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No More Fighting and Biting During Mouth Care: Applying the Theoretical Constructs of Threat Perception to Clinical Practice

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Abstract

The purpose of this article is to describe how the neurobiological principles of threat perception and fear response can support clinical approaches to prevent and reduce care-resistant behaviors during mouth care. Nursing home residents who exhibit care-resistant behavior are at risk for poor oral health because daily oral hygiene may not be consistently provided. Poor oral health predisposes these older people to systemic problems such as pneumonia, cerebral vascular accidents, and hyperglycemia. Care-resistant behavior is a fear-evoked response to nurses' unintentionally threatening behavior during mouth care. Nurses can safely and effectively provide mouth care to persons with dementia who resist care by using personalized combinations of 15 threat reduction strategies.

Keywords

oral health; dementia; nursing home residents; care-resistant behavior

Nursing home (NH) residents with dementia who exhibit care-resistant behavior (CRB) have oral health that has been described as “deplorable” and their mouth care as bordering on neglect (Adam & Preston, 2006; Cohen-Mansfield & Lipson, 2002; Rejnefelt, Andersson, & Renvert, 2006). Poor oral health predisposes these residents to systemic diseases such as NH-acquired pneumonia, cardiac disease and cerebral vascular accidents, and hyperglycemia (Azarpazhooh & Leake, 2006; Desvarieux et al., 2005; Furukawa et al., 2007; Promsudthi, Pimapansri, Deerochanawong, & Kanchanasita, 2005; Terpenning, 2005). These preventable systemic illnesses carry significant pharmacological, hospital, and personal costs that raise the expense of caring for persons with dementia (Zhao, Kuo, Weir, Kramer, & Ash, 2008). Additionally, CRB, which becomes more prevalent with the increasing severity of dementia and functional impairments (Beck et al., 1997; Volicer, Bass, & Luther, 2007), increases the cost of caring for persons with dementia by 30% annually (Beeri, Werner, Davidson, & Noy, 2002). Daily oral hygiene practices are known to improve the oral health of older adults and decrease the incidence of associated systemic diseases (Adachi, Ishihara, Abe, & Okuda, 2007), yet NH residents with dementia who present with CRB receive inadequate, if any, daily oral hygiene (Chalmers & Pearson, 2005;

Newton, 2007; Okura et al., 2010). The number of persons entering NHs with some or all of their own teeth has been trending upward over the past 20 years, from 54% to 70% (The National Institute of Dental and Craniofacial Research, 2002). This trend will continue to increase over time, heightening the urgency of this important problem.

The purpose of this article is to describe how the neurobiological principles of threat perception and fear response can support clinical approaches, which prevent and reduce CRBs during mouth care. When faced with a threat, all organisms react with fear-evoked “flight–fight” responses (Maren, 2005; Ohman, 2005). These responses are both autonomic such as elevated heart rates and sweating, as well as behavioral such as fleeing or fighting. Persons with dementia have heightened threat perception as a result of neurobiological changes that affect the cerebral cortex, hippocampus, and amygdalae (Henry et al., 2009). These individuals may interpret mouth care—which is an intimate and potentially invasive procedure—as a threatening action by threatening people.

RELATIONSHIP BETWEEN CARE-RESISTANT BEHAVIOR AND ORAL HEALTH

The lack of consistent oral hygiene has contributed to the poor oral health of NH residents with dementia; this is an international problem (Bagramian & Heller, 1977; Frenkel, Harvey, & Newcombe, 2001; Kiyak, Grayston, & Crinean, 1993; Murray, Ede-Nichols, & Garcia-Godoy, 2006). More older persons are retaining their dentition; in the United States, more than half of all NH residents are dentate (Dey, 1997). Older adults form plaque more quickly than their younger counterparts when oral care is not routinely performed; this may be caused by gingival recession, which exposes more tooth to the oral environment, and reduced salivary flow (Shay & Ship, 1995). Tooth loss from periodontal disease causes the remaining teeth to shift to the point where occlusal surfaces no longer articulate, interfering with chewing and swallowing functions and placing NH residents at risk for malnutrition (Chai, Chu, Chow, Shum, & Hui, 2006). Suboptimal oral hygiene is among the most common risk factors for aspiration pneumonia; resolving the problem of oral hygiene could have prevented 21% of all aspiration pneumonia cases in one NH sample (Quagliarello et al., 2005). Other systemic diseases associated with inadequate oral hygiene and resulting poor oral health are diabetes (Bakhshandeh, Murtomaa, Mofid, Vehkalahti, & Suomalainen, 2007; Promsudthi et al., 2005) and coronary artery disease (Desvarieux et al., 2003; Desvarieux et al., 2005; Kurihara et al., 2007). Deficient oral health negatively affects quality of life and mortality as well (Padilha, Hilgert, Hugo, Bós, & Ferrucci, 2008).

Most NH residents require assistance in several activities of daily living, including mouth care (Jones, Dwyer, Bercovitz, & Strahan, 2009). The need for assistance increases as dementia progresses. Ironically, the older people with dementia who require more assistance with activities of daily living are also prone to exhibit CRB (Beck et al., 1997). CRBs are actions “invoked by a caregiving encounter ... defined as the repertoire of behaviors with which persons with dementia withstand or oppose the efforts of a caregiver” (Mahoney et al., 1999, p. 28). Previously, behavior meeting this definition was often labeled as “uncooperative behavior” (Adams, 1996; Kambhu & Levy, 1993; Pyle, Jasinevicius, Sawyer, & Madsen, 2005); “disruptive behavior” (Kolanowski & Whall, 2000; Whall, 2002); or even as “agitation” (Volicer et al., 2007). Agitation is different from CRB because agitation may occur independent of a precipitating event but CRB occurs in response to caregiver behavior in the context of direct care. For example, the behavior of a resident shouting “No, no, no!” while sitting in a common area but not interacting with anyone would be labeled as agitation. On the other hand, if the older adult is shouting “No, no, no!” as a nursing assistant attempts to wash the older adult’s hair, the behavior is now classified as CRB. Thus, the context of CRB, not the behavior itself, distinguishes CRB from agitation

(Mahoney et al.; Volicer et al.). Agitation progresses in a bell-curve fashion in persons with dementia; agitation increases as dementia progresses from mild to moderate but will wane as the dementia reaches severe stages (Volicer et al.). CRB, however, increases linearly as the severity of dementia increases; the more severe the dementia, the worse the CRB is (Volicer et al.).

THEORETICAL FRAMEWORK

CRB can be conceptualized as a logical yet hardwired fear response to a perceived threat. The limbic system is responsible for threat detection and initiating fear responses. This evolutionary primitive neural mechanism is designed to protect the organism from danger (LeDoux, 2003; Maren, 2005). The human threat detection system is well established anatomically (LeDoux; Maren). The primary structure is the amygdala, composed of varied sets of nuclei: lateral, basal, basolateral, and basomedial (LeDoux). These nuclei interface with other structures in the limbic system, primarily the hippocampus, as well as the brainstem, to produce fear memories: the autonomic fear responses of sweating and elevated heart rate and, importantly, the behavioral fear responses of immobility, escape, and fight (Ohman, 2005).

Survival of all organisms often depends on rapid recognition of and responses to threat. In the human brain, there are two pathways for threat assessment and fear response. The rapid, quick-response pathway is the amygdala–thalamic network, which is a primitive evolutionary pathway (LeDoux, 2003). Primitive threats such as snakes, spiders, heights, and strangers are rapidly and automatically processed by this neural path (Ohman, 2005). This evolutionary modification allows individuals to perceive and respond to serious threat without thinking and establishes lasting fear memories (Ohman). With evolution, the hippocampus (the brain's largest memory structure), developed to provide contextual control of threat assessment and often modified the subsequent fear response (Corcoran, Desmond, Frey, & Maren, 2005; Maren, 2005). The last part of the brain to evolve—the cerebral cortex—added another dimension of cognition to threat assessment and fear response. Thus, the hippocampus, along with select cortical areas, adds awareness, rationality, and reasoning to the threat appraisal equation; however, this system is much slower (Maren). For example, with just the amygdala working, most people will freeze or frantically run away to escape a snake. Given time or repeated exposure, rather than automatically running away from a snake, cortical and hippocampal influences allow the brain to process additional information: “The snake is a harmless garden snake that is 15 ft away from me.” Even with cortical and hippocampal influences, strongly established threat memories remain highly emotional, inflexible, and incredibly hardwired (LeDoux; Maren; Ohman). Resulting fear memories and paired responses are similarly powerful—often fixed—and will occur before any cognitive control begins (LeDoux; Maren; Ohman).

In persons with dementia, the deterioration of the brain, particularly the hippocampus and cortical structures, affects cognitive perception of potentially threatening stimuli and control of fear responses as degradation of the slower cortical–thalamic–amygdala pathway occurs (LaBar et al., 2005). Thus, primitive threat identification and fear responses have little to no cortical control. Because perception and reasoning become distorted, persons with dementia attribute high threat to low or nonthreatening situations (Corcoran et al., 2005; Henry et al., 2009). The atrophy of the hippocampus in persons with dementia further compromises the ability to place the perceived situation in context, adding to hyperactive threat perception (Corcoran et al.). As dementia progresses, threat perception rises, escalating CRB (Henry et al.; Volicer et al., 2007). Therefore, CRB may be conceptualized as an escape or fight fear response to threat perception.

We propose here that older adults with dementia employ CRB during mouth care to protect themselves. This perception of threat is reinforced when nursing assistants provide physical assistance rather than verbal cueing during mouth care: inserting a toothbrush in an older adult's mouth, or holding down an older adult's hand to prevent the dislodgement of the toothbrush, could easily be perceived by the older adult as direct assault.

No studies conceptualizing care resistance as fear-evoked threat response have been located to date. Previous nurse researchers examined and confirmed that "difficult" (Burgener, Jirovec, Murrell, & Barton, 1992), "aggressive" (Whall et al., 2008), "agitated" (Sloane et al., 2004), and "assaultive" (Somboontanont et al., 2004) behaviors occurred within the context of care. Yet, no care-resistant intervention work has been framed around threat perception and fear response evoked by a threatening situation.

One of the many ways the amygdala recognizes threat in humans is by focusing on facial expressions (Burnham & Hogervorst, 2004). In dementia, the ability to differentiate facial expressions is known to be compromised. Neutral, sad, angry, frustrated, and surprised faces are typically categorized as fearful; in contrast, only smiling faces are associated with happy emotional states (Burnham & Hogervorst; Luzzi, Piccirilli, & Provinciali, 2007). Burgener et al. (1992) examined the relationship between "negative" and "difficult" behaviors from NH residents with dementia and caregiver behaviors and concluded that relaxed and smiling caregivers were less likely to evoke problematic behaviors. Another way of interpreting their findings is that relaxed and smiling caregivers were less likely to be perceived as threatening by the persons with dementia, a finding supported by neurobiological research (Burnham & Hogervorst; Luzzi et al.). Threat is also triggered by physical behaviors perceived as an invasion of personal space and/or physical attack. Whall and colleagues (2008) studied aggressive behavior among NH residents with dementia during the shower bath. The behaviors identified as "aggressive" by Whall and associates were care-resistant ones when occurring within the context of care: hitting, kicking, grabbing persons or objects, pushing, and biting (Mahoney et al., 1999). The fact that these behaviors were associated with negative caregiver interactions during the shower bath also supports the conceptualization of resistance to care as a fear response to perceived threat. In addition, two groups of researchers investigated aggressive (Sloane et al., 2004), agitated (Sloane et al.), and assaultive (Somboontanont et al., 2004) behavior by NH residents with dementia during bathing. Sloane et al. operationalized "non-aggressive physical agitation" as "resistiveness and attempts to exit during the bath" (p. 1797). This is clearly an escape or fight response to a perceived threat. Somboontanont et al. noted that specific caregiver behavior (confrontational communication, spraying water without warning, and touching the perineum during bathing) led a NH resident with dementia to immediately physically assault the caregiver. This immediate physical assault is congruent with the conceptualization of CRB as a fear-evoked fight response. Such findings are in line with the rapid amygdala response to perceived threat and responses that are not controlled or modified by cognitive insight or contextual awareness.

Our conceptualization of care resistance as a fear-evoked escape or fight response explains one particular finding that puzzled Somboontanont et al. during their study. Calling NH residents with dementia by name was among the highest ranked caregiver behaviors to trigger a physical assault (Somboontanont et al., 2004). Given the primitive nature of the amygdala, fear learning occurs rapidly and the memory tends to be inflexible and enduring. Fear learning often takes the form of Pavlovian conditioning, where a conditioned stimulus is paired with an unconditioned stimulus (LeDoux, 2003; Ohman, 2005). In laboratory studies, fear response conditioning was achieved by pairing a conditional auditory or visual stimulus such as a sound or picture, with a noxious unconditional stimulus such as an electric shock to the wrist or foot (LeDoux; Ohman). Even after the noxious stimulus was

removed, the conditioned stimulus continued to elicit a fear response; the fear response in these subjects remained automatic and involuntary (LeDoux). In Somboontanont et al.'s NH setting, the conditional auditory stimulus was the use of the NH resident's name. The unconditional stimulus was something noxious, such as immersion in an unpleasantly cold or hot bath, physical restraint, water sprayed on the face, or an unwelcome and intrusive touch. As noted earlier in the discussion of the neurobiological basis for threat appraisal and fear response, even after uncoupling the condition–unconditioned stimulus, the resulting fear memories are powerful and fixed (LeDoux; Maren, 2005; Ohman).

APPLICATION TO CLINICAL PRACTICE

The 80% of certified nursing assistants (CNAs) have cared for elders who exhibited CRBs during mouth care (Frenkel, 1999). CRBs ranged from mildly resistive (e.g., not opening mouths and turning away) to extremely resistive (e.g., biting the toothbrush, kicking or hitting, and biting the caregiver; Chalmers, Levy, Buckwalter, Ettinger, & Kambhu, 1996). CRBs during mouth care were most likely to occur when CNAs provided physical assistance rather than cueing the NH resident or allowing him or her to perform his or her own mouth care (Coleman & Watson, 2006). Other triggers of mouth care CRB included caregivers attempting to forcefully insert the toothbrush or swab into residents' mouths without alerting them; lack of praise or encouragement; compound commands versus simple one-step commands; unsmiling or negative facial cues from the caregiver; and attempting to provide mouth care without prompts or gestures (Coleman & Watson). These findings support the theoretical foundation of this article, that is, CRB is a fear-evoked response to caregivers' unintentionally threatening behavior during mouth care.

These findings also suggest a cause–effect relationship between CRB and poor oral hygiene in NH residents with dementia. Some study findings have supported this relationship although this was not their original intent. Adam and Preston (2006) analyzed the effect of dementia on oral health and found that persons with moderate to severe dementia had twice as much dental plaque as cognitively intact persons and those with mild dementia. Adam and Preston, however, excluded persons who resisted mouth care in their study. In a descriptive study designed to assess the oral care needs of NH residents, researchers concluded that dental hygiene was inadequate for 60% of the 321 residents in two facilities (Montal, Tramini, Triay, & Valcarcel, 2006). When the researchers separated the residents into “cooperative” and “uncooperative” groups, they found that 90% of the cooperative residents had adequate oral hygiene whereas only 10% of the uncooperative residents did. Similarly, Samson, Berven, and Strand (2009) evaluated the effect of their educational program for CNAs on the oral health of NH residents in one facility for 6 years. They found sustained improvement in oral hygiene for 70% of the residents; the 30% who did not demonstrate improvement included persons with dementia who resisted care (Samson et al.).

In spite of the emerging relationship between poor oral health and CRB during mouth care, researchers have focused their attention on providing educational interventions to CNAs, and measuring oral health outcomes for NH residents without significant cognitive impairments or obvious CRB. For example, several research teams found that providing NH staff with intervention instruction led to clinically and statistically significant improvements in the oral health of older adults with dementia (Frenkel et al., 2001; Nicol, Petrina Sweeney, McHugh, & Bagg, 2005; Peltola, Vehkalahti, & Simoila, 2007; Pyle, Massie, & Nelson, 1998). None of the studies included persons with moderate to severe dementia and all excluded persons with any type of CRB. On the other hand, MacEntee et al. (2007) conducted a randomized clinical trial in 14 NHs involving 113 older adults and found that the educational intervention had no effect on either dental hygiene or oral health. Like the aforementioned studies, MacEntee's team excluded residents who could not, or would not,

cooperate during the study. The variation in results, coupled with the exclusion of older people with dementia, have resulted in little guidance for nurses and other caregivers who must provide mouth care to persons with dementia.

APPLICATION TO NURSING PRACTICE

When providing mouth care to persons with dementia, nurses and other caregivers can use the theoretical components presented earlier to prevent and reduce CRB. Oral care for people with dementia can readily be perceived as an invasive threat or attack; this is often compounded by the threatening perception of the caregiver as stranger as well as the inability to recognize anything but negative emotion in that person's facial expressions.

There are several strategies that can improve the delivery of oral health care to NH residents with CRB. In our pilot study, we implemented a 3-week intervention that included 15 empirically based threat reduction strategies for use during oral care procedures (Jablonski et al., 2011). We successfully provided mouth care to seven NH residents with moderate to severe dementia who were identified by staff as being resistive to mouth care. Following treatment, CRBs dropped from 2.43 CRBs/minute ($SD = 4.26$) to 1.09 CRBs/minute ($SD = 1.56$); ($t = 1.97$, $df = 41$, $p = .06$). We were able to brush teeth, floss, and remove and cleanse dentures by using combinations of the following strategies listed subsequently.

Approach

Approaching the resident at eye level and within his or her visual field helps the nurse or caregiver to appear without surprising the older adult (Kayser-Jones, Bird, Redford, Schell, & Einhorn, 1996). Smiling while approaching the older adult is one of the most basic strategies to avoid and minimize CRB (Kayser-Jones et al.). As the nurse continues to interact with the older adult, he or she can establish rapport by engaging in affirming and simple conversation (e.g., complimenting a resident on her shirt; Kayser-Jones et al.). Throughout the interaction, the nurse should use gentle touch judiciously (Kayser-Jones et al.). The best method is to touch the older adult's hands; if he or she seems soothed, the nurse can touch the elbows, shoulders, or upper back while interacting.

Environment

Mouth care is best provided in a quiet environment with minimum persons present (Kayser-Jones et al., 1996). The ideal location is the older adult's personal bathroom, standing or sitting in front of the sink. The presence of the sink also helps cue the older adult regarding the purpose of the interaction through a process known as *priming*. Priming may access implicit memories, also known as *procedural* or *unconscious memories*, which are those memories surrounding specific tasks learned early in childhood and repeated throughout adult life (Harrison, Son, Kim, & Whall 2007; Son, Therrien, & Whall, 2002).

Mirror-mirror is the provision of mouth care with the caregiver standing behind the resident while the resident faces a mirror (Jablonski et al., 2011). Persons with dementia who resist care by not opening their mouths are more likely to open their mouths automatically if the nurse stands *behind* and reach around to brush and floss their teeth. Its success may lay in the removal of the caregiver between the older adult and his or her image in the mirror (Jablonski et al.).

Respectful Communication

Elderspeak refers to "baby talk" speech patterns associated with infants and pets but inappropriately employed when engaged with older adults: high pitch, short sentences, singsong cadence, patronizing tone, use of collective pronouns, and infantilizing terms

(baby, honey, dearie; Herman & Williams, 2009; Williams, Herman, Gajewski, & Wilson, 2009). Elderspeak is a documented trigger to CRB (Herman & Williams; Williams et al.) because its dehumanizing approach heightens threat perception in persons with dementia. Older adults with dementia may forget aspects of their lives, but they never forget that they are adults.

Respectful communication includes the technique of cueing, or the use of polite, one-step commands (Chalmers, 2000; Kayser-Jones et al., 1996). As dementia progresses, older people may have difficulty understanding verbal instruction. Gestures and pantomiming are excellent communication strategies to convey direction in a nonthreatening manner (Chalmers).

Promote Self-Care

Having the older person complete as much mouth care as possible may also reduce CRB because self-care is unlikely to be perceived as threatening (Burgener et al., 1992). Priming is one method of fostering self-care. Priming is the use of objects from the environment to cue the older person, such as providing mouth care in front of a sink and placing toothbrushes in the older people's hands instead of brushing their teeth for them (Chalmers, 2000). Self-care can also be promoted using the techniques of cueing and chaining. *Cueing* is the use of polite, one-step commands and is the verbal analog of priming (Chalmers; Kayser-Jones et al., 1996). Chaining can be employed in conjunction with priming to encourage the older person to perform as much self-care as possible (Chalmers). *Chaining* is the initiation of specific oral hygiene activities by the caregiver with the expectation that the older person completes the activities (Chalmers).

Hand-over-hand is similar to chaining, except the nurse places his or her hands over the older adult's hands and guiding the older adult's hands to complete the task (Chalmers, 2000). The hand-over-hand technique is especially useful when removing the dentures of an older adult prone to CRB (Jablonski et al., 2011).

Distraction

Distraction can prevent and reduce CRB. Proven distraction techniques include singing, talking, or providing a stuffed animal (Chalmers, 2000). The nurse will need to determine which distraction techniques are best tolerated by the individual older adult. In our study, we found that singing helped to prevent CRB in one resident but triggered it with another older adult (Jablonski et al., 2011). Bridging is a type of distraction technique. With bridging, the nurse has the older adult hold the same item being used in mouth care by the nurse such as a toothbrush or denture cup (Chalmers). Bridging is similar to distraction except the items are congruent with the care being provided.

Rescuing involves the replacement of one caregiver with another caregiver during any unsuccessful mouth care activity where CRBs are escalating (Chalmers, 2000; Kayser-Jones et al., 1996). The "good" nurse literally saves the older adult from the "bad" nurse, and the CRBs usually resolve. Rescuing changes the focus of attention from a negative, threat-inducing interaction to a positive and safe one.

CONCLUSION

Providing mouth care to persons with dementia who exhibit CRB is a challenge. The strategies presented here are based on the neurobiology of threat perception. Initial testing shows promising results; we anticipate testing these strategies in future randomized clinical studies. These strategies are congruent with the basic tenets of person-centered care,

invoking individualized strategies to promote the comfort, well-being, and autonomy of persons with dementia (Crandall, White, Schuldheis, & Talerico, 2007; Sloane et al., 2004).

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References

- Adachi M, Ishihara K, Abe S, Okuda K. Professional oral health care by dental hygienists reduced respiratory infections in elderly persons requiring nursing care. *International Journal of Dental Hygiene*. 2007; 5(2):69–74. [PubMed: 17461957]
- Adam H, Preston AJ. The oral health of individuals with dementia in nursing homes. *Gerodontology*. 2006; 23(2):99–105. [PubMed: 16677183]
- Adams R. Qualified nurses lack adequate knowledge related to oral health, resulting in inadequate oral care of patients on medical wards. *Journal of Advanced Nursing*. 1996; 24(3):552–560. [PubMed: 8876416]
- Azarpazhooh A, Leake JL. Systematic review of the association between respiratory diseases and oral health. *Journal of Periodontology*. 2006; 77(9):1465–1482. [PubMed: 16945022]
- Bagramian RA, Heller RP. Dental health assessment of a population of nursing home residents. *Journal of Gerontology*. 1977; 32(2):168–174.
- Bakhshandeh S, Murtomaa H, Mofid R, Vehkalahti MM, Suomalainen K. Periodontal treatment needs of diabetic adults. *Journal of Clinical Periodontology*. 2007; 34(1):53–57. [PubMed: 17243996]
- Beck C, Heacock P, Mercer SO, Walls RC, Rapp CG, Vogelpohl TS. Improving dressing behavior in cognitively impaired nursing home residents. *Nursing Research*. 1997; 46(3):126–132. [PubMed: 9176501]
- Beeri MS, Werner P, Davidson M, Noy S. The cost of behavioral and psychological symptoms of dementia (BPSD) in community dwelling Alzheimer's disease patients. *International Journal of Geriatric Psychiatry*. 2002; 17(5):403–408. [PubMed: 11994927]
- Burgener SC, Jirovec M, Murrell L, Barton D. Caregiver and environmental variables related to difficult behaviors in institutionalized, demented elderly persons. *Journal of Gerontology*. 1992; 47(4):P242–P249. [PubMed: 1624701]
- Burnham H, Hogervorst E. Recognition of facial expressions of emotion by patients with dementia of the Alzheimer type. *Dementia and Geriatric Cognitive Disorders*. 2004; 18(1):75–79. [PubMed: 15087581]
- Chai J, Chu FC, Chow TW, Shum NC, Hui WW. Influence of dental status on nutritional status of geriatric patients in a convalescent and rehabilitation hospital. *The International Journal of Prosthodontics*. 2006; 19(3):244–249. [PubMed: 16752619]
- Chalmers JM. Behavior management and communication strategies for dental professionals when caring for patients with dementia. *Special Care in Dentistry*. 2000; 20(4):147–154. [PubMed: 11203891]
- Chalmers JM, Levy SM, Buckwalter KC, Ettinger RL, Kambhu PP. Factors influencing nurses' aides' provision of oral care for nursing facility residents. *Special Care in Dentistry*. 1996; 16(2):71–79. [PubMed: 9084339]
- Chalmers JM, Pearson A. Oral hygiene care for residents with dementia: A literature review. *Journal of Advanced Nursing*. 2005; 52(4):410–419. [PubMed: 16268845]
- Cohen-Mansfield J, Lipson S. The underdetection of pain of dental etiology in persons with dementia. *American Journal of Alzheimer's Disease and Other Dementias*. 2002; 17(4):249–253. [PubMed: 12184515]
- Coleman P, Watson NM. Oral care provided by certified nursing assistants in nursing homes. *Journal of the American Geriatrics Society*. 2006; 54(1):138–143. [PubMed: 16420211]
- Corcoran KA, Desmond TJ, Frey KA, Maren S. Hippocampal inactivation disrupts the acquisition and contextual encoding of fear extinction. *The Journal of Neuroscience*. 2005; 25(39):8978–8987. [PubMed: 16192388]

- Crandall LG, White DL, Schuldheis S, Talerico KA. Initiating person-centered care practices in long-term care facilities. *Journal of Gerontological Nursing*. 2007; 33(11):47–56. [PubMed: 18019118]
- Desvarieux, M.; Demmer, RT.; Rundek, T.; Boden-Albala, B.; Jacobs, DR., Jr; Papapanou, PN., et al. Relationship between periodontal disease, tooth loss, and carotid artery plaque: The Oral Infections and Vascular Disease Epidemiology Study (INVEST); *Stroke*. 2003. p. 2120-2125. <http://dx.doi.org/10.1161/01.STR.0000085086.50957.22>
- Desvarieux M, Demmer RT, Rundek T, Boden-Albala B, Jacobs DR Jr, Sacco RL, et al. Periodontal microbiota and carotid intima-media thickness: The Oral Infections and Vascular Disease Epidemiology Study (INVEST). *Circulation*. 2005; 111(5):576–582. [PubMed: 15699278]
- Dey, AN. Characteristics of elderly nursing home residents: Data from the 1995 National Nursing Home Survey. Hyattsville, MD: National Center for Health Statistics; 1997.
- Frenkel HF. Behind the screens: Care staff observations on delivery of oral health care in nursing homes. *Gerodontology*. 1999; 16(2):75–80. [PubMed: 10825845]
- Frenkel H, Harvey I, Newcombe RG. Improving oral health in institutionalised elderly people by educating caregivers: A randomised controlled trial. *Community Dentistry and Oral Epidemiology*. 2001; 29(4):289–297. [PubMed: 11515643]
- Furukawa, T.; Wakai, K.; Yamanouchi, K.; Oshida, Y.; Miyao, M.; Watanabe, T., et al. Associations of periodontal damage and tooth loss with atherogenic factors among patients with type 2 diabetes mellitus; *Internal Medicine*. 2007. p. 1359-1364. <http://dx.doi.org/10.2169/internalmedicine.46.0106>
- Harrison BE, Son GR, Kim J, Whall AL. Preserved implicit memory in dementia: A potential model for care. *American Journal of Alzheimer's Disease and Other Dementias*. 2007; 22(4):286–293.
- Henry JD, Thompson C, Ruffman T, Leslie F, Withall A, Sachdev P, et al. Threat perception in mild cognitive impairment and early dementia. *The Journals of Gerontology: Series B, Psychological Sciences and Social Sciences*. 2009; 64(5):603–607.
- Herman RE, Williams KN. Elderspeak's influence on resistiveness to care: Focus on behavioral events. *American Journal of Alzheimer's Disease and Other Dementias*. 2009; 24(5):417–423. [PubMed: 19692706]
- Jablonski, RA.; Therrien, B.; Mahoney, EK.; Kolanowski, A.; Gabello, M.; Brock, A. An intervention to reduce care-resistant behavior in persons with dementia during oral hygiene: A pilot study; *Special Care in Dentistry*. 2011. p. 77-87. <http://dx.doi.org/10.1111/j.1754-4505.2011.00190.x>
- Jones AL, Dwyer LL, Bercovitz AR, Strahan GW. The national nursing home survey: 2004 overview. *Vital Health Statistics Series 13, Data from the National Health Survey*. 2009; 13(167):1–155.
- Kambhu PP, Levy SM. Oral hygiene care levels in Iowa intermediate care facilities. *Special Care in Dentistry*. 1993; 13(5):209–214. [PubMed: 7716694]
- Kayser-Jones J, Bird WF, Redford M, Schell ES, Einhorn SH. Strategies for conducting dental examinations among cognitively impaired nursing home residents. *Special Care in Dentistry*. 1996; 16(2):46–52. [PubMed: 9084335]
- Kiyak HA, Grayston MN, Crinean CL. Oral health problems and needs of nursing home residents. *Community Dentistry and Oral Epidemiology*. 1993; 21(1):49–52. [PubMed: 8432107]
- Kolanowski AM, Whall AL. Toward holistic theory-based intervention for dementia behavior. *Holistic Nursing Practice*. 2000; 14(2):67–76. [PubMed: 12119972]
- Kurihara N, Inoue Y, Iwai T, Sugano N, Umeda M, Huang Y, et al. Oral bacteria are a possible risk factor for valvular incompetence in primary varicose veins. *European Journal of Vascular and Endovascular Surgery*. 2007; 34(1):102–106. [PubMed: 17478111]
- LaBar KS, Torpey DC, Cook CA, Johnson SR, Warren LH, Burke JR, et al. Emotional enhancement of perceptual priming is preserved in aging and early-stage Alzheimer's disease. *Neuropsychologia*. 2005; 43(12):1824–1837. [PubMed: 16154458]
- LeDoux J. The emotional brain, fear, and the amygdala. *Cellular and Molecular Neurobiology*. 2003; 23(4–5):727–738. [PubMed: 14514027]
- Luzzi S, Piccirilli M, Provinciali L. Perception of emotions on happy/sad chimeric faces in Alzheimer disease: Relationship with cognitive functions. *Alzheimer Disease and Associated Disorders*. 2007; 21(2):130–135. [PubMed: 17545738]

- MacEntee MI, Wyatt CC, Beattie BL, Paterson B, Levy-Milne R, McCandless L, et al. Provision of mouth-care in long-term care facilities: An educational trial. *Community Dentistry and Oral Epidemiology*. 2007; 35(1):25–34. [PubMed: 17244135]
- Mahoney EK, Hurley AC, Volicer L, Bell M, Gianotis P, Hartshorn M, et al. Development and testing of the Resistiveness to Care Scale. *Research in Nursing & Health*. 1999; 22(1):27–38. [PubMed: 9928961]
- Maren S. Building and burying fear memories in the brain. *Neuroscientist*. 2005; 11(1):89–99. [PubMed: 15632281]
- Montal S, Tramini P, Triay JA, Valcarcel J. Oral hygiene and the need for treatment of the dependent institutionalised elderly. *Gerodontology*. 2006; 23(2):67–72. [PubMed: 16677178]
- Murray PE, Ede-Nichols D, Garcia-Godoy F. Oral health in Florida nursing homes. *International Journal of Dental Hygiene*. 2006; 4(4):198–203. [PubMed: 17038058]
- The National Institute of Dental and Craniofacial Research. A plan to eliminate cranio-facial, oral, and dental health disparities. Bethesda, MD: Author; 2002.
- Newton JP. Dementia, oral health and the failing dentition. *Gerodontology*. 2007; 24(2):65–66. [PubMed: 17518952]
- Nicol R, Petrina Sweeney M, McHugh S, Bagg J. Effectiveness of health care worker training on the oral health of elderly residents of nursing homes. *Community Dentistry and Oral Epidemiology*. 2005; 33(2):115–124. [PubMed: 15725174]
- Ohman A. The role of the amygdala in human fear: Automatic detection of threat. *Psychoneuroendocrinology*. 2005; 30(10):953–958. [PubMed: 15963650]
- Okura, T.; Plassman, BL.; Steffens, DC.; Llewellyn, DJ.; Potter, GG.; Langa, KM. Prevalence of neuropsychiatric symptoms and their association with functional limitations in older adults in the United States: The aging, demographics, and memory study; *Journal of the American Geriatrics Society*. 2010. p. 330-337. <http://dx.doi.org/10.1111/j.1532-5415.2009.02680.x>
- Padiilha DM, Hilgert JB, Hugo FN, Bós AJ, Ferrucci L. Number of teeth and mortality risk in the Baltimore Longitudinal Study of Aging. *The Journals of Gerontology Series A, Biological Sciences and Medical Sciences*. 2008; 63(7):739–744.
- Peltola P, Vehkalahti MM, Simoila R. Effects of 11-month interventions on oral cleanliness among the long-term hospitalised elderly. *Gerodontology*. 2007; 24(1):14–21. [PubMed: 17302926]
- Promsudthi A, Pimapan Sri S, Deerochanawong C, Kanchanasavita W. The effect of periodontal therapy on uncontrolled type 2 diabetes mellitus in older subjects. *Oral Diseases*. 2005; 11(5):293–298. [PubMed: 16120115]
- Pyle MA, Jasinevicius TR, Sawyer DR, Madsen J. Nursing home executive directors' perception of oral care in long-term care facilities. *Special Care in Dentistry*. 2005; 25(2):111–117. [PubMed: 15856918]
- Pyle MA, Massie M, Nelson S. A pilot study on improving oral care in long-term care settings. Part II: Procedures and outcomes. *Journal of Gerontological Nursing*. 1998; 24(10):35–38. [PubMed: 9923240]
- Quagliarello V, Ginter S, Han L, Van Ness P, Allore H, Tinetti M. Modifiable risk factors for nursing home-acquired pneumonia. *Clinical Infectious Diseases*. 2005; 40(1):1–6. [PubMed: 15614684]
- Rejnefelt I, Andersson P, Renvert S. Oral health status in individuals with dementia living in special facilities. *International Journal of Dental Hygiene*. 2006; 4(2):67–71. [PubMed: 16637907]
- Samson H, Berven L, Strand GV. Long-term effect of an oral healthcare programme on oral hygiene in a nursing home. *European Journal of Oral Sciences*. 2009; 117(5):575–579. [PubMed: 19758255]
- Shay K, Ship JA. The importance of oral health in the older patient. *Journal of the American Geriatrics Society*. 1995; 43(12):1414–1422. [PubMed: 7490396]
- Sloane PD, Hoeffler B, Mitchell CM, McKenzie DA, Barrick AL, Rader J, et al. Effect of person-centered showering and the towel bath on bathing-associated aggression, agitation, and discomfort in nursing home residents with dementia: A randomized, controlled trial. *Journal of the American Geriatrics Society*. 2004; 52(11):1795–1804. [PubMed: 15507054]
- Somboontanont W, Sloane PD, Floyd FJ, Holditch-Davis D, Hogue CC, Mitchell CM. Assaultive behavior in Alzheimer's disease: Identifying immediate antecedents during bathing. *Journal of Gerontological Nursing*. 2004; 30(9):22–29. quiz 55–56. [PubMed: 15471060]

- Son GR, Therrien B, Whall A. Implicit memory and familiarity among elders with dementia. *Journal of Nursing Scholarship*. 2002; 34(3):263–267. [PubMed: 12237989]
- Terpenning M. Geriatric oral health and pneumonia risk. *Clinical Infectious Diseases*. 2005; 40(12): 1807–1810. [PubMed: 15909270]
- Volicer L, Bass EA, Luther SL. Agitation and resistiveness to care are two separate behavioral syndromes of dementia. *Journal of the American Medical Directors Association*. 2007; 8(8):527–532. [PubMed: 17931577]
- Whall AL. Developing needed interventions from the need-driven dementia-compromised behavior model. *Journal of Gerontological Nursing*. 2002; 28(10):5. [PubMed: 12382452]
- Whall AL, Colling KB, Kolanowski A, Kim H, Son Hong GR, DeCicco B, et al. Factors associated with aggressive behavior among nursing home residents with dementia. *The Gerontologist*. 2008; 48(6):721–731. [PubMed: 19139246]
- Williams KN, Herman R, Gajewski B, Wilson K. Elderspeak communication: Impact on dementia care. *American Journal of Alzheimer's Disease and Other Dementias*. 2009; 24(1):11–20. [PubMed: 18591210]
- Zhao Y, Kuo TC, Weir S, Kramer MS, Ash AS. Healthcare costs and utilization for Medicare beneficiaries with Alzheimer's. *BMC Health Services Research*. 2008; 8:108. [PubMed: 18498638]