Critical Review:

Do oral health education programs for caregivers improve the oral health of residents living in long-term care facilities?*

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This critical review examines the literature on oral health education programs for caregivers and oral health outcomes for residents living in long-term care facilities. A literature search of electronic databases revealed five articles meeting selection criteria. Study designs included three cluster-randomized clinical trials and two single group pre-posttest designs. Overall, the results of this review provide equivocal evidence that oral health education programs for caregivers improve the oral health of residents living in long-term care facilities.

Introduction

Increasing evidence suggests that there is a clear relationship between oral infections and general health complications (Haumschild & Haumschild, 2009). For instance, recent research suggests that bacteria from inadequate oral hygiene and periodontal disease are associated with an increased risk of pulmonary infections such as aspiration pneumonia (Haumschild & Haumschild, 2009; Fernandez & Clave, 2013). When the swallowing mechanism is impaired and oral hygiene is poor, bacteria from the oral cavity can be aspirated into the lungs and cause aspiration pneumonia (Fernandez & Clave, 2013).

Many residents of long-term care facilities develop poor oral hygiene and periodontal disease because of the increased difficulty accessing proper oral care (Haumschild & Haumschild, 2009; Yoneyama et al., 2002). In addition, the prevalence of swallowing disorders in institutionalized elders is roughly 60% (Fernandez & Clave, 2013). As a result, aspiration pneumonia is a leading cause of mortality in elderly residents living in long-term care facilities (Haumschild & Haumschild, 2009; Tada & Miura, 2012). It has recently been hypothesized that prevention of aspiration pneumonia requires the elimination of pathogens from the oral cavity through proper oral care (Furuta & Yamashita, 2013; Tada & Miura, 2012). As a response, oral health education programs for caregivers are frequently recommended as a cost-effective means to improve oral health in elderly residents and potentially control risk factors for aspiration pneumonia. As a large number of baby boomers are entering the current system of long-term care, it is important to examine the literature on oral health education programs for caregivers and oral health outcomes for residents living in long-term care facilities (Haumschild & Haumschild, 2009).

Objectives

The primary objective of this critical review is to analyze the body of research examining effects of oral health education programs for caregivers on oral health outcomes for residents living in long-term care facilities. Recommendations for future research and clinical implications are also discussed.

Methods

Search Strategy

Computerize databases such as SCOPUS, Google Scholar, and PubMed were searched using the following terms: [(caregiver OR (care aid) OR nurse) AND ((oral health) OR (oral hygiene)) AND education AND (long term care)]. The search was limited to papers written in English. Examination of retrieved articles revealed additional studies for review.

Selection Criteria

Studies selected were required to evaluate an oral health education program directed at employed caregivers (e.g., nursing staff) who provide oral care to elderly residents living in long-term care facilities. Studies selected were required to measure outcomes directly related to residents' oral health status. Studies that reported on intervention programs delivered solely by dental professionals were excluded. Studies that only measured outcomes related to caregiver perception, knowledge, and attitudes were also excluded.

Data Collection

Results of the literature search yielded five articles that aligned with the aforementioned criteria. Articles consisted of three cluster-randomized clinical trials and two single group pre-posttest designs.

** This paper was created as a required assignment for the CSD9639 Evidence Based Practice for Clinicians course at Western. While it has been evaluated by course instructors for elements of accuracy and style, it has not undergone formal peer-review.*

Results

All five studies reported on an oral health education program for caregivers. These programs represented three categorical designs: single in-service education programs, pyramid-based education programs, and single in-service education programs supplemented by continuous access to a dental hygienist for further support.

Single In-Service Education Programs

Frenkel, Harvey and Newcombe (2001) conducted a cluster-randomized clinical trial to evaluate whether an oral health education program for nursing staff would improve the oral health of 155 residents living in 11 long-term care facilities. The oral health education program consisted of an optional one-hour education program for nursing staff and was presented by a qualified health promoter. Nursing staff received information regarding the role of plaque in oral disease, a demonstration of cleaning techniques for dentures and natural teeth, and hands-on practice of cleaning techniques. Oral health was assessed pre- and post-intervention using denture plaque, denture induced stomatitis, dental plaque, and gingivitis. Controls received only the pre- and post-testing.

Statistical analyses were performed to detect differences between baseline and follow-up scores one month and six months after the educational intervention session. Tests of difference revealed statistically significant improvements on denture plaque, denture-induced stomatitis, dental plaque and gingivitis in the intervention group. Frenkel et al. (2001) concluded that oral health education programs for nursing staff improve the oral health of residents living in long-term care facilities.

Strengths of this study include a strong research design, a detailed description of methods and procedures, a logical rationale for selected outcome measures, the use of a single examiner who was blind to the randomization process, and a low turnover rate of nurses who received oral health education training. In addition, differences between intervention and control group means were adjusted for clustering effects. Also, baseline values of outcome measures were accounted for as a covariate.

Limitations of the Frenkel et al. (2001) study include ill-defined statistical procedures and imbalances between group characteristics at baseline (i.e., gender, mobility, and time since last dental attendance). Also, this study excluded 21% of residents from the experimental group due to impaired cognitive status, which limits the external validity of this research. Although the study was well designed, the above concerns limit the clinical relevance and validity of this research. Overall this study provides a suggestive level of evidence that oral health education programs improve the oral health of residents living in long-term care facilities.

Simons, Baker, Jones, Kidd and Beighton (2000) conducted a cluster-randomized clinical trial to determine whether an oral health education program for care-aids would improve the oral health of 87 elderly residents living in seven long-term care facilities. The oral health education program consisted of a 90-minute education program for care-aids and was presented by three members of a dental team. Care-aids received an oral hygiene demonstration including denture and dental brushing techniques, hands-on practice of cleaning techniques, individual oral health plans for each resident, a training manual with various oral health aids, and information regarding where to purchase similar materials. Oral health was assessed pre- and post-intervention using coronal status, denture hygiene status, root caries index, Plaque Index, and Gingival Index scores. Controls received only pre- and post-testing.

Parametric and nonparametric tests were performed to detect differences between baseline and follow-up scores collected one year after the educational intervention session. Simons et al. (2000) reported a statistically significant increase in the number of filled coronal surfaces in both the intervention and control group. However, no statistically significant differences were found between the residents who had received oral-health intervention and those who had not. Simons et al. (2000) concluded that there was no evidence to suggest that oral health education programs for care-aids improve the oral health of residents living in long-term care facilities.

Strengths of this study include a strong research design and procedures being described in adequate detail for replication. Simon et al. (2000) reported that there were no significant differences between the intervention and control group based on age, gender, length of time in long-term care, funding arrangements, and type of dentures worn at baseline. Also, intra-rater reliability was determined by having 10% of the residents re-examined for comparison.

A limitation of this study included the high turnover rate of care-aids who received oral health education training. Only 53.8% of the original care-aids still worked in the seven homes after 12 months, which could have minimized the effect of the oral health education program. Other limitations included no mention of examiner blinding, no rationale for selected outcome measures, and poorly described statistical procedures.

Although the study had a strong research design, the above concerns limit the validity of this research. Overall this study provides equivocal evidence that oral health education programs are ineffective at improving the oral health of residents living in long-term care facilities.

Samson, Berven and Strand (2009) used a single group pre-posttest design to examine whether an oral health education program for nursing staff would improve and maintain the oral health of 88 elderly residents living in a nursing home. The oral health education program consisted of a single in-service education program conducted by dentists and dental hygienists. The nursing staff received motivation training and a four-hour theoretical and practical course regarding brushing techniques. In addition, picture-based procedure cards were produced to serve as practice guidelines. Oral health was assessed pre- and post-intervention using mucosal-plaque scores (MPS). Statistical analyses were performed to detect differences between baseline and follow-up scores collected three months and six years after the educational intervention session.

A one-way analysis of variance (ANOVA) suggested a statistically significant difference of oral health between the three time points. Further analysis using Tukey's *post hoc* tests revealed that significant improvements in oral hygiene had occurred after three months, and remained significant after 6 years. Samson et al. (2009) concluded that the introduction of an oral health education program for nursing staff significantly improved the oral hygiene of residents on a long-term basis.

Strengths of this study include an evidence-based rationale for the selected outcome measure and the use of two separate evaluators pre- and post-intervention to ensure unbiased MPS collection. In addition, strong inter-rater reliability was established using Cohen's kappa coefficient.

There are several limitations of this study including no control group and a weak methodological design. There is also no description of how the experimental nursing home was selected; therefore selection bias cannot be excluded. Additionally, participant inclusion criteria, methods, and procedures were not described in adequate detail for replication. Samson et al. (2009) also reported that residents with a clear diagnosis of dementia had significantly better oral hygiene than those who had uncertain cognitive impairment. However, this difference was no longer statistically significant after the alpha value was adjusted using a Bonferroni correction. Furthermore, it is unclear whether a one-way ANOVA is a suitable test for identifying differences between three groups of ordinal data. The above concerns limit the clinical relevance and validity of this research. Overall this study provides equivocal evidence that oral health education programs improve the oral health of residents living in long-term care facilities.

Pyramid-Based Education Program

MacEntee et al. (2007) conducted a cluster-randomized clinical trial to examine whether a pyramid-based oral health education program for care-aids would improve the oral health of 51 residents living in seven long-term care facilities. The experimental group received a pyramid-based education program where a dental hygienist trained a small group of care-aids, who in turn trained a larger group of care-aids. The training consisted of a one-hour seminar with an annotated series of photographs and text, and a demonstration of how to examine and clean the mouth. All care-aids received a copy of the text and had access to the photographs for later review. Care-aids in the control group received the typical oral health education training offered by dental hygienists in the public health service. Oral health was assessed pre- and three months post-intervention using the Geriatric Simplified Debris Index and Gingival Bleeding Index.

MacEntee et al. (2007) reported that there were no significant differences in oral health outcome measures after three months of intervention. It was concluded that the pyramid-based education program did not improve the oral health of residents living in long-term care facilities.

Strengths of this study include a strong research design, examiner and participant blinding, and a detailed description of participant inclusion criteria. Additionally, MacEntee et al. (2007) reported no statistical differences between the two groups for any of the outcome measures at baseline. Furthermore, clustering effects within the facilities were accounted for, and baseline values of outcome measures were included as a covariate.

MacEntee et al. (2007) identified several limitations to their study including low statistical power, and a low percentage of care-aids attending the oral health education session (15% in the experimental group and 22% in the control group). Additionally, outcome measures were assessed and analyzed according to the randomization protocol even though two facilities from the experimental group did not receive the education program due to unforeseen resignations. Furthermore, MacEntee et al. (2007) failed to report the appropriate statistical analyses to support their conclusion that there were no significant differences between baseline and follow-up scores. The above concerns limit the validity and significance of this research. Overall, this study provides equivocal evidence that oral health education

programs are ineffective at improving the oral health of residents living in long-term care facilities.

Supplemented In-Service Education Program

Kullberg et al. (2010) used a single group pre-posttest design to examine whether a repeated oral health education program for nursing staff would improve the oral health of 41 elderly residents living in a nursing home. A dental hygienist provided nursing staff with hands-on training in tooth brushing techniques using electronic toothbrushes. In addition, the dental hygienist was available to the nursing staff one day a week at the nursing home, and also by telephone. Oral health was assessed pre- and three weeks post-intervention using Gingival Bleeding Index and Plaque Index scores. Dental hygiene education had also been given to the nursing staff 1.5 years earlier.

Non-parametric testing was completed to compare pre- and post-intervention measures. Kullberg et al. (2010) reported a statistically significant reduction in gingival bleeding and plaque scores three weeks after the oral health education program was initiated. In addition, *post hoc* statistical analyses revealed that the increased use of electronic toothbrushes throughout intervention did not contribute significantly to the reduction in gingival bleeding and plaque scores. Kullberg et al. (2010) concluded that repeated oral health education for nursing staff improves the oral health of residents living in long-term care.

Strengths of this study include a well-defined research question and an evidence-based rational for selected outcome measures. In addition, appropriate statistical analyses were reported.

There are several limitations of this study including no control group and a weak methodological design. There is also no description of how the experimental nursing home was selected; therefore selection bias cannot be excluded. Also, group characteristics, methods, and procedures were not described in adequate detail for replication. In addition, only three anterior teeth in the lower jaw were assessed using Gingival Bleeding Index and Plaque Index scores, which is a relatively low number of tooth surfaces. Furthermore, Kullberg et al. (2010) identified the increased use of chlorhexidine gluconate 1% gel by dentate residents as a possible confounding variable within their study. In addition, the experimental nursing home was a well-organized dementia care centre, where the nursing staff was already familiar with dental professional contacts; therefore external validity of this research is questioned. The above concerns limit the clinical relevance and validity of this research. Overall this study provides equivocal evidence that oral health education programs improve the oral health of residents living in long-term care facilities.

Discussion

Limitations of the five reviewed articles include weak methodological designs (Kullberg et al., 2010; Samson et al., 2009), lack of experimenter blinding (Kullberg et al., 2010; Simons et al., 2000), unspecified participant eligibility criteria (Kullberg et al., 2010; Samson et al., 2009), and no rationale for selected outcome measures (Simons et al., 2009). In addition, many studies had ill-defined or inappropriate statistical analyses, which limited the validity of their results (Frenkel et al., 2001; MacEntee et al., 2007; Samson et al., 2009; Simons et al., 2000). Although each study reported caregiver education as a means for intervention, the heterogeneity of the educational programs raise some concerns. Firstly, the delivery of the oral health education programs varied among studies. Three studies used a single in-service education session (Frenkel et al., 2001; Samson et al., 2009; Simons et al., 2000), one used a "train-the-trainer" pyramid design (MacEntee et al., 2007), and another used a single in-service education session supplemented by active involvement of a dental hygienist (Kullberg et al., 2010). Secondly, contents of the education program and selected outcome measures varied among studies. As a result, it is not possible to generalize findings across studies. In addition, the education level of caregivers differed greatly at baseline. For example, Simons et al. (2000) reported that care-aids were trained "on-the-job" and had relatively poor baseline knowledge of oral care. Conversely, Kullberg et al. (2010) reported that nursing staff was already familiar with dental professional contacts. Differences in baseline knowledge of proper oral care could affect the efficacy of educational programs. Similarly, the criteria for participant eligibility differed greatly among the five studies. For example, Frenkel et al. (2001) excluded residents with severe cognitive impairments whereas Kullberg et al. (2010) included those from a dementia care centre. Inclusion criteria are important to consider as certain groups have characteristic behaviours that present challenges to the provision of oral care. Collectively, the five reviewed studies provide an equivocal level of evidence that oral health education programs for caregivers improve the oral health of residents living in long-term care facilities.

Based on the discussion, further investigation of this clinical question is recommended. Future research considerations would include the following:

a. Well-designed randomized clinical trials in the area of oral care delivered by caregivers to dependent older adults;

b. Appropriate and reliable outcome measures that directly assess oral health status;
c. Identifying barriers affecting change in caregiver behaviour (e.g., background knowledge and education level of caregivers, motivation for performing oral care).

Clinical Implications

Oral health education programs for caregivers are frequently recommended as a cost-effective means to improve the oral health of residents living in long-term care facilities. However, the literature collected provides limited compelling evidence to support the implementation of these programs in a clinical setting.

The overall quality and heterogeneity of these studies make it difficult to unequivocally recommend strategies for improving oral care in the aforementioned population. However, if an oral health education program were to be implemented it is strongly recommended that the clinical setting and target population be thoroughly examined prior to selecting strategies for improving oral care. For example, consideration must be given to the baseline knowledge of the employed caregivers prior to selecting educational strategies. It is important to identify barriers to change and tailor the selected strategies to support each facility's unique needs.

The role that oral hygiene plays in the management of dysphagia and pulmonary infection is critical. As a result, the clinical importance of providing dependent elders with proper oral care remains compelling. Thus, the present clinical question remains open for further investigation.

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