Mobile Telemonitoring for Arrhythmias in Outpatients in the Republic of Georgia: A Brief Report of a Pilot Study

Zviad Kirtava, M.D., Ph.D.,[1,2] Thea Gegenava, M.D., Ph.D.,[1,2] Maka Gegenava, M.D., Ph.D.,[1,2] Zviad Matoshvili, M.D.,[1,3] Sofia Kasradze, M.D., Ph.D.,[4] and Pavle Kasradze, M.D., Ph.D.[5]

[1]*Partners for Health NGO, Tbilisi, Georgia.*
Departments of [2]*Internal Medicine and* [5]*Sports Medicine, Tbilisi State Medical University, Tbilisi, Georgia.*
[3]*Department of Arrhythmology, Tbilisi University Central Clinic, Tbilisi, Georgia.*
[4]*Institute of Neurology and Neuropsychology, Tbilisi, Georgia.*

Abstract

As the very first trial of mobile telemedicine in the Republic of Georgia, in June–December 2010 we investigated 35 outpatients with different types of arrhythmia (male/female ratio = 16/19; 12–80 years old), among them 5 patients with concomitant epilepsy. The control group comprised 7 clinically healthy sportsmen (soccer players, all men; 15–17 years old), during a 30-min velo ergometer stress test. A three-lead electrocardiogram (ECG) loop recorder (Vitaphone BT 3300; Vitasystems GmbH, Mannheim, Germany) was used in automatic mode, using special LRMA software (MDT, Lázně Bohdaneč, Czech Republic) and a Nokia (Espoo, Finland) model 6730 Symbian phone. Automatically recorded arrhythmia events were transmitted from the loop recorder by Bluetooth® (Bluetooth SIG, Inc., Kirkland, WA) to a phone and then by 3G (through our partner mobile operator, MagtiCom Ltd. [Tbilsi, Georgia]) to the Vitasystems server in Germany and were available to Georgian physicians via e-mail/Internet. Arrhythmias were recorded/monitored during 7–68 h of observation. The number of automatically recorded ECG events varied between 3 and 170 per observation, or 0.4–10.7 hourly. Cases of sinus brady- and tachyarrhythmia, sinus node weakness syndrome, atrial fibrillation, supraventricular tachycardia, supraventricular premature complexes, and ventricular premature complexes were correctly recognized by automatic recognition software and recorded. In 3 patients and 1 sportsman previously unspecified (despite multiple investigations), arrhythmias were recorded: paroxysmal tachycardia (n = 1), sinus node weakness syndrome (n = 1), and ventricular premature complexes (n = 2). In 3 cases (all women) light insomnia and nervousness were reported. In 2 patients with neurosis (both elderly men, 1 with epilepsy) we had to stop investigation prematurely because of anxiety/agitation. Mobile telecardiology represents feasible methodology to monitor arrhythmias in outpatients in Georgia, promoting earlier discharge of non–life-threatening cases, improving patients' comfort of life, and increasing their mobility with enhanced safety. Mobile telehealth might also represent significant cost-saving for insurance companies (this is an ongoing study). Finally, in remote areas mobile telemonitoring of patients will improve quality of care by timely provision of a second opinion in cases when local expertise is not sufficient.

Key words: *telemedicine, e-health, cardiology/cardiovascular disease, home health monitoring, telecommunications*

Introduction

Mobile telehealth (m-health) is a rapidly growing branch of telemedicine. It includes the practice of medicine and public health using mobile devices, such as mobile phones and personal digital assistants, for providing health services and information.

In the process of m-health, broadband mobile connectivity enables data transfer among medical patients and health professionals. Increased availability of cell phones, increases in coverage zones, bandwidth-rich applications, and affordability of services have allowed the growth of m-health as a cost-effective tool. In transition economies, the lack of expensive technology and communications infrastructure are barriers to telemedicine development. However, mobile communications networks exist now.[1,2]

In the Republic of Georgia, mobile communications have grown rapidly since 1996. General packet radio service and 3G provide a means for monitoring outpatients in their homes and in isolated areas, such as mountainous regions, particularly during snowy winters. Mobile telemedicine systems can be used to diagnose arrhythmias and initiate/monitor therapy.

A classical example demonstrating the impact of telemedicine on diagnosis is the event recording of cardiac arrhythmia.[3–5] The documentation is a prerequisite for the subsequent diagnosis and therapy. Event recording also enables the correlation between the arrhythmia and the complaints of the patient and allows evaluating the quantity and quality of clinically relevant arrhythmias. Radiofrequency catheter ablation is an effective treatment of arrhythmias. However, patients may often have recurrent asymptomatic arrhythmias even after the procedure, which requires thorough ECG monitoring.[5] In addition, the impact of medication change on arrhythmias can be more objectively assessed with electrocardiogram (ECG) telemonitoring on outpatients.

Subjects and Methods

During June–December 2010, we studied 35 outpatients with different types of arrhythmia (male/female ratio = 16/19; 12–80 years old), among them 5 patients with concomitant epilepsy, 2 patients after radiofrequency catheter ablation, 1 patient after aorta-coronary bypass

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graft surgery, and 2 patients with unexplained syncope. The control group comprised 7 clinically healthy sportsmen (soccer players, all men; 15–17 years old), during a 30-min velo ergometer stress test. Investigations were conducted with a three-lead ECG loop recorder (Vitaphone BT 3300; Vitasystems GmbH, Mannheim, Germany) in automatic recording/transmitting mode, using special LRMA software (MDT, Lázně Bohdaneč, Czech Republic) and a Nokia (Espoo, Finland) 6730 smartphone. Patients' ECGs after automatic recording by the loop recorder were transmitted by Bluetooth® (Bluetooth SIG, Inc., Kirkland, WA) to a phone and then by 3G communication (supported by our partner mobile operator, MagtiCom Ltd. [Tbilsi, Georgia]) to the Vitasystems server in Germany and were available to Georgian physicians via e-mail/Internet (delay from recording, 30–70 s).

Results

Arrhythmias were recorded/monitored for 7–68 h. Significant ECG events varied from 3 to 170 per observation, or 0.4–10.7 events/h. Minor artifacts were observed mainly in the first minutes of recording (< 4% of subjects) and during vigorous exercise (12% of subjects, mainly in the control group of sportsmen). Cases of sinus bradyarrhythmia and tachyarrhythmia, sick sinus syndrome (prolonged sinus pauses or severe sinus bradycardia), atrial fibrillation, paroxysmal supraventricular tachycardia (PSVT), premature atrial complexes, and premature ventricular complexes (PVCs) were recorded and correctly recognized by the automatic recognition software. In 3 patients and 1 sportsman previously undiagnosed, arrhythmias were recorded: 1 with PSVT, 1 with sick sinus syndrome, and 2 with PVCs. Thirty patients reported no issues with the evaluation, but 2 women had light insomnia and nervousness, and 2 elderly men did not complete the evaluation because of anxiety/agitation. Two patients who had had radiofrequency catheter ablation had arrhythmia relapses recorded, but they were mostly asymptomatic. The vast majority of the 12 arrhythmia events were trivial—isolated premature atrial complexes/PVCs or sinus tachycardia—and only 2 were symptomatic. One patient had episodes of PSVT in 48 h of recording, and another had two episodes of PSVT and PVCs in 72 h of recording (all were asymptomatic).

Conclusions

This pilot study in Georgia has demonstrated the feasibility, reliability, and efficiency of telemonitoring outpatients for arrhythmias. Mobile telecardiology monitoring of arrhythmias enables early diagnosis and more timely intervention to support more cost-effective management and improved quality of care. It also permits evaluations by specialists not available in remote areas and the evaluation of the effects of pharmacologic and invasive interventions (radiofrequency catheter ablation and pacemaker or automatic/artificial implantable cardioverter defibrillator insertions).

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Disclosure Statement

No competing financial interests exist.

REFERENCES

1. Healthcare unwired: New business models delivering care anywhere. PricewaterHouseCoopers (PwC) report. Available at http://pwchealth.com/cgi-local/hregister.cgi?link=reg/healthcare-unwired.pdf (last accessed May 20, 2011).
2. García CU, Sigler FG, Duran MD, et al. On practical issues about interference in telecare applications based on different wireless technologies. *Telemed J E Health* **2007;**13:519–534.
3. Morguet AJ, Kühnelt P, Kallel A, et al. Utilization of telemedicine by heart disease patients following hospitalization. *J Telemed Telecare* **2008;**14:178–181.
4. Malacarne M, Gobbi G, Pizzinelli P, et al. A point-to-point simple telehealth application for cardiovascular prevention: The ESINO LARIO experience. Cardiovascular prevention at point of care. *Telemed J E Health* **2009;**15:80–86.
5. Vassilikos VP, Vogas V, Giannakoulas G, et al. The use of transtelephonic loop recorders for the assessment of symptoms and arrhythmia recurrence after radiofrequency catheter ablation. *Telemed J E Health* **2010;**16:792–798.

Address correspondence to:
Zviad Kirtava, M.D., Ph.D.
Partners for Health NGO
#51, Iv. Javakhishvili Street
Tbilisi 0102
Georgia

E-mail: zkirtava@nilc.org.ge
zkirtava@yahoo.com

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