InterCare

The Interworking and Interoperability of networked services for Healthcare using Internet-based technology

HC 4011

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Healthcare Telematics Applications Programme

incorporating

Cardlink 2, Hector, *Star*☆, Synapses and TrustHealth

Workpackage 6
D6.2
Evaluation

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0. MANAGEMENT SUMMARY

The InterCare project is an umbrella project build on the results of five complementary "best of breed" projects: Cardlink2, Hector, *Star*✯, Synapses and TrustHealth. Goal is to improve the interworking between health systems and to create an environment of seamless care.
Workpackage 6 focuses on an important aspect of the project and one of the key-objectives: Demonstrate the results at demonstrator sites across Europe where they form an integral part of a national strategy and help to solve different aspects of the problems facing the provision of inter-organisational seamless care and give visible evidence of success by promotional activities. The InterCare demonstrations took place in Italy, the Netherlands, Sweden, Finland, Greece and Ireland. The demonstrator sites were described in the first deliverable (D6.1) of Workpackage 6, together with the assessment metrics as well as aims, objectives and goals of the evaluation of the demonstrator sites. In this deliverable, D6.2, the results of the evaluation of the demonstrations are presented and discussed.
Due to delays in the previous workpackages, and a rejection by the European Commission for a 6 month extension for the project, the demonstration and evaluation had to be performed in a period of about 3 months or less (March – June 2000), which is a considerable shorter period compared to the originally planned 12 months. As a result of very hard work during the last months it was possible to provide extensive evaluations of most of the planned services. Clear results on the quality of the InterCare services can be given due to validation of the services by health professionals, patients and members of the general public. Significant results can therefore be presented, although not entirely to the level that was originally planned.
The InterCare demonstrator sites were, within the parameters of the constantly and fast changing world of Telematics, able to provide most services as originally planned.
The most important specific aims and goals as indicated by the demonstrator sites can be summarised as:

1. Give healthcare professionals access to medical information from external information systems.
2. Increase the quantity and quality of information available to citizens regarding health (care) services.
3. Facilitate healthcare professionals by improving the handling of information by offering high quality and user-friendly applications.
4. Increase citizens' participation in healthcare.
5. Provide secure identification of patients and/or professionals.
6. Improve the direct communication between healthcare professionals.

The evaluations show that the InterCare project has been able to realise these to a large extent. Enthusiast users found the InterCare services user-friendly, reliable, secure and fast. Enthusiasm of users is an important prerequisite for the integration of Telematics services into daily routines of these users.
Many healthcare professionals and decision-makers were informed about the various applications and services offered by the demonstrator sites by means of open days, conferences and Internet. Even more publicity and promotion in the near future will expand the knowledge about these products to all involved in healthcare. Visitors of the promotional activities so far were positive about them and have shown interest to use the applications themselves.
All demonstrator sites are confident that further development in new releases of the products and applications will improve the results that were gathered during this evaluation. They are also confident that the demonstrated applications or upgraded versions of the demonstrated applications will in the future be used by many healthcare professionals, administrative staff of healthcare organisations, patients and the general public.

1. GENERAL INTRODUCTION

1.1 General introduction

The InterCare project aims to create useable applications in Telematics, to improve the interworking between health systems and to create an environment of seamless care. The first objective of the InterCare project is to build on the result of five complementary "best of breed" projects to form a new project with the necessary critical mass to integrate the results across project lines. The results of these contributory projects that will be used and integrated by InterCare are as follows:

Cardlink 2, as successor to the earlier Cardlink 1 project, demonstrates a patient held smartcard containing the person's medical record, recent care episodes together with drug and allergy information.
The record is held in a secure form and may be accessed and updated by authorised GPs, pharmacists, hospital clinicians and appropriate administrative staff. The technology provides a seamless information key linking community, primary and hospital care.
The card and the core dataset conforms to the Council of Ministers decision on the development of the 'health passport' recommendation. It is being initially implemented in 10 regions. It provides the citizen with a secure portable medical record which facilitates free movement throughout the European region.

Hector makes use of fixed and mobile communications for transmission media (LAN & WAN Networks, PSDN, GSM, etc.) telediagnostic multimedia terminals, user terminals for mobile units, geographical positioning system (GPS) and information system (GIS). These technologies are used to provide: emergency care, clinical data transmission, virtual telepresence, continuity of care, minimising interventions, and information for training purposes.

Star☆ has developed an open telematics architecture and a number of Internet-enabled services to deliver components of seamless healthcare telematics to the region. The services can be tailored to meet a variety of local needs including:

- Healthcare Service Directory containing detailed information about all healthcare service providers in the region.
- Referral process offering the possibility to directly refer the patient to a provider for a well defined purpose and indicating the relevant supporting information for the provider of the service.
- Access to Medical Information about all contacts between the patient and providers.
- Teleconsultation to enable a healthcare professional to perform a remote consultation with a specialist to obtain advice on the diagnosis or treatment for a patient.
- Remote Booking enables a doctor to book a service in the presence of the patient.
- Access to shared medical expertise.

Synapses provides an open means for systems which manage healthcare records or dossiers to share their data combining it consistently, simply, comprehensively and securely. The Synapses server provides access to the distributed components of the patient record and related data. The Synapses Object Dictionary, which contains the definition and location of the Data Objects to be shared, underpins the operation of the server and is supported by a Common Object Model.

TrustHealth demonstrates how trustworthy telematic systems can be established with the use of modern security techniques while maintaining the possibility for open systems connectivity

and interoperability. The project started by selecting and specifying a set of interface specifications for the following basic modular security functions:

- User Authentication
- Digital Signatures
- Key Exchange.

A layered TrustHealth Security Platform was also developed, and as part of that, a TrustHealth Health Professional Card was also been specified. The major effort of the project is being devoted to establishing the necessary infrastructure of Trusted Third Parties for health care, including procedure policies.

A further aim of the InterCare project was to produce integrated products that can be commercialised by the industrial members of the consortium. This has been the objective of workpackage 3 and workpackage 4 and documented in deliverables D3.1, D3.2 and D4.1.

This, the second deliverable of Workpackage 6 is focused on the third objective: Demonstrate the results at key demonstrator sites across Europe where they form an integral part of a national strategy and help to solve different aspects of the problems facing the provision of inter-organisational seamless care.
WP6 is the demonstration workpackage and is considered to be the main vehicle for showing the results of the project to all that are interested in Healthcare Telematics. Based on the Common Products developed during WP3, the applications described in WP4 have been used to build End-User Applications that are demonstrated in six demonstrator sites. The target areas of action for these products and demonstrations refer to functional and information areas defined in the CEN/TC251 specifications for Healthcare Information System Architecture. All products have been built in a way that allows their positioning on a technical distribution platform, represented by CORBA-based middleware. This provides the pre-requirements of openness that favour the usage and integration in various systems and the compatibility with especially Internet, as the Internet is still fast increasing and Internet technology forms the basis of much of current ICT development, but also with other networks.

The commercial success of the products developed within InterCare will depend upon the demonstrator sites being high quality reference sites. The main purpose of WP6 therefore is to produce six, high quality, extensively utilised, demonstrator sites that deliver both data for the evaluation process as well as visible evidence of success to visitors of the sites. In deliverable D6.1 the demonstrator sites and the parameters for the data-collection to evaluate the services and the way these services would be made known to the general public were described. The purpose of this document, D6.2, is to present the results of the evaluation and promotional activities.

All demonstration and evaluation-activities are obviously closely linked to the exploitation and dissemination of the InterCare products, but these will be documented in deliverable D7.1.

Most evaluations have started in the end of March or later and lasted until the 15th of June. Due to delays in the previous workpackages, the demonstration and evaluation had to be performed in a period of about 3 months or less, which is a considerably shorter period compared to the originally planned 12 months. This is a result of delays during the previous stages of the InterCare-project. The project recognised that the overall results of the project and especially the demonstration and evaluation phase might be negatively impacted by this and requested an extension of 6 months until November 2000. Although we realised that this extension was not yet formally approved by the commission indications were that the extension would be approved. This view was also expressed by the reviewers during the project review on January 18th. Early February however, it became clear that an extension would be denied.

As a result the demonstration and evaluation phase had to be realised in a short period. As a result of very hard work during the last months we have been able to provide extensive evaluations of most of the planned services. Clear results on the quality of the InterCare services can be given due to validation of the services by health professionals, patients and the general public. Significant results can therefore be presented, although not entirely to the level that was originally planned.

The six demonstrator sites have evaluated the following applications (that are described in D4.1):

Site	**Application**	**Service**
Italy: Lombardia region	PATRES	Telematic Administration System
	REHAL	Resources for Health services Archive
	SANICARD	Chipcard with patient-information
	HICAR	Healthcare Information (Yellow Pages)
	RIC	Request Organiser distributed booking
	PROCOM	Transmission of reports
Netherlands: Schiedam region	PHARM-EPR	Electronic Patient Record
	EXHIS	Healthcare Information (Yellow Pages)
Sweden: Stockholm region	AHHC	Clinical information for Home Healthcare
	ERM	Referral Management
Finland: Helsinki region	IC-VPMR	Virtual Patient Medical Record
	IC-HIS SSR	Security Services and Report
	IC-HIS RS	Regional Statistics
	IC-PIDRM	Patient Index Reference Manager
	IC-HIS YP	Healthcare Information (Yellow Pages)
Ireland: North Eastern and Eastern Region	CARD2000	Medical Card Administration System
	DMS	Diabetes Management System
Greece: Crete region	PCDD	Patient Clinical Data Directory
	TCC	Tele-Cardiology and Tele-consultation

The evaluation results will first describe the data collection and analysis, this will determine the validity of the data. Then the results will of the evaluation will be given to determine if the aims, objectives and goals as described in D6.1 could be met.

The evaluation results of the different sites are described in separate chapters. In the first paragraph of each chapter an introduction is given, summarising the setup of the demonstration site. Specific information about the applications has previously been given in deliverable D4.1 Possible changes to the original plans that were expressed at the beginning of InterCare and changes in the evaluation-process compared to the way these were described in D6.1 are discussed in the second paragraph of each chapter. If additional evaluation was done this is mentioned in this paragraph as well.
The third paragraph deals with the promotional activities. Audience feedback on the demonstrations as well as promotional actions that have taken place are mentioned and evaluated in this paragraph.
The paragraph on used methods for data-collection include the questionnaires used as well as a description on how the evaluation took place. The methods for data-analysis are given in the fifth paragraph.
All results that are gathered from the demonstration dealing with the metrics described in D6.1 are validated in the paragraph on the validation results. Each chapter ends with the conclusions.

1.2 Methods used for evaluation

The evaluation-process consists of several stages of which planning is the first. The planning of the demonstration and evaluation is described in deliverable 6.1. D6.1 also describes the general methods used by all sites to generate the evaluation data. The starting point of the actual evaluation are the aims and objectives that were developed during workpackage two and translated in site-specific goals and metrics for each demonstration site in deliverable 6.1. The aims of each site correspond to one or more objectives. Goals were defined as specifications to these objectives. During the evaluation, specific metrics were used to assess if the products and applications provide the service to the level that is mentioned in the goal. The metrics for most sites were defined in close co-ordination with actual users. To get more uniformity and an overview of the evaluation-criteria in the various sites, a general metrics-matrix was compiled (shown in figure 1.1). The services provided by the applications are mentioned in the rows, the criteria used are summarised as column-headings.

Categories	Service:	Availability	User-friendliness	Reliability	Speed	Costs	Security	Other
Patient care	Diagnosis							
	Monitoring							
Customer Service	General Healthcare Information							
	Booking							
	Referral							
	Identification							
	Communication between HCP's							
	Direct communication to patients							
Management	Management information							
	Transparency							
	Legal aspects							
	Awareness							

Figure 1.1. Metrics-Matrix

Changes to the planning as described in D6.1 that occurred during the evaluation are given in the second paragraph for each site.

As the time available for data gathering has been rather short, the results that are presented are intermediate results. In those cases the demonstration and evaluation phase will continue till after the project and final evaluation will be done at a later time. For the relevant cases it is specified when these results will be available.

Questionnaires deliver most of the qualitative information gathered. Logfiles are used to collect more quantitative data. Expert-interviews are used as a third source of data-collection. The used methods for the analysis of the data are usually quite straightforward as generally the number of responses make it unnecessary to use a rigid statistical analysis. Comparisons with baseline data (if available) as well as between the various sources of information are an important part of the analysis.

2. ITALY

2.1 Introduction

The development and experimentation activities of the Italian InterCare pilot and demonstrator, were designed to be located on top of a common region-wide network of services that was in the process to be installed in Lombardia Region.
In D2.2 par. 6 the Italian Demonstrator Site has been described in terms of objectives, system architecture, system conditions and limits and so on.
Concerning the system architecture the aim of the project is the definition and the implementation of a logical and technological architecture for a communication and co-operation system that equally involves health professional, health care structure at local and central level and patients/citizen in the optimised process of request/offer/provision/ acquisition of health care services available in the Lombardia Region.
The logical general architecture of the system should be based on the following hierarchical levels:

- The healthcare central domain (regional services – 1st level), in which are present the services for identification, authorisation, validation and logging, in addition to the management of central databases and central systems;
- The local health care structures, including hospitals and services providers (2nd level), to which are connected
- Health care professionals, including general practitioners, specialists, pharmacists, diagnostic centres (3rd level)

All these actors are connected to the "Virtual Network" that provides to the possibility to use services and to communicate.

In D6.1 the parameters for the evaluation of the pilot site objectives have been developed and will be used in the following paragraphs to obtain the evaluation results.
It is very important to note that the evaluation process must be based on the InterCare healthcare services and not on the software.
The set of healthcare services put at disposal in the Lombardia Region is focussing and centring around the process of request and provision of care, seen in its medical as well as administrative aspects and it consists of the following applications:

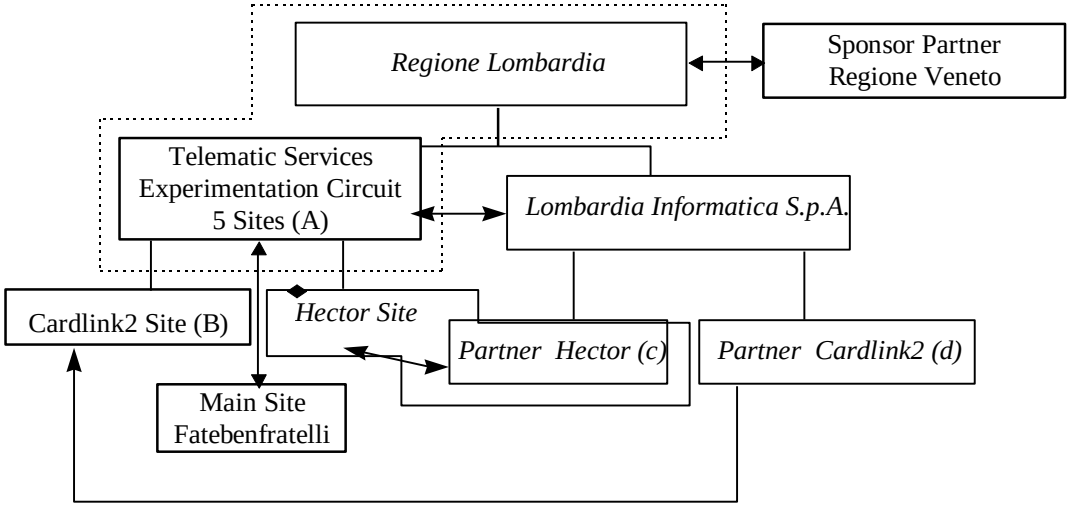
- PATRES
- REHAL
- SANICARD
- HICAR
- RIC
- PROCOM

The involved users in the demonstration activity are grouped as follow:

- Patient & Citizen
- GPs in primary care
- Local health Care Unit Clerk Personnel
- Hospital Health Care Professionals
- Hospital Administration (Health Direction managers)
- Pharmacy Personnel
- Regional Health Care Authority Administration – Clerks

	User's Role						
Application	***Patient citizen***	***GPs primary care***	***L.H.C.U. Clerk Personnel***	***Hospital H.C. Profess.***	***Hospital Administ.***	***Pharm. Person.***	***Regional Author. Admin. Clerk***
PATRES	✓	✓	✓	✓			✓
REHAL	✓	✓			✓		
SANICARD (CIVICARD)	✓	✓				✓	
HICAR	✓						
RIC	✓	✓		✓			
PROCOM			✓				✓

The different applications have been tested in various health care units in the Lombardia Region pilot site.
Indeed in the Lombardia Region there are several operational healthcare structures involved in the project. They are all under the control of the Lombardia Region Public Health Department. This body is responsible for a number of operational units as shown in the following diagram.



The Public Health Department is the main contractor for the Italian demonstration site. It has participated in the analysis and definition of the experimentation scenario and it has co-ordinated the involvement of the operational units during the experimentation period.
On July 97 the Lombardia Region has revised the guide principles of healthcare in Lombardia with the regional law LR 31/97. The aim of this low was to improve the efficiency and the quality of health care services in a mixed system: public and private. The structure of Health Care administration system has significantly changed. On the basis of the renewed principles and functions a territorial reorganization has been implemented in the Lombardia Region. It means that the Intercare Lombardia pilot sites have been changed too. In the following table the new components of the Lombardia pilot site are represented:

Local Healthcare Unit	**Healthcare Structure**
• Pavia LHCU • Bergamo LHCU • Lecco LHCU	• Lecco HC structure • San Donato HC struture

In particular the LHCU Lecco is involved in the SISS project experimentation phase (2000-2001) that is connected to the Italian demonstration of Intercare application. The Lecco province is composed by:

- 305.000 citizens;
- 275 physicians (GPs and paediatrics);
- 20 healthcare units
- 35 social charitable units
- 90 pharmacies

Lecco LHCU has been used as the main pre-validation site in analysis and technical development of the project.

Italian Intercare Partners

Role: Regione Lombardia has led the validation tasks and sequential exploitation plan, having high interest in the diffusion/distribution of positive results across the regional territory.

The Regione Lombardia Intercare associated partners are:

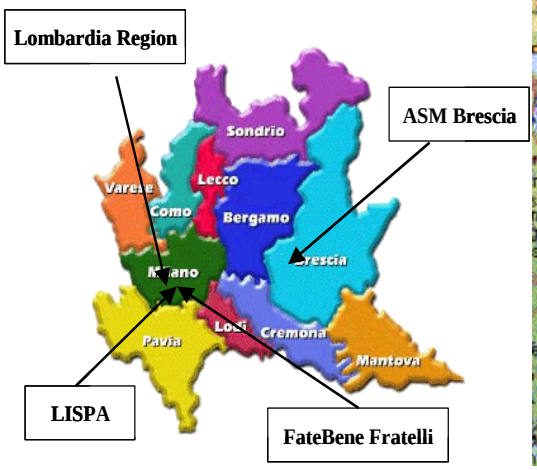
- LISPA – Lombardia Informatica S.p.A.
- ASM - Spedali Civili Brescia
- Fatebenefratelli Hospital - FBF

LISPA is a joint stock company founded in 1982 by the "Regione Lombardia" Local Government that is also its main shareholder; other public bodies participate in the corporate capital such as the Chamber of Commerce of the Lombardia Provinces, Unioncamere, etc. Lombardia Informatica has share holdings in several local firms and consortia oriented towards achieving projects of public interest. The institutional mission of Lombardia Informatica is the design, achievement and management of information Systems for Public Administration and the supply of the entire range of information services to Public Bodies in general and to the Regione Lombardia Government in particular. The market areas of Lombardia are the Regional Administration, Health Service, Geographical Information Systems, Municipalities and Public Bodies and in the last years commitments on foreign markets, Europe and South America, also in collaboration with Italian Foreign Ministry.
Role: LISPA has provided the local development and support for the region as well as providing the network infrastructure.

FBF is one of oldest hospitals in Milan. Two distinct areas compose it: the hospital nucleus and the ophthalmic institute. It was the main validation site and this is the reason way it has had the role of associated partner and not hidden inside the demonstration site. It has provided one of the local web servers used in the demonstration site.
Role: Fatebenefratelli has been used as pre-validation site in analysis and technical development of the project

ASM is the Municipal Services Board of Brescia, which is a town of 200,000 inhabitants situated in the North of Italy. ASM is totally owned by the Municipality of Brescia. ASM is in charge of several services for the municipality, the main ones concentrated in the management of technological networks. ASM acts as partner in the Cardlink2 project, an EC project sponsored by the DG XIII (Telematics Applications programme), dealing with the definition of a standard set of health emergency data recorded on a microchip card.
ASM is also technical co-ordinator of the Citycard project, funded by the Italian Public Function Department, dealing with the design and distribution of 20,000 multifunctional microchip cards in the city of Brescia (which are also, obviously, Cardlink2 cards).
Role: ASM has provided, through a concerted investment, the final users' cards and readers to the Brescia territory.

Associated Partners **LHCU, HC structures**



2.2 Changes to setup

The aim of the evaluation is to assess if in the demonstrator site the aims and the objectives have been realised using the InterCare services. To do this, for each objective one or more goals were specified.
The goal is a specific objective that meets the SMART criteria (i.e. that it is Specific, Measurable, Achievable, Realistic, and Time-dependent)
To assess the benefits of the InterCare applications these goals are assessed using metrics. A metric is defined as: a measurement of something specific.
So for each goal one or more metrics were defined.
Moreover, to be able to give an overview of the services and benefits of InterCare services, a metrics matrix is compiled. This matrix will also be used as a base for comparisons between the different demonstrations. The metrics-matrix is based on a classification of the InterCare benefits, dividing them up in three categories (patient care, customer services and management), and specifying a number of services for each category. The metrics criteria for each ones of these services are:

- Availability
- User-friendliness
- Reliability
- Speed
- Costs
- Security
- Other

In D6.1 par. 2.5 there is a detailed description of all the metrics applied in the Italian demonstrator site. In the following table all the metrics are summarized in a unique metrics matrix (PA=Patres; RE=Rehal; SA=Sanicard; HI=Hicar; RI=Ric: PR=Procom).

Categories:	*Service:*	**Availability**	**User-friendliness**	**Reliability**	**Speed**	**Costs**	**Security**	**Other**
Patient care	Diagnosis				SA4, SA5			
	Monitoring	RE2			RE1 SA7			
Customer Service	General Healthcare Information	HI1, HI2 RI1, RI2, RI3	HI3, HI4, HI5 RI5	HI6	HI7, HI8 RI4		SA8	
	Booking	RI3						
	Referral							
	Identification	PA1, PA2		PA3	PA4	PA5		
	Communica-tion between HCP's	PA6, PA7	PA8					
	Direct com-munication to patients				RI6			
Management	Management information	RE4, RE3 PR4	RE6 SA6 HI6	PA5 RE5	RE8, RE7 SA1, SA3 HI7, HI8 PR3	RI7 PR2	PR1	
	Transparency	RE9			SA2			
	Legal Aspects							
	Awareness							

The set up of the evaluation slightly changed, on the basis of the consideration, after the first trials, that the most interesting topics have to be related to acceptability and usability by the final target users, instead of putting large attention on the performance part of the evaluation metrics, that is normally supported by the underlying used technology. The revolution that the availability of such new applications implies in the health care context, forces to obtain mainly a first users positive feeling that is guided by the provision of access and sharing of information. This is a first step also for creating "culture" on health telematics applications, where the primary faced needs are very basic and are not including a great attention for "technicalities".

Due to unclear and varying security strategy on usage of PKI in Health telematics, the collection of PROCOM application metrics was not satisfactorily completed. Initial trials have been stopped before a significant amount of statistically valid data. The application has been then evaluated on general parameters that are actually lacking of supporting measures.

The metrics have been used in the questionnaire definition, to include all the necessary parameters for a complete evaluation of each InterCare application.

2.3 Results of promotional activities

2.3.1 WEB SITE

Four InterCare applications have been presented under a public web access: PATRES, RIC, HICAR, REHAL. For PROCOM and SANICARD (Civicard) applications the demonstration on an open access environment is not practically possible for the infrastructural requirements (tunnelling and certificates in a VPN and availability of cards and card reader/writer devices) so these two applications have been tested in other pilot sites.

The four applications have been put on public access at www.dgsan.lombardia.it/intercare (formerly www.sanita.regione.lombardia.it/intercare) so directly under the Regional Web Server for Health Care supported and hosted by Lombardia Regional Authority. These web-sites can be entered using for both the guest user-ID and the password "IC1".
The access to the applications under the web is now limited to a recognised group of user that have to apply for registration to the services, excluding the ones related to HICAR application that is absolutely public. On the other applications, namely PATRES, REHAL and RIC a downsized environment containing anyway a conspicuous set of information has been set up.
During the experimentation phase users have tested the applications and an evaluation has been done on the basis of the test results.

Moreover, from the index of patients – PATRES - only few patients have been considered accessible, making them anonymous and associating to them a certain number of clinical cases absolutely not related with such "fantasy" patients. Patient's data are just accessible in retrieval and not in update, having not available there the interface to patient administration systems as in a real environment.

To provide a certain feeling of the exploitation potential anyway, in the reference entry archive have been presented around 300,000 outpatient entries and around 10,000 hospitalisation entries, related to a theoretical quarter of year 1999 in a medium size hospital – REHAL - The hospital that has fictitiously related this info is indicated as Fatebenefratelli hospital. With these data, only few results of examinations have been put available and have been connected to the limited set of patients available for identification process.

For the part of booking application – RIC – the structures of two legacy booking systems have been replicated, using a commercial product named "Camelia-SAE" by LISpA. These two legacy-systems are fictitiously located in Fatebenefratelli and Cuggiono hospitals and will provide concurrent availability for the radiology department from the beginning of year 2001. Not all the speciality are provided, so it can happen that the server can answer with "no availability" for a particular request, or the availability just in one structure.
Surely the example of a complete abdomen echography, as per the scenario described, can give the important feature of distributed concurrent request of the application in several servers in the net.

For accessing and obtaining a grant in terms of user and password for the web, it is enough to write a request mail using the dedicated service presented in the web.

2.3.2 PUBLIC EXHIBITION

A set of public exhibitions has been planned, and some of them performed.

"**International Co-operation in Telemedicine and Health Informatics**" International conference and workshop, Brescia (Italy) May 13-15th 1999. Paper and presentation of "Telemedicine experiences in an integrated seamless care platform" (by Valerio Verderio-Lombardia Informatica S.p.A. and Doriano Basso – Fatebenefratelli Hospital)

Health Cards 99 - International Conference and Workshop, Milan (Italy) October 3rd-5th 1999. Presentation and papers included in the proceeding of :"Regional Networks and Cards: the InterCare Experience" (by Valerio Verderio – Lombardia Informatica S.p.A. and Claudio Beretta – Lombardia Region Health Sector) "Telematics and Cards Supporting Health Services: the implementation strategy of Lombardia Region" (by Walter Cossutta, Valerio Verderio – Lombardia Informatica S.p.A. and Claudio Beretta – Lombardia Region Health Sector)

SMAU 1999. International IT fair, Milan (Italy) first week of October 1999. In the Health care Sector. Stands of Lombardia Region and Lombardia Informatica S.p.A. with presentation of InterCare. Congress on Lombardia Region R&D projects and demonstrations

MOSAN 1999 – first week of October: inside the wider Milano Salute – Milan Health - congress, a particular session has been dedicated by the so called "Sistema Milano" (the group of the main hospitals and local health care units insisting in the metropolitan area) on the telematics experiences. To a selected group of auditors, including around 60 persons representing high management of health care structures from all over the region, a practical demonstration on the concepts and the practical support on distributed medical data acquisition has been provided.

Brescia, Civicard presentation, November 1999. A one day exhibition of the Civicard in all its components, including the health care sector of the card supporting "Sanicard" services. Invitation has bee given to all the representatives of public and private sectors in the Brescia province, plus InterCare partners.

Forum of the Italian Public Administration in Rome, 8th May 2000. Not dedicated section or presentation inside the congress have been made, but just poster presentation and guidance to the InterCare services via the Fatebenefratelli representative.

One other promotional activity for InterCare services has been planned and is under evaluation. It is the **MOSAN 2000** – Milan Health – congress, first and second week of October 2000. In this year, a round table can be prepared under the discussion of results had from experimentation and evaluation phases.

2.3.3 TRAINING COURSES

A certain number of days for training in the usage of the services in the net has been included and scheduled for a selected group of users, directly invited by the Lombardia Regional Health Care Authority. These users are responsible of Hospitals and Local Health care Unit also outside the original structures included in the experimentation circuit.
The appraisal of usage of Internet based technology and the acknowledgement on Internet based applications that are anticipating the consolidated set of applications coming soon in the Regional Health Care Netwrok in the SISS project, are considered important success factors

for the future development of a telematics approach and usage of applications inside the regional health care system.

April 20th, 2000, c/o Consorzio Cefriel (a post graduate training and consultancy structure partially participated by Lombardia Region): open day of InterCare concepts and applications, with a full day duration, focussing in the explanation and positioning of health care in internet and the new perspectives of services that can be available, practical training in finding medical related information in the net and appraisal on InterCare services. Several people invited from Local health Care Units and Hospitals in Lombardia Region. The session is dedicated to Health Direction personnel and responsible of Information Systems centres. The available on web InterCare applications have been presented. Some of the participants already had practical experience in usage of PROCOM and SANICARD (Civicard) not presented in this open day. The participants have filled a questionnaire for an additional evaluation and have had grants of access to the services from their structures for an in-depth evaluation.

May 25th, 2000, c/o Consorzio Cefriel: "Internet advanced concepts": a course attended by the auditors of the previous course (20/04/2000) and by new participants. ASM Brescia has performed a presentation of SANICARD application and the participants have filled other additional questionnaire contributing to an extension of the data collection for the InterCare evaluation phase.

2.4 Used methods for data-collection

Data collection is at the core of program evaluation and the data is worthless if it is not gathered in a reliable, valid manner and managed effectively, which often means building a management information database which allows evaluation staff to easily track important information in a well co-ordinated and efficient system.
There are probably as many different data collection strategies as there are new and innovative programs. Each program requires a customised data collection design to monitor the specific processes and outcomes that have been targeted.
The InterCare evaluation data collection has been developed during application trials at work for the declared metrics and have been combined with more general qualitative results coming from the two days sessions of applications presentation c/o Consorzio CEFRIEL. In these sessions an InterCare applications presentation has been performed and the participants have filled questionnaires prepared for the evaluation project phase, as the ones provided to single test evaluators.. The group of participants was composed by different types of potential final users of the InterCare services to avoid a complete evaluation and a substantial analysis of data. This moment was also beneficial to promote discussion on the applications and to create a common understanding in a varied and combined group of professionals.

The questionnaires presented to the evaluators are the following:

1. First Session

   The questionnaire of the first session consists of three tools with different type of data and different topics.
   Tool 1:"User identification";
   purpose: to collect data concerning the sample of users chosen for the evaluation process and concerning the computer science knowledge of this group.
   Tool2: "User needs";
   purpose: to collect data concerning general information of the work environment of the group and concerning the user needs.
   Tool3: "Applications evaluation";
   Purpose: to collect data concerning in details the InterCare applications. The questions are focused on the applications uses in terms of type and frequency; user interface;

application content with a comparison between the traditional and the telematics procedure.

2. Second Session
The questionnaire of the second session is more specific than the first one. The purpose is to identify better the user opinion about the different applications. The questions are oriented on the services general use and not on the software specific use.

Note that the SANICARD evaluation-questionnaires have been developed autonomously by ASM and were distributed in paper form to the final evaluators: they are not reported in the following pages, but only the achieved results.

Geen referentie naar bijlage?

2.5 Used methods for analysis

2.5.1 General evaluation concepts

The evaluation process is characterised by different methods summarised as follow:

- Planning Evaluation that assesses the understanding of project goals, objectives, strategies and timelines;
- Formative Evaluation that assesses ongoing project activities and it consists of the Implementation Evaluation and Progress Evaluation.
    - Implementation Evaluation assesses whether the project is being conducted as planned;
    - Progress Evaluation assesses the progress made by participants in meeting the project goals;
- Summative Evaluation that assesses project success, the extent to which the completed project has met its goals. It addresses the following types of questions:
        - Was the project successful?
        - Did the project meet the overall goals?
        - Did the participants and the final users benefit from the project?
        - What components were the most effective?
        - Were the results worth the project's cost?
        - Is this project replicable and transportable?

The evaluation that has been implemented concerning the InterCare applications in the Lombardia Region pilot site is similar to the last method above mentioned: the Summative Evaluation. Of course the question types are more detailed and focussed on the goals of each application and not on the general goal of the project. Results of such evaluation are combined with evaluation metrics result to enforce and combine the global outcome.

The evaluation process consists of five phases:
1. Develop evaluation questions
2. Match questions with appropriate information-gathering techniques
3. Collect data
4. Analyse data
5. Provide report information.

1. The development of evaluation questions consists of several steps:
    - Clarify goals and objectives of the evaluation
    - Identify and involve key stakeholders and audiences
    - Describe the intervention to be evaluated

- Formulate potential evaluation questions of interest to all stakeholders and audiences
- Determine resources available
- Prioritise and eliminate questions.

2. The next stage is the determination of the appropriate information-gathering techniques, including several steps:

- Select a general methodological approach
- Determine what sources of data would provide the information needed and assess the feasibility of the alternatives
- Select data collection techniques that would gather the desired information from the identified sources
- Develop a design matrix.

After the evaluation questions have been formulated, the most appropriate methods for obtaining answers must be chosen. In determining what approach to use, some initial questions need to be answered. First, is it better to do case studies, exploring the experiences of a small number of participants in depth or is it better to use a survey approach? In the latter case, do you need to survey all participants or can you select a sample? Do you want to look only at what happens to project participants or do you want to compare the experiences of participants with those of some appropriately selected comparison group of non-participants? How you answer some of these questions will affect the kinds of conclusions you can draw from your study.
Next you need to determine the kinds of data you want to use. Which one or ones to use depends on a number of factors, including the questions, the timeline and the re-sources available.
Finally, you need to decide on the appropriate mix of data collection techniques, including both quantitative and qualitative approaches.
In some instances qualitative data can be transformed into quantitative data using judgmental coding (for example grouping statements or themes into larger broad categories and obtaining frequencies). Conversely, well-designed quantitative studies will allow for qualitative inputs.
Once these decisions are made it is very helpful to summarise them in a "design matrix." Although there is no hard and fast rule, a design matrix usually includes the following elements:

- General evaluation questions
- Evaluation sub questions
- Variables to be examined and instruments/ approaches for gathering the data
- Respondents
- Data collection schedule.

3. Once the appropriate information-gathering techniques have been determined, the information must be collected.
The data should be gathered causing as little disruption as possible. Among other things, this means being sensitive to the schedules of the people or the project, as well as the schedule of the evaluation itself. It also may mean changing approaches as situations come up. For example, instead of asking a respondent to provide data on the characteristics of project participants-a task that may require considerable time on the part of the respondent to pull the data together and develop summary statistics-the data collector may have to work from raw data, applications, monthly reports, etc. and personally do the compilation.

4. Once the data are collected they must be analysed and interpreted. The steps to be followed in preparing the data for analysis and interpretation differ, depending on the type of data. The interpretation of qualitative data may in some cases be limited to descriptive narratives, but other qualitative data may lend them-selves to systematic analyses through the use of

quantitative approaches such as thematic coding or content analysis. Analysis includes several steps:

- Check the raw data and prepare data for analysis
- Conduct initial analysis based on the evaluation plan
- Conduct additional analyses based on the initial results
- Integrate and synthesise findings.

The first step in quantitative data analysis is the checking of data for responses that may be out of line or unlikely. Such instances include: selecting more than one answer when only one can be selected; always choosing the third alternative on a multiple-choice test of science concepts; reporting allocations of time that add up to more than 100 percent; inconsistent answers, etc. Where such problematic responses are found, it is frequently necessary to eliminate the item or items from the data to be analysed.
After this is done, the data are prepared for computer analysis; usually this involves coding and entering (keying) the data with verification and quality control procedures in place.
For the analysis of both qualitative and quantitative data there are statistical programs currently available on easily accessible software.

5. The final stage of the Project Evaluation is reporting what has been found.
The information needs to be provided in a manner and style that is appropriate, appealing, and compelling to the person being informed.

2.5.2 Data collection about Internet activity

Before starting with the analysis of InterCare applications it is useful to understand how the Internet activity is going on. Our InterCare applications are in general internet oriented and it is important to have an overview of the internet real situation: to know how many people use internet; to analyse which are the most information consulted on the web; who is interested and friendly in shopping something on-line, etc.
The population interested in the World Wide Web is growing every day and the quantity of information and services available on the web will satisfy each type of needs.

Internet in the World
In the following table the Internet activities are sorted by percentage of users. It is possible to see that the e-mail is the most used service, furthermore a lot of users access to the web for daily information such as weather and travel information, news…
One of the most striking pieces of evidence of how the Web has become woven into people's everyday lives is the amount of time people spend on the Internet and the frequency with which they go online. Every day 60% of those who have Internet access go online. Of the people who go online on an average day, 56% logged on exclusively from home, 21% logged on exclusively from work, and 20% logged on from home and work. Half of the Internet users (56%) that go online on any given day spend an hour or more online during all their online sessions; 36% spent a half hour to an hour; and about a quarter spent less than a half hour.
The 54% of the users access to health and medical information, this is encouraging data for the InterCare project.

It is also interesting to consider the Top Healthcare Application Areas Considered Most Important:

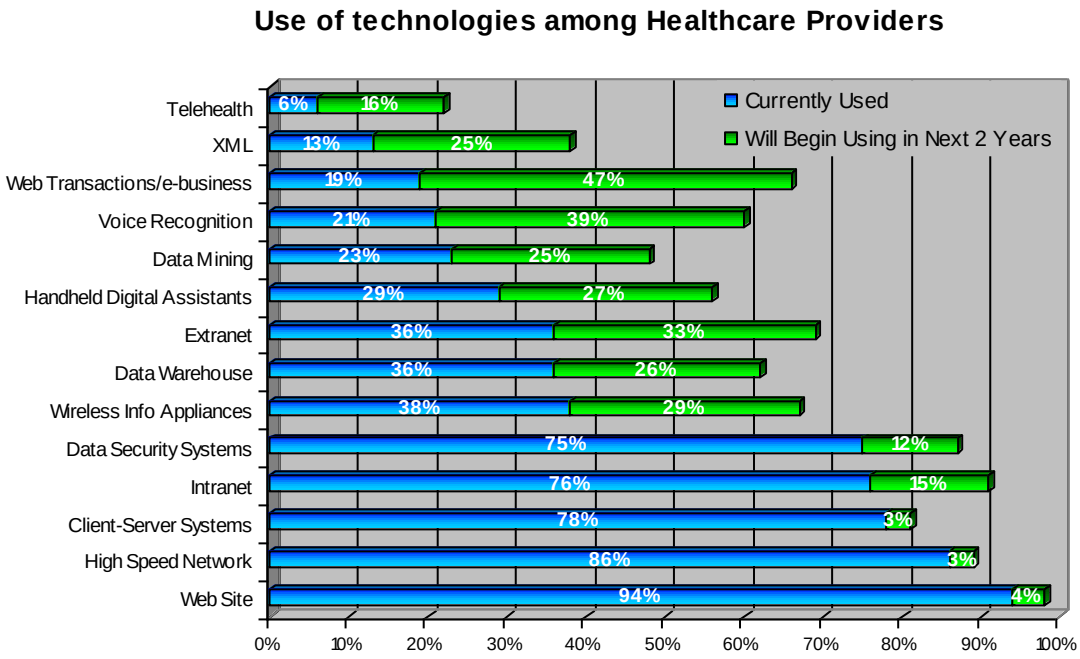
Web-based applications	71%
Clinical Data Repository	63%
Point-of-care Support	52%
Intelligence/Decision Support	52%
Enterprise Master Patient Index	47%

Financial Information Systems	36%
Ambulatory systems	26%
Supply Chain Management	24%
CRM/Call Centre	22%
Tele-medicine Systems	19%
ERP Systems	18%

Internet Activity	**Percentage**
Send e-mail	91%
Look for info on a hobby	76%
Research a product or service before buying it	74%
Get travel information	64%
Surf the Web for fun	63%
Check the weather	62%
Look for info about movies, books, or other leisure activities	62%
Get news	60%
Research for school or training	55%
Look for health/medical information	54%
Do any type of research	49%
Buy a product	48%
Visit a government Web site	47%
Send an instant message	45%
Get financial information	44%
Look information about a job	38%
Buy or make a reservation for travel	36%
Check sports scores	35%
Look for political news/information	35%
Listen to or download music	35%
Play a game	34%
Chat in a chat room or in an online discussion	28%
Look for information about a place to live	27%
Look for religious/spiritual information	21%
Bank online	17%
Participate in an online auction	15%
Buy or sell stocks, bonds, or mutual funds	12%
Gamble	5%

Concerning the technology adoption in Healthcare application field the results show that:

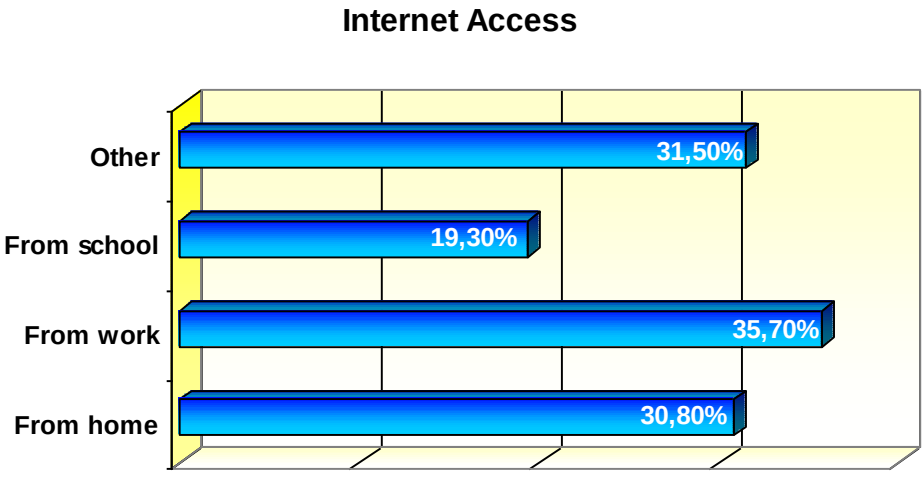
- Web Sites, High Speed Networks, Client-server systems, Intranet and Data Security Systems are the most widespread technologies currently
- Use of e-Business, Extranet and Voice Recognition are expected to increase at a higher rate.



Internet in Italy

Some important information concerning the Internet users in Italy is:

- 10 millions of people have been connected to Internet once;
- 5 millions of people are "Heavy Users, they access to Internet once per week at least;
- 41% of young are between 18 and 34 years old are Internet Users;
- 65% of students uses Internet;
- Until March 2001 the users will be 14.5 millions (6 millions women and 9 millions men; 54.9% young people; 81% students);
- 300000 e-commerce users on February 2000 and 400000 on April 2000

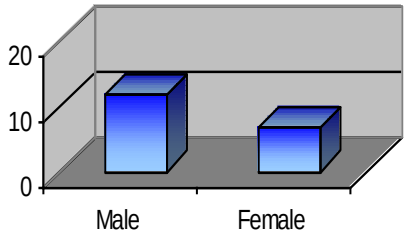


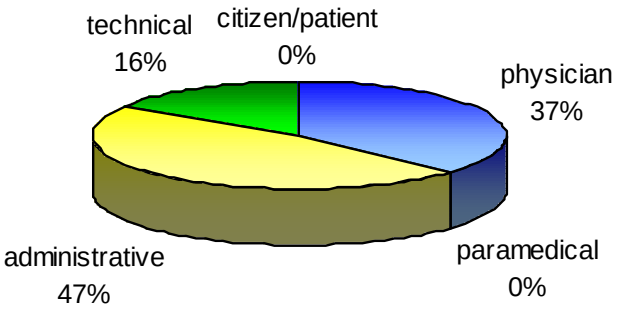
2.6 Validation results

Around 25 people participated to the evaluation using the first questionnaire set. The group characteristics are the following:

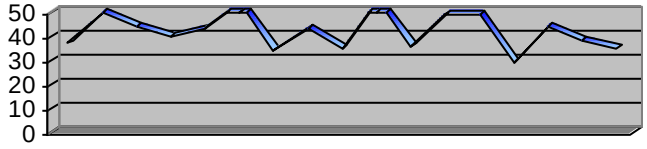
User Role

Sex



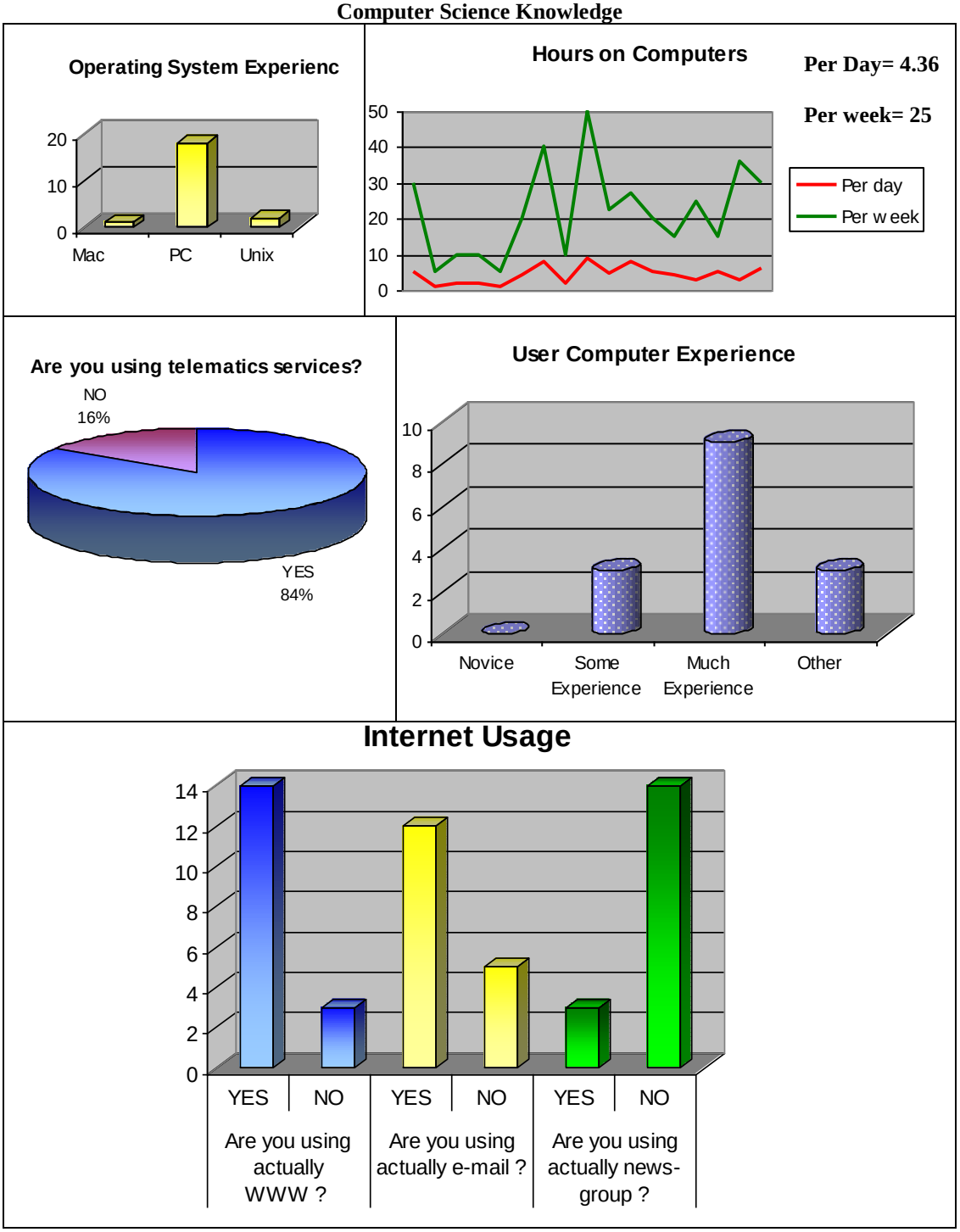


Age

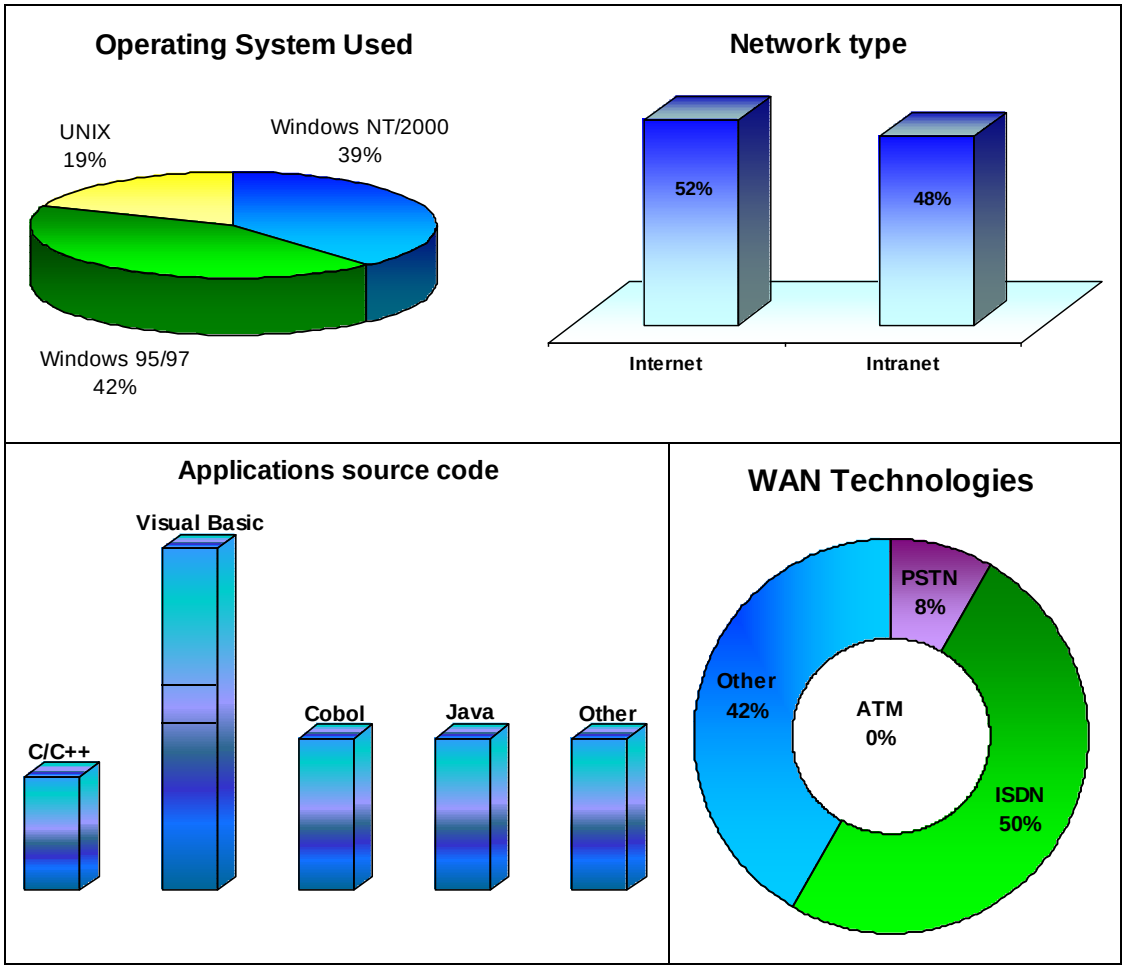


Mean age: 42.1

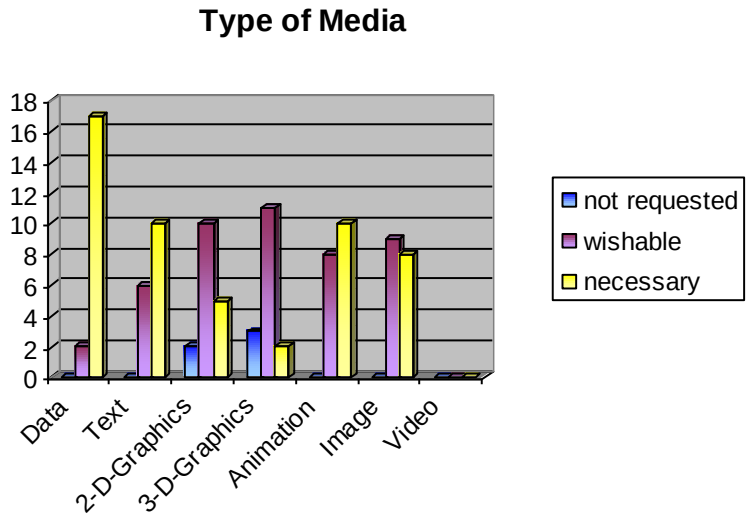
Computer Science Knowledge

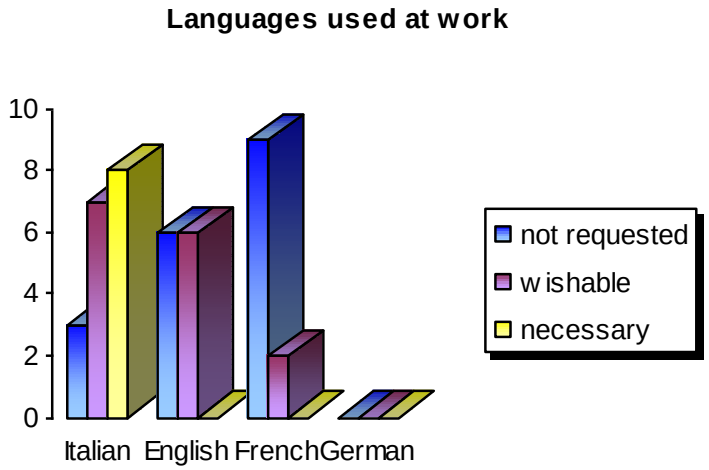


A survey concerning technology used in user's companies has been done and the results are shown in the following graphics. It is very important to know the type of environment where the InterCare services will be available because the applications and the products have to be customised on the basis of the user needs.

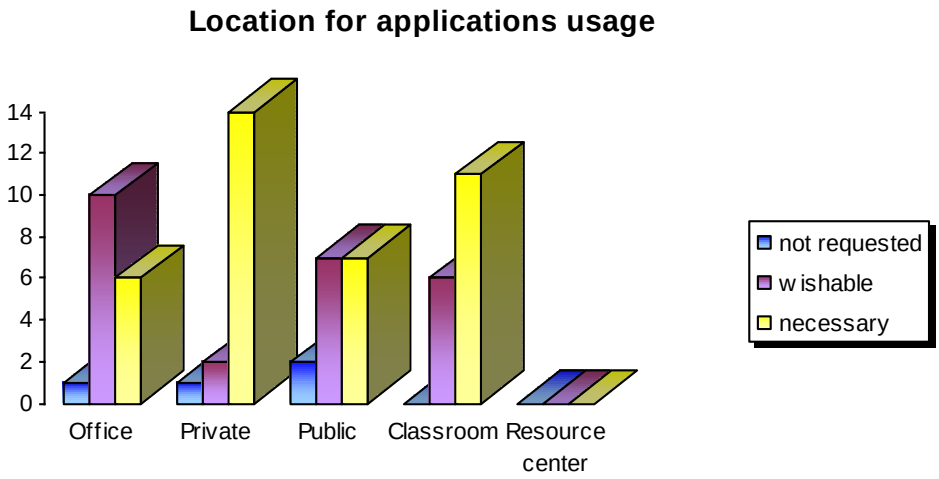


After a preliminary analysis concerning the focus group and the fundamentals users knowledge in computer science, it is necessary to analyse in depth the user needs.
The users usually work with the following type of media and they use the following languages during their works:

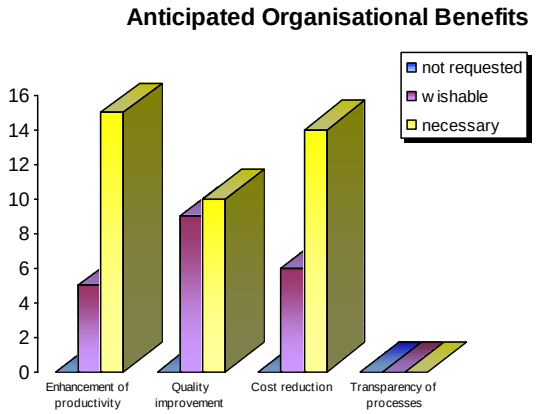


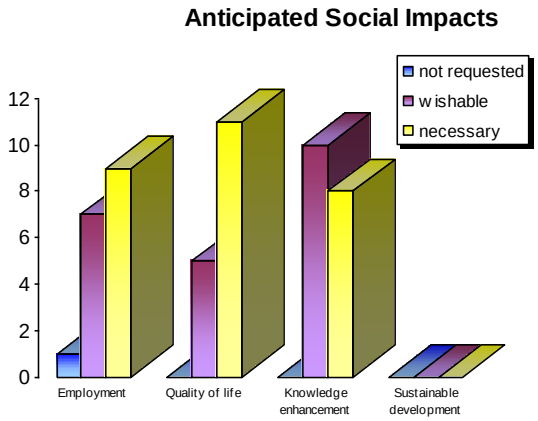


The locations for the InterCare applications usage in considered to be beneficial in:



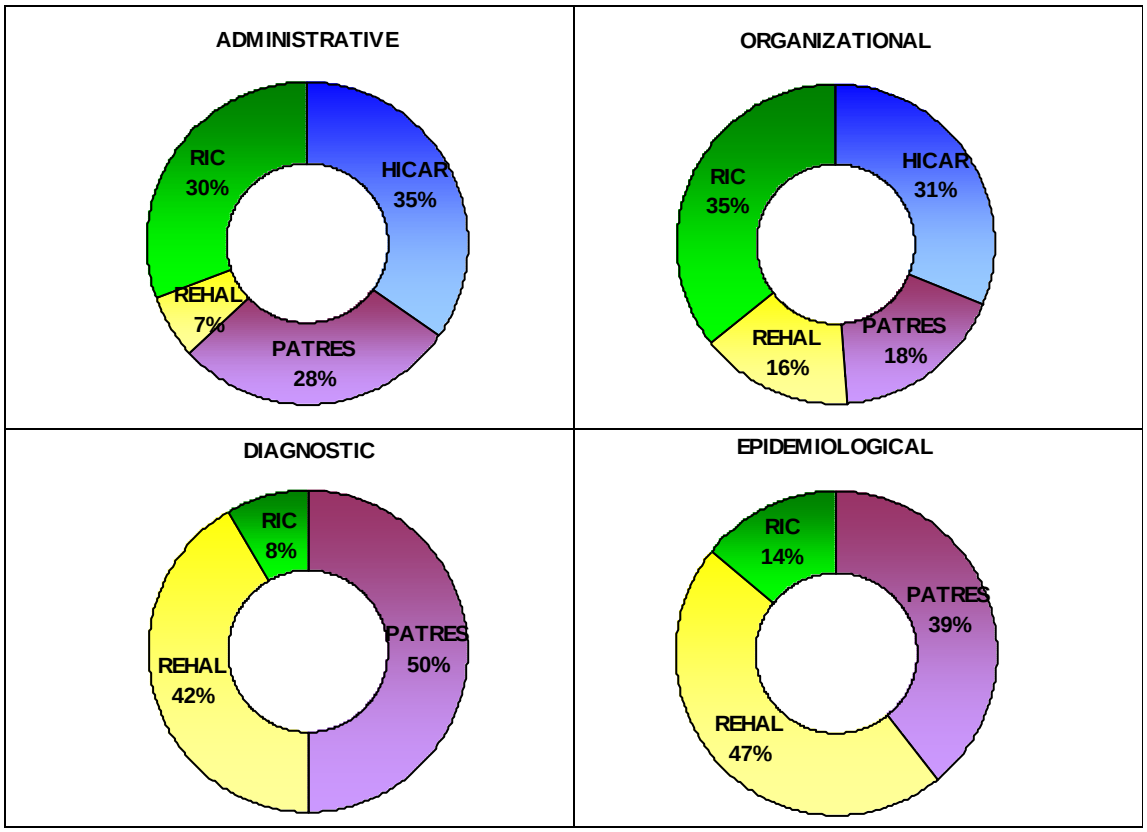
The InterCare applications will have the following benefits on the healthcare company and on the social life in general:





On the basis of the user needs evaluation results it is possible to analyse and evaluate each InterCare application in its own characteristics. First of all we classify the InterCare application considering the type of usage of each ones.

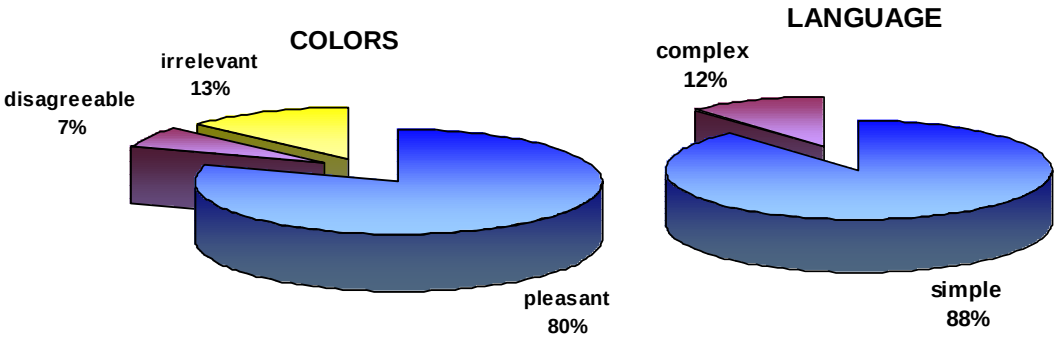
APPLICATION USING

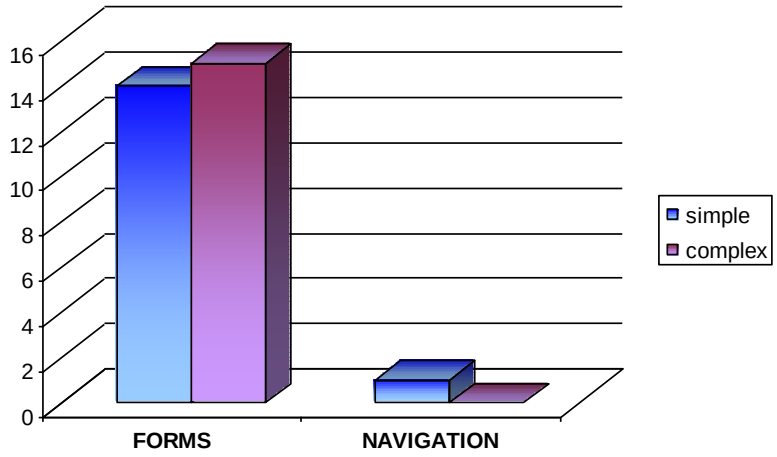


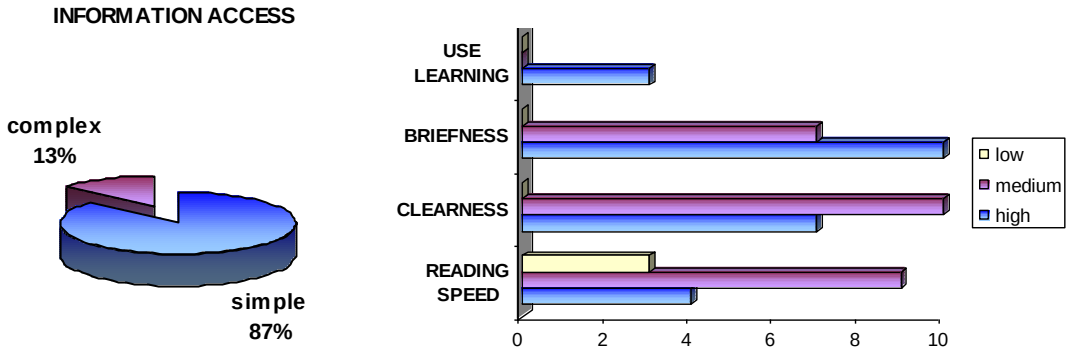
It is excluded from this representation of evaluation PROCOM application, that is totally administrative.
The mixture of context of the other applications is much more interesting, providing different views and exploitation of the data treated and the functions supported.

It is important to note that HICAR application doesn't have any using for diagnostic and epidemiological field but it is only oriented to administrative and organisational activity. PATRES application is mainly used in the diagnostic process; RIC is used on the organisational and administrative activity and REHAL is more oriented to diagnostic and epidemiological fields.

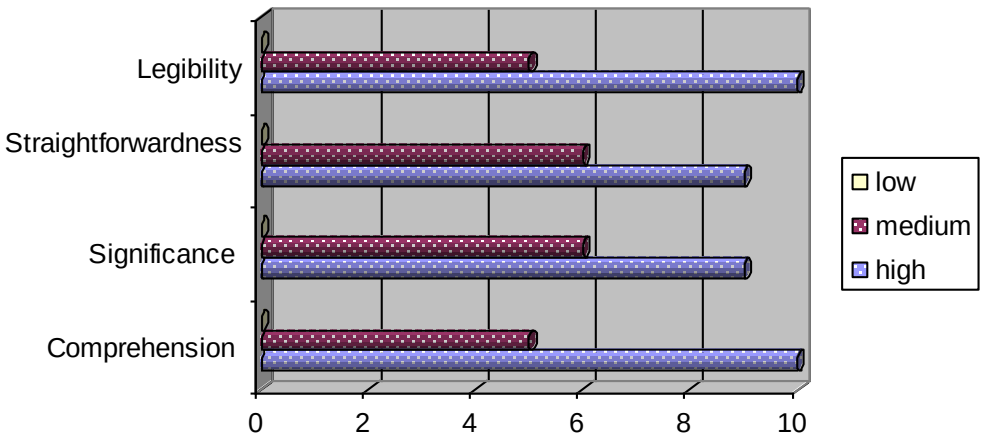
An other aspect very important for services, applications and products is to analyse the final user interface. This is a critical point and it is necessary to ask and to have opinion and advises from the final user. In general, for the producer is not so easy to note every particular and to understand the real needs of the users.
The applications interface has been analysed on the basis of the main significant parameters: i.e. easy to use; buttons; colours; etc.


COLORS
irrelevant
13%
disagreeable
7%
pleasant
80%
LANGUAGE
complex
12%
simple
88%


16
14
12
10
8
6
4
2
0
FORMS
NAVIGATION
simple
complex

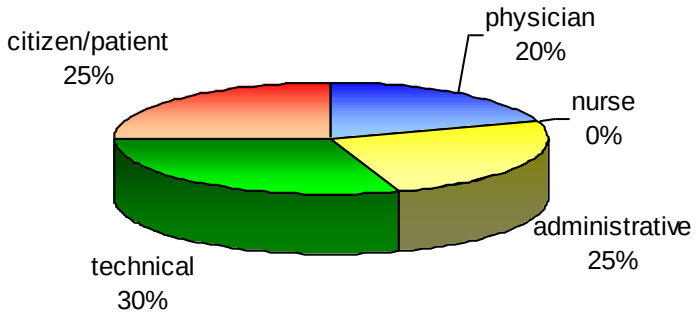

INFORMATION ACCESS
complex
13%
simple
87%
USE LEARNING
BRIEFNESS
CLEARNESS
READING SPEED
0
2
4
6
8
10
low
medium
high

BUTTONS

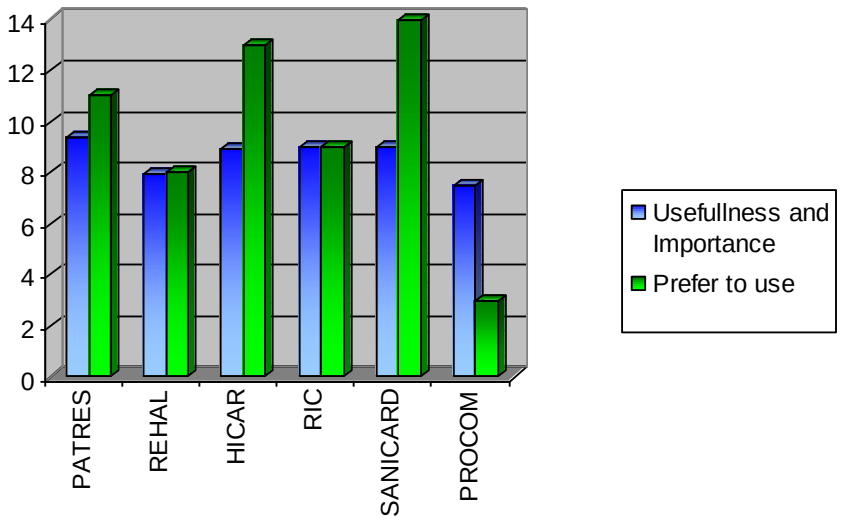


Colour, languages and information access through the InterCare interface are quite simple for the user; instead the forms seem to be complicated. It is necessary to improve also the interface in terms of clearness and reading speed.

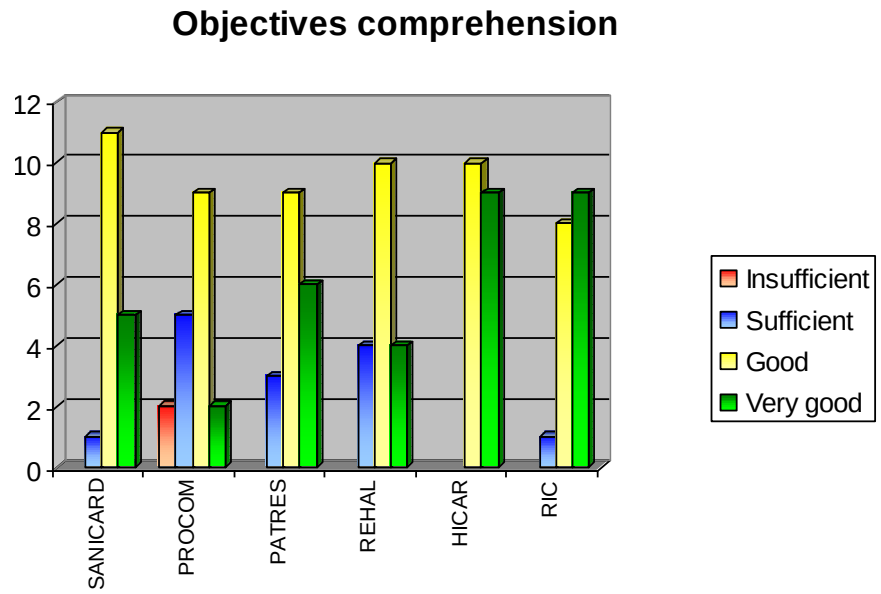
The analysis proceeds in depth for each InterCare application. The following graphs are the results of the first questionnaire last part and of the second questionnaire set. In particular more than 20 people have filled the second questionnaire. This focus group consists of the following type of users:

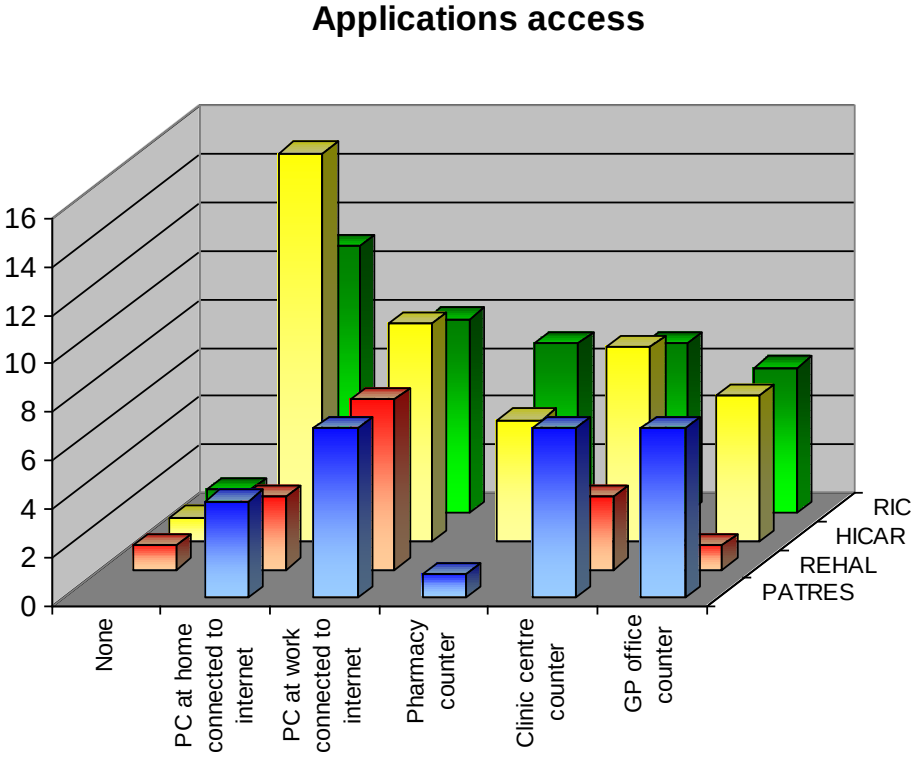


We have evaluated the usefulness and the importance of the InterCare applications in the users opinion and we have asked them which application they would prefer to use.



It is also important to understand if the users find clear the final applications objectives and how they could access to the services.
In general application objectives are clear; RIC and HICAR are the more comprehensive and users could access to the services using several modes. Considering how the user could access to the service, the major access point consists of the PC at home connected to Internet and the PC at work connected to Internet. Otherwise the user prefers the access through a counter positioned in the Clinical centre or in the General Practitioner office.

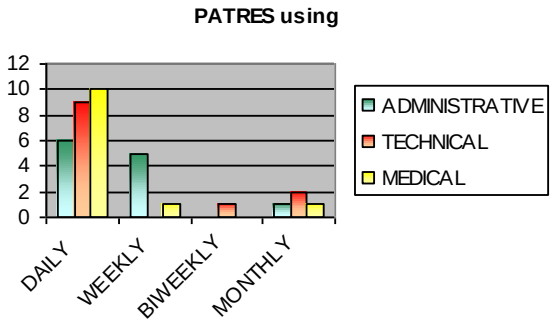


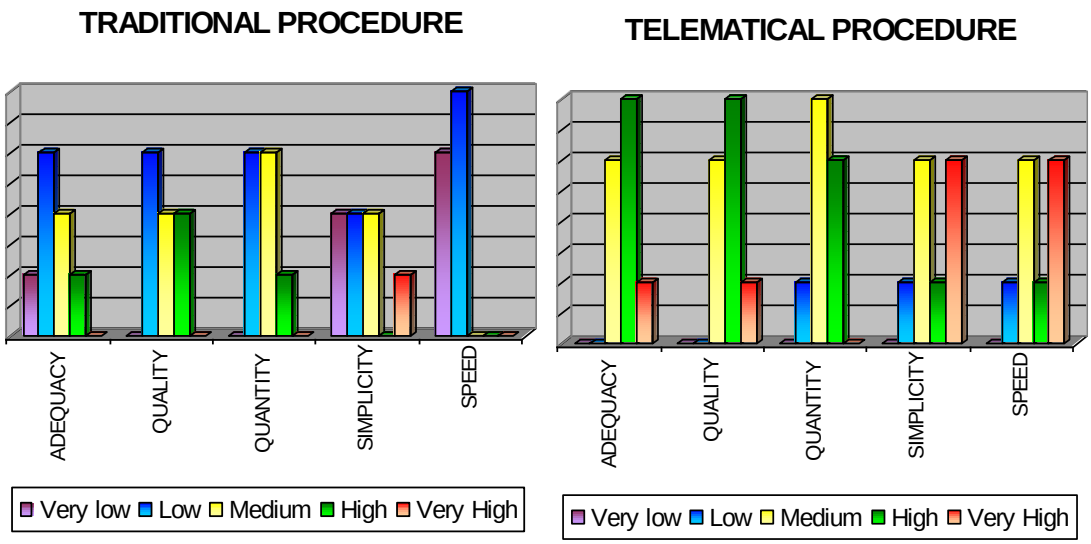


Also in this last graphic, PROCOM is not presented, requesting a dedicated access with tunnelling software that, at the moment, is not foreseen outside the trials installation points.
The analysis goes on details for each application. Several question have been formulated for PATRES, REHAL, HICAR and RIC and the results are shown in the following graphs..
SANICARD application has been analysed on the basis of log file and data collected during the pilot operations that have involved a group of 25 GPs and 14 pharmacies in Brescia province.
There are two common questions concerning the application using and the application content and then, for the different applications, there are some particular questions.

2.6.1 PATRES

The application is devoted to the unique identification of a patient present possibly in different local databases and its alignment vs. a central Regional Master Patient Index. The application allows inputting of querying parameters as coming from legacy systems vs. the Master Index. Recognised central information is then used for querying vs. other local patient databases.

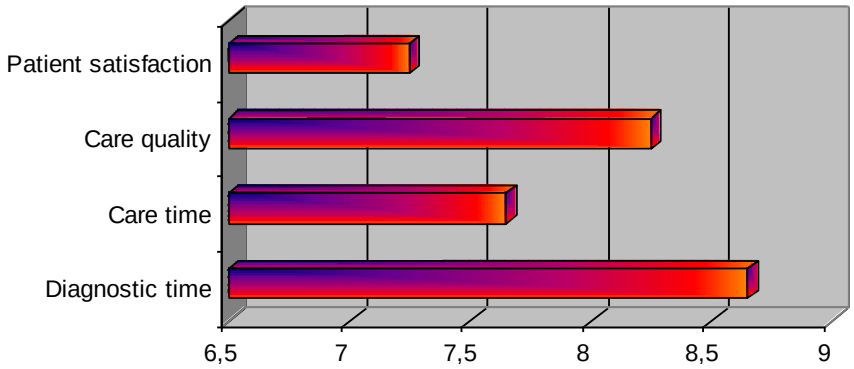




PATRES using is medical daily oriented and administrative weekly oriented. In terms of application content the traditional procedure is compared with the telematics procedure. It is clear that the telematics procedure give many advantages, mainly for the speed and the simplicity.

PATRES allows having the full patient clinic history available for the consultation. This application gives some advantages to the patient health status; a list of advantages follows:

PATRES Advantages



Sometimes the patient reports are included in the patient clinical records. We have asked to the users if they consider important to have the online availability of the patient reports and the results is that is not only important but it seems to be necessary; 9 is the mean value of users opinion (in a scale from 0 to 10)

This global evaluation is combined with results of direct testing in hospital setting trial environment. Coming back to the parameters considered as metrics, (FBF provided data) are giving the following:

Metric PA1 Rate between incorrect/incomplete information recorded as faults after monthly administrative controls.

Information from: monthly reports controlled
Method of collection: comparison with previous year-month report on a number of identifications Baseline-data: around 0.3% in average incorrect – 3% incomplete
Result achieved:
0,1% incorrect; 0,1% incomplete (error rate coming from original master data);references "quality item reported in graphs)

Metric PA2 Proved accessibility to a regional master index or local comparison indexes
Information from: users declaration/questionnaire
Method of collection: IC_PIDRM connection log
Baseline-data: 8 hours per working day, excluding saturday, sunday and holidays
Result Achieved:
Continuous availability in testing and evaluation period (> 3 months) [references speed in graphs]

Metric PA3 Proved reliability of a regional master index or local comparison indexes
Information from: users declaration/questionnaire
Method of collection: IC_PIDRM connection log
Baseline-data: statistic connection failure on similar archive in a private X.25 net, per year, reported to the experimentation duration.
Results achieved:
0,01 % target in X.25 private net, 0,04 tested in the system (3 episodes in system's accessibility due to connection problems. Solved problems in less then 15 minutes) [references quantity in graphs]

Metric PA4 Time passing from patient declaration of information changed and related acknowledgement by a doctor.

Information from: users declaration

Method of collection: questionnaire on difference between actual patient and recorded data

Baseline-data: average 2 months for updates distribution.

Results achieved:

average few second. Due to the current master regional index architecture, using daily updates, 1 day (references time item in graphs)

Metric PA5 Rate between costs reimbursement requests and received after monthly administrative controls, due to lack or incorrect patient identification

Information from: monthly reports controlled

Method of collection: comparison with previous year-month report on a number of identifications

Baseline-data: current 1999 health care organisation values.

Results achieved:

compared to PA1 (incorrectness implies no reimbursement). May 99 = 0,3%, May 2000 = 0,09%

Metric PA6 Information recorded provided by more than one professional/organisation

Information from: users, reference entry control

Method of collection: reference entry logs/questionnaires

Baseline-data: visibility just internal to the user's organisation

results achieved:

>20 professionals availability (references care quality item in graphs)

Metric PA7 Information recorded by one user read by more than one user

Information from: users, reference entry control

Method of collection: reference entry logs/questionnaires

Baseline-data: visibility just internal to the user's organisation

Results achieved:

average >3 (requester, performer, administration and, sometimes, diagnostics) [references diagnostic time in graphs)

Metric PA8 Unique interpretation of information provided by different users/organisations

Information from: users

Method of collection: questionnaires

Baseline-data: no base line data available

Results achieved:

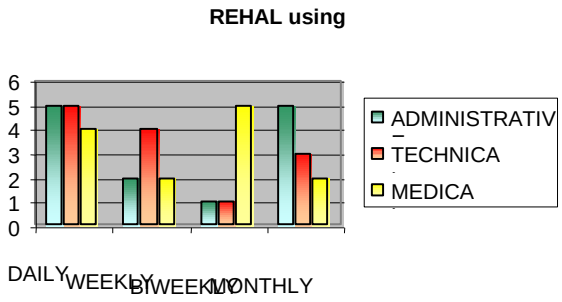
medium-high level of understanding. Large improvement (references simplicity in graphs)

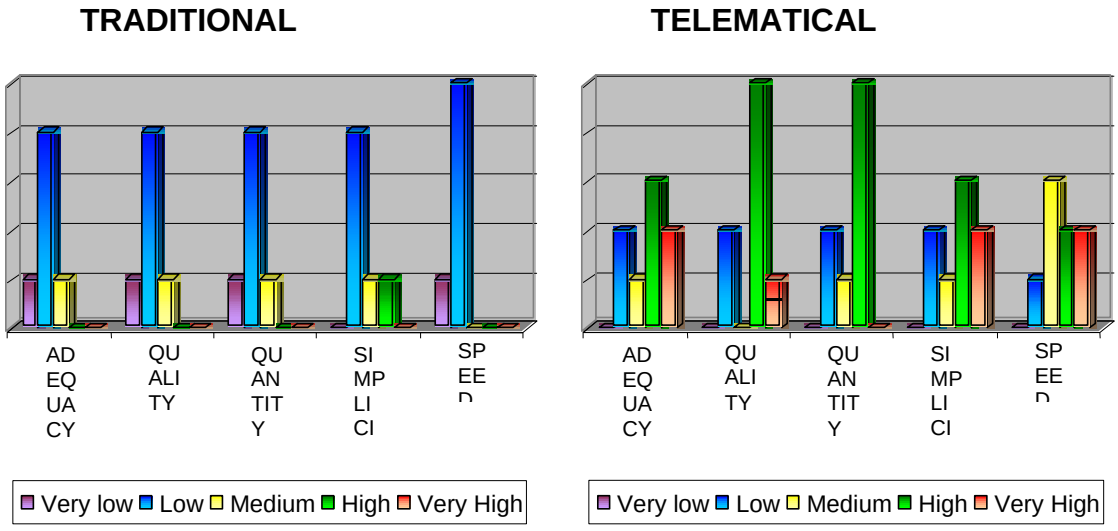
2.6.2 REHAL

The application provides a view applicable to different health care operational structures about the performance given in the provision of care both in hospitalisation and in outpatient care settings. In addition to the statistic values of the information obtained (i.e. all the admission/discharges in a certain period in a certain hospital for a certain diagnosis), the exploitation of IC_PIDRM functions provides the possibility of navigate in linked episodes happened (to the anonymous patient), offering research and epidemiological opportunity to the users.

REHAL using is distributed in terms of frequency and in terms of fields such as administrative, technical and medical.

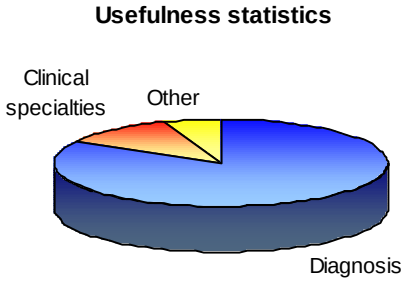
Concerning the application content the telematical procedure give some improvement in terms of quality and quantity of activity that can be performed in comparison with the traditional procedure.

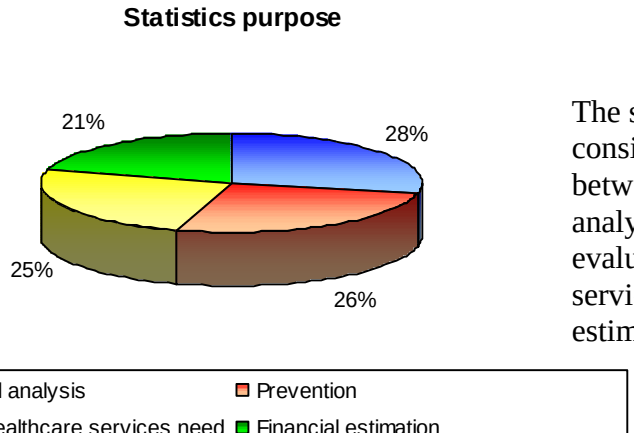




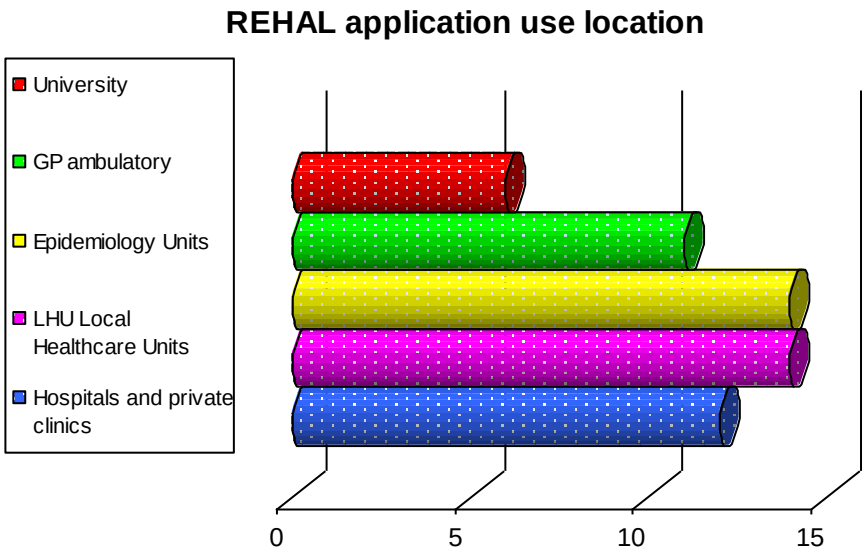
REHAL application gives the opportunity to choose between two types of filter statistics: by diagnosis or by clinical specialties.

The users opinion concerning the more useful of these filters is that the statistics per diagnosis are better than the statistics per clinical specialties. Some user suggests doing the statistics per services cost:





The statistics purpose is considered well distributed between: epidemiological analysis; prevention; evaluation of healthcare services need and financial estimation.



REHAL application could be used in different location on the basis of the main statistics purpose. It could be a good service for university researchers; General Practitioners; Epidemiologist; Specialists…

This global evaluation is combined with results of direct testing in hospital setting trial environment. Coming back to the parameters considered as metrics, (FBF provided data) are giving the following:

Metric RE1 Possibility of information gathering in the net as a co-operative environment
Information from: difference from contact occurrence and registration
Method of collection: log on reference entry.
Baseline-data: no base line data for similar availability in electronic format. Current verbal/telephone process, and limited in data retrieval
Results achieved:
Delta percentage 2,7%: reference entry associated to a set of additional, medical process specific information (references quantity item in graphs)

Metric RE2 Transparency and multi-users exploitation of information
Information from: users
Method of collection: questionnaire, users logging
Baseline-data: no base line data for similar availability
Results achieved:
Transparent multipurpose application (references purpose in graphs)

Metric RE3 Co-operative sense in the care information generated
Information from: users
Method of collection: questionnaires
Baseline-data: current single organisation's relation sense
Results achieved:
High co-operative sense (references use location in graphs)

Metric RE4 Harmonisation of the working manner promoting knowledge exchange – software
Information from: systems connected
Method of collection: number of interfaces available
Baseline-data: current none available
Results achieved:
4 interfaces available (SDO, SAN, IRIS, Camelia software products - an expected increasing number in full engineering process)

Metric RE5 Harmonisation of the working manner promoting knowledge exchange – terminology
Information from: users
Method of collection: questionnaires vs. presentation using one single terminology
Baseline-data: current custom – not available (availability with acceptance target)
Results achieved:
harmonisation and acknowledgement of unified terminology (references quality items in graphs)

Metric RE6 Immediate and simple presentation of information
Information from: HCI, users
Method of collection: questionnaires
Baseline-data: no base line data
Results achieved:
fast and acceptable level (references speed and simplicity items in graphs)

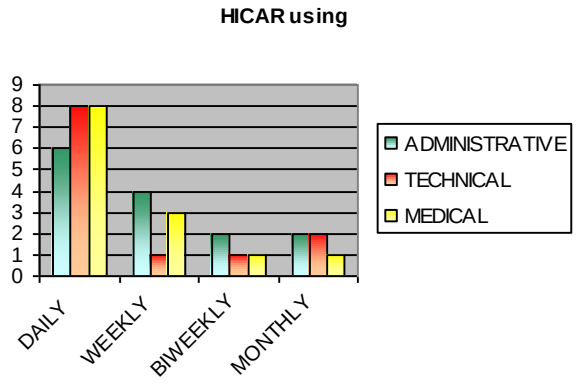
Metric RE7 Importance of an on-line data exchange in care provision – general
Information from: IC_PIDRM reference entry
Method of collection: log on reference entry data vs actual date.
Baseline-data: in standard format and in one organisation, one month
Results achieved:
Delta time around 1,2 days (9 working hours for inpatients entries, close to 0 for outpatient referred) [references speed in graphs]

Metric RE8 Dramatic reduction of uncertain – ambiguous researches of information
Information from: difference from contact occurrence and registration
Method of collection: log on reference entry.
Baseline-data: no base line data for similar availability in electronic format.
Current verbal/telephone process, and limited in data retrieval
Results achieved:
Number of logs per connection on specific reference around 1.3 (references adequacy item in graphs)

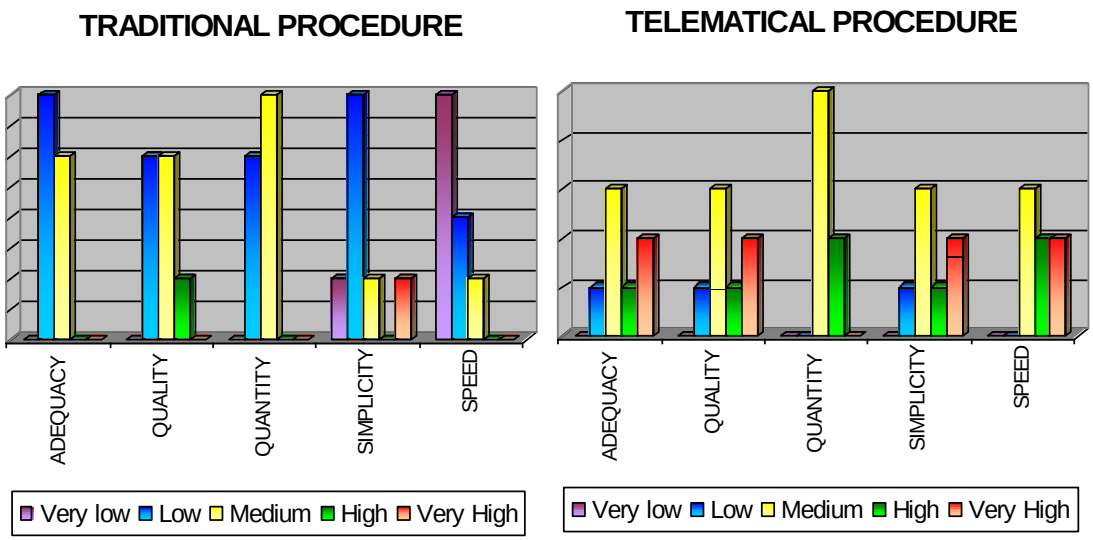
Metric RE9 Stimulation comparison among provider for a better quality of care services
Information from: users-health care directors
Method of collection: questionnaires.
Baseline-data: current written reports per year/semester with no detail.
Reluctance.
Results achieved:
No expression. Negative evaluation

2.6.3 HICAR

The application is a combination and the result of a synergy between InterCare development and telematics services and Teleregions SUN2 project (with “InfoCare” application) for the creation of regionally approved and standardised in contents yellow pages for health care. The exploitation is transforming these kind of yellow pages, accessible to all the citizens, from a static descriptive presentation of a healthcare organisation in a powerful and precise public service to know about the services provided in a Region always with "live" information, accessed in existing operational legacy systems dedicated to daily activities.



The application is more oriented to an administrative and technical daily use.

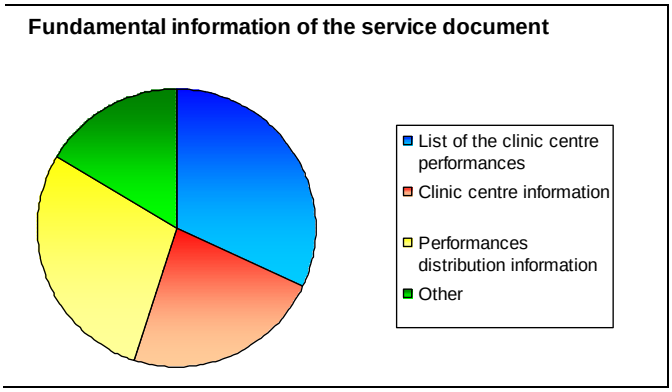


The application is so constituted by a typical web based software with html pages, that are not static, but that are relying on a resources database. From the application is possible to interrogate the presence and the availability of health care resources in the Region.

The improvement between the two procedures interests in general every aspect mentioned in the above reported graphics: adequacy, quality, quantity, simplicity and speed.

HICAR application has to supply the following information:

- List of the clinic centre performances;
- Clinic centre information
- Performances supply information;
- Other (waiting time; pricing list; terms of payment,…)



This global evaluation is combined with results of direct testing in hospital setting trial environment. Coming back to the parameters considered as metrics, (FBF provided data) are giving the following:

Metric HI1: number of centres (hospitals or other health structures) that are included in the DB (quick manual measure).
No baseline.
Results achieved:
< 5 (references adequacy and quantity items in graphs)

Metric HI2: number of services offered by the centres included in the DB. It can be obtained automatically by the software Infocare periodically (weekly) on which HICAR is relying.
No baseline.
>100 *(references adequacy and quantity items in graphs)*

HI3: number of accesses to the Web Site. When the site will be published it will be possible to use tools normally available on the WWW servers to log the traffic in the site page by page.
Results achieved:
< 100 per day (*(references simplicity items in graphs)*

Metric HI4: see HI3.

Metric HI5: this measure can be both quantitative (time duration of the connection to the site available from the log file of the server) and qualitative. In this second case the information can be gathered by a questionnaire given to the citizens that will ask if the service is an improvement with respect to old media (paper booklets, phone calls).
Baseline data for this scenario are the statistics of the use of old media (paper, phone) which can be included in the requested data in the questionnaire.
Results achieved:
connection time around 5 minutes (references speed in graphs)

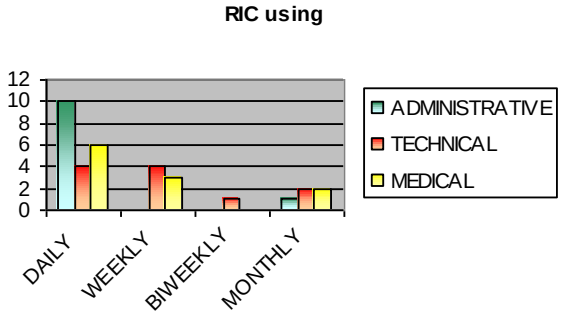
Metric HI6: number of record in the DB that are updated in a unit of time (week, month…). This measure allows the understanding of the easiness to maintain the data correct as time passes. This measure can be obtained from the log file of our software.
Results achieved:
No updates recorded during experimentation. Negative result (references quality and simplicity in graphs)

Metric HI7: As data entry can be made by 'light' modules of our software, the number of these 'peripheral' modules can be important to understand how many centres can update their information quickly.
Results achieved
< 5 Negative result (references adequacy item in graphs)

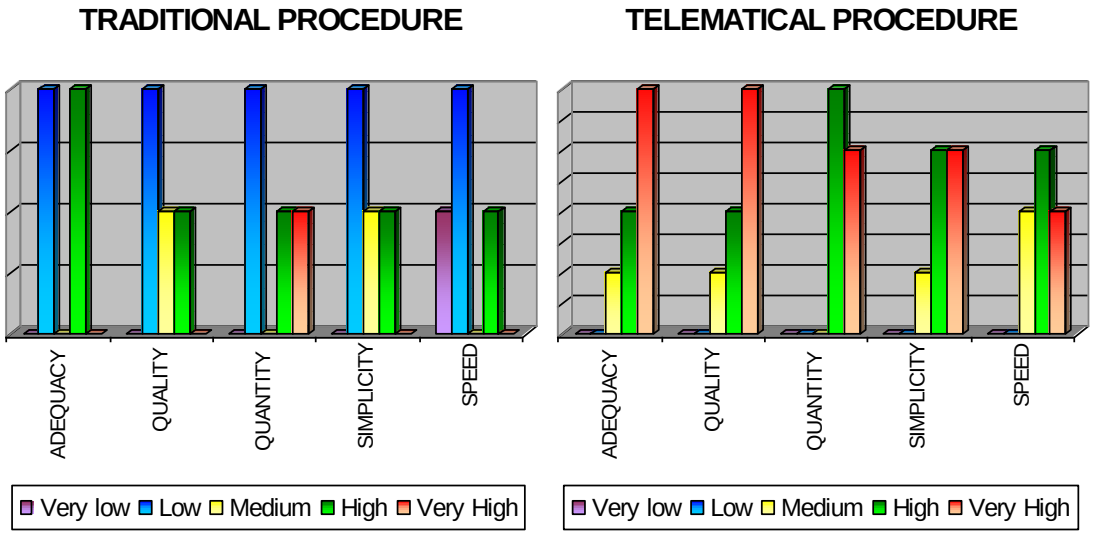
Metric HI8: time between the change of data and the publishing of the new page. This is probably the most important metric as it measures somehow the reliability of the published data. It can be obtained comparing the log files of the data-entry modules with the log of the www server showing the upload of the new page. The baseline for this metric is always that referred to the old media (paper especially).
Results achieved:
Just in trial environment. 1 day for HICAR, 3-4 days for static webs, around 3 months for paper based pages (references quality item in graphs)

2.6.4 RIC

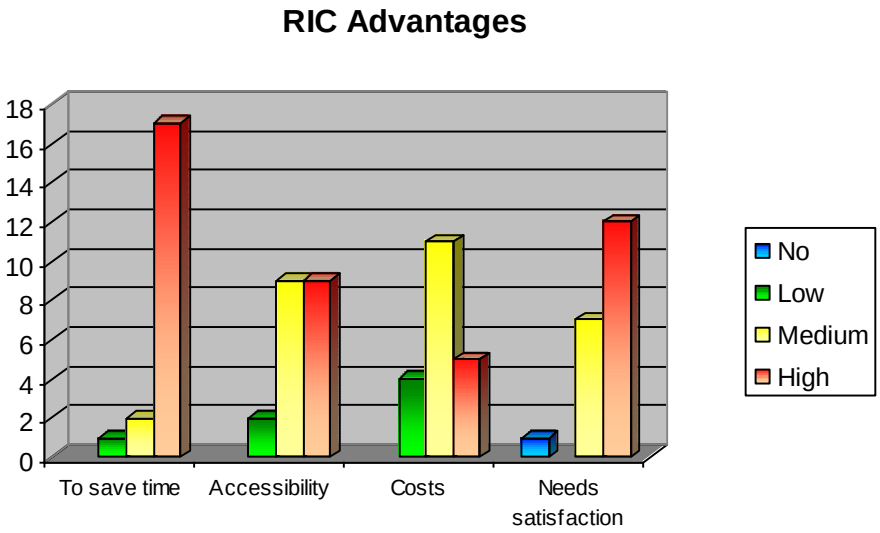
The application is offered to provide facilities on a distributed booking process in the net both for health care professionals and patients, both seen as requesters. After passing through a necessary identification process both of the patient and the healthcare professional as authorised requester, on the basis of the healthcare service identified a searching on availability on the several structures in the net is made and the possibility for booking shown.



The application is more oriented to a daily use in the administrative and medical fields.

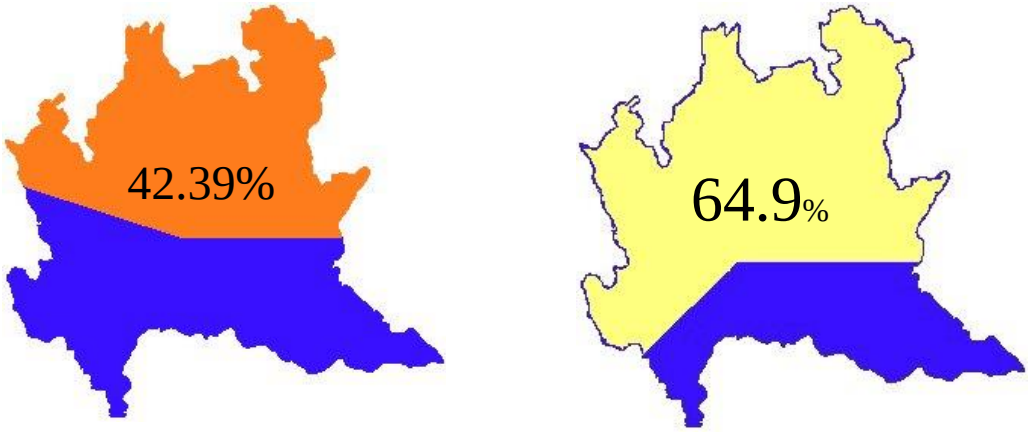


The difference between the traditional and the telematics procedure is big and it interests mainly the adequacy, the quality and the simplicity of services.
Other RIC advantages are: to save time in the booking process, to access information in an easy way; to save costs; to improve user needs satisfaction (i.e. the user can choose the nearest structure for the clinical exam or the cheapest performance). To save time and user needs satisfaction are more important than the other advantages.



An analysis concerning CUP (booking centre) in Lombardia Region has been done during the development of RIC application to understand the user needs. We report a summary of the results analysis:

- In Lombardia Region there are 519 clinical booking counter and only the 42.39% have a telephone access;
- Only the 64.9% of 257 clinical structures have a clinical booking counter with an information system management. The 166 clinical structures with a CUP information system management have different type of operative system: Unix (39.86%); Windows NT (13.07%); Windows 95/98/3.1, DOS, AS/400, Aix, Bull (47.07%).



This global evaluation is combined with results of direct testing in hospital setting trial environment. Coming back to the parameters considered as metrics, (FBF provided data) are giving the following:

Metric RI1: Does the citizen think to have the possibility to book service from anywhere.
Information from: citizen;
Method of collection: a questionnaire is presented to citizen at the end of the demonstration, rating the accessibility of the application on a scale of 1 (low accessibility) to 5 (high accessibility).
Results achieved:
3 accessibility not yet from home. Available from General Practitioner offices and (partly) from pharmacies (references accessibility item in graphs)

Metric RI2: Number of visible centres
Information from: site manager;
Method of collection: questionnaires
Results achieved:
<5. Less than the result expected. (references accessibility in graphs)

Metric RI3: Does the citizen think that he can declare his preferences.
Information from: citizen;
Method of collection: a questionnaire is presented to citizen at the end of the demonstration, rating the flexibility of the application on a scale of 1 (low flexibility) to 5 (high flexibility).
Results achieved:
test on a limited sample of users. Score around 4. (references adequacy and needs satisfaction in graphs)

Metric RI4: Does the citizen think to interact with a quick service
Information from: citizen;
Method of collection: a questionnaire is presented to citizen at the end of the demonstration, rating the speed of the application on a scale of 1 (not fast at all) to 5 (very fast).
Results achieved:
Test on a limited sample of users. Score around 5 (references to speed item in graphs)

Metric RI5: Does the citizen think to interact with an easy service
Information from: citizen;
Method of collection: a questionnaire is presented to citizen at the end of the demonstration, rating the user-friendliness of the application on a scale of 1 to 5.
Results achieved:
Test on a limited sample of users. Score around 4 (references to simplicity item in graphs)

Metric RI6: Does the citizen think to have a reply in real time
Information from: citizen;
Method of collection: a questionnaire is presented to citizen at the end of the demonstration, rating the speed of the application on a scale of 1 to 5.
Results achieved:
Test on a limited sample of users. Score around 5 (references to speed, save time and needs satisfaction items in graphs)

Metric RI7: Number of "no show" related to the current booking system
Information from: healthcare manager;
Method of collection: the number of "no show" are counted on a monthly basis (before and after the use of RIC).
Results achieved:
Having been used for particular urgent cases, the "no show" percentage was 0 (references to needs satisfaction item in graphs)

2.6.5 PROCOM

The application, as a refinement of KHIRA application set in Teleregions SUN2 project, aims to improve controlled and secured transmission of reports from decentralised units to central domain, substituting a previous manual process of data passing. The application, linked to electronic mailing facilities, controls data formal correctness before sending and creates a secure token during transmission (tunnelling). Used at the moment only for performances reporting, the same can be extended to type of professional communications. In addition, some central services about support of correctness of data recording can also be invoked from remote sites (i.e. DRGs calculation using standard certified software).
No significant evaluation has been performed on the metrics for this InterCare application.
Anyway, available data are here under reported, not considered valid for final conclusions.

Metric PR1 Demonstration of security in health care transactions
Information from: connection log
Method of collection: feeling of user/acceptance, intrusion tests
Baseline-data: no baseline data
Results achieved:
Users do not see significant differences in secuirity as theorised and implemented in InterCare and tunnelling tools. Negative evaluation on expectations. A couple of intrusion test performed were positive (no intrusion)

Metric PR2 Realising infrastructure costs decrement
Information from: users declaration/questionnaire
Method of collection: questionnaire
Baseline-data: costs of dedicated lines vs. cost of VPN services
Results achieved:
The infrastructural needs (hw and sw components) should provide costs saving only on a wide usage. Too limited trails for definition.

Metric PR3 Realising faster and better process of interaction from periphery to central authority
Information from: users declaration/questionnaire
Method of collection: application server log
Baseline-data: time passed between sending and receiving notification and feedback on administrative reports.
Results achieved:
Immediate notification, less than 1 week for control checks and feedback. Great improvement compared to the months delayed communication in previous settings.

Metric PA4 Extending the service with wide acceptance.
Information from: users connections
Method of collection: users registered to the server/ expressions to participate

Baseline-data: Number of user in TeleRegions Sun experimentation vs. current installations.
Results achieved:
Currently no significant extension. This is also due to the policy and decisions by central health authority, still choosing final secure communication environment. Negative result vs. expectations.

2.6.6 SANICARD

The current application is provided as a special module for health care support provided inside the so called "Civicard" used in Brescia province and it represents a prototype of the possible future regional card. The health care supported functions are constituting one of the various dedicated modules in the chip of the "Civicard", together with other dedicated sectors devoted to transport, public services etc. The application aims to read and register on the card both patient basics information, emergency data and an abstract of the requests of care (services and drugs). During the process of registration of new abstract request data, these info are also passed to a central archive under a "reference entry" behaviour, in such a way in the process of provision (i.e. of drugs from pharmacy or outpatient care in ambulatory settings) the data can be cross-checked and updated without the support of paper reporting. For this scope and considering the maximum need of transparency for the usage of card requested by healthcare professional, the card libraries are interfaced via an encapsulation of functions inside a set of commercial General Practitioner (as the main requester) products (i.e. Iatros software in Brescia). The same applies for the main providers (i.e. pharmacy terminal interfaces).
With reference to the metrics defined in the par. 2.5 D6.1 the SANICARD evaluation results are reported as follow:

Metric SA1 Rate between the time needed to let the information about a certain drug prescription and release arrive at the central data server and the time actually needed following a traditional procedure

Information from: GP, chemistry, the Central data server
Method of collection: specific log recording at the GP's and Chemistry's and sent to the Central data server
Baseline-data: estimations based on actual procedures

Using SANICARD system, information about drug prescriptions is stored in a log-file into GP's PCs.
Using SANICARD system, information about drug release is stored in a log-file into Chemistry's PCs.
As both chemistries and GPs are connected to the Central Data Server, time to collect data can be set daily. An automatic procedure can join data: we can have data on Central Server in two day.
Time needed today to have the same data using traditional procedure is more or less a month.
So rate is
SA1= 2/30=0.0666

Metric SA2 Rate between the time needed to treat data for drugs prescription and the time needed following traditional procedures

Information from: the Central data server
Method of collection: specific log recording at the central data server.
Baseline-data: estimations based on actual procedures

Using SANICARD system, data logged are correct: GP's software checks the "rightness" of prescription, taking drugs kind from a National Data Base, that is the same used by chemistry's software: then, it stores also drugs prices, taken as well from the National Data Base, that is correct. The only problem is that the two copies of Dbase have to be identical. In

this case, to treat data for drug prescriptions means to join data coming from chemistries and GP's, and to calculate how much money has to be refund to the chemistries. To do this, we need maximum 3 days and data collected don't need any extra control.
Using traditional system, the chemistry counts and gives to the Central Local Office (ASL) his data before the 5th in each month: then, he has his refund before the end of the same month: is it 25 days. After this refund, the Central Local Office (ASL)'s employees have to control data written on paper prescriptions, and notify to the chemistry if there are mistakes or not. They have done this work in two years. Using Sanicard system this is not necessary, as data are correct. Nevertheless, if someone wants to do a control, using digital data is much more easier than using paper data.
SA2=3/25=0.12

Metric SA3 Rate between the time needed for database updating using an automatic connection to the central server and the time needed following traditional procedures

Information from: the Central data server

Method of collection: specific log recording at the central data server.

Baseline-data: the GP's will be requested to measure and record the time needed to update their database with the traditional existing procedures

Having a direct digital connection to the Central data Server means updating database daily: now, the GP's time for having data is 30 days (sometimes more). Here we mean data about drugs, ticket benefits, speciality services, etc. SA3=1/30=0.03333

Metric SA4 Rate between the time needed to retrieve health administrative patient information and the same with traditional means

Information from: GP's

Method of collection: the GP's are requested to measure and record the time needed to retrieve patient health related data using the Civicard PC based reading.

Baseline-data: the GP's will be requested to measure and record the time needed to get the same information without the use of the Civicard

Having a direct digital connection to the Central data Server means updating patients database daily: now, the GP's time for having patients data is 30 days. Besides this, if a patient comes to the GP with his Civicard, on which is stored the GP's identification number, and the GP hasn't update his patients from the Central data Server yet, the health administrative information can be retrieved from the SANICARD itself. SA4=1/30=0.03333

Metric SA5 Rate between the time needed to prescribe drugs and the same with traditional means

Information from: GP's

Method of collection: the GP's are requested to measure and record the time needed to prescribe drugs to the patient health related data using the Civicard.

Baseline-data: the GP's will be requested to measure and record the time needed to perform the same prescription without the use of the Civicard

Time is more or less the same either with or without Civicard. SA5=1

Metric SA6 Does the GP think it is making overall easier patient health data management

Information from: GP's

Method of collection: a questionnaire is presented to GP's at the end of the demonstration period, rating the quality of the Civicard application in general on a scale of 1 (not making easier patient health data management at all) to 5 (making data management very much easier).

Baseline-data: no baseline data can be provided.

Questionnaire not compiled yet

Metric SA7 Rate between the time needed to retrieve emergency patient information and the same with traditional means

Information from: GP's

Method of collection: the GP's are requested to measure and record the time needed to retrieve emergency patient information using the Civicard.

Baseline-data: the GP's will be requested to measure and record the time needed to retrieve the same information without the use of the Civicard

A.) If GPs already have a sw for their patients' data, the time is more or less the same both with or without Civicard.
B.) If the GP hasn't any information stored about emergency, the times for retrieving data are not comparable and are depending from Health Structure (it is the time for analysis prescription and execution).
Using Sanicard, GPs can read and write data on it, so that the patient can use his updated card in the First Aid Health Structure.
A) SA7=1
B) SA7=0

Metric SA8 Does the GP think that offering automatic access to emergency health data is making the patient safer?

Information from: GP's

Method of collection: a questionnaire is presented to GP's at the end of the demonstration period, rating the impact on patient safe of the Civicard emergency health data automatic availability on a scale of 1 (not making safer the patient at all) to 5 (making the patient very much safer).

Baseline-data: no baseline data can be provided.

2.7 Conclusions

The InterCare applications evaluation developed in the Lombardia Region demonstrator site shows that all the applications satisfy the user needs.
The interviewed focus group is significant because it includes each type of final users: information technology professional; healthcare professional; patient/citizen and administrative professional.

The result of the evaluation analysis could be considered positive and we are confident in each InterCare application. The tested applications are now in Beta release phase. On the basis of the analysis results it will be possible to engineer final services with the necessary changes and improvement suggested by the users.

Furthermore the applications have been developed using new available technology (hardware and software layer), giving chances to have continuity in the medium term. It is important to consider the large amount of data that will interest the final version of each service.

In addition to the general conclusions above presented, that speak in favour of a general acceptance and positive evaluation of the services and applications offered in wide terms (references to the first part of evaluation questionnaires), at the current status, it is possible to refer back to a qualitative evaluation of the reaching of stated aims and objectives, as supported by the metrics collected.

For **Patres**, the services and the application the possibility of a certain, precise and unique identification has been demonstrated. The objective of elimination of inconsistency in data

has been proved strongly in Fatebenefratelli hospital and connected structures, as well as the possibility of correlation of different identification systems. This last objective has been highly reached only in a limited environment vs. the wide number of legacy systems existing in the various health care centres. The number of interfaced and correlated systems is expected to increase with time.

For **Rehal**, the availability of anonymous contact data has been exploited mainly as a recap of performances done in a certain structure, reaching fully the first objective stated. About the interpretation of care trends in a certain structure, this services has been appreciated mainly by patient. The attention of health care managers for a comparison of their performance data vs. other structures performances has found a lot of obstacles and this objectives has not been reached.

For **Sanicard (Civicard)**, the assessment obtained is in favour of the improvement of administrative management. This is not completely checked for the situation of emergency, in which the limits of infrastructures and connections are not permitting a valuable interpretation of results.

For **Hicar**, the increase of quality and quantity of the information about health care services delivered to citizen has been proven. Also in this case, the limitation of structures interconnected to provide a complete overview of the health care services in a Region is diminishing the positive impact of the service on users.

For **Ric**, the increase of quality of booking has been assessed, both from the point of view of patient and health care professional. The visibility on services in different booking systems connected just in one shot is an important step forward in the improvement of regional health care services and their co-ordination. Still remain the aspect of a (by some one felt) complexity and long interaction with the application, but this is due to the fact that the selection and definition of all the possible requirements for booking a service impose such a constraint. A reduction a choices will mean also a reduction of complexity and interaction time: this aspect will be evaluated and finalised in the next release of the software.

Procom is surely the application that had the minor favour in interest and usage among the ones presented. This was due both to its pure administrative approach on the version tested and the fact that the not completely provided integration with IC-IACS did not provided increased transparent facilities on security. Anyway the re-organisation of data transmission and feedback received was positively evaluated, but this was mainly an organisational solution instead of a technological one.

As final note, we can confirm that the services and the applications provided by InterCare in Lombardia Region have a great interest and potential.

The delays suffered in the putting at disposal of the large technological platforms and infrastructures foreseen in the original SISS project [to which InterCare resulted and was originally positioned as complementary], have forced InterCare to go through an experimentation that was downsized in respect to the originally planned.

In such a case, and considering the value of InterCare services increasing with the number of the available systems interconnected, the results demonstrated suffered of some “quantitative” limitations.

Despite that, the evaluation phase demonstrated that InterCare provided an important way to re-organise and to improve the health care services in a Region, offering a set of applications that are of great interest in the market.

3. The Netherlands

3.1 Introduction

The Dutch demonstration site is located in the Schiedam-region. Two applications are demonstrated and evaluated: PHARM-EPR (Pharmaceutical Electronic Patient Record) and EXHIS (Extended Health Information System). The demonstration site set-up is described in deliverable 6.1 and summarised in the following diagrams.

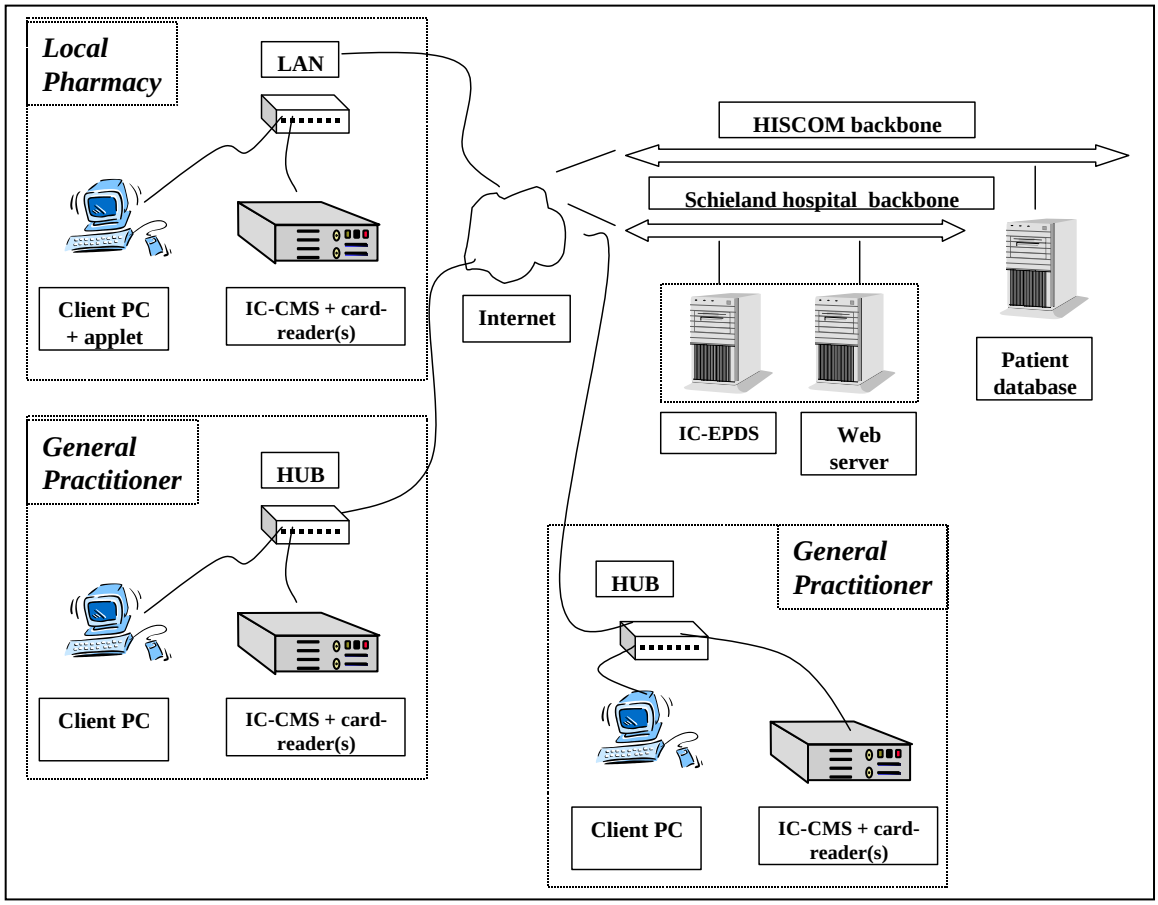


Figure 1 The set-up of the PHARM-EPR part of the Schiedam demonstration

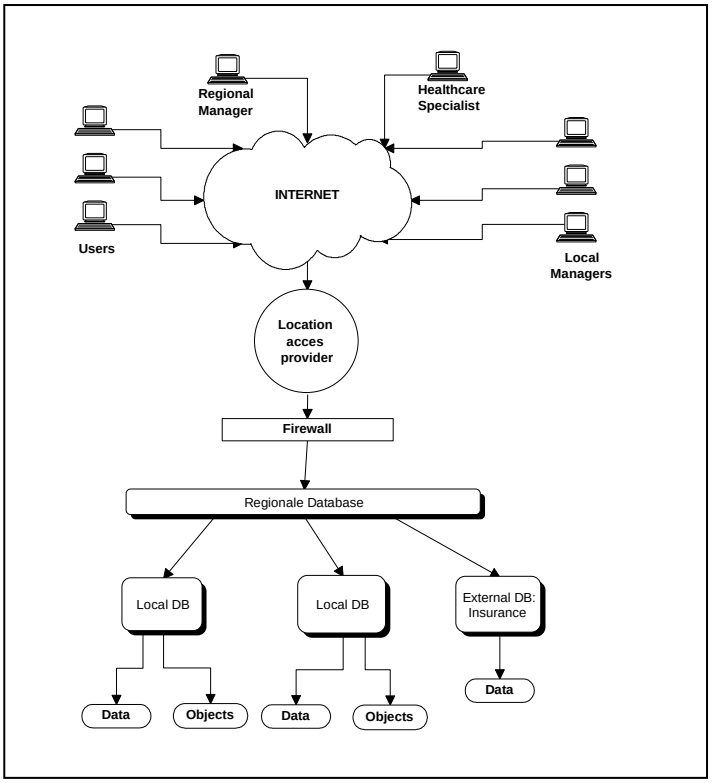


Figure 2 The set-up of the EXHIS-part of the Schiedam demonstration

The major groups involved in the evaluation are mentioned in these diagrams. For the PHARM-EPR part of the demonstration patients, GP's, pharmacists en hospital specialists are involved in the evaluation. The EXHIS part of the demonstration is evaluated by regional and local managers and a user-panel.

3.2 Changes to setup

The content and set-up of the InterCare demonstration-phase in the Netherlands has largely been realised according to the original plans. However due to delays, the demonstration phase started later than originally expected. As a result a full evaluation of the demonstration-site could not be accomplished within the initial time limits of the demonstration phase. The evaluation results from the Netherlands demonstration site that are presented in this document must therefore be considered to be intermediate results. It has already been agreed by all the different Dutch InterCare partners that the demonstration will continue for several months to be able to make a full evaluation, because we are confident about the quality of the applications.
The set-up of the demonstration for EXHIS and PHARM-EPR has been implemented as already described in deliverable D6.1 and the above paragraph, with the exception that for the PHARM-EPR application we have not yet been able to implement encryption of the data using SSL, due to problems with latest releases of the used CORBA software. As a result of this the communication between the different servers does not use the public Internet and a WAN with limited access is used instead, still using Internet technology. It is expected that SSL will be introduced in the demonstration site shortly so that it will be a part of the full evaluation. This has no great impact on the demonstration from the viewpoint of the user, as there is no change in functionality, because as a result of the set-up of the applications the user is basically unaware of the specific way in which connections are established. A further consequence is that the metrics dealing with security evaluation are not included in this evaluation. The final evaluation will be reported in September of this year and will be part of the supplement to D6.2 that will be delivered in the end of this year

The part of the EXHIS application that provides information on healthcare (organisations) to citizens has been made available to the participating organisations (users) since March of this year and users have started to provide data (content) for the application. The editor board of the participating organisations concluded that the application should not be made available to the general public before a certain minimum content was available. The content had to be provided by the users themselves. Providing the content turned out to be more difficult and time consuming than originally expected. As a result the users editor board did not agree to make the application available to the public until June 1st. Marketing of the public websites is a responsibility of the users themselves and organisations have planned marketing activities but not implemented them yet. Evaluation of the use of the application by the general public will take place after the marketing activities have been implemented and are not included in this evaluation. If these marketing activities have taken place before September of this year a final evaluation of EXHIS will be part of the supplement to D6.2 that will be delivered at the end of this year.

In the metrics mentioned in D6.1 the use of smartcards was not evaluated explicitly and a metric on this subject was added to the evaluation (PH11).

3.3 Results of promotional activities

At the MIC (Medical ICT Conference) 1999, the largest conference in this field in the Netherlands a paper on InterCare has been presented: "InterCare, on route to an inter-institutional EPD", H. Lodder, L. Wolf, O.W. Weier, HISCOM, Leiden. A brochure has been distributed on the InterCare project by Hiscom. During the 2-day congress a demonstration of the PHARM-EPR application was given at a stand.

PHARM-EPR has been demonstrated for different groups of customers and visitors of HISCOM. In the Beatrix hospital in Gorichem a demonstration was given to the RIVAS care group. A delegation from Kummunedata from Denmark was introduced to PHARM-EPR during a visit to the Netherlands in February.

A paper written by H.Lodder about the EPDS will be presented at MIE2000 in Hanover in the end of August.

A demonstration-version of PHARM-EPR is also available on Internet: http://www.hiscom.nl/intercare/

The EXHIS-application http://www.zorgwijzer.nl is demonstrated on several occasions this year to groups of interested healthcare-organisations. During the demonstration-phase, two open days were organised at DSW. During the first, on Friday the 19th of May 2000, a demonstration was given, showing the application to local healthcare organisations that are interested in participating in EXHIS as local managers. A demonstration was given about the functionality's offered by EXHIS to the public as well as how local managers can up-date and optimise their site. Most of the organisations visiting this open day decided to participate in EXHIS.
During the second Open Day, a workshop was given about "working with EXHIS". Current and potential local managers were able to ask questions and were shown some novelties that were developed during the last few months like a search-machine. The workshop took place on June the 8th 2000.
On June the 27th a demonstration is given to about 100 visitors of the national info-market of GGD's (Community Healthcare Centres) in Utrecht.

On the 5th of July this year an Open Day is planned at the Schieland Hospital. GP's and pharmacists in the region are invited to a demonstration of PHARM-EPR.
PHARM-EPR will be presented as a solution for problems for pharmacists, hospital specialists and GP's in the region.

3.4 Used methods for data-collection

3.4.1 PHARM-EPR

The Electronic Patient Record is evaluated using Log-files from the common products used and from the application itself. These Log-files provide the information necessary for the following metrics:

PH1. Number of cases in which PHARM-EPR makes a correct connection and provides the required information compared to the total number of attempts

PH3. The time necessary for an information-request using PHARM-EPR

PH6. Use of PHARM-EPR

PH10. Number of access violations

The Patients involved were asked for their opinion on the improvement of care (PH8) using questionnaire 3 from the appendix

The HCP's involved were asked to log the information-requests using the form added as the fourth questionnaire of the appendix)

In this form the information necessary for the following metrics is gathered:

PH11. Number of cases in which PHARM-EPR makes a correct connection and provides the required information compared to the total number of attempts

PH12. Differences between information supplied by PHARM-EPR and information supplied by the feeding HCP by other means.

PH13. The time necessary for an information-request using PHARM-EPR

PH14. Number of sources that provide information compared with pre-PHARM-EPR situation

PH15. HCP registers the cases in which the use of the PHARM-EPR application makes it unnecessary to request information by other means

At the end of the demonstration an interview with the healthcare professionals using a checklist evaluated the above mentioned metrics as well as the user-friendliness (PH 7) of the application.

Security aspects are to be checked by a security expert. A report of his experiences will provide the information for metric PH9: Expert trying to get access to the application at a later stage as explained in paragraph 2.2.

3.4.2 EXHIS

For Metric EX1: the number of local healthcare organisations available on Internet with and without EXHIS, information was gathered from Internet and the DSW regional healthcare organisations list.

The application logfile provides the information for the following metrics:

EX 3 Uptime using system-logs

EX 6 Number of users of EXHIS per day registered in system log

EX 7 Average time spent by citizen in EXHIS

EX10 Number of access violations to managers functionality

EX11 Number of cases in which EXHIS makes a correct connection and provides the information compared to the total number of attempts.

EX13 Number of access violations to insurance information

A users-panel is asked to perform search-requests during an open day for EXHIS in order to measure EX 2: Average time for search-request.
This user-panel also is asked for the user-friendliness of the application (EX 5) by means of the sixth question-form in the appendix.

Regional and local managers are also answering the questions on user-friendliness (EX 5 and EX 8) and they are asked for the number of response-forms as necessary for metrics EX 4: Number of response-forms per healthcare organisation.
During a meeting of local managers, question-form 7 from the appendix was used to evaluate this.

Security aspects were supposed to be checked by a security expert. Information for the following metrics should be gathered this way:
EX 9: Expert trying to get access to the (local managers functionality of the) application

EX12: Expert trying to get access to the (insurance information of the) application

Because of the delays mentioned in paragraph 2.2, these metrics will be evaluated in the final evaluation, later this year.

3.5 Used methods for analysis

The evaluation-process consisted of the following steps:
- Decide which populations should be questioned
- Develop evaluation questions for the various populations
- Collect data
- Analysis and reporting of the information

Because of the relatively small sizes of the groups that were part of the evaluation thus far the data should be interpreted as an indication and rigid statistical analysis was not done. Analysis was conducted, checking the data for completeness and determining the response rate, followed by a comparison between the data from the different sources. Integration and the synthesis of findings completed the analysis.

3.6 Validation results

3.6.1 Evaluation of PHARM-EPR

PH1. Number of cases in which PHARM-EPR makes a correct connection.
The logfile describes 148 attempts to get information about the prescribed medication. 48 of these attempts stopped at the point were the patient could not be identified. This means a correct connection, but information about a patient for which the HCP is not authorised or a patient-ID used that does not exist. From the 100 attempts to get information on existing patients that authorised the HCP to see their medication details, 18 attempts ended describing an error due to system-failure. Most of these occurrences are currently believed to be a result of problems in the feeder systems. The occurrence of errors is steadily decreasing. Expected is that in due time a 99% percent uptime will be realised (goal).

PH2. Differences between information supplied by PHARM-EPR and information supplied by the feeding HCP by other means.
The small group of patients as well as the short period of time did not provide situations that needed verification by phone or fax. In a common situation, a GP contacts a pharmacy or hospital about twice a week. Up to now only twenty-two patients were involved, which is less than one percent of the average size of a GP-practice. The information offered by PHARM-EPR was mainly used additional.

PH3. The time necessary for an information-request using PHARM-EPR.
The logfiles indicate large differences between the time necessary for an information request. The average time is about six seconds of which about three seconds are used before the retrieval of data. This is much shorter than the one minute-period mentioned in the goal. In the logfiles it is not measured though, how long it takes before the HCP reaches PHARM-EPR.

Average	5,61 sec
Max.	29,14 sec
Min	0,52 sec

The HCP's were asked for their opinion on the speed of PHARM-EPR. The application was found (much) faster than expected by three of the four interviewed HCP's. The application never was slower than expected, but to start up the computer and card server, took much more time than expected. Especially the GP's had problems with this, as the application has not been integrated with the information system used by the GP's: ELIAS. Time is an important factor to all HCP's. If the configuration is not working within a couple of minutes, it will not be used.

PH4. Number of sources that provide information compared with pre-PHARM-EPR situation
For the GP's the additional information was considered to be (much) more than expected. They are able to see medication prescribed by dentists, specialists, other GP's and themselves. For the pharmacists the additional information is restricted to information from the hospital information system that is less than one month old. In the demonstration this did not appear much due to the small group of patients involved. When more pharmacies will use PHARM-EPR, the exchange of information between different pharmacies can be an extra source of information.

PH5. The cases in which the use of PHARM-EPR makes it unnecessary to request information by other means

As mentioned in the evaluation at PH2, within the small number of patients no extra information was needed from the pharmacy or the hospital.

PH6. Use of PHARM-EPR.

One of the GP's was on vacation during two weeks of the demonstration. During holidays and weekends, the application was not used. On all other working days, the application was used.

PH7. User-friendliness was measured on a 5-point scale.

The average score for four HCP's is 4.25. This means that PHARM-EPR is more user-friendly than expected. None of the healthcare professionals was disappointed with the user-friendliness of the application. Improvement can be made by fixing the medication-information to one page, so scroll-bars can disappear. Compared to the score mentioned in the set goal mentioned in D6.1 (4), the score is better than expected.

PH8. Rating of improvement in quality of care.

Most patients involved in the demonstration seem to be positive about the application. This came clear from the interviews with HCP's. Only 10% of the patients involved were asked for their opinion about PHARM-EPR using the mentioned questionnaire. In their opinion the InterCare project can be seen as a good start to help HCP's. In the future an increase in the quality of care might occur. Within the demonstration PHARM-EPR is considered to be 'handy'.

PH9 and PH10 will be evaluated at a later stage.

The added value of the smartcard was evaluated in an added metric:

PH11. The opinion on security provided by the smartcard.

The opinions on the security varied. A smartcard might ease the login-procedure according to two of the interviewed HCP's. To three of the interviewed HCP's a password provides more security. A combination of a smartcard and a password is considered to be the best security possible.

3.6.2 Evaluation of EXHIS

EX1. Number of local healthcare organisations available on Internet with and without EXHIS is counted.

In the region Nieuwe Waterweg Noord, about 40 healthcare organisations are recognised as members of the Regional Commission for Healthcare (RCG). The RCG covers all important healthcare organisations in the region. Without EXHIS seven of these organisations manage a homepage. This means 17.5% of the Local Healthcare organisations was available on Internet. Some of these organisations also joined EXHIS. As EXHIS has thirteen participants now, a total of sixteen organisations are available on the Internet (40%). This means an increase of local healthcare organisations on Internet 22.5 percent-point. Even more healthcare organisations are expected to join EXHIS in the near future.

EX2. Average time for a search request
During a users meeting nine users were invited to search for three items mentioned in the table below. The average time necessary per search request is mentioned. The total average of all searches is 2 minutes and 27 seconds.

Search for	Average time spend on search
The date of a coarse about care for elderly in Schiedam	1 minute and 12 seconds
The address of a "mensendieck"-practice (specialised treatment) in Maassluis	2 minutes and 10 seconds
The telephone number of the "CARA-lijn" (help line for people with asthma)	4 minutes

The goal was to answer an average question within three minutes. Although this test does not provide statistically valid figures, it indicates that this goal can be reached.

EX3. Uptime using system-logs
EXHIS is supposed to be available to the public 24 hours a day and 7 days a week. For the last five months the server did not respond in 0.2623% of the available time in the last months. The reasons for failure are described in the following table.

Failure:	How often?	Time 'down'
Updates of software	once	1 hour
Changes of security	twice	15 minutes
Internal problems	none	
External problems (Problems at the provider)	once	7 hours

EX4. The number of response-forms per healthcare organisation per day
During the demonstration no response-forms were received. As described in the introduction, citizens of the Schiedam-region are currently unaware of the possibilities of EXHIS, as no promotion has taken place.

EX5. Qualification of User-friendliness on a 5-pointscale
During a meeting of local and regional managers a questionnaire was distributed to seven people attending the meeting. A response from five people was gathered. Most managers are new at this job of managing a homepage. They marked the user-friendliness with an average mark of 3.9 which is slightly less than 4 (goal). Points that were mentioned as 'rather difficult' are the way links can be made to other internet-sites and deciding what the key-words of a certain page should be.

EX6. Number of users of EXHIS per day registered in system log
Users of EXHIS can be divided in three groups:
1. The visitors searching for information
2. The (regional and local) managers of the site editing the information offered.
3. The HCP's login in to EXHIS to get insurance information

Information about the first group of users (visitors) is not available. This information can only be gathered when EXHIS has been made known more widely to the public in the Schiedam area.

During the second week of June the time local managers edited pages was registered. During one week the visits done by local managers or the regional manager editing the information were logged for a total of 3 hours and 45 minutes.

Healthcare professionals have been using the functionality to check insurance information of patients in 244 cases in a period of two months. Since 65 HCP's are able to login to this functionality this means an average use of 3,75 per HCP in two months.

EX7. Average time spent by citizen in EXHIS

Because the EXHIS-application has been open for the public only since June 1st and promotional activities have not been organised, only few citizen have found EXHIS on the Internet. It is currently impossible to evaluate the average time spent by citizen in EXHIS. This will be measured for the final evaluation.

EX8. Qualification of User-friendliness on a 5-pointscale

During a user-panel meeting, users of EXHIS were very positive about the facilities offered. They found the connections very clear. Users expected less information on indirect care as shown by EXHIS, e.g. information on housing-facilities for elderly people. Both local managers and users were asked for their opinion on the user-friendliness of searching. The average score on this item is 3.8 which means it is considered user-friendly in almost all cases.

EX9, EX10, EX12 and EX13 will be evaluated at a later stage.

EX11. Number of cases in which EXHIS makes a correct connection and provides the information compared to the total number of attempts.

The total number of attempts is mentioned at EX6. When the server was up (EX2), all attempts to get information were answered.

3.7 Conclusions

The results of the evaluation are summarised in the metrics-matrix introduced in deliverable 6.1:

Categories:	Service:	Availability	User-friendliness	Reliability	Speed	Costs	Security	Other
Patient care	*Diagnosis*			Positive effect, expectations for the future.				
	Monitoring							
Customer Service	*General Healthcare Information*	Increase of local healthcare organisations on Internet more than expected. The server was up during 99.7% of the time.	Editing (managers) and Searching (users): User-friendly application		Average search-time shorter than expected		No data yet	Information when URL is made more widely known to the public
	Booking							
	Referral							
	Identification	average of 3,75 requests per HCP					No data yet	
	Communica-tion between HCP's	82% of information-requests answered without failure, errors mostly due to problems with feeder systems. More information provided than expected	More user-friendly than expected by the HCP's	No data provided yet	Average time for an information-request is about 6 seconds, faster than expected by HCP's		Smartcard combined with password preferred security	Application was used during all working days.
	Direct com-munication to patients	No data yet						
Management	*Management information*							
	Transparency							

The evaluation of the InterCare applications in the Netherlands demosite shows that the users are generally satisfied with the InterCare services. This is especially the case for the functionality (such as availability and speed) and user-friendliness of the system. Users expect great medical benefits from the PHARM-EPR system, but this could due to relatively short amount time thus far in combination with the scale of the demonstration not be proven yet. The users are also satisfied with the EXHIS application and we are confident that the number of users for EXHIS will continue to increase.

4. Sweden

4.1 Introduction

Swedish Health Authorities strategically aim towards co-operative structures, where different care units work together to offer the patient relevant and consistent services. Stockholm County Council is making up new strategies for highly communicative co-operation between healthcare professionals and organisations in order to be effective in the provision of shared care and for accomplishing continuity of care.

To be able to reach this aim there is an increasing need to communicate information and use information technology for this communication. In health care there is a lack of information systems, architectures and standard based facilities that have focus on communication. Both synchronous communication, such as advanced telemedicine applications and asynchronous communication like shared electronic patient records should be built on standards and components so that they can be used in an integrated way. Information must be available and shareable to support the communication when the consultation is performed.

Therefore, in InterCare Stockholm, an environment consisting of components - applications that can be used in an integrated and interoperable way using object brokering, IP and web technology has been built up. This environment includes the Information Access Control Server (IACS) that assures selective access in collaborative situations, together with the two demonstrator applications Extended Referral Management (ERM) application, and Advanced Home Health Care (AHHC) application.

Important aims and objectives for the home care unit ASiH, Stockholm north-east, that delivers healthcare services to palliative patients in their homes, are to increase the quality of care and to reduce risks in the medical treatment of patients, to achieve that patients, and their relatives, experience safety in treatment activities, to increase cost effectiveness, to make co-operation between care units related to medical care, home care and primary care possible and effective, and to make it possible for relatives to participate in the care of the patient when the patient and the relative are willing to do so.

The ASiH unit works team-oriented and the teams may involve professionals from several care categories. Important objectives of the application are to support extended communication exchange between the members of the teams and to support access of specific information concerning healthcare decisions and treatment plans shared with other units, based on agreement and business rules.

In the AHHC application each professional category documents according to specified documentation models, but is free to navigate in the documentation across categories and collaborating units if access rules allow. Further, the AHHC provides functionality to use pre-defined and to define new cross-category views on clinical information along parameters such as health aspect, time-period, professional category, units with which one co-operates, type and role of contact, etc. The application also includes functionality to support the planning of care, to document performed care and to support the evaluation of the outcome of prescribed investigation and treatment activities in relation to stated goals for care. Care plans may extend over care unit borders and include planned prescriptive actions from several professionals working at different units. The common agreement part of the care plan is maintained at the main responsible care unit while the planned action objects are distributed over the units in the federation.

Aims and objectives behind the Extended Referral Management application are to achieve high quality in medical decisions, to support patient care with highly skilled medical specialists in specific areas, to assure fast handling of medical errands and to increase patient participation in decision making related to care.

The ERM application is developed to support a dialogue between providers of care. In addition to basic referral handling functionality such as selecting a referral template, creating a referral, submitting a referral, creating a response, and monitoring the referral process, the Extended Referral Management Application provides for attaching multimedia objects to the referral, which makes it possible for a requesting HCP to communicate to the addressed provider additional documents, images and video clips for the provider to reach a high quality judgement. Referral templates may be used, which means that providers can agree on what information should be exchanged/transferred when a certain type of patient is referred.

To demonstrate the Swedish site applications a special demo-lab was established in Stockholm north-eastern healthcare area. The purpose of the demo-lab is to constitute a technical platform on which to run and demonstrate the applications that are developed in the project, to different users, user groups and other interested parties within healthcare, so that these parties can see and understand that the applications can be used, and provide those effects and additional values, which are the purposes of the applications.

The AHHC demonstrator has been demonstrated and validated at location at the Palliative unit, Stockholm north-eastern area, where end-users of several professional categories from this unit and from the community home service of Östermalm participated. One-site and two-site configurations were built up corresponding to the Palliative care unit stand-alone usage situation and the Palliative care unit - Östermalm home service unit collaborative situation.

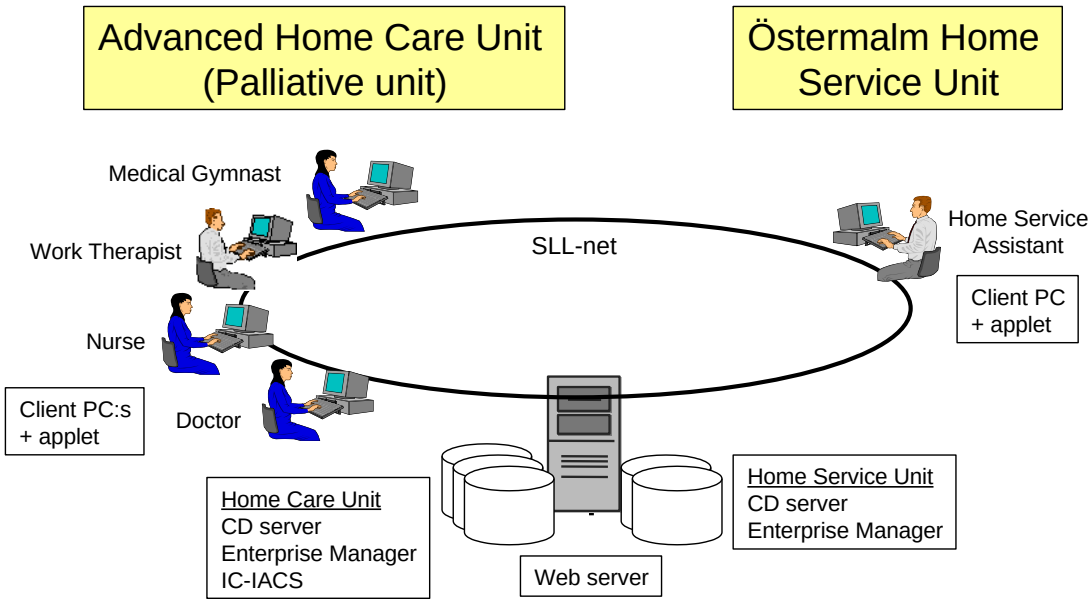


Figure 1: AHHC application demonstration set-up

The Extended Referral Manager was demonstrated using a two-site configuration realising the Tullinge Healthcare Center - Huddinge Hospital Dermatological Specialist Clinic requester/provider collaborative situation.

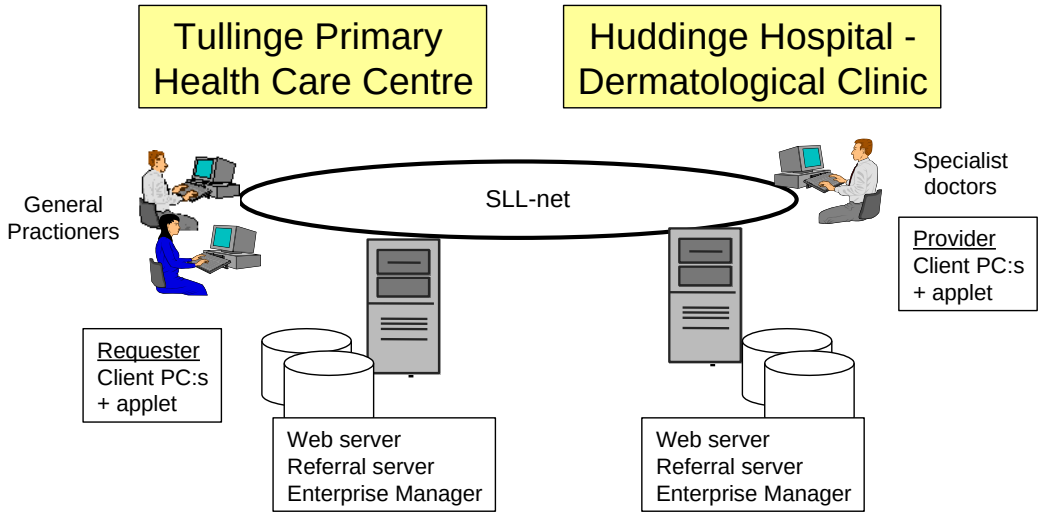


Figure 2: ERM application demonstration set-up

4.1 Changes to setup

The original demonstration set-up for the AHHC application, as shown above, was slightly changed to get a broader representation of the different professional categories working at the involved units. From the home care unit the participating users were one doctor, one nurse, one assistant nurse, one medical secretary, one work therapist and one curator, and from the home service unit, one home service assistance reviewer and one home service assistant.

The demonstration of the ERM application was met with great interest and a decision to extend the demonstration by involving two additional units was taken. Thus, Segeltorp's primary healthcare center was added to the set-up, having their own local Referral server and Enterprise Manager, and in the continued demonstrations the Orthopaedic clinic at Huddinge hospital will be added.

The metrics outlined in the D6.1 Metrics for the Swedish AHHC and ERM applications, based on aims, objectives and goals for the health care business activities were kept on a truly business oriented level. The aims, objectives and goals and the motivation and influencing relationships between them and with accompanying metrics are very much valid for the future, and defining them has had a great value as such.

The method of collection of evaluation data that was planned was to have the application be tried out by the professional user-representativesgroups and let them make a judgement, in two phases, concerning if the suggested goals that were put up, could be achieved when supported in their work by the applications.

However, for the demonstration first phase activities, the goals turned out to be on a higher level than was the most practical at this stage of development and demonstration. The applications are still at a prototype level and the end-users, especially for the AHHC application, are not very familiar with the use of computer support to document the care given. For this application, therefore, a more pragmatic approach had to be taken in the first step, letting the questionnaires concentrate on questions to the users, which at the business goal level were more introductory, and which were completed as set of questions on the usability level, which were conceived more close to the practical situation at hand. For the ERM application, the situation was somewhat different as to application complexity and user computer experience. It was possible via discussions to collect early indications in the

directions of the metrics suggested and expressed as judgements concerning the goals from the users what possibly could be expected, as the applications successively will come into a broader and more extensive demonstration and use.

4.2 Results of promotional activities

The promotional activities for the Swedish demonstrators fall into 3 categories:

1. Seminars, presentations, Web-page
2. Demonstrations for selected interested parties
3. Demonstrations for and involving end-users

The promotion of the resulting applications developed and demonstrated in Stockholm includes a broad spectrum of activities, such as seminars, conferences and exhibitions, continued demonstrations, and by taking up and maintaining strategic contacts, within Stockholm County Council, and outside.

An InterCare Day entitled "Co-operation and Components for Healthcare - InterCare in a Perspective", was arranged in mid May in Stockholm, where some 60 people, healthcare professionals, healthcare decision-makers and other healthcare interested parties, from the Stockholm healthcare areas were attending. On this occasion, the Stockholm InterCare applications also were demonstrated.

The AHHC and ERM applications are not, at the present stage, open to public Internet. However, both have been made available to the Internet, within the firewalls of the Stockholm County Council, via an InterCare application html start-up page from which the both applications and all additional administration tools (EM, ERM, CD and IACS Rules administration tools) are reachable and possible to run as applets from Web browsers. The possibilities to make the two applications open to the public Internet will be further investigated.

InterCare Stockholm has developed a public Web page (www.go.to/InterCare). The web page has been developed in order to disseminate knowledge that has been developed in the project and describes in an introductory way e.g.:

- How can you build component-based systems?
- Object technology and multi-layer architecture
- User-driven IT-development
- Modelling using UML
- User-friendly systems through WEB technology
- Architectures within European Healthcare

In the first place the WEB-site addresses employees interested in the actual issues in Stockholm Health Care. The site is in Swedish and will be available throughout the country.
The WEB site will contribute to an increased knowledge and understanding of the necessity of a regional infrastructure and the advantages of Object Technology.

The AHHC application was extensively demonstrated at a full-day seminar, May 18, together with presentations and discussions about directions for, and requirements on applications for shared patient care documentation in the future to support increased continuity of care. The seminar reached great interest and will be repeated after the summer. The participants had lots of comments and the discussions were intense and fruitful. Participants included members of

other home healthcare teams in the Stockholm region as well as developers, and people interested in and working with concepts and terminology in the healthcare domain.

In addition, the demonstrators have been, and will be actively demonstrated to various interested healthcare parties mainly from the Stockholm area, but also from other parts of Sweden and Scandinavia.

The demonstrations have been performed for:

- Home health care units/teams within but also outside the Stockholm County Council
- Community home service units

Parties and groups working in the field of documentation models in nursing and para-medicine
Projects and interest groups doing work concerning healthcare area concepts and terminology, including the National Board of Health and Welfare in Sweden and Norway
Parties with interest in care planning within Sweden, but also Ullevål hospital, Oslo, Norway.
County councils in Sweden other than Stockholm (e.g. Jönköping, Östergötland)
IT-development units at Huddinge and Danderyd hospitals
etc

In connection to the demonstrations of the applications, issues like the following have been met with great interest:

The development approach used when developing the AHHC application (a business/user-centric, iterative and incremental approach)
The modelling approach used in the project using concept modelling, with subsequent UML use case and class modelling, reusing generic CEN TC251 and CBS models and unit/user-oriented specific modelling in parallel
The approach of the Information Access Control Service (IACS) to authorisation, based on business rules.

The AHHC application has been developed and built as a series of incremental iterations. New and extended functionality has been added successively. To some extent this also applies for the ERM application. Early prototype versions of the AHHC application have been reviewed, demonstrated and validated as to functionality and user interface continuously during autumn 1999 and spring 2000. Many users have been continuously and actively participating in the entire requirement specification, design and implementation phases. The end-users have been deeply involved, e.g. in the specification of functions and user-interface and in the review of prototypes. The application is customised to meet their requirements and they are familiar with the information and the way information is displayed.

A concentrated demonstration round with participants from the Palliative home healthcare unit and Östermalm home service unit was performed within 3 days in the beginning of May 2000. The demonstration approach and the data collection and analysis activities are described below.

The Extended Referral Manager was demonstrated using a two-site configuration realising the Tullinge Healthcare Center - Huddinge Hospital Dermatological Specialist Clinic requester/provider collaborative situation. The demonstration had to be extended to involve one additional primary health care centre. The data collected from these demonstrations and the analysis of them are described in the subsequent sections.

4.3 Used methods for data collection

4.3.1 AHHC application

A "formal" and concentrated demonstration round with participants from the Palliative home healthcare unit and Östermalm home service unit was performed within 3 days in the beginning of May 2000. Participating users from the Palliative unit were representatives from most professional categories working in the home healthcare teams and included one doctor, one nurse, one assistant nurse, one medical secretary and from the paramedical professions, one work therapist and one curator. From the Östermalm home service unit one home service assistance reviewer at management level and one home service assistant participated.

The collaborative activities between the two units concentrated on searching for relevant care documentation items for selected health aspects for patients common to the units and on creating, maintaining and evaluating shared care plans.

More specifically, in day 1, the users were presented an introduction to the InterCare project and a walk-through of the available user functions of the application and were given a short orientation about the purpose and disposition of the demonstration. The demo scenarios were then performed twice. Day 2, the users had a detailed list of instructions to follow the description of what was included in each step and how it was going to be done. In day 3 the assisting instructions were limited and concentrated to what should be done. Both days, 2 observers were present. The 3rd day, the participants also created a shared care plan lead by two instructors.

Each user documented observations and decisions and search for information around de-personified patient cases using the relevant tool functions as to responsibilities and authorisation. Prior to the end-user demonstrations, the two CD servers had been prepared with the unit relevant classifications and the EM servers with the unit relevant organisational and professional structures. This work was done by two IT co-ordinators with professional nursing background thus acting as users of the administration tool.

The demonstration was performed in 7 steps according to use cases and included the following demonstrator functionality's:

Demonstra-tion	**Function**	**Professional category involved**
Step 1/All	Select patient	All
	Retrieve patient data	All
	Read NB! information	All
Step 1/Medical Secretary	Create request and patient	Medical Secretary
	Admit patient	Medical Secretary
	Enter patient data	Medical Secretary
	Update patient data	Medical Secretary
	Delete patient data	Medical Secretary
Step 2	Search & report: Predefined view (Select pre-defined comprehensive health aspect view over all professional categories' documentation in care team)	All
	Search & report: Define view (Create, combine and generate cross-category views on clinical information along parameters health aspect, time-period, professional category and care unit)	All
Step 3	Select documentation	All

	Create new note	All
	Document observations, decisions and performed care activities	All
Step 5	Change note	All
	Delete unsigned note	All
Step 6	Change patient	
	Create care plan	All
	Retrieve care plan	All
	Create new planned prescriptive action of care plan	All
Step 7	Evaluate care plan	All
	Home Care and Home Service units collaborative care planning	All

In the end of each step the users were presented a questionnaire to fill in, each including six questions about the experienced outcome of the actions from a business perspective as well as from a usability perspective. The users were also strongly encouraged to supply comments and remarks concerning benefits on the business level, and to write down suggestions for further developments and extensions.

As explained in the "Changes to set-up" section, a more pragmatic approach had to be taken in the first step, letting the questionnaires concentrate on questions to the users, which they felt were more close to the practical situation at hand.

The questions used for the business perspective were:

1. How did you experience that this way to work was compared to how you work today? (scale 1-5, 1 not at all good/worse, 5 very good/much better)
2. Does this way to perform your task add value to your work from a business point of view?
   (Yes/No, Motivation)

These questions are highly relevant to the original metrics suggested. In addition, the users' opinions about potential benefits at the business level were informally collected.

As baseline data at the level of the metrics suggested (AH1-AH11) are missing to a large extent, the evaluation, as suggested had to be done in relation to the goals put up behind each metric. What can be given at this stage as the result from the analysis of the data collected from the demonstrations so far are very early indications in the directions of the goals suggested and expressed as judgements from the users about what possibly could be expected in the long run.

Additional questions used for the usability/user-friendliness perspective were:

3. Did you go through this part of the test without doing any mistakes? (Yes/No, Motivation)
4. What degree of difficulty do you think this task had? (scale 1-5, 1 very difficult, 5 very easy)
5. How well do you think you were able to perform your work task using the system? (scale 1-5, 1 not at all, 5 very well)
6. Did you experience that this was an efficient way to work? (scale 1-5, 1 not at all, 5 very efficient)

4.3.2 ERM

The demonstration of the ERM application involved users, which are professional doctors coming from Tullinge Healthcare Centre (GP) and Huddinge Hospital (Dermatological specialist). In a second step the demonstration was decided to be extended and will involve two more units, Segelstorp Primary healthcare centre and the Orthopaedic specialist clinic at Huddinge.

Prior to the end-user demonstrations, the EM server was prepared with unit relevant organisational and professional structures and with defined referral request and answer templates including recommendations and guidelines applicable to the information items to be contained in the requests. In this case one IT co-ordinator with professional background as nurse was doing this using the EM administration and Act Builder tools, creating templates designed with help from medical specialist expertise.

The demonstration of the ERM application was based on the use cases of the demonstrator design specifications.

The demonstration scenario used was the following:

- Entered person identification numbers were checked against the central patient demographic data repository and basic demographic person data was retrieved from this repository.
- Referrals were created using the pre-defined referral templates.
- Images were, when felt appropriate, attached to the referrals.
- Referrals were signed and sent to the provider.
- Referral requests were assessed at the provider side and outcomes of assessments registered as status values of the referral request for the requester to be able to monitor the progress of each request.
- Answers to received referrals were created on the provider side.
- Referral answers were signed and sent back to the requester.
- Acknowledgements of the receipt of referral answers were registered as status values of the referral request for the provider to be able to monitor the progress of each answer.
- Requester and provider did deactivate terminated referral acts, print out the referral act documentation and archived it manually.

In parallel, manual back-up procedures were in effect to assure the proper handling of referrals in case of application failures.

As planned, after a one and half month's trial-out of the ERM application, the collection of information was done from Medical doctors (2 GPs and 1 specialist doctor) at the participating units. The representatives were requested to make very early judgements on whether the stated goals, in their opinion should be possible to reach, or whether they could make some indications on that the application had the potential, so if used in a broader and more extended scale, could be said to point in the direction of the goals.

The demonstrations will continue over the summer and in August 2000 a renewed evaluation review and discussion involving all participating professionals is going to be done.

4.4 Used methods for data analysis

The evaluation procedure that was used for the evaluation of both applications was the following:

The respondents were the users who participated in the demonstrations. These user groups in turn were composed according to application area and focused collaborative activities to be supported: for AHHC, home care/home service care teams, for ERM, GP/specialists in requester/provider roles in consultation situations.

Questionnaires and informal data collection procedures (as described above) were designed and thought through and the data were collected.

This was followed by an informal/intuitive analysis and derivation of evidence from data collected in relation to stated goals and metrics.

Due to the nature of goals and metrics, the maturity of applications and size of the respondent population, no formal statistical analysis method was applied.

4.5 Validation results

4.5.1 Evaluation of AHHC

The questions used for data collection were as described above. As mentioned, the users were strongly encouraged to supply comments and remarks concerning benefits on the business level, and to write down suggestions for further developments and extensions.

The two most important demonstration steps in relation to collaborative activities between users belonging to different professional categories and to different care units working together in teams are the steps 2, 6 and 7, concerning cross-professional views and shared care plans. The response and comments from these steps therefore were given special attention.

The following result concerning the objectives/goals/metrics suggested for the home healthcare application was derived:

AH1. No of conclusions and decisions made by professionals in groups where team-based information is directly provided from each professional category using information system support.

The intention behind this metric and the next one, AH2, is to see if application support could contribute to an increase in the number of complementary judgements made by professionals of several profession types in a care/team conference situation, and thereby have a positive influence on the quality of care.

There were clear indications that the cross-professional view functionality was experienced very positively. (“Overall picture of the problem e.g. pain. Simplifies and elucidates”; The information is more available. Quick overview of a specific problem”; “Better overview of activities - results”, “Simplifies co-operation and security of information to the home service staff …”).

This may be interpreted as early indications in the direction of the underlying objective/goal.

AH2. No of conclusions and decisions made by individual professionals at different places based on team-based information made available by information system support.

The intention behind this metric, as of AH1, is to see if application support could contribute to an increase in the number of complementary judgements made by professionals of several profession types, but here in a "stand alone" situation where all relevant information concerning other team members' observations and decisions is made available via the application.

Responses may, as above, be interpreted as early indications in the direction of the underlying objective/goal.

AH3. No of patient risk situations reported per month.

No indications found so far whether application support could lead to a reduction of the number risk situations. Renewed assessment desirable.

AH4. No of patients that have expressed that they have experienced sufficient patient safety in connection to their care.

No indications found so far whether application support could lead to an increase in experienced patient safety. Renewed assessment desirable.

AH5. Percentage of patients treated in the home that has expressed sufficient experienced patient safety.

Same result as AH4.

AH6. Percentage of relatives to patients treated in the home that has expressed sufficient safety for the patient.

Same result as AH4.

AH7. Time for accessing patient information created by different team members.

There were clear indications that application support will lead to faster access to relevant documentation generated by other members of the team.

AH8. No of times that one visit to the home is possible instead of several ones.

There were indications that the possibility to make up care plans for a patient collaboratively could lead to better awareness of each others activities and that this should lead to a better co-ordination of activities. Knowing about each other's visits to the patient and access to the documentation resulting from these visits may also have an effect on the number of visits needed.

AH9. Amount (SEK) of reduction of cost made possible through home care compared to hospital care.

No indications found so far whether application support could play a role in making home care feasible to a larger extent and that this would lead to a reduction of costs. Renewed assessment desirable.

AH10. No of patients treated at home where care plans are actively used.

There were clear indications that the care planning functionality of the application was a good step forward compared to the current situation and that the possibility to work with cross-professional and cross-unit shared care plans could lead to an increase in care planning activities.

AH11. Number of care actions, related to a particular type patient case, performed by a relative to the patient.

No indications found so far whether application support open to document also for patient relatives acting as care givers could increase the amount of care actions executed by this category. Renewed assessment desirable.

The possibilities to have a repeated evaluation round with questions more directly focusing the business level goals and metrics, than shown practicable in the first step, will be investigated. Still the evaluation would have to rely on team members' professional judgements.

The evaluation of the functionality and usability of the AHHC application, which was done in parallel to the business oriented evaluation showed very high scores. The high scores were repeated over all the involved professional categories. The overall average score for all used questions on a scale between 1 - 5 (questions no 1, 3-6) calculated over all 7 demonstration steps was in the interval of 4 to 5.

The compilation and analysis of these data was made by an independent consultant, who concludes: "The positive result reflects most certainly the methods and procedure followed for the development of the application i.e. an iterative and incremental development with strong user participation."

The consultant also brings up some reservations and risks:

- The results to the questions that were asked to the users about how well the functions work from a business perspective are difficult to analyse. The users have no system today to compare with. The answers therefore were positive and relatively uncritical. It was easier for the users to answer the questions about user-friendliness and usability.
- The risk is large that the result to a larger extend reflects how well the prototype works than how well the requirements are defined and illustrated by the prototype. Thus, it is hard to distinguish functions without the users giving opinions about the user interface.
- Also there is evidence that users sometimes have a tendency to be too positive in their judgements to be kind. Another risk is that the users make an extra effort to solve a task during these circumstances than they would normally have done.

4.5.2 Evaluation of ERM

The evaluation of the Extended Referral Management application gave the following indicative results.

ER1. No of times (claimed by professionals) that patients need not be sent to the specialist unit as a result of picture attachments to referrals and where no extra risk is taken.

The judgement from the user group was that it would be possible to reduce the number of visits to specialist clinic/doctor by at least 10% by sending the referral with attached adequate

anamnesis and image. As the goal stated 10%, this indicates that it may be possible to reduce the number of patients, which need not be sent to the specialist by more than that.

ER2. Percentage of total specialist time used for returning incomplete and irrelevant referrals.

The user group pointed out that, by experience, referrals with incomplete content are not very often sent back; instead the patient is called to the clinic.

The judgement was that there is no doubt that a pre-defined template will lead to substantially higher possibility to assess the referral accurately and in this way decide on whether the patient needs to be called to the specialist or not.

ER3. No of referrals returned to requester due to "irrelevance".

Same as ER2.

ER4. No of referrals returned to requester due to contents incompleteness.

Same as ER2.

ER5. No of referrals returned to requester due to missing preparatory actions before the referral was sent.

Same as ER2.

ER6. No of times the doctor recognises that a referral is in wait state and that no further actions are connected to it.

The doctors' judgement was that this electronic referral (ERM application) allows for follow-up requirements, which the earlier handling of referrals has not been able to support.

ER7. No of times a referral has been sent to a provider not having the shortest waiting queue.

The doctors judgement was that the possibilities of coupling the referral manager to information about up-to-date waiting times for relevant healthcare organisations would give an overview of waiting lists useful as one basis for decisions on which provider to select.

ER8. No of times that the referral was sent back with the message that there are more relevant specialist units to consult.

The doctors judgement was that the possibilities of coupling the referral manager to information about the offering of services of healthcare organisations would give useful information as a basis for decisions on which provider to select.

ER9. No of patients that have expressed that they feel that their comments have been considered when selecting the provider special unit.

The doctors judgement was that the possibilities of coupling the referral manager to information about waiting times and the offering of services of different healthcare organisations will increase the possibility to meet the patients' preferences concerning provider.

4.6 Conclusions

The results of the evaluation are summarised in the following metrics-matrix:

Categories:	Service:	Availability	User-friendliness	Reliability	Speed	Costs	Security	Other
Patient care	*Diagnosis*							
	Monitoring					No indications/ data so far		
Customer Service	*General Healthcare Information*							No indications/ data so far
	Booking							
	Referral	When info on waiting lists, useful basis for provider selection		When info on provider service offering, useful basis for provider selection	Should lead to increased possibility to detect referrals in waiting state	Should have impact on costs by reduced no of visits to specialist clinic and more complete and accurate referral content.		Should lead to increased possibility to meet patient's provider preferences.
	Identification							
	Communication between HCP's			Early indications on possible increase of complementary judgements and shared care plans.	Faster access to relevant care documentation generated by other members of the care team.	Early indications on possible reduction of number of home visits.	No indications/data so far	No indications/data so far
	Direct communication to patients							
Management	*Management information*							
	Transparency							

The evaluation of the InterCare applications in the Sweden demonstration site shows that the users are generally satisfied with the InterCare services and that they already at this stage can make some indications, however limited, concerning the potentiality of the applications in relation to the care business goals outlined.

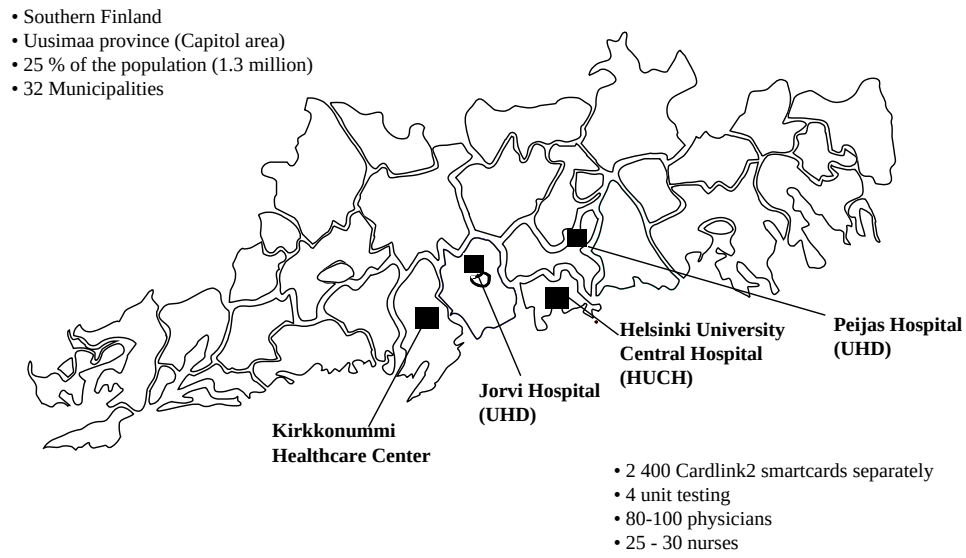
The evaluation of the functionality and usability of the AHHC application, which was done in parallel to the business oriented evaluation showed high scores for all the involved professional categories. The overall average score for all used questions, on a scale between 1 to 5, over all 7 demonstration steps ended up in the interval of 4 to 5. The possibilities to have a repeated evaluation round, to take place before the middle of September -00, more deeply focusing the business level goals and metrics now introduced, will be investigated.

The demonstration of the ERM application is decided to be extended and continue over the summer followed by a new evaluation round in August 2000. The goals and metrics will be returned to and further discussed and judged. As apparent from the early indications, the result so far is judged promising, not least shown by the interest from additional care units to participate in the demonstrations.

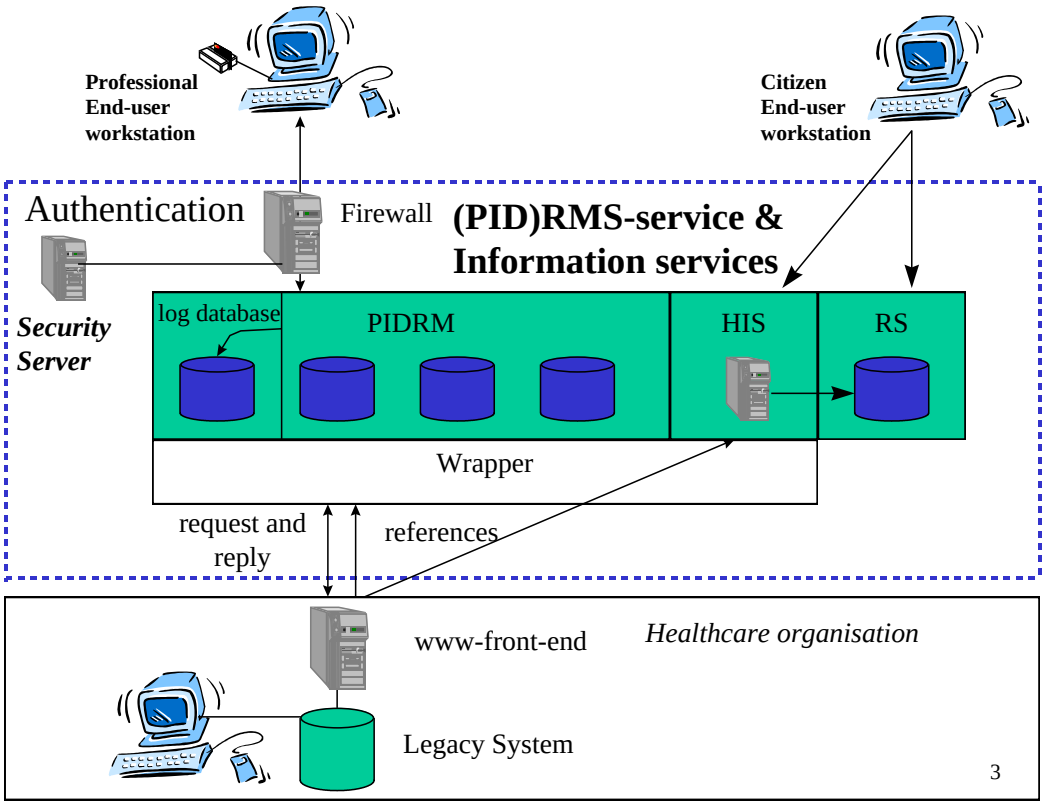
5. Finland

5.1 Introduction

The Finnish demonstration environment for InterCare experimentation includes a set of logically co-operative applications able to support a seamless care environment and services. The demonstration environment includes four healthcare units. Kirkkonummi-Siuntio Healthcare Centre is representing the primary healthcare. The Jorvi hospital and Peijas Hospital are representing the secondary healthcare units and Meilahti Hospital is representing the university level hospitals. The technical environment for demonstration is based on application service provider, which is Helsinki Telephone Company.



Technically described the environment is composed of different products and services. The evaluated services and products were IC-PIDRM, IC- HIS SSR, IC-HIS YP, IC-VPMR and IC-RS. The professionals need to have a more secure environment. The Finnish legislation requires electronic authentication and encryption functions. The Services for the citizen are based on common internet technology without electronic authentication and encryption. The legacy systems of the healthcare units which are participating in the demonstration are completed with the wrapper technique to review the medical record information. The medical records in the legacy systems are also completed with the consent of the patient, which gives the right to access the medical record data.



5.2 Changes to setup

The last demonstration phrase started in the beginning of May 2000. The delay was due to technical problems such as security components, the encryption module and networks. All the technical solutions are within the national data security legislation and technical framework and specifications. The National legislation came into effect in the beginning of December 1999, which caused some changes. The healthcard demonstration started in the June 1999.

The last demonstration phase included over 100 end users (physicians) from 4 different healthcare units as originally planned. The start of the last demonstration phase took longer time than we expected. The training of the end users took much more time, because the basic skills to use computers were lower than expected. Also changes in the organisation's firewalls and technical specifications even in the net components took some time.

Because of the delay, only 10 % of the end users were able to give their feedback in the mode of questionnaires. The feedback of the 90 % of the end users rest, will be gathered and studied later.

The result can be seen as preliminary results, but they don't meet the criteria of the valid scientifically sound study.

5.3 Results of promotional activities

There has been large interest of the seamless care services in Finland. The InterCare project has been presented in many conferences. The Medical Conference 2000, the largest conference for the physicians in this field in the Finland 3 papers of the InterCare-projects has

been presented by Mikko Rotonen, Uusimaa Hospital District, Kari Aho, STAKES and Pekka Ruusulehto, Kirkkonummi-Siuntio HCC.

VPMR has been demonstrated for different groups of customers and visitors of Helsinki Puhelin Company and STAKES. A delegation from the Ministry of Health from the Netherlands was introduced to Cardlink2 and InterCare services (VPMR) during a visit to the Finland in March 2000.

The PIDRM and VPMR-application has been demonstrated on several occasions and seminars this year to groups of interested healthcare-organisations.

Local healthcare professionals (healthcare centre GP's) and private sector physicians and political decision makers have been introduced to the InterCare services during the project. Helsinki telephone Company has several occasions to demonstrate the services to in the area and around Finland with their local commercial partners.

The demonstration-version of the InterCare-services as described above is also available on Internet: Http:// www.kolumbus.fi/teppo/intercare

5.4 Used methods for data-collection

Because the InterCare services are integrated, data-collection for evaluation of the services from the healthcare professionals point of view were collected by questionnaires. The services or products were not evaluated separately, because of the service integration. There were three different questionnaires. One was covering the end users satisfaction (based on metrics of Doll, William J. and Torzadeh, Gholamreza, "The Measure of End-User Computing Satisfaction), the second questionnaire was covering the medical treatment aspects of the services and the third was covering legal and administrational aspects. All the questionnaires and questions are described in the appendix of this deliverable.

5.5 Used methods for analysis

Although of the time and the questionnaires available, the statistical methods were the same as planned. The statistics are basic statistics such as average, mean, standard deviation. The questionnaire for the medical treatment aspects was randomised. Almost all the data was collected by questionnaires. Some technical metrics are collected and analysed from the log files. The cost efficiency analysis was based on ABC-method covering the archive services.

5.6 Validation results

The validation results may be interpreted using the metrics matrix shown in Table 1 so that the questions and the answers are structured in categories and groups.

Categories:	Service:	Availability	User-friendliness	Reliability	Speed	Costs	Security	Other
Patient care	Diagnosis	A4, A10, A11	A1, A2, A5, A6, A9, A13, A14	A3, A7, A8, A15	A12,		B26	A16, A17, A18
	Monitoring					D48		
Customer Service	General Healthcare Information	D46, E47	E45					E44
	Booking							A22
	Referral							A19
	Identification						B35	
	Communication between HCP's	D24, C40	D25, C37, C38, C39		C41		D23	A19, A20, A21
	Direct communication to patients		C42, C43, E49, E50				B33	
Management	Management information							
	Transparency							
	Legal aspects						B27, B28, B34	C36
	Awareness						B29, B30, B31, B32	

Table 1: Metrics matrix (from D6.1)

Information from: Physicians and GP's

Method of collection: a questionnaire was presented to physicians, GP's, citizen, it-experts or administrational staff at the end of the demonstration phrase, rating the quality and the user's satisfaction of the application on a scale of 1 to 5 or yes/no. Typically baseline data can not be provided, but the situation of the present services and functionality (working methods) can be described and measured by time and costs.

Availability

Availability in patient care (diagnosing)

A4: How often is the system available to use ?

Technically the service systems has been available 21 - 23 hours per day in average.
However, there irregularly times when users were not able to use the system.

A10: Do you get the information you need in time for the elective out-patients ?

The average score, varying from 1 to 5 was 2.67. Half of the users found the information in time.

A11: Do you get the information you need in time for the emergency out-patients ?

Measured on a scale from 1 to 5 the average score was 2.83. The half of the users found the systems giving necessary information for emergency out-patients in time.

Availability in Customer service (General Healthcare information)

D46: Is there special services to the healthcare professional ?

There was not any special services in the demonstration. The end users proposed that there should be special services such as video consultations, news groups and links for common medical web-sites.

E47: In there enough links and portal to the other services available?

No, not at the first version, but it is possible to add new links to the commercial web-sites for such services.

Availability in Customer service (Communication between HCP's)

C40: Do you get the information you need in time?

The average score was 2.5 varying from 1 to 5.The half of the users got the information they needed in time.

D24: Is it possibly the search references to the different treatment episodes in the area ?

Yes, there is PIDRM available which provides such a service.

<u>User-friendliness</u>

User-friendliness in patient care (diagnosing)

A1: Is the system user-friendly ?

The half of the users found the systems user-friendly. The average score was 2.83 varying from 2 to 4.

A2: Is the system easy to use ?

The half of the users found the systems easy to use. The average score was 2.83 varying from 2 to 4.

A5: Does the system provide the precise information you need ?

The average was 2.5 varying from 1 to 5. The end user found the information suitable in half of the cases. The electronic medical record or at least the epicrisis is needed in electronic format. After those two extensions the user satisfaction will increase.

A6: Does the information content meet your needs ?

The average was 2.17 varying from 1 to 4. The end users found the information suitable in half of the cases. The need for extension are the same as in metric A5. The users in the university hospital were more satisfied (average score 4).

A9: Do you think the output is presented in useful format and is suitable for the situation?

In most cases the end users found the output suitable for the situation. The average score was 4.0 varying from 2 to 5. The users in the university hospital were most satisfied (average 5).

A13: Does the system provide the precise information you need ?

The average score was 2.17 varying from 1 to 4. The end users found the information suitable in half of the cases. The electronic medical record or at least the epicirisis is needed in electronic format. After those two extensions the user satisfaction will increase. The users in the university hospital were very satisfied (average score 4).

A14: Does the system provide enough the information ?

Average score of 2.5 varying from 1 to 5.The half of the users found the systems easy to use. The users in the university hospital were most satisfied (average 4.5)

User-friendliness in Customer service (General Healthcare Information)

E45: Is there the needed information and services available?

The average was 2.63 varying from 1 to 5. The half of the users found the needed information. The users in the university hospital marked this question with an average of 4.25.

User-friendliness in Customer service (Communication between HCP's)

D25: Does the system provide the precise information you need ?

The average score was 2.17 varying from 1 to 4. The end users found the information suitable in half of the cases.

C37: Is the system user friendly?

The half of the users found the systems user friendly. The average score was 2.83 varying from 2 to 4.

C38: Is the information clear ?

Varying from 2 to 5, the scores averaged 3.8. The half of the users found the information clear and understandable. Users in the university hospital were very satisfied (average 4.5)

C39: Does the system provide sufficient information?

The half of the users found the information sufficient. The average was 2.5 varying from 1 to 5. The users in the university hospital were most satisfied (average 4.5)

User-friendliness in Customer service (direct communication to the patients)

C42: Does the system provide sufficient information (regional statistics)?

Yes, most of the users found the system providing the sufficient information.

C43: Does the system provide sufficient information (Healthcare Information)?

Yes, the most of the users found that the system provides the sufficient information.

E49: Is the system user friendly (regional statistics) ?

The end users found the systems user friendly.

E50: Is there the needed information and services available (regional statistics) ?

Yes, the system provides the needed information and services.

Reliability

Reliability in patient care (diagnosing)

A3: Has the system worked right when you have been able to use it ?

The average was 3.5 varying from 1 to 5. In most cases the system worked right when the user was able to use it.

A7: Do you find the system accurate ?

The average was 4.5 varying from 4 to 5. In the most cases the end users found the system working accurate.

A8: Are you satisfied with the accuracy of the system ?

The average was 3.33 varying from 1 to 5. In the most cases the end users found the system working accurate. The users in the university hospital were most satisfied.(average 5.0)

A15: Are you satisfied with the accuracy of the system ?

The average was 3.33 varying from 1 to 5. In the most cases the end users found the system working accurate. The users in the university hospital were most satisfied (average score 5.0)

Speed

Speed in patient care (diagnosing)

A12: Is the response time quick enough ?

The average was 2.83 varying from 1 to 4. The half of the users found the systems quick enough. The average response time was 1 seconds for delivering the data once logged in. However, the login time was in average (when taking into account the double log in

procedure) 1minute 52 seconds. The users found especially the login phase waiting time too long. The average here was 2.17 varying from 1 to 3.

Speed in Customer service (Communication between HCP's)

C41: Does the system work quickly?

The half of the users found the systems quick enough. The average score on this question was 2.83 varying from 1 to 4. The average response time was 1 second for delivering the data once logged in. However, the login time was in average (when taking into account the double log in procedure) 1 minute 52 seconds.

Costs

Costs in patient care (monitoring)

D48: Are the electronic services cost-efficient / cost-benefit ?

Based on calculations of archive costs in the hospitals the service provides great possibilities to achieve savings. The saving are expected to get in archive functions, logistics (transportation, mailing, faxing) and unnecessary and redundant tests, procedures and examinations. The service is paying back the monthly cost if the physician uses the service for querying medical record data from the other hospital in average 3-4 times per month. The extra cost savings can be achieved if there is not any overlapping clinical test or procedures needed. The analysis is based on abc-methodology.

Security

Security in patient care (diagnosing)

B26: Is the used security technique a commercial product or demo version ?

The used security technique is a commercial, qualified by authorities and owned by NOKIA.

Security in customer service (identification)

B35: Are the identification techniques approved by the authorities ?

Yes, they are approved by local authorities.

Security in customer service (Communication between HCP's)

D23: In case you did not use PIDRM, was the reason that patient did not give consent ?

This was an exceptional reason. Mostly the reason was that the users had disappointed in the very first trials of usage by the technical problems he/she had encountered and did not try to use the system again.

Security in Customer service (direct communication to the patients)

B33: Is it technically possible for the citizen to control the access to his/her medical record data by his/her own consent ?

Yes, the control is based in consent of the patient stored in the legacy systems.

Security in Management (legal aspects)

B27: Is the used technique approved by the local authorities ?

Yes, the used technique is approved by authorities such as ministry of internal affairs and data protection ombudsman.

B28: Is the used technique and service legal ?

Yes, all the services are legal and based on the national legislation.

B34: Are the identification techniques approved by the authorities ?

Yes, they are approved by local authorities.

Security in Management (security aspects)

B29: Has the system reports from security patient's point of view to study the use of medical record data?

Yes, the systems provides different kind of reports.

B30: Has the system reports from security specialist's point of view to study the use of medical record data?

Yes, the systems provides special reports for the data security specialists.

B31: Are there special reports or tool to study unusual use of medical record data ?

Yes, there is possibility to study and find the unusual use of medical records.

B32: Are there standards reports available to the citizens ?

Yes, there are special reports available.

Other

Other aspects in patient care (diagnosing)

A16: Does the use of the system enhances reaching decision on diagnosis or treatment planning ?

More than half of the users found the system helpful in treatment planning and supportive for decision making.

A17: Does the use of the system improves accuracy of the diagnosis or treatment planning ?

This was indicated in the half of the answers. (However, no sound validation of this can be made, since no baseline analysis results are available).

A18: Does the use of the system increases validity of the diagnosis or treatment planning ?

This was indicated in the half of the answers. (However, no sound validation of this can be made, since no baseline analysis results are available).

Other aspects in customer service (general healthcare information)

E44: Is the information in the system approved by the authorities and organisations?

Yes, they are approved by local authorities

Other aspects in customer service (booking)

A22: Is there a possibility to make treatment booking in the different units ?

No, the organisations expect the signatures in the referrals and so far there is not possible to send them in electronic format.

Other aspects in customer service (referral)

A19: Is it possible to send and retrieve electronic referrals ?

Yes, there is a possibility to send and retrieve electronic referrals between hospitals.

Other aspects in customer service (Communication between HCP's)

A19: Is it possible to send and retrieve electronic referrals ?

Yes, there is a possibility to send and retrieve electronic referrals between hospitals.

A20: Is it possible to send and retrieve electronic treatment feedback (epicrisis) ?

Yes, it is possible to send electronic feedback of the treatment, but not to retrieve.

A21: Is it possible to browse electronic treatment feedback (epicrisis) in different units ?

Yes, it is possible to browse the electronic treatment feedback, but only in one unit.

Other aspects in Management (legal aspects)

C36: Is the used technique approved by the local authorities?

Yes, they are approved by local authorities.

5.7 Conclusions

The preliminary results show that the InterCare-services provide an interesting and promising set of services. The results are so promising that Helsinki Uusimaa Hospital District will continue the asp-based testing till the 15th of September and will renew the questionnaires. The extensive results will be analysed in the scientific level as planned

In the preliminary results the end users found the services easy to use and the services accurate in most cases. It is also clear from answers that due to the nature of the pilot project not all technical and administrative aspects were settled in a satisfactory manner from the end users point of view. The main difficulties concerned lack of Single Sign On–mechanism, slow login process and the password policy, which was ruled by the technical software used in for VPN-solutions. Also, the user interface developed for the pilot need to be developed further. However, the user were mostly satisfied the content of the information and the response times of the system once they got inside the system. The will be need to extent the content to cover wide range of clinical information. This matter is also related to the features of legacy systems.

The summary from the answer is also shown in the form of the metrics matrix in table 2 .

Categories:	Service:	Availability	User-friendliness	Reliability	Speed	Costs	Security	Other
Patient care	Diagnosis	Half of the users found system availability good in this aspect.	The users found system reasonable easy to use.	The information content was accurate but limited.	The double login procedure took much too much time. After this the response was fast.			The usage indicated, that the system may improve accuracy and speed of diagnosis
	Monitoring					More than expected according to the calculations		
Customer Service	General Healthcare Information	The system did not provide general information in extensively enough – this was content realted problem.	The system did not provide general information in extensively enough.					The system is approved by the local authorities.
	Booking							Booking needs new arrangements and electronic signature service
	Referral							ENeeds a electronic signature service
	Identification						The identification mechanism is approved by the national authorities.	
	Communication between HCP's	Half of the users found system availability good in this aspect	The users found system reasonable easy to use. Information content must be extended.		The double login procedure took much too much time. After this the response was fast.		The identification mechanism is approved by the national authorities.	Referral service was not available and epicrises and other feedback was available only from one unit.
	Direct communication to patients		System offered accurate but limited information. The usage was user friendly.				The patients did control the delivery of their own information.	
Management	Management information							
	Legal aspects						The identification mechanism is approved by the national authorities.	The identification mechanism is approved by the national authorities
	Awareness						The system was able to report both normal usage & exceptional usage	

Table 5.2: Conclusion

6. Greece

6.1 Introduction

The development of the *Integrated Regional Healthcare Services Network of Crete* (***HYGEIAnet***), is a conscious effort to provide an integrated environment for healthcare delivery and medical training across the island. The system takes advantage of the increasing capacity of terrestrial and mobile communication networks and the development of advanced telemedicine services to provide everyone with effective healthcare and to support remote consultation with health care professionals in specialised centres, district and regional hospitals, and other points of care. It should be mentioned that the development of both the telecommunication infrastructure and the applications and services that are described below, is funded by several European and Hellenic research projects in the health Telematic domain. The regional health Telematic network in Crete is seen as an entity whose several parts are the results of several projects. *InterCare* consists one of the major efforts within the HYGEIAnet activities. The basic healthcare products, applications and services to be offered are: **PCDD** – Patient Clinical Data Directory, and **TCC** – Tele-Cardiology & tele-Consultation. Both local application, and mainly PCCD, exploit basic functional specifications of respective InterCare products such as: ***EPDS*** (Electronic patient Dossier Services), and ***SS/IACS*** – Security Services/Integrated Access Control Services (as presented in detail in previous deliverables, D4.1, D5.1, and D6.1).
The evaluation framework of PCDD and TCC systems/services was the region of Crete, where *Experts* (i.e., healthcare professionals in the region) and *Technical Staff* (members of the CMI-HTA group of ICS-FORTH which came in contact in the various development phases of PCDD and TCC products), took part in the evaluation process form March-May 2000. The ***aims*** of the evaluation/assessment process (as was already indicated and referred in deliverable D6.1) are:

O1: To support exchange of patient information between medical doctors in the region.
O2: To support consultation provided by experts to GPs (latter working in HCC).
O3: To support rationalisation of health care resources within a region.
O4: To support medical doctor development

	Strong
	Medium
	Light

	PC1 No of consultation sessions between GPs and health specialists.	**PC2** Time required to locate patient information during an emergency.	**PC3** Cost of medical examinations per patient.	**PC4** Number of medical examinations per patient.	**PC5** Reduction of time in waiting list in context with visiting a health specialist at the regional hospital.
G1: To reduce time spent in locating patient information.					
G2: To reduce number of duplicate medical examinations.					
G3: To improve quality of information used by doctors in managing patients.					
G4: To improve on timely booking of patients who need so at specialised treatment facilities (located within a regional hospital).					
G5: To support continuous learning of medical personnel (expands the number of cases which they treat).					
G6: To provide readily access to patient information during emergencies.					

Table 6.1 Relationship between goals and metrics

Each aim refers to respective *goals* to be achieved (G1 to G6) each of which is related to some measurable *metric* (PC1 to PC5). The power by which each metric participates into the goals to be achieved is shown in table 6.1.

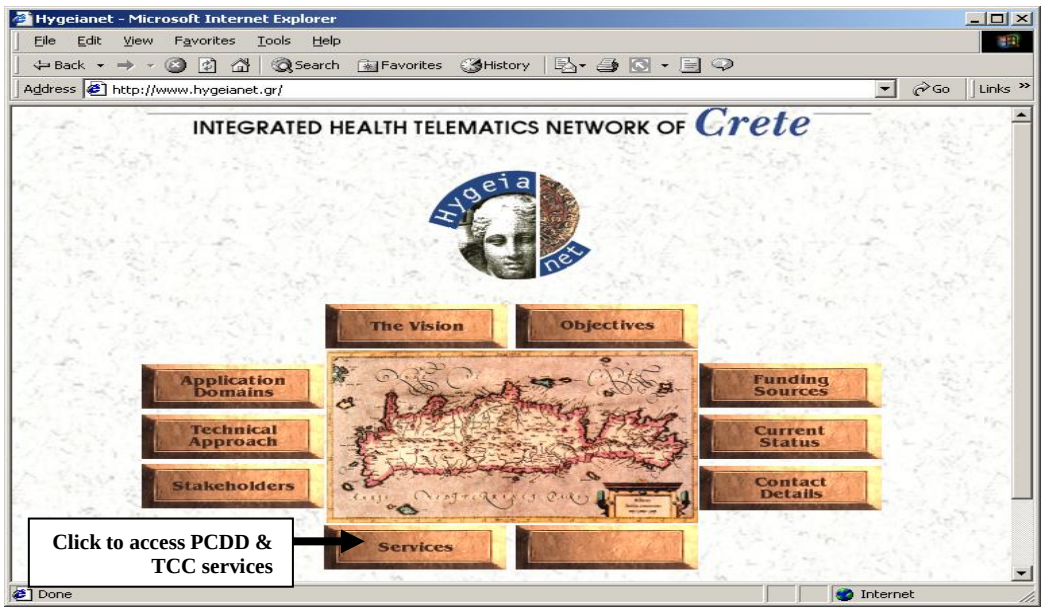
6.2 Changes to setup

The ***PCDD*** and ***TCC*** services is assessed and evaluated according to its relation with specific *quality factors* that characterize it. Each factor is evaluated on a five points scale- [1] *poor*, [2] *fair*, [3] *good*, [4] *very good*, [5] *excellent*.

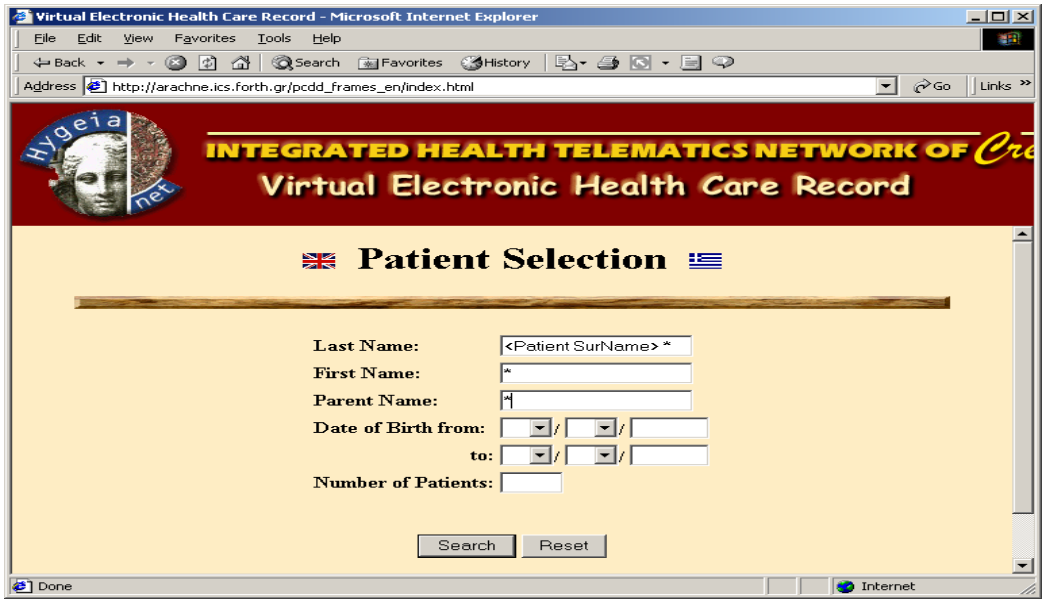
6.3 Results of promotional activities

6.3.1 GREECE: Public Web Access for Local Products & Applications

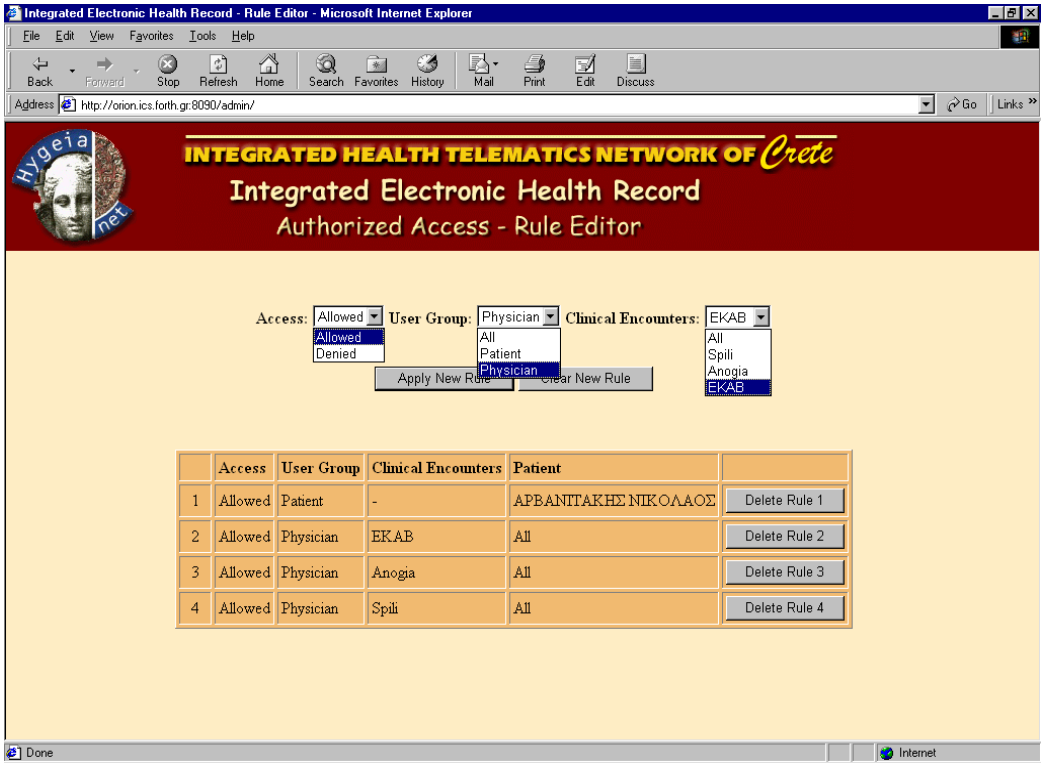
Both PCDD and TCC services are offered via Web-based access (despite their stand-alone application status). The services are offered via the main Web page of the integrated health telematics network of Crete, www.hygeianet.gr, shown in the figure below.



- **PCDD Web-based services:** The Virtual EHCR Service is a prototype providing uniform access to distributed healthcare record segments over HYGEIAnet. Incorporated data come from the Primary Health Care Center Information Systems (PHCCCIS) of Spili and Anogia, the Health Emergency Co-Ordination Center Information System (HECC IS), as well as the Pediatrics Surgery Clinic Information System (PSCIS) of the Regional University General Hospital of Heraklion. The figure below shows the main, entry screen of the Web-based PCDD service.



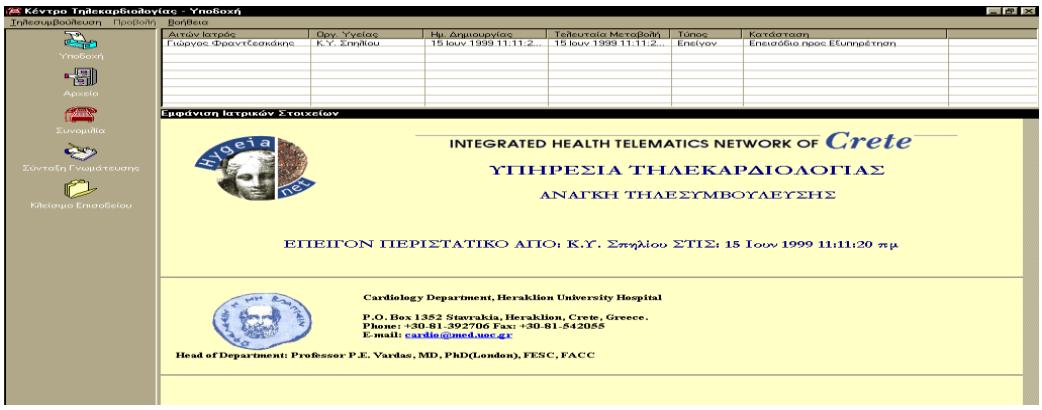
Role-based Access Control Administration to PCDD services. The following screen dump shows the Web entry page in which the access rights to patients' clinical information are assigned to various user groups (according to their roles).

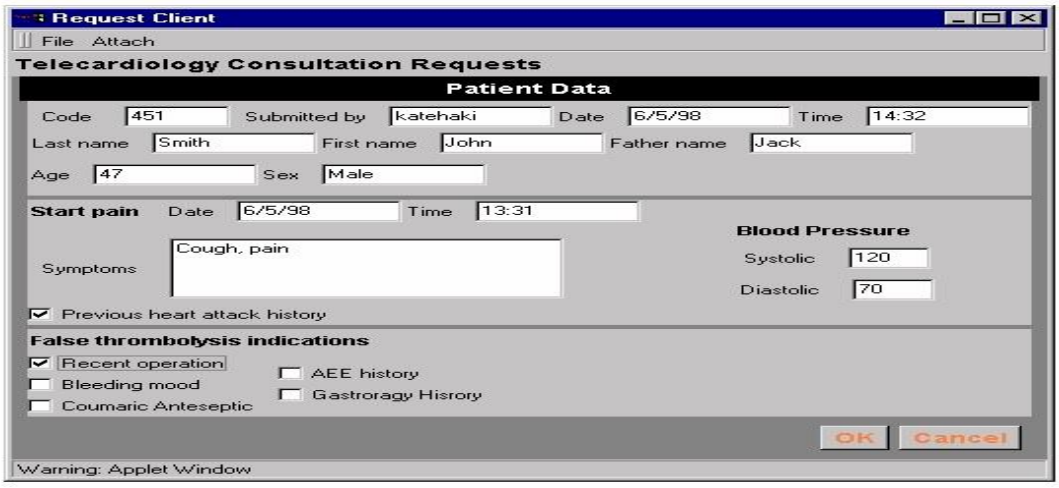


- **TCC Web-based services:** *A scenario-of use:* Consider the following scenario. A GP at a primary healthcare facility admits a patient suffering severe chest pain. If the clinical findings raise the suspicion of myocardial infarction, the GP may request assistance from a central hospital offering specialized telecardiology consultation services. The GP submits a consultation request that includes clinical findings and the patient's electrocardiogram (ECG) to a Telecardiology Service Provider (TSP). The submission of the request triggers an alert in the selected TSP. A specialized cardiologist reviews the clinical data in the request and establishes communication with the GP. This communication may involve asynchronous transfer of objective medical data, tele-monitoring of the patient's vital signs and ECG, and video/desktop conferencing.

  The cardiologist may advise the GP that the patient should be given thrombolytic treatment. An ambulance is requested, while the cardiologist cooperates closely with the GP and monitors the condition of the patient. Finally, the patient is transferred to the hospital and comes under the direct care of the cardiologist, while the telecardiology consultation records become part of the patient's Electronic Healthcare Record (EHR).

  Telecardiology consultation requests are structured forms which may be completed using a web browser or through the primary healthcare center information system. The system maintains the healthcare records of the patients visiting the center. The collaborating GP selects an appropriate TSP from the regional healthcare resource service and submits a telecardiology consultation request. The request form contains the name of the GP, patient identification information, clinical findings, and the patient's ECG. The form is designed so that data entry is semi-automated and is kept to a minimum. To address security aspects, the request form is signed using the digital signature of the GP. The main, entry Web page to access TCC services is shown in the figure below.





The tele-consultation form/***folder*** (created and stored ate the remote HCC and at the TCC center) appears in the Figure below.

6.3.2 Promotion & Open Days

Educational Seminars

1. S. Orphanoudakis. Medical Informatics and Telematic HealthCare Applications, June 1999.
2. M. Tsiknakis. The Architecture of Developing Integrated HealthCare Regional Networks, June 1999.
3. C. Chronaki, WebOnColl: Tele-Cardiology Services Support to Remote HealthCare centers, June 1999.

Open Days

1. Sitia/ Crete county: An open day co-organized with the local regional hospital and decitated to healthcare Telematic solutions, October 1999.
2. Chania/ Crete county: An open day co-organized with the local regional hospital and decitated to healthcare Telematic solutions, October 1999.

Press

Results of the CMI/HTA group, i.e., products, applications and services from European and national projects (including InterCare) were presented into various national and domestic press releases. Newspapers: 'Patris', 'Eleutherotupia', and to the Cretan domestic TV channel, "Creta" and national "Mega".

Talks/ Presentations

- *PCDD & Integrated Health Telematics Network of Crete*

1. P.J. Lees, C.E. Chronaki, E.N. Simantirakis, S.G. Kostomanolakis, S.C. Orphanoudakis, and P.E. Vardas. "Remote Access to Medical Records via the Internet: Feasibility, Security and Multilingual Considerations" In Proceedings of Computers in Cardiology 1999 (CIC 99) - Hannover, Germany, September 26 - 29, 1999.
2. D. G. Katehakis: Virtual EHCR Services over HYGEIAnet: The Patient Clinical Data Directory, Towards an Electronic Health Record Europe (TEHRE'99), Meet the Challenges of Health IT, London, UK, November 15, 1999.
3. *M. Tsiknakis, D. G. Katehakis: Virtual EHCR Services over HYGEIAnet: The Patient Clinical Data Directory, Towards an Electronic Health Record Europe (TEHRE'99), Meet the Challenges of Health IT, London, UK, November 15, 1999.*
4. M. Tsiknakis, HYGEIAnet: Integrated Health Telematics Network of Crete, International Conference of Medical Physics, Patras, September 1999.
5. M. Tsiknakis, Technological challenges for the development of HYGEIAnet, Integrated Telemedicine in the 21st Century: *Opportunities for Citizens, Society and Industry*, International Workshop, *Strasbourg, France,* November 1999.
6. G. Potamias, M. Tsiknakis, D. Katehakis, E. Karabela, V. Moustakis, and S. Orphanoudakis. Role-Based Access to Patients Clinical Data: The InterCare Approach in the Region of Crete. MIE2000 (accepted for presentation and publication).

- *Tele-Cardiology & tele-Consultation (TCC)*

1. C. Chronaki, et al. "WebOnCOLL: Medical Collaboration in Regional Healthcare Networks" IEEE Tran. on Inform. Techn. in Biomedicine. Vol. 1, no. 4. Dec. 1997. http://www.ics.forth.gr/ICS/acti/cmi_hta/publications/papers/1997/ieee97weboncoll/ieee97weboncoll.html

2. C. E. Chronaki, X. Zabulis, D.G. Katehakis, A. Giannopoulos, N. Stathiakis, M. Tsiknakis, P.J. Lees, E.N. Simantirakis, P.E. Vardas, and S.C. Orphanoudakis, "WebOnCOLL-enabled Remote Cardiology Consultation for Suspected Myocardial Infarction," In Proceedings of Mednet'98, London, England, 16-19 November 1998, pages 41-43. http://www.ics.forth.gr/ICS/acti/cmi_hta/publications/papers/1998/mednet98/mednet98.html

6.4 Used methods for data-collection

The form shown in Table 6.2 below, was used as the evaluation/assessment *questionnaire* and was filled by the respective evaluation group. Note that, not all measurable factors contribute to the measurement of respective services (i.e., "user friendliness" contribute just to "general healthcare information", "direct communication to patients", and "transparency").

CATEGORIES ↓	SERVICE ↓	Availability	User-Friendliness	Reliability	Speed	Costs	Security
Patient care	***Diagnosis***	Need: [ ] Objective: [ ]			Need: [ ] Objective: [ ]		
	Monitoring	Need: [ ] Objective: [ ]			Need: [ ] Objective: [ ]	Need: [ ] Objective: [ ]	
Customer Service	***General Healthcare Information***	Need: [ ] Objective: [ ]	Need: [ ] Objective: [ ]		Need: [ ] Objective: [ ]	Need: [ ] Objective: [ ]	Need: [ ] Objective: [ ]
	Booking						
	Referral	Need: [ ] Objective: [ ]			Need: [ ] Objective: [ ]	Need: [ ] Objective: [ ]	Need: [ ] Objective: [ ]
	Identification	Need: [ ] Objective: [ ]			Need: [ ] Objective: [ ]	Need: [ ] Objective: [ ]	Need: [ ] Objective: [ ]
	Communication between HPC's	Need: [ ] Objective: [ ]		Need: [ ] Objective: [ ]	Need: [ ] Objective: [ ]		Need: [ ] Objective: [ ]
	Scheduling						
	Direct communication to patients	Need: [ ] Objective: [ ]	Need: [ ] Objective: [ ]		Need: [ ] Objective: [ ]	Need: [ ] Objective: [ ]	Need: [ ] Objective: [ ]
Management	***Management information***	Need: [ ] Objective: [ ]	Need: [ ] Objective: [ ]		Need: [ ] Objective: [ ]	Need: [ ] Objective: [ ]	Need: [ ] Objective: [ ]
	Transparency	Need: [ ] Objective: [ ]					

Table 6.2. Questionnaire form used for the valuation of PCDD and TCC

Guide/ Index to the Questionnaire

In [ ] put a number form [1-5]: [1] *poor*, [2] *fair*, [3] *good*, [4] *very good*, [5] *excellent*

Need: The user's "level of subjective need" for the respective service

Objective: The user's "assessment/evaluation level" of the respective service (i.e., the level of satisfaction for the provided service)

- *Availability*: Is the service available and on what level?
- *User-Friendliness*: Is the service "user-friendly" and on what level?
- *Reliability*: Is the service "reliable" and on what level?
- *Speed*: Are you satisfied with the "speed" that the respective service is provided and what is the level of your satisfaction?
- *Costs*: What is the level of your satisfaction with relation to the costs of the provided service?
- *Security*: Is the service provided in a secure manner and what is the level of your satisfaction for the provided security add-ons?

The overall evaluation of the PCDD and TCC local applications and provided services is based on this questionnaire as were filled by 3 different user groups: (**I**) Six- (6_ Experts/healthcare professionals in HealthCare Centers (from the Spili and Anogia HCCs), (**II**) Seven- (7) Experts/healthcare professionals in Hospital units/clinics (from the PEPAGNH, Rethymnon and SITIA general hospitals), and (**III**) Seven- (7) Experts/technical staff involved and/or used the respective applications and services (from the CMI-HTA , ICS-FORTH group). A total of *20* users took part in the evaluation process.

6.5 Used methods for analysis

6.5.1 Evaluation of PCDD services: Statistical Methods Used

As it was mentioned above, the questionnaire shown in table 2.2.5.1. was given to users in order to evaluate PCDD and TCC services.

In this questionnaire and for each specific measurable factor two distinct numbers occur:

- **Need**: An integer number in [1-5] reflecting the ***level of the need*** for the specific measurable factor and for the specific service.
- **Objective**: An integer number in [1-5] reflecting the ***level of user's satisfaction*** regarding the specified measurable factor and for the respective service.

In order to capture the overall performance of systems'/services' (i.e., PCDD and TCC) performance we formed a formula that combines both user's need and satisfaction.

Definition 1. Denote with ***s*** a specific service (for example: "General Healthcare Information"); there is a total of ***s*** = 11 services identified in the form/questionnaire. Denote with N_{is}, $O_{i,s}$, the level of need, and the level of satisfaction for a specific measurable factor, ***i***, (there are ***i*** = 7 measurable factors) for the specified service, respectively (i.e., N_{11} = "*Availability of Diagnosis*", O_{11} = "*Satisfaction for the Availability for Diagnosis*").

Definition 2. The ***Combined Subjective Objective Metric*** for factor I with respect to service s is defined as:

$$CSOM_{i,s} = N_{i,s} \times O_{i,s}$$

i.e., as the product between the respective level of user's need and level of user's satisfaction.

- With this metric we are able to capture the *relativeness* between the needs of different users and their levels of satisfaction for the performance of the different services (as measured with reference to the respective measurable factors).
- Using variations of the aforementioned metric we are able to evaluate and measure : (a) *Services* (i.e., by computing the mean of *the CSOM metric for the factors that influence its performance), (b) Categories* of services (i.e., by computing the mean of the CSOM metric for the factors that influence the specified category of services, and (c) Factors (i.e., by computing the mean of CSOMs for the services that the factor influence).

Note: The metrics defined above fall into the area of "*natural statistics*". They are not meant as a substitute to traditional statistical analysis methods and techniques (like statistical significance, principal factor analysis and others). The metrics, and the underlying evaluation methods/techniques, *reflect* in a natural way the ***impact*** of the respective local applications into the healthcare users' community.

6.5.2 Evaluation of TCC services: Set-Up and Evaluation Scenario

TCC application is a client-server application running between *Health Care Centers* (HCC) and *tele-Cardiology Centers* (tCC; operating in a respective authorised hospital unit).

In the current status of the healthcare network of the Crete region there is no provision for an authorised tCC (the situation applies to all other Greek regions). Confronted with this situation, and because TCC service provides for real emergency medical situations (i.e., a real cardio-infraction episodes) where, a real tCC exists and operates, we decide to proceed into a *'prototype' lab-based* evaluation set-up. This set-up includes:

- The main *human actors:* (a) a GP (HCC physician), and (b) an expert cardiologist (one form the PEPAGNH Heraklion University Hospital acting as an authorised tCC expert).
- The main *systems actors*: (a) PHCCIS (the Primary HealthCare Center Information System), (b) the TCC system/server application.

In this lab-restricted evaluation set-up we did not proceed into a full-scale statistical analysis- the number of involved users is not enough for a such a trial. Instead, we tried to capture the experts' first impressions about the *general functionality* of the application and record their *recommendations* (for the future improvement of the provided TCC services) according to a fixed pre-defined use scenario.

The TCC evaluation use-scenario

1. *GP (at HealthCare center) request telecardiology consultation* → Automatic generation of the Tele-Consultation Form (***TCF***)
2. *GP checks, completes and signs the request:* The request is forwarded to a telecardiology center → Telecardiology consultation folder is created
3. *Specialized cardiologist on-call (in the Hospital/Tele-Cardiology Center) is alerted*
4. *Doctors collaborate:* Chat → Examine medical data, → Activity log is maintained
5. *TCF is made part of the Integrated-EHR of the patient* (accessible from PCDD service)

6.6 Validation results

6.6.1 PCDD: Validation Results

In table 2.5.5.1. below we present the results of our CSOM-based, statistical analysis for the filled questionnaires and for the PCDD system/services. Note that for each measurable factor there are two- (2) columns:

- (Column1) - The computed CSOMs for the *Experts/Healthcare professionals*
- (Column2) - The computed CSOMs for the *Technical Staff* that evaluated PCDD and TCC services/systems.

CATEGORIES	SERVICE	Availability		User Friendliness		Reliability		Speed		Costs		Security		TOTAL	
		HCP	*TS*	*HCP*	*TS*	*HCP*	*TS*	*HCP*	*TS*	*HCP*	*TS*	*HCP*	*TS*	*HCP*	*TS*
Patient care	**Diagnosis**	0.71	0.87			0.72	0.60	0.60	0.87			0.74	0.80	**0.70**	**0.79**
	Monitoring	0.30	0.33			0.60	0.70	0.29	0.57	0.40	0.30	0.41	0.40	**0.40**	**0.46**
	Overall	0.51	0.60			0.66	0.65	0.45	0.72	0.40	0.30	0.58	0.60	**0.55**	**0.62**
Customer Services	**General HealthCare Information**	0.86	0.90	0.61	0.63			0.68	1.00	0.40	0.30	0.83	0.73	**0.68**	**0.71**
	Booking														
	Referral	0.44	0.40					0.36	0.40	0.60	0.50	0.69	0.80	**0.53**	**0.53**
	Identification	0.87	1.00					0.85	0.83	0.60	0.50	0.82	0.80	**0.79**	**0.78**
	Communication between PCs	0.69	0.90			0.52	0.80	0.48	0.80			0.93	0.80	**0.66**	**0.83**
	Scheduling														
	Direct. Communication to Patients	0.49	0.57	0.43	0.40			0.43	0.60	0.65	0.40	0.64	0.80	**0.53**	**0.56**
	Overall	0.67	0.75	0.52	0.52	0.52	0.80	0.56	0.53	0.56	0.43	0.78	0.79	**0.64**	**0.68**
Management	**Management Information**	0.82	0.83	0.65	0.60			0.70	0.87			0.85	0.80	**0.76**	**0.78**
	Transp/cy	0.66	0.72											**0.66**	**0.72**
	Overall	0.74	0.80	0.65	0.60			0.70	0.87			0.85	0.80	**0.71**	**0.75**
	OVERALL	**0.64**	**0.70**	**0.59**	**0.60**	**0.59**	**0.73**	**0.57**	**0.70**	**0.48**	**0.37**	**0.74**	**0.73**		

Table 6.3 PCDD evaluation – computed Combined Subjective Objective Metrics (CSOM) for measurable factor and respective services

How to Read the Results Table

Each cell presents the computed CSOM metric for the respective measurable factor and for each respective service. For example, the first cell "***Diagnosis→/ Availability↓***" = "0.71" should be interpreted as follows: *"For all Expert/HealthCare professionals evaluators the mean of the computed CSOM metrics for the satisfaction* ***Index*** *of the Availability for the Diagnosis service is 71/%".* Actually, the '0.71' figure comes from the following summarized information (as recorded in the filled-in questionnaires):

Service: ***Diagnosis***	**Expert-1**	**Expert-2**	**Expert-3**	**Expert-4**	**Expert-5**	**Expert-6**	**Expert-7**	**Expert-8**	**Expert-9**	**Expert-10**	**Expert-11**	**Expert-12**	**Expert-13**	
Factor: ***Availability***	Need: [5] Objective: [5]	Need: [4] Objective: [4]	Need: [5] Objective: [5]	Need: [4] Objective: [4]	Need: [5] Objective: [5]	Need: [5] Objective: [5]	Need: [5] Objective: [4]	Need: [4] Objective: [4]	Need: [3] Objective: [5]	Need: [4] Objective: [4]	Need: [3] Objective: [3]	Need: [3] Objective: [5]	Need: [3] Objective: [3]	

6.6.2 TCC: Validation Results

The recorded expert evaluators' reactions and recommendations concern the following key-functions/operations and provided TCC services.

1. *Telecardiology Consultation Folders* (TCF)
   - Customized forms in HTML
2. *Accounting of Medical Acts*
   - Integration with the PHCC IS (HealthCare Centers' dedicated Clinical Information System)
3. *Accounting of Medical Acts*
   - Digital signing of medical data
   - Digital ECGs (SCP standard)
   - Digitization of X-rays (DICOM standard)

The following table 2.5.5.2 summarizes the reactions and recommendations of involved experts regarding TCC application.

		Poor	Good	Excellent	Recommendation
Telecardiology Consultation Folders	Customized forms in HTML		√		*Need to be more adaptive to users.*
Accounting of Medical Acts	Integration with the PHCC IS			√	*o.k. Need for more efficient elaboration in emergency situations*
Accounting of Medical Acts	Digital signing of medical data		√		*Good in general – Need to integrate data from other legacy systems (e.g., PCDD, in order to access patients' clinical historical data)*
	Digital ECGs	√			*Just for one vendor – Need to integrate and host more ECG types.*
	Digitization of X-rays	√			*In general is poor. Need for a dedicated and customized environment to acquire and view X-Rays*

Table 6.4 *TCC lab-based evaluation and recommendations for further improvement*

6.7 Conclusions

Expert/HC professionals:

- Categories of Services

  Patient Care: A Satisfaction Index of **55**%, (to be considered as 'acceptable') mainly because of high satisfaction index for 'Diagnosis'(= **70**%), but low satisfaction index for 'Monitoring' (= 40%). This was to be expected, because PCDD offers mainly "patients' clinical information" which could be used for monitoring, but not directly!

  Customer Services: A satisfaction Index of **64**%, (to be considered as 'good'), mainly because of high satisfaction index for 'Healthcare Information' (68%) and 'Identification' (**79**%). This was to be expected because one of the main services of PCDD is the identification of both patients and their encounter segments. More should be done on the direction of adding 'Referral' operations, which received an overall satisfaction index of 53% ('nearly acceptable').

  Management: A satisfaction Index of **71**%, (to be considered as 'very good'), mainly because of high satisfaction index for 'Information Management' (**76**%; a variety of

managing- navigating, filtering, viewing, operations are offered by PCDD). The 66% satisfaction index for 'Transparency' should be considered as 'good', but more should be done on this direction.

- *The Key-Factors*: From a close look ate the filled-in questionnaires, the main factors on which the HC professionals base their evaluation for the PCDD services are: "*Availability*", "*Speed*", and "*Security*" (these factors rank the *highest mean-need-level* over all expert evaluators). All these factors receive a mean satisfaction index of: *Availability*=**64**% (*very good*), *Speed*=**57**% (*acceptable*), and *Security*=**74**% (*very-good*). Even with these *acceptable-to-very-good* satisfaction figures, more should be done in order to achieve highest satisfaction rates.

Technical Staff:
As it could be confirmed from the results table above, the technical Staff evaluators gave more-or-less the same results as the healthcare professionals. The trend is to give highest satisfaction figures for all of the services' categories. This is due to the fact that the '*Need'* for all technical staff evaluators was fixed to '***5***', and so, the computed metrics gave largest numbers.

6.7.1 Evaluation Results vs. Original Aims and Goals

G1: To reduce time spent in locating patient information.
The related services are: "*Communication between PCs*", "*General healthcare information*" and "*Management Information*". For these services the direct involved measurable factor is "Speed" which exhibits satisfaction indices from 50% to 70% (with a mean of ~ 60%) . So, we may assign a '**good**' performance index for G1.

G2: To reduce number of duplicate medical examinations.
The related services are: "*Patient Care/Diagnosis, Monitoring*", "*General healthcare information*" and "*Referral*". For these services the direct involved measurable factors are "*Availability*" and "*Costs*" which exhibit satisfaction indices from ~40% to ~75% (with a mean of ~ 55%) . So, we may assign a '**good**' performance index for G2.

G3: To improve quality of information used by doctors in managing patients.
The related services are: "*General healthcare information*" and "*Management/ Transparency of Information*". For these services the direct involved measurable factors are "*Availability*" and "*Reliability*" which exhibit satisfaction indices from ~55% to ~85% (with a mean of ~ 70%) . So, we may assign a '**very-good**' performance index for G3.

G4: To improve on timely booking of patients who need so at specialised treatment facilities (located within a regional hospital).
The related services are: "*Booking*" and both PCDD and TCC do not provide related operations and functionality (at least with a direct way). In this respect we may consider the application that perform '**poor**' with respect to goal G4. It is worthwhile to note here, that in the planed and scheduled new releases of PCDD and TCC (~ end of the year 2000) there is the provision to add booking operations and functionality.

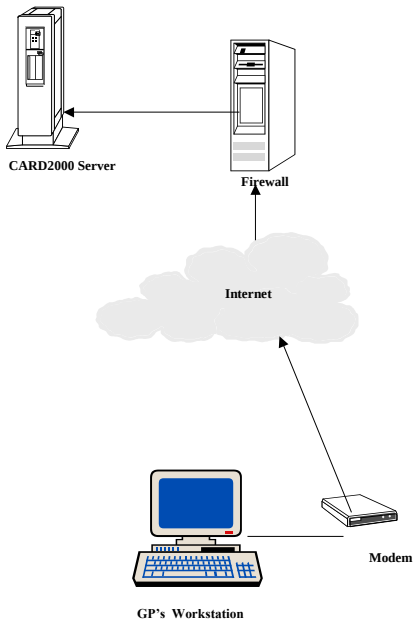
G5: To support continuous learning of medical personnel (expands the number of cases which they treat).
The related services are: "*General healthcare information*" and "*Management/ Transparency of Information*". For these services the direct involved measurable factor is "*Availability*" and "*Reliability*" which exhibit satisfaction indices from ~65% to ~85% (with a mean of ~ 75%) . So, we may assign a '**very-good**' performance index for G5.

G6: To provide readily access to patient information during emergencies.
The related services are: "Management/ Transparency of Information". For this service the direct involved measurable factors are "Availability" and "Speed" which exhibit satisfaction indices from ~70% to ~80% (with a mean of ~ 75%) . So, we may assign a '**very-good**' performance index for G6.

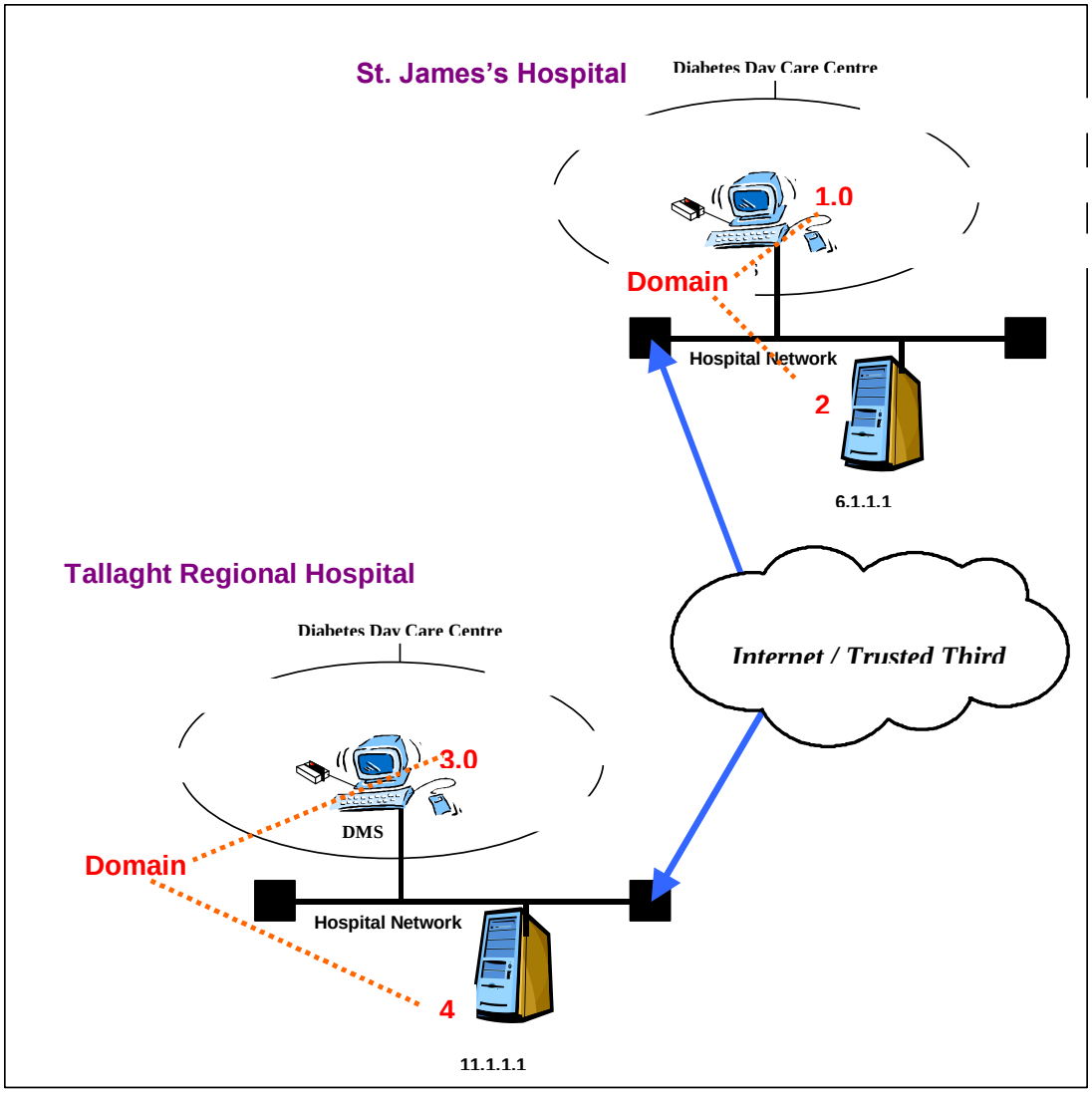
7. Ireland

7.1 Introduction

The Irish demonstration-site is described in D6.1. (see diagrams below).



CARD2000 Demonstration Setup



DMS Demonstration Set-up

Demonstrations were carried out during the month of May 2000. Users involved included; GPs for the CARD2000 application and a range of healthcare professionals involved in caring for patients with diabetes for the DMS application.

CARD2000

CARD2000 is a Medical Card Administration System. A Medical Card is issued by Health Boards to citizens who satisfy certain criteria (means based). A medical card holder has entitlements to certain free health services. The application uses the IC-PIDRM product. The application was implemented in the Eastern Regional Health Authority in May, 1999 and currently has in excess of 200 users. The North Eastern Health Board implemented the system in November, 1999 in all their Community Care Area Headquarters and certain large health centres.

The North Eastern Health Board was selected as the demonstration site for the CARD2000 application because of it's security infrastructure (firewall in place). A group of 20 GPs were selected to participate in the demonstrations. These GPs had existing IT equipment and were familiar with the Internet. They were given a 1 hour training session in their practices to

enable them to participate in the demonstrations. They were also spread out geographically throughout the North Eastern Health Board catchment area.

They were invited to use the system for a week (including weekends) and access through the firewall was enabled for them.

DMS

The DMS is an application for managing diabetes specific information for individual patients with diabetes and was developed by St. James's and Tallaght Hospitals. The DMS enables healthcare professionals involved in the shared care of patients with diabetes to access their patient's data and in particular laboratory data. Also, the application provides an access point to the data, replacing current methods of access including telephone and post.

The Common Product being used is the IC-PIDRM and this provides a management and mapping service for patient ids from different domains. The IC_PIDRM supports both the assignment of Ids within a particular Identification Domain and the correlation of Ids among multiple Identification Domains.

The data to be used in the analysis phase was supplied by results collected from the user-testing phase, in which the involved users employed the DMS to manage patient data for patients with Diabetes Mellitus. This management of data included:

- Entering patient data given to them in the form of a case scenario as shown below:

DIABETES MELLITUS CASE SCENARIO

Presenting Information
A Patient presents with one or more symptoms of diabetes including the following: – Fatigue, Polydypsia, Polyuria,Weight Loss. On measuring the patient's blood glucose level it was found to be elevated and also the patient has been suffering from recurring urinary tract infections. On the basis of this information the patient is referred to the Diabetes Day Care Centre.
The following are demographic and referral data fort the patient.

Demographics:

Name:	Mr. Joseph Bloggs
DOB:	07/09/1959
Sex:	M
Address:	55 Rathdrum Villas, Crumlin, Dublin 6.
Telephone:	01 – 3456479
Referral from:	Dr. John Grey, Rialto, Dublin 8. Telephone: 01 – 2387287
Family GP:	As Above

For the initial screening of the patient of the patient the following clinical laboratory investigations were carried out:

Screening Tests:

2 Hour O.G.TT
T4/TSH
Fasting Lipid Profile
HBA1C
Microalbumin
Renal Profile
Liver Profile

The Diagnosis of diabetes was confirmed and the patient was referred to the Diabetes Out Patient's Department (OPD). At this the patient underwent a physical examination and the following information was recorded:

Full Patient History:

Date Recorded:	23/01/00
Diabetes Mellitus	Type II
Diagnosis confirmed by	Fasting Glucose
Original Complaint	Urinary Tract Infection
Medications Allergies	None
Medications Allergies	None

Full Family History:

Family Member	Father
DM Type II	Related Disorder
Related Disorder	DM Type II

Year of Diagnosis	1923

On interview with the dietician the following nutritional history was recorded:

Nutritional History:

Regular Meals:	Yes
Fatty Foods:	No
Sugar Foods:	Yes
Alcohol	Yes
Smoker	Yes – 20/25 per day
Current Weight	70 Kg
Previously Document Weight	
Usual Weight	80 – 85 Kg

Physical Findings:

Height	180 cm
Weight	70 Kg
Fundi	Normal
Neuro – KJ	+
Neuro – VIB	+
Neuro – AJ	+
Thyroid	Normal
Respiratory	Normal
Oral	Normal
Cardiac	Added Sound

- Viewing patient data previously existing in the system. Each of the users involved in the prototype testing was assigned five different patients of their own and were given the Patient Identification information required to view the individual patients.
- Generating Reports & sending data

A means for the user to record their results during the prototype testing phase was provided in the form of a questionnaire. This questionnaire was based on the Metrics Framework outlined in D6.1 for the DMS and is illustrated in section 7.4 below.

7.2 Changes to setup

Demonstrations of the HIS/HSIS were not possible as the HIS application was not available in time. Therefore, no data relating to HSIS is available in this deliverable. The evaluation should take place by November, 2000 and the results will be included in a supplement to D6.2.

7.3 Results of promotional activities

There is great interest within the Irish healthcare community in the HIS/HSIS application so it is unfortunate that we were unable to demonstrate it. However, the value of the CARD2000 and DMS applications should not be underestimated. Although both are targeted to a narrower audience, they have considerable value to the healthcare professionals involved.

In the case of the CARD2000 application, currently there are only manual methods of determining client eligibility to free healthcare (either by telephone enquiry, or consultation of monthly printout) so online access is a considerable improvement. A number of presentations have been made to GP Units in both the North Eastern Health Board and the Eastern Regional Health Authority. The GPs involved in the actual evaluations have also discussed the system with their colleagues.

Healthcare Professionals involved in the care of patients with diabetes currently do not use any form of condition-specific application in Ireland so an application targeted to this group is

both welcomed and much needed. Presentations have been given at Continuing Medical Education events where specialists in diabetes attended. It is also likely that a paper on InterCare will be presented at the next Irish Health Telematics Conference in Autumn 2000.

7.3.1 Availability on the Internet

HSIS

Once the IC-HIS product has been installed and evaluated by end-users, it will be available on the Internet at http://www.slainte.ie. In the interim, the HSIS is available (in prototype form) at http://192.169.1.104

DMS

Information on the DMS application will be made available on the St. James's Hospital website at http://www.stjames.ie

CARD2000

Information on the CARD2000 application will be made available on the North Eastern Health Board website at http://www.nehb.ie

7.4 Used Methods for data collection

CARD2000

GPs who participated in the evaluation were asked to fill out the CARD2000-questionnaire (questionnaire 10 in the appendix). One questionnaire per client lookup was used.

DMS

The questionnaire provided to the users for recording the results of their testing of the DMS was based on the Metrics Framework outlined in D6.1 for the DMS. The questionnaire had the format of questionnaire 11 in the appendix.

7.5 Used Methods for Analysis

Questionnaires were used for both applications. Technical metrics were obtained from firewall log files for the CARD2000 application.

7.6 Validation results

The following table displays the metrics matrix used. Please note that the HSIS metrics have been removed as the application could not be evaluated (change from D6.1):

Categories:	Service:	Availability	User-friendliness	Reliability	Speed	Costs	Security	Other
Patient care	Diagnosis	C2			C1			
	Monitoring							
Customer Service	General Healthcare Information	DMS3, DMS4	DMS7		DMS6		DMS1 DMS2	
	Booking							
	Referral							
	Identification			DMS4 DMS5				
	Communica-tion between HCP's							
	Direct com-munication to patients							
Management	Management information		DMS9 DMS10		DMS6			
	Transparency	DMS8 DMS9 DMS10						

7.6.1 CARD2000

114 questionnaires were completed and returned.
Firewall log files were examined to determine the number of connections **outside normal working hours**. It found that there were 30 such accesses to the system by GPs involved in the evaluation.

Answers to questionnaires

	Yes	**No**
Could you access the system	109	5
If No, did you revert to manual procedures?	5	0
If Yes, did you determine the clients medical card status?	105	4
Did you find it quicker than normal methods?	103	2
If yes, how much quicker was it?	10 minutes (average)	-
If no, how much slower was it?	5 minutes (average)	

7.6.2 DMS

Answers to questions on questionnaire
As stated in Deliverable 5.1, there were eight users involved in the testing of the Diabetes Management System, and so the questions were answered by these users.

Questions	**Out of 8**	
	YES	**NO**
1a. Did you use your correct username and password when logging into the DMS?	**5**	**3**
1a.1 If NO for above – Were you able to login anyway?		**3**
1b. Could you gain access to patient information for patients other than your assigned five patients?		**8**
2a. Did you find the DMS interface easy to use?	**8**	
2a.1 If NO for above – Why not?		
2b. Does the DMS provide entry facilities for all the required information?	**8**	
2b.1 If NO for above - What additional entry facilities do you wish to see?	**-**	**-**
3a. Was the information of your five patients complete?	**8**	
3a.1 If NO for above – What sections were missing?		
3b. Was the laboratory information available for each of your patients?	**8**	
3c. Was the information view provided for you clear and understandable?	**8**	
3d. Was the time taken to retrieve the required information to you satisfaction?	**8**	
3e. Were there duplicate records retrieved for any of the patient ids that you entered?	**7**	**1**
3e.1 If YES for above – For how many of your patients did this occur?	**One patient**	
4a. Did you find the report generation interface easy to use?	**8**	
4a.1 If NO for above – Why not?		
4b. Were the generated reports to your satisfaction?	**8**	
4b.1 If NO for above – Why not?		
4c. Was the information on each report complete?	**8**	
4c.1 If NO for above – What sections were missing?	**N/a**	
5a. Was the external information you requested retrieved?	**8**	
5b. Was the information retrieved complete to your satisfaction?	**8**	
5b. Was the time taken to retrieve the required information to your satisfaction?	**8**	

7.7 Conclusions

On examining and analysing the results of the user testing phase the following conclusions were made in the form of the metrics matrix:

Resulting Metrics Matrix

Categories:	Service:	Availability	User-friendliness	Reliability	Speed	Costs	Security	Other
Patient care	Diagnosis	**C2** 30 connections were made outside normal working hours			**C1** 103 client lookups found to be quicker. Only 2 found it slower. Upon investigation it was found that technical problems caused the system to operate slower. On average, using the system was saved 10 minutes of GP/Practice staff time.			
	Monitoring							
Customer Service	General Healthcare Information	**DMS3&4** All of the users were satisfied that the information set available for each of their patients was complete, including laboratory information.	**DMS7** All of the users found the information clear and understandable.		**DMS6**All of the users were satisfied with the time taken to retrieve patient data.		**DM1&2** None of the users were able to log onto the system without the correct username and password, and each user only had access to their own set of patients.	
	Booking							
	Referral							
	Identification		**DMS4&5** Duplication of a record for the same patient occurred for approx. 3% of the total number of patients in the DMS					
	Communication between HCPs							
	Direct communication to patients							

Management	Management information		**DMS9&10** All of the users found the interface to be user friendly and were satisfied that the DMS has most of the essential functionality required.		**DMS6** All of the users were satisfied with the time taken to retrieve patient data.			
	Transparency							

7.7.1 Original Aims, Goals and Objectives

As outlined in D6.1, the following are the original aims and objectives of the respective applications. The results of the evaluation are noted as appropriate;

7.7.1.1 CARD2000

Aim	**Objective**	**Goal**	**Metric**	**Result**
Improve Patient Care	Reduce amount of time taken by GPs in accessing eligibility information	GP can access eligibility information more quickly	C1 Difference in time taken to access CARD2000 as against current methods (telephone calls or referring to lengthy print-outs)	103 of the 105 valid responses said that it was faster – average 10 minutes
		Access to information available outside of normal work hours	C2 Number of connections to CARD2000 outside work hours as against current situation	There were 30 accesses outside normal working hours

7.7.1.2 DMS

Aim	**Objective**	**Goal**	**Metric**	**Result**
Increase quality of care for the patient.	Enable healthcare professional to access the data of shared patients.	Allow secure access to data by authorised healthcare professionals who are caring for, and are involved in the shared care of the patient.	**DMS1**: No. of users that can logon without the correct username or password. **DMS2**: No. of authorised users that can gain access to patients not under their care.	100% satisfied 100% satisfied
	Provide a complete diabetes record for each patient	Provide complete information on clinical laboratory investigations carried out.	**DMS3**: Percentage of incomplete patient records on viewing each patient	100% satisfied
		Correlate Ids from different domains.	**DMS4**: Percentage of complete and correct clinical laboratory investigations corresponding to the correct patient.	100% satisfied
	Uniquely identify each patient within the DMS.	Prevent multiple records for the same patient.	**DMS5**: Percentage of duplicate records for the same patient.	Duplication occurred in 3% of records

Improve facilities for shared care.	Support exchange of patient information between medical doctors in the region.	To reduce time spent in accumulating the vast amounts of patient data associated with each diabetic patient.	**DMS6**: Time required to locate patient information.	100% satisfied
	Provide a user-friendly application.	-Store and manage data in a consistent and standard format. -Allow communication between healthcare institutions. -Provide a user-friendly graphical user interface that captures the features of workflow currently in practice.	**DMS7**: Is the information clear and understandable for the healthcare professionals at both hospital sites? **DMS8**: Can a healthcare professional successfully request, send and receive data from one site to another? **DMS9**: Is the interface user-friendly? **DMS10**: Does the application provide all the necessary functionality?	100% satisfied 100% satisfied 100% satisfied 100% satisfied

8. CONCLUSIONS

In deliverable D6.1 a metrics-matrix was provided with all the metrics that were planned to be assessed during the evaluation of Workpackage 6. To show which services have been assessed in the evaluation phase by the different demonstrator-sites an overview of the evaluated metrics is given in figure 8.1 The specific results on these metrics and the discussion of the results can be found in the chapter dealing with that particular site. The following abbreviations have been used:

A: Healthcare Information System Virtual Patient Medical Record, Finland	HI: Health Information services Chart, Italy
B: Healthcare Information System Security Services and Report, Finland	PA: Patient Administration Telematic Regional System, Italy
C: Healthcare Information System Regional Statistics, Finland	PC: Patient Clinical Data Directory Services, Greece
D: Patient Index Directory Reference Manager, Finland	PH: Pharmaceutical EPR-server, Netherlands
E: Healthcare Information System Yellow Pages, Finland	RE: Resources for health services archive in Lombardia region, Italy
AH: Advanced Home Healthcare application, Sweden	RI: Healthcare Services Request Organiser, Italy
CA: CARD2000, Ireland	PR: Health Care Professional Communicator, Italy
DM: Diabetes Management System, Ireland	SA: Sanicard / Civicard, Italy
ER: Extended Referral Management, Sweden	TE: Tele-cardiology and Consultancy, Greece
EX: Extended Health Information System, Netherlands	

Most of the metrics from D6.1 have been assessed as planned. Some of the metrics however could not be assessed yet because the impact (e.g. on costs and the level of care) can only been seen after a longer period of time. Other metrics have been changed because it was impossible to collect the data as planned in the actual demonstration setting. Technical problems that are believed to be solved in the near future with the common product IC-HIS have led to problems with the demonstration of applications using this product in Ireland and Finland.

In D6.1 the most important specific aims and goals as indicated by the demonstrator sites were summarised:

1. Give healthcare professionals access to medical information from external information systems.
2. Increase the quantity and quality of information available to citizens regarding health (care) services.
3. Facilitate healthcare professionals by improving the handling of information by offering high quality and user-friendly applications.
4. Increase citizens' participation in healthcare.
5. Provide secure identification of patients and/or professionals.
6. Improve the direct communication between healthcare professionals.

The overall conclusion of the evaluations is that the InterCare project has been able to realise its objectives to a large extend.

Categories:	Service:	Availability	User-friendliness	Reliability	Speed	Costs	Security	Other
Patient care	***Diagnosis***	CA2, A4, A10, A11	A1,A2,A5,A6, A9,A13, A14	A3, A7, A8, A15	CA1, SA4, SA5, A12		B26	A16,A17,A18
	Monitoring	RE2			RE1, SA7	D48		
Customer Service	***General Healthcare Information***	DM3, DM4, HI1, HI2, RI1,RI2,RI3, RI5, EX1, EX3, D46, E47	DM7, HI3, HI4, HI5, EX5, EX7, EX8		DM6 , HI7, HI8, RI4, EX2		DM1, DM2, SA8	E44
	Booking	RI3						A22
	Referral	ER7		ER8	ER6	ER1, ER2, ER3, ER4, ER5		ER9,A19
	Identification	PA1, PA2, EX11		DM4, DM5, PA3	PA4	PA5	B35	
	Communication between HCP's	PA6, PA7, PH1, PH4, D24, C40	PA8, PH7,D25, C37, C38, C39	AH1, AH2	PH3,PH5, AH7, C41	AH8	PH11, D23	PH6,A19, A20, A21
	Direct communication to patients		C42, C43, E49, E50				B33	
Management	***Management information***	RE3,RE4	DM9, DM10, RE6,	RE5,	DM6, PA5, RE7, RE8, SA1, SA3, HI7, HI8, RI6, PR3		PR1	
	Transparency	DM8 DM9 DMS10			SA2	RI7		
	Legal aspects						B27,B28, B34	C36
	Awareness						B29, B30, B31, B32	

Figure 8.1 Matrix of all metrics assessed within InterCare

The demonstrator sites and the results evaluation of the InterCare services prove that the InterCare services have been able to provide services that enable seamless care. Users from various groups found the InterCare services user-friendly, reliable, secure and fast. The evaluations have shown that healthcare professionals are very interested in new technologies and Telematics as a way to improve care. Enthusiasm of users is an important prerequisite for the integration of Telematics services into the daily routines of these users.

The InterCare demonstrator sites were, within the parameters of the constantly and fast changing world of Telematics, able to demonstrate most services as originally planned. As a result of changing circumstances some changes to the planned applications were necessary, but also some new not planned applications were realised.

The extent of the evaluation was in some cases not on a scale as planned and prototype evaluation was used instead of the evaluation of a large-scale implementation. In other cases the evaluation was too short to give a final evaluation and intermediate results were presented This is the result of the delays that were discussed in the introduction of this document. Users involved in the evaluation show confidence in the future of the developed products. In those cases the implementation and subsequent evaluation of the services is planned for the near future, encouraged by the positive results of the current prototype or intermediate evaluation.

Evaluations show that in some cases improvements should be made to the logon-procedures that are perceived as rather complex. The impact on treatment in some cases is limited by the size of the demonstration, especially if the number of patients involved is small compared to the total number of patients treated. It is however believed by users that this will improve after increasing the scale of use of the applications.

Many healthcare professionals and decision-makers were informed about the various applications and services offered by the demonstrator sites by means of open days, conferences and Internet. Even more publicity and promotion in the near future will expand the knowledge about these products to all involved in healthcare. Visitors of the promotional activities so far were positive about them and have shown interest to use the applications themselves.

All demonstrator sites are confident that further development in new releases of the products and applications will improve the results that were gathered during this evaluation. They are also confident that the demonstrated applications or upgraded versions of the demonstrated applications will in the future be used by many healthcare professionals, administrative staff of healthcare organisations, patients and the general public.

APPENDIX: QUESTIONNAIRES

1. FIRST ITALIAN QUESTIONNAIRE

TOOL 1 : USER IDENTIFICATION

❖ InterCare ❖

1) Identification

N°	N	TOPICS	DESCRIPTION
		PART ONE	
1		NAME	...
2		SURNAME	...
3		REGION	...
4		ORGANISATION (Please indicate name and complete address)	
		PART TWO	
5		USERS BACKGROUND	
	5.1	Current occupation:	...
	5.2	Sex:	Man ☐ Woman ☐
	5.3	Role:	☐ Physician ☐ Paramedical ☐ Administrative ☐ Technical ☐ Citizen/patient
	5.4	Main task:	...
	5.5	Age:	
	5.6	Operating system experience	Mac ☐ PC ☐ Unix ☐
	5.7	Hours on computers:	Per day : Per week :
	5.8	As a User	
	5.8.1	*Are you using actually telematics services:*	yes ☐ no ☐
	5.8.2	*If yes: As a user, do you consider yourself as*	Novice ☐ Some Experience ☐ Much Experience ☐ Other - Specify ...

	5.8.3	*If no: Do you consider yourself as a potential User?*	yes ☐ no ☐
	5.8.4	*If you consider yourself as a potential User: When are you planning to start using Telematics services?*	Months: Years:
6		*Internet:*	
	6.1	*Are you using actually WWW?*	yes ☐ no ☐
	6.2	*Are you using actually e-mail?*	yes ☐ no ☐
	6.3	*Are you using actually news-group?*	yes ☐ no ☐

2) Technologies used in your company

N°	N	TOPICS	DESCRIPTION
1		OPERATING SYSTEM	☐ Windows NT/2000 ☐ Windows 95 ☐ Unix ☐ Other.....
2		NETWORK TYPE	☐ INTRANET ☐ INTERNET
3		DATABASE	☐ ACCESS ☐ ORACLE ☐ Microsoft SQL Server ☐ Other.....
4		WHICH OF THE FOLLOWING LAN TECHNOLOGIES DO YOU USE	☐ Ethernet ☐ Token ring ☐ Fast Ethernet ☐ Other.....
5		WHICH OF THE FOLLOWING WAN TECHNOLOGIES DO YOU USE	☐ ATM ☐ ISDN ☐ PSTN ☐ Other.....
6		APPLICATIONS SOURCE CODE	☐ C/C++ ☐ Cobol ☐ Visual Basic ☐ Java ☐ Others.....
7		WHICH OF THE FOLLOWING PRODUCTS DO YOU CURRENTLY USE	☐ OpenDOC ☐ OLE ☐ CORBA ☐ Sunsoft Java

TOOL 2 : USER-NEEDS

❖ InterCare ❖

1	CONTEXT			
	1.1 TYPE OF MEDIA			
N°	TOPICS	DESCRIPTION		
		not requested	wishable	necessary
1	Data	☐	☐	☐
2	Text	☐	☐	☐
3	2-D-Graphics	☐	☐	☐
4	3-D-Graphics	☐	☐	☐
5	Animation	☐	☐	☐
6	Image	☐	☐	☐
7	Video	☐	☐	☐

	1.2 LANGUAGE USED AT WORK : SPEAKING AND WRITING			
N°	TOPICS	DESCRIPTION		
		not requested	wishable	necessary
1	Italian	☐	☐	☐
2	English	☐	☐	☐
3	French	☐	☐	☐
4	German	☐	☐	☐

	2.5 LOCATION:			
N°	TOPICS	DESCRIPTION		
		not requested	wishable	necessary
1	Office	☐	☐	☐
2	Private	☐	☐	☐
3	Public	☐	☐	☐
4	Classroom	☐	☐	☐
5	Resource centre	☐	☐	☐

3	ANTICIPATED ORGANISATIONAL BENEFITS			
N°	TOPICS	DESCRIPTION		
		not requested	wishable	necessary
1	Enhancement of productivity	☐	☐	☐
2	Quality improvement	☐	☐	☐
3	Cost reduction	☐	☐	☐
4	Transparency of processes	☐	☐	☐

4	ANTICIPATED SOCIAL IMPACTS			
N°	TOPICS	DESCRIPTION		
		not requested	wishable	necessary
1	Employment	☐	☐	☐
2	Quality of life	☐	☐	☐
3	Knowledge enhancement	☐	☐	☐
4	Sustainable development	☐	☐	☐

TOOL 3 : APPLICATIONS EVALUATION

❖ InterCare ❖

1) Applications using

N°	TYPE	HICAR	PATRES	REHAL	RIC	PROCOM
1	ADMINISTRATIVE	☐	☐	☐	☐	☐
2	ORGANIZATIONAL	☐	☐	☐	☐	☐
3	DIAGNOSTIC	☐	☐	☐	☐	☐
4	EPIDEMIOLOGICAL	☐	☐	☐	☐	☐

2) Interfaces evaluation

N°	N	TOPICS	DESCRIPTION
1		COLORS	pleasant ☐ disagreeable ☐ irrelevant ☐
2		READING SPEED	high ☐ medium ☐ low ☐
3		LANGUAGE	simple ☐ complex ☐
4		CLEARNESS	high ☐ medium ☐ low ☐
5		BRIEFNESS	high ☐ medium ☐ low ☐
6		INFORMATION ACCESS	simple ☐ complex ☐
7		BUTTONS	
	7.3	Comprehension:	high ☐ medium ☐ low ☐
	7.4	Significance:	high ☐ medium ☐ low ☐
	7.5	Straightforwardness:	high ☐ medium ☐ low ☐
	7.6	Legibility	high ☐ medium ☐ low ☐
8		FORMS	simple ☐ complex ☐
9		NAVIGATION	simple ☐ complex ☐
10		USE LEARNING	high ☐ medium ☐ low ☐

3) Single application evaluation:

3.1) HICAR

A) Application using

N°	Type / Frequency	ADMINISTRATIVE	TECHNICAL	MEDICAL
A1	DAILY	☐	☐	☐
A2	WEEKLY	☐	☐	☐
A3	BIWEEKLY	☐	☐	☐
A4	MONTHLY	☐	☐	☐

B) Application content

N°		TRADITIONAL PROCEDURE	TELEMATICAL PROCEDURE
B1	ADEQUACY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐
B2	QUALITY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐
B3	QUANTITY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐
B4	SIMPLICITY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐
B5	SPEED	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐

3.2) PATRES

A) Application using

N°	Type / Frequency	ADMINISTRATIVE	TECHNICAL	MEDICAL
A1	DAILY	☐	☐	☐
A2	WEEKLY	☐	☐	☐
A3	BIWEEKLY	☐	☐	☐
A4	MONTHLY	☐	☐	☐

B) Application content

N°		TRADITIONAL PROCEDURE	TELEMATICAL PROCEDURE
B1	ADEQUACY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐

B2	QUALITY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐
B3	QUANTITY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐
B4	SIMPLICITY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐
B5	SPEED	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐

3.3) REHAL

A) Application using

N°	Type / Frequency	ADMINISTRATIVE	TECHNICAL	MEDICAL
A1	DAILY	☐	☐	☐
A2	WEEKLY	☐	☐	☐
A3	BIWEEKLY	☐	☐	☐
A4	MONTHLY	☐	☐	☐

B) Application content

N°		TRADITIONAL PROCEDURE	TELEMATICAL PROCEDURE
B1	ADEQUACY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐
B2	QUALITY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐
B3	QUANTITY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐
B4	SIMPLICITY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐
B5	SPEED	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐

3.4) RIC

A) Application using

N°	Type / Frequency	ADMINISTRATIVE	TECHNICAL	MEDICAL
A1	DAILY	☐	☐	☐
A2	WEEKLY	☐	☐	☐
A3	BIWEEKLY	☐	☐	☐
A4	MONTHLY	☐	☐	☐

B) Application content

N°		TRADITIONAL PROCEDURE	TELEMATICAL PROCEDURE
B1	ADEQUACY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐
B2	QUALITY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐
B3	QUANTITY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐
B4	SIMPLICITY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐
B5	SPEED	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐

3.5 PROCOM

A) Application using

N°	Type / Frequency	ADMINISTRATIVE	TECHNICAL	MEDICAL
A1	DAILY	☐	☐	☐
A2	WEEKLY	☐	☐	☐
A3	BIWEEKLY	☐	☐	☐
A4	MONTHLY	☐	☐	☐

B) Application content

N°		TRADITIONAL PROCEDURE	TELEMATICAL PROCEDURE
B1	ADEQUACY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐
B2	QUALITY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐
B3	QUANTITY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐
B4	SIMPLICITY	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐
B5	SPEED	1☐ 2☐ 3☐ 4☐ 5☐	1☐ 2☐ 3☐ 4☐ 5☐

2. SECOND ITALIAN QUESTIONNAIRE

Healthcare telematic services

Name and Surname _____

Company _____

Role:

- *physician* ☐
- *nurse* ☐
- *administrative* ☐
- *technical* ☐
- *citizen/patient* ☐

1 Evaluate the usefullness and the importance ok the Intercare applications (1 to 10:

- PATRES ☐
- REHAL ☐
- HICAR ☐
- RIC ☐
- SANICARD ☐
- PROCOM ☐

2 Which ones you'd prefer to use?

- PATRES ☐
- REHAL ☐
- HICAR ☐
- RIC ☐
- SANICARD ☐
- PROCOM ☐

3 How do you access to the applications?

	PATRES	REHAL	HICAR	RIC
None				
PC at home connected to internet				
PC at work connected to internet				
Pharmacy counter				
Clinic centre counter				
GP office counter				

Other _____

4 Evaluate if it easy to understand the objectives for each service:

	SANICARD	PROCOM	PATRES	REHAL	HICAR	RIC
Insufficient						
Sufficient						
Good						
Very good						

PATRES

5 To have the full patient clinic history could give some advantages for his health status?

- ☐ Diagnostic time
- ☐ Care time
- ☐ Care quality
- ☐ Patient satisfaction
- Other _____

6 Is it important having the on-line availability of reports:

REHAL

7 Which statistics are more usefull?

- ☐ Diagnosis
- ☐ Clinical specialties
- Other _____

8 Which purpose could have the statistics?

- ☐ Epidemiological analysis
- ☐ Prevention
- ☐ Evaluate the healthcare services need
- ☐ Financial estimation
- Other _____

9 Where the application is used?

- ☐ Hospitals and private clinics
- ☐ LHU Local Healthcare Units
- ☐ Epidemiology Units
- ☐ GP ambulatory
- ☐ University
- ☐ User interaction
- Other _____

HICAR

10 Which information the clinic information document has to include?

- ☐ List of the clinic centre performances
- ☐ Clinic centre information
- ☐ Performances distribution information
- Other _____

RIC

11 Which advantages the telematic porcedure gives instead of the traditional procedure?

	No	Low	Medium	High
To save time				
Accessibility				
Costs				
Needs satisfaction				

3. DUTCH QUESTIONNAIRE FOR PATIENTS PHARM-EPR

Dear Sir/ Madam,

In the past few weeks you have participated in the project InterCare. We would like to thank you for this co-operation. We hope that through the new applications that are developed within InterCare, care for patients will be improved. For the evaluation of the project we would like to get your opinion on the following statements:

	Totally agree	Agree	Partly agree	Not agree	Absolutely not agree
1. I experienced the InterCare project as an improvement of medical care.					
2. The quality of medical care will increase when GP's, specialists and pharmacists exchange information electronically					
3. My co-operation to this project did cost a lot of effort. I experienced this as a burden.					

Kind regards on behalf of the InterCare project-group,

4. DUTCH LOG-FORM FOR HCP'S (PHARM-EPR)

During the pilot of the InterCare project in Schiedam, the products that were developed within InterCare will be evaluated. Could you please denote on the following list for every search-request:

1. The date on which you used the PHARMaceutical –Electronic Patient Record.
2. How long it took you to get the information you needed.
3. How many sources contributed to the information you had available during your search-request (Elias, Aposys, ZIS)
4. If the information offered by PHARM-EPR was different from the information you received by phone or fax.
5. If the information was satisfying and a call or fax did not have to be made anymore.

Not in all cases point 4 and 5 will be relevant. When you are using PHARM-EPR for a situation in which you would not check for extra information at a pharmacy or specialist, you can just put the word *EXTRA* in that column. When you can compare information you received through PHARM-EPR with information you received in a call or fax from the pharmacist or the hospital, there might be differences. If this is the case, we would like to hear from you what kind of difference this was. We shall discuss this with you in the evaluation-meeting at the end of the demonstration-period.

Date (time) dd-mm	**Time necessary** Seconds	**Number of sources** 1, 2 of 3	**Different information** Yes/No Extra	**Enough information** Yes/No Extra

5. CHECKLIST USED FOR INTERVIEWS WITH DUTCH HCP'S.

1. Did PHARM-EPR supply different information compared to information you got by means of a phone-call or fax? (Inventory point 4)

2. Checklist with differences between PHARM-EPR en contact by phone or fax:
   a) More information via PHARM-EPR
   b) Other quantities supplied by PHARM-EPR
   c) Other medicine-description received via PHARM-EPR
   d) …

3. How did you experience PHARM-EPR considering speed.
   a) (much) faster than expected
   b) as expected
   c) (much) slower than expected

4. How did you experience PHARM-EPR considering completeness.
   d) (much) more information than expected
   e) as expected
   f) (much) less information than expected

5. How did you experience PHARM-EPR considering user-friendliness.
   a) Much more user-friendly than expected (score 5)
   b) More user-friendly than expected (score 4)
   c) As expected (score 3)
   d) Less user-friendly than expected (score 2)
   e) Not user-friendly at all (score 1)

6. What do you feel about the use of the smartcard?
- It is a user-friendly way for to log in as a user yes / no
- It is a secure way to identify the HCP yes / no
- It has a lot of added value, namely … yes / no

7. Other points that have influenced your opinion and satisfaction with the demonstration...

6. FIRST DUTCH QUESTIONNAIRE ABOUT EXHIS

- Average time necessary for the answering of a search-request;
  1. Less than 1 minute
  2. 1-3 minutes
  3. 3-5 minutes
  4. longer than 5 minutes

Explanation: ……..
……

- User-friendliness of a searching information by means of EXHIS:

  1. not user-friendly
  2. hardly ever user-friendly
  3. mostly user-friendly
  4. always user-friendly
  5. very user-friendly

Explanation:……
……

7. SECOND DUTCH QUESTIONNAIRE ABOUT EXHIS

As members of the editor-board you have seen the site of 'Zorgwijzer Nieuwe Waterweg Noord' quite a lot. For the evaluation of the user-friendliness of the "Zorgwijzer" we would like to ask you to mark one of the figures 1 - 5 at the following two questions.

- User-friendliness in editing and up-dating the local site:
  1. Not user-friendly at all
  2. Hardly ever user-friendly
  3. User-friendly in most cases
  4. User-friendly
  5. Very user-friendly

- User-friendliness in search a certain item:
  6. Not user-friendly at all
  7. Hardly ever user-friendly
  8. User-friendly in most cases
  9. User-friendly
  10. Very user-friendly

If you want to explain you answers, u can use the backside of this form for your explanation.

Thank you very much for your evaluation,

InterCare projectgroup

8. FIRST FINNISH QUESTIONNAIRE.

InterCare-questionnaire 1 5/2000

Dear Sir/ Madam,

In the past few weeks you have participated in the project InterCare. We would like to thank you for this co-operation. We hope that through the new applications that are developed within InterCare, care for patients will be improved. For the evaluation of the project we would like to get some background information and especially your opinion on the following statements

1. Unit / Specialty

1 surgery
2 pediatrics / gynegology
3 internal medicin

2. Sex

1 male
2 female

3. Year of birth ____

4. How often do you use pc at home, work or elsewhare ?

1 Every day, almost daily
2 Every now and then at home and according to my work
3 Very seldom

5. How often have you used PIDRM ?

1 Many times a day
2 Once a day in avarage
3 Couple times in a week
4 More seldom than once a week
5 Not at all

6. How often did you expect to use PIDRM ?

1 Many times a day
2 Once a day in avarage
3 Couple times in a week
4 More seldom than once a week
5 I did not planned to use it at all

7. Remark the most suitable alternative, which describes best your opinion of the service:

Question	Very seldom	In part of the cases	In half of the cases	In most cases	Almost always
1. Does the system provide the precise information you need ?	1	2	3	4	5
2. Does the information content meet your needs ?	1	2	3	4	5
3. Do you think the output in the different screen are in useful format ?	1	2	3	4	5
4. Does the system provide enough the information ?	1	2	3	4	5
5. Do you find the data reliable and accurate ?	1	2	3	4	5
6. Are you satisfied to the accuracy of the data ?	1	2	3	4	5
7. Do you think the output is presented in useful format and is suitable for the situation??	1	2	3	4	5
8. Is the information clear ?	1	2	3	4	5
9. Is the system user friendly ?	1	2	3	4	5
10. Do you get the information you need in time for the elective out-patients ?	1	2	3	4	5
11. Do you get the information you need in time for the emergency out-patients?	1	2	3	4	5
12. Do you get on-line data in the elective out-patient visits ?	1	2	3	4	5
13. Do you get on-line data in the emergency out-patient visits ?	1	2	3	4	5
14.Have you been able to login the service when you have wanted ?	1	2	3	4	5
15.Has the system work accurate when you have used it ?	1	2	3	4	5
16.Is the login to the service quick enough ?	1	2	3	4	5
17.Is the response time quick enough ?	1	2	3	4	5
18. Has the PIDRM had impact on use of medical record data co-operatively between primary healthcare and hospitals ?	1	2	3	4	5

8. What kind of impact has the PIDRM to the co-operation between primary healthcare and hospitals and between different hospital ?

1 Co-operation between organisation has increased
2 PIDRM has not changed the co-operation
3 Co-operation has decreased

9 . Has it easy for you to learn to use PIDRM ?

1 No, I had to use lot of time to learn to use it
2 No, I had use quite a lot of time to learn to use it
3 Yes, the training I needed was easy to get
4 Yes, the interface and use of the system is so similar to other software, so I trained to use the systems by myself

10. What are the best features of PIDRM concerning the interoperability in the service chain ?
Name 3 positive things.

_____

_____

_____

11. What are the 3 most important faetures to be developed in PIDRM ?

_____

_____

_____

12. PIDRM devolopment will be done in phrases. How would you put the following information in order of importance according the development which are already included in PIDRM ?

1 = most important , 6 = less important

___ a) Outpatient care
___ b) Inpatient care
___ c) Laboratory tests
___ d) Xray tests
___ e) Surgical operations
___ f) Epicrises

Argumentation:_____

_____

_____

13. PIDRM devolopment will be done in phrases. How would you put the following development issues in order of importance according to the support of service chain ? Pick up 5 most important issues.

1 = most important , 6 = less important

___ a) Regional booking system
___ b) Information services in web: care plans, availability of the treatment, forums for medical discussion
___ c) Imaging and videoconsulting services
___ d) Electronic medication and prescription services
___ e) Electronic referral and consultion services
___ f) Electronic patient medical record
___ g) Smartcard for citizen and professionals (digital signature and identification)
___ h) Reference database
___ i) Other:
_____

Argumentation:_____

_____

_____

14. What kind of impact has the smartcard in the treatment of patient ? Name 3 most important issues.

_____

_____

_____

15. Name 3 most important problems in using the smartcard in the treatment of patient?

_____

_____

_____

9. SECOND FINNISH QUESTIONNAIRE

InterCare-Questionnaire 2 5/2000

ASSESSMENT OF INTERCARE PROJECT

1. Is the patient suffering from a chronic disease? 1. Yes 2. No
   (for example diabetes, rheumatoid arthritis, ischamic heart disease)
   a) Is the visit associated with this disease or change in it? 1. Yes 2. No
   b) Has the patient visited this hospital within one year? 1. Yes 2. No

2. Did you use PIDRM and VPMR ? 1. Yes 2. No
   a) How much time did you spend? (Time in minutes)_____

3. What information did you search for ? (Please circle the most important)
   a) Outpatient data b) Pathology data
   b) Inpatient data d) Radiological data
   c) Laboratory data f) Operative data

4. Assess the value and significance of the information from the point of patient diagnosis or treatment planning (on a scale from 1 - 6, where 1= very important … 5= minor importance and 6 = No opinion)
   a) Patient information 1 2 3 4 5 6
   b) Case history 1 2 3 4 5 6
   c) PIDRM and VPMR 1 2 3 4 5 6
   d) Personal expertise 1 2 3 4 5 6

5. Assess the effect of the information from the PIDRM and VPMR (on a scale from 1…6)
   a) Enhances reaching decision on diagnosis or treatment planning 1 2 3 4 5 6
   b) Improves accuracy of the diagnosis or treatment planning 1 2 3 4 5 6
   c) Increases validity of the diagnosis or treatment planning 1 2 3 4 5 6

6. Evaluate the information from PIDRM and VPMR (on a scale from 1….6)
   a) How useful was the information from a clinical standpoint? 1 2 3 4 5 6
   b) What was its value in regard to time and inconvenience? 1 2 3 4 5 6
   c) Did it reveal something relevant from the patients disease? 1 2 3 4 5 6

7. In case you did not use PIDRM, specify the reason for this
   a) Patient did not give consent 1. Yes 2. No
   b) Technical skills 1. Yes 2. No
   c) No need for the information 1. Yes 2. No
   d) Other reason _____

10. IRISH CARD2000-QUESTIONNAIRE

Practice:		GP Name:	

Date:		Yes/No
1.	Could you access the system?	
	If No, did you revert to manual procedures?	
	If Yes, did you determine the clients medical card status?	
2.	Did you find it quicker than normal methods i.e. telephone call to Area HQ or referral to monthly printout?	
	If Yes, estimate how much quicker it was to use the system?	
	If No, estimate how much slower it was to use the system?	

Questionnaire for Testing Phase of Diabetes Management System

User Information

User forename: _____ **User surname**: _____

User role / position: _____

User location: _____

DMS Username: _____ **DMS Password**: _____

Section 1 - User Authentication

1a. Did you use your correct username and password when logging into the DMS? YES ☐ NO ☐

1a.1 If NO for above – Were you able to login anyway? YES ☐ NO ☐

1b. Could you gain access to patient information for patients other than your assigned five patients? YES ☐ NO ☐

Section 2 – Entering Information into the DMS

2a. Did you find the DMS interface easy to use? YES ☐ ☐

2a.1 If NO for above – Why not? _____

2b. Does the DMS provide entry facilities for all the required information? YES ☐ NO ☐

2b.1 If NO for above - What additional entry facilities do you wish to see? _____

_____

_____

Section 3 – Viewing Information on the DMS

3a. Was the information of your five patients complete? YES ☐ NO ☐

2a.1 If NO for above – What sections were missing?_____

3b. Was the laboratory information available for each of your patients? YES ☐ NO ☐

3c. Was the information view provided for you clear and understandable? YES ☐ NO ☐

3d. Was the time taken to retrieve the required information to you satisfaction? YES ☐ NO ☐

3e. Were there duplicate records retrieved for any of the patient ids that you entered? YES ☐ NO ☐

3e.1 If YES for above – Did this occur for 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ of your patients?

Section 4 – Generating Reports

4a. Did you find the report generation interface easy to use? YES ☐ NO ☐

4a.1 If NO for above – Why not? _____

4b. Were the generated reports to your satisfaction? YES ☐ NO ☐

4b.1 If NO for above – Why not? _____

4c. Was the information on each report complete?

4**c.1** If NO for above – What sections were missing?_____

Section 5 – Retrieving External Information

5a. Was the external information you requested retrieved? YES ☐ NO ☐

5b. Was the information retrieved complete to your satisfaction? YES ☐ NO ☐

5b. Was the time taken to retrieve the required information to your satisfaction? YES ☐ NO ☐