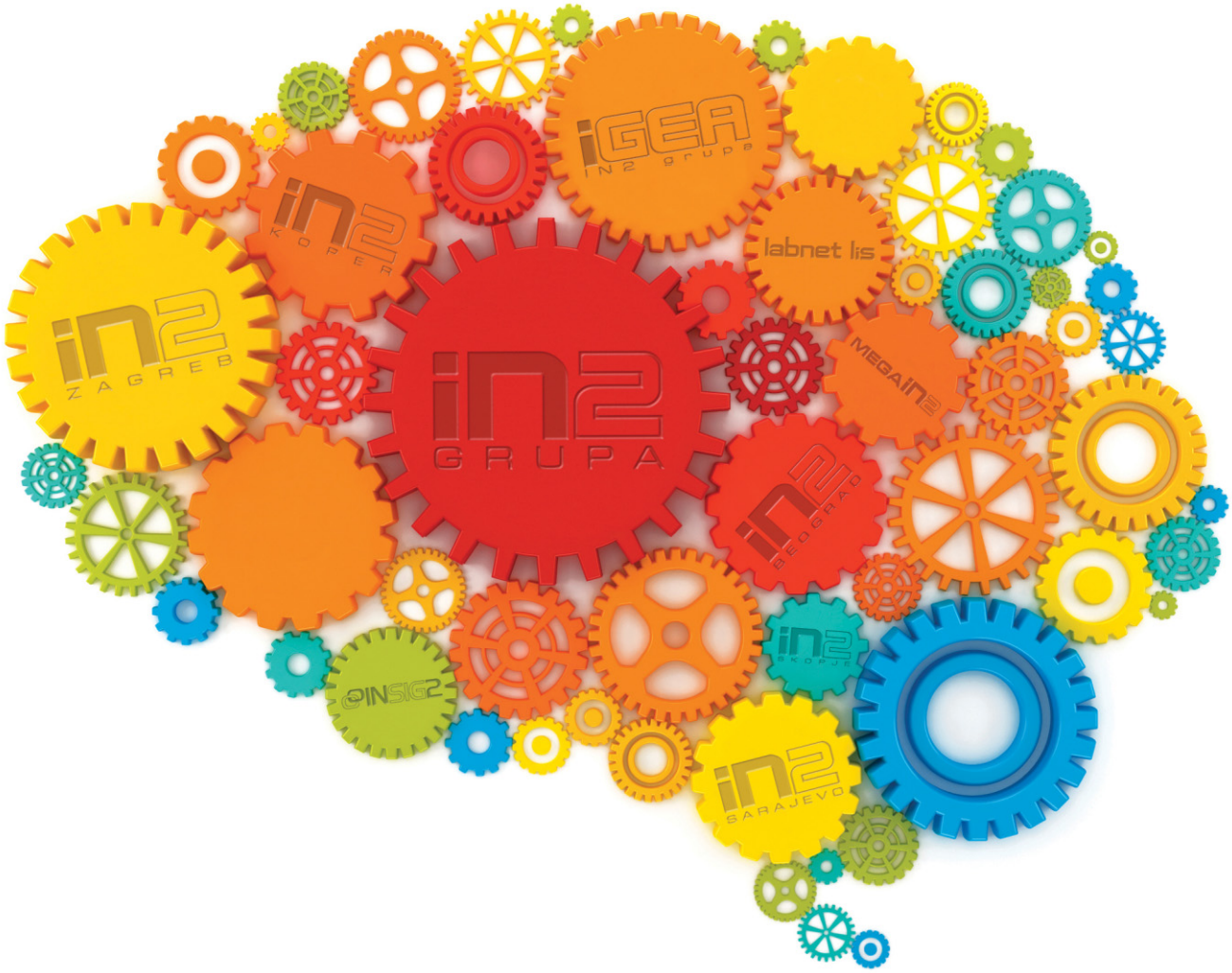


creative IT solutions

IN2 GROUP

IBIS – INTEGRATED SOLUTION FOR HOSPITAL INFORMATIZATION

About IN2 group

IN2 was established in 1992 as a company specialized in developing customized software solutions. Over the years it grew into IN2 Group, a leading software company in SE Europe which is now consisted of 11 interconnected companies, 1 branch office and more than 430 employees. IN2 Group provides competencies in public, financial and health sector, retail and telecom in 6 countries in SEE region.

Competencies in health

IN2 entered the health sector in 2009 by the acquisition of company Grad. It completed it's offer in hospital IT solutions a year after with acquisition of LabNet, a company specialized in providing IT support for medical-biochemical laboratories. Today, IN2 covers 55% of the Croatian health market in domain of hospital information systems.

IN2 also offers a range of complementary services necessary for implementing complete IT solution in healthcare institutions:

- Delivery and installation of equipment (purchase and installation of the servers, installation of operative systems and system packages for servers, delivery of client computers etc.).
- System implementation by putting whole IBIS system into function. During the implementation, elementary activities of joint project teams include analysis and evaluation of the current state, installation, configuration and adjustment, user education and training, testing the system, conversion and data migration.
- Implementation of HL7 module for the integration with other vendors Information Systems.
- System support and maintenance during the whole IS lifecycle.
- Consulting in business processes – professional assistance in reengineering business processes.

What is IBIS?

IBIS stands for Integral Hospital Information System (in Croatian: **I**ntegralni **B**olnički **I**nformacijski **S**ustav).
IBIS is a complete IT solution for hospitals, providing support in all aspects of hospital operations: **medical** (managing medical documentation), **economical** (e.g. invoicing of medical services) and **business** (managing business records, standard ERP functionalities). The system is implemented in 70% of Croatian hospital capacity, from large hospital centers to small specialized hospitals. IBIS has been continuously improving for more than 20 years upon the customer's requirements and legal regulations in Croatia.

Major functional characteristics of IBIS

IBIS is integral system that provides IT support for all primary hospital processes:

1. **Managing patient's data**– applications for administrating general information about patients and for keeping track of patient's status in hospital.
2. **Support in medical treatment** – applications for managing patient's medical documentation.
3. **Financial calculation of hospital services** – applications for calculating the cost of hospital services and overview of hospital business operations.
4. **Support for standard ERP processes** – as any other company, hospitals have their operational business part (e.g. orders, purchases, warehouses, bookkeeping etc.).
5. **Support for business decisions and hospital management** – creating reports for better analytics of the efficiency of hospital management and business.

Architecture of IBIS

IBIS integrates following applications:

1. **BIS** – (Bolnički Informacijski Sustav in Croatian) is (Hospital Information System), the base (core) of the complete hospital information system supporting hospital's core processes.
2. **PIS** – (Poslovni Informacijski Sustav) is ERP, Bussiness Infromation System that provides administrative support for business aspects such as: invoicing, receipt of hospital material and creating financial reports.
3. **HR** – (Human Resources) is a solution for managing human resources and information about employees and other personnel, payroll calculations and daily working records (currently supports only Croatian legislative).
4. **BI module** – creates reports from all transaction systems (BIS, PIS and HR) by the user's defined criteria, essential for successful management of complex organizational structures like hospitals.
5. **BioNet LIS** –information system specialized for IT support of medical-biochemical laboratories.

Features of IBIS modules

1. BIS – Hospital information system designed by the experience of physicians

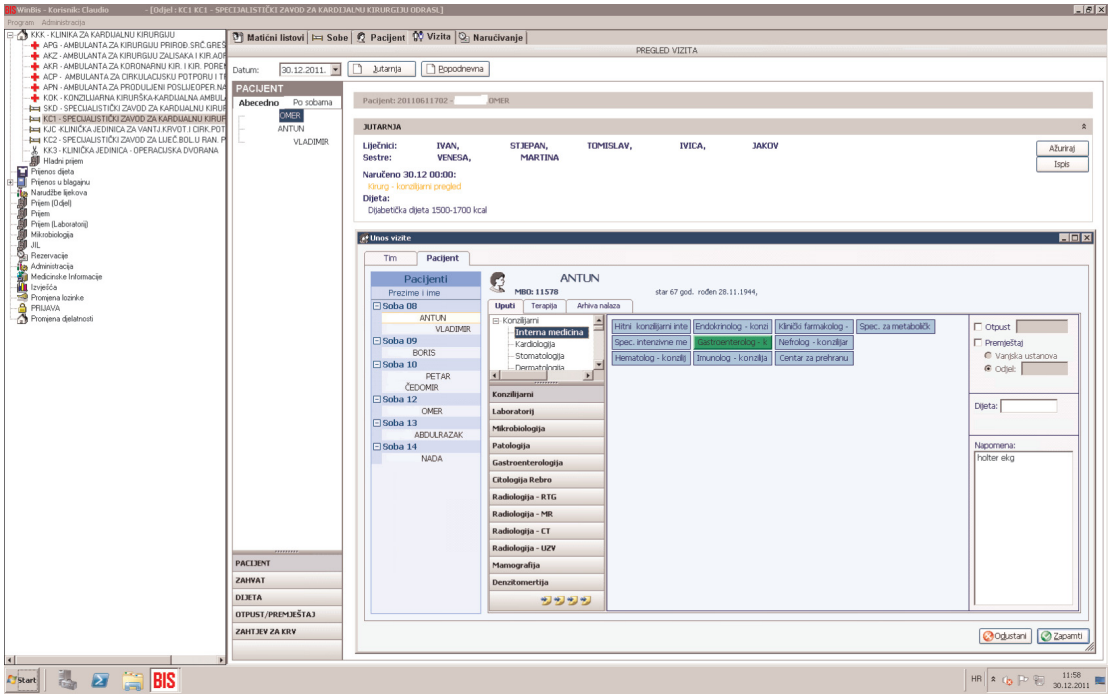
BIS (Hospital Information System) combines everything that involves informatization of hospital. It efficiently connects data from various hospital sources, in order to provide short term and long term plans for further diagnostics and patient therapy. It's basic characteristic is that it represents: „System designed by the experience of the physicians, for the physicians". Innovative combination of software, services and technology provides effective supervision and optimal use of hospital resources. BIS primarily represents solution that puts medical service on a higher level, while providing business support for processes like: calculation of services, overview on finances and management of institution.

Features of BIS are:

- **Open architecture** – BIS has the abilityy to interconnect with other hospital systems and use them in the way hospital currently needs. This feature makes BIS appropriate for use in different environments. BIS uses industrial standard HL7 protocol for connecting with other vendor applications.
- **Modularity** –„core" of the system is a standalone "patient oriented" module which supplies all other parts of the system with all essential information; from the first patient's admission into hospital, booking the date for medical examination, recording all of the results and events that occur during the treatment, up to discharging from the hospital. Information needs to be entered only once in order to be available in all necessary places. In this way the staff is not burdened with entering the same information multiple times, the patients don't need to repeatedly answer questions, and the most important fact is that central module stores all informations in one place (patient electronic record) at the moments they are created.
- **Reliability** – informations are always correct and updated, because the change of information in one workplace is instantly visible to all other actors providing medical services. The result is accelerated patient „flow" through hospital processes, reduction of administrative work and, as the ultimate result, increase in the quality of medical treatment.

Some of the more significant BIS sub-modules are:

- e-Karton (e-PHR – Patient Health Record) – electronic medical record in digital „file cabinet". It is an information archive with the history of patient's treatments. With E-Karton, treatment and diagnostics information are available instantly, accurately and safely whether they relate to diagnoses, medical history and status, discharge summary, specialized results, laboratory results, radiology recordings, pharmacological treatment, ordered procedures or data for the calculation of treatment.
- e-Vizita (e-Daily Record) - allows recording of the daily activities and procedures in the Clinic, referring to the ordering of examinations and tests, prescribing medications, tracking indications for surgery, ordering blood and blood products, prescription diet, decision making about release or transfer.
- e-Uputnica (e-Order) enables electronical examination and booking. It allows keeping track of the released orders and automatic distribution of results.
- e-Recept (e-Prescription), e-Dijeta (e-Diet) are also some of the solutions in the process of managing and treating patients.



KLINIČKI BOLNIČKI CENTAR ZAGREB
KLINIKA ZA KARDIJALNU KIRURGIJU
Medicinskog fakulteta Sveučilišta u Zagrebu
10000 Zagreb, Kišpatićeva 12, tel +385 (1) 2367 529
Predstojnik: Prof.dr.sc. BOJAN BIOČINA

KLINIČKA JEDINICA - OPERACIJSKA DVORANA
tel. +385(0)1 2388686, fax: +385(0)1 2367014, www.kbc-zagreb.hr
Pročelnik odjela Prim.dr.sc. Višnja Ivančan

OPERACIJSKA LISTA

Protokol br. **000049 / 2011** Datum operacije: **20.12.2011.**

Pacijentica , rođena 4.11.1950,

Broj matičnog lista : 2011 / ., primljena na odjel **20.12.2011.**

Uputna dijagnoza: I05.2 - Mitralna stenoza s insuficijencijom
I25.11 - Aterosklerotska bolest srca koronarne arterije

Operacijske dijagnoze: I05.2 - Mitralna stenoza s insuficijencijom
I25.11 - Aterosklerotska bolest srca koronarne arterije

Operater : Prof.dr.sc.
Asistent : dr. med.
Asistent : dr. med.
Instrumentarka :
Perfuzionista :
Anesteziolog : Prim.dr.sc.
Anest. tehničar :

Operacija
Zamjena mitralnog zaliska mehaničkom protezom (St. Jude 27 mm)
Jednostruko koronarno premoštenje (CABGx1 RCA cum VSM)

Opis nalaza i postupka
Nakon pranja i sterilnog pokrivanja operacijskog polja pristupi se preparaciji desne vene saphene magne (VSM). Ista se ispreparira i ekstirpira u području potkoljenice. Nakon vađenja vene uspostavi se hemostaza uz postavljanje Redon drena. Rana se sašije po slojevima, te povije elastično kompresivnim zavojem.
Učini se medijana sternotomija i potpuna heparinizacija. Perikard je otvoren u obliku obrnutog slova 'T' i suspendiran za rubove sternuma. Uobičajena kanilacija aorte, te separatno gornje i donje šuplje vene. Slijedi uspostava izvantjelesnog krvotoka u hipotermiji od 29° C. Vent je postavljen u gornju desnu pulmonalnu venu. Postavi se kateter za retrogradnu primjenu kardioplegije kroz desni atrij u koronarni sinus. U korijen aorte je postavljena kardioplegijska i vent igla. Aorta se odvoji od pulmonalne arterije elektrokauterom. Srce se jatrogeno zafibrilira prije postavljanja poprečne kleme na aorti. Potom se srce zaustavi u hladnom kardioplegijskom arestu primjenom retrogradne i anterogradne kardioplegije u korijen aorte uz topičku primjenu leda. Kasnije se protekcija miokarda nastavlja intermitentno retrogradnom kardioplegijom. Ispreparira se Sondergaardov žlijeb, te se uđe u lijevi atrij.

Pristupi se na mitralnu valvulu koja je degenerativno promjenjena uz kalcificirani stražnji anulus i kuspis. Nađe se kombinirana mitralna greška. Potom se pristupi na distalnu desnu koronarnu arteriju

2. PIS – support for administrative business activities

PIS is a software package that supports all administrative aspects of hospital work such as: invoicing, receipt of goods and creating financial reports (practically all business processes standard for ERP solutions). Besides reducing paper by using digital documents it enables easier access to electronic or paper copy of business documents. PIS also guarantees information security and secure data archiving so the documents are available for later search, printout, statistical treatment etc.

Basic features of PIS are:

- IN2 offers installation, education, implementation and maintenance, as well as continuous development of new modules and functions.
- At the moment, program is translated into Croatian and Slovenian languages and customized to Croatian and Slovenian legislatives and regulations.
- Program can be used as a standalone application or as an integral package if connected with other programs from IBIS package. It can be used on a single computer or multiple computers in local area network.
- Uses information protection on different levels from unauthorized data access
- Backup and archiving of information with the possibility of reviewing information from the previous years
- Main code lists are shared between all modules of IBIS program package
- Data export and reporting into DBF, TXT, PDF or XLS format with possibility of sending information via e-mail
- Open architecture – possibility to communicate with other systems over the Internet or over commonly agreed protocols.

3. BioNet LIS – systems for support of medical-biochemical laboratories

BioNet LIS is group of client/server applications for the informatization of medical-biochemical laboratories.
Basic features of BioNet LIS are:

- **Automation of the working procedure** – application supports magnetic card reading and simplifies the procedure of entering data about patients and medical personnel authorized for ordering medical examination. When the information is entered, „Barcode" identifying the blood sample is automatically generated. It is unique and generated for a specific sample and a patient, so the possibility to switch the samples is minimized. In BioNet LIS application all required information about patients is entered only once and then delivered to a specific diagnostic device. Thus, preparation of the sample for treatment is done faster and diagnostic device has better utilization.

- **Review and delivery of the examination results** – result of medical examination can be exported in protected PDF format, and additional protection option is available through implementation of e-signature. Examination results can be delivered on the remote medical department via extra developed „Client" application, BIS, Web server application or just simple printout on remote printer (if the technical infrastructure can support it). Printer can be defined for every organizational unit which is entered in the database.

- **Statistics and financial reports** – application has the ability to keep track of the statistics of conducted examinations in the whole laboratory or separate departments/ambulances/clinics/physicians. Also, it provides statistics of conducted examinations for certain device, as well as consumption of reagent per device. It also has the ability to create financial reports and export them in .XLS format.

- **Quality control** – special module is developed for the internal laboratory work control which makes calculation of statistical parameters (SD, BIAS, KV, variance) and displays them in Levy – Jennings and Youden graphic charts.

- **Open architecture** – BioNet LIS can be connected with other applications through HL7 standard. Connection with BIS can be implemented during any phase of LIS system implementation. Connection can also be made after implementing LIS in laboratory.

- **Scalability** – support for large number of diagnostic devices available on the market (Roche, Siemens, Dade-Behring, Bayer, Sysmex, Olympus, Coulter, Abbot, Hitachi, Hyrys, IL and many others). Support for any device can be additionally developed if there is sufficient available information for device.

bionet lis

4. HR – System for managing human resources

Managing human resources is part of system which keeps records on all employees, payrolls and daily work evidence. System is made of following modules: Human resource evidence, Daily work evidence and payroll module (Croatian legislative at this moment).

1. Human resources record

Module keeps the record about all employees and other personnel (e.g. student jobs, part-time jobs, temporary employment, contingent workers etc.). It can be used as a separate module even though, if it is a part of the Integrated system Managing human resources, it has higher level of automation. Information from Human resources and Daily work evidence are directly forwarded into Payrolls as calculation elements for a Payroll.

Module keeps records of the following:

- General record: information on counties of residence, municipalities, type of employment, work experience, job specifications, qualifications, occupation, professional exams, certificates etc.
- Overview of employees: includes personal information, position, type of job, previous employment records (either in this or other institutions) etc.
- Chronological record about changes of employment, records of absence and presence.
- Other records: information record for tax card, record of health insured and other members of families, jubilee awards etc.
- Various calculations: calculation of past service addition fee on specific day for payroll calculation, holidays etc.
- Various reports and forms defined by different elements (job positions, residence etc.).

2. Payrolls

Payrolls are connected with modules Human resources record and Daily record of working time. Information are taken over connected modules which ensures high level of automation.

Payroll module ensures:

- Simultaneously different types of employee's payrolls according to payroll contributions: disabled workers, Croatian war veterans etc.
- Simultaneous calculation of different types of payrolls such as full-time work, military service etc.
- Work calendar (working hours), keeping track of work in shifts, record of presence and absence and automatic enrollment of predefined hours to all employees.
- Wide range of options for creating reports by user's criteria from the master data, by individual process or cumulative of numerous processes regardless of the date of processing.
- Ability to self-incorporate new types of incomes and deductions, and write equations for their calculation.

3. Daily records of work

Integrates a number of modules for daily record of work and absence of work:

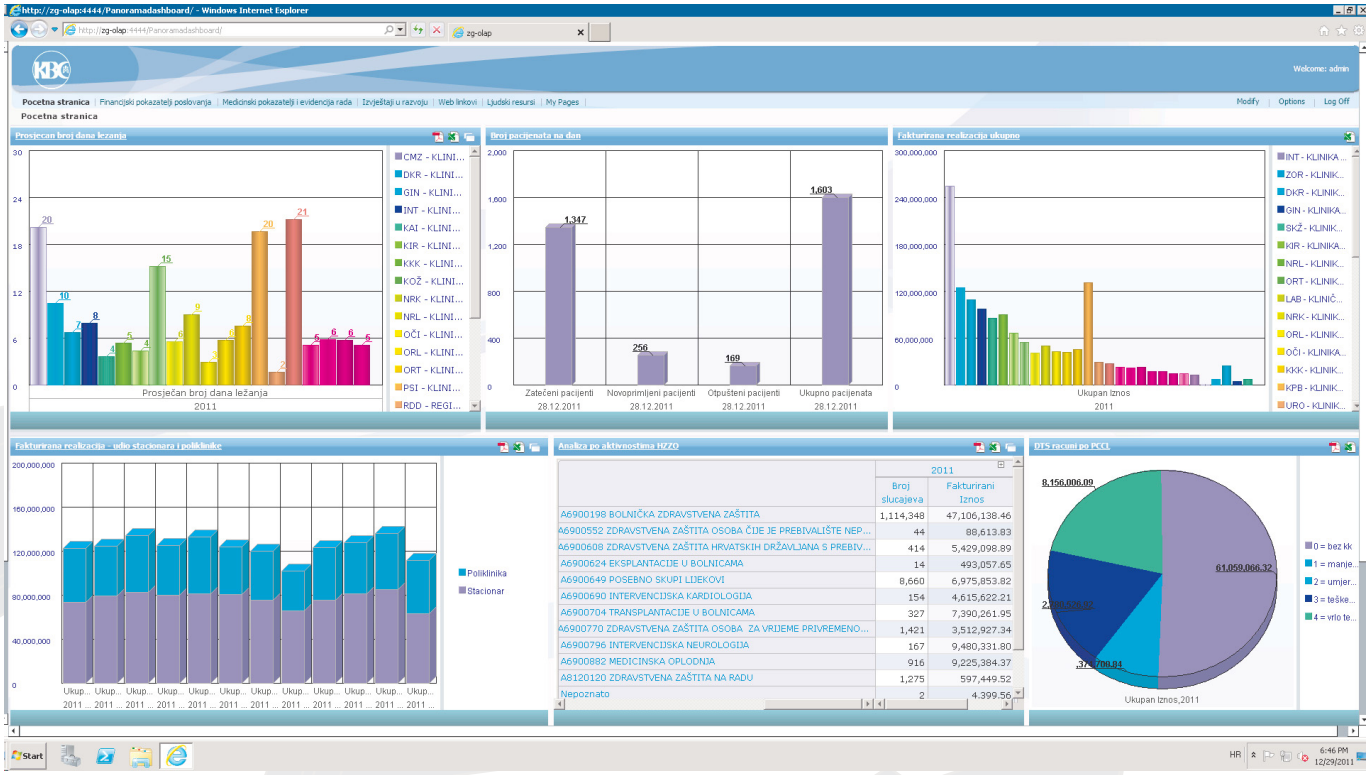
- Work calendars –module for calculation of working hours and absences.
- Planning of working time – keeps record of working time, business trip, educations etc.
- Daily work report – it keeps the record of actual work and makes the calculation of the working hour norm
- Record of annual leave (vacation) – keeps record about absence from work due to annual leave
- Payment of sick leave – keeps record of absence due to sick leave
- Calculation and hour analyzes – calculation and analysis of hours on a daily basis and for a specific period: record of work, business travels, education and other leave, except sick leave and vacations.

5. BI – Business Intelligence

IBIS BI is a system for business intelligence whiose primal function is business decisions support in hospitals. Direct benefit in health segment is a possibility of analyzing business information on a daily level, thus making better analysis and understanding in the connection between patients, treatments and follow-up of business results. Daily analysis of business results simplifies business processes, reduces risk in making business decisions, and maximizes cost efficiency by optimal use of BIS, PIS and HR.

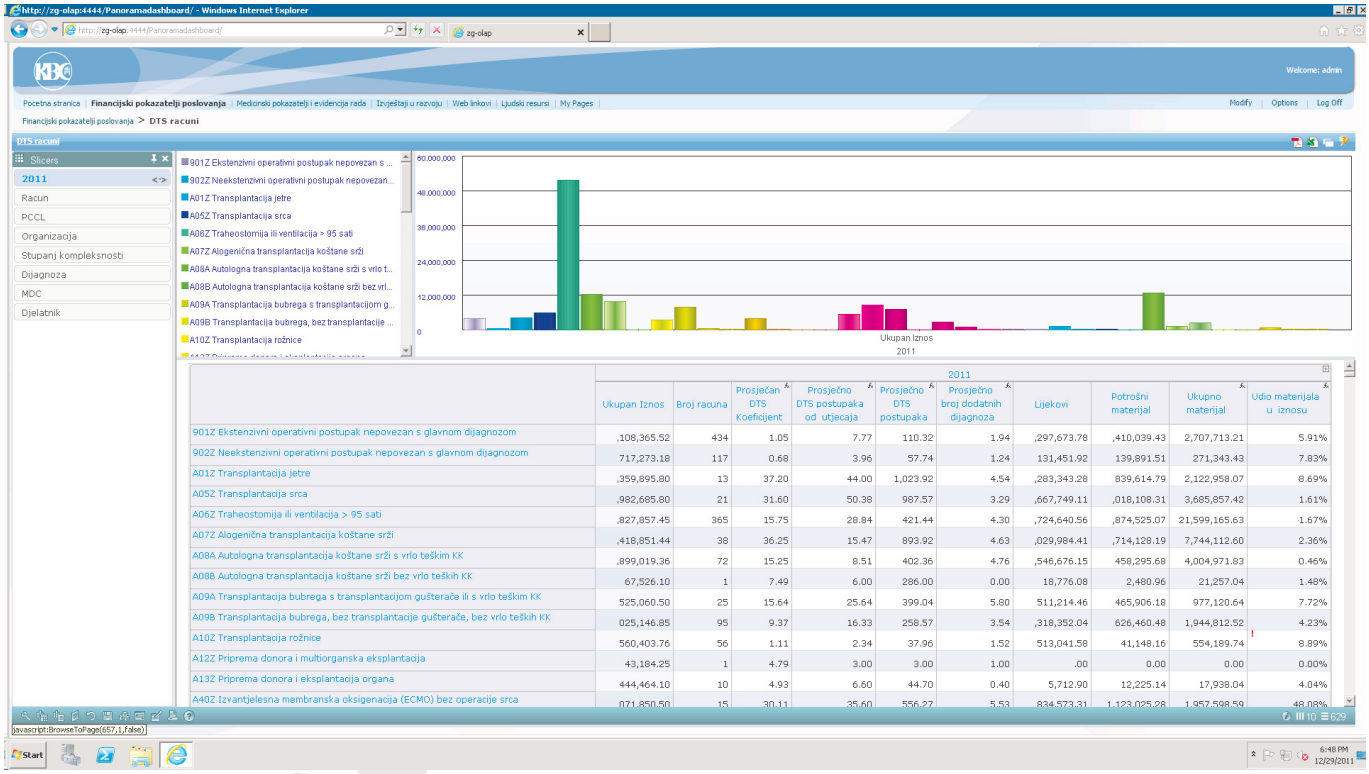
IBIS BI system features:

- Access to information necessary in making business decisions.
- Availability of key performance indicators in different formats (such as graphical charts).
- High analytical qualities: identification and focusing on problem by „drill-down" analysis of data (in-depth analysis). The result is business optimization, cost efficiency and better use of resources.
- Creating reports on various hospital organizational levels.
- quick response to changes (like change of prices or financing regulations from Health Insurance Companies).



BI concept:

1. BI reporting system enables analyzing of key business indicators in one place, since it combines information from various existing information hospital subsystems.
2. System is detached from other subsystems (BIS, PIS, HR, BioNet LIS) so it doesn't burden or slow down their work.
3. Collection of data is on a daily basis. Users have access to updated information on the previous date, which is satisfactory for reports intended to support making quality business decisions.
4. Creating reports - the ability to create reports matching defined criteria. Standard version can be changed, adapted and saved in personal folder to create your own collection of reports. The user alone has the ability to modify existing reports by adding or removing columns in a few clicks of a mouse, depending on the importance and relevance of the data in the time of need. Key indicators can be defined with their graphical representation on the reports.
5. High analyzing level - reports can be analyzed by time (by year, quarter, month up to the day), organizational structure of the hospital from the highest to the lowest level and many other factors relevant to the business aspect that is being analyzed.



REFERENCES

With their solutions for the informatization in health, IN2 Group is present in most medical institutions in Croatia (specially hospitals). Some of the major users are:

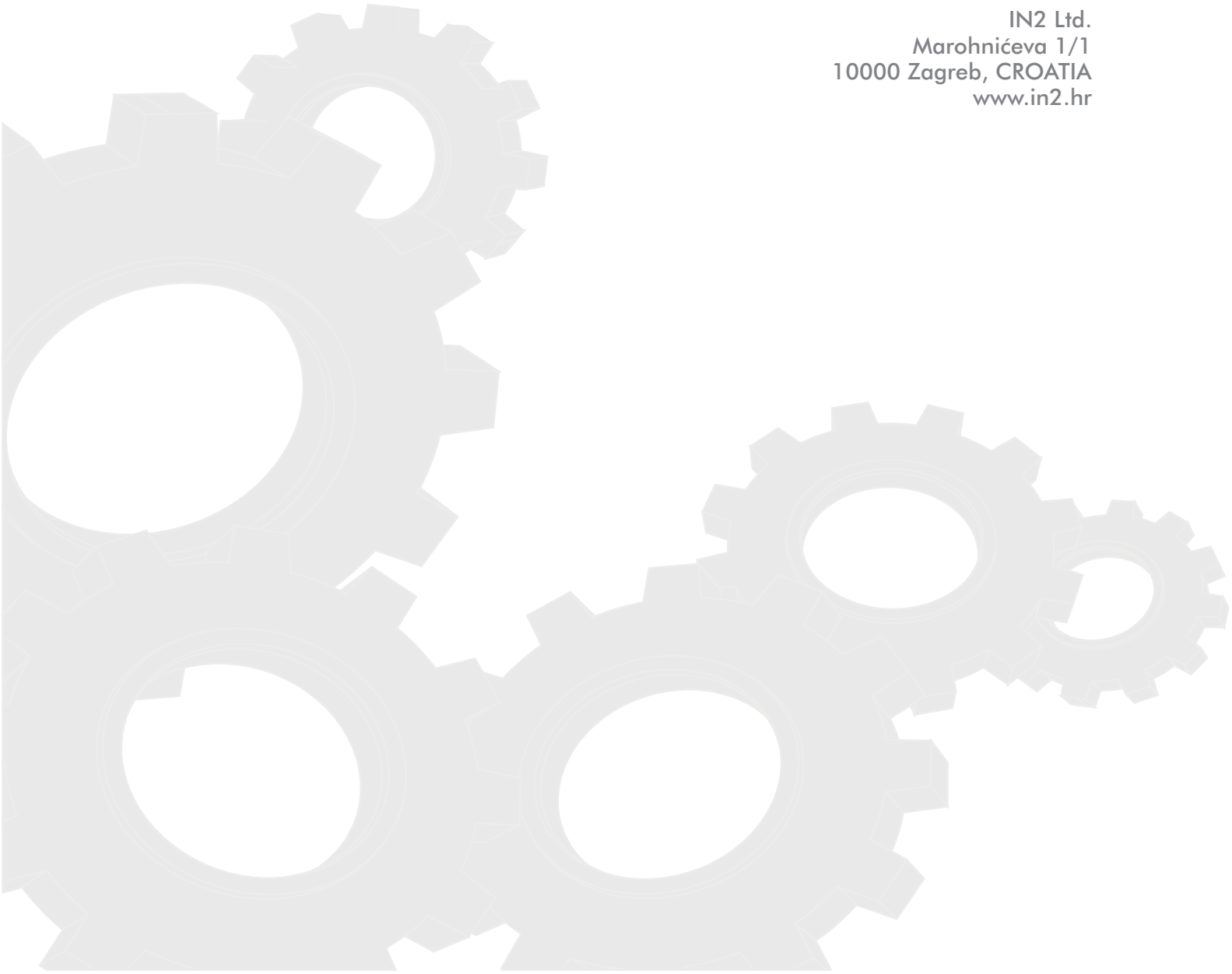
Clinical hospital centers:
KBC Zagreb, KBC Rijeka, KB Dubrava Zagreb.

Clinics:
Klinika za dječje bolesti Zagreb,
Klinika za traumatologiju Zagreb,
Sveučilišna klinika "Vuk Vrhovac" Zagreb.

General hospitals:
Opća bolnica Bjelovar, Opća bolnica Dubrovnik,
Opća bolnica Karlovac, Opća bolnica Koprivnica,
Opća bolnica Nova Gradiška, Opća bolnica Ogulin,
Opća bolnica Pula, Opća bolnica Slavonski Brod,
Opća bolnica Šibenik, Opća bolnica Virovitica,
Opća bolnica Zabok, Opća županijska bolnica Požega,
Županijska bolnica Čakovec.

Psychiatric hospitals:
Psihijatrijska bolnica Rab,
Psihijatrijska bolnica "Sv. Ivan" Zagreb,
Psihijatrijska bolnica Ugljan,
Psihijatrijska bolnica za djecu i mladež Zagreb.

Special hospitals:
Specijalna bolnica Daruvarske toplice,
Specijalna bolnica Klenovnik,
Magdalena - specijalna bolnica za kardio-vaskularnu kirurgiju i kardiologiju,
Specijalna bolnica Novi Marof,
Specijalna bolnica Rovinj,
Specijalna bolnica Stubičke Toplice,
Specijalna bolnica Thalassotherapija Opatija,
Specijalna bolnica Thalassotherapija Crikvenica,
Lječilište Istarske toplice.



IN2 Ltd.
Marohnićeva 1/1
10000 Zagreb, CROATIA
www.in2.hr