

Revolutionizing Diagnostic Innovation Through AI-Powered Metrology: Standardizing Point-of-Care Testing Healthcare Systems

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INTRODUCTION:

Point-of-care testing (POCT) is a diagnostic method utilized within the healthcare industry, providing rapid results directly in patient care settings. This approach is characterized by its efficiency and convenience, significantly impacting patient management and treatment decisions.

Why POCT Standardization is Critical;

POCT (Point-of-Care Testing) devices are used in both advanced hospitals and rural clinics, but varying results from different manufacturers can compromise patient safety and clinical decision-making. When POCT results are not standardized, it can lead to incorrect diagnoses and treatment decisions, posing serious risks to patients. Standardizing POCT devices ensures more reliable test results, enables better comparison, ensures compliance with regulations, and promotes equal healthcare opportunities worldwide.

Challenges in metrology and calibration deviations;

Challenges in metrology and calibration deviations arise when different POCT devices produce varying results due to each manufacturer's unique calibration methods. Test accuracy is also impacted by environmental factors such as temperature, humidity, and power fluctuations. Additionally, human errors in sample collection, reagent preparation, or device operation can further affect test outcomes.

Conclusion:

Standardization of POCT is paramount to ensure patient safety improve clinical decision-making, promote regulatory compliance and facilitate equal healthcare opportunities. Addressing the challenges of standardization is crucial for optimizing the effectiveness and widespread adoption of POCT in healthcare.

Methodology (AI-Powered Metrology Solutions)

How AI-Driven Calibration Boosts POCT Accuracy

AI-driven calibration enhances the accuracy of Point-of-Care Testing (POCT) by using real-time quality control systems to detect and self-correct measurement deviations. Advanced machine learning models predict environmental factors that may affect diagnostic results, while continuous monitoring helps identify and adjust for operator errors, reducing human-induced discrepancies.

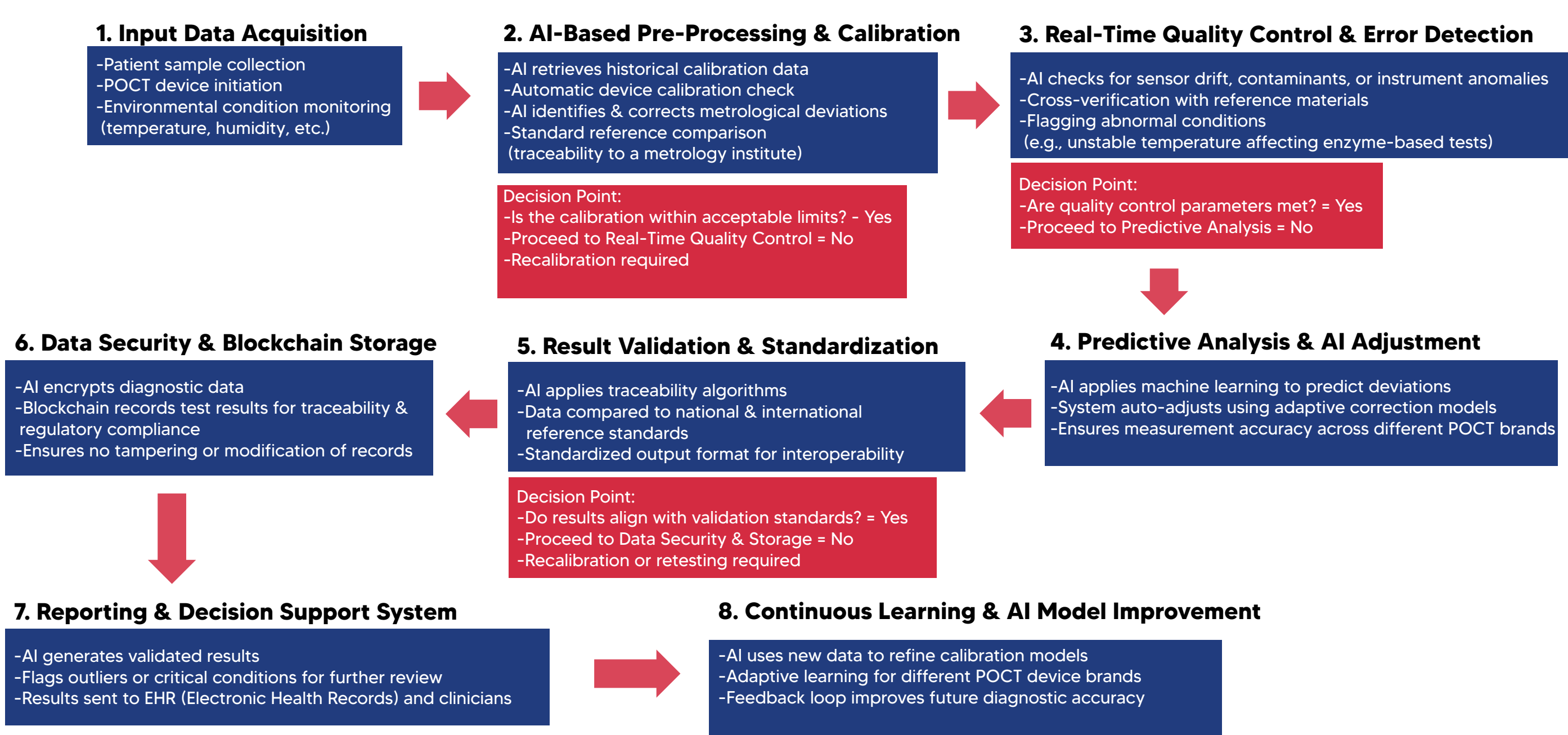
Standardization Across Different POCT Manufacturers

AI-driven standardization unifies test results across different POCT manufacturers by converting outputs into internationally recognized formats, ensuring result comparability. The automated calibration system allows devices to adjust their performance to meet metrological standards, enhancing reliability

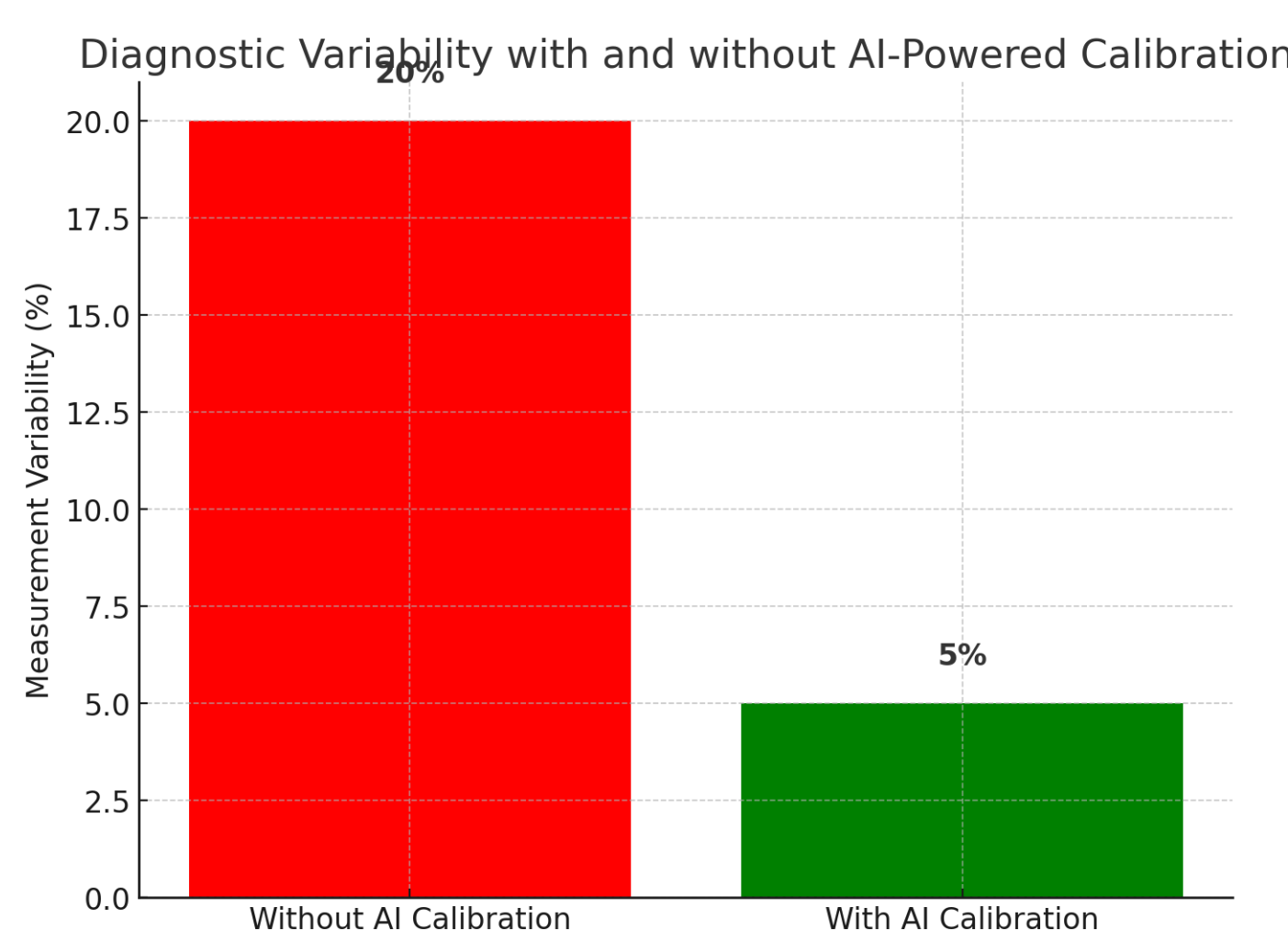
Error detection and self-calibration capabilities;

POCT devices with AI-driven self-calibration can automatically detect and correct measurement variations during use. Error detection algorithms identify potential machine malfunctions, user mistakes, and reagent issues, preventing incorrect diagnose. Additionally, machine learning algorithms continuously improve diagnostic accuracy by recognizing patterns. Error detection and self-calibration capabilities; POCT devices with AI-driven self-calibration can automaticall detect and correct measurement variations during use. Error detection algorithms identify potential machine malfunctions, user mistakes, and reagent issues, preventing incorrect diagnose Additionally, machine learning algorithms continuously improve diagnostic accuracy by recognizing patterns.

Flowchart: AI-Driven POCT Workflow



Diagnostic variability with and without AI-powered calibration.



POCT device with AI-driven quality control



Reference:

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