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The Use of Telehealth to Reduce Inequalities in Cardiovascular Outcomes in Australia and New Zealand: A Critical Review

Victoria Wade, BMBS, PhD^{*}, Nigel Stocks, MBBS, PhD

Discipline of General Practice, School of Medicine, Faculty of Health Sciences, The University of Adelaide, Adelaide, SA, Australia

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Telehealth, the delivery of health care services at a distance using information and communications technology, is one means of redressing inequalities in cardiovascular outcomes for disadvantaged groups in Australia. This critical review argues that there is sufficient evidence to move to larger-scale implementation of telehealth for acute cardiac, acute stroke, and cardiac rehabilitation services. For cardiovascular chronic disease and risk factor management, telehealth-based services can deliver value but the evidence is less compelling, as the outcomes of these programs are variable and depend upon the context of their implementation.

Keywords

Telehealth • Telemedicine • Cardiovascular inequalities

Introduction

Cardiovascular disease (CVD) continues to be the leading cause of death and the greatest burden of disease in Australia [1]. Mortality has declined from 20% of deaths in 2001 to 15% of deaths in 2011, due to both improvements in treatment and reduction in risk factors [1], however, this large advance in CVD outcomes has not raised everyone's status to the same extent. Rather, inequalities, also known as disparities, in both total and cardiovascular health status are demonstrable for people who are poor, rural, or members of an Indigenous community. This critical review, which is part of the work of the Centre for Research Excellence to Reduce Inequality in Heart Disease [2], assesses the value of telehealth for reducing these inequalities.

For socioeconomic status (SES), there is a linear relationship with cardiovascular disease, such that in Australia those of highest SES have about half the prevalence of those with the lowest SES [3]. This is attributable to higher rates of

modifiable risk factors such as obesity, smoking, hypertension, physical inactivity, psychological stress, and lack of social support in low SES groups [4,5]. Additionally, those with lower SES make a poorer recovery from an acute cardiac event, which contributes to worse outcomes in the longer term [6]. There is also evidence from Australia that men in higher socioeconomic groups and cities, with lower overall CVD risk, are prescribed more statins than men of lower SES and in rural/remote areas [7,8].

Those who live in regional and rural areas have an increased prevalence of cardiovascular disease the further they live from major cities [3]. This inequality can be partly explained by lower SES and increased CVD risk factors in the rural population, although an epidemiological study from the USA has indicated that after these factors have been accounted for, an increased risk remains from rurality alone [9]. In countries with large geographical distances, this is most likely due to service accessibility, and it has been documented that rural Australians have reduced

^{*}Corresponding author at: Discipline of General Practice, The University of Adelaide, North Terrace, Adelaide, South Australia 5005. Tel.: +61 8 83130644. Email: victoria.wade@adelaide.edu.au

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Table 1 Types of Telehealth

Technology	Common Clinical Applications
Telephone	Remote and home consultations, health care triage, coaching for lifestyle change, specialist to generalist clinical support
Video communication	Remote and home consultations, pre and postoperative checks, patient assessment, clinical case conferencing, specialist to generalist clinical support.
Fixed sensor devices	Passive home monitoring (eg to detect falls or activity levels)
Wearable monitoring devices	Personal alarms, chronic disease monitoring (eg weight, blood pressure, activity levels), assessment (eg ECG telemetry), lifestyle management
Text messaging (SMS)	Lifestyle change programs, consultation recall and reminders
Health apps for mobile devices	Specific, narrow-use software for chronic disease Management and self-management, plus lifestyle change

access to acute cardiac [10] and specialist heart failure services [11].

Aboriginal and Torres Strait Islanders have, overall, far worse health status than the general population, with cardiovascular disease being the greatest single contributor to this gap [12]. Much of this difference can be attributed to the greater risk factors of tobacco, overweight and obesity, physical inactivity, and high cholesterol, but it should also be noted that Australian Indigenous peoples are disproportionately undermanaged following an acute cardiac event, as shown, for example, by lower rates of coronary angiography, even in a metropolitan setting [13]. In New Zealand, a similar picture exists; inequalities between Maori and non-Maori populations are found for heart disease risk factors, hospitalisation, mortality and revascularisation procedures [14].

Overall, these inequalities are hard to reverse because the advantaged groups who already have better outcomes, i.e. those who are urban, of higher SES and non-Indigenous, have greater access to health care, adhere more to treatments, and are more likely to benefit from programs advocating healthy lifestyles, particularly those that focus on information delivery promoting individual change [15], hence the disparity grows. This effect is commonly known as the “inverse care law”.

Telehealth, which is the delivery of health care services at a distance using information and communications technology, is one means of redressing the above inequalities, both by increasing timely access to care, and by making the resources more broadly available to assist people to modify their lifestyle and risk factors. The term “telehealth” was coined in the 1970s, initially referring to conducting medical consultations by video communication [16], but since then the meaning has been broadened to include all modes of health care delivery in different geographical locations, including pre-existing forms of communication such as the telephone [17]. **Table 1** summarises the main forms of telehealth in use today.

In cardiovascular disease, telehealth can contribute across the full spectrum of care, including primary prevention, acute care, rehabilitation, chronic disease management and palliative care. With the advent of fixed and mobile

broadband connections to most of the population and near-universal ownership of mobile phones, the uses of telehealth have grown to include behavioural and telemonitoring applications which can assist the increasing number of people with chronic conditions. Given this potential, the purpose of this review is to survey the ways that telehealth has been applied to reducing inequalities in CVD outcomes and to suggest directions for future research and service development.

Applications of Telehealth

Acute Care

Acute Coronary Syndrome

Telehealth applications are used for both diagnosis and treatment of acute cardiac events. The most common intervention is to transmit patient ECGs to a cardiac centre where specialists can interpret the ECG and facilitate rapid access to definitive care. Persons sending the ECGs include rural GPs, rural hospital staff, paramedics, or other emergency service workers. A systematic review conducted in 2012 of five comparative studies using this type of intervention showed that all demonstrated efficacy, and a meta-analysis of three studies found reduced in-hospital mortality [18]. More recent individual studies confirm these findings [19].

Initiating such a service offers a way to improve the outcomes of acute coronary syndrome outside of metropolitan areas by enabling cardiologists to rapidly advise local health services on patient management, however ECG transmission is just one of the components needed for a complete rural cardiology service. Two reports of multi-function cardiac services to rural areas have shown how improved outcomes can be delivered. In Denmark, a combination of pre-hospital ECGs and greater use of helicopters to transport patients to the nearest centre that is able to conduct percutaneous coronary interventions (PCIs), has led to a decrease in mortality for patients living in the remoter areas [20]. In Australia, the distances are such that transport to a PCI centre cannot

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