Impact of dining room environment on nutritional intake of Alzheimer's residents: A case study

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Abstract

This case study, in a Veterans Affairs Alzheimer's unit, was conducted to evaluate noise and lighting conditions at mealtimes and to assess the food intake of ambulatory dementia residents. The case study compared the noise, lighting, and nutritional intake of 16 Alzheimer's residents eating the same cycle menu in the extended-care (EC) dining room and the Alzheimer's unit (AU) dining room five weeks later. Noise was significantly lower in the EC ($p \leq .02$). Lighting was significantly higher in the EC ($p \leq .001$). Intake of calories and protein was slightly higher, with some days significantly higher, in the AU. Total five-day fluid intake at breakfast was significantly higher in the AU ($p \leq .02$). Although residents' total food and fluid intake was higher in the AU, the project identified a need to decrease noise and increase lighting in the AU. Lighting enhancement and noise reduction may further improve intake, which, in turn, may promote improved nutritional status.

Key words: Alzheimer's disease, dining room environment, extended-care unit, lighting, noise, nutritional intake, Alzheimer's unit

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Introduction

To ensure a positive mealtime experience for patients with Alzheimer's or other forms of dementia can be challenging for the caregiver. The stage of the disease, dining environment, and experience of the caregiver all impact the dining experience of persons with Alzheimer's disease.

In the early stages, those with dementia often forget to eat or drink, or may eat twice, not realizing they have already eaten. In the middle stages, they may forget how to feed themselves, and in later stages they may forget how to chew and swallow food and beverages.[1]

Dementia patients can become malnourished due to decreased intake that is often combined with increased expenditure of energy from pacing or wandering. Inadequate intake of fluids promotes dehydration, electrolyte imbalance, and urinary tract infections.[1] Early correction of malnutrition in persons with dementia might improve their physical well-being, accentuate their remaining functions,[2] and reduce infections and skin breakdown,[3] thereby improving their quality of life.

Dining room environment

Color, light, sound, aroma, and touch are significant environmental factors that affect physical and emotional health and well-being. Noise and glare significantly impact on comfort levels.[4] The typical group dining room environment can be a source of noise, activity, and glare, which may cause agitation in those with dementia. Agitation may lead to behavioral disturbances that affect food intake.

Researchers recommend clearing the dining room environment of abrasive and institutional noises, and appropriately substituting things that help residents feel as if they are in homelike surroundings. By closing doors

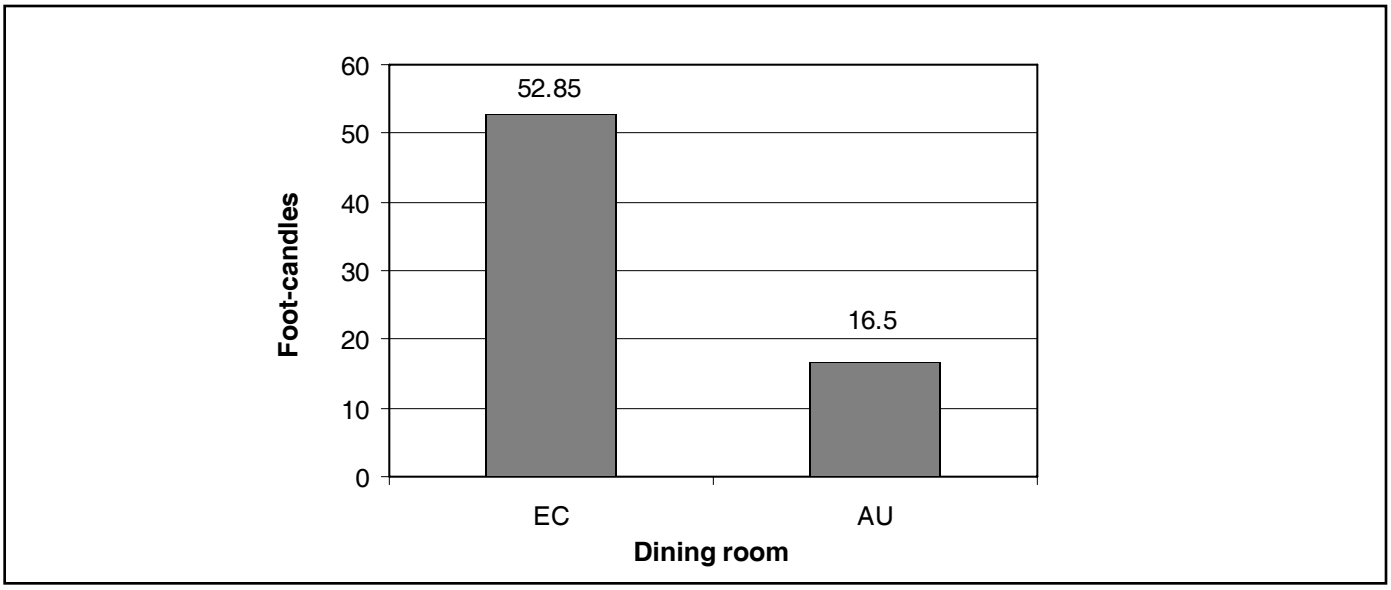

Figure 1. Comparison of lighting between extended-care (EC) and Alzheimer's unit (AU) dining rooms. Foot-candles were significantly different between EC and AU ($P \leq .001$).

and turning off televisions, radios, and intercoms, competing auditory stimuli can be eliminated, thereby decreasing sensory overload and anxiety.[5]

The Illuminating Engineering Society's (IES) committee on lighting for the aged and partially sighted recommends the minimum level of ambient light for dining during active hours to be no less than 50 foot-candles.[6] To design an extended care facility with an even distribution of light can be challenging. Pendant indirect lighting and cove lighting can be combined to provide even illumination and the distribution of high levels of ambient light needed without promoting glare.[7]

Extended-care versus special-care units

Most extended-care units are not equipped to provide a safe environment for dementia patients who wander, have too much stimuli, or do not have specialized staff trained in the needs of dementia residents. The environment of an extended-care unit, in particular, the dining room, is often distracting to dementia patients. For this reason, many facilities have developed "special-care units" (also called dementia or Alzheimer's units [AUs]). The design of an AU dining room should enhance intake of meals by promoting a relaxed, low- or controlled-stimulus environment.

Designing the dining room: Case illustration

The Veterans Affairs Medical Center (VAMC) opened an 18-bed AU (attached to the EC unit) to provide a safe, predictable environment for ambulatory veterans with dementia. In retrospect, more research into dining room design specifically for dementia residents would have been beneficial prior to construction. This case study was conducted in order to make best use of the current dining room environment or to determine whether environmental changes were indicated. Noise and lighting conditions at mealtime were evaluated and the food intake of ambulatory dementia residents living in the AU was assessed.

Dining room environment

The VAMC extended-care unit has two dining rooms, the EC and the AU. The EC dining room is 1,762 square feet with quarry tile and ceiling fans. The dining room tables are round pedestals or rectangular with four legs. There is a cafeteria-style service line that serves ambulatory patients (but not the residents in this case study). Medication pass is often conducted during meals in the EC and the television is on during each meal.

In contrast, the AU is 484 square feet with low-gloss vinyl composition tile and no ceiling fans. The dining room has round tables that are recessed into the ceiling and lowered by the nursing staff with wall-mounted controls (similar to a light switch). There is no cafeteria-style service line in this unit. There is no television in the AU dining room and medications are not passed during meals. Relaxing music is routinely played during meals. "Tune Your Brain™ with Mozart"[8] was played during the AU dining phase.

Alzheimer's residents

This 18-bed VAMC Alzheimer' unit requires applicants to have an established diagnosis of probable

Table 1. Subjects' mean and total intake of calories, protein, and fluid[a] (days 1 - 5)		
Day and meal	**EC[b]**	**AU[c]**
Day 1		
Breakfast calories	532.61	573.99
Lunch calories	523.70	515.37
Total calories	1023.02	1089.37
Breakfast protein	18.56	19.36
Lunch protein	27.22	26.86
Total protein	44.63	46.23
Breakfast fluid	8.93	12.93*
Lunch fluid	11.75	10.93
Total fluid	20.12	23.87
Day 2		
Breakfast calories	785.01	792.84
Lunch calories	569.67	570.29
Total calories	1354.68	1327.49
Breakfast protein	18.38	17.71
Lunch protein	20.56	21.40
Total protein	38.94	37.77
Breakfast fluid	14.25	14.25
Lunch fluid	7.93	9.46
Total fluid	22.18	23.12
Day 3		
Breakfast calories	508.21	529.73
Lunch calories	582.88	655.73
Total calories	1022.90	1185.46*
Breakfast protein	18.63	19.31
Lunch protein	23.85	26.70
Total protein	39.84	46.02*
Breakfast fluid	10.80	13.06
Lunch fluid	7.35	8.62
Total fluid	17.02	21.68**

Table 1. Subjects' mean and total intake of calories, protein, and fluid[a] (days 1 - 5) (continued)		
Day and meal	**EC[b]**	**AU[c]**
Day 4		
Breakfast calories	576.00	676.89**
Lunch calories	618.60	767.78**
Total calories	1194.60	1396.69**
Breakfast protein	21.36	23.51
Lunch protein	30.29	35.34
Total protein	51.64	56.65*
Breakfast fluid	17.87	19.45
Lunch fluid	7.03	11.73**
Total fluid	24.91	30.45
Day 5		
Breakfast calories	523.38	569.26
Lunch calories	718.72	669.92
Total calories	1242.10	1168.03
Breakfast protein	19.20	20.38
Lunch protein	35.95	34.17
Total protein	55.15	52.00
Breakfast fluid	14.18	17.38
Lunch fluid	14.62**	9.00
Total fluid	28.81	24.20
Total breakfast & lunch calories	5837.33	6167.05
Breakfast calories	2860.16	3071.57
Lunch calories	2977.16	3095.48
Total breakfast & lunch protein	230.23	238.69
Breakfast protein	93.83	97.75
Lunch protein	136.40	140.94
Total breakfast & lunch fluid	113.06	123.35
Breakfast fluid	64.81	74.91**
Lunch fluid	48.24	48.43

[a] Expressed calories (kcal), protein (grams), and fluid (ounces); [b] Extended care dining room; [c] Alzheimer's unit dining room.
* $p \leq .05$; ** $p \leq .02$.

Alzheimer's disease or related dementia with display of cognitive impairment that affects normal social interactions and the ability to care for themselves.

Applicants must be veterans, ambulatory, at least partially continent, and have some comprehension of spoken language. They also must be able to assist with feeding and dressing themselves. Patients who require skilled nursing cannot be accepted (*i.e.*, patients with respiratory equipment, ostomies, feeding tubes, or intravenous fluids).

The VAMC Alzheimer's wing had 15 male and two female residents at the time of the case study. Fifteen males and one female were observed for this project. Their ages ranged from 61 to 81 years old. Their Mini-Mental State[9] scores ranged from zero to 24, out of a maximum possible score of 30. Each resident was ambulatory. Fifteen of the residents fed themselves. Of those who fed themselves, three required supervision and cueing to complete their meal. One resident would not feed himself; therefore, he was fed by nursing staff.

Case study protocol

The case study was conducted in two five-day phases. Each phase was Monday through Friday during breakfast and lunch meals (supper was not included due to the primary author's work schedule and other assignments). Phase I took place during week one of the cycle menu in the EC dining room. After phase I meals in the EC dining room were completed, the residents returned to eating in the AU dining room. Phase II was conducted in the AU dining room when the week-one cycle menu was repeated five weeks later. Weight of each resident was taken on Sunday evening at 6 p.m. prior to each phase and the end of each phase on Friday afternoon at 3 p.m.

The same meal service protocol was followed for each phase. The residents ate at round tables, four per table, with their regular table mates. Two members of the usual AU nursing staff accompanied the residents to the dining room and assisted with orientation to their seats and tables. The meals were served according to the week-one cycle menu, with appropriate ladles, scoops, and a scale to assure accurate servings. Residents were served meals according to their prescribed diet. Supplements such as health shakes were served as usual according to their individual needs. Time for the residents to consume their meals was recorded. After the residents had finished eating, the remaining food was weighed and measured.

Noise was measured in decibels with a sound level meter 15 minutes after meal service began. A light meter was used to measure light in foot-candles immediately after the noise level had been measured. Room temperature was measured using a calibrated thermometer.

A five-day nutritional analysis was completed for each resident's breakfast and lunch meals, using *Nutritionist IV* software.[10] The mean caloric, protein, and fluid intakes in the AU dining room were compared to those in the EC dining room by using t-tests to determine differences in intake. Difference in lighting and noise level in the EC and AU were also compared by using t-tests.[11]

Results

All 16 residents completed the case study. Food intake was measured for calories, protein, and fluid intake. The intake means were calculated for each meal for daily and five-day totals (Table 1). Mean total five-day intake of breakfast and lunch calories and protein was higher, though not significantly higher, in the AU as compared to the EC. Total five-day intake of fluids at breakfast was significantly higher ($p \leq .02$) in the AU as compared to the EC.

When intake was broken down by day, day 3 resulted in significantly higher total calories ($p \leq .05$), total protein ($p \leq .05$), and total fluid ($p \leq .02$) in the AU. On day 4, the AU had significantly higher total calories ($p \leq .02$), total protein ($p \leq .05$), and lunch fluid ($p \leq .02$).

Total time for meals (breakfast and lunch combined) was similar in both phases. The average total time was 48.81 minutes in the EC and 51.23 minutes in the AU.

Mean weight change was not statistically significant; however, three residents lost over one pound during the EC phase and two residents lost over one pound during the AU phase. A difference in activity, snacks, or intake of supper meals also could have affected the residents' weight.

Noise in decibels was recorded after meals began. The EC had a significantly lower mean of 73.63 decibels as compared to 78.26 decibels in the AU ($p \leq .02$). Possible causes of increased noise in the AU were relaxing music being played next to the table where decibel measurements were taken, the door to the nourishment room loudly slamming shut near the dining room area as staff were entering and leaving, and the lower height of the dining room ceiling. Although the television was turned on and the dining room was larger in the EC, the residents were on the opposite side of the long dining room and fairly secluded in the back.

Mean illuminance in the EC was 52.85 foot-candles; whereas in the AU it was 16.5 foot-candles ($p \leq .001$) (Figure 1). The EC dining room had 32, 23-watt incandescent lamps in reflective recessed cans and 20, 40-watt T-8 fluorescent recessed fixtures with two lamps in each. Windows were located along the entire length of the dining room to allow daylight to enter. The AU dining room had 20, 13-watt fluorescent lamps in recessed reflective cans with a black ring around the bottom of each can. No windows are in this dining room due to it being an interior room.

In the AU, one retractable table was broken and therefore stayed in the up position at the ceiling (a substitute round

pedestal table was used). As a result, the table blocked the lamps that were hidden above it and inhibited illuminance. Repeat measurements of illuminance, averaging 17.7 foot-candles, were taken when the table was operational (after the project was concluded). In addition, these tables were not aesthetically pleasing to the eye due to the four bars that drop from the ceiling to the center of the table. Also, shadows from the bars of the retractable tables (holding them to the ceiling) were cast upon each tabletop.

Improving the dining environment

An effective AU should provide appropriate lighting, low noise level, and staff trained to limit inappropriate environmental stimuli. This comparison of the EC and AU found areas for improvement in the AU such as noise reduction and increased lighting. Furthermore, the need for glare reduction from inappropriate lighting was identified in the EC dining room.

The noise level in the AU dining room was significantly higher than in the EC, and may contribute to sensory overload and anxiety among the residents. Evaluation of the sources of noise led to a number of recommendations for reducing noise levels.

Recommendations for reduction in noise in the AU dining room:

1. Determine method to keep door of nourishment room from slamming;

2. Staff and visitors to keep voices down during meals;

3. Staff training on reduction of noise in the dining room;

4. Quietly open and close tray cart doors; and

5. Consider obtaining acoustic tiles or wall hangings.

Lighting in the AU was significantly lower than in the EC and below standards set by the IES committee on lighting for the aged and partially sighted. The following recommendations were made to bring lighting up to the IES standard.

Recommendations for improving the lighting in the AU dining room:

1. Install cove lighting on sidewalls that do not interfere with lowering of tables from ceiling;

2. Install at least two sconces with frosted bulbs or lamp shades; and

3. If further illumination is needed, add chandelier in center of dining room (between the four tables) with frosted bulbs or lampshades.

As part of the hospital's program for energy efficiency, the lamps were changed or retrofitted in the EC dining room. The EC dining room now has fluorescent lamps in reflective cans. Although the new lights can be dimmed with the dimmer switch set at its highest, the average foot-candles now measure 58.12, which is higher than during the study measurements. The new fluorescent lamps create an uncomfortable glare off the reflective cans. A change from fluorescent lamps in reflective cans back to incandescent flood lamps that project light downward would limit glare.

Recommendation for improvement in lighting in the EC dining room:

1. Change fluorescent lamps in reflective cans to incandescent flood lamps.

The VA's extended-care committee approved the above recommendations for change. The committee then submitted a project request for approval. At the time of this writing, we are waiting on final approval for this project.

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