

REVIEW ARTICLE

Continuous and integrated health care services in rural areas. A literature study

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ABSTRACT

This article presents the result of a literature review examining possible ways to improve healthcare services in rural areas. While there is abundant literature on making healthcare programs integrated, interdisciplinary and managed in order to reduce fragmentation and improve continuity and coordination of care, only some part of this relates to rural issues. An added challenge is the lack of a generally accepted international definition of rurality, which makes it difficult to generalise from one region to another, and to develop an evidence-based understanding of rural health care. In evaluating the literature it was found that the development of new forms of interaction is particularly relevant in rural regions - such as interdisciplinary and team-based work with flexibility of roles and responsibilities, delegation of tasks and cultural adjustments. In addition, programs such as integrated and managed care pathways, outreach programs, shared care and telemedicine were relevant initiatives. These may be associated with greater equity in access to care, and more coherent services with greater continuity, but they are not necessarily linked to reduced costs; they may, in some cases, entail additional expenses. Such endeavours are, to a large degree, dependent on a well-functioning primary healthcare system as a base.

Key words: continuity of patient care, integrated care, intermediate care, patient pathways, rural medicine, shared care, telemedicine.



Introduction

Healthcare providers in rural areas face challenges in providing coherent and integrated services. A growing political trend in planning health services for rural and remote populations, is to take rurality into account in order to ensure greater equity in health services and health outcomes^{1,2}. Rural health research is flourishing, especially in the United Kingdom, Australia and North America, but findings from these areas may not be transferable to the geography and demography of other regions or continents, such as Africa or Asia.

A special challenge in rural areas is that the proportion of older people often is higher than that of the general population. As a consequence, rural health practitioners often have to deal with older patients with multiple and chronic diseases. In addition, unfavourable health outcomes have been linked to rural populations, such as higher asthma mortality rates and a more advanced stage at diagnosis of some cancers³⁻⁶.

We conducted a literature study to explore evidence on how to promote continuity and integration in healthcare services in order to meet the special demands of populations in rural areas. Concepts and terms commonly used in the literature related to these issues are presented. Policy documents and strategies from northern European regions are also presented in some detail.

Rurality

There is a lack of internationally agreed-upon definitions of what rurality entails, how it is measured and how it is used in research and healthcare policy and planning. Researchers usually employ their own definition according to the study area of interest. This makes it difficult to interpret and compare study results internationally and to establish an evidence base for these issues^{1,2,7}.

According to the Organisation for Economic Co-operation and Development (OECD), the definition of rurality is fewer than 150 persons per km². In the UK, authorities have recently developed a methodology to define rural and urban areas which is now being used as a national statistic⁸. Another initiative to describe and delineate rurality is the 'Clinical peripherality index' from Scotland's health service⁹. This index reflects characteristics of rural and remote general practices and the communities they serve, including their access to secondary care facilities, to centres of decision-making and to professional education and support.

In this study our understanding of rurality relating to health care entails some or all of the following elements: isolated and dispersed communities, low density populations, limited public transport and road infrastructure, long distances to hospitals and health care services, and the difficulties in attracting and recruiting qualified personnel.

Method and Results

Search strategy

Electronic database searches were performed in Pubmed, MEDLINE and EMBASE using controlled vocabulary and text words. Definitions of search terms are presented (Table 1). The first search was in PubMed for the period 1995-2005, resulting in 214 hits. The abstracts were reviewed, and 21 were selected. Then searches for systematic reviews were made in MEDLINE for the period 1966-2005 and in EMBASE for the period 1980-2005, resulting in 507 hits in total, of which 18 were selected. Supplementary searches of MEDLINE and EMBASE for the period 2005-October 2006 resulted in the selection of 10 of 139 articles. In addition, some studies were identified from desktop searches and some from reference lists. Only one Cochrane systematic review was found¹⁰. The selection of articles was based on the authors' estimate of what was relevant to providing continuous and integrated services in



rural areas from review of the abstracts, and articles published in recent years.

National public health strategies and policy documents relating to the needs for more integrated and decentralised health services in rural areas from some northern European countries were also identified.

Data analysis

On the basis of the collected literature, using an editing analysis style¹¹, we identified units in the material that were indicators of organisational forms and programs that would lead to more continuous and integrated services, such as access to services, delegation, cooperation and teamwork. Some of these were specific to rural areas, but some were not. From these units we synthesised five common themes:

1. Trends in public health strategies and policy documents.
2. Delegation and substitution of tasks, team-based working, flexibility of roles and cultural adjustments.
3. Integrated care programs and managed care.
4. Intermediate care, shared care and specialist outreach.
5. Telemedicine.

Trends in public health strategies and policy documents

Health policy documents in many countries focus on the need for integrated, continuous and decentralised health services, but many fail to take into account the special context of rurality. According to the Board of Science of the British Medical Association, rurality will increasingly be recognised as an issue worthy of its own health policies². Their report *Health care in a Rural Setting*² is a policy update on rurality, healthcare delivery to local areas, acute and emergency services, local provision of facilities for

disabled people, interprofessional work and education, and expert patient programs.

Another report from the UK, *Keeping the NHS local – A New Direction of Travel*, outlines modernisation strategies for models of care ‘closer to home’ that suit the demands of populations in rural areas¹. The goal is to work with local communities and staff to rebuild local services around local needs. The service modernisation proposed includes new and extended roles for doctors, nurses and other clinical staff, a shift towards team-based work, an appropriate balance in care from generalists and specialists, networking between hospitals, and using telemedicine.

The report from NHS Scotland⁹ states:

The Scottish Executive’s report (2002) on the availability of services in rural Scotland identified poor access to public services as one of the main causes of social exclusion for rural areas. The loss of local health services can have a significant knock-on effect to the sustainability of fragile local communities and recruitment and retention of healthcare professionals in remote and rural areas presents particular challenges.

A report from northern Norway on the rural dimensions in decentralisation of health services recommends the use of outreach/ambulatory services, community hospitals, enhanced use of telemedicine solutions and better counselling and guidance from specialists to primary care workers¹².

A key impression gained from our review is that there is a growing emphasis on the rural dimensions in health planning, calling for a shift of services from secondary care to community-based care, and from community-based to home-based care or self-management programs.



Table 1: Definitions of MeSH search terms

MeSH search term	Definition
Rural health services	Health services, public or private, in rural areas. The services include the promotion of health and the delivery of health care
Case management	A traditional term for all the activities which a physician or other healthcare professional normally performs to insure the coordination of the medical services required by a patient. It also, when used in connection with managed care, covers all the activities of evaluating the patient, planning treatment, referral, and follow up so that care is continuous and comprehensive and payment for the care is obtained.
Critical pathways	Schedules of medical and nursing procedures, including diagnostic tests, medications, and consultations designed to effect an efficient, coordinated program of treatment.
Delivery of health care, Integrated	A healthcare system which combines physicians, hospitals, and other medical services with a health plan to provide the complete spectrum of medical care for its customers. In a fully integrated system, the three key elements - physicians, hospital, and health plan membership - are in balance in terms of matching medical resources with the needs of purchasers and patients.
Patient care team	Care of patients by a multidisciplinary team, usually organized under the leadership of a physician; each member of the team has specific responsibilities and the whole team contributes to the care of the patient.
Disease management	A broad approach to appropriate coordination of the entire disease treatment process that often involves shifting away from more expensive inpatient and acute care to areas such as preventive medicine, patient counselling and education, and outpatient care. This concept includes implications of appropriate versus inappropriate therapy on the overall cost and clinical outcome of a particular disease.
Health services accessibility	The degree to which individuals are inhibited or facilitated in their ability to gain entry to and to receive care and services from the healthcare system. Factors influencing this ability include geographic, architectural, transport, and financial considerations, among others.
Medically underserved area	A geographic location which has insufficient health resources (manpower and/or facilities) to meet the medical needs of the resident population
Continuity of patient care	Health care provided on a continuing basis from the initial contact, following the patient through all phases of medical care.
Efficiency, organizational	The capacity of an organization, institution, or business to produce desired results with a minimum expenditure of energy, time, money, personnel, material etc.
Ambulatory care facilities	Those facilities which administer health services to individuals who do not require hospitalization or institutionalization.
Regional medical programs	Coordination of activities and programs among healthcare institutions within defined geographic areas for the purpose of improving delivery and quality of medical care to the patients.
Regional health planning	Planning for health resources at a regional or multi-state level.



Delegation and substitution of tasks, team-based work, flexibility of roles and cultural adjustments

Greater flexibility in traditional professional roles and responsibilities, such as nurse practitioners or community pharmacists managing common conditions, is proposed in order to alleviate a scarcity of personnel and resources¹³. Empowering primary-care practitioners by training and education combined with support and supervision is described in studies dealing with diabetes and mental health^{14,15}. Other examples include generalist providers, particularly community and home-care nurses, playing a greater role in the delivery of primary palliative care^{16,17}. Primary-care professionals may also substitute for secondary care in hospitals' acute and emergency departments¹⁸.

Substitution of health personnel with lay health workers or paraprofessionals, often in combination with interdisciplinary teams, is among measures proposed to alleviate staff shortage and to overcome cultural barriers¹⁹. The Kansas Health Education Training Center describes the role of the 'community health worker' as 'partners for health'²⁰: 'Working in health promotion and self-management programs they assist in bridging culture, language and patterns of health behaviour in underserved populations.' While the working conditions in remote areas are characterised by: 'Geographical, professional and, often, social isolation of practitioners; a strong multidisciplinary approach; overlapping and changing roles of team members; a high degree of general practitioner substitution; and practitioners requiring public health, emergency and extended clinical skills'²¹.

The literature reveals that working in remote and rural areas calls for flexibility of roles and responsibilities, delegation of tasks, and cultural adjustments by the healthcare practitioners.

Integrated care programs and managed care

Integrated care implies coordinated programs in all phases of medical care. An integrated care pathway (ICP) is an outline of planned care for a specific patient group. Much of the focus on patient pathways has been related to clinical pathways in hospital settings, or to the gate-keeping and case-management mechanisms used by managed care organisations. But a broader approach is emerging, where ICP are multiprofessional documents designed to embed locally accepted, evidence-based, patient-centred guidelines in everyday use for the individual patient^{22,23}. A design for implementing integrated pathways into rural health services implied identifying patient pathways for patient groups and the planning of multidisciplinary, comprehensive care on a timescale, not only for those needing isolated episodes of care, but also for chronically ill patients²⁴.

An analysis of systematic reviews carried out in the Netherlands evaluating the effectiveness, definitions, and components of integrated care programs for chronically ill patients²⁵ found that:

The most common components were self-management support and patient education, often combined with structured clinical follow up and case management; a multidisciplinary patient care team, multidisciplinary clinical pathways and feedback, reminders and education for professionals.

Such integrated care programs appeared to have positive effects on the quality of care.

Both integrated patient care and managed care are intended to improve access, continuity and coordination of care. But managed care also takes into account payment and economic elements, and the cost-effectiveness of care. One definition of managed care²⁶ is:



Any system that manages healthcare delivery with the aim of controlling costs. Managed care systems typically rely on a primary care physician who acts as a gatekeeper through whom the patient has to go to obtain other health services such as specialty medical care, surgery, or physical therapy.

It is proposed that rural case management depends on a locally based case manager, rather than a regular case manager who travels to rural areas from an urban centre²⁷. This is illustrated in a US study describing the nurse's role as case manager in rural settings²⁸. The highest ranked essential skills for rural case managers were identified as: the ability to be creative in the coordination of resources, multidimensional nursing skills, excellent communication skills, high-calibre computer skills and excellent driving skills. The authors²⁸ found the emphasis on technology and telemedicine somewhat surprising and offered the following conclusion:

Case management in a rural environment requires a much broader and generalist knowledge base, it covers all levels of prevention and traverses all age groups. Rural case management is a distinct specialty area of practice, with a distinct knowledge base and skill level, and nurses should be prepared at the advanced practice level.

Our review revealed that planned care programs such as integrated care and managed care must be adjusted to the context of rural areas, and that they also require of rural health professionals special knowledge and skills.

Intermediate care, shared care and specialist outreach

Many of the initiatives to improve health services in rural and remote areas are attempts to better the interaction and communication between primary and specialist levels. The Rural Access Action Team of Scotland offers the following definitions⁹:

- *Intermediate care* describes the expansion of primary health care and social care services to bridge the interface with secondary care.
- *The rural general hospital* is a locally based, consultant-led service that provides emergency medical care such as triage, resuscitation and stabilisation. It also provides locally based elective care, diagnosis, treatment or transfer. It handles care for the elderly and for those with chronic illness such as stroke and diabetes, and support for renal dialysis patients.
- *The community hospital* varies as to what services are provided, but usually has a core of GP inpatient beds, while some have consultant long-stay beds, primary care nurse beds or delivery beds run by midwives. Community hospitals may also play a role in palliative care, outpatient functions including day case surgery, specialist clinics and in telemedicine including teleradiology.

In Norway, community hospital functions are often placed in small units with 2-3 beds within a nursing home. Others are part of district medical centres, combining primary health care and specialist outreach services. A recent political trend in Norway is to strengthen such services, mostly in rural areas^{29,30}.

In Scandinavia, GPs are often engaged as advisors to the hospital staff, acting as facilitators of cooperation between generalists and hospitals. They participate in the development of clinical guidelines for shared care and also conduct multidisciplinary patient pathway analyses in order to identify areas of quality improvement³¹. A patient pathway may be defined as the route that a patient will take from their first contact with their GP, through referral, to the completion of treatment. It also covers the period from hospital admission to discharge. It may, thus, be illustrated on a timeline, on which every event relating to treatment can be entered³².



The formal liaisons between GPs and specialist teams were evaluated in a systematic review³³. Patient retention rates within treatment programs improved with GP involvement, as did patient satisfaction. With such cooperation, the behaviour of both GPs and specialists changed. More rational use of diagnostic tests, improved clinical skills, increased use of appropriate treatment strategies, and more frequent clinical behaviours designed to detect disease complications were reported. Cost-effectiveness could not be determined.

In a literature review of *shared care* at the primary-secondary interface, one of the most fundamental aspects identified was the need for improved data transfer relating to discharge planning, shared prescribing and shared management of disease³⁴. Although information technology may provide solutions to this, it was concluded that a culture change compelling health professionals to share patient information in a more timely and efficient way should be given higher priority.

Specialist outreach clinics in primary care and rural hospitals were studied in a 2004 Cochrane systematic review, providing an assessment of effectiveness in terms of access, quality, health outcomes, patient satisfaction, use of services and costs¹⁰. Most comparative studies came from urban non-disadvantaged populations in developed countries. Specialist outreach as part of more complex multifaceted interventions involving collaboration with primary care, education or other services was associated with improved health outcomes, more efficient and guideline-consistent care, and less use of inpatient services. The additional costs of implementing outreach may be offset by improved health outcomes. The benefits of simple outreach models in urban non-disadvantaged settings, however, appeared to be small¹⁰.

A study from Australia's northern Aboriginal communities evaluated a specialist outreach service, confirming the findings of the Cochrane study in that specialist outreach is dependent on a well-functioning primary healthcare system³⁵. It also states that 'according to the way in which

outreach is conducted and the service is organised, it can either support primary care or it can hinder primary care and, as a result, reduce its own effectiveness.'

Our study found evidence that collaboration at the interface between primary and secondary sectors may improve access, continuity of care and the quality of service delivery in rural areas. These measures are dependent on a well-functioning primary healthcare system as a base.

Telemedicine

Telemedicine may be defined as 'Medicine practiced at a distance. It therefore encompasses diagnosis, treatment and medical education'³⁶. The benefits of telemedicine involve the facilitation of access to health services and medical information regardless of time and place. In this context, there is abundant literature on applications in rural settings; however, there is a lack of evidence supporting its clinical and cost advantages relative to traditional services³⁷.

One report of well-functioning telemedicine services comes from the state of Maine, USA, where there has been rapid a growth in state-wide telemedicine systems in rural, economically disadvantaged areas³⁸. Here telemedicine is used in a broad array of interactive videoconferencing applications, including mental health and psychiatry, diabetes management, primary care, paediatrics, genetics, and dermatology. An article from Tennessee, USA, describes an integrated telehealth network linking three hospitals, a healthcare clinic and patient homes³⁹. Outcomes from the disease management program for diabetes showed an increase in the number of diabetic patients who had managed to control their blood glucose levels. In Scotland, remote nurse practitioners in a community hospital staffed accident and emergency services, supported by telemedicine advice from a regional hospital by videoconference and a document camera which allowed transmission of still images of wounds and radiographs⁴⁰. Both professionals and patients reported high levels of acceptance and satisfaction.



It is also reported that telemedicine may contribute to acceptable services in palliative care and cancer treatment programs in remote and rural areas⁴¹. The use of telemedicine to facilitate thrombolytic therapy for patients with acute stroke, by providing stroke consultative services to remote-site hospitals, has also been shown to be reliable^{42,43}. There is good evidence that systemic thrombolysis can be employed in remote sites with telemedical consultation⁴⁴.

This review found that telemedicine can be a valuable tool in achieving access to healthcare services in remote and rural areas, but that documentation of its cost-effectiveness has been limited.

Conclusion

The findings of this literature review indicate that continuous and integrated healthcare services may be achieved in rural areas by decentralisation of services, delegation and substitution of tasks, interdisciplinary and team-based working, flexibility of roles, and cultural adjustments. In addition, it was found that programs such as integrated and managed care pathways, outreach programs and shared care were relevant measures. Telemedicine may also be a useful tool to achieve access to services in remote areas. Most of the literature comes from industrialised countries in Europe, USA, Canada and Australia; much of it reflects a lack of evidence and indicates the need for future research. There is also a need for further studies on the relevance and validity of these findings in other regions, such as in the southern hemisphere.

References

1. UK Department of Health. *Keeping the NHS local - A new direction of travel*. (Online) 2003. Available: http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT_ID=4010316&chk=H%2BFDrS (Accessed 3 March 2007).
2. British Medical Association; Board of Science. *Healthcare in a rural setting*. (Online) 2005. Available: [http://www.bma.org.uk/ap.nsf/AttachmentsByTitle/PDFrural/\\$FILE/rural.pdf](http://www.bma.org.uk/ap.nsf/AttachmentsByTitle/PDFrural/$FILE/rural.pdf) (Accessed 3 March 2007).
3. European Rural and Isolated Practitioners Association, EURIPA. *A collaborative analysis of public health and health service issues in rural areas*. (Online) 1999. Available: <http://www.euripa.org/research.htm> (Accessed 3 March 2007).
4. Campbell N, Elliot A, Sharp L, Ritchie L, Cassidy J, Little J. Rural and urban differences in stage at diagnosis of colorectal and lung cancers. *British Journal of Cancer* 2001; **847**: 910-914.
5. Jones A, Bentham G, Horwell C. Health service accessibility and deaths from asthma. *International Journal of Epidemiology* 1999; **28**: 101-105.
6. Ryan-Nicholls KD, Racher FE. Investigating the health of rural communities: toward a framework development. *Rural and Remote Health* **4**: 244. (Online) 2004. Available: www.rrh.org.au (Accessed 13 November 2006).
7. Public Health Agency of Canada. *Definitions of 'rural' summary*. (Online) 2002. Available: http://www.phac-aspc.gc.ca/rh-sr/paper_e.html (Accessed 3 March 2007).
8. UK Online National Statistics. *Rural and Urban Area Classification 2004* (Online) 2004. Available: <http://www.statistics.gov.uk/geography/nrudp.asp> (Accessed 3 March 2007).
9. Scottish Executive Health Department. *A National framework for service change in the NHS in Scotland*. (Online) no date. Available: <http://www.sehd.scot.nhs.uk/nationalframework/Reports.htm> (Accessed 3 March 2007).
10. Gruen RL, Weeramanthri TS, Knight SE, Bailie RS. Specialist outreach clinics in primary care and rural hospital settings. *Cochrane Database of Systematic Reviews* 2004; (1):CD003798. DOI: 10.1002/14651858.CD003798.pub2



11. Malterud K. Qualitative research, standards, challenges, and guidelines. *The Lancet* 2001; **358**: 483-487.
12. Desentralisering av spesialisthelsetjenester i Helse Nord. *Rapport fra prosjektgruppe oppnevnt av Helse Nord RHF*. (Online) 2005. Available: <http://www.helsenord.no/category5929.html> (Accessed 3 March 2007).
13. Chapman JL, Zechel A, Carter YH, Abbott S. Systematic review of recent innovations in service provision to improve access to primary care. *British Journal of General Practice* 2004; **54**: 374-381.
14. Maddigan SL, Majumdar SR, Guirguis LM, Lewanczuk RZ, Lee TK, Toth EL et al. Improvements in patient-reported outcomes associated with an intervention to enhance quality of care for rural patients with type 2 diabetes: results of a controlled trial. *Diabetes Care* 2004; **27**: 1306-1312.
15. Donoghue A, Hodgins G, Judd F, Scopelliti J, Grigg M, Komiti A et al. Training case managers to deliver focused psychological strategies. *International Journal of Mental Health Nursing* 2004; **13**: 33-38.
16. Phillips JL, Davidson PM, Jackson D, Kristjanson L, Bennett ML. Enhancing palliative care delivery in a regional community in Australia. *Australian Health Review* 2006; **30**: 370-379.
17. Kelley ML, Habjan S, Aegard J. Building capacity to provide palliative care in rural and remote communities: Does education make a difference? *Journal of Palliative Care* 2004; **20**: 308-315.
18. Roberts E, Mays N. Can primary care and community-based models of emergency care substitute for the hospital accident and emergency (A & E) department? *Health Policy* 1998; **44**: 191-214.
19. Breedlove G, Lamping B, Smith JA. The Kansas Health Education Training Center: caring for the underserved. *Kansas Nurse* 2006; **81**: 1-3.
20. Minore B, Boone M. Realizing potential: improving interdisciplinary professional/paraprofessional health care teams in Canada's northern aboriginal communities through education. *Journal of Interprofessional Care* 2002; **16**: 139-147.
21. Wakerman J. Defining remote health. *Australian Journal of Rural Health* 2004; **12**: 210-214.
22. Miranda S, Davies PD, Lipp A. Introducing an integrated care pathway for the last days of life *Palliative Medicine* 2005; **19**: 33-39.
23. National Library for Health. *About integrated care pathways*. (Online) 2005. Available: <http://www.library.nhs.uk/pathways/page.aspx?pagenam=ICPS> (Accessed 3 March 2007).
24. Hicks LL, Bopp KD, Winter F. Integrated pathways for managing rural health services. *Health Care Management Review* 1996; **21**: 65-72
25. Ouwens M, Wollersheim H, Hermens R, Hulscher M, Grol R. Integrated care programs for chronically ill patients: a review of systematic reviews. *International Journal for Quality in Health Care* 2005; **17**: 141-146.
26. MedicineNet.com. *Definition of managed care*. (Online) 2007. Available: <http://www.medterms.com/script/main/art.asp?articlekey=4270> (Accessed 3 March 2007).
27. Kelley ML, MacLean MJ. I want to live here for rest of my life. The challenge of case management for rural seniors. *Journal of Case Management* 1997; **6**: 174-182.
28. Stanton MP, Dunkin J. Rural case management: nursing role variations. *Lippincott's Case Management* 2002; **7**: 48-55.
29. Garaasen H, Kaasa S, Roesstad T, Broen P. Specialised short-term wards in nursing homes: a professionally and financially sound solution. *Tidsskrift for Den Norske Legerforening* 2005; **125**: 1503-1505.



30. Aaraas I, Langfeldt E, Ersdal G, Haga D, Sykestuemodellen, nøkkel til bedre samhandling i helsetjenesten – la sykestuene leve! *Tidsskrift for Den Norske Legeforening* 2000; **120**: 702-705.
31. Olesen F, Jensen PB, Grinsted P, Henriksen JS. General practitioners as advisers and coordinators in hospitals. *Quality in Health Care* 1998; **7**: 42-47.
32. Department of Health. *Patient pathways*. (Online) 2007. Available: http://www.dh.gov.uk/PolicyAndGuidance/OrganisationPolicy/SecondaryCare/TreatmentCentres/TreatmentCentresArticle/fs/en?CONTENT_ID=4097263&chk=RGATY4 (Accessed 3 March 2007).
33. Mitchell G, Del M, Francis D. Does primary medical practitioner involvement with a specialist team improve patient outcomes? A systematic review. *British Journal of General Practice* 2002; **52**: 484.
34. Hampson JP, Roberts RI, Morgan DA. Shared care: a review of the literature. *Family Practice* 1996; **13**: 264-279.
35. Gruen R, Bailie R. Specialist clinics in remote Australian Aboriginal communities: where rock art meets rocket science. *Journal of Health Services & Research Policy* 2004; **9**Suppl 2: 56-62.
36. Journal of Telemedicine and Telecare e-journal. *Guidelines for authors*. (Online) no date. Available: http://www.rsmppress.co.uk/jtt_gfa.htm (Accessed 3 March 2007).
37. Wootton R, Jebamani LS, Dow SA. E-health and the Universitas 21 organization: Telemedicine and underserved populations. *Journal of Telemedicine and Telecare* 2005; **11**: 221-224.
38. Edwards MA, Patel AC. Telemedicine in the state of Maine: a model for growth driven by rural needs. *Telemedicine and e-Health* 2003; **9**: 25-39.
39. Dimmick SL, Burgiss SG, Robbins S, Black D, Jarnagin B, Anders M. Outcomes of an integrated telehealth network demonstration project. *Telemedicine and e-Health* 2003; **9**: 13-23.
40. Brebner EM, Brebner JA, Ruddick-Bracken H, Wootton R, Ferguson J, Palombo A et al. Evaluation of an accident and emergency teleconsultation service for north-east Scotland. *Journal of Telemedicine and Telecare* 2004; **10**: 16-20.
41. Campbell NC, Ritchie LD, Cassidy J, Little J. Systematic review of cancer treatment programs in remote and rural areas. *British Journal of Cancer* 1999; **80**: 1275-1280.
42. Levine SR, Gorman M. 'Telestroke'. The application of telemedicine for stroke. *Stroke* 1999; **30**: 464-469.
43. Audebert H. Telestroke: effective networking. *Lancet Neurology* 2006; **5**: 279-282.
44. Hess DC, Wang S, Gross H, Nichols FT, Hall CE, Adams RJ. Telestroke: extending stroke expertise into underserved areas. *Lancet Neurology* 2006; **5**: 275-278.
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