Poslijeanalitička faza u laboratorijskoj hematologiji

Branka Krešić

Zavod za medicinsko laboratorijsku dijagnostiku

KBC Split

Anketa RGLH HDMBLM

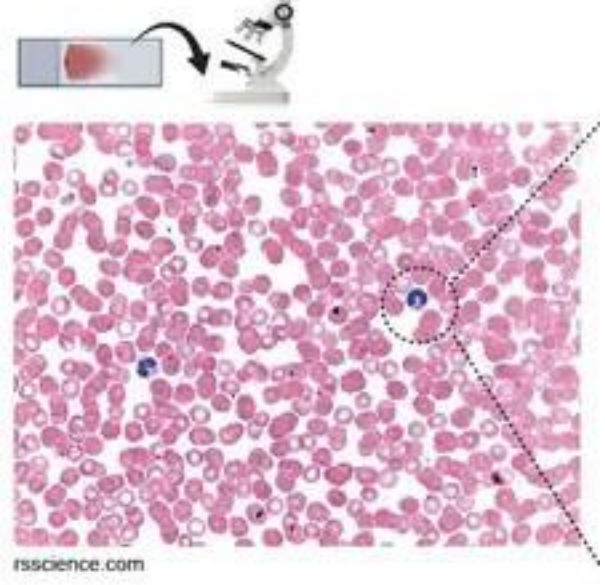
Table 7: Survey results related to results reporting.

Question	Answers	n (%)
39. How do you manage samples with results above hematology analyzer's measuring range?	a) Dilute the sample and report corrected result	91/129 (70)
	b) The initially obtained (native) result is reported from the hematology analyzer	15/129 (12)
	c) The result is reported as ">" of the upper limit of linearity of the respective analyser	23/129 (18)
40. How do you manage samples whose results are below hematology analyzer's measuring range?	a) The result is reported from the hematology analyzer	37/129 (29)
	b) The result is reported as "<" of the lower limit of linearity for certain parameters	92/129 (71)
41. Do you use autovalidation for hematology parameters?	a) Yes, for all parameters	11/129 (9)
	b) Yes, for certain parameters	3/129 (2)
	c) No	115/129 (89)
42. What is the monthly percentage rate of auto-validated results?	a) more than 50%	a) 5/9
	b) Less than 50%	b) 4/9
43. Which of the following criteria you use for autovalidation (multiple answers possible)	a) Delta check	1/99
	b) Combination of the following criteria: delta check, critical results, analysers flags, and/or linearity	14/99
	d) We do not use autovalidation	84/99
44. Please specify the applied TAT for STAT and routine CBC parameters.	Stat samples:	
	a) Between 1 and 2 h	a) 10/118 (9)
	b) Between 30 and 60 min	b) 90/118 (76)
	c) Less than 30 min	c) 18/118 (15)
	Routine samples:	
	a) 12–24 h	a) 12/114 (10)
	b) 5–8 h	b) 41/114 (36)
	c) 2–4 h	c) 53/114 (47)
	d) Within 1 h	d) 8/114 (7)
45. Which reference intervals do you use for reporting CBC results?, n=129	a) Recommended national harmonized reference intervals	129/129 (100)
	b) Recommendations from manufacturer	0/129
	c) Other (please specify)	0/129
46. Do you provide comments on your laboratory reports?, n=129	a) Yes, only predefined comments	24/129 (19)
	b) Yes, interpretative comments	26/129 (20)
	c) Yes, predefined and interpretative comments	63/129 (49)
	d) No, we do not report any comments	16/129 (12)
47. Do you report critical values for CBC?/do you communicate CBC critical values to referring clinicians?	a) Yes	127/129 (98)
	b) No	2/129 (2)
48. Do you have CBC critical values specified on laboratory report?	a) Yes	11/129 (9)
	b) No	118/129 (91)
49. Please specify the source of used critical values for CBC.	a) CCMB recommendations	a) 108/115 (94)
	b) Thomas L., critical limits of laboratory results for Urgent clinician Notification	b) 2/115 (2)
	c) CSMBLM national recommendations	c) 5/115 (4)

CCMB, Croatian Chamber of Medical Biochemists; CSMBLM, Croatian Society of Medical Biochemistry and Laboratory Medicine.

29% ???

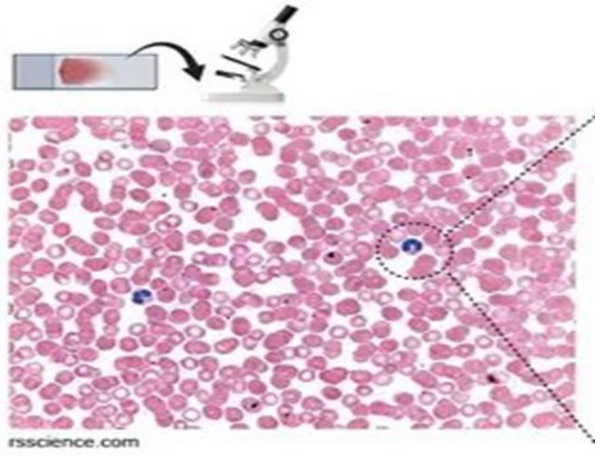
Nacionalne preporuke!



Nalaz mikroskopskog pregleda

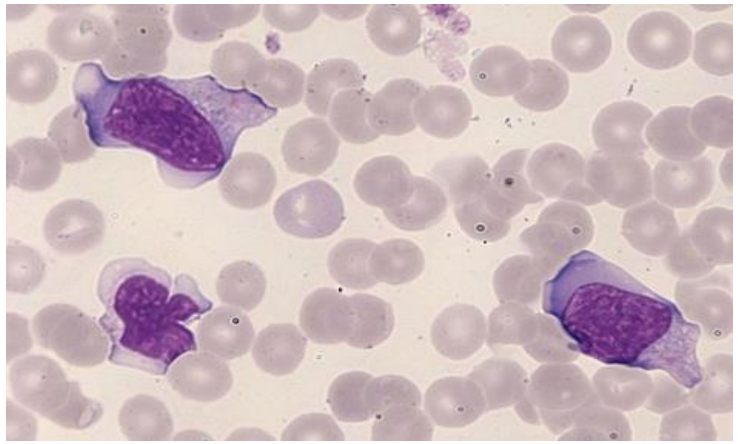
Interpretirati kliničku značajnost

Pružiti samo korisnu informaciju koja doprinosi diferencijalnoj dijagnozi



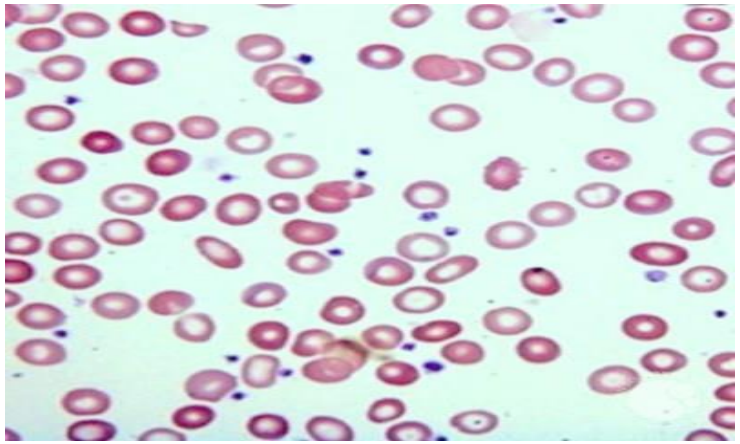
Usporedivost rezultata

Nomenklatura

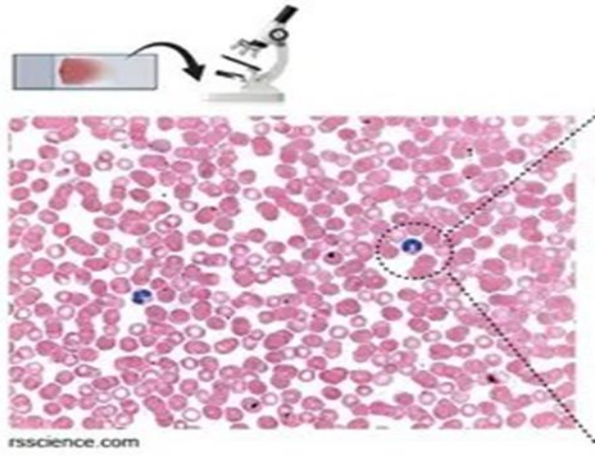


Reaktivni, atipični , varijabilni, aktivirani …

Stupnjevanje



Rijetki, + do ++++ (po vidnom polju ili %)…

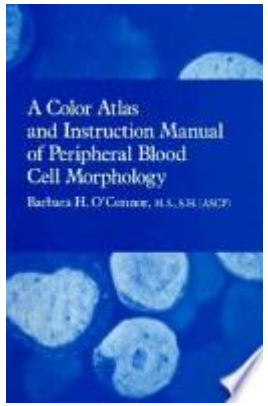


Usporedivost rezultata

International Journal of Laboratory Hematology
The Official journal of the International Society for Laboratory Hematology
REVIEW
INTERNATIONAL JOURNAL OF LABORATORY HEMATOLOGY

Reporting and grading of abnormal red blood cell morphology

B. T. CONSTANTINO



Nema dokaza da je način superiorniji od drugih!

Nacionalne smjernice

International Journal of Laboratory Hematology
The Official journal of the International Society for Laboratory Hematology
ORIGINAL ARTICLE
INTERNATIONAL JOURNAL OF LABORATORY HEMATOLOGY

ICSH recommendations for the standardization of nomenclature and grading of peripheral blood cell morphological features

L. PALMER*, C. BRIGGS†, S. MCFADDEN‡, G. ZINI§, J. BURTHEM¶, G. ROZENBERG**, M. PROYTCHEVA††, S. J. MACHIN†

2015.

Standardizacija nomenklature i stupnjevanja morfoloških značajki

↓

Pouzdano i ujednačeno izvještavanje rezultata

International Journal of Laboratory Hematology
The Official journal of the International Society for Laboratory Hematology
ORIGINAL ARTICLE
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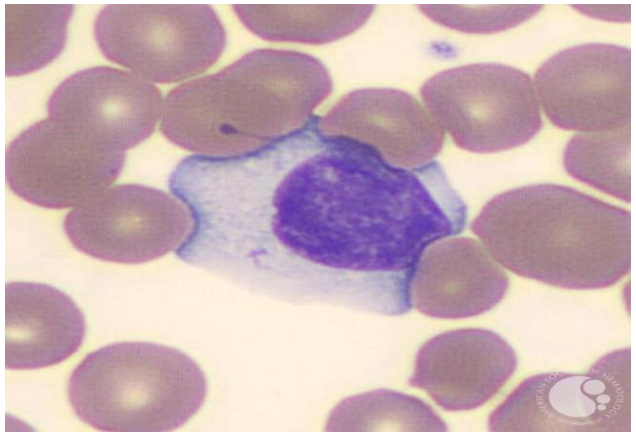
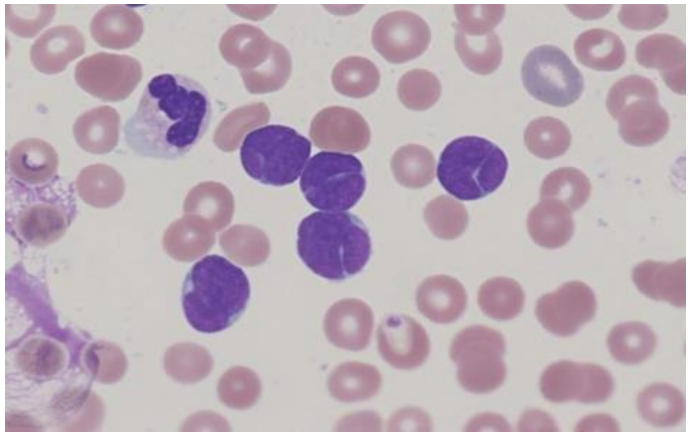


Reaktivni limfociti
Samo u značajnom broju kao odvojena populacija!



Abnormalni engl. *abnormal* limfociti

International Journal of Laboratory Hematology
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ORIGINAL ARTICLE
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% na najmanje 1000 eritrocita

RDW →

MCV →

Table 1. Morphology Grading Table

Cell Name	Grading System		
	Few/1+	Mod/2+, %	Many/3+, %
RBC			
Anisocytosis	N/A	11–20	>20
Macrocytes	N/A	11–20	>20
Oval macrocytes	N/A	2–5	>5
Microcytes	N/A	11–20	>20
Hypochromic cells	N/A	11–20	>20
Polychromasia	N/A	5–20	>20
Acanthocytes	N/A	5–20	>20
Bite cells	N/A	1–2	>2

Interpretativni komentari

Klinička validacija nalaza

Komunikacija laboratorij → Liječnik
Komunikacija laboratorij → Pacijent

Dodatna vrijednost nalazu i kliničkoj primjeni različitih rezultata međusobno povezanih patofiziološkim procesom

SIBioC Diagnostic Hematology Study Group (DHSG) 2014

Harmonizacija interpretativnih komentara u hematologiji

- 423 različitih interpretativnih komentara
- „Zbunjujuća slika” stanja u talijanskim laboratorijima
- Nedostatak standardizacije
- Različiti opisi iste morfološke promjene
- Dio ne izvještava o klinički značajnim promjenama

SIBioC Diagnostic Hematology Study Group (DHSG) 2014

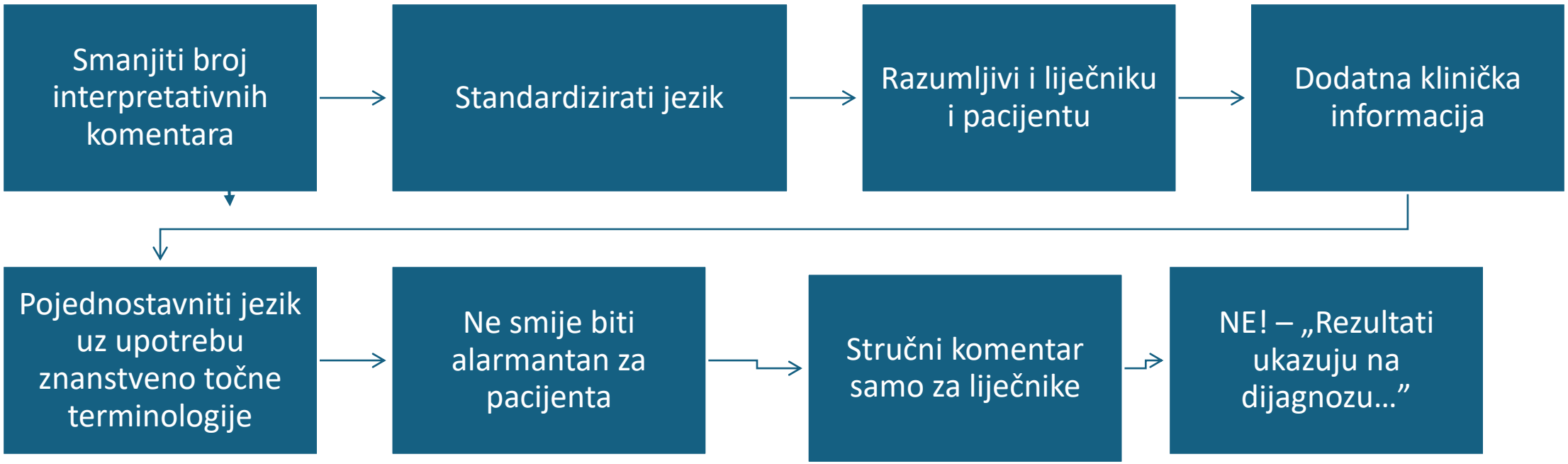


Table 1 WBC-Lymphocytes Group. Activated lymphocytes

Code	Comment	Indication/action	references
1-LYMP	Presence of activated lymphocytes	To use for values of activated lymphocytes > 5%. For values <5%, the faculty to signaling the presence of activated lymphocytes depend on a careful evaluation of the context and the available data (clinical symptoms, serological and biochemical pictures)	
2-LYMP	Presence of activated lymphocytes and apoptotic cells	To use in co-presence of activated lymphocytes and lytic cells	7, 9-12
3-LYMP	The serological study is recommended	Add to 1-LYMP or 2-LYMP if serology has not already been requested	

All three comments are extended to increase the clinical information for Physicians. This extended text is not in the laboratory report but in the appendix that was be sent "una tantum" to Physicians as a separate document that they can consult when specific comments are present in the hematologic report. For the IHCs from 1-LYMP to 3-LYMP the additional information is reported below:

Activated lymphocytes are the morphological equivalent of a functional state of the lymphocytes participating in the immunological response when a viral infection is present (from cytomegalic or *Epstein-Barr* and others). More rarely, non-viral agents can be involved such as *Toxoplasma gondii; Bordetella Pertussis* and others.

Because of the number of activated lymphocytes does not correlate with the prognosis and the evolution of the disease, the reporting of their presence only is enough in itself to direct towards the diagnostic hypothesis of infectious mononucleosis or mononucleosis-like syndromes.

Apoptotic lymphocytes represent the lithic terminal stage of the cell-virus interaction and constitute a confirmation, albeit indirect and not specific, of the reactive nature of lymphocytosis. Based on the patient's clinical picture, it may be useful to check for anti-EBV, anti-CMV (or others) IgM and IgG antibodies

Nalaz

Liječnik

Table 4. WBC - Lymphocytes group. The Adult Lymphocytosis

Code	Comment	Indication/action	references
15-LYMP	The lymphocytosis must be confirmed in about three months	To use for lymphocytosis >5.0x10^9/L that have been observed for the first time and without the presence of atypical lymphocytes	
16-LYMP	The lymphocytosis previously observed is confirmed. Cytofluorimetry is recommended	To use for lymphocytosis >5.0 x10^9/L that have been observed for the first time at least three months before.	16,26,27

the immunological response. The persistence/increase of the small lymphocytes could mean that they are clonal lymphocytes (non-reactive; neoplastic). This hypothesis requires a cytofluorimetric confirmation, since values of clonal lymphocytes >5.0 x10^9/L are WHO diagnostic criterium for chronic lymphocytic leukemia/small lymphocytic lymphoma (CLL/SLL). Values <5.0 x10^9/L characterize the Monoclonal B-Lymphocytosis (MBL).

A suggested operative algorithm in case of lymphocytosis:

a. lymphocytosis >5.0 x10 /L or LGL counting >2.0 x10^9/L: the CBC must be repeated after 3 and 6 months respectively

b. the counting is confirmed: cytofluorimetry (CF) is required

c. CF confirms the lymphocyte's clonality or LGL counting increases: you need to a haematological counselling

Harmonisation of full blood count reports, recommendations of the French-speaking cellular haematology group (GFHC) 2015

Preporuke kod **inicijalne dijagnoze**

Konsenzus francuskih stručnjaka nakon validacije kliničkih hematologa

Na nalazu naznačiti da se radi o mikroskopskoj DKS (HR??)

GFHC - interpretativni komentari

Nisu automatski!

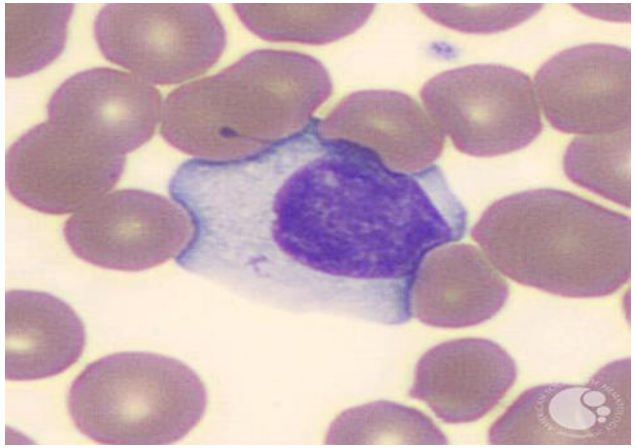
Razina 1 – jezgrovit **opis** morfologije

Razina 2 – **interpretacija** i ako je moguće usmjeravanje na dijagnozu

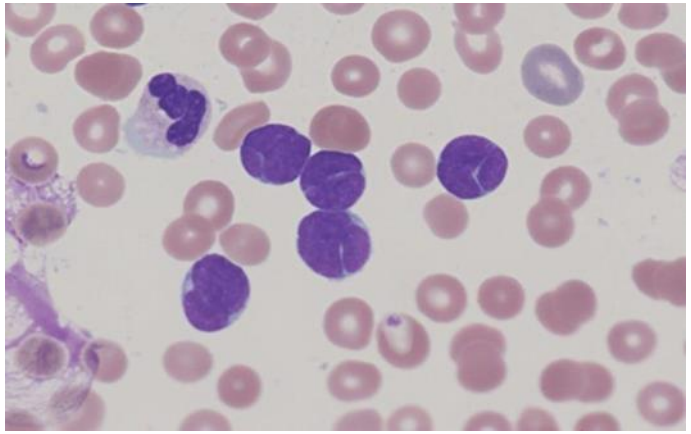
Razina 3 – **savjetovanje** o daljnjim testiranjima

- Primatelj nalaza liječnik!
- Pacijent??

GFHC



- Atipični reaktivni limfociti – „aktivirani” funkcionalno obilježje
- Sve stanice se broje kao limfociti
- > 10% bazofilnih limfocita - samo komentar Razine 2 – „Sindrom mononukleoze”



- Sve stanice se broje kao limfociti
- Razina 1 – Jezgrovit opis stanica
- Razina 2 – Morfologija kompatibilna s …
- Razina 3- Navesti dodatna testiranja

Dijagnoza!

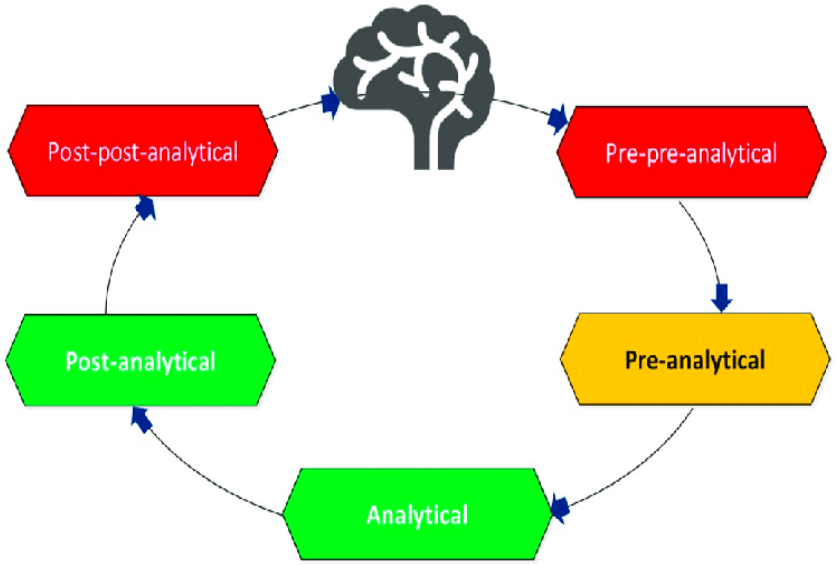
Nakupine trombocita

SIBioc

5 - PLT	The platelets count was not performed due to the presence of agglutination. The numerical value of the platelets must not be given.	The instrumental numerical value of the platelets must not be given even if in the normal range.	54, 55

GFHC

State 'Platelet count normal' if this is clearly so



Što je ispravno?

The Association for Clinical Biochemistry & Laboratory Medicine

Better Science, Better Testing, Better Care

Section: ACB Executive
Author: Prof Eric Kilpatrick
Date of publication: September 2014

Best Practice when providing interpretative comments on laboratory medicine reports

Short communication

Interpretative comments - need for harmonization? Results of the Croatian survey by the Working Group for Post-analytics

Vladimira Rimac[1,2], Sonja Podolar[1,3], Anja Jokic[1,4], Jelena Vlasic Tanaskovic[1,5,7], Lorena Honovic[1,5], Jasna Lenicek Krleza[1,6,7]

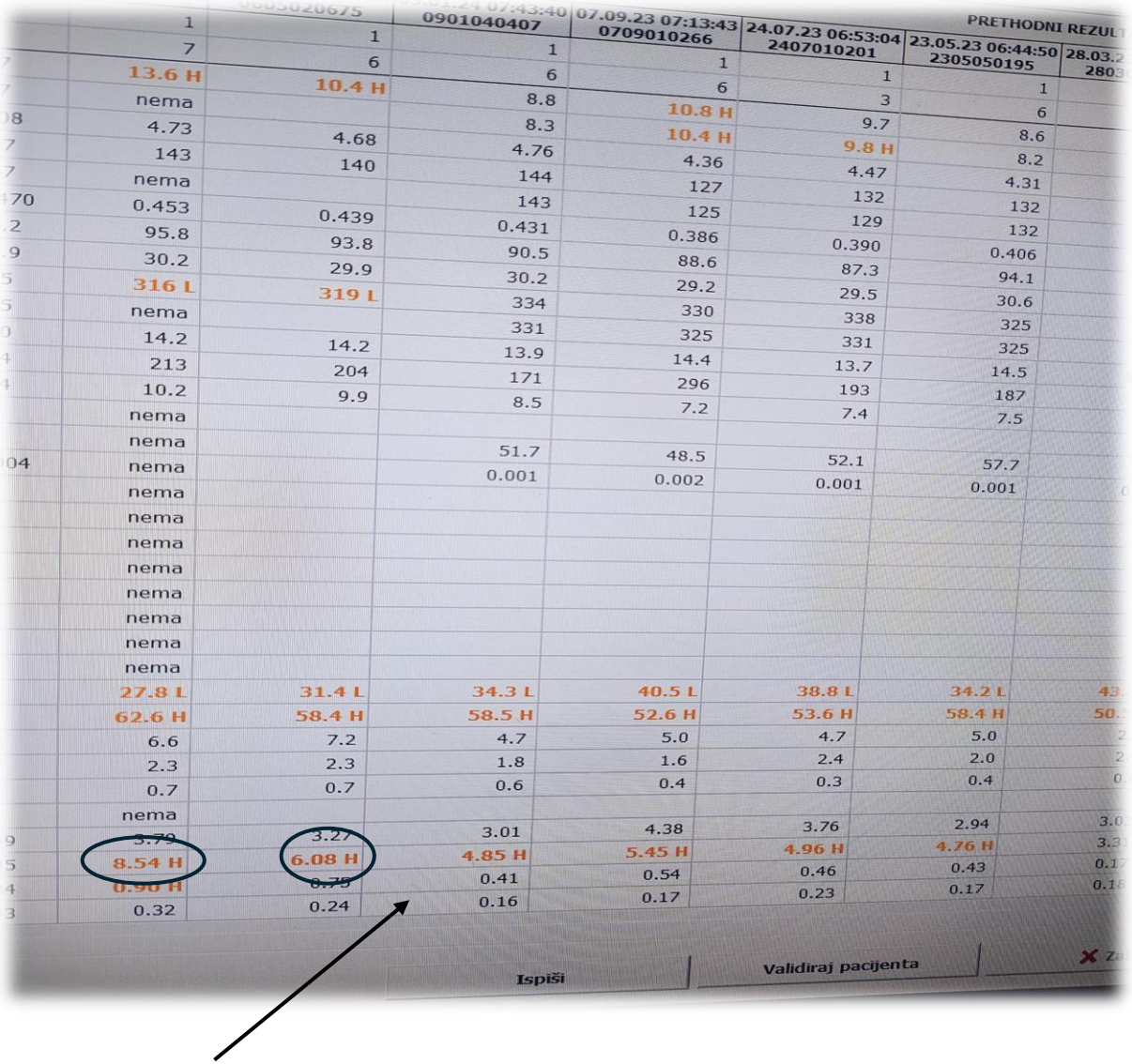
?

- Smjernice ne rješavaju glavno pitanje – za koji rezultat je potrebna klinička validacija
- Kompentencije (iskustvo) validatora
- Specijalnost liječnika koji prima nalaz
- Strah od zadiranja u kompetencije liječnika i odnos s pacijentom
- Klinički kontekst

Dostupnost podataka o pacijentu!!!

9. Which of the following do you think has the greatest impact on the quality of expert opinion in the case of laboratory professionals? (multiple-choice answers)	Limited access to patient's medical record	100 (62)
	Insufficient professional knowledge	15 (9)
	Lack of communication	19 (12)
	Unavailability/lack of interest of physician	104 (64)
	Lack of time	65 (40)

Smjernice kao edukativni materijal +



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	7	6	1	1	1	1	
	13.6 H	10.4 H	6	6	3	6	
	nema		8.8	10.8 H	9.7	8.6	
8	4.73	4.68	8.3	10.4 H	9.8 H	8.2	
7	143	140	4.76	4.36	4.47	4.31	
7	nema		144	127	132	132	
70	0.453	0.439	143	125	129	132	
2	95.8	93.8	0.431	0.386	0.390	0.406	
9	30.2	29.9	90.5	88.6	87.3	94.1	
5	316 L	319 L	30.2	29.2	29.5	30.6	
5	nema		334	330	338	325	
0	14.2	14.2	331	325	331	325	
4	213	204	13.9	14.4	13.7	14.5	
4	10.2	9.9	171	296	193	187	
	nema		8.5	7.2	7.4	7.5	
	nema						
04	nema		51.7	48.5	52.1	57.7	
	nema		0.001	0.002	0.001	0.001	
	nema						
	nema						
	nema						
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	nema						
	nema						
	27.8 L	31.4 L	34.3 L	40.5 L	38.8 L	34.2 L	43
	62.6 H	58.4 H	58.5 H	52.6 H	53.6 H	58.4 H	50
	6.6	7.2	4.7	5.0	4.7	5.0	2
	2.3	2.3	1.8	1.6	2.4	2.0	2
	0.7	0.7	0.6	0.4	0.3	0.4	0
	nema						
9	3.79	3.27	3.01	4.38	3.76	2.94	3.0
5	8.54 H	6.08 H	4.85 H	5.45 H	4.96 H	4.76 H	3.3
4	0.90 H	8.75	0.41	0.54	0.46	0.43	0.1
3	0.32	0.24	0.16	0.17	0.23	0.17	0.1

Ispiši | Validiraj pacijenta

Prikaz rezultata

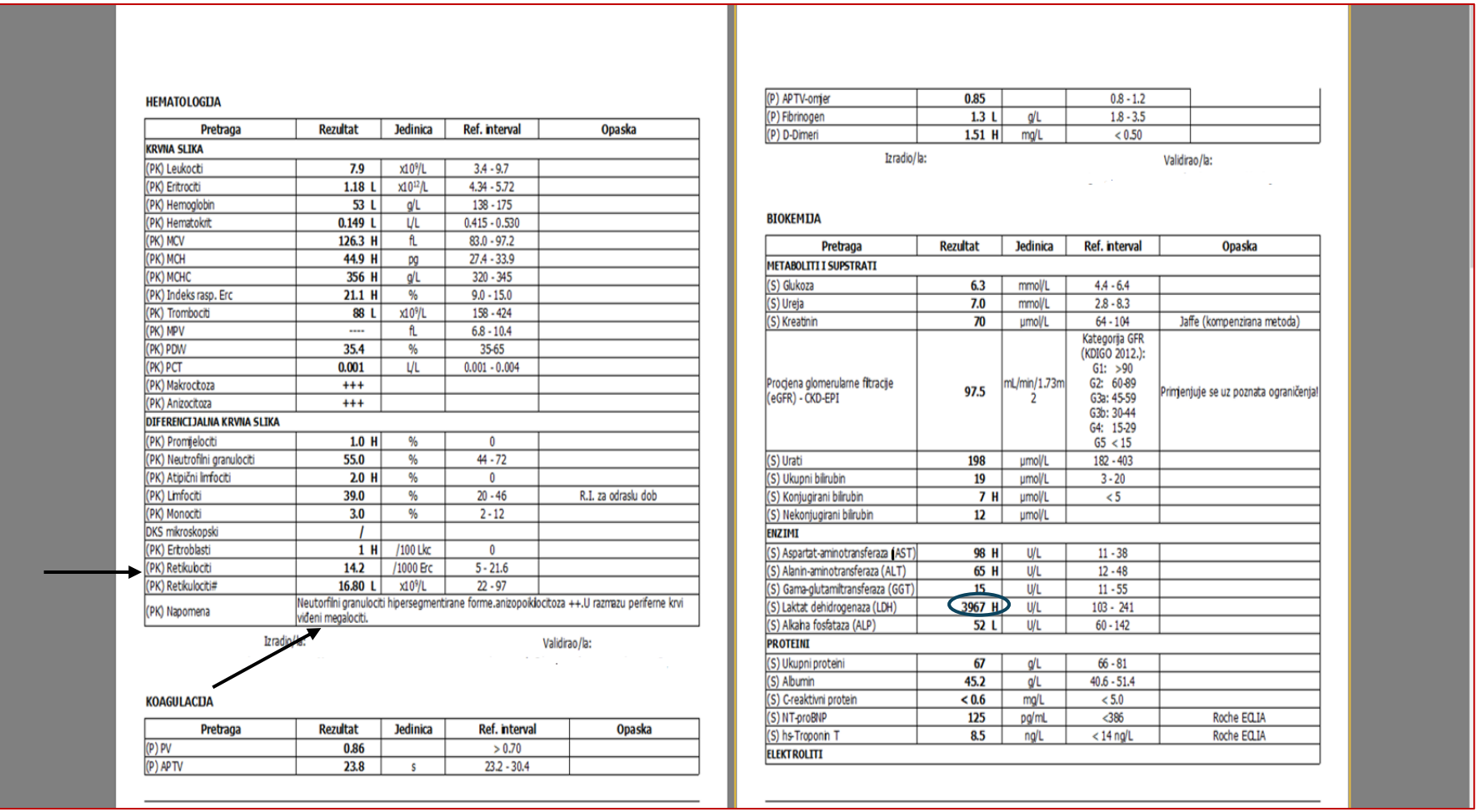
Pacijentica nakon liječenja karcinoma dojke

- Redovne kontrole
- 2 rezultata s brojem limfocita >5 x109/L
- DKS mikroskopski

Podaci iz BIS-a:

- Nema nalaza hematologa
- Ne spominje se limfocitoza
- S onkološke strane sve u redu

Svi uvjeti za interpretativni komentar!



HEMATOLOGIJA

Pretraga	Rezultat	Jedinica	Ref. interval	Opaska
KRVNA SLIKA				
(PK) Leukociti	7.9	x10⁹/L	3.4 - 9.7	
(PK) Eritrociti	1.18 L	x10¹²/L	4.34 - 5.72	
(PK) Hemoglobin	53 L	g/L	138 - 175	
(PK) Hematokrit	0.149 L	L/L	0.415 - 0.530	
(PK) MCV	126.3 H	fL	83.0 - 97.2	
(PK) MCH	44.9 H	pg	27.4 - 33.9	
(PK) MCHC	356 H	g/L	320 - 345	
(PK) Indeks rasp. Erc	21.1 H	%	9.0 - 15.0	
(PK) Trombociti	88 L	x10⁹/L	158 - 424	
(PK) MPV	----	fL	6.8 - 10.4	
(PK) PDW	35.4	%	35-65	
(PK) PCT	0.001	L/L	0.001 - 0.004	
(PK) Makroctoza	+++			
(PK) Anizocitoza	+++			
DIFERENCIJALNA KRVNA SLIKA				
(PK) Promijelociti	1.0 H	%	0	
(PK) Neutrofilni granulociti	55.0	%	44 - 72	
(PK) Atipični limfociti	2.0 H	%	0	
(PK) Limfociti	39.0	%	20 - 46	R.I. za odraslu dob
(PK) Monociti	3.0	%	2 - 12	
DKS mikroskopski	/			
(PK) Eritroblasti	1 H	/100 Lkc	0	
(PK) Retikulociti	14.2	/1000 Erc	5 - 21.6	
(PK) Retikulociti#	16.80 L	x10⁹/L	22 - 97	
(PK) Napomena	Neutorfilni granulociti hipersegmentirane forme.anizopoikilocitoza ++.U razmazu periferne krvi viđeni megalociti.			

Izradio/la: Validirao/la:

KOAGULACIJA

Pretraga	Rezultat	Jedinica	Ref. interval	Opaska
(P) PV	0.86		> 0.70	
(P) APTV	23.8	s	23.2 - 30.4	
(P) APTV-omjer	0.85		0.8 - 1.2	
(P) Fibrinogen	1.3 L	g/L	1.8 - 3.5	
(P) D-Dimeri	1.51 H	mg/L	< 0.50	

Izradio/la: Validirao/la:

BIOKEMIJA

Pretraga	Rezultat	Jedinica	Ref. interval	Opaska
METABOLITI I SUPSTRATI				
(S) Glukoza	6.3	mmol/L	4.4 - 6.4	
(S) Ureja	7.0	mmol/L	2.8 - 8.3	
(S) Kreatinin	70	µmol/L	64 - 104	Jaffe (kompenzirana metoda)
Procjena glomerularne filtracije (eGFR) - CKD-EPI	97.5	mL/min/1.73m2	Kategorija GFR (KDIGO 2012.): G1: >90 G2: 60-89 G3a: 45-59 G3b: 30-44 G4: 15-29 G5 < 15	Primjenjuje se uz poznata ograničenja!
(S) Urati	198	µmol/L	182 - 403	
(S) Ukupni bilirubin	19	µmol/L	3 - 20	
(S) Konjugirani bilirubin	7 H	µmol/L	< 5	
(S) Nekonjugirani bilirubin	12	µmol/L		
ENZIMI				
(S) Aspartat-aminotransferaza (AST)	98 H	U/L	11 - 38	
(S) Alanin-aminotransferaza (ALT)	65 H	U/L	12 - 48	
(S) Gama-glutamiltransferaza (GGT)	15	U/L	11 - 55	
(S) Laktat dehidrogenaza (LDH)	3967 H	U/L	103 - 241	
(S) Alkalna fosfataza (ALP)	52 L	U/L	60 - 142	
PROTEINI				
(S) Ukupni proteini	67	g/L	66 - 81	
(S) Albumin	45.2	g/L	40.6 - 51.4	
(S) C-reaktivni protein	< 0.6	mg/L	< 5.0	
(S) NT-proBNP	125	pg/mL	<386	Roche ECLIA
(S) hs-Troponin T	8.5	ng/L	< 14 ng/L	Roche ECLIA
ELEKTROLITI				

GFHC

Razina 1 Hipersegmentirani neutrofili + makrocitoza

Razina 2 Rezultati ukazuju na megaloblastičnu deficijentnu dismijelopoezu

Razina 3 Odrediti vitamine

Laboratorij: refleksno retikulociti, mikroskopski pregled

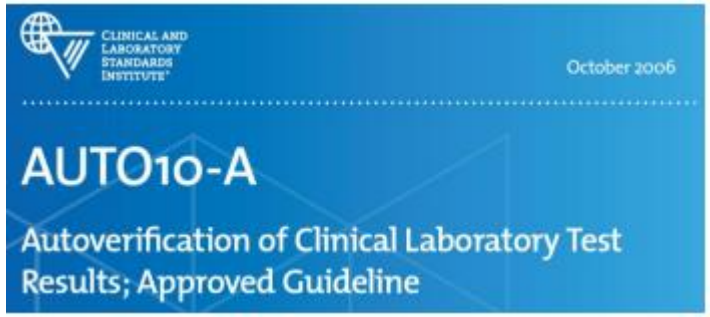
Bez interpretativnog komentara

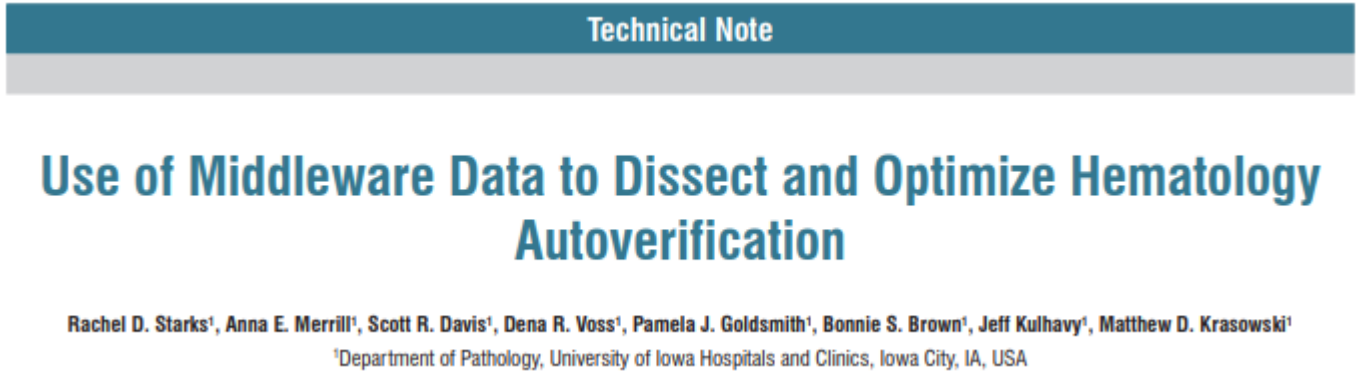
Dežurni liječnik nakon nalaza:
Jako je visok LDH, akutna hemoliza? B12, folna kiselina?

Autovalidacija

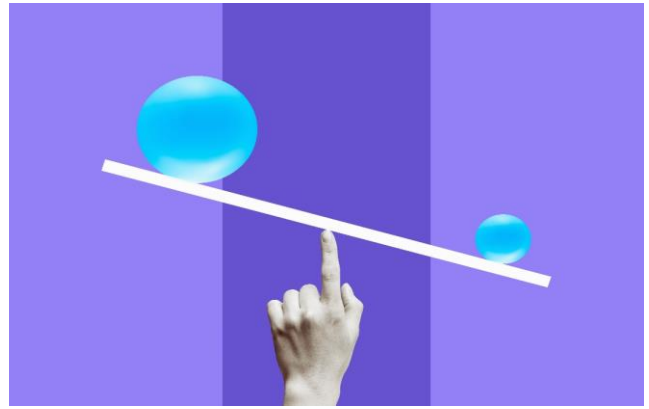
- Automatsko izdavanje nalaza bez ručne intervencije
- Ujednačen proces procjene svakog nalaza
- Svaki rezultat prolazi jednaka pravila – kvaliteta rezultata.

Kako započeti?





Želje i mogućnosti

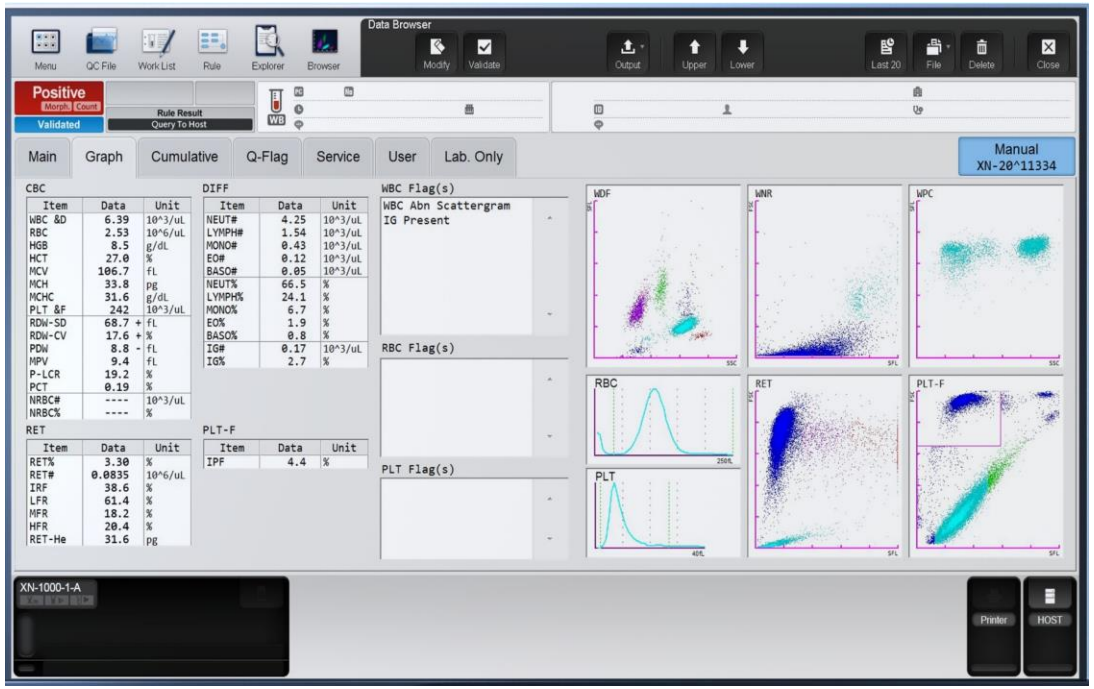


Autovalidacija u hematologiji

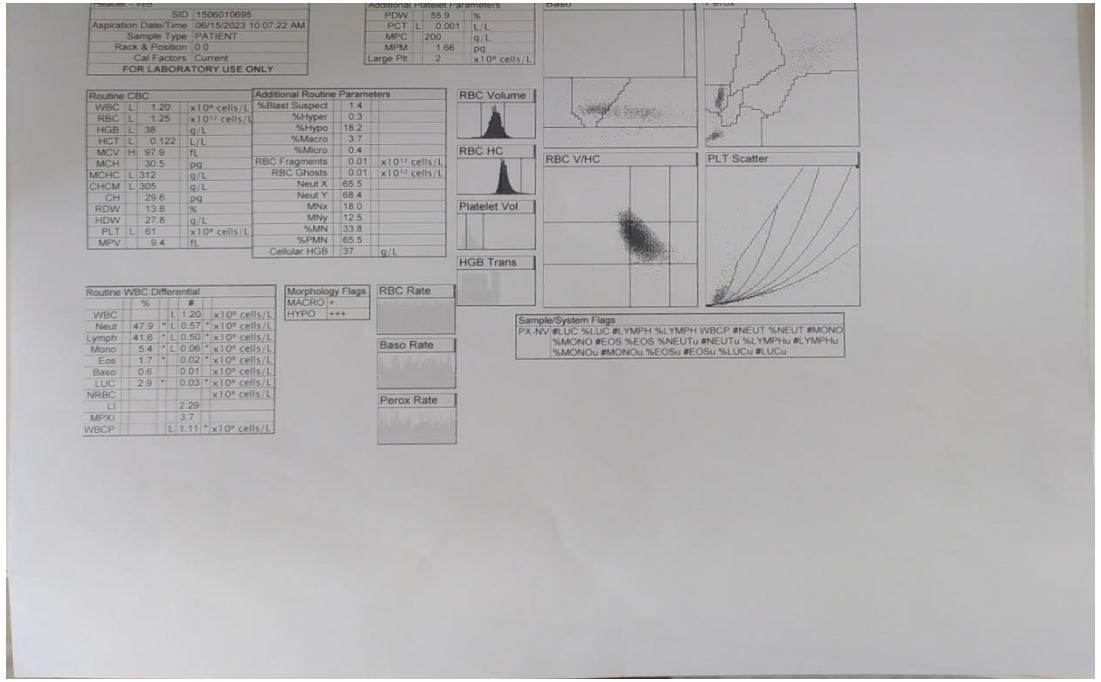
- Nema pregleda rezultata i verifikacije – procjena u programskom sustavu
- Osigurati adekvatnu komunikaciju s programskim sustavom – LIS i/ili međusustav engl. *middleware*
- Definirati što je rezultat (”----” ili „****”, broj, „nema”)
- Postavke analizatora za zaustavljanje i automatsko slanje rezultata

Procjena rezultata u hematološkom laboratoriju

Pregled i validacija na analizatoru



Pregled detaljnog ispisa



Kriteriji - delta check

CLSI AUTO15 2.3.21 osnovni uvjeti

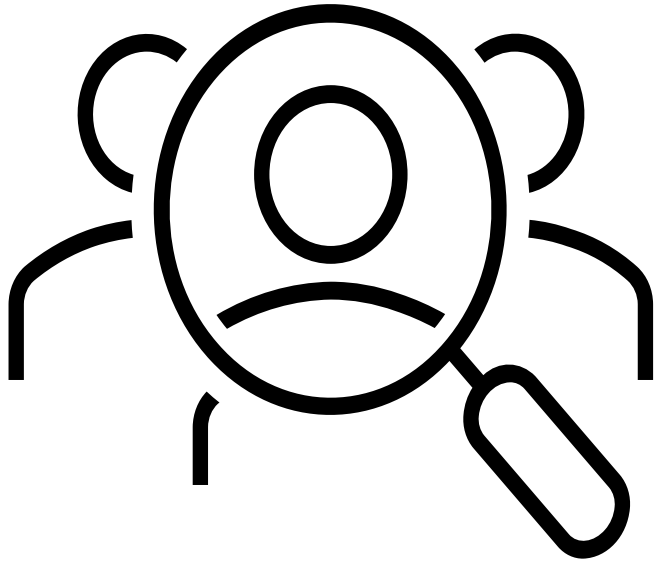
- Prethodni rezultat
- Što ako ga nema („/” umjesto rezultata) ili je rezultat „<„
- Rezultati koji nisu izdani ili su naknadno povučeni moraju biti uklonjeni iz programskog sustava

DELTA check-cilj

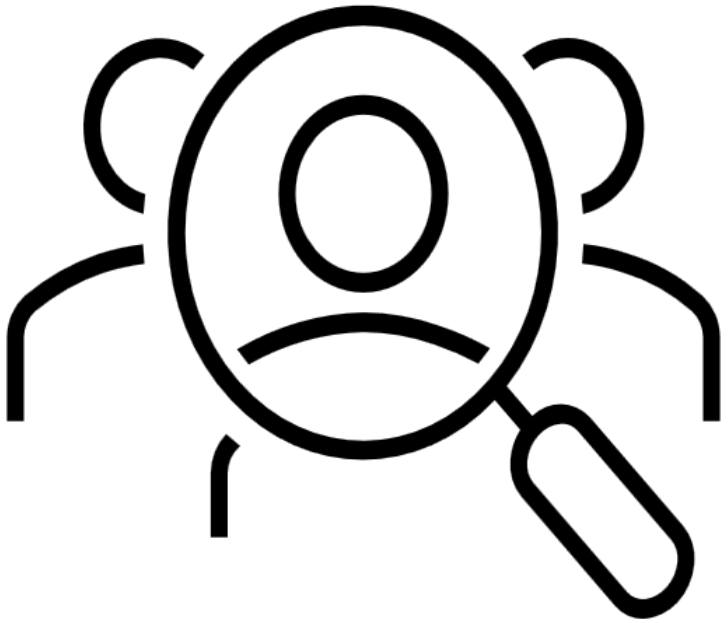
- **CLSI EP33 ED2:2023** — Use of Delta Checks in the Medical Laboratory, 2nd Edition
- Detekcija pogrešne identifikacije pacijenta
- Detekcija problema s uzorkom (nakupine, razrjeđenje uzorka)
- Klinički značajna promjena kod pacijenta

- Analitički problemi – učestala kalibracija
- Pogreške kod ručnog unosa rezultata?

Populacija pacijenata +



Neočekivana promjena

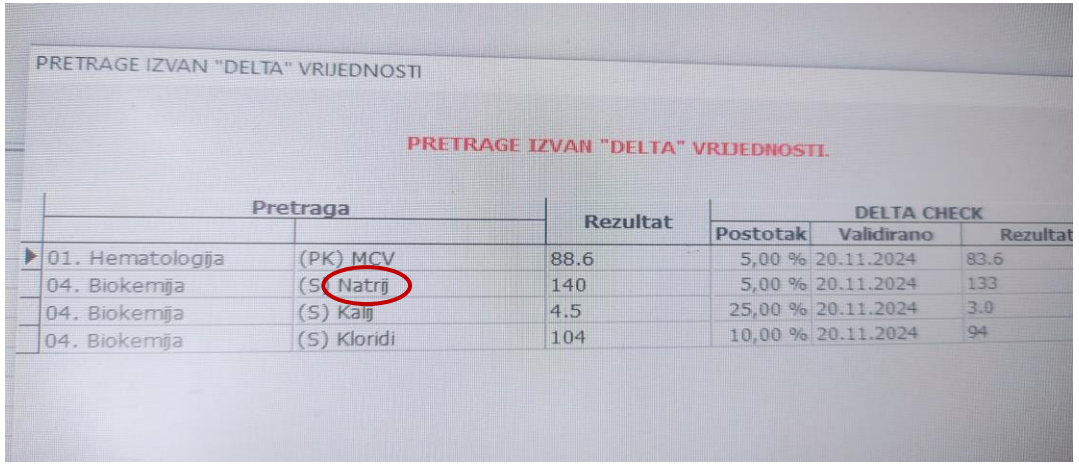


Pretrage

- MCV
- Hemoglobin
- Leukociti
- Trombociti
- Neutrofilni granulociti

DELTA check

- Za detekciju pogrešne identifikacije pacijenta parametri koji su stabilni u određenom vremenskom razdoblju – MCV
- Mali broj akutnih stanja uzrokuje promjenu


PRETRAGE IZVAN "DELTA" VRIJEDNOSTI

PRETRAGE IZVAN "DELTA" VRIJEDNOSTI.

Pretraga		Rezultat	DELTA CHECK		
			Postotak	Validirano	Rezultat
01. Hematologija	(PK) MCV	88.6	5,00 %	20.11.2024	83.6
04. Biokemija	(S) Natrij	140	5,00 %	20.11.2024	133
04. Biokemija	(S) Kalij	4.5	25,00 %	20.11.2024	3.0
04. Biokemija	(S) Kloridi	104	10,00 %	20.11.2024	94

Način izračuna

- Apsolutna razlika
- Relativna razlika %
- Relativna razlika / vremensko razdoblje
- Relativna razlika / raspon RI

Granice prihvaćanja - delta check limits

- **Empirijske literatura ili temeljene na iskustvu**

- RCV
- Klinički značajna razlika - korist u bolničkoj populaciji?

KBC Split RCV za hemoglobin 6%

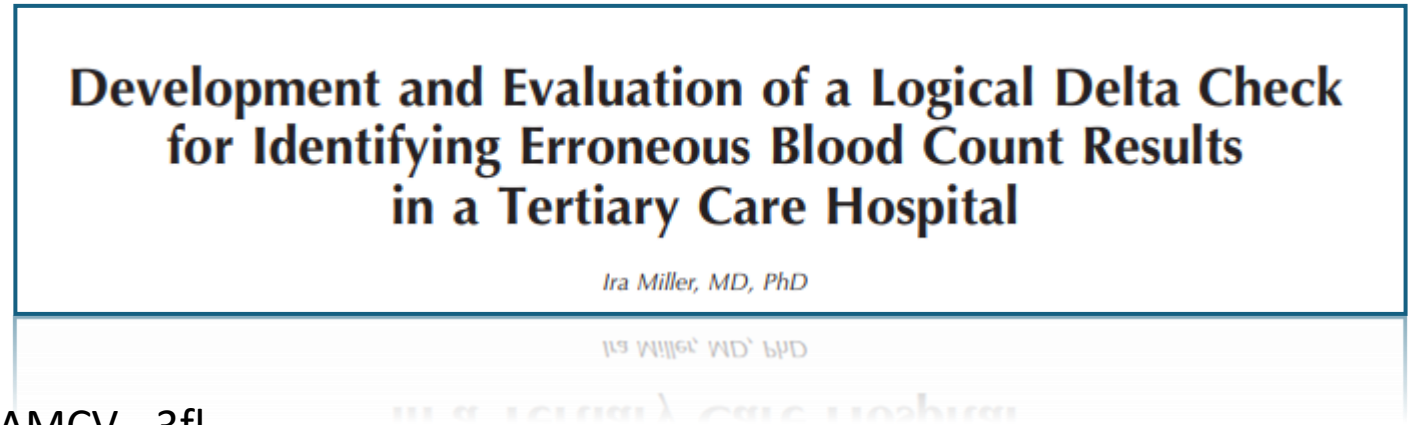
Literatura

ΔMCV

- 3- 6 fL
- 3- 10%

- **Δ Hgb 15- 35%**
- **Δ Trc 35-50%**

- Ovisno o cilju: ΔA detekcija značajne promjena rezultata (MCV 5%)
  ΔB detekcija pogreške (MCV 10%)



- ΔMCV - 3fl
- 3 dana
- Niska specifičnost i osjetljivost za detekciju pogreške

- „composite CBC delta (**CCD**) check”

$$\mathbf{CCD} = \sqrt{([50 \times \Delta\mathbf{Hb}]^2 + [100 \times \Delta\mathbf{MCH}]^2 + [100 \times \Delta\mathbf{RDW}]^2 + [1.5 \times \Delta\mathbf{PLT}]^2)}$$

$$\mathbf{HMR} = \sqrt{([50 \times \Delta\mathbf{Hb}]^2 + [100 \times \Delta\mathbf{MCH}]^2 + [100 \times \Delta\mathbf{RDW}]^2)}$$

- logical delta check (**LDC**) - CCD >250 and HMR >116

Development and Evaluation of a Logical Delta Check for Identifying Erroneous Blood Count Results in a Tertiary Care Hospital

Ira Miller, MD, PhD

Table 2.

Characteristics of Failures for CCD and LDC Using Cutoff Values Indicated in the Text

Variable	CCD	LDC
Length of evaluation period, d	14	35
Total CBCs performed during the evaluation period, No.	11 193	26 566
Total delta checks, No. (% of CBCs with recent priors)	5792 (52)	13 234 (50)
Failed delta checks	**(n = 110)**	**(n = 205)**
Interim transfusion, No. (%)	54 (49)	76 (37)
No interim transfusion, valid based on medical record review, No. (%)	39 (36)	85 (42)
Failure due to platelet change only, No. (%)	14 (13)	0
Presumed or confirmed mislabeled, No. (%)	9 (8), comprising 5 events	16 (8), comprising 15 events
Failure due to other problem, No. (%)	**8** (7)	**28** (14)
Specimen dilution from intravenous fluid in line, No.	3	11
Analytic (agglutinin or unmixed specimen), No.	5	17
Failed tests		
Both MCV delta (>3.0 fL) and CCD, No.	38[a]	Not determined
Both MCV delta (>3.0 fL) and CCD, presumed or confirmed mislabeled, No./total No.	2/38, comprising 1 event	8/13 assessable LDC failures

Abbreviations: CBC, complete blood cell count; CCD, composite CBC delta; LDC, logical delta check; MCV, mean red blood cell volume.

[a] There were 269 MCV delta check failures (5% of values with recent priors) in this period.

Programski sustavi

Idealno

- Različita pravilo za niske, normalne i visoke vrijednosti
- Različiti kriteriji ovisno o smjeru promjene
- Lokacija pacijenta

Realno

- Jedno pravilo za sve

Jedno pravilo za sve

- Kriterij za trombocite **40%**

$$trenutni\ rezultat - prethodni\ rezultat / prethodni\ rezultat \times 100$$

Trc trenutni	280 x 109/L
Trc prethodni	178 x 109/L
Δ 57%	

Trc trenutni 88 x 109/L
Trc prethodni 195 x 109/L
Δ 55%

Uzroci promjena rezultata hematoloških parametara

- Promjene kliničkog stanja pacijenta (krvarenje, sepsa…)
- Terapijski postupci (transfuzija, infuzija, operacija, primjena antibiotika, kemoterapija, heparin…)

- Razrjeđenje uzorka
- Pogreške u identifikaciji
- Analitički problemi

Verifikacija Δ check kriterija

Glavni cilj detekcija **neočekivanih razlika** u rezultatima

- Posljedica pogreške (Hgb razrjeđenje)
- Stvarna promjena koja zahtjeva neodgodivu komunikaciju s liječnikom (Hgb akutno krvarenje)
- Lažno negativni (autovalidirani nalazi kojima Δ check nije detektirao neočekivanu promjenu)
- Lažno pozitivni (nalaz nije autovalidiran, a detektirana promjena je očekivana)

Prilagoditi dozvoljena odstupanja

Minimalan broj lažno pozitivnih uz prihvatljivu stopu detekcije neočekivanih rezultata

Autovalidacijski raspon

Određuje se za svaki parametar prema vlastitoj populaciji pacijenata

- Referentni interval
- AMR
- Kritične vrijednosti
- Vrijednosti koje nisu moguće
- Kriterij za mikroskopski pregled
- Vlastiti kriteriji
- Interferencije

Rezultati koje želimo zaustaviti kada nema upozorenja s analizatora i prethodnog rezultata

Primjer 1 - Hemoglobin

Literatura AV raspon – kritične vrijednosti

Hgb 171 g/L+ HDP + 5 g. =

Autovalidacija ✓

AV raspon 66-199 g/L

Slijedeći dan Hgb 141 g/L

Delta check zaustavlja autovalidaciju

Pregled arhive: djeca do 10 godina rijetko vrijednosti iznad RI (max 15g/)

Prilagođen AV raspon!

Primjer 2 -Eozinofilni granulociti

AV raspon 0 - 25% - na temelju verifikacije i iskustva

Danas veliki broj pacijenata s povišenim % eozinofila

Dnevna usporedba uređaja ✓

Autovalidacija ✓

Rezultati na drugom analizatoru unutar RI

Uzrok: problem s analizatorom rezultati bez „flaga”

Nije promijenjen AV raspon!

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Kristine Roland *, Jim Yakimec, Todd Markin, Geoffrey Chan, Monika Hudoba

Vancouver General Hospital, Vancouver, BC, Canada

Vrijeme uzorkovanja

Odjel

Table 1
Middleware rules for complete blood count, differential and coagulation testing.

Rule source		Rule	Hold for review	Notes
CBC and differential				
DI		Sample collection time >24 h	CBC, Diff	Suppress Auto diff + RBC indices
DI		Sample collection time >72 h	Reticulocyte	Not reported
DI		Patient age <3 days		Reflex CBC, Diff, NRBC, Retic, Smear
DI	★	WBC <0.5	Diff	Reflex smear review + referral
DI		WBC <0.5 + previous WBC >1.0 + not oncology		Reflex smear review + referral
DI		WBC >30.0 + Outpatient		Reflex Diff
DI		WBC 250.0 – 450.0	Diff	Report RBC indices as Unavailable
DI		WBC exceeds linearity	WBC, HCT, Diff, Reticulocyte	Report RBC indices as Unavailable
DI		WBC lower limit of quantitation		Report WBC as < x.x
DI	★	Neutrophil # <1.0 + not oncology		Reflex smear review
DI	★	Neutrophil # <0.5		Follow Critical Result SOP + referral
DI	★	Neutrophil # >30.0		Reflex smear review
DI		Neutrophil # >50.0		Referral if no previous >50.0
DI		Lymphocyte # > reference interval Child		Reflex smear review + referral
DI	★	Lymphocyte # >5.5 Adult		Reflex smear review + referral
DI	★	Monocyte # >2.0 + Neutrophil # <8.0		Reflex smear review
DI	★	Monocyte # >3.0		Reflex smear review + referral
DI		Eosinophil % >20.0	Diff	Reflex smear review
DI	★	Eosinophil # >2.0		Reflex smear review + referral
DI	★	Basophil # >0.5	Diff	Reflex smear review + referral
DI	★	IG % >5, or >10 + previous <5, or >20 + previous <10		Reflex smear review Suppress IG # <0.2
DI	★	NRBC % >2.0 + not ICU/oncology		Reflex smear review + referral
DI		NRBC % >25.0 + patient age <31 d		Reflex smear review + referral
DI		NRBC linearity	WBC, Diff, NRBC	
Sysmex/DI		WBC abnormal scattergram + WBC >0.5	Diff	Reflex smear review
Sysmex/DI		Abnormal lymphocytes/blasts flag	Diff	Reflex smear review

★ denotes if no previous test result

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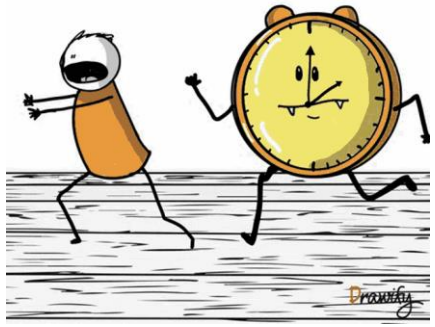
DI		HB delta failure	All results	14 days: + 40 Adult, + 20 Child
Sysmex/DI		Turbidity/Hb interference + MCHC >375	CBC, Diff	Reflex rerun, Dilute X7
DI		HCT >0.55, add Patient User Field		For use in coagulation rules
DI		HCT linearity	CBC	Dilute X7
DI	★	MCV outside reference interval – Child		Reflex smear review + referral
DI		MCV delta failure	All results	60 days: + 5 Adult, + 4 Child
Sysmex/DI		MCV <60	PLT	Reflex PLT-F
DI		MCV <80 + RBC, HB, RDW, Age, Gender		Auto comments - Microcytosis
DI	★	MCV <80 + HB <50 or HB >165 male or >150 female		Reflex smear review and referral
DI	★	MCV 105-110 + HB <100 or PLT <50 or Neutrophil# <1.0		Reflex smear review and referral
DI	★	MCV >110		Reflex smear review
				Referral with exceptions
Sysmex/DI		MCHC <275 or > 375	All results	Reflex rerun
DI	★	PLT <100		Reflex smear review
				Referral if Child
DI		PLT <75 + previous >120	All results	Reflex smear review
DI	★	PLT <50	All results	Child – critical result

% autovalidiranih nalaza

- Postavljenim pravilima
- Specifikacijama hematološkog analizatora
- Mogućnostima automatizacije dodatnih postupaka
- Dostupnosti međusustava
- Mogućnostima LIS-a



Unatoč ograničenjima uz osnovne kriterije broj autovalidiranih nalaza > 50%

Hvala na pažnji!