

Results of user evaluation

Golling FR¹, Bröker HJ², Schäfer M², Klopprogge K³, Schulz I⁴,
Zerback R⁴

¹ Praxis für Kardiologie und innere Medizin, Dortmund, Germany

² Diakonissenkrankenhaus Kassel, Kassel, Germany

³ Exco Engineering Systemtechnik und Consulting GmbH, Maxdorf,
Germany

⁴ Evaluation Department Near Patient Testing, Roche Diagnostics,
Mannheim, Germany

Introduction

Experiences with the Cardiac reader system in non-laboratory settings

- CARMYT Study: Clinical study with CARDIAC T Quantitative and CARDIAC M
 - Risk stratification in the ED (Ordóñez-Llanos et al. 2005)
 - Detection of AMI in patients with a non-diagnostic electrocardiogram in the ED (Kellett et al. 2004)
 - Diagnostic efficiency in the CCU (Derhaschnig et al. 2004)
 - Reduction of turnaround time by 65 minutes with Cardiac reader system in the ED (Gaze et al. 2004)
- CARDIM Study: Clinical study with CARDIAC D-Dimer
 - Diagnostic sensitivity of 97 % at the GP and in the hospital (Dempfle et al., in preparation)
- Own experiences with the Cardiac reader system since 1998

Introduction

Goal of the evaluation

- To demonstrate the reliability of CARDIAC proBNP in the hands of the intended users, non-laboratory health care professionals like nurses, physicians or GP assistants
- To assess the usability and acceptance of the handling of instrument and test as well as the comprehensibility of the manual and the package insert
- To compare the analytical performance of the test obtained in the performance evaluation with that obtained in the user evaluation

Materials and methods

Evaluation sites

- EV 12: Dr. Hans-Joachim Bröker, Dr. Markus Schäfer, Edeltraud Groterjahn, Kassel, Germany
- EV 13: Dr. Felix-Rainer Golling, Dortmund, Germany
- Roche Diagnostics, Mannheim, Germany

Materials and methods

Analytical methods

- CARDIAC proBNP
 - Test lot: 226382-30
 - Sample material: Heparinized venous blood
 - Controls: Cardiac Control proBNP Level 1 and 2, lot P3
CARDIAC IQC Level 1 and 2, lot 22614192
 - Instruments: 1 Cardiac reader per site
- Elecsys proBNP
 - Test lot: 168597
 - Calibrator: Cal Set proBNP Elecsys, lot 166148
 - Sample material: Heparinized venous plasma (and serum)
 - Controls: PreciControl Cardiac Elecsys, lot 169148
 - Instrument: Elecsys 2010 (Analytics Department Near Patient Testing, Roche Diagnostics)

Materials and methods

Patients

- 90 samples from patients with suspected heart failure
- 56 values within the measurement range with CARDIAC proBNP (60 to 3000 ng/L)

Materials and methods

Quality control

- CARDIAC proBNP: Daily single determination of Cardiac controls proBNP level 1 and 2
- Elecsys proBNP: Elecsys controls in each run

Materials and methods

Table 1. User evaluation. Overview on the study design

Investigation	Patients	Sample material/ Method	CARDIAC proBNP, lot 226382-30	Elecsys proBNP	User
Familiarization		IQC Level 1	N = 3	—	1 to 2 per site
		IQC Level 2	N = 3	—	
		CARDIAC Control proBNP Level 1	N = 10	—	
		CARDIAC Control proBNP Level 2	N = 10	—	
Method comparison	30 samples from patients with heart failure	Heparinized venous blood/plasma	N = 1	N = 1	1 to 2 per site
Daily quality control		CARDIAC Control proBNP Level 1	N = 1/day	—	1 to 2 per site
		CARDIAC Control proBNP Level 2	N = 1/day	—	
		Elecsys Control proBNP 1	—	N = 1/run	
		Elecsys Control proBNP 2	—	N = 1/run	
Assessment of the system		Questionnaire	—	—	1 to 2 per site
Evaluation of manual and package insert		Questionnaire	—	—	1 to 2 per site

Results

Table 2. User evaluation. Results from daily quality control

EV	Site/ Days		CARDIAC proBNP, lot 226382-30	
			Control Level 1	Control Level 2
12	Kassel N = 11	Recovery [%]	97.3	96.7
		CV [%]	13.4	12.2
13	Dortmund N = 14	Recovery [%]	83.1	87.3
		CV [%]	16.8	15.7
	All N = 25	Recovery [%]	88.4	90.3
		CV [%]	17.3	15.3

Results

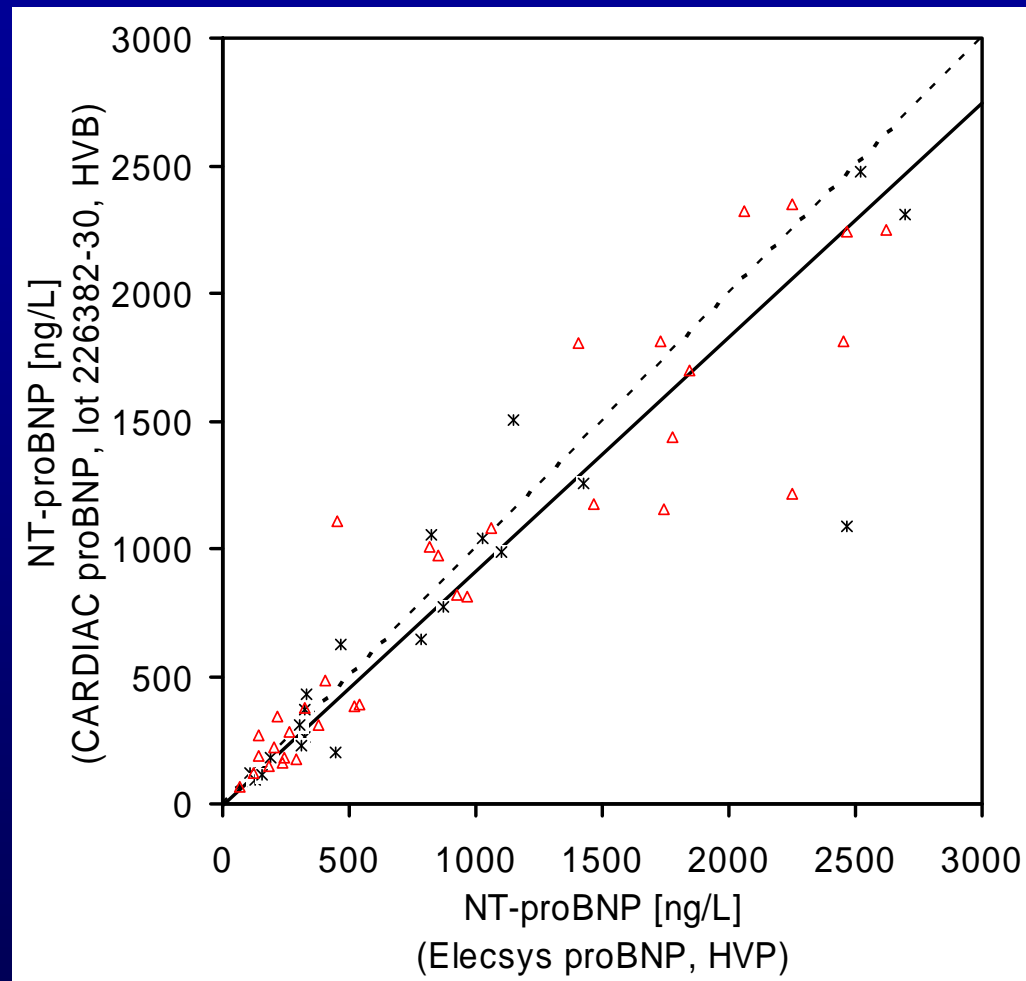


Figure 1. User evaluation. Method comparison CARDIAC proBNP, lot 226382-30 versus Elecsys proBNP. $Y = 0.92x - 6.2$ (Bablok-Passing regression); $r = 0.93$; $N = 56$. HVB = heparinized venous blood, HVP = heparinized venous plasma. Triangles stand for male, crosses for female patients

Results

Table 3. User Evaluation. Overview on standard method comparisons CARDIAC proBNP (heparinized blood) vs. Elecsys proBNP (heparinized plasma, *measured at Roche*). Regression was calculated according to Passing and Bablok: $y = a + b \cdot x$, $r =$ correlation coefficient

EV	Site	x	y	N	Median bias [%]	Mean bias [%]	r	a	b
12	Kassel	Elecsys proBNP	CARDIAC proBNP	35	-12.1	-7.1	0.90	-23.6	0.91
13	Dortmund	Elecsys proBNP	CARDIAC proBNP	21	4.3	7.6	0.97	22.4	0.99
	All	Elecsys proBNP	CARDIAC proBNP	56	-8.6	-1.6	0.93	-6.2	0.92

Results

Diagnosis	CHF	N = 3 (3.3 %)	N = 56 (62.2 %)	
	No CHF	N = 13 (14.5 %)	N = 18 (20.0 %)	
		Test negative	Test positive	
		0	125	>3000
		CARDIAC proBNP [ng/L]		

Figure 2. User evaluation. Diagnostic 2 × 2 comparison CARDIAC proBNP vs. diagnosis. N = 90 patients. The diagnostic cut-off with CARDIAC proBNP was 125 ng/L. Diagnostic sensitivity 95 %, diagnostic specificity 42 %, negative predictive value 81 %, positive predictive value 76 %

Results

Table 4. Results of the user survey. All three operators who gained experiences with the test during the user evaluation completed the questionnaire. Rating was from 1 (best) to 7 (worst). In total 11 out of 210 answers were rated worse than 3.0

Section of the questionnaire	No. of questions	Mean
Hardware (display, buttons, printout, warm-up time etc.)	7	2.0
User interface (comprehensibility, logic etc.)	5	1.6
Installation (set-up menu, printer)	5	1.9
Sample handling and measurement (test insert, sample application, Cardiac pipette, sample volume etc.)	8	1.7
Time consumption (measurement time, sample preparation, controls, learning time)	4	1.8
Manual Cardiac reader (completeness, conciseness, comprehensibility, error messages etc.)	13	1.9
Connectivity (completeness, memory)	3	2.2
Package Insert CARDIAC proBNP (completeness, conciseness, comprehensibility, test principle, test handling, medical information etc.)	20	1.2
System acceptance (handling, efficiency, functionality etc.)	5	1.4
Total	70	1.6

Conclusion

Conclusion

- In all investigated performance aspects (imprecision and recovery of the controls, accuracy, diagnostic sensitivity) CARDIAC proBNP was at the user evaluation sites as good as at the performance evaluation sites
- The evaluation demonstrated that the test can be performed not only by laboratory personnel experienced in the execution of analytical methods, but also by ordinary staff in clinical units outside the laboratory setting. CARDIAC proBNP is therefore suitable for routine use in the emergency department, in the outpatient clinic and in primary care
- The evaluation in the clinical routine also showed that the CARDIAC proBNP Package Insert is fundamentally usable and structured in accordance with the requirements for use with non-laboratory personnel



Point of care testing is a new dimension

„Medicine is a science of uncertainty
and an art of probability“

Sir William Osler

My algorithm to clarify the reason of acute dyspnoe

- Anamnesis and examination
- ECG and Echo in every patient
- Suspicion of:
 - - acute myocardial ischemia with troponin T
 - - pulmonary embolism with D-Dimer
 - - heart failure in certain circumstances with
NT pro BNP

Point of care testing with NT pro BNP in the cardiological practice

- - urgent decision: necessary to decide whether treatment in hospital or as an outpatient
- - no echocardiography available to decide on heart insufficiency
- - uncertain echocardiographic result e.g. obesity
- - differential diagnosis: dyspnoe in patients with restrictive/obstructive lung disease
- - differential diagnosis in difficult situations e.g. suspected pulmonary embolism or heart failure

Point of care testing with NT pro BNP in the practice of the family doctor

- NT pro BNP could be an ideal screening test in patients with suspected heart insufficiency visiting the practice of the family doctor

End