Plants, Animals, and Children in Long Term Care: How Common Are They? Do They Affect Clinical Outcomes?

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Abstract:
In spite of considerable interest and anecdote, the degree to which plants, animals, and children are present in long-term care, and the impact of these interventions on resident outcomes, has received relatively little empirical attention. As part of a longitudinal study of 193 residential care/assisted living (RC/AL) facilities and 40 nursing homes (NHs) in four states, the presence of plants, animals, and children in study facilities was assessed, and nearly 3000 subjects were followed longitudinally for a year. Data were analyzed to identify the relationship of plants, animals, and children to mortality, hospitalization, and the rate of resident decline in activities of daily living (ADLs). The majority of both RC/AL and NH facilities provided their residents with little or no contact with plants, animals, or children. In longitudinal analyses, the presence of plants was associated with 4 unfavorable and 1 favorable outcome (out of 24 comparisons made), the presence of animals was associated with 3 favorable and no unfavorable outcomes (out of 24), and the presence of children was associated with no significant outcomes. While the study had limitations, the trend for animals and not plants to be associated with favorable outcomes may represent a true effect based on interactions between animals and residents. The lack of results regarding children may be due to the overall low prevalence of child-resident interactions.
Key words: assisted living, Edenization, environment, nursing homes, outcome

Article:
Therapeutic environments in long-term care involve an interface between environmental design and activities planning. Ideally, design should foster improved resident mood, health, and activities. Nowhere is this interface more salient than in the employment of plants, animals, and children in long-term care facilities.

The availability of living things has been widely claimed to provide residents in long-term care with social and mental stimulation and to foster recreational activities. Plants, animals, and children are a cornerstone of the Eden Alternative, a popular philosophy of nursing home care that aims to combat loneliness, helplessness, and boredom through companion animals, green plants, intergenerational programs, environmental diversity, and a decentralized nursing care delivery system. [1,2]

In spite of considerable interest and anecdote, the involvement of plants, animals, and children in long-term care has received relatively little empirical attention. Investigators have suggested that decreases in resident monthly prescriptions, psychotropic drug use, infections, pressure sores, behavioral incidents, and deaths may follow implementation of the Eden Alternative.[2–4] However, these studies have tended to be small and not well controlled. Furthermore, environmental components have been difficult to separate from the changes in policies and procedures that accompany the introduction of living things in "Edenized" facilities. Overall, research in this area has been hampered by lack of theory, clear concept definitions, appropriate methodologies, and out-come measures.

The paucity of empirical support for the incorporation of plants, animals, and children into institutional settings is especially true of residential care/assisted living (RC/AL), a rapidly growing alternative to nursing home (NH) care in the United States. RC/AL facilities are more diverse than NHs, ranging from tiny "mom-and-pop" facilities in which a few elderly are cared for in a single-family home, to freestanding, purpose-built facilities or wings or sections of multilevel campuses (such as continuing care retirement communities). Over the next decade, RC/AL facilities are projected to exceed NHs in terms of the number of residents served.[5]

This article presents the results of a longitudinal study of 193 RC/AL facilities and 40 NHs in four states. In that study, the presence of plants, animals, and children in study facilities was assessed, and nearly 3000 subjects were followed longitudinally for 1 year. Analyses presented here document the extent to which these facilities provided contact with plants, animals, and children, and the associations between these components of "Edenization" and resident health outcomes.

METHODS

Data for these analyses were gathered as part of the Collaborative Studies of Long-Term Care (CS-LTC), a longitudinal study of the structure and process of care in RC/AL facilities and NHs in four states. The CS-LTC enrolled a diverse and randomized sample of 193 RC/AL facilities and 40 NHs from the states of Florida, Maryland, New Jersey, and North Carolina. The CS-LTC defined RC/AL as facilities or discrete portions of facilities, licensed by the state at a non-nursing home level of care, that provide room, board, 24-hour oversight, and assistance with activities of daily living (ADLs).

In each state, RC/AL facilities were sampled within three strata: "small" (< 16 bed), "new-model" (~ 16 beds, built after 1986, and with at least one characteristic that represented a focus on higher-acuity residents), and "traditional" (**~~!!**16 beds, not meeting the new-model definition). The fourth study stratum consisted of a random sample of NHs from each study state. Because the study was designed to select approximately equal numbers of residents in each stratum, more small homes (n=113) were studied compared with the other three strata (n= 40 homes in each stratum). Within RC/AL homes, a random sample of 2078 residents aged 65 and older were enrolled as subjects. In order to select a NH sample whose acuity level would more closely approximate the RC/AL group, the 761 subjects in that stratum were sampled in approximately equal proportions from persons aged 65 and older who either (1) had a dementia diagnosis and were ambulatory, or (2) were dependent in transfer, continence, and/or feeding (irrespective of cognitive status). Across the study sample, the prevalence of moderate or severe dementia was 42% in small RC/AL homes, 23% in traditional RC/AL homes, 35% in new-model RC/AL homes, and 60% in NHs.[6] Details of the CS-LTC study design are published elsewhere.[7]

Each of the 233 study facilities received site visits by trained CS-LTC data collectors. An extensive variety of data were gathered at the resident and facility level at baseline. As part of the data collection protocol, the following data were gathered on plants, animals, and children:

Each facility director was interviewed and asked to identify the number of dogs, cats, cages with live birds, fish tanks, and other domestic animals available to residents in the facility; in addition the director was asked how often activities involving children took place in the facility.

As part of an observational assessment of the physical environment, each subject's room and all indoor public areas were evaluated for the presence and extent of plants. The extent of plants in public and private spaces was independently rated as not at all, somewhat, or extensive.

To gather longitudinal data on resident mortality, hospitalization, and changes in function, facilities were telephoned quarterly, and information obtained for all subjects who remained in the facility.

A summary variable was calculated by assigning plants, animals, and children a value between 0 and 2, and then adding the scores, yielding an index that ranged from 0 to 6. The score for plants weighted room and

common area plants equally. The score for animals was based on the total number of animals available (0 = 0, 1–2 = 1, >2 = 2), and the score for children was computed as follows: <monthly = 0, 1–3 times per month = 1, one or more times a week = 2.
Simple statistics were run in SAS 6.12;8 and multivariate models were run in Stata 6.0.9 The relationship between the availability of plants, animals, and children and longitudinal resident outcomes was computed as follows: (1) mortality over 1 year was calculated using Cox proportional hazards modeling;10 (2) hospitalization (yes/no) for each quarter of follow-up (through 1 year) was modeled using generalized estimating equations (GEE)11 assuming a Poisson distribution and log link function; and (3) changes in the level of impairment of seven ADLs (each rated on a 0–4 scale) from the additive Minimum Data Set ADL scale (range 0 to 28)12 were modeled using GEE, assuming a Gaussian distribution and identity link function. For GEE models, length of follow-up was included as an offset variable. To control for baseline differences in facility case mix, all final models were adjusted for resident age, sex, and baseline impairment of study subjects in ADLs.

RESULTS

Table 1 displays the distribution of plants and animals in the study facilities, and the extent to which scheduled activities occurred that involved interactions between facility residents and children. The majority of common areas and 25–50% of resident rooms in both RC/AL facilities and NHs had no plants. Plants were somewhat more common in public areas; however, extensive use of plants was rare. The majority of facilities had no dogs, cats, bird-cages, or fish tanks; however, the number of each ranged widely, with a few facilities providing access to multiple animals. The availability of plants, animals, and children did not differ markedly between RC/AL facilities and NHs.

Most facilities reported some intergenerational programming involving children. However, 52.9 percent of RC/ALs and 48.8 percent of NHs reported that activities with children occurred less than once a month. Approximately one-fifth of facilities reported having scheduled activities with children at least once a week (Table 1).

Facility scores on the summary variable ranged from 0 (essentially no plants, animals, or programming involving children) to 6 (high levels of each). Among RC/AL facilities, 12.1 percent scored greater than 4; the figure for nursing homes was similar at 10.8.

Table 2 displays the relationships between resident health outcomes and the extent to which plants, animals, and children were present in the facility environment. In both nursing homes and RC/AL facilities, a number of statistically significant ($p<.05$) associations were identified. The following relationships were identified in which the variables being studied were associated with decreased risk of adverse health outcomes:

- mortality was reduced in NHs with at least one cat and/or a moderate score on the summary variable
- hospitalization was reduced among RC/AL facilities with 3 or more animals, and/or at least one dog, and/or with moderate scores on the summary variable, and among NHs with plants in the majority of resident rooms
- rates of functional decline in NHs were reduced by increased scores on the summary variable.

The following relationships were identified in which the variables being studied were associated with increased risk of adverse health outcomes:

- mortality was increased in NHs with some plants in the common areas and extensive plants in resident rooms
- hospitalization was increased in RC/AL facilities with more plants in common areas

- ADL decline was greater in RC/AL facilities with extensive plants in common areas and with high scores on the summary variable.

Discussion

This study represents the largest investigation to date of the impact of animals, plants, and children on resident outcomes in long-term care facilities. As an observational study (as opposed to a controlled trial), its findings can be best characterized as exploratory. Furthermore, determination of relationships between plants, animals, and children in long-term care facilities and resident out-comes was limited by low levels of the independent variable. In other words, the majority of both RC/AL and NH facilities provided their residents with little if any contact with plants, animals, or children (Table 1), thereby limiting the study's power to detect differences in spite of its

Table 1.

Availability of Plants, Animals, and Children to Residents of Residential Care/Assisted Living (RC/AL) Facilities and Nursing Homes (NHs), as Number and Percent of Facilities Sampled[a]

	RC/AL n = 193 facilities		NH n = 40 facilities	
	Frequency	Percent	Frequency	Percent
Extent of plants present in common areas				
None	78	42.2	15	37.5
Somewhat	75	40.5	15	37.5
Extensively	32	17.3	10	25.0
Percent of resident rooms with any plants, by facility				
0%	73	39.0	10	25.0
1–24%	44	23.7	14	35.0
25–50%	34	18.1	13	32.5
51–74%	18	9.7	3	7.5
75–100%	18	9.6	0	—
Number of dogs available to residents	(range 0–15)		(range 0–15)	
None	133	71.1	34	87.2
One	33	17.6	2	5.1
Two	14	7.5	1	2.6
Three or more	7	3.6	2	5.2
Number of cats available to residents	(range 0–15)		(range 0–15)	
None	147	78.6	28	71.8
One	16	8.6	3	7.7
Two	11	5.9	2	5.1
Three or More	13	6.8	6	15.4
Number of bird cages available to residents	(range 0–9)		(range 0–3)	
None	150	80.2	30	76.9
One	20	10.7	3	7.7
Two	10	5.3	5	12.8
Three or more	7	3.8	1	2.6
Number of fish tanks available to residents	(range 0–5)		(range 0–3)	
None	146	78.1	21	53.8
One	28	15.0	12	30.8
Two	5	2.7	4	10.3
Three or more	8	4.2	2	5.2
Number of other domestic animals on site	(range 0–26)		(range 0–0)	
None	173	92.5	38	100.0
One	2	1.1	0	0.0
Two	1	0.5	0	0.0
Three or more	11	5.9	0	0.0
Total number of animals available to facility residents	(range 0–37)		(range 3–32)	
None	80	42.8	12	30.8
One	43	23.0	7	17.9
Two	19	10.2	6	15.4
Three	10	5.3	5	12.8
Four	8	4.3	4	16.3
Five or more	13	7.0	5	12.8
Extent to which scheduled activities occur in which residents interact with children				
Never or very rarely	53	28.3	1	2.6
Occasionally but not monthly	46	24.6	18	46.2
1–3 times a month	52	27.8	13	33.3
Once a week or more	36	19.3	7	17.8

[a]Frequencies are included to identify amount of missing data per item. For example, data on plants in common areas were missing for 8 RC/AL facilities.

Table 2.

Association between Availability of Plants, Animals, and Children in Facility and One-Year Resident Outcomes*												
	Residential Care/Assisted Living (RC/AL) Subjects (n = 2078 residents)						Nursing Home (NH) Subjects (n = 761 subjects)					
	Outcome						Outcome					
	Mortality		Hospitalization		ADL Decline		Mortality		Hospitalization		ADL Decline	
Environmental Feature	*rr***	*p*	*rr***	*p*	*mean*	*p*	*rr***	*p*	*rr***	*p*	*mean*	*p*
Plants in common area												
None	1.00	(ref)	1.00	(ref)	2.34	(ref)	1.00	(ref)	1.00	(ref)	3.95	(ref)
Somewhat	0.94	.607	1.15	.118	2.62	.410	1.59	**.006**	1.01	.946	2.97	.105
Extensive	1.07	.731	1.24	**.038**	3.29	**.026**	0.84	.530	1.07	.678	3.19	.298
Percent of resident rooms with plants												
0	1.00	(ref)	1.00	(ref)	3.67	(ref)	1.00	(ref)	1.00	(ref)	3.25	(ref)
1–49	1.01	.954	0.97	.750	3.16	.506	1.56	.144	1.02	.875	3.13	.696
50+	0.87	.443	1.02	.850	2.51	.074	1.83	**.008**	0.56	**.001**	3.83	.523
Total number of animals												
0	1.00	(ref)	1.00	(ref)	2.42	(ref)	1.00	(ref)	1.00	(ref)	3.96	(ref)
1–2	1.01	.955	0.96	.639	2.62	.584	0.74	.152	0.81	.223	3.94	.974
3+	0.92	.591	0.82	**.031**	2.96	.154	0.92	.656	0.86	.349	2.83	.103
Availability of a dog												
0	1.00	(ref)	1.00	(ref)	2.50	(ref)	1.00	(ref)	1.00	(ref)	3.33	(ref)
1+	0.77	.075	0.74	**.001**	3.06	.114	0.94	.796	0.86	.452	4.79	.079
Availability of a cat												
0	1.00	(ref)	1.00	(ref)	2.48	(ref)	1.00	(ref)	1.00	(ref)	3.72	(ref)
1+	0.99	.939	0.92	.353	3.14	.067	0.69	**.040**	1.19	.224	2.90	.198
Availability of children												
< monthly	1.00	(ref)	1.00	(ref)	2.54	(ref)	1.00	(ref)	1.00	(ref)	3.94	(ref)
1–3 times a month	1.14	.333	0.99	.922	2.71	.611	0.97	.881	1.14	.360	2.82	.071
> once a week	1.15	.466	0.84	.119	2.75	.636	1.25	.985	0.98	.889	3.47	.583
Summary variable												
0–1.5	1.00	(ref)	1.00	(ref)	2.34	(ref)	1.00	(ref)	1.00	(ref)	5.28	(ref)
2–3.5	1.12	.481	0.82	**.030**	2.43	.816	0.65	**.022**	1.08	.648	2.71	**<.001**
4–6	1.03	.885	0.95	.594	3.51	**.011**	1.36	.123	0.99	.954	3.15	**.034**

*All estimates adjusted for resident age, sex, and baseline impairment in activities of daily living (ADLs).**Relative risk.

large overall sample size. This is particularly true of children, and so the finding of no association between the presence of children and any outcome of interest (Table 2) may be an issue of study design rather than one of lack of effect.

Nonetheless, several intriguing findings resulted (Table 2). First, the presence of plants was in general not associated with favorable resident outcomes, and in several instances was associated with unfavorable ones. All three significant results involving plants in public areas involved worse outcomes (increased rates of hospitalization and ADL decline in RC/AL, and increased mortality in NHs with moderate plants). Only two significant results were seen involving plants in resident rooms, and they were in opposite directions (moderate plants in NHs increased mortality, but extensive plants decreased hospitalization rates).

Animals, on the other hand, were associated with three significant favorable results and no unfavorable ones. The availability of animals, and dogs in particular, was associated with reduced hospitalization rates in RC/AL facilities, and the availability of a cat was associated with reduced mortality in NHs. These findings should not be overinterpreted, however. Effect sizes are small; patterns inconsistent across the two facility types; and the above findings scattered among many nonsignificant results. However, the observed associations are consistent with findings from other studies involving human/companion animal research. Friedmann et al. 13 suggest that pet owners live longer after myocardial infarctions; Barba14 suggests that animals can improve communication skills of withdrawn and isolated elders by facilitating interactions; Siegel15 found that elderly pet owners reported less psychological distress and fewer visits to physicians over a 1-year period than respondents who did not own pets; and Garrity et al. 16 found an inverse relationship between pet ownership and depression. In addition, a wide range of studies have reported favorable effects of animal-assisted therapy on long-term care resident social behaviors, performance of ADLs, diversion/entertainment, and well-being. 17–21 These findings might provide an explanation for a favorable impact of animals in facilities on resident outcomes.

A more precise assessment of the impact of animals, plants, and children on resident health would have been possible if information had been obtained on the type and extent of interactions that occurred. However, while analyses were conducted at the resident level, the independent variables were measured at the facility level and, therefore, the study was unable to determine the extent to which individual residents actually had contact with plants, animals, and children. For example, the study asked about formal activities involving children but did not evaluate whether individual residents participated or whether informal contact occurred. Since interactions among residents and children who know each other personally may offer better effects on health outcomes than scheduled children's activities, such data may be critical. Similarly, personal involvement with plants and animals may be more crucial to health outcomes than their mere presence.

We recognize additional limitations of the study. Data on plants, animals, and children were collected at the first data point while data on health outcomes were collected 1 year later. While unlikely, health outcomes may be the result of changes in the availability of plants, animals, and children that occurred during that year. Health outcomes may also have been influenced by other factors, for example, changes in policies regarding hospitalization of residents. Mortality rates can be affected by changes in admission policies and affiliation of long-term care facilities with hospital management. Perhaps most important of all is the fact that facilities that adopt innovations (such as Edenization) tend to be different (e.g., larger, chain affiliated, with more private-pay residents) than those that do not, and these facility factors rather than the innovation itself may account for any observed effects.22 Thus, separating the effects of treatment from underlying facility and resident characteristics is a continuing challenge in long-term care. True randomized designs are rare, and potentially biased anecdotal reports tend to be the norm. Furthermore, because facility characteristics affect the likelihood of choosing to be involved in research on innovations, what works in limited settings often does not in the general facility context.

Nonetheless, the concept that contact with children, plants, and animals will have favorable effects on long-term care residents remains appealing both because of evidence from other settings and the relative low cost and widespread applicability of such an intervention. Future research with a variety of designs and settings is needed to help clarify whether, to what extent, and in what manner the inclusion of plants, animals, and children can result in increased quality of life and enhanced health outcomes among long-term care residents.

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