Table 4. Assignment of Relative Complexity to Specimens and Procedures (cont)

System	Description	Complexity (Level or L4E)	Comment
GIT	Hemorrhoids	3	If gross, only 1; if gross and micro, 3
GIT	Liver biopsy/wedge resection, for medical conditions (includes pretransplantation and transplant)	5	
GIT	Liver biopsy/wedge resection, for metastases	4	
GIT	Liver resection	4/5/6	Rule 4
GIT	Pancreas – core biopsy	4/5/6	Rule 2
GIT	Pancreas – segmental or total resection, benign	4/5/6	Rule 4
GIT	Pancreas – segmental or total resection, malignant	6	
GIT	Peritoneal biopsy	4/5	Rule 1
GIT	Pilonidal sinus/cyst	3	
GIT	Small bowel biopsy for transplant	4/5	Rule 1
GIT	Stoma – enterostomy, ileostomy, colostomy, etc., and donuts	3	
GIT	Vermiform appendix – incidental and no pathology	2	
GIT	Vermiform appendix – neoplastic	4/5/6	Rule 4
GIT	Vermiform appendix – non-neoplastic	3	
Gyne	Bartholin gland – abscess/cyst	3	
Gyne	Cervix – biopsy or curettings	4/5	Rule 1 or 3
Gyne	Cervix – cone/LEEP biopsy	5	
Gyne	Endometrial biopsy/curettings	4/5	Rules 1 or 3
Gyne	Fallopian tube – biopsy	4/5	Rule 1
Gyne	Fallopian tube resection for benign and malignant conditions	4/5/6	Rule 4
Gyne	Fallopian tubes – sterilization	2	
Gyne	Fallopian tubes or contents – ectopic pregnancy	4	
Gyne	Hydatid of Morgagni	3	
Gyne	Hysterectomy ± adnexa, benign conditions	4/5/6	Rule 4
Gyne	Hysterectomy ± adnexa, malignant condition	6	
Gyne	Hysterectomy ± adnexa, prolapse	4	
Gyne	Leiomyoma(s) – with/without uterus	4/5/6	Rule 4
Gyne	Omentum	4	
Gyne	Ovarian biopsy or wedge resection	4	
Gyne	Ovary with/without tubes, benign or malignant	4/5/6	Rule 4
Gyne	Placenta – gross and micro	4	
Gyne	Placenta, multiple gestation – gross and micro	5	
Gyne	Products of conception, missed/spontaneous	3	
Gyne	Products of conception, therapeutic (family planning)	2	
Gyne	Vagina repair	2	
Gyne	Vulva/vagina – malignant with nodal dissection	6	6
Gyne	Vulva/vagina – resection, without nodal dissection	4/5/6	Rule 4
Gyne	Vulva/vagina/perineal – biopsy	4/5	Rule 1
Head/neck	Cholesteatoma	3	
Head/neck	Larynx – biopsy	4/5	Rule 1
Head/neck	Larynx – partial or total resection with nodes, malignant	6	
Head/neck	Larynx – partial or total resection, nonmalignant	4/5/6	Rule 4
Head/neck	Lip biopsy/wedge resection	4	
Head/neck	Mucus retention cyst – salivary/oral	3	

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Table 4. Assignment of Relative Complexity to Specimens and Procedures (cont)

System	Description	Complexity (Level or L4E)	Comment
Head/neck	Nasal/sinonasal polyps – inflammatory or allergic	3	
Head/neck	Nasal cartilage – gross only	1	
Head/neck	Odontogenic tumour resection	4/5/6	Rule 4
Head/neck	Odontogenic/dental cyst	4	
Head/neck	Oral, paranasal sinus, nose, mucosal biopsy	4/5	Rule 1
Head/neck	Paranasal sinus, biopsy/curettings	4	
Head/neck	Pharynx, biopsy	4	
Head/neck	Salivary gland biopsy	4/5	Rule 1
Head/neck	Salivary gland resection, benign or malignant	4/5/6	Rule 4
Head/neck	Teeth – gross only	1	
Head/neck	Thyroglossal duct/cyst	4	
Head/neck	Tongue biopsy	4/5	Rule 1
Head/neck	Tongue resection, benign or malignant	4/5/6	Rule 4
Hem/lymph	Adenoid/tonsils, 15 and under – gross and micro	2	
Hem/lymph	Adenoid/tonsils, 15 and under – gross only	1	
Hem/lymph	Adenoid/tonsils, 16 and over – gross and micro	3	
Hem/lymph	Adenoids/tonsils – malignant, resection with nodal dissection	6	
Hem/lymph	Bone marrow biopsy	5	
Hem/lymph	Extranodal lymphoma, biopsy	5	
Hem/lymph	Lymph node – hematolymphoid neoplasm or infection	5	
Hem/lymph	Lymph node – metastatic tumour	4	
Hem/lymph	Lymph node – regional resection, per side of body	5	
Hem/lymph	Lymph node – sentinel node(s) with tumour resection	6	
Hem/lymph	Lymph node – sentinel node(s) alone	4	For each identified numbered sentinel node
Hem/lymph	Mediastinal mass/tumour	4/5/6	Rule 4
Hem/lymph	Spleen – diagnostic or for tumour	5	
Hem/lymph	Spleen – trauma	2	
Hem/lymph	Thymus – tumour resection	4/5/6	Rule 4
Intraop consult	First specimen	3 L4E	
Intraop consult	Second and subsequent specimens on same case	2 L4E	
Male	Foreskin incidental in pediatrics 15 years and below	2	
Male	Foreskin, 15 years and over	3	Foreskin <1 year (?)
Male	Hydrocele sac	1 or 2	If gross, only 1; if gross and micro, 2
Male	Penis resection for malignant conditions	6	
Male	Prostate – needle core biopsies	4/5/6	Rule 2
Male	Prostate – prostatectomy, benign	4/5/6	Rule 4
Male	Prostate – prostatectomy, malignant	6	
Male	Prostate – TURP	4/5	Rule 3
Male	Testis, orchidectomy for carcinoma of prostate	2	
Male	Testis, orchidectomy for primary benign or malignant condition	4/5/6	Rule 4
Male	Testicular biopsy	4	
Male	Testicular biopsy for medical conditions	5	
Male	Testis – appendix	2	
Male	Testis, appendage	3	

Table 4. Assignment of Relative Complexity to Specimens and Procedures (cont)

System	Description	Complexity (Level or L4E)	Comment
Male	Testis, spermatocele	3	
Male	Testis, varicocele	3	
Male	Vas deferens, for sterilization	2	
Male	Vas deferens, not for sterilization	3	
Misc	Abscess	3	
Misc	Branchial cleft cyst	4	
Misc	Calculus (stone), foreign body	1	
Misc	Hernia sacs	1 or 2	If gross, only 1; if gross and micro, 2
Misc	Material passed per vaginam or other orifices	3	
Misc	Mesothelium (peritoneum/pericardium/pleural) – biopsy/tissue	4/5	Rule 1
Misc	Thrombus or embolus or blood clot	1 or 2	If gross, only 1; if gross and micro, 2
Nervous	Brain biopsy	5	
Nervous	Brain cyst	4	
Nervous	Brain/meninges – trauma – gross and micro	2	
Nervous	Brain/meninges – tumour resection	5	
Nervous	CNS, spinal cord – tumour resection	5	
Nervous	Muscle biopsy, metabolic and medical conditions	5	
Nervous	Nerve biopsy	5	
Nervous	Nerves, confirm nerve (vagus, sympathectomy, ganglia)	2	
Orthopedic	Amputation, extremities, traumatic – gross and micro	4	
Orthopedic	Amputation, extremity, benign and nontraumatic condition	5	
Orthopedic	Amputation, finger and toes, benign and nontraumatic		
Orthopedic	Amputation, finger and toes, malignant	5	
Orthopedic	Amputation, finger and toes, traumatic – gross and micro	2	
Orthopedic	Amputation, finger and toes, traumatic – gross only	1	
Orthopedic	Amputation/disarticulation, extremity, malignant condition	6	
Orthopedic	Bone – exostosis	3	
Orthopedic	Bone – metastatic tumour and pathological fracture	4	
Orthopedic	Bone biopsy for medical and metabolic disorders	5	
Orthopedic	Bone biopsy or curettings for metastatic carcinoma	4	
Orthopedic	Bone biopsy or curettings for primary bone tumour	5	
Orthopedic	Bone fragments requiring histology	3	
Orthopedic	Bone, femoral head, benign conditions – gross ± micro	3	
Orthopedic	Bone, primary bone tumour – resection	6	
Orthopedic	Intervertebral disc – gross	1	
Orthopedic	Intervertebral disc – gross and micro	2	
Orthopedic	Joint resection	4	
Orthopedic	Joint, bursa	3	
Orthopedic	Joint, cartilage and shavings – gross and micro	2	
Orthopedic	Joint, loose body – gross and micro	2	
Orthopedic	Joint, loose body – gross only	1	
Orthopedic	Joint, meniscus – gross and micro	2	
Orthopedic	Joint, meniscus – gross only	1	
Orthopedic	Joint, synovium – biopsy	4	

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Table 4. Assignment of Relative Complexity to Specimens and Procedures (cont)

System	Description	Complexity (Level or L4E)	Comment
Orthopedic	Joint, synovium cyst	3	
Orthopedic	Rib, incidental, gross only	1	
Pediatric	Gross and micro, full examination	6	
Pediatric	Gross only	5	
Respiratory	Lung – biopsy (transbronchial or wedge)	4/5	Rule 1 or 3
Respiratory	Lung – resection (segmental, lobe, total), benign conditions	4/5/6	Rule 4
Respiratory	Lung – resection (segmental, lobe, total), malignant conditions	6	
Respiratory	Lung transplant biopsy	5	
Respiratory	Lung, explant	5	
Respiratory	Pleural biopsy	4/5	Rule 1
Respiratory	Respiratory tract (trachea to lung) – all biopsies	4/5	Rule 1 or 3
Skin	Epidermal inclusion cyst	3	
Skin	Finger and toe nail – gross only	1	
Skin	Adnexal tumours	4	
Skin	All benign tumours (includes typical nevus) except adnexal tumour	3	
Skin	All malignant tumours except basal cell carcinoma	4	
Skin	Atypical nevus and melanoma (without minimal data set)	4	All melanocytic lesions including melanoma if no checklist completed
Skin	Basal cell carcinoma	3	
Skin	Alopecia	5	
Skin	Immunofluorescence	5	
Skin	Inflammatory skin disease	4	
Skin	Large excisions	4/5/6	Rule 4
Skin	Malignant condition with nodal dissection	6	Melanoma, squamous or Merkel cell carcinoma
Skin	Melanoma with minimal data set	5	
Skin	Plastic repair – gross and micro 2		
Soft tissue	Carpal tunnel tissue	3	
Soft tissue	Fibromatosis – palmar/plantar/others	3	
Soft tissue	Ganglion cyst	3	
Soft tissue	Lipoma or traumatic neuroma	3	
Soft tissue	Muscle biopsy	5	
Soft tissue	Soft tissue, benign tumours other than lipoma and traumatic neuroma	4/5/6	Rule 4
Soft tissue	Soft tissue, débridement	3	
Soft tissue	Soft tissue, malignant – radical surgery	6	
Soft tissue	Soft tissue, malignant tumour, biopsy or excision	4/5/6	Rule 4
Urinary	Immunofluorescence – kidney, (includes transplanted kidney)	3	
Urinary	Kidney – biopsy for allograft rejection	5	
Urinary	Kidney – biopsy with EM	6	
Urinary	Kidney – biopsy without EM	5	
Urinary	Kidney – partial or total nephrectomy, malignant (includes ureteric lesions)	6	
Urinary	Kidney – partial or total nephrectomy, benign (includes ureteric lesions)	4/5/6	Rule 4

Table 4. Assignment of Relative Complexity to Specimens and Procedures (cont)

System	Description	Complexity (Level or L4E)	Comment
Urinary	Ureter/urethra – biopsy or resection for benign lesions	4/5/6	Rule 4
Urinary	Urinary bladder – biopsy or TUR	4/5	Rule 1 or 3
Urinary	Urinary bladder – partial or total resection, benign (includes urethral lesions)	4/5/6	Rule 4
Urinary	Urinary bladder – partial or total resection, malignant (includes urethral lesions)	6	
Urinary	Urinary tract, ureter and urethra – biopsy	4/5	Rule 1

CNS = central nervous system; consult = consultation; CVS = cardiovascular system; EM = electron microscopy; FNA = fine-needle aspiration; GIT = gastrointestinal tract; gyne = gynecological; hem/lymph = hematology and lymphatics; intraop consult = intraoperative consultation; L4E = level 4 equivalent; LEEP = loop electrosurgical excision procedure; misc = miscellaneous; Pap = Papanicolaou's; TUR = transurethral resection; TURP = transurethral resection of the prostate.

Comment

Although different models of workload analysis in anatomical pathology lead to similar conclusions about what is a reasonable and safe workload for a pathologist (Table 5),^{2,17,18} the use of the L4E system of measurement derives from an earlier study that demonstrated its superiority to the other indicators.² This document contains the simple guidelines by which the L4E system can be applied in any pathology laboratory. After much discussion, in which pathologists representing all 10 Canadian provinces participated, the guidelines were endorsed by CAP-ACP at its Annual General Meeting in Halifax, Nova Scotia, in July 2009. Nevertheless, it was recognized at that meeting that, with continuing changes in pathology practice, the document would need to be updated at regular intervals. The L4E system was not designed to serve as a template for the equitable distribution of work between pathologists in any particular pathology department but, rather, as an indicator of the number of pathologists that would be required to handle that department's workload safely. Further evaluation may allow it to be modified so that it can be used to calculate appropriate daily caseloads for individuals.

Given that throughout Canada many smaller laboratories are staffed by general pathologists or by anatomical pathologists with clinical pathology responsibilities, it should be emphasized that there is no established model for clinical pathology (CP). There are many studies that indicate that the manpower in anatomical pathology (AP) can be used as

Table 5. Comparison of the Various Models of Workload Analysis

Model	Recommendation per FTE in L4E
L4E study	3,455 (range 3,362–3,554)
Royal College of Physicians and Surgeons of Canada*	3,278
Royal College of Pathologists (UK) – modified to Canadian working conditions [†]	3,570 (4 h/session) 3,123.75 (3.5 h/session)
Medical Group Management Association (US) [‡]	3,442 (mean)
Manitoba Model [§]	3,702 (75th percentile)
Mean	3,513
Median	3,552
Standard deviation	209

FTE = full-time equivalent; L4E = level 4 equivalent.

* The Royal College of Physicians and Surgeons of Canada recommends one tissue pathologist for a population of 24,500, and the original L4E study regression analysis indicates 1 FTE for a population of 25,819 ($3,455 \times 24,500/25,819 = 3,278$ L4E).

[†]The Royal College of Pathologists (UK) recommendation: *original* – 40 wk/y × 7.5 sessions/wk × 4 h (3.5 h)/session × 10 units/h = 12,000 (10,500) units; *usual Canadian situation* – 42 wk/y × 8.5 sessions (15% PD time)/wk × 4 h/session × 10 units/h = 14,280 units. Comparative studies show that 1 L4E = 4 UK units. Therefore, annual workload per FTE = 14,280/4 = 3,570 L4E.

[‡]CPT code 88305 is very similar to level 4 specimens = 1.12 RVU professional component. A study by RPOptions for the British Columbia government has shown that because of different methodology in the categorization of specimens, there is 16.9% overcounting compared with L4E methodology. The Medical Group Management Association recommends on average 4,639 (75th percentile 4,989) RVU per pathologist. The equivalent L4E will be $[4,639 \times (100\% - 16.9\%)]/1.12 = 3,442$ L4E (75th percentile = 3,702 L4E).

[§]The Manitoba Model uses 7 categories (vs. 6 categories in other models). It includes only microscopy since gross examination is performed exclusively by pathology assistants. If a 25% or 20% discount is included for gross examination, the recommendation from the Manitoba Model of 7920 PCU is equivalent to 3,550 or 3,800 L4E per FTE.

a baseline to calculate the number of FTEs needed in clinical pathology. A large survey in the United States¹⁹ indicated the following:

- For academic institutions and institutions with residents, the appropriate AP:CP ratio is 1.5:1.
- For community institutions, the appropriate AP:CP ratio is 2:1.

In this context, clinical pathology also includes direct patient consultation and administration. Although not totally satisfactory, this guideline may, in most situations, give a reasonable estimate of the number of FTEs needed to provide adequate laboratory services in an institution. Further studies are necessary in the Canadian setting to determine the appropriate human resource needs for hematopathology, clinical chemistry, microbiology, cytogenetics, and molecular pathology. A possible scheme for the application of the L4E system to diagnostic activities in clinical pathology laboratories is shown in Table 6.

The impact of professional extenders is another area in which there is no consensus. In some institutions there are dedicated pathologists' assistants (PAs) and, in others, trained histotechnologists who perform some or all of the gross examinations. These examinations are carried out under the supervision of a pathologist, who signs out the case, reviews the gross dictation of the PAs, and re-examines and takes more blocks from the specimen if necessary. The pathologist is thus ultimately responsible for the work of the professional extender. As with other professional extenders working with, for example, lawyers, accountants, or dentists, the degree of autonomy and responsibility of the professional extender depends on the ability, training, and experience of the individual, as well as the level of comfort and trust of the professional who takes responsibility for the work. The degree of autonomy and extent of the gross examination by the PAs and trained technologists should be at the discretion of the pathologist who will be responsible for the case. How the work of professional extenders should be accounted for in the L4E system remains to be determined.

Table 6. Possible Workload Values for Examples of Diagnostic Activities in Clinical Pathology

Interpretative Reports: 1 L4E	
	Serum protein electrophoresis
	Cardiac enzymes
	Routine blood culture interpretation
	Gram stain interpretation
	Peripheral blood smear
Routine Clinical Consultations: 2.0 L4E	
Hematopathology	Flow cytometry
	Coagulation
	Fluid morphology
	Semen analysis
Transfusion medicine	Consultation for test selection
	Routine transfusion/blood products consultation
	Routine transfusion reactions
	Interpretation of antibody investigations
Microbiology	Autologous blood transfusion consultations
	Interpretation of culture results and susceptibility testing
	Review and consultation for complicated infections
	Fungal/parasite identification and interpretation
Clinical chemistry	Consultation for test selection
	Consultation in lipid clinics
	Consultation over metabolic and endocrine problems
Complicated Clinical Consultations*: 10 L4E	
	Investigation of infection outbreak
	Consultation in and investigation of complex metabolic disorders
	Consultation in and investigation of complex coagulation disorders

L4E = level 4 equivalent.

*May include chart and laboratory results review and recommendations.

Acknowledgement

Thanks to the following members of the provincial representatives that had input into the formulation of this document: Dr. Pauline Alakija, Dr. Martin Trotter, and Dr. Al Oryschak (Alberta), Dr. Esther Ravinsky (Manitoba), Dr. Anne O'Brien (New Brunswick), Dr. Nebojsa Denic and Dr. Barry Gallagher (Newfoundland), Dr. Shawn Murray (Nova Scotia), Dr. Suhas Joshi and Dr. Virginia Walley (Ontario), Dr. Marvin Tesch (Prince Edward Island), Dr. Louis Gaboury and Dr. Robert Dube (Quebec), and Dr. Edward Jones (Saskatchewan).

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