

The Comprehensive Telemedicine System for improving medical services to population in the Caribbean countries



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Abstract

Introduction: The modern telemedicine systems based on information and telecommunication technologies are effective means for rendering of medical services to population and control over epidemiologic situation, in rural and distant hard-to-reach areas with underdeveloped public healthcare system, shortage of medical facilities and personnel. In order to ensure of social development in the Caribbean countries considering difficult situation in economics it is expedient to implement the Comprehensive Telemedicine System (hereinafter - CTS). Methods: CTS consists two parts: Network of Telemedicine consulting and diagnostic points established in medical facilities of different levels and subsystem of Mobile Telemedicine Laboratory-Diagnostic Units (MTU), connected via information and telecommunication channels with telemedicine points in stationary medical facilities. MTU are intended for decision of broad spectrum of medical tasks. Based on the international standards, CTS can be integrated with similar systems of other countries and become a part of global telemedicine system

Keywords: Comprehensive Telemedicine System; Mobile Telemedicine Laboratory-Diagnostic Units; Optimize the costs of health-care.

Resumen

El Comprehensive Sistema de Telemedicina para mejorar servicios médicos para la población en países Caribeños.

Introducción: Los sistemas modernos de telemedicina basados en tecnologías de información y comunicación son medios efectivos para la prestación de servicios para la población y de control sobre la situación epidemiológica, en áreas rurales y de difícil acceso con sistema público de salud subdesarrollado, falta de instalaciones médicas y personal. Método: Para asegurar el desarrollo social de países caribeños considerando la situación difícil de la economía del país es indispensable implementar el Sistema Comprehensive de Telemedicina (en adelante - CTS). Conclusión: CTS consiste de dos partes: puntos de la Red de Consultoría y Diagnósticos en Telemedicina establecidos en facilidades médicas de diferentes niveles y subsistemas de Unidades Laboratorio-Diagnósticas Ambulantes de Telemedicina (MTU), conectadas a través de canales de información y telecomunicación con puntos de telemedicina en facilidades médicas estacionarias. MTU son para la decisión de tareas médicas de amplio espectro. Basada normas internacionales, CTS pueden ser integradas con sistemas similares de otros países y se tornar parte del sistema global de telemedicina. Palabras-clave: Sistema Comprehensive de Telemedicina; Unidades Laboratorio-Diagnósticas Ambulantes de Telemedicina; Optimizar los gastos sanitarios

Palabras-clave: Educación Continua; Conocimientos en Informática; Medios Audiovisuales; Telemedicina; Tecnología de la Información.

Resumo

O Sistema Compreensivo de Telemedicina para melhorar os serviços médicos para a população nos países do Caribe.

Introdução: Os sistemas modernos de telemedicina baseados nas tecnologias de informação e comunicação são meios efetivos de prestação de serviços médicos para a população e de controle sobre a situação epidemiológica, em áreas rurais e de difícil acesso com sistemas de saúde pública subdesenvolvidos, falta de instalações médicas e pessoal. Método: Para assegurar o desenvolvimento social em países caribenhos considerando a situação econômica difícil é fundamental a implementação do Sistema Compreensivo de Telemedicina (a seguir: CTS). Conclusão: O CTS consiste de duas partes: pontos de consulta e diagnóstico da Rede de Telemedicina baseados em instalações médicas de diferentes níveis e subsistemas de Unidades Laboratório-Diagnóstica Móveis (MTU) conectados via canais de informação e telecomunicação com pontos de telemedicina em instalações médicas fixas. As MTU serve para tomada de decisões de largo espectro em tarefas médicas. Baseadas em padrões internacionais, as CTS podem ser integradas com sistemas similares ao de outros países e se tornar parte do sistema global de telemedicina.

Palavras-chave: Sistema Compreensivo de Telemedicina; Unidades Laboratório-Diagnóstica Móveis; Optimizar os custos de cuidados na saúde.

Introduction

Traditional methods of medical services and struggle against epidemic diseases are insufficiently effective and the 58-th World Health Assembly of the World Health

Organization has approved the «e-Health» resolution with recommendations to make active efforts for introduction of telemedicine technologies (document WHA58.28).

The modern telemedicine systems based on information and telecommunication technologies are effective means for rendering of medical services to population and control over epidemic situation, first of all in a rural areas, removed and hard-to-reach areas with underdeveloped public health care systems, shortage of medical facilities and personnel¹.

Considering economics in order to ensure of social development in the Caribbean countries it is expedient to implement the Comprehensive Telemedicine System (hereinafter - CTS)².

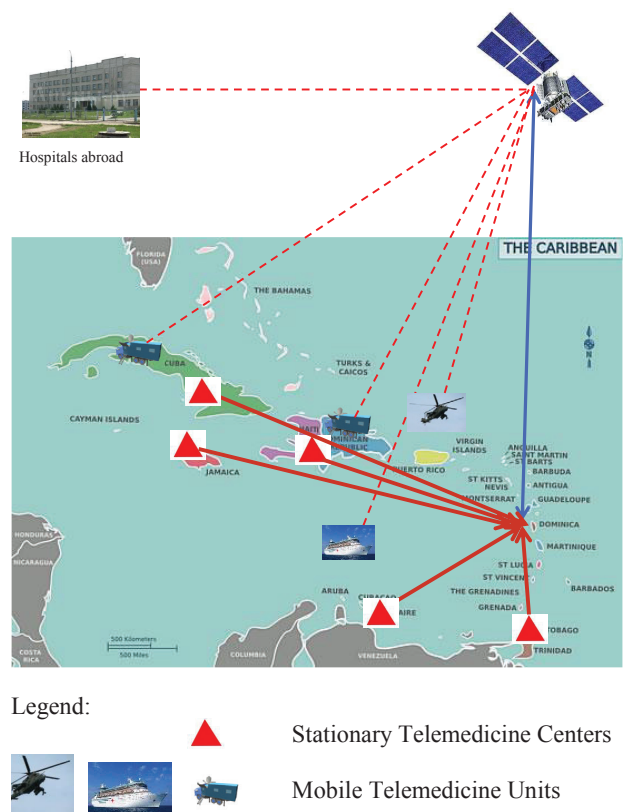
The UN Millennium Goals are: reduce child mortality; improve maternal health; combat HIV/AIDS; malaria and others diseases, halt and begin to reverse the spread of HIV/AIDS; halt and begin to reverse the incidence of malaria and other major diseases. The Comprehensive Telemedicine System intends to collaborate in achieving these objectives resolving four socially important challenges: (i) Maintenance of accessibility of medical and social services for the population; (ii) Ensuring of unified and common high quality of medical and social service for citizen irrespective of their residence and social status; (iii) Optimize the costs of healthcare while improving quality and coverage; (iv) Establishing of new workplaces for technical and medical CTS personnel. This article describes the systems, the overall goals, the structure, functionalities and solutions.

Methods

The systems structure, functionalities and the organizational outline of CTS work are defined by objectives of public health system in Caribbean islands as economic, social, demographic, conditions of development of the Caribbean islands; geographical and climatic features of the given regions.

CTS consists in two parts: Network of Telemedicine consulting and diagnostic points established in medical facilities of different levels in the Caribbean countries, and subsystem of Mobile Telemedicine Laboratory-Diagnostic Units (MTU), connected via information and telecommunication channels with telemedicine points in stationary medical facilities. MTU³ are intended to solve wide spectrum of medical tasks. Based on the international standards, CTS can be integrated with similar systems of other countries and become a part of global telemedicine system (Fig. 1).

Fig. 1: Scheme of the Comprehensive Telemedicine System for improvement of medical services to population in the Caribbean islands



CTS also provides the solution for public health challenges in following fields:

Clinical Telemedicine organization and rendering of advisory-diagnostic services from the national (regional) and foreign medical institutions to patients or their health care providers in charge in places of their residence and treatments;

Prophylactic telemedicine; monitoring and control of epidemic situation: organization and carrying out of prophylactic medical surveys of employees of the enterprises and general population, in particular in rural areas⁴, distant and hard-to-access districts, first of all for struggle against tuberculosis, malaria, HIV/AIDS and other socially dangerous diseases;

Application of telemedicine technologies in emergency situations: management and rendering of medical services at mass injuries following natural and anthropogenic catastrophic events, including rendering assistance to injured at the initial stage of liquidation of emergency situation consequences; Telemedicine support for foreign tourists; Remote training, improvement of professional skill for medical staff.

Basics for Comprehensive telemedicine system establishment

The initial composition of the CTS pilot segment includes at least 3 stationary telemedicine centers (STC) located at medical facilities of the Caribbean countries This segment provides:

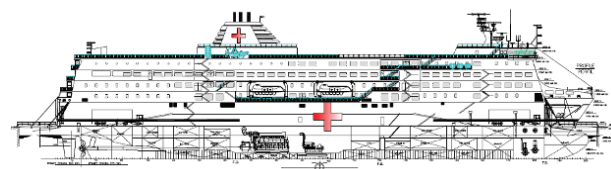
- Regular telemedicine advisory-diagnostic service to patients or medical professionals in charge by highly skilled experts of the leading national and foreign (including Russia) health care centers;
- Telemedicine support and control of Mobile Telemedicine Units (Fig. 2) personnel activity;
- The control of epidemic situation in regions based upon MTU examinations;
- Remote training and improvement of professional skills for medical personnel in the distant regions;
- Rendering of assistance during liquidation of catastrophic events consequences.

Fig. 2: General view of Mobile Telemedicine Unit in working position



The Mobile Telemedicine sea-vessel hospital (Fig. 3) allows the simultaneous hospitalization up to 400 patients with rendering of all necessary medical services. The vessel is equipped with laboratories, operational units, systems of independent air-conditioning and air clearing, quarantine unit. The vessel cargo deck is intended for transportation of mobile telemedicine trucks, including air cushion telemedicine ships, helicopters or seaplanes for servicing of distant continental areas. All conditions for comfortable residing of the medical personnel and a vessel crew are provided at the vessel.

Fig. 3: The medical hospital vessel meant for hospitalization up to 400 patients with rendering of all necessary medical services



The Mobile Telemedicine Laboratory-Diagnostic Units «Terek» for monitoring and control over epidemic situation and spending out of anti-epidemic arrangements.

STCs are completed with hardware-software complexes «Pyramid» intended for providing of advisory-diagnostic assistance and removed access to MTU workstations and servers with the purpose of screening management.

The complex «Pyramid»'s equipment allows to perform telemedicine consultations in on-line and off-line modes, including high-quality video conferencing; to accumulate, to store and to process various medical data of patients in the form of text, images and video, digital records of devices indications (such as electrocardiogram) and text descriptions of medical personnel, to transmit and receive data and experts conclusions via communication channels.

The complex «Pyramid» provides data transmission and carrying out of telemedicine consultations including videoconference with use of IP-protocol; it is possible to use it for the purposes of medical personnel professional skills improvement, patient's care guidance, for coaching of patients for healthy lifestyle, social and other matters.

Complexes «Pyramid» allow its functional expansion, including integration into the medical facility network.

Mobile Telemedicine Unit properties:

- High efficiency digital medical diagnostic equipment (Fig. 4);
- Telecommunication and telemedicine equipment (Fig. 5) for electronic formation of the medical documents (patient data, conclusions etc.), storage of documents in the digital form, transmission of medical documents via communication channels and receiving of recommendations and the conclusions from the stationary medical centers;

- Ability of moving at all kinds of roads and out of roads;
- The body of the MTU can be installed on any vehicle delivery: vessel, railway platform, helicopter;
- The systems for providing of independent MTU operation (power supply, heating, ventilation, air-conditioning, air-disinfection, etc.) and work of the personnel and MTU equipment, carrying out patient examinations in comfortable environment under virtually any climatic conditions (from -50° till +60°) even in long-term trips.
- Revealing of DNA/RNA and antibodies – activators of infectious diseases in bio-tests of people, animals and birds;
- Investigation of environment objects (water, ground) by method of polymerase chain reaction (PCR) in a real time mode (PCR-RT);
- Investigation of environment objects (water, ground) by method of polymerase chain reaction (PCR) with fluorescent detection (PCR-FD) with automatic registration of obtained results and info-communication analysis.

Fig. 4: Interior of Mobile Telemedicine Unit



Fig. 5: Mobile Telemedicine Unit: Working places of medical staff.



MTUs are equipped with independent satellite communication facilities (antenna diameter up to 1,8 m), also means of connection with networks, Internet, IP-telephony, etc.

MTUs equipment fulfills requirements of bio-protection BSL-2/3 class.

MTU «Terek» medical equipment provides following examinations:

Conclusion

The «National Telemedicine Agency» Research-and-Production Union registered in Moscow (Russian Federation) proposes delivery and putting into operation in the Caribbean countries of equipment for mentioned above Comprehensive Telemedicine System.

According to opinion of Russian Public Health Institutions exploiting similar telemedicine systems, provided by «National Telemedicine Agency» («NTA»), it have proved their social and economical efficiency.

Implementation of proposed telemedicine system is possible through several steps: the first step can be a pilot segment with only major parts of the system with involvement of limited number of regions of the Caribbean islands. Henceforth this segment can be extended through expansion to other regions.

The pilot segment putting may be up and running within 12 months after first payment.

Developed by «NTA» equipment of proposed telemedicine system is completely compatible to the equipment for emergency telemedicine system intended for rendering of medical and social services to the injured during anthropogenic and natural catastrophes people.

The schedule and expected results of project realization supposed period of the project implementation is two years: At first year – formation of infrastructure, including delivery and putting into operation of equipment, training of local personnel; and at the second year – beta testing operation (12 months). During the beta testing operation of pilot segment there will be performed: preventive examinations and rendered medical services up to 50 thousand of persons, including the ones from rural and distant areas and also up to 300 thousand tests for revealing infection agents of human and veterinary diseases that essentially will improve epidemiological control on surveyed territory.

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INDICATION OF LIABILITY: All co-authors have put equal impact into the writing of this article.