Performance evaluation of Mindray BC-6800 Plus versus Sysmex XN-1000 and DxH 800 hematology analyzers

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Introduction

Automated hematology analyzers are essential in modern laboratory medicine, providing rapid and standardized results for clinical decision-making. The Mindray BC-6800 Plus represents a new-generation analyzer with enhanced throughput and advanced differential capabilities. However, implementation of new systems requires rigorous validation against established platforms. The Sysmex XN-1000 and Beckman Coulter DxH 800 are currently utilized in our laboratory. This study aimed to evaluate the analytical performance and comparability of the BC-6800 Plus against these systems.

Materials & Methods

A total of 3,954 EDTA-anticoagulated blood samples were analyzed. Performance for red blood cell (RBC), white blood cell (WBC), hemoglobin (HGB), and platelets (PLT) was assessed using correlation analysis, Passing–Bablok regression, and Bland–Altman analysis. Results were evaluated against Clinical Laboratory Improvement Amendments (CLIA) 2025 total allowable error limits to ensure clinical acceptability.

Results

The Mindray BC-6800 Plus demonstrated excellent agreement with both comparator analyzers, with all key parameters showing strong correlations (r ≥ 0.995).

Comparison 1: Mindray BC-6800 Plus vs. Sysmex XN-1000

Excellent correlations were observed for all parameters (r = 0.995–0.999). Systematic biases were minimal, with slight underestimation for WBC (–0.96) and HGB (–0.55), and mild overestimation for RBC (+1.88) and PLT (+6.92). HGB showed the best agreement, with an ideal slope (1.000) and 99.1% of results within CLIA limits. In contrast, RBC exhibited the lowest compliance (93.2%). Although PLT showed the largest bias, agreement remained acceptable, with 95.8% of results meeting CLIA criteria.

Table 1. Comparison of Sysmex XN-1000 and Mindray BC-6800 Plus (N=1,955)

Parameter	Within CLIA (%)	Correlation coefficient (r)	Passing-Bablok regression analysis		Bland-Altman analysis
			Intercept (95% CI)	Slope (95% CI)	Mean difference (95% CI)
WBC	96.7	0.999	0.01603 (0.008700 to 0.02321)	0.9792 (0.9771 to 0.9813)	-0.96 (-1.303. to -0.622)
RBC	93.2	0.998	0.1373 (0.1260 to 0.1788)	0.9831 (0.9800 to 0.9859)	1.88 (1.814 to 1.94)
HGB	99.1	0.996	-0.1 (-0.1 to -0.15)	1 (0.9792 to 1)	-0.55 (-0.620 to -0.486)
PLT	95.8	0.995	-0.2143 (-1.010 to 0.3316)	1.071 (1.068 to 1.076)	6.92 (6.482 to 7.367)

Comparison 2: Mindray BC-6800 Plus DxH 800

Similarly strong correlations were observed (r = 0.995–0.999) with slightly greater bias. WBC and PLT were overestimated (bias: +4.34 and +5.34; slopes: 1.04 and 1.077), with WBC showing the lowest CLIA compliance (89.2%). RBC maintained good agreement, with 97.0% of results within CLIA limits. HGB again demonstrated optimal performance, with a slope of 1 and the highest compliance (99.3%).

Table 2. Comparison of Beckman Coulter DxH 800 and Mindray BC-6800 Plus (N=1,999)

Parameter	Within CLIA (%)	Correlation coefficient (r)	Passing-Bablok regression analysis		Bland-Altman analysis
			Intercept (95% CI)	Slope (95% CI)	Mean difference (95% CI)
WBC	89.2	0.999	-0.002 (-0.01034 to 0.005556)	1.047 (1.044 to 1.049)	4.34 (3.851 to 4.823)
RBC	97.0	0.998	0.01137 (0.001680 to 0.02261)	1.014 (1.011 to 1.016)	1.65 (1.593 to 1.6999)
HGB	99.3	0.998	-0.2 (-0.2 to -0.1)	1(1 to 1)	-1.40 (-1.447 to -1.352)
PLT	96.8	0.995	-1.166 (-1.796 to -0.6738)	1.077 (1.073 to 1.082)	5.34 (4.867 to 5.816)

Conclusion

Mindray BC-6800 Plus analyzer demonstrated excellent analytical comparability with the DxH 800 and Sysmex XN-1000 reference systems. All CBC parameters showed strong correlation (r > 0.995) and high clinical agreement, with HGB consistency exceeding 99%. Although minor systematic biases were observed in PLT and WBC counts, most results remained within acceptable CLIA limits. These findings support the clinical suitability and reliability of the Mindray BC-6800 Plus for routine hematological analysis.