Health @ Home

A Telecare System for Patients with Chronic Heart Failure

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Outline

- Heart failure scenario
- H@H objectives
- Users’ requirements
- H@H System Architecture
- Conclusions
Scenario

- Around **14 millions** of Europeans are affected by Chronic Heart Failure (CHF)
- Incidence of **3.600.000** new cases/year
- Most common cause of hospitalization in persons with more than 65 years of age

*Figure 1. Projected Increases in the U.S. Population 65 Years of Age or Older. Data are from the U.S. Census Bureau.*
Objectives

- Develop an efficient system for home tele-monitoring of CHF patients
- ICT technologies can be efficiently used both for promptly acting in cases of destabilization of the CHF patients and for reducing avoidable hospital re-admissions, resulting in an improved quality of life for the patients and in a cost reduction for the National Sanitary System.
Concise Papers

Telemedicine: New Application of Communications Technology

WALTER H. HOLZER, MEMBER, IEEE

Abstract—Telemedicine may be defined as the practice of medicine at long distance by means of telecommunications, in particular, closed-circuit television and telemetry. Two-way television enables physicians to establish a nominal doctor–patient relationship with patients at a remote location, while providing the means for visual examination of patients. Biomedical telemetry transmits patients’ vital signs, detected by standard medical bioelectric sensors and physiological function transducers.

In a telemmedicine simulation experiment, a test group of physicians deemed black-and-white television adequate for most diagnostic purposes, but expressed a preference for color. The group evidenced little interest in picture resolution greater than that provided by the standard U.S. 525-line system. The Plumbicon camera was said to provide better pictures for medical purposes than the vidicon. In either color or black-and-white television, lighting is a critical factor in the proper rendition of flesh tones as well as in providing the necessary illusion of depth for the observation of detail. Com-

CONCLUSIONS

The telemedicine concept, which makes possible the provision of specialized medical care at locations not served by medical specialists, requires only the application of well-known and proved techniques and equipment from the fields of closed-circuit television, television broadcasting, medical electronics instrumentation, telemetry, and wide-band radio relaying. While absolutes with regard to television mode or operating parameters have not yet been defined, criteria are available for planning and designing telemedicine systems that will provide physicians with the necessary tools for diagnosis and treatment. Of particular importance in telemedicine is the engineering of lighting systems to provide consistent rendition of flesh tones with the necessary resolution, clarity, and depth. Telemetry requirements for the transmission of analog data can be keyed specifically to the known useful bandwidths and dynamic ranges of the various bioelectric and physiological signals and parameters to be measured in diagnosis.

REFERENCES

State-of-the-art

IEEE literature shows scientific interest in telemedicine since 1974 with references dated back to 1963.

Today, the authors have no evidence of extensive use of telemedicine in sanitary public organizations.

There are mainly few experimental trials typically in the framework of public funded projects with no concrete follow-up after project conclusion.
H@H Consortium

Research

- Consorzio Pisa Ricerche-IT
- Fundación CITIC-ES
- Fondazione Gabriele Monasterio-IT

End-User

- Fondazione Gabriele Monasterio-IT
- Zdravstveni Dom Koper-SLO
- Hospitales Universitarios "Virgen del Rocío"-ES

Industrial

- Caribel Programmazione-IT
- Caen-IT
- Mediasoft-SLO

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H@H strength

- H@H is “user-driven”: The end-user partners are important HealthCare providers in their respective countries, they are involved throughout the whole project duration with a fundamental role in the user’s requirements definition and technology demonstration phases.
H@H strength

- H@H project benefits of the As.Ter. Software Platform created by Caribel Programmazione which allows planning, controlling and monitoring of activities carried out from social and sanitary professionals (doctors, nurses, physiotherapists etc) operating on the territory. This product, is widely accepted and used in Italy and has been adopted by nearly 20% of Italian public sanitary institutes.

- Compliance with HL7-RIM and HL7-CDA standards
The As.Ter Platform

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<table>
<thead>
<tr>
<th>WPs</th>
<th>MONTHS</th>
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<td>WP1 Requirement Analysis</td>
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<tr>
<td>WP2 System Architecture</td>
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<td>WP3 Detailed design and implementation</td>
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<td>WP4 System Integration</td>
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<td>WP5 Demonstration</td>
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<td>WP6 Dissemination &amp; Exploitation</td>
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KO: 1 February 2009

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Main Users’ requirements

- The impact with the patient should be minimal.
- The signal quality should not excessively depend on transducers positioning.
- Interaction with the remote monitoring system is to be limited to simple actions (like turn on-off).
- Remotely measured data are to be flowed into the usual Hospital information system so that clinicians should not be required any additional work.
- The system shall provide standard methods of interaction with external devices and systems.
- Alarms have to be generated both from monitoring devices and Hospital Information Systems; such alarms have to be provided to both a referring center and directly to family care givers or health professionals so that appropriate care actions could be taken.
System Architecture

- HL7 CDA fully compliant output towards server
- XML compliant response from server
- Standard Bluetooth for communication with sensors
- Communication with server over public networks using HTTPS
Potential Patients

Potential Clients
INPUT

Primary Care
Stable Phase
Functional Class II-III

Specialist Care
Unstable/Acute
FC: III-IV

Critical care-Urgencies
Acute
FC: II-IV

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Types of monitoring

- HOME TELEMONITORING
  - Stable Phase Basic Monitoring
  - Stabilization after admission Phase Basic-Advanced
  - Exacerbation Phase Advanced Monitoring
### H@H versioning

<table>
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<tr>
<th>Functional feature</th>
<th>Basic</th>
<th>Advanced</th>
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<tr>
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<tr>
<td>ECG</td>
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<td>✓</td>
</tr>
<tr>
<td>Respiration-Chest Impedance</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Scale (weight + water retain)</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Posture</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>SpO₂</td>
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<tr>
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<tr>
<td>Asynchronous server request</td>
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<tr>
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<tr>
<td>Reminder for planned measurements</td>
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<tr>
<td>Drug assumption reminder/recorder</td>
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<td>✓</td>
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<tr>
<td>Remote Therapeutic Protocol Update</td>
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<td>Remote monitoring Protocol Update</td>
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<tr>
<td><strong>Processing</strong></td>
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<td></td>
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<tr>
<td>Alarm detection in the gateway</td>
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<td>✓</td>
</tr>
<tr>
<td>Automatic protocol updating</td>
<td></td>
<td>✓</td>
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Conclusion

- the effort of putting together clinical expert advise on drawing personalized strategies of follow-up for the CHF patient;
- define strategies of graduated use of paramedic and clinical staff, on the basis of clinical severity;
- up-to-date ICT, applied to clinical informatics, wearable device implementation for pathophysiological parameter collection and transmission;
- comparison analysis (quality/cost ratio) with usual follow-up strategies.

Are keys to the success of the CHF Health@Home care model and so to its transfer to the market and to an extensive use by Public Sanitary Systems.
Thanks for the attention !!

http://www.health-at-home.eu/