



# TRANSFORMING HEMATOLOGY WORKFLOWS FOR EFFICIENCY

## INNOVATING HEMATOLOGY SERVICES AT BIOIATRIKI HEALTHCARE GROUP

Bioatriki Healthcare Group has been active in the medical services sector in Greece and Cyprus since 1981.

Founded on the commitment to continuous innovation and reliability in medical results, the Healthcare Group is the leading private provider of primary health care services in Greece.

Bioatriki operates in a dynamic social and economic environment that is rapidly consolidating. Embracing this trend, Bioatriki implemented a multi-dimensional investment program to expand into other European countries.

As part of this expansion, Bioatriki made the decision to evaluate and integrate Abbott Alinity h-series in their laboratory. They installed the Abbott Alinity hq hematology analyzer in November 2017, and over a period of two months, an extensive evaluation was completed. The capabilities of the system are aligned with Bioatriki's pursuit of efficiency improvements to address the growing laboratory workload and increasing physician expectations.

## BIOIATRIKI HEALTHCARE GROUP



Greece and Cyprus



47 autonomous diagnostic centers



3 clinics



3,800 employees



>3,000,000 visits annually



2,800 samples per day

# IMPROVED WORKFLOW AND OPERATIONAL EFFICIENCY

Prior to integrating the Alinity h-series, Bioiatriki was equipped with two Sysmex XE-2100 hematology analyzers linked with an SP-1000i slide maker stainer on the HST track and two stand-alone XE-2100 analyzers and an SP-1000i slide maker stainer. Ten dedicated biomedical scientists and one laboratory technician analyzed around 2,800 blood samples per day, 365 days per year. Of these samples, approximately 50 (2%) required reflex testing (NRBC, optical platelets), and approximately 300 samples (10-11%) required a manual differential analysis.

Both efficiency and high clinical value are of great importance to Bioiatriki. In addition to the conventional complete blood count (CBC) and five-part WBC differential, the measurement of nucleated red blood cells (NRBC) and optical platelets in every sample by Alinity hq provides additional information that previously has only been available via reflex testing. Enumeration of immature granulocytes (IG) adds value in the assessment of inflammatory and infectious conditions. Quantitation of the reticulated platelet percentage (%rP) as a subset of the total platelet concentration can serve as a non-invasive prognostic indicator of thrombopoietic activity in conditions associated with thrombocytopenia.

Bioiatriki also provides laboratory results for a dialysis center in the Athens area. Patients with end stage renal disease are at risk for anemia and could benefit from advanced reticulocyte parameters such as Immature Reticulocyte Fraction (IRF) and mean cell hemoglobin of the reticulocyte (MCHr).

The extensive studies included the calculations of within-run and within-laboratory imprecision, determination of correlation and concordance with Sysmex XE-2100 results, comparison of invalidated and suppressed results, and an assessment of workflow efficiency. After a successful evaluation, Bioiatriki entered into an agreement to integrate Alinity h-series into their laboratory in May 2018.

Since the implementation of the Alinity hq systems, laboratory staff have observed a significant improvement in hematology workflow due to the reduction in reflex testing.

**“Each day, approximately 50 reflex tests for NRBCs and optical platelets have been completely eliminated.”**

**50**

Reduction of samples  
per day needing reflex  
testing

**12**

Reduction of downtime  
hours per month

Another key workflow improvement has resulted from the fully automated maintenance of Alinity hq, which can be scheduled during hours when the systems are not in use or periods of reduced workload. Reagent management has also improved as Alinity hq requires only four reagents to produce a complete blood count including differential, NRBC, and reticulocyte parameters, while the Sysmex XE-2100 requires eleven (excluding the cleaning solution in both cases). Three of these four Alinity hq reagents are duplicated on-board and can be replaced without interruption of sample processing.

**“This feature has enabled their lab to reduce unplanned analyzer downtime from reagent changes by 12 hours every month.”**





# EVALUATION RESULTS

## WITHIN-RUN PRECISION (REPEATABILITY)

Remnant native blood samples were selected from the routine work load and analyzed within six hours after blood collection in ten replicates. Samples were selected to include low, normal and high measurand levels. Mean value, standard deviation (SD) and coefficient of variation (%CV) were calculated for select CBC and differential parameters (Table 1).

Table 1: Within-run precision summary of select CBC and differential measurands

PARAMETER	UNIT	LOW			NORMAL			HIGH		
		MEAN	SD	% CV	MEAN	SD	% CV	MEAN	SD	% CV
WBC	x 10 <sup>9</sup> /L	1.44	0.04	3.10	4.40	0.05	1.20	35.80	0.16	0.40
NEU	x 10 <sup>9</sup> /L	0.35	0.02	6.00	3.90	0.06	1.50	29.50	0.23	0.80
LYM	x 10 <sup>9</sup> /L	0.98	0.03	2.90	2.00	0.05	2.70	18.00	0.27	1.40
RBC	x 10 <sup>12</sup> /L	1.79	0.02	0.90	4.13	0.01	0.30	6.62	0.03	0.40
HGB	g/dL	5.80	0.03	0.80	14.00	0.04	0.50	23.70	0.07	0.40
MCV	fL	62.00	0.24	0.40	90.00	0.14	0.10	112.00	0.42	0.40
PLT	x 10 <sup>9</sup> /L	15.00	2.28	15.40	236.00	4.19	1.80	516.00	7.14	1.40

## WITHIN-LABORATORY PRECISION

The Alinity h-series 29P tri-level control material was tested at each level (Low, Normal and High) twice per day in duplicate for five successive days, generating 40 data points (20 for the left and 20 for the right dilution block) per control (Table 2).

Table 2: Within-laboratory precision summary of select CBC and differential measurands

PARAMETER	UNIT	LOW			NORMAL			HIGH		
		MEAN	SD	% CV	MEAN	SD	% CV	MEAN	SD	% CV
WBC	x 10 <sup>9</sup> /L	3.01	0.06	2.10	6.97	0.12	1.70	16.10	0.17	1.10
NEU	x 10 <sup>9</sup> /L	1.28	0.04	3.40	3.27	0.09	3.00	8.50	0.12	1.40
LYM	x 10 <sup>9</sup> /L	1.00	0.03	3.40	1.88	0.06	3.20	3.18	0.09	2.80
MONO	x 10 <sup>9</sup> /L	0.30	0.02	8.30	0.74	0.03	5.10	1.65	0.06	3.80
EO*	x 10 <sup>9</sup> /L	0.06	0.01	n.a.	0.18	0.02	n.a.	0.45	0.02	5.40
BASO*	x 10 <sup>9</sup> /L	0.03	0.01	n.a.	0.06	0.01	n.a.	0.14	0.02	n.a.
IG	x 10 <sup>9</sup> /L	0.33	0.03	8.50	0.83	0.04	5.00	2.11	0.07	3.20
NRBC**	x 10 <sup>9</sup> /L	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2.26	0.07	3.20
RBC	x 10 <sup>12</sup> /L	2.82	0.02	0.80	4.06	0.03	0.80	5.15	0.04	0.90
HGB	g/dL	7.41	0.06	0.90	11.20	0.05	0.50	16.40	0.08	0.50
MCV	fL	83.80	1.95	2.30	85.30	1.30	1.50	96.80	1.53	1.60
RETIC	x 10 <sup>9</sup> /L	203.00	5.93	2.90	133.00	4.59	3.40	109.00	5.00	4.60
MCHr	pg	26.00	0.35	1.30	28.70	0.33	1.20	35.70	0.55	1.50
PLT	x 10 <sup>9</sup> /L	63.00	5.27	8.40	196.00	7.15	3.60	436.00	7.72	1.80

\*if the absolute concentration is <0.20 x 10<sup>9</sup>/L only the standard deviation is calculated

\*\*NRBC parameter is only available in the high control

## CORRELATION BETWEEN SYSMEX XE-2100 AND ABBOTT ALINITY HQ RESULTS

1,488 remnant blood samples were selected from the routine workload and analyzed within six hours after blood collection on the Sysmex XE-2100 in the CBC + Diff mode. Immediately after the analysis on the Sysmex XE-2100, the samples were analyzed on the Alinity hq in the CBC + Diff test. Correlation was assessed using Pearson's correlation, and concordance was evaluated by Passing-Bablok regression (Table 3). Invalidated results were excluded on an analyte-by-analyte basis. No samples were excluded based on morphological flagging.

Table 3: Correlation summary between Sysmex XE-2100 and Abbott Alinity hq

PARAMETER	RANGE	UNIT	SLOPE	INTERCEPT	CORRELATION COEFFICIENT
WBC	1.43 - 46.80	x 10 <sup>9</sup> /L	0.98	0.02	1.00
NEU%	12.10 - 90.90	%	1.01	-1.48	0.99
LYM%	3.50 - 81.00	%	0.99	-0.04	0.99
MONO%	1.10 - 27.00	%	1.18	-0.02	0.92
EO%	0.00 - 26.80	%	1.00	-0.03	0.98
BASO%	0.00 - 2.70	%	1.34	-0.20	0.64
RBC	2.32 - 6.83	x 10 <sup>12</sup> /L	1.02	-0.12	0.99
HGB	6.00 - 18.10	g/dL	1.00	-0.17	1.00
MCV	54.30 - 114.70	fL	1.03	-0.45	0.97
PLT	3.00 - 935.00	x 10 <sup>9</sup> /L	0.96	-6.14	0.97

INVALIDATED AND SUPPRESSED RESULT COMPARISON

Inter-instrument correlation and agreements were strong. However, there was a significant difference in the number of invalidated results between the two analyzers. WBC results for 17 samples were suppressed or invalidated on the Sysmex XE-2100, compared to one on Alinity hq. Even more significant was the difference in the invalidation rate of PLT and MPV results. There were 136 invalid and one suppressed PLT results out of the 1,488 (9%) by Sysmex XE-2100, compared to 16/1,488 (1%) on Alinity hq. In addition, MPV was suppressed in 66 additional cases on the Sysmex XE-2100, resulting in a total of 67 suppressed MPV results compared to the Alinity hq, where there were no suppressed PLT and MPV results (Table 4).

Table 4: Overview of invalidated and suppressed results by the Sysmex XE-2100 and Abbott Alinity hq

PARAMETER	SYSMEX XE-2100		ALINITY HQ	
	INVALIDATED	SUPPRESSED	INVALIDATED	SUPPRESSED
WBC	16	1	0	1
NEU	27	3	5	0
LYM	22	3	5	0
RBC	1	4	0	0
HGB	1	1	0	0
MCV	0	4	0	0
PLT	136	1	16	0
MPV	136	67	16	0

THOUGHTFULLY DESIGNED AROUND THE WAY YOU WORK



CLINICAL RELEVANCE

Alinity hq has provided the Bioiatriki laboratory and clinicians with additional clinically relevant hematology parameters, such as IG, %rP, IRF and MCHr



OPERATIONAL EFFICIENCY

Switching to Alinity hq has resulted in a significant increase in operational efficiency due to scheduled automated maintenance and fewer reagents to manage and track



WORKFLOW IMPROVEMENT

Enhanced laboratory workflow with NRBC and optical platelet counts for every sample along with fewer result invalidations and suppressions

# Alinity



Alinity hq



Alinity hq-hq



Alinity hq-hs



Alinity hq-hs-hq

The Alinity h-series represents the next generation hematology solution, part of the Alinity family of harmonized systems.

## SEAMLESSLY WORK ACROSS ALINITY PLATFORMS

with common, intuitive and easy-to-use system software.

## ERROR PROOF REAGENT LOADING

with color-coded, uniquely keyed reagent packaging for convenient loading and prevention of reagent mix-ups.

## DESIGNED WITH BUILT-IN AUTOMATION

to integrate modern hematology workflows.

## CONTINUALLY LOAD AND UNLOAD

reagents and supplies without stopping or pausing the system. CBC reagents loaded in duplicate allow for reagent replacement on the fly.

## INNOVATIVE OPTICAL DESIGN

of the flow cell with hydrodynamic focusing of the cell stream. Advanced WBC algorithms for improved separation of WBC subtypes. Optical RBC and PLT counting that uses six angles of light scatter detection for improved separation.

## LOAD UP TO 120 SPECIMENS

on the front of each Alinity hq which uses one single mode of sampling for both open and closed tubes. STAT sample processing available at any time without pausing the system.

## CORELABORATORY.ABBOTT/HEMATOLOGY

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The Alinity h-series is available in select countries. Alinity hq is a Class I laser product. For *in vitro* diagnostic use only. Refer to the Operations Manual for operational precautions, limitations, and hazards.

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Rx Only

**Abbott**