

2. Keeping Track of Drug Flow from Prescription to Administration **Physicians' Prescriptions**

- Physicians can use the Prescription Software in their practices and in patients' hospital rooms; in the latter case, they can use Modem Palm Pilots via the Web
- The Prescription Software highlights drug interactions, inappropriate associations, etc.
- Any single prescription can be validated after checking either with the Admissible-Drug List (PTO) or with any available drugs
- Physicians validate prescriptions
- Any change or update is recorded



2. Keeping Track of Drug Flow from Prescription to Administration **Prescription Monitoring**

- Every prescription, as well as administration-related information, is available at any time to hospital pharmacists
- Hospital pharmacists check the prescriptions and make any needed changes



2. Keeping Track of Drug Flow from Prescription to Administration **Therapy preparation**

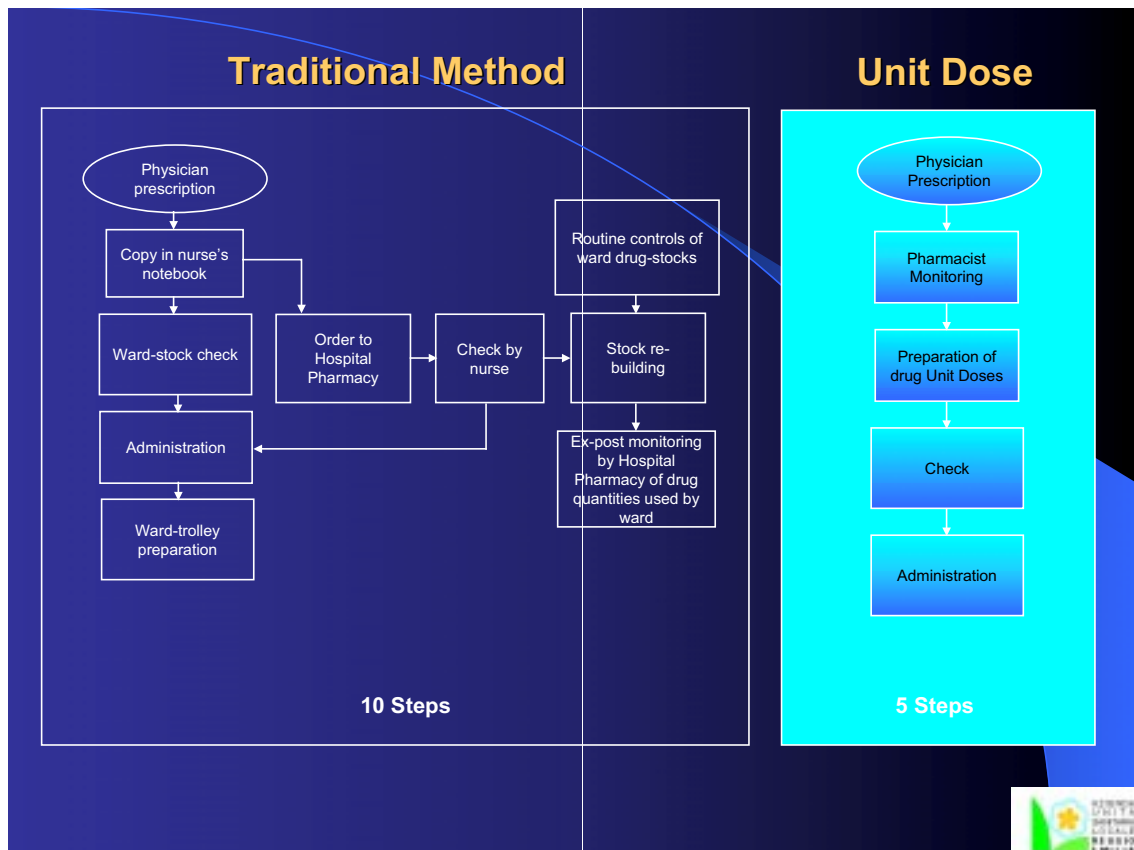
- A pharmacist prints out prescription form
- The Hospital Pharmacy:
 - √ prepares drug Unit Doses for each patient
 - ↳ other drugs (syrups, collyria, etc.) are added to individual Unit Doses if necessary
 - ↳ a device for automated preparation of “Therapy Drawers”, run by technical staff or nurses, is used
 - √ sends ward trolleys to wards along with prescription forms



2. Keeping Track of Drug Flow from Prescription to Administration **Administration**

- A nurse:
 - √ receives ward trolley and the prescription form
 - √ downloads prescriptions to a bar code reader from computer which runs the Prescription Software
 - √ hands out Unit Doses and compares the bar code on any Unit Dose with the one on patient's bracelet, using the bar code reader
- Bar code reader shows any error or mismatch and keeps track of the administration fulfilment





3. Cutting drug costs

- The problem with drug packages designed for commercial use is solved (multiple-dose packages are re-packaged in Unit Doses)
- Only the daily-needed quantities are delivered to the wards (with an estimated saving of 10% on drug use)



3. Cutting drug costs

- Ward stocks are reduced (by 70% to 90%)
- Ward stocks are under control (“automated ward cabinets” allow only authorised access and record every drug movement)
- Drug cost for every patient is calculated



4. Improving the Use of Hospital Staff

- Time nurses devote to drug management and preparation is reduced (by approximately 20 hours per week in a 15/20-bed ward); consequently, patient care can be improved
- Pharmacists' roles in the clinical teams are enhanced



5. Guaranteeing the continuity of care after de-hospitalisation

✓ Patients being discharged: Surgical Day Hospitals

- Prescriptions are set out in forms produced by the Prescription Software
- Drugs are distributed in Unit Doses prepared by the Hospital Pharmacy in quantities suitable for the needs of each patient
- The Prescription Software is also used for therapy monitoring



5. Guaranteeing the continuity of care after de-hospitalisation

- Patients' behaviour at home fully complies with prescriptions
- Drug waste is reduced
- Drug management for out-patients becomes more efficient by using the Unit-Dose Model



E-Health for professional knowledge transfer and diffusion of paediatric excellence

Introductory speech.

Author: Professor Luciano Beolchi; Dr Ing. Sara Facchinetti

Genova, 8th of January 2004

E8

WORKSHOP VIII

Scope of this session is to present opportunities of Telemedicine for Paediatrics.

My name is Luciano Beolchi and I have been working for more than 12 years in the Telemedicine Research Sector of the European commission. I'm a medical doctor, though a radiologist and not a paediatrician as my background. The speakers in this session are among the most qualified in the world, all of them having played a relevant role in the European scenario for Telemedicine.

What is Telemedicine is and what will be

Telemedicine includes two major areas: Home care, as the care at the point of need through connected sensors, hubs, middleware and reference centres; and co-operative working, as a network of medical expertise linked together.

In the simplest form it is defined as *medicine at distance*.

More comprehensively, telemedicine can be defined as the investigation, monitoring and management of patients and staff using systems which allow ready access to expert advice and patient information no matter where the patient or relevant information is located¹ the use of electronic information and communication technologies to provide and support health care when distance separates the participants² the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities³ any healthcare related activity (including diagnosis, advice, treatment and monitoring) that normally involves a professional and a patient (or one professional and another who are separated in space (and possibly also in time) and is facilitated through the use of information and communications technologies.⁴

*In order to identify Telemedicine support to economic development and social objectives, several areas of interest can be highlighted according **the targeted population, the type of interaction and the technologies to be used.***

Targeted Population	Type of interaction	Technologies
Medical staff⁵ <-> Medical staff Live ⁶ Store and forward ⁷	Expert opinion, 2nd opinion (teleophthalmology, teledermatology, telepathology, teleradiology,)	Video conferencing and multimedia e-mail over ISDN and internet, security technologies <i>Future:</i> mobile device technologies, including satellite; virtual reality technologies; PDA
Medical staff <-> Medical staff + patient Live	Teleconsultation in conservative care (teledermatology, telepsychiatry); Telerobotics (telesurgery, telementoring)	Video conferencing over PSTN or ISDN; teleguided robotic technologies <i>Future:</i> technologies to transmit the tactile sense (haptic feedback)
Medical staff <-> Non-medical staff + patient Live	Teleconsultation in emergency care	Video conferencing, transmission of vital signs over mobile communications <i>Future:</i> direct information transmission from microsensors and –systems
Medical staff <-> Citizen/patient Live Store and forward	Lifestyle counselling, home care (disease management, e.g. diabetes)	Video telephony and conferencing over PSTN, ISDN or internet, interactive TV, multimedia e-mail <i>Future:</i> Integration of intelligent monitoring equipment, including information transmission from microsensors and –systems; PDA
Medical staff <-> Healthcare organisation Live Store and forward	Teleworking (teleradiology, telepathology)	Video conferencing, multimedia e-mail over ISDN and internet <i>Future:</i> mobile technologies, including satellite
Medical staff <-> Virtual university Live On demand	Teleconferencing, teletraining	Video conferencing, multicasting, video on demand over ISDN, internet or satellite, virtual reality technologies, data mining

As a consequence of the above table, Telemedicine services could be categorised as follows:

- Initial urgent evaluation of patients, triage decisions and pre-transfer arrangements;
- Medical and surgical follow-up and medication checks at the point of need;
- Supervision and consultation from primary-care encounters;
- Routine consultations and second opinions based on history, physical examinations and available text data;
- Transmission of diagnostic images;
- Transmission of medical data;

- Extended diagnostic work-ups or short-term management of self-limited conditions;
- Management of chronic conditions at the point of need ;
- Preventative medicine and patient education
- Pre-admission assessment
- Discharge planning
- Long duration follow up
- Rehabilitation at the point of need
- Home Drug delivery
- Help and education to the families and NGOs
- Patient Info
- Booking
- Repository of personal files

As exemplified above, the main Telemedicine support to economic development and social objectives can be summarised as follows: better medical assistance for less cost.

With that purpose Telemedicine has become one of the leading chapter in the Programme for **e-Europe**.

If this is specially valid for developed country, it should not be forgotten the overwhelming value that telemedicine can assume for developing countries as one of the major tool for the **Millennium Development Goals for 2015**. Proposed by the UN Secretary General they were agreed by the world's heads of government at the Millennium Summit in 2000. The basic goal regarding poverty is to “*halve the proportion of people living in extreme poverty*” between 1990 and 2015. Extreme poverty is defined as living on less than \$1 per day (1993 PPP US\$). A related poverty goal is to “*halve the number of people suffering from hunger*” between 1990 and 2015. The MDG health targets include: i) a reduction in infant and child mortality by two-thirds of the 1990 level by 2015; ii) a reduction in maternal mortality ratios by three-fourths of the 1990 level by 2015; iii) the assurance of access for all to reproductive health by 2015; and iv) and the end of rising HIV/AIDS prevalence no later than 2015.

Other recent international initiatives, such as the **Roll Back Malaria** and **Stop TB** programs, have added additional and more tightly specified targets for disease control in specific areas.

It was estimated through WHO sources (*Special Commission for Macroeconomics and Health*) that in year 2000 6 billion \$ were channelled through *Official Development Assistance* (ODA) for Health. With the purpose of saving 8 million life a year, an increase of the ODA to 27 billion a year by year 2007 has to be foreseen. Out of that sum, 4.5 billion \$ should be devoted to *Research* in specific sectors and according specific priorities. The delivery of such large donor financing will require a new *modus operandi*. The Commission strongly supports the establishment of the new *Global AIDS and Health Fund* (GAHF), which initially will focus on the global response to AIDS, malaria, and TB. They recommend that the GAHF be scaled up to around \$8 billion per year by 2007 as part of the overall \$22 billion of donor aid to country programs.

Telemedicine is and will remain a major instrument and area of investment in order to implement that programme.

The Framework Programme of the European Commission

The European Commission through its framework programme for research is one of the major actor for developing Telemedicine. Since 1988 more than 500 project in Telemedicine have been funded through that scheme, the majority but not all of them through a dedicated sector called first

Advanced Informatics in Medicine, later e-Health. The following chapter will give to the reader a more exact information on what the framework programme is and how it can be useful for future development.

The **Framework Programme (FP)** provides a coherent and truly European framework for supporting Research and Technological Development (RTD) as part of Community research policy and constitutes a *four-year strategic plan*.

The FP reflects with its structure and contents the transformation from an industrial society to the information society.

RTD in the fields of **Information Society Technologies (IST)** is conducted with the EU support since 1988, in particular RTD on Telematics (i.e. a combination of Telecommunication and Informatics) was developed through the following Framework Programmes:

Second Framework Programme (FP2: 1988 - 1990) and

Third Framework Programme (FP3: 1991-1994):

Launch of Concerted Actions (i.e. studies and pre-normative research) for Trans-European Networks and Services (**ENS**), Advanced Informatics in Medicine (**AIM**), Distance Learning for Education and Training (**DELTA**) and Information systems for Transport (**DRIVE**).

Fourth Framework Programme (FP4: 1994-1998):

The above-mentioned concerted actions were integrated and implemented through the Telematics Applications Programme (**TAP**) with an indicative budget of ~900 M€. TAP was one of eleven parts of the 4th FP and comprised five areas such as Telematics for services of public interest (Administrations, Transport), Telematics for Knowledge (Research, Education and Training, Libraries), Telematics for Improving Employment and the Quality of Life (Urban and rural sectors, Healthcare, Elderly and disabled people, Environment), Horizontal RTD Activities (Language Engineering, Information Engineering) and Support Actions (Integrated Applications for Digital Sites) dealing with applications of information or communication technologies. The aim was to improve the delivery of general interest services in the European Union.

Fifth Framework Programme (FP5: 1998-2002):

Trans-national collaboration in research, particularly between industry and universities, and the establishment of Networks of Excellence (NoE) was stimulated in this Framework Programme. FP5 comprised four thematic programmes, each addressing a series of scientific, technological and societal issues.

The *user-friendly Information Society Technologies (IST)* was one of the four thematic programmes with an indicative budget of 3.600 M€. Within **IST** the former RTD programmes such as **ACTS** (Advanced Communication Technologies), **Esprit** (European Strategic Programme on Information Technologies) and **TAP** (*Telematics Applications Programme*) have been integrated.

The IST programme contained 4 *Key Actions*. The part on RTD of the former Telematics applications is implemented in **Key Action 1: Systems and Services for the Citizen** with an indicative budget of 646 M€, especially with the following sectors:

Applications related to Health

Applications for special needs

Applications related to Administrations

Applications related to Environment

Applications related to Transport and Tourism.

Sixth Framework Programme (FP6: 2002-2006):

The aim of the sixth Framework Programme is to contribute to the creation of the **European Research Area (ERA)** and to innovation, i. e. target groups are Governments, Citizens, Business, Researchers. Further objectives of the ERA are also to improve living standards by improving productivity and competitiveness. The sixth Framework Programme is implemented through specific programmes which are structured around the following three headings, under which activities will be undertaken:

Focusing and integrating Community research,

Structuring the European Research Area,

Strengthening the foundation of the European Research Area.

Information Society Technologies (IST) is one of the seven thematic priorities that are part of the specific programmes dealing with the focusing and integrating Community research.

The objectives of IST in the sixth FP are therefore to ensure European leadership in the generic and applied technologies at the heart of the knowledge economy. IST aims to increase innovation and competitiveness in European business and industry and to contribute to greater benefits for all European citizens.

The focus of IST in the sixth FP is on the future generation of technologies in which computers and networks will be integrated into the everyday environment, rendering accessible a multitude of services and applications through easy-to-use human interfaces. The vision of “ambient intelligence” places the user, the individual, at the centre of future developments for an inclusive knowledge-based society for all.

The Community will contribute financially with an indicative budget of 3.625 M€ under the specific programmes, and subject to the rules for participation, to research and technological activities, including demonstration activities, of this Programme. These activities, will be implemented by means of a range of new *instruments* as described below:

Networks of Excellence (NoE): The purpose of NoE is to strengthen and develop Community scientific and technological excellence by means of the integration, at European level, of research capacities currently existing or emerging at both national and regional level. Each Network will also aim at advancing knowledge in a particular area by assembling a critical mass of expertise. They will foster co-operation between capacities of excellence in universities, research centres, enterprises, including SMEs, and science and technology organisations.

Integrated Projects (IP): Integrated Projects are designed to give increased impetus to the Community’s competitiveness or to address major societal needs by mobilising a critical mass of research and technological developments resources and competence. Each IP should be assigned clearly defined scientific and technological objectives. IPs should be directed at obtaining specific results applicable in terms of, for instance, products, processes or services. They may include more long-term or ‘risky’ research. The activities carried out as part of an IP should include research and, as appropriate, technological development and /or demonstration activities, activities for the management and use of knowledge in order to promote innovation, and any other type of activity directly related to the objective of the Integrated Project.

Specific Targeted Research Projects (STRP): These projects will aim at improving European competitiveness. They should be sharply focused and will take either of the following forms, or a combination of the two:

(a) a research and technological development project designed to gain new knowledge either to improve considerably or to develop new product, processes or services or to meet other needs of society and Community policies;

a demonstration project designed to prove the viability of new technologies offering potential economic advantage but which cannot be commercialised directly.

STRPs are designed to test, validate and disseminate new innovation concepts and methods at the European level.

The IST thematic priority will also use other instruments like co-ordination actions and support measures.

The calls for proposals in the first two years will be open to all instruments but it is expected that 70% of the budget will be devoted to Integrated Projects (IP) and Networks of Excellence. (NoE).

Mechanisms of the Framework Programmes:

The general mechanisms of the Framework Programme are as follows:

The Commission's role is to offer financial support or other support to private and public research bodies, and companies and institutions wishing to embark on a RTD project.

Each RTD project is managed by a project co-ordinator, and at the administrative and financial levels monitored by a project officer in the Commission.

Normally, proposals must be submitted in response to a specific **Call for proposals** or tenders published in the **Official Journal** of the European Communities, within specified time limits. The proposal's content must correspond to objectives set out in one of the specific Programmes, especially in the **Workprogrammes** of the related FP. **Workprogrammes** are updated on a yearly basis by the **IST Advisory Group (ISTAG)** according to achievements on RTD and additional requirements. Proposals are evaluated on the basis of objective criteria by panels of independent experts in the various fields concerned. The **IST Committee (ISTC)** which represents the different Member States of the EU is informed about the results of the evaluations and is requested provides an opinion on the evaluation results for proposals with a funding of more than 1,5 M€. Proposals are selected by the Commission for Framework Programme support on the basis of specified criteria, such as scientific and technical quality and socio-economic impact, and on condition that they comply with the programme objectives, within the limits of the budgets available. Contract negotiations are established for selected proposals which are completed with are contract signature. Advance payments of normally 40% are paid to the consortia after contract signature. Interim/final payments are made on the basis of submitted cost statements.

Telemedicine in the Framework Programs

The following is a list of EC funded projects categorised along the years trough the titles considered, at that time, the most relevant. It's an interesting approach to the evolution of Telemedicine in the past 15 years.

2nd FP- AIM, Advanced Informatics in Medicine - Exploratory Action(1988-1990)

Advanced instrumentation, equipment and services : BIOLAB, CAMARC, FEIP, HOME, KISS, MEDICA, MURIM, QUIRT.

Communication and functional integration: EUCLIDES, INFORM, PACS-IMACS, PRECISE, SCP-ECG, TELEMEDICINE, HIPACS, MIMI

Data structures and medical records: AVICA, CACOHIS, EURODIABETA, ICSIC

Development of a common conceptual framework: VALIDATA, ADAM, ASSIST, CAMAC

Integration of knowledge based systems: AEMI, AIDMED, COVIRA, GAMES, HELIOS, IRHIS, KAVAS, LEMMA, MNOMS, NLPAD, OAR

Medical informatics environment: CHIC, HOSCOM, MCASE

Non technological factors: EPIAIM, MASQUES, QAMS, SESAME

3rd FP- AIM, Advanced Informatics in Medicine(1991-1994)

Medical records and coding standards: *CARDLINK, DIABCARD I&II, DIABCARE-Q-NET, EDI-FORHEALTH, EUROCARDS, GALEN, GEHR, IDMR, MARGOT, MEDIREC, MENELAS, OPEN-LABS, TANIT, TELENURSE*

Medical multimedia workstations and images, mobility and education: *ATIM, COVIRA, EDUC-TRA, EURIPACS, MARIA, MILORD, MOBICARE, SAMMIE*

Knowledge based and decision support systems: *CAMI, DILEMMA, EPISTOL, GAMES-II, KAVAS-2, OPADE*

Primary care and resource management: *CAMIREMA, HELIOS-2, PRIMACARA, PRIMCARE*

Rehabilitation, integrated instrumentation and biosignals: *BRITER, CAMARC-II, ESPIS-EEG, ESTEEM, IMPACT, IREP, MAGNOBRAIN, OEDIPE*

Application framework for Telemedicine: *AFASIA, EMDIS, EPIC, FEST, ISAAC, ISAR, NUCLE-US, SHINE, TELEPRIM, TRILOGY*

Security, data protection, confidentiality and quality assessment: *BEAM, DIABCARE-Q-NET, EUROMEDIES, MEMPHIS, OBSQUID, ORATEL, PROCAS, QUICHE, SEISMED, TELEGASTRO*

International co-operation: *CAMIREMA-EAST, EPI-AIM, ET-SETUP, EURO-AAP, INT-NICT, MUM, PRIMAS*

Accompanying measures and studies: *ACOSTA, ECOTESLA, EDICON, METROPOLIS, TELE-CARE, TELEMEDICINA-SIP*

4th FP - Health Care Telematics (1994-1998)

Electronic Healthcare Records: *BSTD, CARDLINK 2, DIABCARD 3, EHCR-SupA, EU/CEN II, GALEN-IN-USE, I4C, I4C TRIPLE C, PROREC, SYNAPSES, SYNEX, TELENURSE, TELENURSE ID, TOMELO, WISECARE*

Telematics Applications for Collaborative Work of Health Professionals: *CONQUEST, ECOLE/GRIP, EURO-AAP, EUROPATH, GLOBAL HORIZON, HORIZON, INTERPATH, MACRO, MANSEV, MARGRITE, MEDICO, PROGUIDE, PROMPT, RETRANSPLANT, RUBIS, TARGET*

Medical Imaging: *CARDIASSIST, EASI, GASTER, GASTER 2, IAEVA, IAEVA II, IGOS, IGOS 2, MEDIMEDIA, ORQUEST, ROBOSCOPE, SAMMIE, TANIT II, TELEINVIVO, VIRTUOSO, VREPAR, VREPAR II*

Continuity of Care, Regional Healthcare Networks and Integration Platforms: *CHAINED, CHIN, CO-CO, DIABCARE Q-NET, ENN, HANSA, HANSA-MED, HC-REMA, INTERCARE, INTRANET HEALTH CLINIC, ISAR-T, ITHACA, NDSNET, PATMAN, PLANEC, PRESTIGE, PRIMACOM, RECOVER, REMEDES, STAR, USE DHE, WISE*

Telemedicine: *AMBULANCE, ARGONAUTA, ATTRACT, EMERGENCY-112, ET-ASSIST, ET-SETUP, HEALTHLINE, HECTOR, HERMES, HOMER D, IN EMERGENCY, MERMAID, MOB-CARE, MOMEDA, NIVEMES, OPHTEL, SAMTA, TELEPLANS, TESUS, T-IDDM, WETS*

Information for citizens: *BEAM II, CATCH, CATCH II, EISOSH, HS PRO EU, INFOCARE, INFOPHARMA, SEAHORSE, SEAHORSE 2, TESEMED, TESEMED II*

Cohesion/Education/Regulatory Issues/Assessment: *ABC MALE, ALLNET, AORTICS, CANTOR, EHSI-IT, EHTO, EHTEL, EMG-NET, EOCS-HSC, EU-MIE96, EUPHIN-EAST, HEAL-SA, HEALTHPLANS, HEALTHWATCH, ISHTAR, ITEDUCTRA, ITNICT, MIE97, NETLINK, NETLINK-CEE, NIGHTINGALE, SIREN, TAPLINK, TASTE, TEAC-HEALTH, TELECAT, TRUSTHEALTH, TRUSTHEALTH II, VATAM, VICO, WOMAN.*