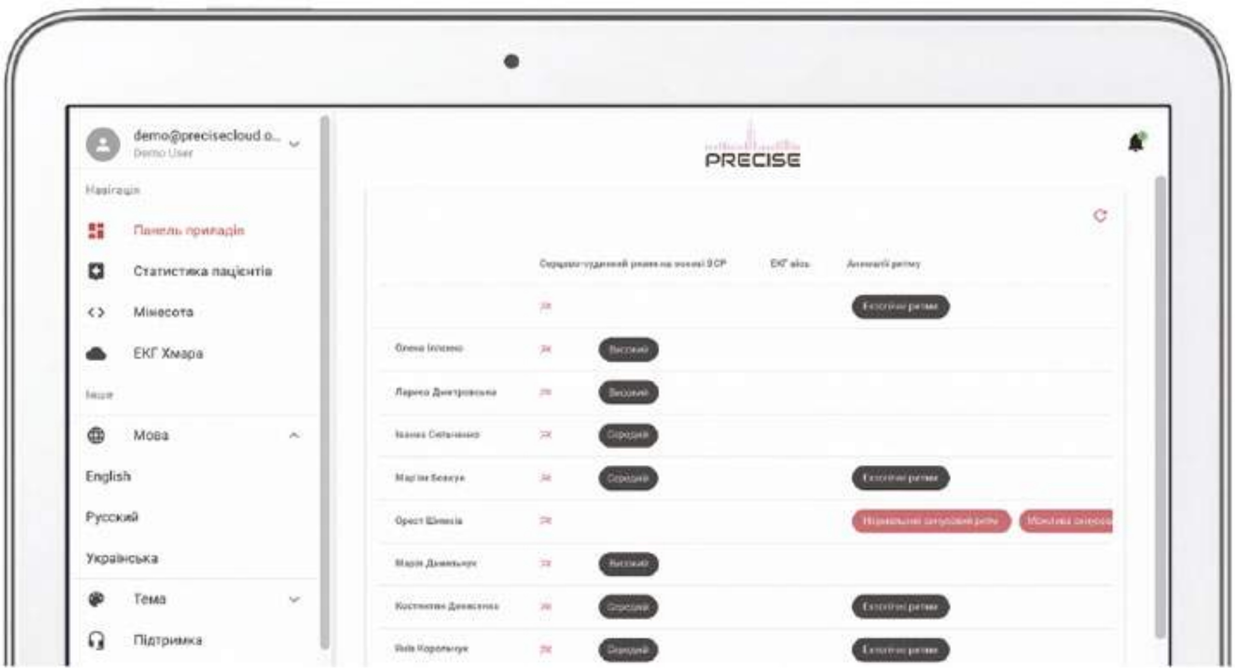
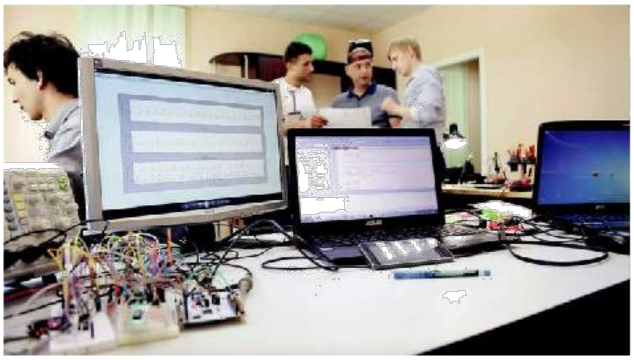
PRECISE

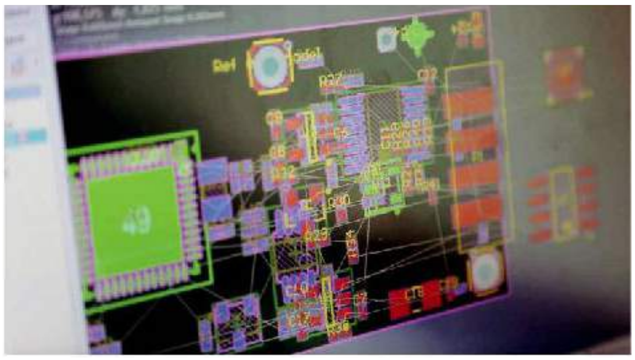
automated ECG interpretation

UNLEASH THE FULL POTENTIAL OF ECG





PRECISE is developed by Planexta Inc., a biotech company founded by medical software and hardware engineers, who have implemented innovative technologies at Mayo Clinic, The Johns Hopkins Hospital, Mount Sinai Hospital and a number of clinics in Alaska. It is launched by Precise Cardiology Limited.



Planexta Inc. holds two 2017 CES Innovation Awards for the world's first one wrist ECG band. The company also produces the world's first medical-grade cuff-less blood pressure monitor for one wrist.

A farewell to manual ECG interpretation

The manual process of routine ECG interpretation poses a major throwback, keeping clinics and hospitals from reaching new frontiers.

Average ECG interpretation and report take 8-15 minutes (0.17 RVU[1])

This tedious task consumes precious time and effort.

The cost-effectiveness of today's routine ECG interpretation practice is unacceptably low

The national average reimbursement amount of one ECG interpretation can reach as high as $10[2].

Striving to raise the standards of medical services, we often find ourselves being held back by outdated tools and methods.

Human factor may interfere with the accuracy of results[3,4,5,6,7,8]

Certain medical specialties use alternative ECG interpretation patterns[9].

Implementation of quality management standards in a clinical process and at the hospital management level becomes severely complicated.

So if you use a calculator for complex calculations, then why should you use an outdated ECG reading approach and perform such a complicated and vitally important task as ECG interpretation manually?

1791 Luigi Galvani reports that an electric spark can cause muscle to twitch

1856 R.A. von Kölliker and Heinrich Müller discover that a frog's heart generates electric currents

1887 A.D. Waller records a human electrocardiogram (ECG)

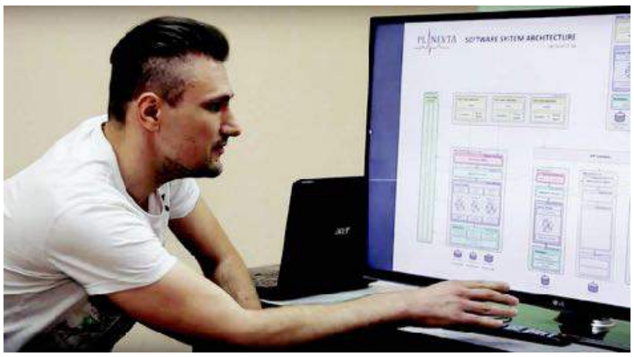
1901 Willem Einthoven describes the string galvanometer for recording an ECG

Unleash your full potential with PRECISE automatic Cloud ECG interpretation

Modernise your ECG diagnostic routine to improve accuracy, content, processing and cost-effectiveness.

Imagine your cardio diagnostics becoming twenty^{10} times more efficient.

Use the potential of a 100% fully automated Cloud ECG interpretation service.



1933 Frank Wilson relates current sources in the heart to external potentials

1949 Norman Holter invents an ambulatory ECG monitor

2016 Planexta invents world's first one wrist ECG sensor

2017 Planexta Inc. launches **PRECISE** Cloud ECG interpretation service

PRECISE - Routine Cloud ECG Interpretation Solution

Fully automated ECG measuring and interpretation

Standardised according to ISO, AHA and ESC[11] guidelines with constantly updated databases.

Greatly improves cost-effectiveness

Reduces the cost of an ECG interpretation to as low as US$1 per reading.

PRECISE-ly accurate

Completely eliminates human error in data processing.

Unlimited ECG interpretations run simultaneously

Allowing for more patients to be checked.

Remote access to ECG data

ECG interpreting can be outsourced outside a clinic or hospital. And ECG interpretation data can be easily analysed to assess the quality of medical services.

State-of-the-art approach

Analyses over 700 ECG parameters[12] concurrently

The Arden Syntax[13] rule-based approach allows the use of any ECG interpreting algorithms, including the Minnesota Code[14], the Selvester QRS Score[15], the CIIS[16], STEMI[17] the complete heart rate variability analysis[18], etc.

Makes any doctor with an ECG machine 7 times more efficient.

Reduces the time spent on one interpretation from 15 minutes to less than 2 minutes.

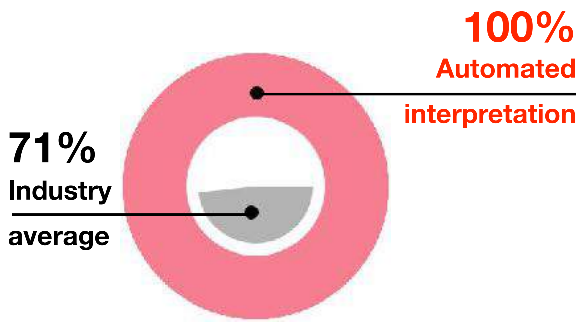
Free integration

PRECISE supports 10 main ECG formats[19] and can be integrated into a hospital information system[20] without any additional costs.

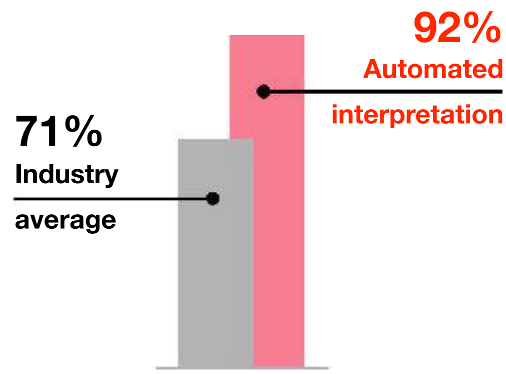
Regardless of cardiograph types used (high-end cardiographs, Holter monitors, wearable sensors or simple home cardiographs)

PRECISE provides quality assurance of ECG interpretation, retrospective ECG files processing and remote care management.

ECG intervals interpretation accuracy



Improved efficiency of atrial fibrillation detection



Wider range of ECG-based services

From commonly used ECG nosological diagnostics to HRV-based pre-nosological diagnostics of cardio-vascular and non-cardiac diseases[21].

Raise your standards

With **PRECISE**, the quality management standards are easy to implement and raise.

Additional revenue streams

Provides opportunity to accumulate big data in a hospital information system that could be sold to government and scientific research programs.

Savings

Saves thousands of dollars on equipment upgrade.

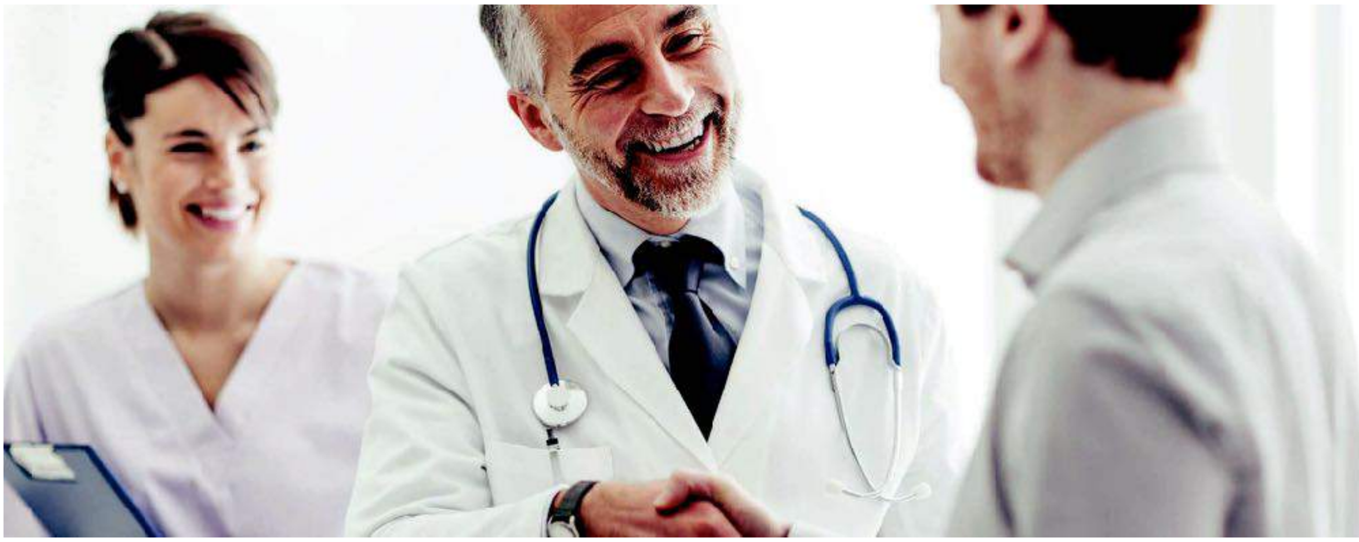
x2 Up to 2 times **more accurate**

x10 Up to 10 times **faster**

x7 Up to 7 times **more informative**

x20 Up to 20 times **cheaper**

Multilevel ECG interpretation



Level I

1. P wave, QRS complex, ST-T wave detection.

2. Wave inversion detection.

3. PR interval, QRS complex, QT interval, RR interval, PP interval durations and segment voltages calculated; for each in the sequence and average ones.

4. Abnormal complexes detection and indication.

5. Markup implementation in accordance with an ECG standard: Reference Event – an event defined to which relative time points are anchored [e.g. a meal, a drug dosage, etc.], Relative Time Point – a time point relative to the reference event [e.g. 30 minutes post dosage], ROI – Region Of Interest, used to define a region within an ECG series.

6. U-wave detection.

7. J-point detection.

8. Delta wave detection.

Level II

1. Heart Rate obtained

2. HR abnormalities evaluated for regularity: regular [e.g., paroxysmal supraventricular tachycardia], regular irregularity [e.g., ventricular bigeminy], irregular irregularity [e.g., atrial fibrillation], irregular [e.g., multifocal premature ventricular contractions].

3. Normal/short/prolonged PR interval.

4. Normal/prolonged QRS duration.

5. Normal/prolonged QT interval.

6. ST segment elevation detection.

7. Heart Rate Variability parameters: Time domain: SDNN, SDANN, RMSSD, SDNN index, SDSD, pNN50, HRV triangular index, TINN; Frequency domain: Total Power, VLF, LF, HF, LF/HF.

8. Wave form analysis: symmetry, deformations, etc.

9. Abnormal rhythm: site of origin, rate, active/passive onset.

10. Premature atrial/ventricular complexes, junctional rhythms detection.

Level III

1. Bradycardia/tachycardia indication.
2. LQTS (Long QT Syndrome) indication.
3. Atrial flutter vs Atrial fibrillation differentiation.
4. First degree AV block, Second degree AV block (Wenckebach, Mobitz) indication.
5. Conventional STEMI (ST-elevation myocardial infarction (MI)) indication.
6. Abnormalities in the QRS Axis indication.
7. MI localisation evaluation: inferior, posterior, right ventricular, anterior, lateral, septal STEMI vs Hypertrophy differentiation.
8. Wellens' Syndrome (Wellens' Warning) detection [24-hours advance sign of possible MI and ECG manifestation of LAD coronary artery stenosis].
9. Wolff-Parkinson-White syndrome.
10. RBBB (Right bundle branch block) and LBBB detection.
11. Sgarbossa criteria evaluation.
12. HRV rhythm patterns analysis.
13. Non-linear HRV analysis (Poincare plots, CGSA, 1/f scaling, H scaling etc).

Level IV

1. The Minnesota Code Classification System for ECG Findings implementation[22].
2. Arrhythmia classification (I47.*-I49.*).
3. HRV-based cardiovascular risk scoring[23].
4. HRV frequency domain analysis of acute and survived MI cases[24], HRV-based risk assessment.
5. HRV signs of myocardial dysfunction25.
6. HRV-based evaluation for non-cardiac diseases[26,27,28].

1. Physician Fee according the Centers for Medicare & Medicaid Services (CMS) 2017 Pricing information HCPCS Code CPT 93010.

2. CPT 93010, Physician Fee Schedule.

3. Mant, Jonathan et al. "Accuracy of Diagnosing Atrial Fibrillation on Electrocardiogram by Primary Care Practitioners and Interpretative Diagnostic Software: Analysis of Data from Screening for Atrial Fibrillation in the Elderly (SAFE) Trial." BMJ: British Medical Journal 335.7616 (2007): 380. PMC. Web. 2 Feb. 2017.

4. McCabe, James M. et al. "Physician Accuracy in Interpreting Potential ST-Segment Elevation Myocardial Infarction Elec-trocardiograms." Journal of the American Heart Association: Cardiovascular and Cerebrovascular Disease 2.5 (2013): e000268. PMC. Web. 2 Feb. 2017.

5. Zeng, Rui et al. "New Ideas for Teaching Electrocardiogram Interpretation and Improving Classroom Teaching Content." Advances in Medical Education and Practice 6 (2015): 99–104. PMC. Web. 2 Feb. 2017.

6. Kopeć, Grzegorz et al. "Competency in ECG Interpretation Among Medical Students." Medical Science Monitor : International Medical Journal of Experimental and Clinical Research 21 (2015): 3386–3394. PMC. Web. 2 Feb. 2017.

7. Macallan DC, Bell JA, Braddick M, Endersby K, Rizzo-Naudi J. The electrocardiogram in general practice: its use and its interpretation. Journal of the Royal Society of Medicine. 1990;83(9):559-562.

8. Sur DK, Kaye L, Mikus M, Goad J, Morena A: Accuracy of electrocardiogram reading by family practice residents. Fam Med. 2000, 32: 315-319.

9. Escudero, Carolina A et al. "Electrocardiogram Interpretation by Canadian General Paediatricians: Examining Practice, Accuracy and Confidence." Paediatrics & Child Health 19.2 (2014): 77–83. Print.

10. The approximate efficiency calculation based on reducing time and cost per 1 ECG interpretation and increasing the number of ECG interpretations.

11. International Standard Organization, American Heart Association / European Cardiological Society.

12. Planexta CardioCloud technical specification file / PL-CC-2017-01.

13. Health Level Seven Arden Syntax for Medical Logic Systems.

14. The Minnesota Code Manual of Electrocardiographic Findings.

15. Carey MG, Luisi AJ, Baldwa S, et al. The Selvester QRS Score is More Accurate than Q Waves and Fragmented QRS Complexes Using the Mason-Likar Configuration in Estimating Infarct Volume in Patients with Ischemic Cardiomyopathy. Journal of electrocardiology. 2010;43(4): 318-325. doi:10.1016/j.jelectrocard.2010.02.011.

16. Cardiac Infarction Injury Score: An Electrocardiographic Coding Scheme for Ischemic Heart Disease.

17. Jianhua Wu et al."Impact of initial hospital diagnosis on mortality for acute myocardial infarction: A national cohort study" European Heart Journal: Acute Cardiovascular Care (2016).

18. Heart rate variability. Standards of measurement, physiological interpretation, and clinical use / Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology.

19. Binary, SCP-ECG, DICOM-WS 30, HL7 aECG, ecgML, MFER, Philips XML, XML-ECG, mECGml, ecgAware.

20. In compliance with IEC 62304, HIPAA, ISO 27000, HL7/FHIR, 95/46/EC.

21. Level 1 Diagnostics. A Comprehensive Testing Program to Detect and Prevent Cardiovascular Disease.

22. The Minnesota Code Classification System for Electrocardiographic Findings.

23. Stefanie Hillebrand, Karin B. Gast, Renée de Mutsert, Cees A Swenne, J. Wouter Jukema, Saskia Middeldorp, Frits R. Rosendaal, Olaf M. Dekkers; Heart rate variability and first cardiovascular event in populations without known cardiovascular disease: meta-analysis and dose–response meta-regression. Europace 2013; 15 (5): 742-749. doi: 10.1093/europace/eus341

24. Huikuri, Heikki V., and Phyllis K. Stein. "Clinical Application of Heart Rate Variability after Acute Myocardial Infarction." Frontiers in Physiology 3 (2012): 41. PMC. Web. 8 Feb. 2017.

25. Depression, Heart Rate Variability, and Acute Myocardial Infarction Robert M. Carney, James A. Blumenthal, Phyllis K Stein, Lana Watkins, Diane Catellier, Lisa F. Berkman, Susan M. Czajkowski, Christopher O'Connor, Peter H. Stone and Kenneth E. Freedland Circulation. 2001;104:2024-2028, originally published October 23, 2001. https://doi. org/10.1161/hc4201.097834

26. Ushiyama, T., Mizushige, K., Wakabayashi, H. et al. Heart Vessels (2008) 23: 53. doi:10.1007/s00380-007-0997-6

27. Reena Ranpuria, Martica Hall, Chris T. Chan, Mark Unruh; Heart rate variability (HRV) in kidney failure: measurement and consequences of reduced HRV. Nephrol Dial Transplant 2007; 23 (2): 444-449. doi: 10.1093/ndt/gfm634

28. Celik, A., Aytan, P., Dursun, H., Koc, F., Ozbek, K., Sagcan, M., Kadi, H., Ceyhan, K., Onalan, O. and Onrat, E. (2011), Heart Rate Variability and Heart Rate Turbulence in Hypothyroidism before and after Treatment. Annals of Noninvasive Electro-cardiology, 16: 344–350. doi:10.1111/j.1542-474X.2011.00461.x

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