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Review

Current Organisation of Clinical Cytology in Croatia

Valerija Miličić-Juhas[1,4], Branka Lončar[1], Vesna Mahovlić[2], Ika Kardum-Skelin[3,5] and Marija Pajtler[1,4]

[1] Department of Clinical Cytology, University Hospital Center Osijek, Osijek, Croatia
[2] Department of Gynecologic Cytology, University Department of Gynecology and Obstetrics, University Hospital Center Zagreb, Zagreb, Croatia
[3] Laboratory for Cytology and Hematology, University Hospital »Merkur«, Zagreb, Croatia
4 University of Osijek, School of Medicine, Osijek, Croatia
5 University of Zagreb, School of Medicine, Zagreb, Croatia

A B S T R A C T

Current cytological service in Croatia is organised in 46 cytological organisational units in 23 towns with total of 350 employees: 101 specialists of clinical cytology, 20 residents in clinical cytology, 141 cytotechnologists (cytoscreeners), 45 health technicians, and 25 administrators and 18 auxiliary personnel. In spite of employment of significant number of cytotechnologists in the last ten years, there is still an unacceptable ratio of number of cytologists and cytotechnologists (1:1.4) which is the result of unresolved education of cytotechnologists which should be permanent, complete and acknowledged. Education and scientific promotion of cytologists is continuous and today our profession has 31 masters of science and 9 doctors of science, one of which is the assistant professor, and four of them are associate or full professors at medical schools in Zagreb and Osijek. Croatian cytology, in average, is in its »best years«, i.e. an average cytologist is 46 years old and cytotechnologist is averagely 43 years old, but »suffers« from personnel deficit. With regard to the type of activity, the most numerous are units dealing the entire diagnostic cytology (72%), 13% general cytology without gynaecological cytology, while 15% are engaged in one diagnostic field (gynaecological, pulmological or thyroid cytology). According to accessible data, total of 770996 cytological examinations were done in Croatia in 2008. The increasing application of additional methods (cytochemical, immunocytochemical, molecular, cytogenetics and computer-assisted image analysis) has become a trend in numerous cytological units. Exclusively morphological analysis of standard stained samples is performed in 37% of units, morphological and cytochemical staining methods are used in 17% of units, and additional immunocytochemical methods in 30% of units. According to the long tradition of cytology in Croatia, that has progressed thanks to the enthusiasm and great effort of our teachers, we believe that the following generations of cytologists will continue working on its improvement and will be able to concord the basic cytomorphology and sophisticated diagnostic procedures with other diagnostics, to stay the field of optimal results in the shortest time with the reasonable price.

Key words: *clinical cytology, cytological unit, methodology in cytology*

Introduction

The foundation of specialisation in medical cytology in Croatia in 1974 is the result of multiannual effort of clinicians in period between two world wars of the last century, the enthusiasm of the pioneers of Croatian cytology in period after the Second World War and the effort of the teachers and the attendants of Postgraduate study of medical/clinical cytodiagnostics in second half of 20th century. Cytology has become important field of medicine, examinations of which are unavoidable part of diagnostic clinical work up of a patient. So far, 138 medical doctors have specialised in cytology (medical and clinical) in Croatia giving great contribution to significance and progress of Croatian cytology[1,2].

Current cytological service in Croatia is organised in 46 cytological organisational units in 23 towns performing within clinical hospital centres, clinical and general

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hospitals, health centres and as private cytological laboratories. Cytological units are most often organised as individual units (41%) or as common unit together with pathology (37%). Numerous units that have been a part of other clinical/diagnostic units has halved in the last decade[3,4] and today makes not more than 22% of all organisational units (Table 1). It is discouraging still not to have organised cytological unit in four general hospitals (Knin, Gospić, Ogulin and Našice).

Today cytological service employs 350 full time professionals along with nearly 20 administrative and auxiliary staff members who within departments, wards or policlinics work for more services, including cytology. From total of 121 medical doctors, 101 are specialists in clinical cytology, and 20 of them are residents. In two hospitals cytodiagnostics are run by other specialists (3 pathohystologists). Since 2000[3], number of cytotechnologists (cytoscreeners) has increased by 1.88 times (75:141), while number of health technicians did not change significantly (Table 2). In spite of employment of significant number of cytotechnologists in the last ten years, there is still an unacceptable ratio of number of cytologists and cytotechnologists (1:1.4), which is the result of unresolved education of cytotechnologists that should be permanent, complete and officially recognized. With regard to scientific promotion of cytologists in Croatia, today there are 31 masters of science and 9 doctors of science, one of which is an assistant professor, and four of them are associate or full professors at medical schools in Zagreb and Osijek. Thirty-seven cytologists and 13 cytotechnologists take part in education of cytologists and cytotechnologists, as well as other medical profiles.

According to the number of employees, the biggest units are Department of Clinical Cytology and Cytometry of University Hospital Dubrava and Department of Clinical Cytology of University Hospital Osijek with 20 employees each, then follow Department of Clinical Cytology of University Hospital Centre Split and Department of Gynaecological Cytology at Department of Obstetrics and Gynaecology of University Hospital Centre Zagreb with 19, and 18 employees respectively. In the last decade number of small units with only one specialist-cytologist has been reduced significantly, i.e from 68%[3] in 2000 to only 31%, recently.

TABLE 2
NUMBER OF EMPLOYEES IN CYTOLOGICAL SERVICE SINCE 2000

Number	2000[3]	2004[4]	2009
Cytologists	64	83	101
Doctors of science	7	9	12
Masters of science	17	28	31
Residents	22	24	20
Cytotechnologists	75	122	141
Health technicians	41	36	45
Administrators	**	20	25+9*
Auxiliary personnel	**	15	18+11*
Ratio cytologists : cytotechnologists	1:1.2	1:1.37	1:1.4

*part-time employees, i.e. common employees of departments, wards or policlinics

Croatian cytology, in average, is in its »best years«, i.e. an average cytologist is 46 years old, and cytotechnologist is averagely 43 years old, but in four laboratories, only one specialist over 60 years of age is employed, so the continuity of the practise in these units will soon be questionable. In these units it is necessary to send young doctors on specialisation as soon as possible. In conclusion, Croatian cytology has no problem with the age structure of its employees but with chronic deficit of them, in spite of continuous increase of number of cytologists, cytotechnologists and in lesser extent technicians since 2000 till nowadays (Figure 1). Asked to asses how many employees do they currently miss for optimal work, heads of departments point out lack of 25 specialists, 27 cytotechnologists and 12 administrative and assistant personnel. But to this evaluation, it is necessary to add 23 doctors and 37 cytotechnologists whose deficit will be evident in the next five years, presumably because of retirement and increase of work-extent. That makes total of 48 cytologists and 64 cytotechnologists, i.e. more than 49% of doctors and 45% of cytotechnologists that are currently available. The additional concerns are unresolved officially recognized education of cytotechnologists, ex-

TABLE 1
CYTOLOGICAL ORGANISATIONAL UNITS AND TYPE OF SERVICE SINCE 2000

		2000[3]	2004[4]	2009
Towns (n)		21	19	23
Organisational unit (n)		38	45	46
Cytological unit (%)	With patology	29%	29%	37%
	Part of ward or university department	42%	33%	22%
	Independent	29%	38%	41%
Cytological service N (%)	General laboratory	24 (63%)	24 (55%)	33 (72%)
	General – without gyneacology	6 (16%)	4 (9%)	6 (13%)
	Specialised	8 (21%)	16 (36%)	7 (15%)

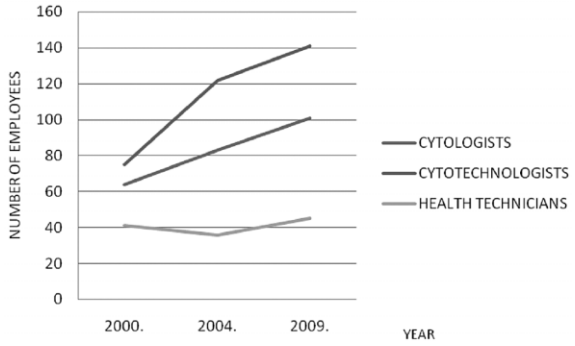

Fig. 1. Employees in cytological service since 2000 till today.

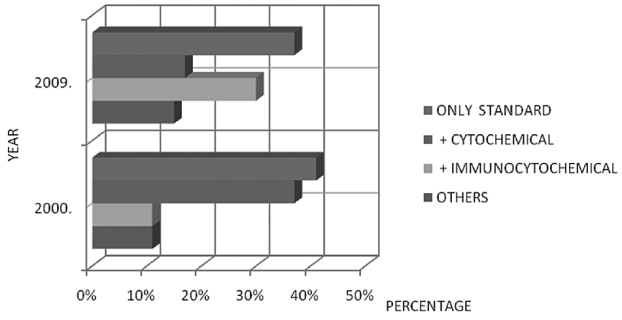

Fig. 2. Standard and additional methods per organisational units since 2000 till today.

tended duration of doctors' education as well as the lack of doctors in Croatia in general.

In spite of significant lack of personnel, thanks to remarkable effort of all staff, hospital patient in Croatia waits for its vaginal-cervical-endocervical (VCE) smear result 4 days in average (maximally 15 days), and for the results of other cytological examinations 2 days in average (maximally 7 days), while non-hospital patient waits for its VCE smear result 25 days in average (maximally 90 days), and for other cytological findings 5 days in average (mostly 15 days).

With regard to the type of service, the most numerous are units that cover entire cytology (72%), only 6 laboratories performs general cytology without gynaecological cytology (13%), while 7 laboratories (15%) are specialised in one field of cytology (gynaecological, pulmological or thyroid cytology). According to the total number of units, gynaecological cytology is performed in 80.43% of units (73% in 2005[5,6]). Four units are engaged only in gynaecological cytology.

Comparing year 2000[3] and today, there is a trend of increasing application of additional methods (cytochemical, immunocytochemical, molecular, cytogenetics and computer-assisted image analysis) in large number of cytological units. Exclusively morphological analysis of standard stained samples is performed in 17 units (37%), standard morphological and cytochemical staining methods are used in 8 units (17%), and additional immunocytochemical methods in 13 units (30%). Only one unit uses immunocytochemical methods along with standard staining, but without cytochemistry, while 7 (15%) units are using all available diagnostic methods (Table 3, Figure 2).

Working area available to cytological units ranges from 15 m^2 to 644 m^2. Only 60% of heads of departments consider that working area is appropriate for their optimal activity, while there is significant number of units working in inappropriate (too small or inadequate) conditions, including redesigned corridors and parts of sanitary premises. Nine organisational units are accommodated in premises up to 50 m^2, majority (21 units) occupies premises up to 100 m^2, while 6 of them have up to 200 m^2, and 6 of them over 200 m^2. In thirty-one cytological units (68.9%), cytological out-patient department is included, too.

In processing and archiving of cytological findings most of the units use computers. Every cytological unit has in average 3.2 computers, but as much as one quarter of units have none (2 units) or only one computer (9 units) without possibility of electronic issue of results and data base, which makes difficult getting insight in number of examinations and their structure. Additional difficulty presents unconciliated sample numeration that leads to unrealistically large or small number of processed samples, i.e. comparison of examination number and assessment of work load *per* employee is not objec-

TABLE 3
ADDITIONAL METHODS *PER* ORGANISATIONAL UNITS SINCE 2000

		2000[3]	2004[4]	2009
Additional methods	Only standard N (%)	20 (41%)	20 (44%)	17 (37%)
	+ Cytochemical N (%)	18 (37%)	11 (24%)	8 (17%)
	+ Immunocytochemical N (%)	6 (11%)	14 (31%)	13+1*(30)
	Others N (%)	5 (11%)	**	7 (15%)

*one organisational unit uses along with standard staining only immunocytochemical staining
** data not available

tive. Therefore, it is necessary to implement unique sample numeration.

Work-extent of cytological unit and number of examinations depends on general organisation of health services in towns of Croatia. The largest number of cytological units is located in the capital, Zagreb, where also works the majority of employees of all profiles (cytologists, cytotechnologists, technicians), but the organisational units are smaller and proportionally number of examination *per* units is smaller. In other towns of Croatia cytological service is mostly organised in one place, and the number of employees and examinations *per* unit in some greater towns is large. According to available data from 2008, total number of cytological examinations done in Croatia was 770996. The largest number of examinations had units in Osijek (44788 VCE + 22454 of other samples), Split (30660 VCE + 16705 of other samples) and Department of Gynaecological Cytology in Rijeka (36153 VCE + 4130 of other samples).

Cytology in Croatia has a long tradition. From improvised laboratories in hospitals, to independent wards and departments, it has progressed for decades, thanks to enthusiasm and great effort of our teachers. We believe that the following generations of cytologists will continue to work on its progress to maintain positive trend, and be able to harmonize basic cytomorphology and sophisticated diagnostic procedures in cooperation with other diagnostics, in order to enable our profession to stay diagnostic field of optimal results in the shortest time with the reasonable price[7,8].

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V. Miličić-Juhas

Department of Clinical Cytology, University Hospital Center Osijek, 31000 Osijek, J. Huttlera 4, Croatia
e-mail: valerija.mj@gmail.com

KLINIČKA CITOLOGIJA U HRVATSKOJ DANAS

SAŽETAK

Danas je u Hrvatskoj citološka djelatnost organizirana u 46 citoloških organizacijskih jedinica u 23 grada s ukupno zaposlenih 350 djelatnika: 101 liječnik specijalist kliničke citologije, 20 specijalizanata kliničke citologije, 141 citotehnolog (citoskriner), 45 zdravstvenih tehničara te 25 djelatnika administrativnog i 18 pomoćnog profila. Unatoč zapošljavanju većeg broja citotehnologa tijekom posljednjih deset godina, i dalje je prisutan neprihvatljiv odnos broja specijalista citologa i citotehnologa (1:1,4) koji je posljedica u prvom redu neriješenog školovanja citotehnologa na nivou trajne, kompletne i statusno priznate edukacije. Naobrazba i znanstveno napredovanje citologa se nastavlja te danas naša struka broji 31 magistra te 9 doktora znanosti, od kojih je jedan docent, a četvero redoviti odnosno izvanredni profesori na medicinskim fakultetima u Zagrebu i Osijeku. Hrvatska je citologija, u prosjeku gledano, u »najboljim godinama« tj. prosječni citolog star je 46 godina, a citotehnolog 43 godine, ali »pati« od manjka djelatnika. Prema vrsti djelatnosti najbrojnije su jedinice koje se bave cjelokupnom citologijom (72%), 13% se bavi općom citologijom bez ginekološke, dok je 15% specijalizirano za jednu djelatnost (ginekološka, pulmološka ili citologija štitnjače). Prema dostupnim podatcima, u 2008. godini ukupno je izvršeno 770996 citoloških pretraga u Hrvatskoj. Zapaža se trend sve veće primjene dodatnih metoda (citokemijskih, imunocitokemijskih, molekularnih i citogenetskih te kompjutorske analize slike) u sve više citoloških jedinica. Isključivo morfološku analizu standardno obojenih uzoraka rabi 37% djelatnosti, morfološke i citokemijske metode bojenja 17%, a još i imunocitokemijske metode 30%. S obzirom na dugu tradiciju citologije u Hrvatskoj, koja je napredovala zahvaljujući entuzijazmu i velikom trudu naših učitelja, vjerujemo da će i buduće generacije citologa i dalje raditi na njezinom boljitku te znati uskladiti temeljnu citomorfologiju i sofisticirane dijagnostičke postupke, kako bi u suradnji s ostalim dijagnostičkim strukama omogućili da ostane djelatnost koja u najkraćem vremenu i uz najmanje troškove daje optimalne rezultate.