Failure of Technical Communication in Remote Monitoring of Cardiac Implantable Electronic Devices

Results of a Long-term Study

Pedro Silva Cunha, Mário Martins Oliveira, Manuel Nogueira da Silva, Joana Feliciano, Sandra Alves, Ricardo Pimenta, Sofia Almeida Santos and Rui Cruz Ferreira
Santa Marta Hospital, Cardiology Service, Rua de Santa Marta nº 50, 1169-024 Lisboa, Portugal

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Abstract: Remote monitoring of cardiac implantable electronic devices has been developed for technical control and follow-up using transtelephonic data transmission methods. In this study we explore the pitfalls of a remote monitoring program concerning failure of data transmission in a population with implantable cardioverter-defibrillators.

1 INTRODUCTION

Remote monitoring of cardiac implantable electronic devices has been developed for technical control and follow-up using transtelephonic data transmission methods. This technology allows evaluation of settings and status of cardiac implantable electronic devices and the resulting outcome. The remote monitoring features transmit selected device-related data to a service-center via a standard phone line or a mobile phone network. In case of a potential emergency situation, event reports are generated automatically according to the selected setting for alarms notification. It has been proven to be technically reliable, allowing early identification of device malfunction and arrhythmic events, and minimizing the risk of under-reporting. This remote interrogation can be used for scheduled and unscheduled technical and patient monitoring and follow-up. However, there is lack of data regarding technical problems related with failure of communication and data transmission.

2 AIM

To explore the pitfalls of a long-term remote monitoring program regarding data transmission in a population with an implantable cardioverter-defibrillator (ICD).

3 METHODS

We reviewed the data from two hundred and sixty patients (74% men; 60.4±14.6 years) with an ICD (n=190; 21% dual-chamber) or an ICD combined with a cardiac resynchronization therapy device (n=70).

Cardiac implantable electronic devices were implanted for primary prevention of sudden death in 160 cases and for secondary prevention in 100 cases. The cardiac implantable electronic devices and remote monitoring systems manufacturer´s were Biotronik (n=95), Medtronic (n=92); Boston Scientific (n=62) and Sorin (n=8).

Data was incorporated into the hospital information system via web and analyzed by an allied professional and an electrophysiologist in a single center follow-up program. The transmitter will only send the data according to scheduled time intervals or if requested by the patient or health-care professional (non-scheduled transmission). Patients were included in the study if they were followed-up for a period longer than 6 months. We considered data of all transmissions, including communication concerning cardiac implantable electronic devices and the transmitter, communication amongst the transmitter and the manufacturer's remote monitoring data centre, and communication between the manufacturer's data centre and the hospital. The data could be sent to the manufacturer's remote monitoring data centre by the conventional

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telephone cable network often called a ‘landline’ or by a digital cellular phone technology. All communication between the transmitter and the manufacturer’s data centre were encrypted to guarantee patient privacy and safety.

4 RESULTS

After a mean follow-up of 34±18 months, there were alert messages in 60 patients (range from 1 to 234 per patient) resulting in a response from the health-care team (<48 hours period of time).

In the majority of cases (83%) the information was due to ventricular tachyarrhythmia (n=24) or atrial fibrillation (n=26) episodes. Failure of data transmission occurred in 9 patients (3,4%), distributed by all device companies, and were due to: reduced signal strength of landline phone in the coverage area (n=2), repeated local energy failure (n=1), travelling abroad (n=2), technical problems with the transmitter (n=3), unknown (n=1).

After identification of the type of difficulty the transmission problems were solved after new instructions for the management of the transmitter or changing of the communication equipment in 3 of the cases.

5 CONCLUSIONS

Remote monitoring systems may represent an advantage in the complex follow-up of cardiac implantable electronic devices. However, in a long-term period, there are a few cases in which data transmission failed due to technical communication problems.

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