Key Performance Indicators for Laboratories

Dashboard for Improving Accuracy and Efficiency

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What do we understand by the term
“Key Performance Indicators” (KPIs)?

Attributes of an ideal Key Performance Indicator

Factors that affect a lab: Pre-analytical, Analytical, and Post-Analytical.
Examples of a few KPIs used in laboratories

Key Performance Indicators used at Microbiology Laboratory, JPNATC, AIIMS, New Delhi

How can Key Performance Indicators help in diagnostic accuracy and efficiency?

What do we understand by the term “**Key Performance Indicators**” also known as **‘Quality Indicators’** (KPI/QI):?

- These are evidence-based, data driven measure that provide healthcare decision-makers with tools to:

a) Assess their data.

b) Highlight potential quality concerns.

c) Identify areas that need further study and investigation, and

d) Track changes over time.

Agency for Healthcare Research and Quality Indicators

Attributes of an **Ideal Key Performance Indicator**

An Ideal KPI should be/have:

Objective: Measurable and quantifiable.

Actionable: Action can be taken on it to improve.

Ease of use: Easy to understand and can be taken from existing data.

Prioritisation: Priority can be given and achieved

Completeness: Comprehensive (includes all the areas that need analysis).

Non-overlap: Not overlapping between KPIs

Agency for Healthcare Research and Quality Indicators

Factors that affect

Pre-analytical,
Analytical and
Post-analytical Phases in a Laboratory

Factors affecting Pre analytical Phase

- Test Request
- Preparation of Patient (Instruction and pre-collection)
- Specimen collection: technique/ sterility/ quantity/ quality
- Specimen Transport
- Test order accuracy
- Patient Identification
- Monitoring of specimen condition
- Specimen preservation, retention
- Sample processing

Factors Affecting Analytical Phase

- Internal quality control
- Assay and instrument selection
- Centrifugation
- Actual testing
- Re-testing
- Reporting accuracy
- Interpretation (Microbiology)
- Guidance for treating doctors according to test results

Factors Affecting Post Analytical Phase

- Recording and releasing of result
- Accuracy in transcription and filling of results.
- Report dispatch format: Hard copy/ online/ LIS
- Patient and physician satisfaction
- Turnaround time

Pre analytical Phase

- It is important to remember that **most laboratory errors** occur in the pre-analytical phase of the total laboratory testing process.
- Therefore, key performance indicators in this phase are necessary to keep these errors in check
  - How many samples were in wrong containers/ leaking/ had improper forms

- All the factors of the pre-analytical phase can be reasons for sample rejection
- Therefore, a sample rejection criteria with adequately documented and informed reasons helps to reduce the particular concerns
- Registration errors, if any, by the receptionist or staff when a sample is received are pivotal for documentation

- Take action on pre-analytical KPIs, informing the clinical areas
  - How to improve performance
  - How these KPIs affect the patient’s reports
  - Ultimately patient risks/ outcomes
  - Risk mitigation

Analytical Phase

- During the analytical phase, our commitment to maintaining Internal Quality Control, managing Equipment breakdowns, and conducting actual & accurate sample testing is paramount.

- These factors serve as **Key Indicators**, and vigilance in this phase is vital
  - How many times the QC failed, how many times test reports were out of range/ key reagents failed/ Equipment gave errors/ stopped mid-way

- Some critical alerts are reported in this phase.
  - Some of the critical alerts of Biochemistry and Hematology have a significant role in the analytical phase.
- In Microbiology, Gram’s stain reporting for organisms is informed as a critical alert even before the Antibiotic Susceptibility Results are completed.
  - Blood culture report informed verbally after a signal is flagged
  - Unusual organism
  - Organisms from CSF

- The Lab is responsible for timely informing critical alerts
- If this is not done, root cause analysis and corrective action are required

Post-Analytical Phase

- The correct result entry and report release (transcription) is essential in the post-analytical phase.
- Here, any transcriptional error plays a significant role.

- The turnaround time (TAT), which is the time from sample collection until report release, is specific to labs.
- The TAT should be on alert in all Labs so that the correct report reaches the correct patient at the proper time.
- Change in TAT is a definite KPI & must be adhered to

- Any deviation in TAT is an area where the lab may pitch to prevent such occurrences.
- Some high-volume labs also use dashboards to check the samples deviating from their TAT.
- It is mandatory that all samples should have their TAT reported.
- TAT reflects the commitment of labs to deliver timely reports

A few examples of Key Performance Indicators use in Laboratories

QUALITY INDICATORS FOR MONTORING LABORATORY'S PERFORMANCE

YEAR MONTH

QUALITY INDICATORS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PRE- ANALYTICAL INDICATORS																
Syntax errors during patient registration																
No. of veni-puncture failures																
No. of Sample Rejections																
No. of times samples marked URGENT reached late for testing																
ANALYTICAL INDICATORS																
No. of Re Test on patient / clinician request																
No. of times alert values not informed to Ref. doctor																
No. of equipment failures																
No. of parameters with IQC outside good % CV (Monthly)																
No. of parameter outside the EQAS acceptable criteria																
POST-ANALYTICAL INDICATORS																
Reports not delivered on time (TAT)																
No. of reporting errors																
No. of complaints received from clinicians																
No. of complaints received from patients / attendants																
Done By																

Key Performance Indicators used at Microbiology Laboratory, JPNATC, AIIMS, New Delhi

Pre-Analytical Indicators

- Rejection Rate
- Registration Error Rate

Analytical Indicator

- Blood Contamination Rate

Post-Analytical Indicators

- Transcriptional Error Rate
- Critical Alert Communicated Rate
- Report Error Rate

- Why is the Blood contamination rate used as an analytical indicator?
  - To tackle areas of pre-analytical factors and to maintain the NHSN definition of contaminants as causes of infection.
  - Train clinicians and make them a part of diagnostic stewardship

STANDARD OPERATING PROCEDURE FOR QUALITY INDICATORS

1. **Quality indicators defined are:**

   a. **Pre- analytical Indicators-** { Rejection Rate; Registration Error Rate

   b. **Analytical Indicator-** { All sample Contamination rate; Blood culture Contamination rate

   c. **Post-analytical Indicator-** { Critical alert communicated rate; Transcriptional Error rate; Report Error rate

2. The total samples (Rejected + Received) are noted from the **Rejection register** at the sample receiving area and from the **excel sheet** that is downloaded from the LIS by the IT personnel.

   The total samples received are registered, processed and reports generated.

3. Rejection rate is calculated as $\frac{\text{Number of samples rejected in that month}}{\text{Total samples (received + rejected) in that month}} \times 100$

   The threshold for rejection rate is 3%. Whenever the rate is beyond this, the corrective measure of classes on sample collection and sample rejection criteria are undertaken.

4. Registration error rate is $\frac{\text{Number of registration errors in that month}}{\text{Total number of samples received in that month}} \times 100$

   (The number of the registration errors are noted in the Registration Error Register)

5. All sample Contamination rate is $\frac{\text{Number of cultures reported as contaminants, >3types \& URF}}{\text{Total number of samples received in that month}} \times 100$

   (The number of contaminants, >3types &URF are collected from the excel sheet)

   The All sample contamination rate inclusive of blood samples is monitored to check the efficiency of sample collection and transport.

Blood Contamination rate is $\frac{\text{Number of blood cultures reported as contaminants \& 3types}}{\text{Total number of blood culture samples received}} \times 100$

(The number of the Blood cultures reported as Contaminants & 3 types are taken from the excel sheet)

The blood contamination rate is separately analyzed to maintain proper aseptic sample collection measures at wards, ICUs and FOPD.
The threshold for Blood contamination rate is 10%. Corrective measures will consist of classes for all residents on proper sampling for blood culture and sensitivity with sensitization on contamination rate. The classes will be conducted at all wards/ICUs and FOPD where sampling takes place.

6. Critical alert communicated rate is given as $\frac{\text{Critical alerts communicated in a month}}{\text{Total number of Critical alerts that arose in a month}} \times 100$

   (The number of Critical alerts communicated in a month is from the Critical Alert Register and the number of Critical alerts that arose in a month is checked daily by the report entry person).
   Any alert that is not communicated will undergo a root cause analysis and risk analysis for the same will be conducted.

7. Transcriptional error alert rate is given by $\frac{\text{Number of mistakes in report entry in LIS/Register}}{\text{Total number of samples received}} \times 100$

   (The number of mistakes in report entry in LIS/Register are noted in the Transcriptional Error Register)

   The total samples received are registered, processed and reports generated.

8. Report error rate = $\frac{\text{Number of reports with error}}{\text{Total number of reports generated}} \times 100$

   (The number of reports with errors are found from the Report Error Register while the total number of reports generated is from the excel sheet)

A trend analysis of the Quality Indicators using **one indicator each from pre-examination, examination and post examination area is done on a six-monthly basis.** This is useful in the **continual improvement** of the concerned areas.

How can Key Performance Indicators help in **Diagnostic Accuracy and Efficiency**?

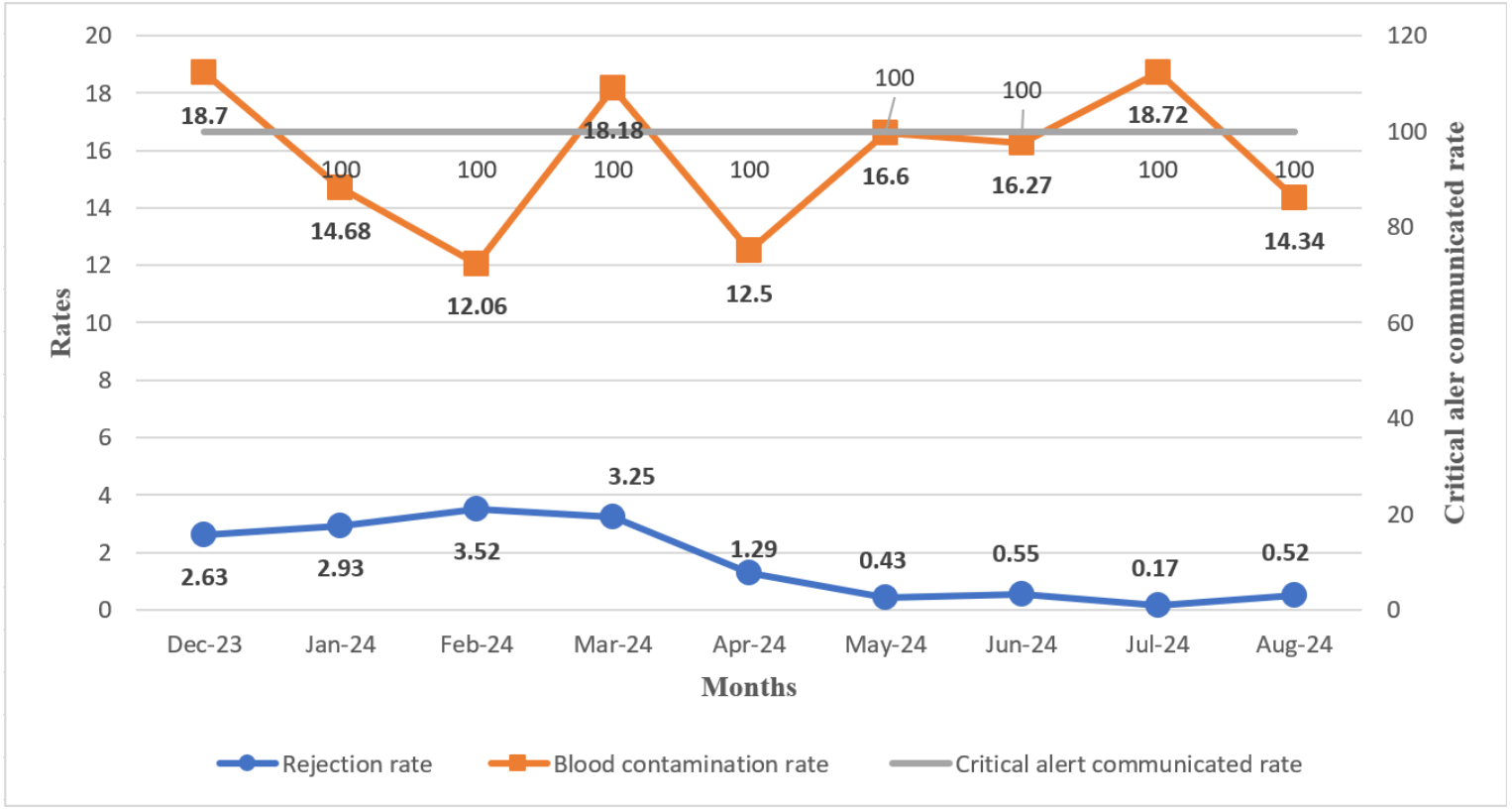
How to use the data of KPI?

- All or a selected few KPIs should be monitored monthly or as defined by the laboratory.
- This monitoring can be represented in the form of **Run charts**.
- A specific and designated threshold should be set for these KPIs so that monthly analysis can guide decision-makers in improving areas where necessary.

How to use the data of KPI?

- Threshold definitions are an essential measure required for an adequate, informed and complete utilisation of KPIs.
- The laboratories can set thresholds as per their convenience.
- These thresholds need to be periodically reviewed and monitored.

Run chart of KPI in our lab



How to use the data of KPI?

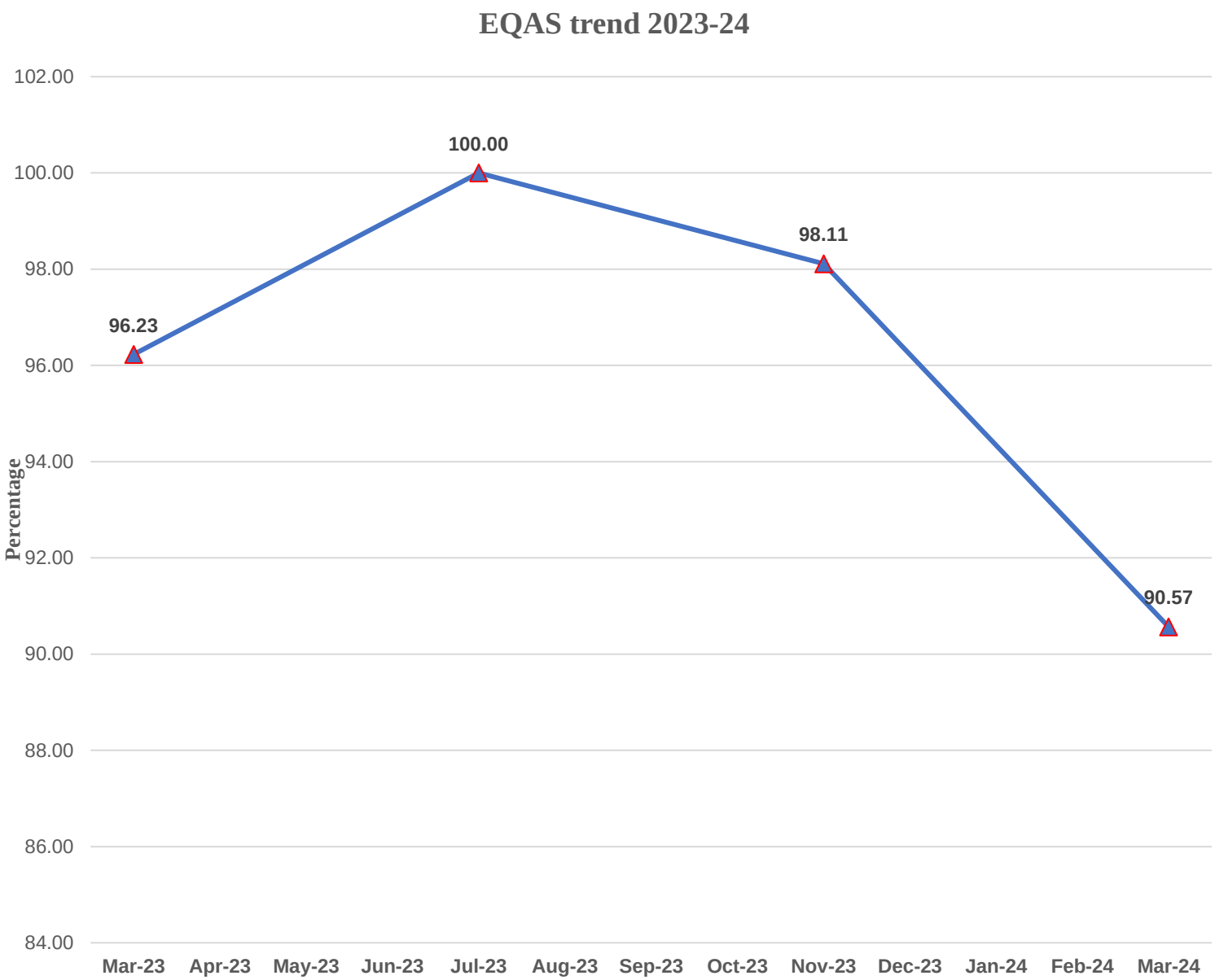
The **threshold set** at the Microbiology Laboratory, Trauma Centre includes:

- Rejection Rate of 3%
  - Whenever the rate exceeds >3%, corrective measures are undertaken
  - Train staff : phlebotomists and registration staff, residents in clinical areas, and lab attendants.

- Blood Contamination Rate of 10%; this is a closely monitored KPI, and we have formulated an action plan.
  - There are many reasons for this elevation
  - RCA is being performed
  - Action based on results of RCA
  - Trainings are mainstay

- Any deviation in critical alert communicated rate, transcriptional error, and report errors require root cause and corrective action.

External Quality Assurance Services (EQAS) trends can be used as KPI after keeping a defined percentage where **Corrective Action** may be required



Corrective action when the score is < 90%

How does the KPI data affect Diagnostic Accuracy and Efficiency?

- Improving all factors that affect Pre-analytical, Analytical, and Post-Analytical Phases in a laboratory helps streamline the process of test requisition form completion, adequacy and correct sample collection techniques (including volume, patient preparation, etc.), Internal quality control and external quality assurances, equipment upkeep, and actual sample testing with final result entry, reporting, and turnaround time of that sample.
- All these steps altogether increase diagnostic accuracy and efficiency, if monitored continuously.

- The end goal of KPI is to improve the system.
- It is a collective team effort of the laboratory.
- It may require extra effort, but knowing the area of improvement is a huge motivation and game-changer.
- Bringing to a certain threshold may take time and patience.
- Without KPIs, we will continue working, but we will not know the areas where we can improve.
- Set KPIs with thresholds of your own choice but include all phases in a laboratory.

Thank You