Biological Variation:
Bridge Between Laboratorians and Clinicians

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Biological Variation Working Group

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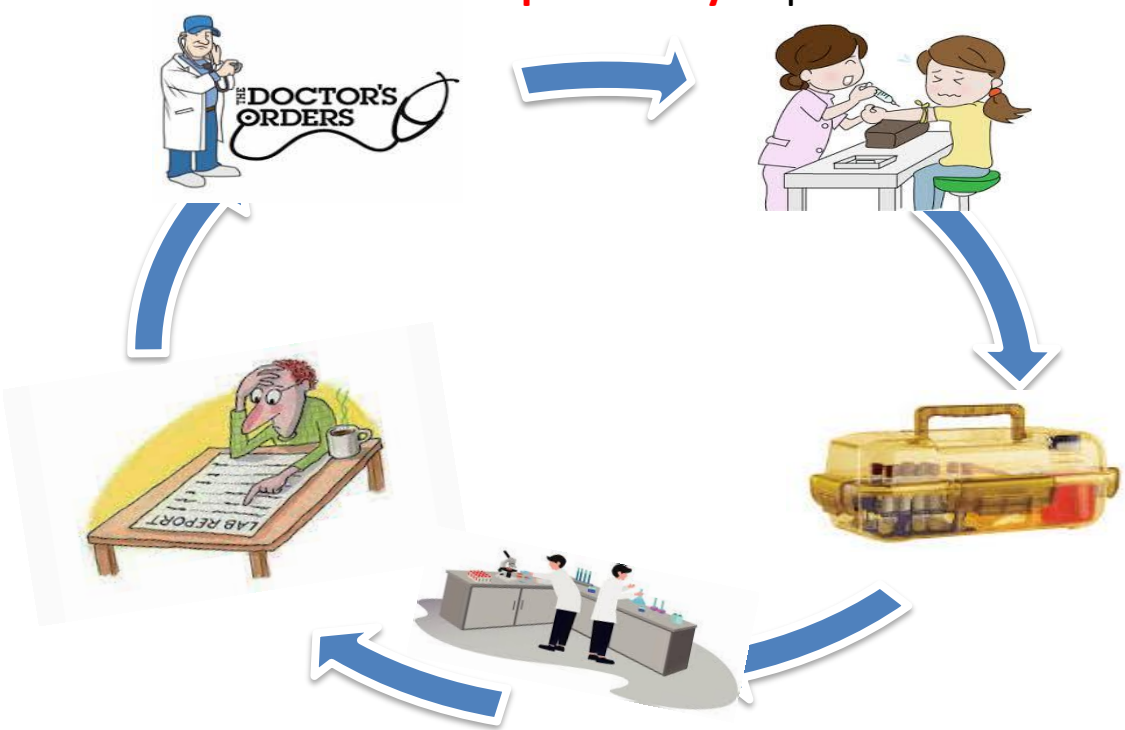
Objectives:

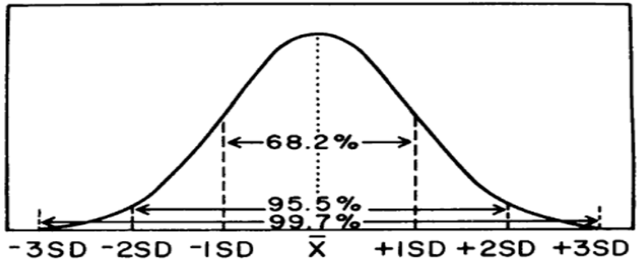
- To investigate clinicians' understanding and use of biological variation during interpretation of test results.

Laboratory Errors

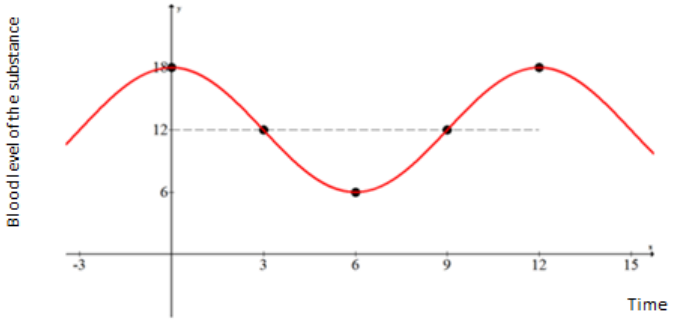
Most common reasons for laboratory related errors are due to **pre-pre analytic** and **post-post analytic** processes



Variability in the Lab



- Analytical variability (CVA)
- Biological variability (CVI)
  - **within a subject over time (CV_I)**
  - **between subjects (CV_G)**



Intra-individual biological variation is ~ 5 % for creatinine

$$RCV = \sqrt{2} * 2 * \sqrt{CVA^2 + CVI^2}$$

The Questionnaire

- Face to face interview
- Four closed - ended questions
- Five open - ended questions

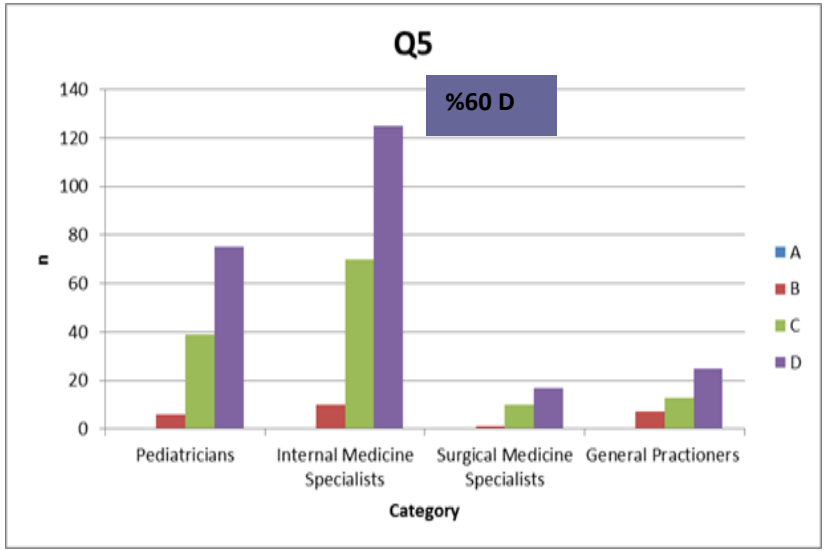
Evaluation of the open ended questions

A. The highest level of knowledge and ability of **calculation** of biological variation

B. Clinician has some knowledge about biological variation, but **lacks ability** to calculate

C. Clinician has overall knowledge about variation in laboratories, but not particularly on biological variation

D. Clinician has no knowledge about variations in laboratory



Demographic Characteristics of The Study

Characteristics	Category	Number	Frequency (%)
Gender	Male	164	41.1
	Female	235	58.9
Age	<25	7	1.8
	25–39	294	73.7
	40–59	69	23.4
	>59	5	1.3
Experience	<1 yr	7	1.8
	1-5 yrs	226	56.6
	>5 yrs	166	41.6
Hospital	University (Public)	158	39.6
	University (Foundation)	25	6.3
	Training & Research Hospital	181	45.4
	Public Hospital	8	2
	Private Hospital	26	6.5
	Other	1	0.2
Category			
1	**Paediatricians**	120	30
2	**Internal Medicine Specialists**	206	51
3	**Surgical Medicine Specialists**	28	7
4	**General Practitioners**	45	12
	Total	**399**	

Questions & Answers

Q1:

- Which criteria do you apply when interpreting test results?
  - *Reference intervals based on age and gender*
  - *Clinical assessment*
  - *Literature*

A1:

- Clinicians interpret test results using a combination of **reference intervals** and **clinical assessment**

Questions & Answers

Q2:

- Would you consider an increase in serum ALT levels from 40 to 60 IU/L, in a patient on a medication with hepatic side effects, as significant?

A2:

Difference between two test results were interpreted based on solely clinical evaluation.

Questions & Answers

Q3:

- What's your assessment if your patient's cholesterol levels lower by %25 in two consecutive measurements, while both values are within the reference interval?

A3:

- Physicians regarded changes in cholesterol levels as significant even if the values were within the reference interval.

Questions & Answers

Q4:

- Which factors do you think may influence test results?

A4:

- Physicians have knowledge about
  - **Pre-analytical**
  - **Analytical factors**

Questions & Answers

Q5:

- What do you think about the biological variation of lab tests?

A5:

- Physicians are not familier with the concept of BV

Questions & Answers

Q6:

- Do you consider biological variation during interpretation of lab results?

A6:

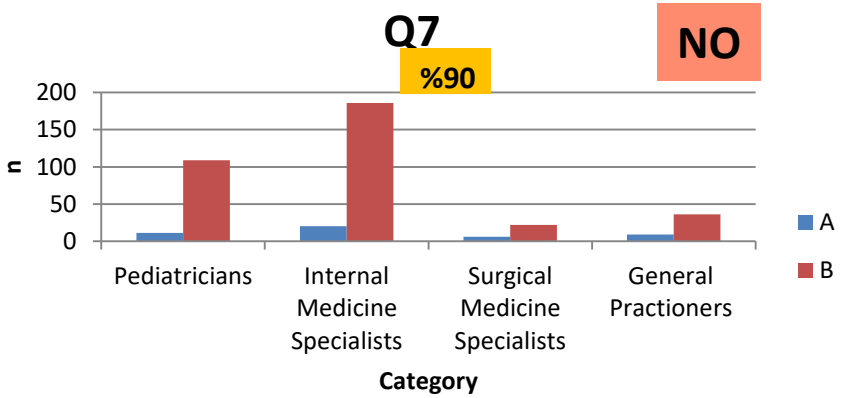
- Most of the physicians scored D
- Followed by C
  - They were aware of **biological factors age, gender ect.**

Q7:

- Did you read any publication on the intra-individual and inter-individual biological variation that may affect the test results?

A7:

- **They have not read any articles**

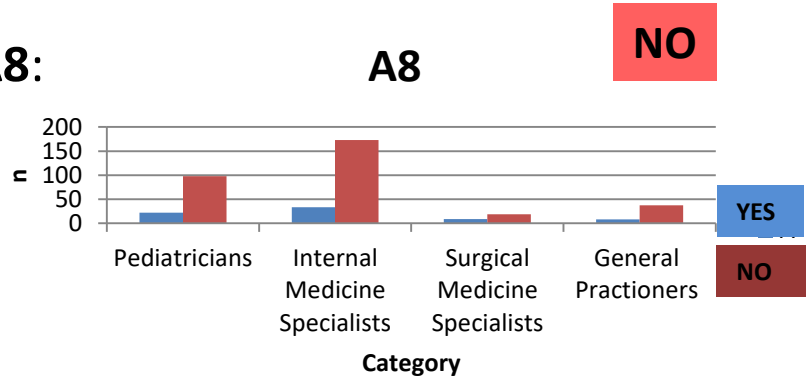


Questions & Answers

- **Q8:** Have you ever had any formal education on intra- or inter-individual biological variation at pre- or post graduate level?

- **A8**:

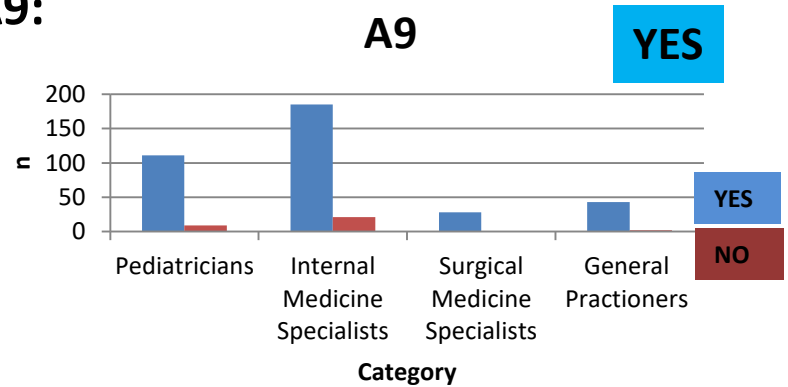
NO



- **Q9:** Do you think biological variation should be included in medical education?

- **A9:**

YES



Conclusion

- Clinicians' knowledge of **biological variation** is **inadequate**
- **All our efforts are for nothing if we cannot reach the clinicians**
- Clinicians should be encouraged to use RCV for interpretation of laboratory results
- For this purpose, educational programs should include laboratory variability


if a tree falls in a forest
and no one is around to hear it,
does it make a sound?