

ANALYSIS OF SUSTAINABLE FOOD PRACTICES IN TEXAS ACUTE CARE HOSPITALS

Paula Cook, MS, RDN, LD¹; Darla Daniel O'Dwyer, PhD, RDN, LD^{2*}; Ray Darville, PhD³;
Mitzi Perritt, PhD, NCIDQ, RID²; Sally Ann Swearingen, MFA, NCIDQ, RID²

¹Cura Hospitality a division of Elior—North America, Pineville, LA, USA

²School of Human Sciences, Stephen F. Austin State University, Nacogdoches, TX, USA

³Department of Anthropology, Geography and Sociology, Stephen F. Austin State University, Nacogdoches, TX, USA

ABSTRACT

Foodservice directors in Texas hospitals were surveyed to document the frequency of participation in sustainable practices and to identify support systems and barriers. The three sustainability practices that had the highest mean frequency were recycling fat, cooking oil, and grease; using reusable plates and dishes; and using reusable silverware. Specific foodservice directors and hospital characteristics significantly influenced adoption of sustainability practices, most notably, directors with more years of experience (2 out of 3 practices) and larger hospitals (all 3 practices). Significant barriers were cost/financial burdens and space limitations. Administrative, customer, and staff support were important to a successful program.

Keywords: Sustainability, hospital foodservice, recycling, waste-management, reusable service ware

INTRODUCTION

Hospital foodservice operators are faced with many administrative tasks including financial accountability, customer service initiatives, employee engagement programs, Group Purchasing Organization compliance, and environmental sustainability strategies. The United States adopted the National Environmental Policy Act in 1969 to commit to sustainability and “to create and maintain conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations” (US Environmental Protection Agency, 2016, para. 2). Sustainable practices are related to the growth and production of food, the conservation of resources including energy and water, and the reduction of waste.

The implementation of environmentally sound food sustainability strategies is becoming increasingly important due to the fact that health care facilities in the US emit 9.8% of greenhouse gases (Eckelman & Sherman, 2016). Hospital foodservice greatly impacts the entire foodservice system due to the large amounts of resources used, their considerable purchasing power and waste production (Carino, Porter, Malekpour, & Collins, 2020). The healthcare sector is beginning to understand that food impacts human health not just through nutrition, but through a complex system of social, economic, and environmental connections. To help hospital management staff build sustainable food systems, campaigns such as the Healthy Hospital Initiative, in conjunction with Practice Greenhealth, Healthcare without Harm and the Center for Health Design, have been developed to provide resources and support to hospitals engaging in sustainability programs (Eckelman & Sherman, 2016). Little research exists to determine if hospital membership in these programs increases sustainability efforts.

BACKGROUND

The Environmental Protection Agency and the American Hospital Association developed a memorandum of understanding in 1998 for the purpose of setting ambitious goals for waste reduction (Sustainability Roadmap for Hospitals, n.d.). Waste reduction programs in hospital foodservice operations can involve the implementation of many different practices. Recycling is often the most easily initiated strategy comprising such practices as recycling cooking oil, cardboard and paper, tin and aluminum cans, and plastics. Recycling programs usually encompass the entire facility, not just the foodservice area. They can be financially lucrative if the cost of waste removal services are reduced and have environmental benefits (Sustainability Roadmap for Hospitals, n.d.). A study in 2011 surveyed 290 hospital foodservice directors across the United States to determine the implementation of solid waste sustainable practices (Huang, Gregoire, Tangney, & Stone, 2011). The most commonly implemented sustainable practices included recycling fats, oils, and grease; recycling cardboard and paper; recycling batteries; and promoting reusable silverware.

Waste oil from frying and cooking can be transformed into biodiesel fuel and is preferred due to its environmental benefit (Karabaş, 2019). The sustainable practice of recycling fats, grease, and cooking oil was found to be the most commonly implemented practice by foodservice directors in hospitals (Huang et al., 2011). According to a National Restaurant Association survey conducted in 2018, of 500 restaurant operators (or managers) surveyed, 64% recycled fat, cooking oil and grease, implying that this practice is also common in many foodservice establishments (National Restaurant Association, 2018).

Recycling fat, cooking oil and grease as well as the use of reusable plates/dishes and silverware are sustainable practices that are important to the environment. As hospitals strive to reduce waste, practices that reduce the use of disposable foodservice ware must be considered. The most environmentally preferable form of foodservice ware is reusable dishes and cutlery. Reusable foodservice ware requires fewer material resources and uses less energy in its production than the disposable counterparts. A study completed in 1998 by the Alliance for Environmental Intervention showed that reusable mugs generate lower levels of air and water pollutants and less solid waste in production, use, and disposal than similar disposable products (Dennison, 1998). The majority of plastics are produced solely for packaging and short-lived purposes and are discarded after 1 year. Four percent of the world's oil and gas production (a non-renewable resource) are used to make plastics. These two factors indicate that the use of plastics are not sustainable (Hopewell, Dvorak, & Kosior, 2009). It is important that a sustainability program incorporate reusable service ware.

*Corresponding Author: Phone: (936) 468-2439; E-mail: dodwyer@sfasu.edu

Little available research exists on the sustainability practices implemented by hospital foodservice directors in Texas. In addition, there is little evidence on the impact of foodservice director's demographics and hospital demographics on adopting sustainability practices. The objectives of this study were to 1) identify current sustainable practices implemented in the foodservice department in hospitals in Texas, with particular emphasis on the recycling of fat, cooking oil, or grease; reusable plates/dishes and reusable silverware; 2) identify support systems and barriers, and 3) recognize significant demographic factors related to sustainability practices.

METHODS

An online cross-sectional questionnaire was administered through Qualtrics (www.qualtrics.com). The questionnaire was a modification of the questionnaire used, with permission, from the thesis titled "hospital foodservice directors' current practices and attitudes toward sustainability" (Huang, 2007). All data were held confidential; no individual or facility was identified. The researchers' university institutional review board reviewed and approved the research questionnaire, study design, and procedures.

Sample Selection

The population for this study was foodservice directors at general hospitals in Texas. Directors' contact information was retrieved from The Texas Health and Human Services Directory of General and Special Hospitals (Texas Health and Human Services, n.d.). The 2014 directory contained a total of 663 facilities that combined general and special hospitals, licensed to provide varying degrees of care. The hospital list was filtered to include only hospitals that were licensed as general hospitals, yielding a total of 417 facilities. General hospitals are commonly referred to as acute care hospitals. The email addresses for foodservice directors or managers were obtained from multiple sources including foodservice vendors, group purchasing organizations and Texas members of the Association for Healthcare Foodservice listed in the online directory. Additionally, phone calls were made to obtain email addresses for any facilities not found through previously stated sources. Every effort was made to collect contact information from all 417 facilities.

Questionnaire Development

Several terms were defined at the start of the questionnaire to minimize confusion for respondents. Sustainable practices were defined as "simply the actions that hospital foodservice directors take in order to conserve resources" (Huang et al., 2011, pp. 243-244). The modified questionnaire had four main sections:

Section 1: Current Sustainable Practices. Twenty sustainable practices were listed, including recycling various waste streams, serving locally grown or organically grown foods, and using pesticide-free, hormone-free or antibiotic-free meat or dairy products. Participants were asked to indicate the frequency of participation in each of these practices using a 5-point Likert scale ranging from *Never* to *All of the Time*. Participants were asked about participation in farm/garden programs, purchase of energy and water efficient equipment, and participation in energy, water, or waste audits. Additionally, Section 1 included questions regarding the barriers and the support systems connected with sustainable practices.

Section 2: Management Attitude on Sustainable Practices. This section investigated the impact of personal commitment and attitude on the sustainability program. Participants were asked to share the strength of their personal perspectives by replying to a series of nine statements using a 5-point Likert scale ranging from *Strongly Disagree* to *Strongly Agree*. The results from this section were not included in this study.

Section 3: Sustainability Organization and Challenge Participation. Six sustainability organizations were listed in this section, and participants were asked to identify any programs they had joined. Four food sustainability challenges were also listed. Additionally, the questionnaire collected information on the existence of "green teams" and on the assignment of responsibility for the sustainability program in each facility.

Section 4: Demographic Information. The final section of the questionnaire gathered demographic information including age, education, credentials, and years of professional service of respondents. Facility demographics were also collected including hospital bed size, total daily meal count, full-time equivalents (FTEs) and foodservice management structure. These items were tabulated for comparison to both sustainable practices and attitudes.

Data Collection Procedure

The questionnaire was administered in February 2015. Information accompanying the questionnaire explained the study's purpose and importance and requested timely participation. Questionnaire participants were guaranteed confidentiality. Questionnaire participants' email addresses were located in the blind copy area to protect confidentiality and questionnaires were sent in groups of 10 to avoid spam filters. Out of 417 hospitals identified, the initial invitation to participate in the study was sent to 410 foodservice director's email addresses. Seventy-six email addresses were returned as invalid, leaving 334 possible respondents. Follow-up emails were sent at one- and two-week intervals after the initial questionnaire. Information was also posted on the social media Facebook pages for the Texas Academy of Nutrition and Dietetics and the Association for Healthcare Foodservice. Follow up phone calls were made in an effort to improve response rates. A final request email was sent out on. The questionnaire remained active for 28 days.

Data Analysis

The IBM Statistical Package for the Social Sciences (SPSS) Version 25 was utilized for all data analysis. Frequencies were analyzed to check each variable for coding errors. Descriptive statistics were calculated for all variables.

RESULTS AND DISCUSSION

Questionnaires were sent electronically to 410 foodservice director's email addresses. Seventy-six email addresses were found to be invalid, leaving 334 possible respondents. Twelve respondents did not agree to participate in the questionnaire. Seventy-three participants responded by completing at least some portion of the questionnaire, resulting in a 22% overall response rate.

Respondent Demographics

All questionnaire responses ($n=73$) were reviewed for completeness. The questionnaire consisted of 24 multiple response questions and one subjective comment area. Eleven respondents failed to complete at least 50% of the questionnaire and were eliminated from the data file. The final questionnaire sample consisted of 62 respondents that completed half of the questionnaire or more. This sample represented a 19% response rate.

Personal demographic information was collected to create a profile of the personal attributes of the respondents (foodservice directors) (Table 1). Respondents varied in age from 26 to 65+ years with the median age being 46 to 55 years of age. Median educational attainment was a bachelor's degree while over a third had a graduate degree. Forty-two percent were registered/licensed dietitians, 15% were certified chefs, while 26% were certified dietary managers. Only

42.6% of hospitals have someone designated as sustainability coordinator in the foodservice department. In about 65% of these cases (17 of 26), the department director also served as sustainability program coordinator.

Questionnaire respondents were classified based on years of experience as a foodservice director and years of experience in their current position. Respondents also reported longevity in their current position, with the median respondent reporting 6–10 years in the current position.

Facility Demographics

The facilities represented a variety of sizes and locations (Table 2). By location, 35% ($n=21$) of the hospitals were in major metropolitan areas, 41% ($n=25$) were located in rural areas, and 23% ($n=14$) were located in suburban areas. Hospital size information was based on licensed beds, with the median hospital in the 101-200 bed range. Foodservice departments were sized by number of staff (FTEs) and average number of meals served daily which included both retail and patient meals. The questionnaire respondents were questioned on the status of the foodservice department as well as various hospital classifications. The facility population consisted of 64.5% ($n=40$) with “government” (military and veteran hospitals) affiliation and 35.5% ($n=22$) had “no government” affiliation (Table 2).

Sustainable Practices

The questionnaire asked respondents to document the frequency of their participation in 20 sustainable practices related to reducing waste and recycling, and to serving or using sustainable food

products. In each instance, participants were asked to use a five-point scale with the range of “never,” “rarely,” “sometimes,” “most of the time,” or “all of the time” to assess the strength of practice participation. Responses to the frequency of participation in sustainable practices were compiled in Table 3.

The three sustainability practices having the highest mean frequency (averaging more than three (sometimes) on the 5-point scale) were (1) recycling fat, cooking oil, and grease, (2) using reusable plates and dishes, and (3) using reusable silverware. These practices were compared to hospital foodservice director’s demographic variables (Table 4) and hospital demographic variables (Table 5).

The three key sustainability practices variations based on six selected socio-demographic variables were examined (Table 4). No significant mean differences were detected among these practices by age, education, whether the respondent was a registered dietitian (RD), whether the individual was a certified chef, years as a foodservice director, and whether the hospital had a sustainability coordinator. Two of these findings agreed with Huang et al. (2011) who found no differences between sustainability scores and educational levels and years as a foodservice director. Interestingly, foodservice directors who had the RD credentials had lower mean sustainability scores than non-RD foodservice directors and directors aged 35-40 had lower scores than the other age ranges (ages less than 35, 41-45, 46-50, 51-60, over 60) (Huang et al., 2011). However, a significant mean difference ($p = 0.014$) was found for encouraging usage of plates and dishes for the certified dietary managers; certified dietary managers had a significantly higher mean ($M = 3.96$) compared to not being

Table 1. Demographic Characteristics of Hospital Foodservice Directors (n = 62)

Variable	Description	Frequency	Percent
Age	26–35 years old	10	16.1
	36–45 years old	12	19.4
	46–55 years old	18	29.0
	56–65 years old	19	30.6
	Over 65 years old	3	4.8
Highest education completed	High School Graduate	8	13.1
	Associate’s Degree	10	16.4
	Bachelor’s Degree	20	32.8
	Master’s Degree	21	34.4
	Doctorate Degree	0	0.0
	Other	2	3.3
Credentials	Registered/Licensed Dietitian	26	41.9
	Certified Chef	9	14.5
	Certified Dietary Manager	16	25.8
	Other	11	17.7
Years as foodservice director	Less than 6 years	13	27.1
	6–10 years	6	12.5
	11–15 years	7	14.6
	16–20 years	7	14.6
	21–25 years	4	8.3
	More than 25 years	11	22.9
Years in current position	Less than 6 years	24	47.1
	6–10 years	9	17.6
	11–15 years	8	15.7
	16–20 years	2	3.9
	21–25 years	1	2.0
	More than 25 years	7	13.7
Sustainability Coordinator	No	35	57.5
	Yes	26	42.6

certified dietary managers ($M = 2.85$). Finally, a significant mean difference ($p = 0.046$) was found on encouraging usage of plates and dishes with those working in their current position 16 or more years ($M = 4.20$), having a significantly higher mean than those individuals who had been in their current position for 10 or less years ($M = 2.88$). On the other hand, Huang et al. (2011) did not find any differences in sustainability practices and years the foodservice director had worked (Huang et al., 2011).

The data for significant mean differences in these three key sustainability practices based on hospital characteristics were examined. No significant mean differences were detected for the following variables: number of licensed beds, foodservice management, and whether the hospital was a government or non-government hospital. One or more significant mean differences were found for the location of the hospital, FTEs, average number of meals served daily, and whether or not the hospital was for profit.

All three dependent variables exhibited significant mean differences for hospital location (major metropolitan area, suburban area, or rural area). For recycling fat, cooking oil, and grease, metropolitan areas had the highest mean ($M = 4.48$) while rural areas had the lowest mean ($M = 3.32$). Two pairwise comparisons were significant with metropolitan areas significantly higher than rural areas ($p = 0.026$) and suburban areas were significantly higher than rural areas ($p = 0.035$). For encouraging reusable silverware, rural areas ($M = 3.52$) had a significantly higher ($p = 0.028$) mean compared to suburban areas ($M = 2.29$). For encouraging reusable plates and dishes, while the model was significant ($p = 0.048$), the pairwise comparison test did not produce any significant mean differences. The pattern in the data were not very strong or clear for hospital location. The size of the hospital appeared to be more important than the location.

Significant mean differences were found for FTEs for recycling fat, cooking oil, and grease ($p = 0.046$) as well as encouraging reusable silverware ($p = 0.012$). For recycling, those with 11 to 50 FTEs had a

significantly higher mean ($p = 0.043$) than those with only 10 or fewer FTEs. For encouraging reusable plates and dishes, the only significant pairwise difference ($p = 0.007$) was between those with 51 to 100 FTEs compared to 10 or less FTEs with the largest hospitals having the higher mean. The results regarding the number of FTEs from this study directly correlated with Huang et al. (2011), who found that increases in FTEs had positive impacts on the adoption of sustainability practices (Huang et al., 2011).

All three key sustainability practices exhibited significant mean differences with average number of meals served daily. For recycling fat, cooking oil, and grease, two pairwise differences were noted; in both instances, the larger hospitals (measured by number of meals) had a significantly higher mean. Specifically, those producing more than 2,000 meals had a significantly higher mean than those serving 100 meals or less ($p = 0.004$) and those serving 1,001 to 2,000 meals had a higher mean than those serving only 100 meals or less ($p = 0.015$). For encouraging reusable plates and dishes, two more significant pairwise differences were noted: (1) hospitals serving over 500 meals had a significantly higher mean ($p = 0.002$) than those with 100 or less meals and (2) those with 1,001 to 2,000 meals had a significantly higher mean than the hospitals with 100 meals or less ($p = 0.002$). With average number of meals served daily, encouraging reusable silverware had almost identical results for these two comparisons ($p = 0.034$ and $p = 0.002$ respectively). In all these instances, the larger hospitals had higher sustainability measure means. These results were not consistent with a study conducted in New Brunswick. The researchers surveyed foodservice managers in healthcare settings and found that 86% of facilities practiced waste reduction, but there were no significant differences between the size of the facilities and their waste reduction practices (Robichaud, Cormier, & Gaudet-Leblanc, 1995).

Other Sustainable Practices

Many organizations have been developed to provide resources and support to hospitals engaging in sustainability programs and

Table 2. Demographic Characteristics of Hospitals (n=62)

Variable	Description	Frequency	Valid Percent
Location	Major metropolitan area	21	35.0
	Suburban area	14	23.3
	Rural area	25	41.7
Licensed beds	100 beds or less	24	40.7
	101 to 200 beds	8	13.6
	201 to 300 beds	11	18.6
	301 to 400 beds	7	11.9
	401 to 500 beds	6	10.2
	More than 500 beds	3	5.1
Full-time equivalents	10 FTEs or less	17	27.9
	11 to 50 FTEs	26	42.6
	51 to 100 FTEs	14	23.0
	More than 100 FTEs	4	6.6
Average number of meals served daily	100 meals or less	11	19.0
	101 to 500 meals	19	32.8
	501 to 1000 meals	7	12.1
	1001 to 2000 meals	12	20.7
	More than 2000 meals	9	15.5
Foodservice management	Self-operated	35	60.3
	Contract managed	23	39.7
Hospital type	For profit	27	54.0
	Not for profit	23	46.0
	Government	40	64.5
	Non-government	22	35.5

Table 3. Sustainability Practices (n=62)

Description	Never		Rarely		Sometimes		Most of the time		All of the time		Mean ± SD
	N	%	N	%	N	%	N	%	N	%	
Practices related to reducing waste or recycling											
Recycle fat, cooking oil, or grease	11	17.7	2	3.2	4	11.3	7	11.3	38	61.3	3.95 ± 1.56
Encourage reusable plates/dishes	12	19.4	7	11.3	17	27.4	15	24.2	11	17.7	3.10 ± 1.36
Encourage reusable silverware	13	21.0	9	14.5	11	17.7	17	27.4	12	19.4	3.10 ± 1.43
Recycle cardboard	27	43.5	2	3.2	2	3.2	7	11.3	24	38.7	2.98 ± 1.87
Recycle paper	24	39.3	5	8.2	5	8.2	11	18.0	16	26.2	2.84 ± 1.70
Use products made of 100% recycled materials	12	19.7	9	14.8	32	52.5	5	8.2	3	4.9	2.64 ± 1.05
Recycle tin or aluminum cans	27	43.5	7	11.3	6	9.7	9	14.5	13	21.0	2.58 ± 1.65
Encourage reusable beverage containers	20	32.3	9	14.5	18	29.0	11	17.7	4	6.5	2.52 ± 1.29
Use biodegradable disposable products	23	37.1	9	14.5	21	33.9	6	9.7	3	4.8	2.31 ± 1.21
Recycle plastic	33	53.2	6	9.7	4	6.5	9	14.5	10	16.1	2.31 ± 1.61
Donate food to the needy	32	52.5	11	18.0	15	14.6	1	1.6	2	3.3	1.85 ± 1.06
Compost food scraps	50	82.0	2	3.3	3	4.9	2	3.3	4	6.6	1.49 ± 1.16
Practices related to the service/use of sustainable food products											
Fair Trade coffee / tea	22	35.5	11	17.7	11	17.7	8	12.9	10	16.1	2.56 ± 1.49
Locally grown or produced foods	21	33.9	6	9.7	24	38.7	11	17.7	0	0.0	2.40 ± 1.14
rBGH-free or rBST-free dairy products	26	42.6	10	16.4	13	21.3	5	8.2	7	11.5	2.30 ± 1.40
Antibiotic free meat products	28	45.2	10	16.1	13	21.0	5	8.1	6	9.7	2.31 ± 1.36
Pesticide free food products	26	41.9	15	24.2	13	21.0	2	3.2	6	9.7	2.15 ± 1.28
Free range animal products	25	40.3	14	22.6	16	25.8	3	4.8	4	6.5	2.15 ± 1.20
Organically grown foods	33	58.2	12	19.4	16	25.8	1	1.6	0	0.0	1.76 ± 0.90
Organic dairy products	38	61.3	10	16.1	14	22.6	0	0.0	0	0.0	1.61 ± 0.84

promoting the human and environmental health benefits of a sustainable lifestyle. The Healthy Hospital Initiative, in conjunction with Practice Greenhealth, Healthcare without Harm and the Center for Health Design is one of those organizations and represents 1300 hospitals nationwide (Healthier Hospitals Initiative, n.d.) Hospital foodservice directors were surveyed on their participation in 6 organizations with the expectation that being a member of these organizations would increase sustainability practices. The Healthy Hospital Initiative had the highest participation, at 18% (n=11) while 79% were not members of any organization. Comparison data were analyzed for Healthy Hospital Initiative and the adoption of sustainability practices and it was found that being a member did not influence higher sustainability efforts at a $p > 0.05$. Furthermore, one test (encouraging usage of plates and dishes) was significant ($p = 0.048$), but was in the opposite direction as predicted, with not associated with Healthy Hospital Initiative having the significantly higher mean. However, other studies have found that participating in hospital sustainability challenges and initiatives increased sustainability practices (Gray, Orme, Pitt, & Jones, 2017; Ranke, Mitchell, St. George, & D'Adamo, 2015). The sample size for membership in Healthy Hospital Initiative was very small, which may

have impacted the results. There is some uncertainty about the impact of organizational membership on a variety of hospital-related sustainability functions; however, membership in these organizations should not be discounted.

BARRIERS AND SUPPORTS

In the implementation of any program or practice, factors exist that both hinder and support the success of sustainability programs. The identification of barriers and support systems was a key objective of this research. Table 6 documents the factors identified by respondents.

Barriers

Foodservice directors commonly cite issues which are considered to hinder the implementation of sustainability practices. Respondents were asked to select all the barriers that they encountered which hindered the success of their sustainability programs. Almost 80% (n=48) of respondents indicated that “cost and financial burden” was a hindrance to the success of their sustainability programs. Additionally, 72% (n=44) of respondents reported that their facility space was not conducive to sustainability programs. Almost 70%

Table 4: Comparisons of Three Sustainability Practices by Hospital Foodservice Director's Demographic Variables (n=62)

Variable	Sustainability Practices					
	Recycle fat, cooking oil, and grease		Encourage usage of plates and dishes		Encourage reusable silverware	
	Group Mean	p Value	Group Mean	p Value	Group Mean	p Value
Age						
26-35	3.90		2.70		2.50	
36-45	3.50		2.33		2.50	
46-55	4.39		3.56		3.56	
56-65	4.00		3.26		3.26	
66 or older	3.00		3.67		3.67	
Total	3.95	0.882	3.10	0.147	3.10	0.129
Education						
High School	3.50		3.88		3.63	
Associates	3.40		3.50		3.60	
Bachelor	4.15		2.95		3.00	
Masters	4.24		2.81		2.81	
Total	3.97	0.129	3.12	0.248	3.12	0.318
Credentials						
Registered Dietitian	4.15		2.96		2.92	
Not a Registered Dietitian	3.81		3.19		3.22	
Total	3.95	0.391	3.10	0.511	3.10	0.422
Certified Chef	3.89		3.33		3.22	
Not a Certified Chef	3.96		3.06		3.08	
Total	3.95	0.898	3.10	0.578	3.10	0.779
Certified Dietary Manager	3.94		3.81		3.56	
Not a Certified Dietary Manager	3.96		2.85		2.93	
Total	3.95	0.967	3.10	0.014	3.10	0.133
Years as Foodservice Director						
Less than 6 years	3.62		2.38		2.62	
6–10 years	4.33		3.00		2.83	
11–15 years	4.43		3.14		3.14	
16–20 years	3.71		3.71		3.00	
21–25 years	4.75		2.75		2.25	
More than 25 years	3.73		3.73		3.64	
Total	3.96	0.741	3.10	0.134	2.98	0.468
Years in Current Position						
Less than 6 years	3.88		2.71		2.67	
6–10 years	4.22		3.33		3.22	
11–15 years	3.88		3.63		3.63	
16–20 years	4.00		3.50		4.50	
21–25 years	5.00		5.00		5.00	
More than 25 years	3.86		4.29		4.29	
Total	3.96	0.980		0.046		0.020
Sustainability Coordinator						
No	3.83		2.91		3.03	
Yes	4.23		3.27		3.12	
Total	4.00	0.313	3.07	0.340	3.07	0.807

(n=41) of respondents noted that products were not available on purchasing contracts and 50% (n=30) of respondents noted that the desired products were not available. Almost 50% (n=30) of respondents indicated that sustainability programs were not supported by customers and 41% (n=25) indicated that their programs were not supported by administration. Only 25% (n=15) of respondents believed that regulatory agency oversight was a hindrance to the success of their sustainability programs. Respondents commented that pest issues were a barrier to recycling and also noted that management lacked the time to devote to sustainability.

An investigation in sustainable practices in hospital foodservice in Montana reported similar barriers (Montague, Wilcox, & Harmon, 2014). Some of the barriers that were documented in this study

included hesitation from hospital administrators to adopt sustainable practices due to costs and food safety concerns from locally sourced foods. In addition, directors were concerned about abiding by vendor contracts, a decrease in consistency of delivery and products, and the increase in workload and costs that might be incurred by adopting sustainable practices.

Supports

In the present study, respondents were also asked to identify actions that provided support and contributed to the success of their sustainability programs. Administrator, staff and customers can be a large influencer on sustainability practices, both positive and negative. Almost 70% (n=35) of respondents indicated that the support of administration had been particularly helpful in making their sustainability program successful. Additionally, 62.7% (n=32) of

Table 5. Comparisons of Three Sustainability Practices by Hospital Demographic Variables (n=62)

Variable	Sustainability Practices					
	Recycle fat, cooking oil, and grease		Encourage usage of plates and dishes		Encourage reusable silverware	
	Group Mean	p Value	Group Mean	p Value	Group Mean	p Value
Location						
Major metro area	4.48		3.00		2.90	
Suburban area	4.57		2.29		2.57	
Rural area	3.32		3.52		3.60	
Total	4.02	0.010	3.05	0.032	3.12	0.048
Licensed Beds						
100 beds or less	3.42		3.67		3.46	
101 to 200 beds	4.63		3.25		3.38	
201 to 300 beds	4.18		2.27		2.27	
301 to 400 beds	4.71		2.86		2.86	
401 to 500 beds	4.17		2.67		2.83	
More than 500 beds	5.00		3.00		2.67	
Total	4.03	0.170	3.12	0.098	3.05	0.313
Full time Equivalents						
10 FTEs or less	3.12		3.71		3.82	
11 to 50 FTEs	4.38		2.92		3.08	
51 to 100 FTEs	4.00		2.43		2.29	
More than 100 FTEs	4.75		3.50		3.50	
Total	3.97	0.046	3.07	0.072	3.13	0.012
Average Number of Meals Served Daily						
100 meals or less	2.73		4.18		4.27	
101 to 500 meals	4.11		3.32		3.05	
501 to 1000 meals	4.43		2.43		2.43	
1001 to 2000 meals	4.42		2.17		2.08	
More than 2000 meals	4.78		3.22		3.44	
Total	4.05	0.014	3.12	0.003	3.07	0.002
Foodservice Management						
Self-operated	3.77		3.06		3.23	
Contract managed	4.50		2.91		2.83	
Total	3.98	0.203	3.00	0.710	3.07	0.270
Hospital Type						
For profit	3.93		3.30		3.41	
Not for profit	4.04		2.92		2.84	
Total	3.98	0.796	3.12	0.501	3.13	0.015
Government	3.50		3.20		3.23	
Non-government	4.15		3.13		3.13	
Total	4.04	0.286	3.19	0.896	3.21	0.857

respondents credited customer support, and 60.8% (n=31) cited staff support as important factors. Huang et al. (2011) also found that administrators, customers, and staff were the most influential on decisions regarding sustainable practices (Huang et al., 2011). Over 56% (n=30) indicated that a vendor that provided product information was an important support for their program. Less than 40% (n=20) of respondents identified customer education campaigns as a supportive factor, and only 38% (n=19) identified that attending educational conferences on sustainability promoted the success of their program. Only 35% of respondents (n=18) believed that a clear mission statement and clearly defined sustainability goals were factors in the success of their sustainability program. One respondent commented that collaboration with other departments such as environmental services was important. Several respondents commented that their sustainability program was their own initiative and that they did not receive much support.

Limitations of this Study

Several limitations to this study have been identified. A current list of the email addresses of the population, foodservice directors in general, acute care hospitals in Texas, does not exist; therefore, this study was limited by the researchers' inability to collect contact information on the complete population. The low response rate was another limitation of the study. The response rate may have been impacted by email spam filters, personal reluctance to respond to the questionnaire, and the job demands of the responding professionals. The low response rate may also be due to possible response bias. Foodservice directors who did not have sustainability programs may have been hesitant to reply, while those with well-developed programs may have seen this study as an opportunity to boast their success. A review of the results indicated that the data did contain responses from both ends of the spectrum, and thus, these responses hopefully represent the spectrum of sustainable programs in Texas at

Table 6. Barriers and Supports to Sustainability Programs (n=62)

Barriers and Supports	Description	Frequency	Percent
Barriers	Cost/financial burden	48	78.7
	Facility space not conducive	44	72.1
	Products not on purchasing contracts	41	68.3
	Staffing Issues	38	63.3
	Desired products are not available	30	50.0
	Programs not supported by customers	30	49.2
	Programs not supported by administration	25	41.0
	Lack of knowledge of sustainable practices	22	37.3
	Regulatory agency oversight	15	26.3
	Supports	Administration support	35
Customer support		32	62.7
Staff support		31	60.8
Vendors providing product information		30	56.6
Organized program participation (i.e. Healthy Hospital Initiative)		25	50.0
Budgetary support for sustainable initiatives		24	47.1
Customer education campaigns		20	39.2
Attending educational conferences on sustainability		19	38.0
A clear mission statement and sustainability goals		18	35.3

the time of data collection. The researchers intended to analyze further hospital type characteristics, namely chain-owned versus free standing. However, there was uncertainty in the final data set and the results could not be compared to the 3 sustainability factors.

In future studies of hospital sustainability, several items could be examined in more detail. Each of the sustainable practices contained in this study have the potential to become individual studies that would include a detailed cost benefit analysis, a product availability search and the identification of specific supports and barriers to that practice. The depth of these practice focused studies would take already strong sustainability programs to even greater levels.

CONCLUSIONS AND APPLICATIONS

Results of this study indicate that hospital foodservice departments in the State of Texas have implemented some sustainable practices. The practices with the highest mean frequency were recycling fat, cooking oil, and grease; using reusable plates and dishes; and using reusable silverware. The adoption of these practices varied significantly based on the demographic characteristics of the foodservice director and of the facility. In particular, directors with more years of experience (2 out of 3 practices) and larger hospitals (all 3 practices) were more likely to engage in 2 or more of the sustainability practices that were analyzed in this study.

It was disconcerting to find that professional credentials did not have a positive relationship to the strength of the sustainability program (except for one sustainable practice for certified dietary managers). The initial educational component for registered dietitians, certified chefs, and certified dietary managers should be reviewed and standardized to include sustainability rationale and processes. Ongoing education for all disciplines should be provided to keep the commitment to a healthy environment in the forefront of professional practice.

Foodservice directors identified cost/financial burden as the most significant barrier to implementing sustainable food practices. They also clearly identified that most important support systems needed for successful sustainability programs are the support of administration, customers, and staff.

The significant factors identified in this study which influence the extent/success of the sustainability programs in Texas hospital foodservices can provide guidance for hospital foodservice directors and administrative leaders who are intent on implementing a new sustainability program or improving their existing programs. In this study, successful sustainability programs had the following characteristics:

- Support of administration, customers, and staff
- Foodservice managers with 16 or more years of experience
- Larger hospitals (51-100 FTEs and serving > 1000 meals per day)

The list of program features presented here represents the most influential characteristics found in this Texas study to positively influence the strength of the sustainability program. As healthcare leaders look for ways to impact the foodservice sustainability programs, the results of this study can help them understand the opportunities and challenges they may face based on foodservice director and hospital demographics.

Healthcare professionals must look beyond the provision of daily clinical services and meals to see the bigger picture. It is estimated that one of the biggest global threats in the 21st Century is climate change (Costello et al., 2009). To make a commitment to a healthy future, foodservice professionals must continue to embrace the challenges and turn them into opportunities to improve sustainability throughout their operations and organizations.

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