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THE APPLICATION OF
TELEPRESENCE IN MEDICINE

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16.1 INTRODUCTION

Telemedicine has been defined most clearly as ‘the use of electronic information and communications technologies to provide and support health care when distance separates the participants’ [1]. Applications of telemedicine in remote consultation fall into two broad categories — store and forward of electronic patient-related information for remote diagnosis, and real-time interactive remote consultation between geographically separate clinicians or patient and clinician. Store-and-forward applications are the fastest growing area of commercial telemedical services, for example, the managed radiological case-reporting service offered by Worldcare Ltd [2]. Patient-related images or case reports are transmitted to a remote expert clinician for report back within 6 to 48 hours. Store-and-forward applications are not explored in this chapter since the remote expert is not telepresent during a consultation. This chapter details the BT trials and pilot schemes which have helped to establish the credentials for real-time medical telepresence. It highlights technical solutions to clinical concerns which can change real-time teleconsultation from an interesting technology for enthusiasts to a potentially important means of making more effective use of limited human resources, leading to improved patient care at acceptable costs.

16.2 REMOTE FETAL SCANNING

The remote fetal ultrasound trial [3] was designed to assess the clinical validity of the transmission of real-time fetal ultrasound images over BT’s dial-up ISDN30 service. The system was implemented to provide an expert consultant opinion from a central specialist referral centre to the local clinicians in a hospital. Expectant mothers are routinely scanned at 14-18 weeks of pregnancy at their local antenatal clinic. Up to 5% of scans in the UK have an ambiguity in
the image which would normally result in the mother being referred to one of the UK specialist fetal care centres for a second opinion. During this trial, high-quality ultrasound images generated in the antenatal clinic at St Mary’s Hospital on the Isle of Wight were transmitted over the BT ISDN network to Queen Charlotte’s Hospital in London, where for the purposes of referral they were viewed by a consulting expert with virtually no delay or degradation in quality. The technical and geographic configuration is shown in Fig. 16.1.

![Fig. 16.1 Schematic of remote scanning equipment.](image)

The equipment in the antenatal clinic at St Mary’s consisted of a stand-alone cabinet containing a BT VC2300 videocodec, an ISDN channel inverse multiplexer, video and audio mixers, plus a small floor-mounted mobile control console for use next to the scanner. There was also a wall-mounted low-light camera within the scanning room which captured a general view of the patient and sonographer during the scan. This view allowed the remote consultant to correlate the ultrasound image on view with the position and orientation of the ultrasonic transducer held by the sonographer. The control console allowed the sonographer to determine which images were sent to the consultant or how they should be mixed together. The console had a small LCD monitor which displayed the image being transmitted to the consultant so that the sonographer could be confident the configuration was correct. Figure 16.2 indicates the view most often seen by the remote consultants at Queen Charlotte’s.