Technical Feasibility Study of 3G Stroke Consultation

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Abstract

The study assesses the potential for enhanced community based tele-consultation for stroke patients in the South Eastern Trust area of Northern Ireland. We have used a tele-consultation approach, which can be utilized by a health professional in conjunction with a scheduled home visit. It provides a synchronous telecommunications link to a consultant neurologist located in the main hospital. Third generation telephony (3G) provides wireless connectivity at 'mid-broadband' data rates (128-500kbps), and these services are becoming available in parts of the North Down peninsula. The technical feasibility study has shown that clinical tele-consultations for stroke follow-up is feasible given 3G duplex data rates of 500kbps. Lower rates 200-500kbps can sustain calls, albeit at poorer quality. Services are available in the larger population centres, less so in the more rural areas.

Keywords:

Teleconsultation, Mobile, 3G, Telemedicine, Stroke

Introduction

Each year over 130,000 people in England and Wales and thousands of people in Northern Ireland have a stroke. The increase in precedence, due to an ageing population, means that follow-up care requires new thinking on the delivery mechanism. Tele-consultation offers the potential for access to a specialist neurologist without the need to travel to a specialist unit. 3G technology offers mobility, and ensures tele-consultation will be independent from the communications infrastructure at the recipient's house.

Methods

Skype is an application with an easy to use interface and built in security. It allows consultants based in their office to carry out video consultations with patients who are in their own home using a mobile broadband connection. A number of trials took place to test the effectiveness of video calls and to assess call quality. A TCP/IP protocol monitor was used to evaluate the connection metrics. Initial trials were carried on a wired LAN with an approximate available download bandwidth of 74.2Mbps and an approximate available upload bandwidth of 23.1Mbps. This bandwidth was more than sufficient for an excellent quality video connection. Trials then involved establishing a video call over differing bandwidth connections and monitoring the throughput to determine how much bandwidth is required for an acceptable consultation. The throughput was monitored in a variety of potential consultation situations: *Call Established, Disabled video within Call, Re-enabled within Call, Erratic Body Movements During Call, No Movement During Call, Ending Call*.

Results

It was found that when a call was established the average number of bits received was 596kbps and the average number of bits sent was 582 kbps. When the video feed in the call was cancelled the sent data rate dropped to 125kbps and when the video feed was re-enabled the sent data reverted to 565kbps. Erratic movements resulted in peak rates of more than 800kbps. When movements ceased the rates returned to around 530kbps. The data gathered was useful in determining, the required data rate (500kbps) for carrying video calls over a network. Lower rates 200-500kbps can sustain calls, albeit at poorer quality. 3G services (provider was O2) were tested at the Ulster Hospital (consultant's base), indicating that an enhanced 3G protocol High-Speed Downlink Packet Access (HSDPA) was available. However, services throughout the region were variable, with the minimum required speed (>200kbps) only available in main towns.

Conclusion

The current infrastructure in rural areas of the North Down Peninsula is not robust enough to allow tele-consultations to be currently carried out everywhere. In population centres sufficient speed is normally available. As demand for commercial services increases and the infrastructure improves, so will the available data rates and coverage. In particular, the 3rd Generation Partnership Project (3GPP) long term evolution (LTE) http://www.3gpp.org/ should deliver mobile broadband rates starting at 10Mbps downlink/ 5Mbps uplink. This approach should have applications in developing countries where the main communication infrastructure in place is the mobile network.