CRITICAL VALUES ARE CRITICAL TO THE LABORATORY

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INTRODUCTION

- Definition Of Critical Values
- Critical Values Practice Patterns
- Characteristics Of Critical Values
- Development Of Critical Values
- Conclusions

DEFINITION CRITICAL VALUES

- “Representing a pathophysiological state at variance with normal as to be life threating unless something is done promptly”
- Not Convenience Values
- Importance

EXAMPLES OF CRITICAL VALUES

ANALYTE	LOW CRITICAL VALUE PERCENTILE			HIGH CRITICAL VALUE PERCENTILE		
	10TH	50TH	90TH	10TH	50TH	90TH
Calcium (mg/dL)	6.0	6.0	7.0	12.0	13.0	14.0
Sodium (mmol/L)	110	120	125	150	160	170
Potassium (mmol/L)	2.5	2.8	3.0	6.0	6.2	6.5
Glucose (mg/dL)	40	40	50	300	450	700
Hematocrit (%)	15.0	20.0	25.0	55.0	60.0	65.0

Howanitz et al. Arch Pathol Lab Med 2002:126:663-666

Reporting Microbiology Criticals

MICRIBIOLOGY RESULT	% Participants
Positive Blood Culture	95.0
Positive CSF Cultures	91.2
Positive AFB Smear Or Culture	71.9
Positive Gram Stain Sterile Body Fluid	66.8
Initial Stool Isolate, Salmonella, Shigella, Yersinia, Campylobacter	59.7
Positive Latex Agglutination &/Or Antigen Detection Test	25.7
Other Microbiology Critical Values	44.8

DRUG REPORTING PRACTICES

DRUG RESULTS	PARTICIPANTS %
Drugs of Abuse	
Reported All Positives	25.2
Do Not Report All Positives	52.8
Not Applicable	22.0
Therapeutic Drugs	
Reported All Toxic Values	96.3
Do Not Report All Toxic Values	2.9
Not Applicable	0.8

TIME TO COMPLETE CALL (N=599)

	MEAN TIME TO COMPLETE CALL (Min)			
	INPATIENTS			OUTPATIENTS
# Beds	Night	Evening	Day	All Shifts
1-150	7.0	10.1	8.1	13.2
151-300	5.7	5.8	5.9	11.4
301-450	5.4	6.0	7.5	21.2
451-600	2.9	3.4	4.0	9.5
>600	3.1	4.7	3.3	9.3
All	5.3	6.5	6.4	13.7

TIME TO ABANDON CALL (N=133)

	MEAN TIME TO ABANDON CALL (Min)			
	INPATIENTS			OUTPATIENTS
# Beds	Night	Evening	Day	All Shifts
1-150	9.8	46.6	54.8	23.4
151-300	3.5	7.3	7.5	27.2
301-450	15.7	36.4	6.4	108.6
451-600	0.8	0.5	6.1	28.3
>600	15.0	13.3	0.0	34.2
All	8.5	25.3	23.9	46.3

PERSONNEL INVOLVED IN CRITICAL VALUES

	INPATIENTS (% OF TOTAL)	OUTPATIENTS (% OF TOTAL)
REPORTING PERSONNEL		
Person Performed Test	91.0	77.3
Section Supervisor	2.6	3.9
Laboratory Clerk	5.6	17.2
Other	0.8	1.6
RECEIVING PERSONNEL		
Registered Nurse	37.8	21.2
Any Staff Nurse	18.1	13.3
Unit Clerk/Office Staff	12.5	42.1
Medical Student	0.2	0.1
Physician On Call	3.6	6.7
Physician Ordering Test	8.6	16.7

REPEAT CRITICAL VALUES

POLICY	PARTICIPANTS (%)
No Policy On How Handled	71.4
Repeat Values Not Called	11.6
Values Not Called On Physician Request	6.8
Seek Physician Permission To Not Call	1.9
Have Preset Policy On Number Of Calls	1.8
Seek Physician Permission Not To Call After Preset # Of Calls	0.3
Use Another Policy	6.1

PERCEPTION CRITICAL VALUE NOTIFICATION

FINDING	5426 Charts Reviewed	4737 Physicians Surveyed
Critical Value Anticipated (%)	54.3	59.3
Critical Value Influenced Therapy	64.9	62.9
Test Reordered	66.3	43.3
Found In Nursing/Progress Notes	75.5	

PERCEPTION CRITICAL VALUE POLICY

LOCATION	RESPONDERS	% List Is Valid Indicator	% Calls Helpful
ED	575 Nursing Supervisors	16.7	19.1
ICU/CCU	576 Nursing Supervisors	23.3	27.6
Medicine/Surgery	576 Nursing Supervisors	33.4	40.8
Other Stations	574 Nursing Supervisors	16.2	20.6
Hospital	514 Physicians	78.6	94.9

SOURCE CRITICAL VALUE POLICY

Literature Review Only Includes Manufacturer's Help	**18.0%**
Literature Review Including Manufacturers' Help & Lab Meetings	**36.0%**
Literature Review Modified By Hospital Committee Includes In-House Studies	**16.8%**
Literature Review Modified By In-House Studies and Medical Staff Consultations	**72.7%**

CAP CHECKLIST CRITICAL RESULT NOTIFICATION 2013

- The laboratory has procedures for immediate notification of a physician (or other clinical personnel responsible for the patient's care) when results of designated test exceed established "alert" or "critical " values that are important for prompt patient management decisions. COM. 30000 Phase II

CAP CHECKLIST CRITICAL RESULT NOTIFICATION

- When critical results are communicated verbally or by phone, there is a policy that laboratory personnel ask for a verification "read-back" of the results. COM30100 Phase I
- Note: Laboratory personnel should document the read-back.
- Evidence of Compliance: Records of critical result notification with documented read-back.

2013 THE JOINT COMMISSION NATIONAL PATIENT SAFETY GOAL 2

- Critical Results Procedure
  - Definition Of Critical Values
  - By Whom & To Whom Results Delivered
  - Acceptable Time To Report
- Implement Procedures For Critical Values
- Evaluate Timeliness Of Reporting

TEMPLATE FOR READ BACK OF CRITICAL VALUES

[*CALLER: Technologist*]:

I am calling to inform you of a critical result for a laboratory test performed for patient [*NAME/MR #*].

To ensure patient safety & verification of the correct test result, we require that you *WRITE DOWN* and *READ BACK* the laboratory test result you are about to receive.

HOW TO DETERMINE CRITICAL VALUES
1. CHOOSE ANALYTE

TOTAL SERUM AND WHOLE BLOOD SODIUM RESULTS/ 6 MONTHS	
	Number Of Results
Total Sodium Results	111,545
Critically Low Results (≤125 mmol/L)	166
Critically High Results (≥150 mmol/L)	447
Total Critical Results (% Of Total)	613 (0.5)

Howanitz et al. Am J Clin Pathol 2007:127:56-59

HOW TO DEVELOP CRITICAL VALUES:DATA COLLECTION

SODIUM RESULTS (MMOL/)	# RESULTS	# PATIENTS
	LOW	
≤115	85	25
116-120	94	46
121-125	624	431
	HIGH	
150-154	45	37
155-159	274	70
≥160	175	31

HOW TO DEVELOP CRITICAL VALUES:OUTCOMES

SODIUM (MMOL/L)	# PATIENTS
HYPONATREMIC	62
116-120 & Died	10
111-115 & Died	2
≤110 & Died	0
Total Died	12 (19%)
HYPERNATREMIC	97
155-159 & Died	36
160-164 & Died	6
≥ 165 & Died	5
Total Died (% of Patients)	47 (48%)

HOW TO DETERMINE CRITICAL VALUES
2. DETERMINE PATIENT DEMOGRAPHICS

	Critically Low Results	Critically High Results
Our Current Critical Value	≤ 120 mmol/L	≥ 160 mmol/L
Number Of Patients	71	101
Age Range	<1-92	<1-90
Number Of Outpatients	9	4
Number Of Inpatients	62	97
Length Of Stay ≥ 6 d (% Of Patients)	40 (65)	82 (85)

HOW TO DETERMINE CRITICAL VALUES
3. EVALUATE DIFFERENT VALUES

SODIUM RESULTS (mmol/L)	TIME OF ACTION (HOURS)	NUMBER OF PATIENTS
116-120	0-4	18
	4-24	15
	>24	0
	None	2*
111-115	0-4	16
	4-24	2
	>24	0
	None	0
≤ 110	0-4	5
	4-24	5
	>24	2
	None	0

*-Died

HOW TO DETERMINE CRITICAL VALUES
3. EVALUATE DIFFERENT VALUES

SODIUM RESULTS (mmol/L)	TIME OF ACTION (HOURS)	NUMBER OF PATIENTS
155-159	0-4	46
	4-24	15
	>24	0
	None	3*
160-164	0-4	46
	4-24	9
	>24	0
	None	0
≥165	0-4	9
	4-24	5
	>24	0
	None	1*

*-Died

HOW TO DETERMINE CRITICAL VALUES
4. IDENTIFY VALUES IN DEATH

SODIUM RESULTS (mmol/L)	NUMBER OF PATIENTS
HYPONATREMIA (n=62)	
116-120	10
111-115	2
≤110	0
Died (% of patients)	12 (19)
Hypernatremia (n=97)	
155-159	36
160-164	6
≥165	5
Died (% of patients)	47 (48)

HOW TO DETERMINE CRITICAL VALUES
5. REVIEW DATA & DETERMINE VALUE

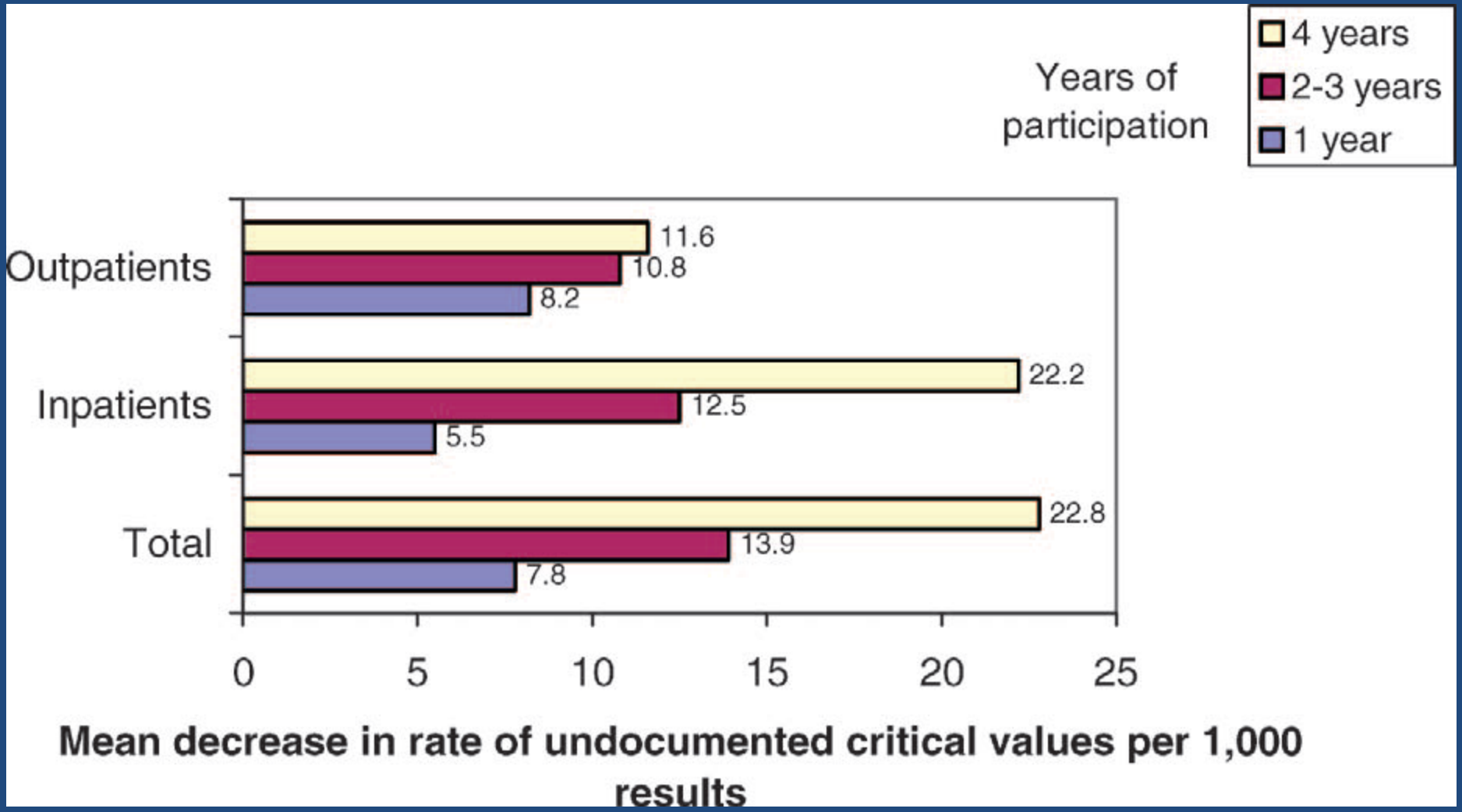
SODIUM RESULTS (mmol/L)	NUMBER OF RESULTS	NUMBER OF PATIENTS.
Hyponatremia		
≤115	85	25
116-120	94	46
121-125	624	431
Hypernatremia		
150-154	45	37
155-159	274	70
≥160	175	31

GREATEST REPORTING OBSTACLES

OBSTACLE	RESPONSES	% OF TOTAL
Providers Not Returning Calls/Pages	365	74.6
Getting Person To Accept Result	27	5.5
Reporting To Covering Physicians	24	4.9
Incorrect Provider Contact Information	23	4.7
Caregiver Unwilling To Read Back	21	4.3
Placed On Hold Awaiting Caregiver	18	3.7
Too Long A List Of Critical Values	5	1.0
Reporting Interrupts Technologist Work Flow	4	0.8
Discharged Patients	2	0.4
Total	489	100

Dighe et al Arch Pathol Lab Med 2008:132:1666-1671.

ABANDONED CRITICAL VALUES



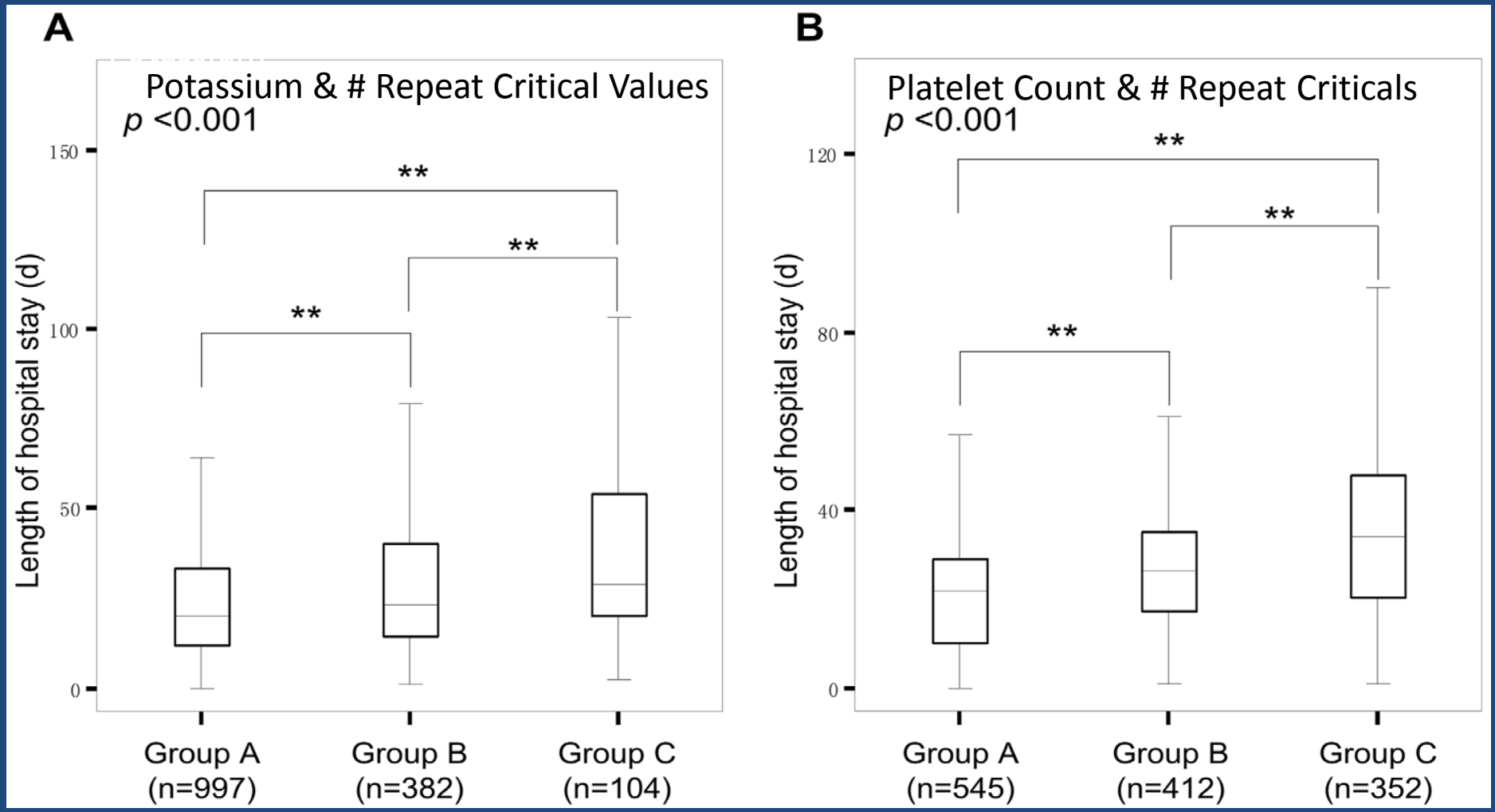
Wagar et al Arch Pathol Lab Med 2007:131; 44-49.

CRITICAL VALUES AUTOMATED

- Used at Some Hospitals
- Requires Use of Up To Date On-Call Schedules
- Eliminated Many Problems
- Transfers Results Mobile/Communication Devices
- Acknowledgement Of Receipt


3:22 PM
85%
Critical Lab Results
Wed Nov 21 3:23 pm 2012
PATHOLOGIST: Dr. Adams
INSTITUTION: Metro Hospital
DEPARTMENT: Lab
Critical Test Results
Patient Name: Brown, Daniel
Patient MRN: 123456
Test: Serum Glucose
Findings:
1.) Serum Glucose 750 mg/dl
2.) Verified by repeat analysis
Sender Phone: 262.456.9876
Amcom
SOFTWARE

CRITICAL VALUES IN CHINA HOSPITAL



Yang et al. PLoS ONE 2013:8: e59518

SURGICAL PATHOLOGY CRITICAL VALUES

- CONTROVERSIAL
  - What Are The Critical Results?
  - Communication Problems?
  - Variable Standards Of Practice?
  - Waste Of Pathologists Time?

11 PROPOSED SURGICAL PATHOLOGY CRITICAL VALUES

- Bacteria In A Heart Or Bone Marrow Specimen
- Select Organisms In Immunocompromised Patients
- Fat In An Endometrial Curettage
- Transplant Rejection
- Crescents In <50% Of Glomeruli In a Kidney Biopsy Specimens
- Mesothelial Cells In A Cardiac Biopsy Specimen
- Uterine Contents Without Villi Or Trophoblast
- Neoplasms Causing Paralysis
- Malignancy In Superior Vena Cava Syndrome
- Fat In colonic endoscopic polipectomy specimen
- Vasculitis

Pereira et al. Am J Clin Pathol 2008;130: 731-35.

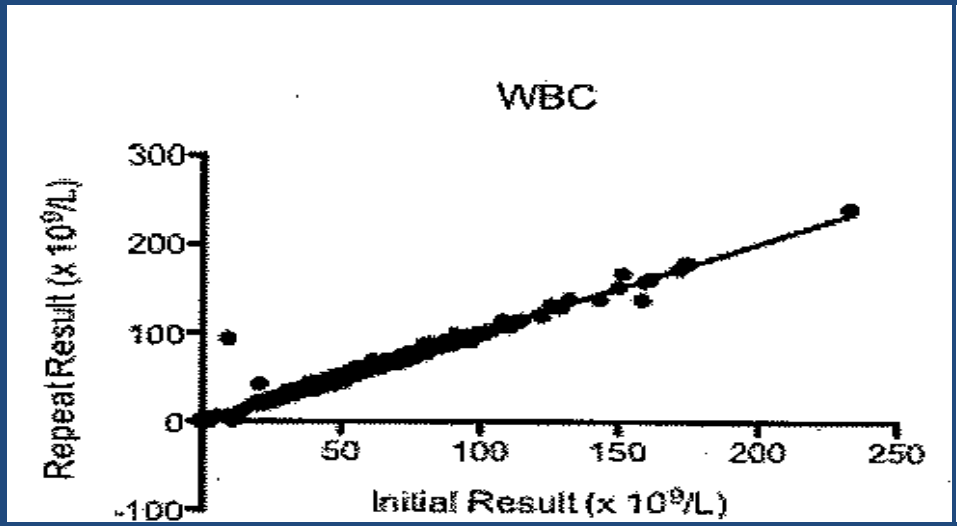
10 PROPOSED CYTOLOGY CRITICAL VALUES

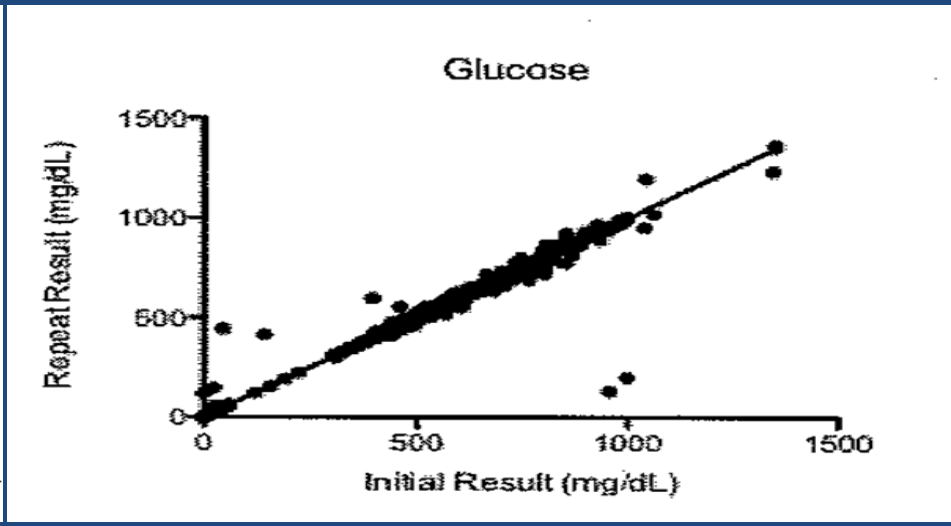
- Bacteria/Fungi in CSF immunocompromised
- Bacteria/Fungi in CSF
- Pneumocystis, fungi, viral cytopathic changes in BAL, wash, brush specimen Immunocompromised
- Malignancy in critical place
- Pneumocystis, fungi, viral cytopathic changes in BAL, wash, brush specimen
- Acid Fast bacilli in any specimen
- FNA-Disagreement immediate & final diagnosis
- Fungi in FNA immunocompromised
- Completely unexpected malignancy
- Acid Fast bacilli any specimen immunocompromised

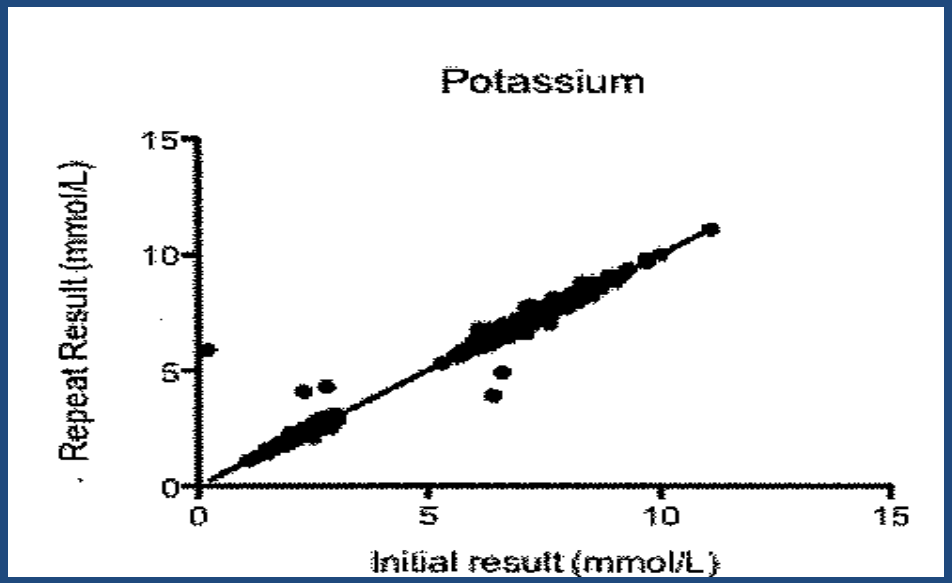
RADIOLOGY CRITICAL VALUES

- Agreement On What Constitutes Critical Value
- Joint Commission Requirements Same As Path
- Research On Automatically Extracting Critical Values

SHOULD CRITCAL VALUES BE REPEATED?







Lehman et al. In Press Arch Pathol Lab Med

CONCLUSIONS

- Definition Of Critical Values
- Critical Values Practice Patterns
- Characteristics Of Critical Values
- Development Of Critical Values
- Problems Of Handling Critical Values