



Review Essay

Geographic issues in cardiac rehabilitation utilization: A narrative review

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ABSTRACT

Objective: The purpose of this study was to review the current evidence regarding the relationship between geographic indicators and cardiac rehabilitation (CR) utilization among coronary heart disease (CHD) patients.

Results: Seventeen articles were identified for inclusion, where nine studies assessed rurality, 10 studies assessed travel time/distance, and two of these studies assessed both. Nine of the 17 studies (52.9%) showed a significant negative relationship between geographic barrier and CR use. Four of the 17 studies (23.5%) showed a null relationship, while four studies (23.5%) showed mixed findings. Inconsistent findings identified appeared to be related to restricted geographic range, regional density, and socioeconomic status.

Conclusions: Overall, 52.9% of the identified studies reported a significant negative relationship between geographic indicators and CR utilization. This relationship appeared to be particularly consistent in North American and Australian settings, but somewhat less so in the United Kingdom where there is greater population density and availability of public transport.

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1. Introduction

Cardiac rehabilitation (CR) is an outpatient chronic disease management program designed to enhance and maintain cardiovascular health through individualized, inter-professional care. CR programs offer medical assessment, structured exercise, client and family education, as well as comprehensive risk factor and behavior modification. It is an effective means for the secondary prevention of coronary heart disease (CHD), as evidenced by the 25% reduction in morbidity and mortality when compared to usual care (Boulay and Prud'homme, 2004; Taylor et al., 2004). Despite its established benefits, CR remains underutilized, with rates of participation ranging from 13% to 60% in studies conducted in Europe, the United States, Canada, and New Zealand (Cooper et al., 2002).

The problem of CR underutilization is multi-factorial in scope, and barriers have been identified at the patient, provider, program, and health-system levels (Cooper et al., 2002; Ades, 2001; Grace et al., 2008a). Of particular importance are patient-level logistical and health system factors that are geographic in nature, such as CR site location and distribution, distance,

transportation access, parking costs, and patient driving status (Cooper et al., 2002; Ades et al., 1992; Harrison and Wardle, 2005; Missik, 2001; Suaya et al., 2007; Yates et al., 2003). For instance, longer distances and drive times have been frequently reported as reasons for CR non-enrollment and drop-out (King et al., 1999, 2001). Moreover, rural patients are shown to be less likely to be utilizing CR (Brady et al., 2005; Johnson et al., 1998). However, some inconsistent results are reported in the literature (Harrison and Wardle, 2005; Johnson et al., 1998; Curnier et al., 2005).

Here the evidence regarding the relationship between geographic indicators and CR utilization among CHD patients is synthesized and reviewed critically. For the purposes of this review, "utilization" refers to all phases of the process from referral through enrollment, participation and completion. In particular, the current review investigated the effect of: (1) rural residence and (2) distance and/or travel time on CR utilization. The latter were grouped together as they are often highly correlated.

2. Methods

For this narrative review, articles were identified by searching MEDLINE, CINAHL, and SCOPUS from January 1990 to January 2010, and references from key articles. Search terms included the following subject headings and keywords: *cardiac rehabilitation, barriers, countryside, distance, travel time, commute, geographic,*

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remote, residence, regional, rurality, underserved, small town, suburban, urban, access, attendance, enrollment, participation, and utilization. English-language papers or abstracts were included if they were published in a peer-reviewed journal and were from primary or secondary observational or interventional studies in which participants were cardiac patients eligible for cardiac rehabilitation. Studies where patients reported geographic factors in relation to CR access were not incorporated into the summary tables, but were considered in the discussion section.

3. Results

There were 17 unique publications identified for inclusion, in which two of these studies (11.8%) assessed both distance and rurality status as geographic factors in CR utilization (Suaya et al., 2007; Higgins et al., 2008). Table 1 summarizes nine studies (47.4% of all included findings) assessing rurality in relation to CR utilization (Harrison and Wardle, 2005; Suaya et al., 2007; King et al., 1999; King et al., 2001; Brady et al., 2005; Johnson et al., 1998; Higgins et al., 2008; Smith et al., 2006; Sundararajan et al., 2004). Table 2 summarizes 10 studies (52.6% of all findings) that examined distance/travel time to CR (Ades et al., 1992; Missik, 2001; Suaya et al., 2007; Yates et al., 2003; Higgins et al., 2008; Melville et al., 1999; Grace et al., 2008b; De Angelis et al., 2008; Dunlay et al., 2009; Brual et al., 2010). All studies are presented in chronological order and when necessary, alphabetical order of the first author.

Nine studies (52.9%) out of 17 unique studies were prospective cohort studies, six (35.3%) were retrospective cohort studies, and two (11.8%) were cross-sectional. Sample size ranges from 78 to 12,821 participants. Participants were diagnosed with a variety of coronary heart diseases (CHD) ranging from angina pectoris, to myocardial infarction (MI) and heart failure, and/or had undergone coronary artery bypass graft (CABG) and percutaneous coronary interventions. Three studies (17.6%) sampled only rural participants (Yates et al., 2003; Johnson et al., 1998; De Angelis et al., 2008). One study (5.8%) sampled solely females (Missik, 2001). Most studies defined CR utilization as “attending at least one CR session”. Only three studies (17.6%) distinguished between the effects of geographic barrier on CR enrollment versus level of participation (Harrison and Wardle, 2005; Johnson et al., 1998; Brual et al., 2010). Of these, only one study (5.8%) assessed the impact of geographic issues on CR program completion (Harrison and Wardle, 2005).

3.1. Nature and quality of the geographic indicators

Overall, 12 out of 17 unique studies (70.6%) reviewed used objective geographic indicators, while the remaining five studies relied on self-report distance/time (Ades et al., 1992; Missik, 2001; Yates et al., 2003; De Angelis et al., 2008; Dunlay et al., 2009). All nine studies testing the relationship of “rurality” to CR utilization used different definitions of geographic indicator such as urban versus rural, patients’ location of residence, and degree of rurality or urbanization. For operationalizing rurality or urbanization, four previously established classification were used: (1) the Montana State University (MSU) Index (Weinert and Boik, 1995), which measures the degree of rurality by quantifying physical geography; (2) the Accessibility/Remoteness Index of Australia (ARIA) (The Information and Research Branch and Department of Health and Aged Care, 2001), which is an index of remoteness derived from measures of road distance between populated localities and service centers developed using geographic information system (GIS; The Information and Research Branch and Department of Health and Aged Care,

2001); (3) remoteness classifications based on concordances developed and provided by the Australian Bureau of Statistics (ASGC Remoteness Areas) and the Department of Health and Ageing (The Information and Research Branch and Department of Health and Aged Care, 2001); and (4) the Oxford-Countryside Agency classification of rural wards (Chandola et al., 2000), which is based on key local characteristics, landscape, settlement, and historical and cultural influences. Moreover, three studies used municipal region to determine urbanization or rurality living status (e.g., living within metropolitan area; King et al., 1999, 2001; Smith et al., 2006). One study used the Cardiac Care Network Ontario definition of living 30 min or greater from emergency care to define urban or rural living (Cardiac Care Network, 2002; Brady et al., 2005). One study used the census data linking to patients’ zip code to determine rurality status (Suaya et al., 2007).

In the 10 articles using distance/travel time as a geographic indicator, studies used non-self-report indicators. Three non-self-report tools were used: (1) GIS, which calculates distance and drive time based on geographic and spatial information (Higgins et al., 2008; Melville et al., 1999; Grace et al., 2008b; Brual et al., 2010); (2) the US 2000 Census data and linked zip codes to levels of urbanization in which five quintiles were used to classify distance from CR site (Suaya et al., 2007); and (3) the cut-off of 30 min drive time to define “Accessible” health care services (Brady et al., 2005).

3.2. Rurality

As shown in Table 1, of the nine studies that assessed rurality, five studies (55.6%) showed a significant negative relationship between rurality and CR utilization (King et al., 1999, 2001; Brady et al., 2005; Smith et al., 2006; Sundararajan et al., 2004), two studies (22.2%) showed no relationship (Harrison and Wardle, 2005; Higgins et al., 2008), and two studies (22.2%) showed mixed findings (Suaya et al., 2007; Johnson et al., 1998). One of these studies showed a significant positive relationship between rurality and CR utilization (Suaya et al., 2007).

3.3. Distance/travel time to CR

As shown in Table 2, of the 10 studies that assessed distance/travel time in relation to CR utilization (Ades et al., 1992; Missik, 2001; Suaya et al., 2007; Yates et al., 2003; Higgins et al., 2008; Melville et al., 1999; Grace et al., 2008b; De Angelis et al., 2008; Dunlay et al., 2009; Brual et al., 2010), six studies (60%) reported a significant negative relationship (Ades et al., 1992; Suaya et al., 2007; Yates et al., 2003; Higgins et al., 2008; Grace et al., 2008b; De Angelis et al., 2008). Three studies (30%) showed no relationship between distance/travel time to CR use (Missik, 2001; Melville et al., 1999; Dunlay et al., 2009). One study (10%) showed a mixed finding (Brual et al., 2010).

Of the five studies that used objective geographic assessment of distance/travel time (Suaya et al., 2007; Higgins et al., 2008; Melville et al., 1999; Grace et al., 2008b; Brual et al., 2010), three studies (60%) found a significant negative association between distance/travel time and CR utilization (Suaya et al., 2007; Higgins et al., 2008; Grace et al., 2008b), while one (20%) study showed null findings (Melville et al., 1999) and one (20%) study showed a mixed findings (Brual et al., 2010).

4. Discussion

This paper reviewed the literature regarding the relationship between geographic factors and CR utilization among CHD

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