

Detection of Ventricular Tachycardia for Patient through Remote Continuous Health Devices

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Abstract - Three different types of implantable cardiac devices are now commonly used in clinical medicine: pacemakers (including cardiac resynchronization systems), cardiac defibrillators, and loop recorders. Although pacing specialists and electro physiologists have traditionally been responsible for device follow-up, the newest generation of implanted devices stores a wealth of information that can be useful to the clinical cardiologist. Important information, in addition to device function, such as incidence and type of arrhythmias, general clinical condition of the patient, and hemodynamic status can now be stored on large databases that are available via web access to all physicians caring for an individual patient. The advent of the remote monitoring capability of implanted devices has initiated a rapidly accelerating paradigm shift in device follow-up that can potentially improve patient care at lower cost. It is possible to collect massive amount of data for localization and tracking of Health of the patient.

This project describes the design of a simple, low-cost controller based patient health monitoring system. Heart rate of the subject is measured from the thumb finger using IRD (Infra Red Device sensors and the rate is then averaged and displayed on a 16 X 2 LCD display).

This instrument employs a simple Opto electronic sensor, conveniently strapped on the finger, to give continuous indication of the pulse digits. The Pulse monitor works both on battery or mains supply. It is ideal for continuous monitoring in operation theatres, I.C.units, biomedical/human engineering studies and sports medicine. By reading all the values of temperature and heart rate will be displayed on PC/Phone. This project uses AT89S52 Microcontroller as heart of the project.

This Project Uses Regulated 5V, 750ma Power Supply. 7805 Three Terminal Voltage Regulator Is Used For Voltage Regulation. Bridge Type Full Wave Rectifier Is Used To Rectify The Ac Output Of Secondary Of 230/12V Step Down Transformer. Temperature, Heartbeat, Will Be Displayed On The LCD Display Which Is Connected To The Microcontroller.

Keywords: Cardiac Implantable Electronic Devices, Implantable Cardioverter Defibrillator, Remote Monitoring, Follow-Up, Recall Management, Atrial Fibrillation, Ventricular Arrhythmias, Heart Failure.

1. INTRODUCTION

Management of cardiac arrhythmia abnormalities that are not transient or reversible requires constant

clinical monitoring as a chronic condition. Delays on diagnosis or medical assistance increase the risk of adverse outcomes such as heart failure, stroke, and sudden cardiac death. Therefore, Cardiovascular Implantable Electronic Devices (CIED) have become a part of the standard therapy in patients who are at risk of life threatening cardiac arrhythmias.

According to a consensus statement prepared jointly by the Heart Rhythm Society and the European Heart Rhythm Association, more than 800,000 patients in Europe have implanted CIEDs for the treatment or secondary prevention of cardiac arrhythmias. In addition, the number of follow-up visits for patients with implanted cardiac devices (ICDs) exceeds 5.8 million per year, and that number will continue to increase as more devices are implanted. The exponential growth rate of cardiac device implantation calls for new methods of long-term surveillance with a view to optimizing patient safety and care, alleviating the burden of caregivers, and lowering health care costs through information communication technology support.

CIED devices with remote monitoring capabilities can store and transmit the cardiac status and device function data. Remote sensor devices are located in patients' homes to transfer stored data from the cardiac implant to a remote monitoring service center.

These remote monitoring service centers operated by device manufacturers, receive, store, analyze and translate transmitted data into patient-specific reports and allow healthcare professionals to access patient data or to receive alerts in case of unusual persisting data variations.

2. RELATED WORKS

There are a number of pilot studies in the literature that address remote monitoring of cardiac patients with electronic implant devices through the facilities provided by CIED manufacturers. A good survey of several studies for remote monitoring of cardiovascular implantable electronic devices was presented in by discussing the advantages, the privacy and legal issues. Clinical experiences of remote monitoring for "early detection of device technical troubles and differential diagnosis of

appropriate and inappropriate discharges” were presented in. It was stated that the morbidity of patients with ICD is closely related to the appropriateness of ICD therapies as well as technical problems of the device, and early detection and handling of these adverse events might significantly decrease morbidity in ICD patients. Several studies concluded that remote monitoring allows early detection of medical and technical events in ICD patients, improves individualized therapy control, and shortens physicians’ reaction time to arrhythmias and technical problems

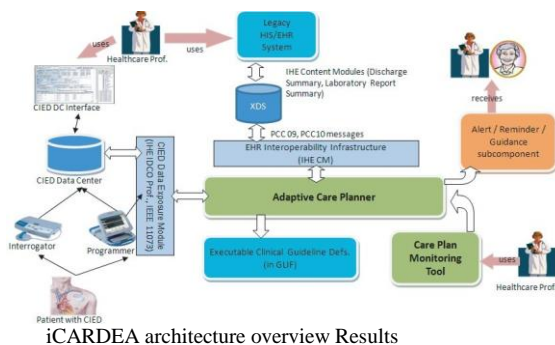
3. Advantages:

- Ease of operation
- Low maintenance cost
- Fit and forget system
- No wastage of time
- Durability
- Accuracy

4. Applications:

- Hospitals
 - Remote heart rate monitoring applications
 - Local monitoring applications
 - Designed for Home and Clinical Applications
- Abstract Prepared By

5. ICARDEA SYSTEM ARCHITECTURE



Ostensibly, RM is more attractive for high-volume centers, where arrhythmia services may be overcrowded. Moreover, within each center, RM may be preferentially allocated to patients undergoing de novo ICD implantation, patients who are more compliant, or those to whom standard in-clinic visits cause greater inconvenience. Appropriate reimbursement by health care systems and insurance companies, which is currently lacking in Italy and other European countries, is critical to stimulating the widespread adoption of RM [24]. Similarly, the adoption of new organizational models in the centers is warranted, in order to effectively and efficiently implement RM in standard clinical practice, converting this innovative approach to a cost-saving solution for patients, hospitals, and the public payer.

Device Reprogramming

In our survey, device reprogramming was reported to be necessary in 10% of visits. Similarly, Mascioli et al reported that device reprogramming was performed in 12% of scheduled visits. Boriani et al reported a higher proportion of device reprogramming (about 30%) and a significant impact of reprogramming on the duration of the visit. However, it has been demonstrated that, following an initial optimization period, the frequency of device reprogramming declines and RM systems may become a more attractive alternative to in-clinic visits.

In general, RM may be timesaving for scheduled, no actionable transmissions, while transmissions with clinically important findings and poor patient compliance have considerable workflow implications. Therefore, in order to implement RM in standard clinical practice, new organizational models need to be developed in which nurses are responsible for training patients, entering and reviewing data, submitting critical cases to physicians, contacting patients, and ensuring patient compliance. Recently, Ricci et al reported that an outpatient clinic workflow model based on primary nursing could be extremely effective and could reduce resource consumption. Specifically, they showed that nurses could perform 76% of remote interrogation sessions. However, our results revealed that, in the vast majority of centers, remote ICD interrogations continued to be performed by a cardiologist.

CONCLUSIONS

In conclusion, in-clinic ICD follow-up visits currently consume a large amount of health care resources. Internet-based RM has been developed as a cost-effective solution for the management of patients with implantable cardiac devices. However, we showed that RM has only partially been adopted in Italy and, although many centers have begun to implement RM in their clinical practice, the majority of their patients continue to be routinely followed up by means of in-clinic visits.

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