Respiratory applications of telemedicine
Christopher B Cooper

Dramatic advances in electronic communications have expanded access to information and contributed vastly to global human knowledge and understanding. At the same time, electronic acquisition, processing, storage and transmission of data is rapidly becoming an integral part of modern health care. The potential seems boundless. The electronic medical record has the ability to improve the reliability and completeness of individual healthcare information and should therefore facilitate continuity of care between healthcare providers and minimise human errors. At the same time, legislators have seen the absolute necessity to respect privacy in handling protected health information.1

A promising application of electronic data transmission in healthcare development and delivery is telemedicine.2 Telemedicine has evolved from the development of synchronous data modalities, through data transfer and storage, towards automated decision making and robotics.3 One recent review article2 analysed 104 published articles on telemedicine in order to develop an operational definition. The authors concluded that telemedicine is a branch of e-health that uses communications networks for delivery of healthcare services and medical education from one geographical location to another. Although more than 50% of published articles on telemedicine originate from the USA,2 telemedicine has the potential to advance healthcare delivery in developing or underserved regions of the world by concentration of expertise in special centres and dissemination of services through information technologies.

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patients with suspected sleep apnoea compared with laboratory testing. New diagnostic and monitoring applications of telemedicine must be validated against accepted gold standards of laboratory testing before being included in mainstream clinical practice.

Another application of telemedicine in pulmonary function testing is the uniform application of quality improvement indicators through centralised “overread” services. The value of an overread service in detecting deficiencies in spirometry was tested in 30 primary care practices in New Zealand. Centralised review was performed using ATS criteria for acceptability and reproducibility. Even after attending spirometry workshops, only 33% of tests performed by trained primary care technicians met these criteria. White et al explored the feasibility of remote specialist reporting of primary care spirometry and showed that additional clinically significant information was frequently added to the reports of the primary care clinicians. There are many benefits to be derived from incorporating centralised spirometry into multicare clinical trials. Coupled with the provision of the same apparatus for the performance of spirometry at each site, electronic transmission of data facilitates monitoring of site compliance with procedures and other aspects of quality assurance, as well as data collation and subsequent analysis. The medical literature contains few systematic studies of centralised spirometry. One was in the context of a clinical trial in patients with cystic fibrosis. During the trial, 1418 spirometric measurements were obtained in 89 study subjects. Differences were observed between centralised reporting and individual study sites and the discrepancies could easily be identified, particularly if they recurred at one study site, allowing corrective measures to be implemented. The report of the Burden of Obstructive Lung Disease (BOLD) study highlights the coordinated use of electronic spirometry at 12 sites in different countries, each with a target recruitment of 600 subjects. Lung function data were obtained with identical portable electronic spirometers and all spirometers were interpreted by a central Pulmonary Function Reading Center (FFRC) which assigned a score based on ATS/ERS criteria for acceptability and reproducibility. Centralised data review can track recruitment at individual study sites, verify compliance with specified study visits and also with the timing and conduct of procedures. Sites can be audited remotely and their individual performance compared with other sites. For example, in the BOLD study, spirometry technicians were certified before the start of data collection and received regular feedback about the quality of their performance. Perez-Padilla et al reported a quality control analysis of spirometry performed in five central and South American cities as part of the PLATINO study. These investigators again emphasised the importance of using the same type of spirometer at each site (in their case, a portable electronic spirometer), employing centralised training of pulmonary function technicians and providing feedback to all sites on calibration checks, intratest reliability and technician performance. This approach can potentially reduce the costs of site monitoring by contract research organisations that have traditionally relied upon clinical monitors making repeated site visits to accomplish these goals.

The discipline of telemedicine is still relatively new and further exploration of methods and outcomes are needed. Experimental approaches are needed to simultaneously evaluate the structure and cost of telemedicine services, diagnostic accuracy, impacts on treatment plan and clinically meaningful patient-centred outcomes. At least two studies have reported general acceptance and satisfaction of telemedicine by patients. However, specific applications in home monitoring need to be carefully established with an understanding of what is a clinically meaningful deviation from baseline of the measure of interest in the home setting. On the other hand, there is compelling evidence that telemedicine can be introduced into multicare clinical trials to facilitate quality control of pulmonary function testing.

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