

**FROM FLYING DOCTOR TO VIRTUAL DOCTOR:
NOTES FROM AUSTRALIA'S TELEHEALTH EXPERIENCE**

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Short title:

From flying doctor to virtual doctor

The link between economic evaluation and funding is often complex, especially in a new service delivery environment offered by telehealth. This paper examines this link and argues that the funding environment in which telehealth services are established is inseparable from the efficiency of the service. With this premise, and using Australia as a case study, the current funding arrangements are examined in the context of telehealth. The paper finds that the current funding environment impedes the efficient use and integration of telehealth services in Australia. These impediments are not unique to telehealth, but are accentuated by its ability to traverse many different locations, clinical areas and purposes. Given these complexities, should telehealth be funded? The paper concludes that the answer to this question is likely to be 'sometimes' - depending on the circumstances. It is partly dependent on (1) the objectives and priorities of the health system (2) the relative efficiency of telehealth versus other forms of health care delivery and (3) the funding environment. In terms of resource allocation processes, the optimum scenario is thought to be where the decision to invest in telehealth services is made taking local needs into account and where pragmatic considerations such as market structure and network compatibility are balanced with the principles of efficiency and equity.

INTRODUCTION

In a world of scarcity, decisions have to be made about the deployment of resources. Economics is concerned with the decision-making mechanism that ensures that resources are allocated efficiently. For instance, under perfect market conditions, goods and services should be consumed (and produced) up to the point where the cost of producing one extra unit is equal to the value that society places on that unit. Producing more than this point would mean that the cost of producing one extra unit is greater than the value that society places on it. Similarly, producing less than the equilibrium point entails that the value placed on the next unit to be produced is higher than the cost of producing that unit. Either scenario would constitute an inefficient allocation of resources.

In health care, the lack of information about the relative costs and effectiveness of alternative health care interventions make resource allocation decisions more complex. These complexities arise out of the lack of data on the true cost of providing a service and knowing what the true value of a health care service is. One of the main purposes of economic evaluation is to overcome this lack of information and assist decision-makers in making informed choices about resource deployment based on the cost and value of services.

Telemedicine is a method of delivering health care services, using telecommunications technology. Implementing this type of service has resource and outcome consequences. For instance, there are additional capital costs such as telecommunication infrastructure and equipment and administrative costs such as scheduling of appointments. Telemedicine may lead to resource savings. For example, there may be fewer patients/providers needing to travel long distances. Telemedicine may also have health consequences. For example, more timely diagnosis may improve health status. Given these conditions, telemedicine should be scrutinised for its relative costs and effectiveness over alternative forms health care delivery, to ensure that resources are deployed efficiently.

Despite the publication of a number of frameworks on evaluating telemedicine services in recent years (INSERT REFS), economic evaluations of telemedicine remain relatively rare. Three separate review studies consistently concluded that there was either insufficient evidence to make generalisable conclusions about either the effectiveness and/or cost effectiveness of telehealth (Whitten et al 2000, Hakansson et al 2000 and Mair et al 2000).

Perhaps a bigger indictment of economic evaluation in telehealth is the statement made by Hakansson & Gavelin who state that “it makes little sense to talk about costs effectiveness of telemedicine in general”. They argue that the results of an economic evaluation are context specific and that factors such as the *use* and the *setting* need to be specified.

The message from this is that even with good economic information on the relative merits of telemedicine, the *setting* has to be appropriate to ensure that services are provided and utilised efficiently. This paper examines these *settings* further in the context of the Australian health care system placing particular emphasis on Australia’s current funding arrangements and its likely impact on telemedicine. The first section of this paper will provide a brief outline of the Australian health care system and the second section will analyse how the system has thus far impacted on the development of telemedicine. The third section provides a set of criteria for the efficient integration of

telehealth services as well as an analysis of some of the barriers for meeting these criteria. The fourth section aims to highlight a potential policy directions to ensure that telemedicine can be integrated efficiently into various facets of the health care system.

The Australian health care system

There are two distinguishing features of Australia that have had a remarkable impact on the development of telemedicine, and health care policy in general. These are its (1) its low population density with only 19.1 million inhabitants but over 7.5 million square kilometres of land and (2) its federal system of government with its various jurisdictions over health care provision and funding.

Whilst Australia is a highly urbanised country, approximately 30% of its population lives in rural and remote areas. The level of remoteness is unique with some townships being thousands of kilometres from city based health care services. It should come as no surprise that Australians have historically used technology to bridge distances. The school of the air, established in 1951¹, and the Royal Flying Doctor Service, established in 1928, are good examples of this.

The Australian Constitution, adopted in 1901, sets out the roles and responsibilities of the Federal (aka the Commonwealth Government) and State Government. Some areas of public life are the exclusive domain of the State Governments (eg policing), some are solely Commonwealth Government responsibilities (eg customs and defence) and other areas are shared by both the State and Commonwealth Governments (eg health).

Australia has a universal public health care system that is made up out of a complex arrangement of public and private funding and provision. In addition, Australia also has a large voluntary private health insurance sector. Figure 1 is a simplified diagrammatic representation of the Australian health care system with individuals, as the ultimate funder of all services. The diagram shows the means by which different funding bodies are paid. At the bottom of the diagram sit the providers, producing services that are ultimately consumed by the individuals.

INSERT FIG 1

Australia's system of health care funding and provision has led to the creation of many artificial boundaries. A myriad of funders (and providers) are responsible for the health of a single patient at different stages of a disease, depending on where the service takes place. For example, when pathology services are provided to outpatients, the Commonwealth Government will subsidise the service through its Medicare program. This service is likely to have been provided by a private pathology company. However, if the same pathology service is provided to a public hospital inpatient, the cost of the service will be fully met by the public hospital, usually owned by the State government.

The implication of this funding system is that no single funder has the capacity to look after the entire health care needs of an individual patient. This, in turn, leads to a narrow focus of health care provision with limited coordination between different parts of the health care system. It has also led to the national past-time of *cost-shifting*, where health care agencies shift responsibilities (and therefore costs) to other sectors of the health care system. This is probably intensified by the fact that two federal programs,

¹ The Alice Springs School of the Air, the first of its kind started official operations in June 1951. See www.assoa.nt.edu.au

Medicare and the Pharmaceutical Benefit Scheme (PBS), are open ended and fee for service whereas the public hospital system has stringent controls over total expenditure.

The structure of Australia's health care system has had a significant impact on the development and integration of telemedicine. As identified by Alexander in 1995, key determinants of the development of telemedicine in Australia include the funding of services, with the 'crux being a shift in resources and income from some institutions to others' [Alexander, 1995 #33].

Telemedicine in Australia.

Given the size of Australia's land mass and the distribution of its population, coupled with the problems facing health and health care services in rural and remote Australia, the adoption of telemedicine should come as no surprise. Australia's unique features would seem to encourage the use of this technology. In addition, Australia has a good telecommunications network to enable the operation of telemedicine.

In the last decade, Australian governments have invested in numerous telemedicine projects. Most of these projects have started in the publicly funded State systems. Private diagnostic telemedicine projects have also been established and are facilitated by their eligibility under the MBS (eg those diagnostic services that do not require the patient to be present at the time of the service).

The Australian New Zealand Telehealth Committee (ANZTC) reports that there are currently over 175 telehealth projects, programs and services listed in its database², with each project containing one or more telemedicine sites (ANZTC 2000a). More funding on the horizon. For example, the NSW Government recently announced the establishment of a further 51 sites in NSW alone [Health, 2001 #34]. The Commonwealth's Networking the Nation program will also assist the establishment of telehealth projects across the country.

Due to the nature of telemedicine only a limited range of services can be delivered over the network. The technology is suited to consultations that provide advice or education or where local staff can assist in the physical aspects of the session. For example, an ophthalmology consultation may involve a nurse handling the ophthalmoscope examination with images sent to a distant specialist for advice. Limited evidence from various Statewide data collections revealed that the type of services provided are outpatient type services (examples from NSW and Qld).

Despite considerable growth in ambulatory type services in Australia, public outpatient services have been declining. Per capita services grew from XX in 1984 to XX in 1998. However the proportion of services provided in a public setting fell by XX over the same period. This is partly due the shift from publicly provided outpatient services to private services, funded through the Commonwealth's MBS program (source: BUTLER). This in turn reflects the practice cost shifting where administrators of capped budget close or limit services that could be provided by other means and, more importantly, other budgets.

During its short history, various telemedicine projects have fallen by the way side or have been highly underutilised. Eg Melbourne ED and nsw health data collection. In Queensland in 1998, with 133 telemedicine sites, there were only 210 hours of patient

² Current as at March 2000

contact time during an entire month (Kennedy 1999). On average each site had 96 minutes worth of patient consultations during one calendar month. Primary use of the Queensland Network was for education and meetings.

Figure XX shows the types of clinical activities that Australia and New Zealand telehealth projects are involved in. The number of clinical activities has expanded over the years but is dominated by mental health.

It is worthwhile examining the reasons why mental health, especially psychiatric consultations, is the biggest clinical area in Australia. Whilst rural and remote Australia has a shortage of psychiatric services, this shortage is no more apparent than in other specialty areas. What is unique about the psychiatric workforce however is that it is probably the most integrated discipline out of all specialty areas. That is, a psychiatrist is more likely to practice in both the publicly funded hospitals and in their private practice than any other specialty area (source: Phil and Hunter AHS). This feature allows psychiatrists to be remunerated in either setting. Depending on the location of the consultation psychiatrists can be paid through the MBS by the public hospital. Given the nature of telemedicine services (ie outpatient), this has likely been an important factor in the domination of mental health services using telemedicine applications.

This level of integration is not as apparent in other disciplines. In other specialty areas, it is more likely that specialists practice either in the public sector or private sector but it is less likely that they practice in both. So in a climate where the number of public outpatient services are falling and given that telehealth services are ineligible for MBS remuneration, it is perhaps not surprising that any moves to substitute services away from the private sector and towards the public sector are not encouraged. There are disincentives to do so for both the private workforce and hospital administrators.

Given this incentive structure it becomes easy to see why telehealth has developed the way it has in Australia. The problem is that this development is largely a product of its environment rather than design. Hence, planning for telehealth services are haphazard, likely to make costly mistakes and unlikely to lead to the efficient integration of a potentially useful piece of technology.

Criteria for success

The key efficiency criteria in resource allocation decisions is that goods and services be produced up to the point where marginal benefits equal marginal costs. As such, a funding model should set the incentives such that the decision to invest in telehealth remains neutral. That is, a decision-maker has to assess whether the benefits of running a telehealth service warrant the costs.

Viney and Haas (1998) developed a set of criteria for a future funding model to be evaluated against. The criteria used technical efficiency, allocative efficiency and equity to allow evaluation of whether a telehealth service:

1. *Reduces the cost of providing particular health care services or of identified health outcomes (Technical Efficiency);*
 - Does it encourage substitution from more resource intensive to less resource intensive modes of delivery?
 - Does it encourage substitution rather than expansion of services?

2. *Results in more appropriate service provision (Allocative Efficiency);*
 - Does it encourage substitution to services that improve the quality of health care, for example, improved or more rapid diagnosis, improved treatment?
 - Does it encourage substitution to services that are more acceptable to consumers?
 - Does it encourage substitution to services that are more acceptable to providers?
 - Does it result in improved health outcomes?
 - To what extent is it possible to value these additional outputs/outcomes relative to alternative uses of resources?
3. *Increases access to appropriate services (Equity)*
 - Where there is an expansion of services does the expansion relate to identified gaps in service provision?
 - Does it result in reduced waiting times for people in rural and remote locations?
 - Does it increase access to specialised services for people in rural and remote locations?
 - Does it increase the range of services available locally?

Barriers to success: information requirements

To answer the questions set out above requires information of the type that is not readily available. That is, the marginal costs and benefits of telehealth services are difficult to measure. Hence the need for economic evaluation to overcome this information gap. However, economic evaluations of telehealth services are likely to encounter their own set of problems and complexities. The next section outlines the main issues:

Generalisability

A complicating factor in telemedicine studies is that the results are highly dependent on the local context. For example, telehealth may be used as a substitute for existing services, as an adjunct to existing services or as a new service. Further, depending on the model of care, telehealth may change the roles of GPs, specialists and other health care providers. All of these factors make the generalisability of evaluations problematic.

In the case of economic evaluations this issue is likely to complicate effectiveness measures (ie are we measuring the effects of telehealth, changes in the model of care or both?). The generalisability of economic evaluations of telehealth is further reduced by local circumstances as the alternative method of service delivery may not always be applicable. For example, whilst most economic evaluations rightly use face-to-face consultations as the alternative intervention, there are many situations where such alternatives are not widely available. The relative efficiency of telehealth depends on the alternative. Namely, the distance patients/providers have to travel or the throughput of a given service.

Technology

The pace of technological development makes the evaluation of telehealth a moving target. Not only do the applications and services develop rapidly but so do the cost structures. It is therefore likely that evaluations of telehealth will quickly become out-dated. Further, many of these technologies are at different levels of development, proven effectiveness and cost-effectiveness. Hence, telehealth can not be viewed as a monolithic entity, nor indeed as a straightforward new intervention which can be readily described, evaluated and costed.

Jointness in production

Telehealth technology allows for a variety of uses and applications. For example, the same videoconferencing equipment may be used for psychiatric purposes, general medical services, specialists services, training and support and administration.

This makes the costing of telehealth, especially videoconferencing equipment, complicated in so far as the cost of the equipment cannot be attributed to any one application. Again, this impacts on the way that economic evaluations should be conducted and interpreted.

Patient preferences

One of the aims of Telehealth is to reduce the barriers to health care access. In the Australian context this usually refers to sub-populations who face high barriers such as lengthy and costly travel and lengthy waiting times. There are other aims such providing re-assurance through second opinions, more care provided closer to home and earlier diagnosis.

Some of these factors may be measured through health outcomes measures (eg earlier diagnosis, reduced waiting time) but these aims may also result in non-health outcomes. For example, patients may suffer less anxiety through reassurance, less waiting and more care provided closer to home. The value of such outcomes may be significant in populations where barriers to access are high.

However, if all other constants are held equal, telehealth consultations may not be the most preferred method of service delivery by patients. In their review of patients satisfaction studies, Mair and Whitten (2000) found that, overall, patients noted the advantages of less travel and reduced waiting times. They also found that patients had some concerns over the mode of service delivery, especially relating to the communication between the provider and client.

It seems then that there is some trade-off for patients (and/or providers). For example, lower costs and less waiting time are seen as an advantage of telehealth. However, face-to-face consultations are preferred to telehealth consultations *ceteris paribus*. The extent of this trade-off and hence the value that patients place on the attributes of telehealth is an important piece of information. This suggests that future economic evaluations should incorporate some measurement and valuation of patient preferences.

What is clear is that until these factors are taken into account, the results of telehealth evaluations will misrepresent the true social value of the benefits and costs.

Barriers to success: incentives

Economic evaluations can provide information about the potential benefits and costs that telehealth services can deliver. Just as important is the funding system (and its inherent incentive structure) that can turn these potential benefits into realised benefits. The incentive structures in the Australian health care system can impede the efficient application of telehealth. In particular:

Perspective

Before telehealth services can be offered, an investment will need to be made in the capital equipment. If one local area invests in such equipment, its potential reward may be to save resources through fewer patient transfers. The greatest beneficiary of fewer transfers though may not be the one local agency. In other words, the savings of fewer

transfers may also go to the patient, providers, other agencies and even the State and Commonwealth Governments.

The impact of this may be that even though, from a societal perspective, telehealth may have net benefits, the local area making the investment could face higher costs. That is, the costs of providing telehealth may fall almost completely on the local area making the investment, but the savings it provides are split amongst a diverse group. This issue also has implications on the way economic evaluations are conducted and interpreted. That is, it is important to identify which agencies are the beneficiaries of telehealth and which agencies carry the costs under applicable funding arrangements.

The telehealth network

One factor that should also be taken into account is that with each additional telehealth site, the telehealth network gains in overall value. This gain in value is similar to the telephone or e-mail networks. The more people on the network, the more valuable the tool. This increase in the network's value would arise if the additional site created further flexibility of the available workforce or allowed wider clinical applications.

Cross subsidisation

Telehealth can (1) enhance existing services to a local area, (2) introduce new services to a local area and (3) replace existing services in a local area.

Each of these possible scenarios has some workforce and/or market implications most striking of which is the third scenario. If telehealth was to replace existing services then this in turn can alter the historical referral and service patterns between facilities/providers. This is essentially about introducing competition into a local area, which is not a problem in itself but may have further consequences. Take for example a telehealth service that only performs certain types diagnostic tests and is competing against an existing service provider who offers a wider range of tests. The extra competition may mean that the existing service becomes unprofitable and therefore has to close. This would leave the community with fewer services than they had before.

The market

Unlike other markets such as the United States, Australia has only a few companies that supply telehealth equipment. In the combined NSW, Victorian and South Australian markets, one company has a market share of 70.6% and a second company has a market share of 27.9% (derived from ANZTC 2000c).

This is made even more important by the need for the telehealth network to be compatible. In other words, if all telehealth sites can communicate with each other the network as a whole will be more flexible, provide greater opportunities and be more valuable than if the network was disparate. However, compatibility of the equipment is not always guaranteed and will depend on the company, model and telecommunication infrastructure. In most instances, equipment can communicate but users may experience a loss of performance and features. The dilemma is that on the one hand, competition amongst hardware providers will bring price reduction but on the other hand there is a need to ensure that the network remains compatible.

Further, with high set up costs (especially in the area of setting up a reliable maintenance network) and the need for compatibility, there are contestability issues in the telehealth market. Currently, the incentive and opportunity is there for those companies to behave strategically in their dealings with health care agencies.

The opportunity to do so is intensified when there are many health care agencies and when these agencies act like separate bodies. Bringing together those agencies to combine their purchasing power will disable suppliers from setting premiums for their equipment and maintenance costs. It will also provide a forum to guide future research and development as well as ensure that systems are compatible.

Telehealth is of course highly dependent on the telecommunications market. Telecommunications, including the installation of the required ISDN lines, are widely available in rural and remote Australia (although some significant parts of the country are not covered by this service). The roll-out of this infrastructure has been highly subsidised and remains monopolised by Telstra. A recent Commonwealth Discussion Paper (NOIE, 2000) stated that the price for calls using the ISDN network are expected to fall significantly in the future however these falls are not expected to be as great in rural and remote areas.

Unmet need/demand

Telehealth services may increase the utilisation of health care services in rural areas. For instance, distance may previously have acted as a barrier to health-care services. Telehealth is about reducing these barriers and making access to services easier, better and possibly cheaper for patients. Because of this, there is an expectation that the utilisation of telehealth services will be greater than just the substitution of existing services.

In other words, the introduction of telehealth has the potential to alter the underlying level of “unmet demand” for health care services in the rural community. In such a situation the utilisation of services will rise and hence the overall costs to the local area are also likely to rise. Such rising costs may occur despite efficiency and health outcome improvements. The consequence of this is that local areas face disincentives to invest in a service that is likely to increase overall costs. This then would result in a level of investment below the social optimum.

Equity considerations

The task of resource allocation is made more difficult when equity considerations are taken into account. The objective of telehealth technology is to make health care services more accessible and thereby provide communities with limited access to health care services with greater equity. Through reducing the travel costs and waiting times and increasing the availability of medical provision, telehealth can assist in improving overall access. Equity is an important yet complicating aspect of telehealth.

Towards a telehealth funding model

The criteria and barriers to success, as set out above, point towards two opposite directions. On the one hand, the criteria seems to direct the funding model towards entrusting local managers to make resource allocation decisions. On the other hand, there are factors in telehealth that will prevent local managers from being able to allocate resources efficiently. This leaves a dilemma in designing a funding model that reconciles these two factors.

It is suggested that a funding model for telehealth should ensure that while local managers still make the resource allocation decisions, centralised specific-purpose funding back those decisions. This would entail a central agency (either Commonwealth or State) making funds available towards the establishment of

telehealth projects, leaving local areas with the responsibility for meeting the variable costs of the service.

The level of central funding assistance should equate to the difference between the local areas' benefits and the social benefits. In other words, central funding should be sufficient to overcome the three main issues of 'perspective', 'jointness of production' and the 'telehealth network'.

Making local managers responsible for the variable costs means that they will purchase services from other agencies. Local managers therefore have the incentive to purchase telehealth services up to the point where it brings enough benefits to warrant the additional costs. Further, with a compatible telehealth network, purchasers have more choice from which to make those purchasing decisions.

The decision making process may involve a cost-minimisation study that compares a prospective telehealth service with the existing (if any) or some other feasible method of service delivery. Note that before a valid cost-minimisation study can take place, previous studies must establish health outcome equivalence first.

Incorporating equity considerations is problematic. However the framework outlined thus far will assist in dealing with equity issues. Namely, if local managers make resource-allocating decisions and those decisions are made on a neutral basis (ie no one method of service delivery has an unfair advantage) then the incentive is to choose the most efficient form of delivering that service. The equity issue is then, how much is society willing to pay to provide horizontal equity to rural and remote areas? Note that this is not an issue unique to telehealth but rather it is the same equity of access principal facing the entire health care system.

The extent to which equity should be taken into account will depend, in large part, on the existing overall funding mechanism. For example, if rural areas are already funded on the basis of population, geography and rural costs then local areas are capable of making equity decisions themselves³. If on the other hand overall local area funding does not include equity considerations, there will be a need to include such considerations in the telehealth funding model. For example, the central agency can increase specific-purpose funding to incorporate equity.

This model will also assist in overcoming some of the market issues discussed in the previous section. By combining some of the purchasing powers of several health agencies, a central agency can oversee the implementation of a compatible telehealth network. Further, given the dominant position of one or two companies, combining the purchasing power may be an appropriate way to combat any potential strategic behaviour.

This issue highlights the need for a national framework in funding policy. Current funding arrangements are built around the various jurisdictions of Commonwealth, State, public and private sectors. However, given the large set-up costs, telehealth is probably more efficient if the boundaries of those jurisdictions are redrawn.

Ultimately, the chosen funding and remuneration model (including national funding model) of telehealth services will impact on the balance of this issue. For example, if

³ This would be a novel way of looking at equity (eg equity first, efficiency second)

private health providers are remunerated for telehealth services on a fee-for-service basis (eg MBS), any other policy initiatives in this area may be ineffectual.

CONCLUSION

To a large extent funding arrangements dictate the model of care. For example, under the current MBS structure, the incentive for private psychiatrists is to see patients face-to-face. The National Mental Health Strategy however has recommended that a more efficient use of psychiatrists is to promote their role as specialist consultants. That is, they become part of shared care arrangements and more of their time is spent educating and training other professionals (McKay 1996).

In rural areas, where there is a shortage of available psychiatrists, such a model of care is of even greater importance, as patients are more reliant on mental health nurses and their GPs for care. The opportunity cost of an inefficient service in areas where resources are extremely scarce are higher, often leading to more acute problems and sub-optimal care (Emmerson 1995).

Telehealth facilitates alternative models of care. For example, psychiatrists can now more readily be part of an overall shared care package. However, existing funding arrangements may still impede such a model.

It is therefore imperative that the issue of providing flexible funding arrangements to rural and remote areas is carefully examined. For example, the pooling of MBS and State funding allows the design of an incentive structure that is built around a more appropriate model of care. Telehealth, can play an essential part in enabling different models of care to be trialed in rural and remote parts of the country.

Telehealth may or may not be an efficient way of delivering a health care service. The jury is still out on whether the technology is cost-effective relative to other methods of service delivery. The reasons for this lack of knowledge have been discussed in this paper. However, it is apparent that future economic evaluations will need to incorporate a broader perspective if the social benefits of telehealth are to be assessed accurately. This paper has aimed to highlight some of the factors that need to be considered in such evaluations.

What is clear is that as telecommunication charges and capital costs fall and the technology improves, telehealth is likely to become a bigger part of the health care system. It is therefore important to investigate how telehealth services should be funded. This is especially so given the fact that the decision made today will have an impact on the type of services that can be delivered tomorrow.

Finally, it is not suggested that the funding of telehealth be treated as an entity in itself. There is a need for the telehealth funding model to comply with existing funding arrangements. Nor is it suggested that the problems in designing a funding model are unique to telehealth. For example, issues surrounding the model of care are prevalent with or without the advent of telehealth. Telehealth in many ways merely exposes those issues more clearly.

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Figure 1: Outline of the Australian health care system

Source: ANZTC (2000a).

