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LETTER FROM THE EDITORS

JOURNAL OF FOODSERVICE
MANAGEMENT & EDUCATION

Welcome to the first issue of the *Journal of Foodservice Management and Education* for 2013. Thank you to the authors who have submitted journal articles and the reviewers who have helped review these articles. Special thanks to the Foodservice Systems Management Education Council and National Association of College and University Foodservice for their continued support, and Kerri Cole, our assistant editor, for her hard work behind the scenes.

The goal of the journal is to support researchers, educators, and industry by publishing quality research and educational resources that enhance operations and assist educators in developing an environment to support and nurture student development. The manuscripts included in this issue of the journal are certain to achieve this goal.

Communal eating, food safety training, oral nutrition therapy, and nutritional guidance are all topics in this diverse collection of manuscripts. College students were the population of interest for two studies. Bauer and Proctor share their finding on how communal eating in first year college students effects their perception of support and success. Davis and Prakash share how traffic light-inspired signage can provide nutritional guidance to university students. Strohbehn and colleagues provide insight with their research on the delivery method of food safety managerial training. In addition, Ody and colleagues share their research concerning the effects of a hospital's foodservice system on patients' nutritional intakes.

The Journal continues to see a large number of manuscripts and a second addition is planned this fall. This is only the second time that the Journal has been able to publish two issues in one year. With that in mind, please continue to keep the *Journal of Foodservice Management and Education* in mind as you consider Journals in which to publish your work.

Thank you again to all the reviewers who have taken the time to review the manuscripts that have been submitted. Without your dedication to our profession this Journal would simply not be possible.

Warmest Regards,

Kevin R. Roberts, PhD
Co-Editor

Kevin L. Sauer, PhD, RD
Co-Editor

ABSTRACTS

Research Manuscripts

The effects of communal eating on perceived social support and academic success in first year college students

First-year students living in collegiate residence halls (n=303) completed a survey about dining center usage and perceived social support, and granted access to first semester grade point average (GPA) and dining center usage data. Participants reported social benefits of eating with others and eating in the dining center. A significant positive relationship was noted between frequency of eating in the dining center and GPA (p=0.000). Frequency of eating with others was found to be significantly positively correlated to perceived social support (p=0.000). Frequency of eating with others was significantly positively correlated with GPA for males (p=0.046) and females (p=0.020).

Effectiveness of food safety managerial training: Face-to-face or computer-based delivery

Because cases of foodborne illnesses are estimated to exceed 40 million each year, current and future managers of retail foodservices must understand their role in training employees about food safety and influencing the work culture to ensure knowledge is practiced. Two educational modules to aid managers in motivating employees and establishing a positive food safety culture were tested among industry managers: recognition and discipline and communication. The effectiveness of two delivery methods, face-to-face and computer-based training, was also assessed with knowledge based questions and attitude statements. Mixed findings from participants (mostly over 30 years of age) regarding effectiveness of delivery method illustrate there is no “one best way” to providing training to managers.

The effect of hospital foodservice systems on patient consumption of oral nutritional therapy

Poor consumption of prescribed oral nutritional therapy (ONT) is a common problem resulting in health and financial implications. We investigated whether a breakdown of food service systems, rather than patient non-compliance, could be the predominant cause of non-consumption of ONT, in an Australian hospital. Production, delivery and patient compliance was monitored for two days in 10 wards. Of the 431 prescribed ONT prepared in this time, 50.5 % were not consumed by patients. Delivery error accounted for 34% of non-consumption; only 10% was due to patient non-compliance. Our results suggest effective food service delivery is important for ONT consumption rates.

Applied Solutions Contributions

A pilot study to develop nutritional guidance signage for a university cafeteria based on a traffic light design Students

This study describes the creation and implementation of signage that provides guidance to students in making healthy food choices. Information regarding saturated fat, fiber, and sodium content of various cafeteria offerings is presented using a traffic light approach based on daily values, where green indicates that the meal/product is a healthy choice in regards to that nutrient, orange indicates that the food should be consumed in moderation, and red signifies that the food should be consumed sparingly. Daily values were used as the basis for color-coding. Calorie, sugar, and protein content per serving size are also presented. Student feedback indicated that use of the traffic light colors for key nutrients allowed them to make comparisons between choices and healthier decisions with a quick glance. The signage system is suitable for institutional cafeterias, but is readily adaptable to any food service setting.

Research Contribution

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THE EFFECTS OF COMMUNAL EATING ON PERCEIVED SOCIAL SUPPORT AND ACADEMIC SUCCESS IN FIRST YEAR COLLEGE STUDENTS

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ABSTRACT

First-year students living in collegiate residence halls (n=303) completed a survey about dining center usage and perceived social support, and granted access to first semester grade point average (GPA) and dining center usage data. Participants reported social benefits of eating with others and eating in the dining center. A significant positive relationship was noted between frequency of eating in the dining center and GPA (p=0.000). Frequency of eating with others was found to be significantly positively correlated to perceived social support (p=0.000). Frequency of eating with others was significantly positively correlated with GPA for males (p=0.046) and females (p=0.020).

Keywords: Communal Eating, Social Support, Academic Success, College Foodservice

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INTRODUCTION

More than two million students live in collegiate residence hall facilities across the United States each year (US Census Bureau, 2003). Many of these students routinely consume meals at an on-campus dining center. Therefore, dining centers have the potential to impact student health. Most of the research related to collegiate dining centers has focused on the foods chosen and consumed in the dining center, and food safety. Due to the multidimensional nature of health (Espelage, Hale, & Hannum, 2005) each aspect of health (physical, mental, and social) must be investigated in each setting with potential to influence overall health and well-being. Effects beyond the physical implications of eating in a dining center seem likely. Unfortunately, little research has been conducted to determine the role of the collegiate dining center in the mental and social health and academic success of students.

Research has been conducted on family meals and the role that eating together plays during a child's development. There are multiple physical health benefits related to consuming family meals (Croll, Hannan, Neumark-Sztainer, Perry, & Story, 2003; Gillman et al., 2000; Koszewski, Behrends, Nichols, Sehi, & Jones, 2011). Family meal research has extended beyond physical health and nutrition to show that family meals are a vehicle for social support (Fulkerson, Neumark-Sztainer, & Story, 2006; Mestdag & Vandeweyer, 2005; Neumark-Sztainer & Story, 2005) and that family meals promote the well-being and academic success of children (Eisenberg, Olsen, Neumark-Sztainer, Story, & Bearinger, 2004).

Some research has been conducted on the benefits of eating meals with others in elderly patients with dementia. Most studies on this topic focus on the nutritional benefits and improved eating patterns of dementia patients who dine with others. However, there is evidence that when patients with dementia dine with caretakers, there is an increased perception of social support by caretakers (Keller, Edward, & Cook, 2007) and measurable improvements in the eating behaviors, resident-resident interaction, and mood of the patients with dementia (Charras & Fremontier, 2010).

Overall, social support is important for health. General social support has been defined as 'any interpersonal or social relationship that might promote health and wellbeing' (Cohen, Gottlieb, & Underwood, 2000; Sarason, 1990). There is evidence that social support and interpersonal relationships contribute to mental and physical health and wellbeing (Cohen et al., 2000; Sarason, 1990). Additionally, research shows a positive relationship between social support and physical health (Espelage, Hale, & Hannum, 2005).

Social support is important throughout life. Social support in children has been linked with better academic adjustment and GPA (Causey, et al., 1991). Familial social support provided by family meals has also been found to be related to more positive academic outcomes (Eisenberg, et al., 2004). Social support in college students (DeBerard et al., 2004) has also been found to be positively correlated with GPA.

Social support is extremely important for college students' health and well being (Assouline, Colangelo, Cole, Cutrona, & Russell, 1994; Eisenberg & Hefner, 2009; Sumi, 2006). Interpersonal support was found to be positively related to increased mental health and decreased symptoms of psychological distress, including depression and symptoms of loneliness in Japanese college students (Sumi, 2006). College students in the United States have demonstrated much higher incidence of depression when social support is low (Eisenberg & Hefner, 2009). In Eisenberg and Hefner's research 1,378 students at a large, public university took an online survey based on the Multidimensional Scale of Perceived Social Support to evaluate the relationship between mental health and social support (2009). Results indicated that students with a lower perceived social support score were at six times the risk of depressive symptoms (Eisenberg & Hafner, 2009). Social support from parents has been linked to higher college GPA (Assouline, et al., 1994). In Assouline's research 418 undergraduate students completed a survey based on the Social Provisions Scale- Parent Form. The study found that parental support significantly predicted GPA for both males and females (Assouline, et el., 1994). These studies demonstrate the importance of social support for physical and psychological health and well-being.

Current literature shows that collegiate dining centers have an impact on health (Adams & Colner, 2008; Brown et al., 2005; Hoffman et al., 2006; Holm-Denoma et al., 2008). Adams and Colner's research found that both male and female college students who lived in the residence halls had a greater intake of fruit and vegetables than students living off campus (2008). Brown et. al found that having a prepaid meal plan was related to increased intake of fruit, vegetables,

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and meat based on 3-day dietary assessments of 503 undergraduate students (2005). According to Holm-Denoma's research, women and men gained 3.5 and 4.0 lbs respectively in their first semester of college (2008). Hoffman found a mean weight increase of 2.86 pounds from fall to spring semester for college freshmen (2006). Despite the wide variety of studies that have been conducted related to collegiate dining, there has been little research on the social and psychological role of communal meals in collegiate dining centers.

Gender differences are often found in research that focuses on social support. Colarossi found that female adolescents reported having a greater number of supportive friends and receiving more frequent support from friends compared to male adolescents (2001). Numerous studies have demonstrated differences in GPA between males and females. Epstein's book*, Failing Boys, Issues in Gender and Achievement,* included material from many studies that have found males to have lower achievement (including GPA) compared to their female counterparts (1998).

The present study collected fall semester GPA for first-year freshmen in addition to data regarding perceived social support, dining center usage, and frequency of eating with others in a dining center. The purpose of this study was to investigate the possibility that communal meals in a collegiate dining center and eating with others may be related to perceived social support and GPA for first-year students living in the residence halls. This study will also explore potential differences in the aforementioned relationships between male and female participants.

METHODOLOGY

Elements of the Survey Instrument

A survey was created based on the primary variables of interest (frequency of eating in the dining center, frequency of eating with others, perceived social support, and GPA). The survey included 50 multiple choice questions. All questions were written by the primary researcher except for the questions in the final section of the survey which were part of the Short Form of the Interpersonal Relationship Inventory (Tilden, n.d.). The first 11 questions were used to collect demographic information including gender, year in college, race/ethnicity, extracurricular involvement, hall of residence, and number of roommates. The next section of the survey included 13 questions pertaining to the participant's university dining center usage. This section sought information including: number of meals eaten per week, number of meals taken out of the dining center to eat per week, and number of times per week one sat with friends at the dining center. This section also included four questions about how eating in the dining center made the student feel:

- Even though there are people sitting near you in the dining center, how often do you feel lonely or alone while in the dining center?
- When you are sitting alone in the dining center, how often do you feel lonely?
- Does eating in the dining center make you feel more socially connected?
- Does eating in the dining center make you feel less lonely?

The final section of the survey was the Short Form of the Interpersonal Relationship Inventory (Tilden, n.d.) used with permission from the author. The Short Form of the Interpersonal Relationship Inventory includes 26 Likert scale items. Thirteen of the items are summed to yield a social support score. The remaining 13 questions are used to calculate a conflict score. The Interpersonal Relationship survey was created in 1983 and has been validated and refined by a number of subsequent studies (Tilden & Stewart, 1985; Tilden & Galyen 1987; Tilden, Nelson, & May, 1990a; Tilden, Nelson, & May, 1990b; Weinert & Tilden, 1990; Tilden, Hirsch, & Nelson, 1994). This survey has been assessed for validity and reliability in samples including students, cancer patients , weight-control patients, HMO subscribers in health education classes, adults in the community, pregnant women, battered women, bereaved elderly, and active duty female service members (Tilden & Stewart, 1985; Tilden & Galyen 1987; Weinert & Tilden, 1990; Nayback-Beebe & Yoder, 2011).

The methodology for this project was approved by the Committee for Research Involving Human Subjects at Kansas State University.

Pilot Study

A pilot study was administered in paper format to 50 students at a dining center on a different part of campus than the primary study. Forty-six of 50 students completed the pilot survey. The population of college students surveyed in the pilot study did not overlap with the participant pool used for the primary study. Due to feedback from the pilot study, the order of the survey sections was reversed. The order of the sections for the final version of the survey was as follows: perceived social support (Interpersonal Relationship Inventory Short Form), followed by dining center usage information, and ending with demographic data. One question from the pilot study was not included in the final version of the survey because it was too similar to another question on the survey. Two questions (age and estimated first semester grade point average) were added to the demographic section of the final study. The final version of the survey included 50 multiple choice and one short answer question (age).

Data Collection

The final version of the survey was sent electronically to all first-year students living in one residence hall complex in early November, 2011. These students (n=1,554) received an email asking them to participate in a research survey about the dining centers and to grant access to their first semester GPA and dining center usage data. Participants were informed that, if they completed the survey, they would be entered in a prize drawing for free laundry money for the spring semester or gift cards redeemable at housing convenience stores. The survey remained open for one week. During that week two reminder emails with links to the survey were sent to students. Responses from participants answering a majority of the survey questions were included in the data analysis.

Independent Variables

The actual dining center usage data set was used to calculate average number of meals consumed per week for students who granted access to this information. For students who did not grant access to this information, the self-reported value for the question, "How many meals do you eat in the dining center in a typical week? Include breakfast, lunch, and dinner meals" was used as the meals per week data point. The frequency of eating with others was based on the response to the question, "How many times per week do you sit with friends in the dining center? Include breakfast, lunch, and dinner."

Dependant Variables

The actual first semester GPA issued by the university was used for all participants who granted access to this information. For participants who did not grant access to their first semester GPA and students whose actual GPA could not be obtained, an estimated GPA was imputed based on the student's self-reported first semester GPA and the actual GPA of other participants who self-reported the same GPA. Using this method, the researcher was able to obtain a valid

approximation of GPA for each participant. Perceived social support score was calculated based on the responses to questions on the Short Form of the Interpersonal Relationship Inventory (Tilden, n.d.).

Data Analysis

All data analysis was conducted using PASW Statistics 18, Release Version 18.0.0 (© SPSS, Inc., 2001, Chicago, IL, www.spss.com). Each of the following correlations was calculated once using all participants combined and a second time for males and females separately.

- Dining center usage x GPA
- Dining center usage x social support score
- Frequency of eating with others x GPA
- Frequency of eating with others x social support score
- Dining center usage x frequency of eating with others
- Social support score x GPA

In addition to these correlations, 2-way analysis of variance was used to test the following null hypotheses:

- Mean grade point averages for different levels of dining center usage by gender are not significantly different
- Mean social support scores for different levels of dining center usage are not significantly different by gender
- Mean grade point averages for different levels of frequency of eating with others are not significantly different by gender
- Mean social support scores for different levels of frequency of eating with others by gender are not significantly different

Preparing the Data for Analysis

Real dining center usage data was available for the majority of participants (n= 289). For students who did not grant access to this information (n=14), the self-reported value for question 10 ("How many meals do you eat in the dining center in a typical week? Include breakfast, lunch, and dinner meals.") was used as the meals per week data point. The correlation between actual meal usage and question 10 responses was 0.685 (p= 0.00) indicating a strong positive correlation.

The actual first semester grade point average issued by Kansas State University was used for all participants who granted access to this information (n= 266). For participants who did not grant access to their first semester grade point average (n=37) and students whose actual grade point average could not be obtained (n=20), an estimated grade point average was imputed based on the student's self-reported first semester grade point average and the actual grade point average of other participants who self-reported the same grade point average on the survey. For students who granted access to their grade point average, the correlation between actual grade point average and estimated grade point average was 0.702 (p=0.00). Using this method, the researcher was able to obtain a valid grade point average for all but one participant. Grade point averages ranged from 1.07 to 4.0.

Most participants fully completed the questions related to social support (n=298) and conflict (n=298). For the participants who responded to at least 10 of the 13 questions in a given section, the social support or conflict score was imputed based on the average response to the answered questions for that portion of survey.

RESULTS AND DISCUSSION

A total of 216 students completed the online survey. Since a sample size of a 309 was needed for adequate power (based on a population of 1553, an alpha of 5%, and a beta of 95%), paper copies of the final version of the survey were administered during lunch (n= 28) and dinner (n=61) two days after the online survey closed. Eighty nine additional paper surveys were completed by freshmen students living in the complex who had not completed the survey online, resulting in a total of 303 survey responses. The mean social support score and GPA were not significantly different for people who took the survey online and those who took the paper version (df=1; F= 0.069; p=0.79 and df=1; 0.524; p=0.47 respectively). Demographic variables for those who took the survey online versus in paper were very similar (Bauer, 2012). Therefore, data from participants who completed the survey online and data from participants who completed the paper format of the survey were combined and analyzed together.

Participant Demographics

In total, 303 participants completed at least 10 of the 13 questions for each scale on the Interpersonal Relationship Inventory. All participants were first-year students living in the residence hall complex. This sample was comprised of 61% females (n=209). Participant age ranged from 17-21 years, with an average age of 18.3 years. Most (85.1%) participants identified as Caucasian (n=285), 4.6% identified as African American (n=14), 4.6% identified as Asian (n=14), and 2.6% identified as Hispanic (n=8). Most (77.2%) participants reported living with one roommate.

Population Demographics

Sample demographics were representative of the population composition of all first-year students living in the complex in fall 2011. Of the first-year freshmen living in the complex at the time of the study, 59% were female and the average age was 18.4 years. Responses were distributed representatively among the halls. Halls with the highest and second highest number of first-year freshmen residents yielded the highest and second most survey responses, respectively. The majority of first-year freshmen students living on campus live in standard rooms with one roommate, which was also reflected in the sample. The racial-ethnic demographics of the population were not known, but the sample was representative of the overall demographics of university first-time freshmen students. In fall semester 2011, 79.0% of first-time freshmen self-identified as White, 5.15% as African American, 1.85% as Asian, and 5.77% as Hispanic (Kansas State University Fact Book, 2011).

Qualitative Findings

Four survey questions were constructed to gauge participants' feelings and perceptions of eating in the dining center.

1. "Even though there are people sitting near you in the dining center, how often do you feel lonely or alone while in the dining center?" Most participants (76.9%) reported they are rarely or never lonely when people are sitting near them in the dining center. A minority of participants (20.5%) reported they are sometimes or often lonely even when there are people sitting near them in the dining center. Males and females answered this question similarly.
2. "When you are sitting alone in the dining center, how often do you feel lonely?" About one-third (32.0%) of participants reported they are sometimes or often lonely when sitting alone in the dining center, and 43.6% of participants reported they were rarely or never lonely when sitting alone in the dining center. Nearly a quarter (23.8%) of participants indicated they "never sit alone in the dining center." Females were more likely to report often or sometimes feeling lonely. Males were more likely to report rarely or never being lonely when sitting alone.
3. "Does eating in the dining center help you feel more socially connected?" The majority of participants (62.4%) indicated that eating in the dining center made them feel more socially connected. Only 11.2% of respondents indicated that they did not feel that eating in the dining center made them feel more socially connected. Males and females responded similarly to this question with a slightly larger percentage of females giving a response of "unsure."

Table 1: Summary of Correlations for All Participants

		Grade Point Average	Social Support Score	Dining Center Usage	Eat With Others
Grade Point Average	Pearson Correlation	1	0.162	0.221	0.086
	Sig. (2-tailed)		0.005*	0.000*	0.138
	N	303	301	303	301
Social Support Score	Pearson Correlation	0.162	1	-0.019	0.184
	Sig. (2-tailed)	0.005		0.745	0.001*
	N	301	301	301	300
Dining Center Usage	Pearson Correlation	0.221	-0.019	1	0.468
	Sig. (2-tailed)	0	0.745		0.000*
	N	303	301	303	301
Eat With Others	Pearson Correlation	0.086	0.184	0.468	1
	Sig. (2-tailed)	0.138	0.001	0	
	N	301	300	301	301

*Significant relationships

4. "Does eating in the dining center help you feel less lonely?" Almost half (44.9%) of participants answered yes, 28.4% were unsure, and 26.1% reported eating in the dining center did not help them feel less lonely at all. Males and females responded similarly to this question with a slightly larger percentage of female respondents indicating they were unsure if eating in the dining center helped them feel less lonely.

Quantitative Findings

Dining Center Usage x GPA: The correlation for the relationship between dining center usage and GPA for all students was 0.221 (p=0.000) indicating a significant positive relationship between dining center usage and GPA for the sample as a whole (See Table 1). A significant positive relationship was also noted for males alone (r=0.306, p=0.003) and females alone (r=0.291, p=0.000) (See Table 2 & Table 3). There was no interaction between gender and dining center usage (df=3; F=0.728; p=0.536). The means of GPA for the different levels of dining usage were statistically significant (df=3; F=9.576; p=0.048). The mean GPA for the different levels of dining usage for males and females was significantly different (df=1; F=29.046; p=0.005) with females having a higher GPA than males.

Dining Center Usage x Perceived Social Support: Dining center usage and perceived social support were not significantly correlated for the combined group (r= -0.019, p=0.745), males alone(r=0.082, p=0.429), or females alone(r= -0.005, p= 0.946) (See Table 1, Table 2, & Table 3). There was no interaction between gender and dining center usage (df=3; F=0.958; p=0.413). Means of social support scores for the different levels of dining center usage were not statistically significant (df=3; F=0.254; p=0.855). Means for different levels of dining usage for males and females were not statistically significant (df=1; F=6.843; p=0.060).

Frequency of Eating with Others x GPA: The correlation for the relationship between frequency of eating with others and GPA for all students was not significant (r=0.086, p=0.138) (See Table 1). However, when looking at males and females separately, significant relationships were noted. For males alone, the Pearson Coefficient was 0.206 (p=0.046) and for females alone the correlation was 0.162 (p=0.020) (See Table 2 & Table 3). There was no interaction between gender and frequency of eating with others (df=4; F=0.468; p=0.759). The means of GPA for the different levels of eating with others were not statistically significant (df=4; F=3.690; p=0.117). The means for the different levels of eating with others for males and females were statistically significant (df=1; F=21.100; p=0.000) with females having a higher GPA than males.

Frequency of Eating with Others x Social Support: There was a significant positive correlation between the frequency of eating with others and social support for all students (r=0.495, p=0.000), males alone (r=0.325, p=0.001), and females alone (r=0.458, p=0.000) (See Table 1, Table 2, & Table 3). There was no interaction between gender and frequency of eating with others (df=4; F=0.677; p=0.608). The means of the social support scores for the different levels of eating with others were not statistically significant (df=4; F=4.533; p=0.086). The means for the different levels of eating with others for males and females were statistically significant (df=1; F=11.632; p=0.005) with females having a higher average perceived social support score than males.

Table 2: Summary of Correlations for Females

		Grade Point Average	Social Support Score	Dining Center Usage	Eat With Others
Grade Point Average	Pearson Correlation	1	0.219	0.291	0.162
	Sig. (2-tailed)		0.002*	0*	0.02*
	N	209	207	209	207
Social Support Score	Pearson Correlation	0.219	1	-0.005	0.264
	Sig. (2-tailed)	0.002		0.946	0*
	N	207	207	207	206
Dining Center Usage	Pearson Correlation	0.291	-0.005	1	0.458
	Sig. (2-tailed)	0	0.946		0*
	N	209	207	209	207
Eat With Others	Pearson Correlation	0.162	0.264	0.458	1
	Sig. (2-tailed)	0.02	0	0	
	N	207	206	207	207

*Significant relationships

Table 3: Summary of Correlations for Males

		Grade Point Average	Social Support Score	Dining Center Usage	Eat With Others
Grade Point Average	Pearson Correlation	1	-0.058	0.306	0.206
	Sig. (2-tailed)		0.579	0.003*	0.046*
	N	94	94	94	94
Social Support Score	Pearson Correlation	-0.058	1	0.082	0.218
	Sig. (2-tailed)	0.579		0.429	0.035*
	N	94	94	94	94
Dining Center Usage	Pearson Correlation	0.306	0.082	1	0.325
	Sig. (2-tailed)	0.003	0.429		0.001*
	N	94	94	94	94
Eat With Others	Pearson Correlation	0.206	0.218	0.325	1
	Sig. (2-tailed)	0.046	0.035	0.001	
	N	94	94	94	94

*Significant relationships

CONCLUSIONS AND APPLICATIONS

The results of this research suggest there are significant relationships between variables of interest measured and analyzed in this study. There was a positive correlation between frequency of eating in a collegiate dining center and GPA for the sample as a whole and for males and females alone. Frequency of eating with others in a collegiate dining center setting was positively correlated to the GPA for males and females alone, but not the sample as a whole. Frequency of eating with others in a collegiate dining center setting was positively correlated to perceived social support score for the sample as a whole and males and females alone.

A positive relationship was noted between frequency of eating in the dining center and frequency of eating with others for all participants and males and females alone. Because most participants reported typically dining with others, it is generally the case that the more one eats in the dining center, the more one eats with other people. Although the variables of frequency of eating in the dining center and frequency of eating with others seem similar, it is important to note that these two variables measured different aspects of the dining experience. This is supported by the differing relationships between these variables and perceived social support. Perceived social support was found to be related to eating with others, but not related to frequency of eating in the dining center.

In addition to noted differences in GPA, there are also differences in perceived social support between genders, with females having higher perceived social support scores than males. Dining center usage is positively related to GPA. Frequency of eating with others is positively related to GPA and perceived social support. These relationships lend support to the underlying hypothesis that eating in the dining center and eating with others is related to positive mental health and wellbeing. More research is needed to determine if dining center usage and/or eating with others is causally related to social support and/or higher academic achievement.

Study Strengths

Completing a pilot study with participants who did not overlap with the primary population of interest ensured that the sample for the main study was not contaminated. The feedback and data from the pilot study were useful in determining questions that could be deleted, questions that needed to be added, and organizing the survey to have a better flow. The final version of the survey was administered to the target population at an ideal time in the academic year. Surveys were completed in early November 2011. This time frame for survey completion was planned to be late enough in the year that students had established dining habits. If the survey was administered any later in the semester, students may have been distracted by Thanksgiving break or finals. This could have resulted in a much lower response rate or disruption of typical dining habits.

Participants who completed the survey were a good representation of the population of interest. The proportion of males and females who completed the survey was nearly identical to the gender ratio in the residence hall complex. Similarly, the number of respondents from each hall was proportionally consistent with the number of first-year students who were living in the hall at the time of the survey. The racial/ethnic composition of the sample reflected the overall population of first-time freshmen students at the university.

Study Limitations

The overall number of survey respondents was six participants (2%) short of the power calculation. Having a higher survey response rate would have strengthened the findings in this study. The fact that some of the students did not complete every question on the survey is also a weakness. It would have also been desirable to have more male survey respondents. However, the percentage of male respondents (39%) was consistent with the demographic of the population (41% male). It would also have strengthened the results if data had been collected at multiple institutions of higher education to determine if the results of this study are applicable to college freshmen as a whole.

The most important weakness of this study is that it reflects analysis of data collected at only one point in time. Without collection of data at multiple points in time, it is impossible to determine a potential direction of causality within these relationships. Another limitation of this study is that response to the survey was voluntary. There may have been response bias and differences between those who responded to the survey and those who did not respond. It is possible that students with higher GPAs were more likely to participate in the survey, which could have skewed survey results. If more studies are conducted on this topic, it may be helpful to control for GPA when conducting the data analysis.

Implications

The present study can be used as support for the benefits of communal dining and eating in the collegiate dining center. More than 60% of participants surveyed indicated that eating in the dining center made them feel more socially connected. Almost half (44.9%) of the participants in this study indicated that eating in the dining

center helped them feel less lonely. Colleges, universities and dining centers could use this information as an additional selling point for collegiate dining center meal plans. Academic advisors and success coaches could also use this information as another tool to help students acclimate and academically achieve in college.

Additional research is needed to clarify the relationships of interest in the present study. It could be that people who feel more socially supported to begin with are more likely to eat with others in college. It is equally plausible that people feel more socially supported when they eat with others. An intervention-type study could better explain this relationship.

Similarly, an intervention could be conducted to further clarify the relationship between frequency of eating in the dining center and GPA. It would be difficult to conduct this study with students already living and eating in the dining center. However, if a group of off-campus students agreed to eat at the dining center a certain number of times per week and GPA data were collected at the start and finish of the study, changes in GPA could be investigated. This type of study would probably be time and cost prohibitive since GPA is only assigned twice a year. Classes and many other aspects of college life change semester to semester. Therefore, it would be nearly impossible to design and implement an experiment to demonstrate that a single variable such as frequency of eating in the dining center *causes* students to have a higher GPA.

The sample of participants in the present study was comprised of first-year students living the residence halls at a single mid-western university. Similar research would need to be conducted at multiple institutions of higher education to be able to generalize the findings of this study to first-year college students in the United States as a whole. It would be helpful for future research to include off-campus students and upperclassmen to see if the relationships found in the present study could be extrapolated to the larger population of university students. This research marks some of the first investigations into the relationship between eating with others in a collegiate dining center setting and psychological and academic outcomes in college students. Although this research leaves many unanswered questions, it can be used as background and fuel for further research in this field.

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Research Contribution

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EFFECTIVENESS OF FOOD SAFETY MANAGERIAL TRAINING: FACE-TO-FACE OR COMPUTER-BASED DELIVERY

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ABSTRACT

Because cases of foodborne illnesses are estimated to exceed 40 million each year, current and future managers of retail foodservices must understand their role in training employees about food safety and influencing the work culture to ensure knowledge is practiced. Two educational modules to aid managers in motivating employees and establishing a positive food safety culture were tested among industry managers: recognition and discipline and communication. The effectiveness of two delivery methods, face-to-face and computer -based training, was also assessed with knowledge based questions and attitude statements. Mixed findings from participants (mostly over 30 years of age) regarding effectiveness of delivery method illustrate there is no "one best way" to providing training to managers.

Keywords: food safety, managers, motivation, training methods

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INTRODUCTION

Persons in charge of retail foodservices have the responsibility of training employees about food safety and monitoring their behaviors to ensure safe food handling practices are followed (U.S. Food and Drug Administration [FDA], 2009). However, research has found a gap between employees' food safety knowledge and application of this knowledge in day-to-day operations (Clayton, Griffith, Price, & Peters, 2002; Henroid & Sneed, 2004). Barriers to following safe food handling behaviors have been identified, including lack of infrastructure and employee motivation (Roberts et al., 2008; York et al., 2009).

The benefits of employee food safety training have been explored in several studies, although results have been inconsistent. Several studies have found that training helps to improve overall employee knowledge of food safety (Costello, Gaddis, Tamplin, & Morris, 1997; Lynch, Elledge, Griffith, & Boatright, 2005; Roberts et al., 2008), while other studies have found that training is not consistently associated with improved knowledge (Egan et al., 2007; Pilling et al., 2008).

Studies have also found that food safety training is positively associated with increased food safety inspection scores (Cotterchio, Gunn, Coffill, Tormey, & Barry, 1998; Noble, Griffith, Thompson, & MacLaurin, 2009; Smith & Shillam, 2000) and self-reported changes in food safety practices (Clayton et al., 2002). Observational research has found that actual behaviors consistently fall short of Food Code recommendations (FDA, 2000, 2004, & 2009; Strohbehn et al., 2008). Recently, researchers have begun to explore the link between knowledge and behavior. Roberts et al. (2008) explored food safety knowledge and behaviors of foodservice employees after employees completed a four-hour training class based on the ServSafe® food handler program. The researchers focused on the top three factors that contribute to foodborne illness: improper holding temperatures, poor personal hygiene, and cross contamination. Using a sample of 160 employees, the researchers found that even though overall employee knowledge improved, behavioral compliance remained low after the knowledge training, with little significant improvement.

Management culture is important in assuring safe food practices are followed (Griffith et al., 2010; Yiannas, 2008). Emerging research is highlighting the role of management in establishing an organization's food safety culture. One model to explain foodservice employees' motivation for following safe food handling practices was proposed by Arendt and Sneed (2008), with subsequent testing and refinement (Arendt, Ellis, Strohbehn, & Paez, 2011; Ellis, Arendt, Strohbehn, Meyer, & Paez, 2010). The initial model proposed supervisors had key responsibilities related to: 1) establishing policies and standards; 2) fulfilling expectations of accountability; 3) serving as role models; 4) controlling rewards and punishment; 5) providing training; and 6) providing resources. Using a mixed methods approach with qualitative (focus groups) and quantitative (national survey) data collected from nonsupervisory employees, current managers, and future managers, some of the challenges to following safe food practices were identified. Findings included inconsistent or unclear messages, lack of rewards/discipline, lack of resources, and need for internal motivation (Arendt et al., 2011). The need for training available in multiple forms of delivery was also identified (Roberts, Arendt, Strohbehn, Ellis & Paez, 2012). The refined model identified four clusters of motivators: internal drivers, recognition and discipline, communication and resources.

Research has investigated training delivery preferences and effectiveness among those working in retail foodservices. One study of school foodservice managers and line employees found a continued preference for face-to-face training (Sullivan, Harper & West, 2001), whereas Costello et al. (1997) found quick service managers receiving computer-based food safety training scored higher on food safety knowledge tests than those receiving the same content via face-to-face lecture. However, as new generations enter the workforce and Generation X and Y assume managerial roles, fewer challenges associated with computer-based training are present. Wilson (2007) found in her survey of hourly school foodservice staff in six Midwestern states that over 80% of the 671 employees owned a computer and "surfed" the Internet. Rajagopal

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and Strohbehn (2011) reported hospitality college students' mean attitude ratings of the delivery mechanism of podcasting for a class assignment at 3.54 on a 5 point scale, indicating favorable views toward the "anytime anywhere" availability of this method. While students may have perceived other advantages of the access to resources such as podcasts, those reasons were not explored.

Those involved in providing food safety education and training to new generations in the workforce must recognize the need to establish a workplace culture that motivates employees to practice safe food handling behaviors. Those who provide training should understand the importance of incorporating new and changing technologies into the training sessions and consider the effectiveness of different methods of information delivery. Thus, the objective of this study was to compare effectiveness of two delivery methods of a research based SafeFood© Motivators Tool Kit for managers. Effectiveness was assessed based on knowledge gain and attitude change. The two methods of delivery of the two modules in the Tool Kit (which focused on topics of Recognition and Discipline and Communication) were face-to-face and computer-based instruction. An industry roll out of the modules was held through a workshop for managers in retail foodservices in Iowa. At the workshop, an assessment of the effectiveness of the modules and delivery modes was conducted.

METHODS

One outcome from past research (Arendt & Sneed, 2008; Arendt et al., 2011; Ellis et al., 2010; & Roberts et al., 2012) was the development of the SafeFood© Motivators Tool Kit, which consists of two versatile education modules on topics of Recognition and Discipline and Communication. The modules were developed for managers to improve their ability to establish a work culture of food safety and motivate employees to practice safe food handling. Each module consisted of six components: Pre-assessment; Checklist (self-assessment); Case Studies; Narrated Power Point Presentation; Standard Operating Procedures (SOPs)/Best Practices; and Post-assessment. Stated objectives of the modules are for managers to 1) use effective (oral and written) communication to motivate employees to use safe food handling behaviors; 2) identify ways to consistently communicate appropriate food safety behaviors to employees; 3) describe ways in which the managers can serve as a role model to employees using nonverbal communication; 4) identify informal and formal disciplinary strategies and how this might be used as motivators, and 5) describe different ways to recognize employees who exhibit safe food handling behaviors.

Each module is available in two delivery modes: a self-contained tool kit with printed materials or a computer based version. A comprehensive four-phase review process, which included input from academic experts, industry practitioners, and students, was conducted with each of the educational modules prior to industry roll out. In this four-phase review, the Tool Kit was evaluated by knowledgeable colleagues, interviews were conducted with supervisors and students, managers in commercial and noncommercial foodservices reviewed the modules, and a final check was made by industry professionals and students. The SafeFood© Motivators Tool Kit including both modules is available at www.iowafoodsafety.org. Figure 1 presents an example of the on-line version of the Recognition and Discipline Module. The Institutional Review Board approved all materials and protocols used in data collection. The workshop to introduce both delivery formats of the final version of the SafeFood© Motivators Tool Kit to managers from retail foodservices in Iowa was held in October of 2010.

Recruitment of participants

Multiple methods were used to disseminate information about the workshop to reach as broad an audience as possible, including promotional flyers distributed by foodservice health inspectors, direct marketing to foodservices/restaurants and at professional meetings. Those interested in attending confirmed a reservation and identified preferred method of training: face-to-face or computer-based instruction. The workshop was held in a central location of the state from noon to 4 PM. Participants received mileage reimbursements and lunch.

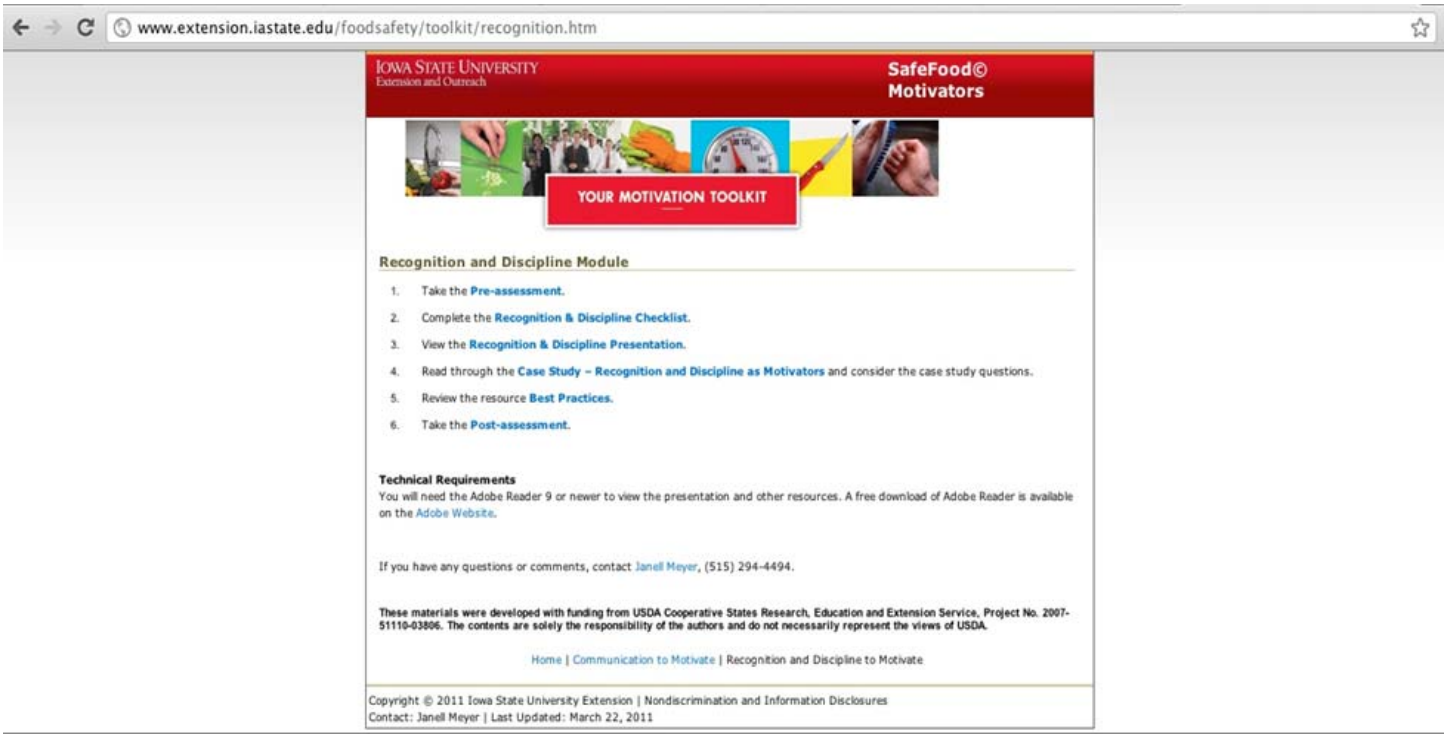

Figure 1. SafeFood© Motivators On-line Module

Note. Example of on-line module main page which allows viewers to preview the six components of the module

Workshop format

The 41 participants who attended the workshop completed a short demographic questionnaire about themselves (age, work title, number of years work experience in foodservice) and their work organizations (type and size) as they registered. Participants were from 23 commercial and noncommercial foodservices and a representative from the state restaurant association.

The workshop began with a welcome to all participants and an overview of the project. In addition, the components of each module were shown: Pre-assessment; Checklist; Case Studies; Narrated Power Point Presentation; SOPs/Best Practices; and a Post-assessment. All participants filled out the pre-assessment for each module and these were turned in as their "tickets" to the buffet lunch. See Appendix A for the Pre and Post Module Assessment.

Five multiple choice knowledge questions related to Recognition and Discipline and ten about Communication were presented on the pre- and post-module assessment using a multiple choice format. The difference in number of questions was due to extent of module content. Recognition and Discipline knowledge questions asked about internal and external types of rewards and benefits to implementing recognition and discipline procedures and programs. Communication knowledge questions asked about purposes and use of SOPs, types of communication, and barriers to effective communication.

Positively and negatively phrased attitude statements were presented on the pre- and post-module assessment with 15 statements related to Recognition and Discipline and 17 items about Communication. A five-point Likert-type rating scale was provided with 1 = Strongly Disagree and 5 = Strongly Agree.. An example of an attitude

Table 1: Characteristics of Participants

Characteristics[a]	Overall (n = 41)	By training method: Face-to-Face (n = 21)	By training method: Computer (n = 20)
Gender			
Female	27 (65.9%)	17 (80.9%)	10 (50.0%)
Male	12 (29.3%)	3 (14.3%)	9 (45.0%)
Age			
18-21 years	1 (2.4%)	0 (0%)	1 (5.0%)
22-25 years	1 (2.4%)	0 (0%)	1 (5.0%)
26-30 years	3 (7.3%)	1 (4.8%)	2 (10.0%)
31-40 years	15 (36.6%)	5 (23.8%)	10 (50.0%)
41-50 years	9 (22.0%)	4 (19.0%)	5 (25.0%)
51-60 years	6 (14.6%)	6 (28.6%)	0 (0%)
Over 60 years	5 (12.2%)	5 (23.8%)	0 (0%)
Years of experience in foodservice			
Less than 1 year	1 (2.4%)	0 (0%)	1 (5.0%)
1-3 years	1 (2.4%)	0 (0%)	1 (5.0%)
4-7 years	4 (9.8%)	2 (9.5%)	2 (10.0%)
8-12 years	11 (26.8%)	5 (23.8%)	6 (30.0%)
13-20 years	15 (36.6%)	6 (28.6%)	9 (45.0%)
Over 20 years	8 (19.5%)	8 (38.1%)	0 (0%)
Type of foodservice operation where currently working[b]			
Restaurant	15 (36.6%)	7 (33.3%)	8 (40.0%)
Hospital or nursing home	12 (29.3%)	6 (28.6%)	6 (30.0%)
School	7 (17.1%)	6 (28.6%)	1 (5.0%)
Other	6 (14.6%)	2 (9.5%)	4 (20.0%)
Length of time worked at current operation			
Less than 1 year	7 (17.1%)	6 (28.6%)	1 (5.0%)
1-3 years	6 (14.6%)	1 (4.8%)	5 (25.0%)
4-7 years	6 (14.6%)	3 (14.3%)	3 (15.0%)
8-12 years	9 (22.0%)	4 (19.0%)	5 (25.0%)
13-20 years	6 (14.6%)	4 (19.0%)	2 (10.0%)
Over 20 years	4 (9.8%)	3 (14.3%)	1 (5.0%)
Length of time supervisory/ management responsibilities			
Less than 1 year	3 (7.3%)	2 (9.5%)	1 (5.0%)
1-3 years	3 (7.3%)	0 (0%)	3 (15.0%)
4-7 years	9 (22.0%)	5 (23.8%)	4 (20.0%)
8-12 years	9 (22.0%)	3 (14.3%)	6 (30.0%)
13-20 years	12 (29.3%)	8 (38.1%)	4 (20.0%)
Over 20 years	3 (7.3%)	3 (14.3%)	0 (0%)
Supervisory/management experience			
Prior to current operation	11 (26.8%)	6 (28.6%)	5 (25.0%)
Only at current operation	29 (70.7%)	15 (71.4%)	14 (70.0%)

[a]Responses may not equal 100% due to non-response
[b]In addition to the primary workplace, four participants had a secondary workplace

statement related to Recognition and Discipline was "Every employee is motivated by the same rewards" while an example of an attitude statement from the Communication pre- and post-assessment was "Written SOPs for procedures such as handwashing are not needed".

Participants were assigned, based on preferences indicated when registering for the workshop, to one of two delivery modes for completion of the modules: a method of face-to-face or computer-based instruction. Those in the computer group relocated to a computer lab while those in the face-to-face group stayed in the original meeting room. Each of the two trainings was facilitated by two members of the research team and co-developers of the Tool Kit, following establishment of presentation protocols.

The two groups reconvened for closing comments and to complete a workshop evaluation. The workshop evaluation consisted of ten Yes/ No questions. Each participant received a SafeFood© Motivators Tool Kit for use in his/her work organization at the end of the workshop.

Description of face-to-face training

Twenty-one people from the entire group of 41 participants went through the Tool Kit modules in a face-to-face setting. This group began the training with an explanation and demonstration of the Tool Kit by facilitators. Next, this group completed the Communication Checklist (a self-assessment of behaviors related to the topic) using paper and pencil. The Checklists were collected before the narrated Power Point presentation with video clips shown. After this, trainers facilitated a case study based discussion related to the topic of Communication and the important role SOPs play. Participants then completed the Communication post-module assessment using paper and pencil. (See Appendix A). Following collection of Communication post-module assessments, the narrated Power Point presentation with video clips on the topic of Recognition and Discipline was shown. Because of time constraints, not all components of the Recognition and Discipline module were completed in face-to-face instruction, such as the Checklist or self-assessment of behaviors related to this module topic. Participants responded to discussion questions based on a case study which was a real-life scenario related to Recognition and Discipline. Following completion of these components of the module, participants completed the Recognition and Discipline post-module assessment. (See Appendix A).

Description of computer-based training

Following a short walk to the computer lab, the 20 participants in this group received passwords to log in to the computers. Each attendee determined which module to complete first following the instructed sequence of first completing the checklist before viewing the narrated Power Point presentation with video clips, responding to the case study's discussion questions; and lastly, completing the post-module assessment. About half of the participants in the computer training section self-selected the Communication module as their first choice while others completed the Recognition and Discipline module.

DATA ANALYSIS

Demographic information about participants, pre- and post-module assessments' knowledge scores and attitude ratings, and evaluations of the workshop were analyzed using SPSS (Windows Version 18.0, 2009). Frequencies of correct responses to the knowledge questions were calculated for all participants and by attendees in the two training groups before and after the instruction. Frequencies, means, and standard deviations of the attitude ratings were calculated for all participants and by attendees in the two training groups pre- and post -workshop. Overall mean attitude ratings were also calculated for each module topic with alpha reliability coefficients determined. Negative phrased statements were reverse coded for calculating overall mean ratings for each module topic and alpha coefficient of reliability. The minimum alpha value of 0.60 was used and deemed to be acceptable for newly developed measurement (Gamble, 1999; Nunnally, 1978). Independent sample *t*-tests analysis was conducted to compare participants' mean attitude ratings between pre- and post -workshop and between the two training modes.

RESULTS AND DISCUSSION

Profile of participants

At least a portion of the workshop evaluation and the pre- and post-module assessments were completed by 39 participants. Table 1 shows characteristics of the participants who completed the modules and assessments. Of the 39 individuals who completed the assessments, 27 were female and 12 were male. Of the age groups listed, the majority were in the 31- 40 years of age category. Twenty-eight of respondents identified their work sites with 60% of these indicating a commercial operation and the rest various onsite foodservice types. All attendees had supervisory responsibilities such as owner (n = 7), manager/chef (n = 19), supervisor/sous chef (n = 11), director (n = 2), or administrator (n = 2). The length of time reported as a supervisor or manager ranged from less than one year to over 20 years. Average length of time at current work location was 9 years, with a range of 1 month to 23 years.

Evaluation of workshop

Table 2 shows responses to yes/no questions on the workshop evaluation form regarding whether the instructional style used and the tool kit were helpful. A majority (95%) of participants indicated the instructional style used in the tool kit helped them to learn and that they would be inclined to use the tool kit information posted on the web and 90% noted they would be inclined to use this tool kit. Just over half (58%) of the participants indicated they would attend the workshop, even if there is a charge to participate in this workshop. However, 87% indicated the workshop did change their attitudes about the role they play in motivating employees to follow

Table 2. Participants' Evaluation of Workshop

	Yes		No	
Evaluation items	**n**	**%**	**n**	**%**
Facilitator was effective	38	97	1	3
The location was accessible	38	97	1	3
Adequate time was allotted for the workshop	38	97	1	3
Instruction style helped me learn	37	95	2	5
Inclined to use Tool Kit information on the web	36	95	2	5
Attending this workshop was valuable	35	95	2	5
Inclined to use this Tool Kit	34	90	4	10
Changed my attitudes	34	87	5	13
Opportunities to learn this information other sources	23	59	16	41
I would pay a fee to come to this workshop	22	58	16	42

TABLE 3. Participants' Correct Responses on Knowledge Assessment by Training Method

Knowledge items	Pre-assessment correct responses	Post-assessment correct responses by training method[a]	
		Face-to-Face	Computer
Recognition and Discipline Module	(n = 39)	(n = 21)	(n = 15)
External reward example	37 (94.9%)	19 (90.5%)	14 (100.0%)
Internal reward example	33 (84.6%)	18 (85.7%)	15 (100.0%)
Consequences of rewarding employees safe food handling behaviors	32 (82.1%)	18 (85.7%)	9 (60.0%)
Precaution when using recognition or discipline as motivators	30 (76.9%)	14 (66.7%)	12 (80.0%)
Effect of discipline on employee's motivation	28 (71.8%)	12 (57.1%)	13 (86.7%)
Communication Module	(n = 40)	(n = 21)	(n = 20)
The best way to communicate proper handwashing to an employee who did not speak English as his/her first language	40 (100%)	20 (95.2%)	18 (100%)
Type of communication when a supervisor leaves a written note	39 (97.5%)	18 (85.7%)	18 (94.7%)
Steps in the flow of food which would not require an SOP	38 (65%)	21 (100%)	16 (100%)
Problem employees typically voice regarding supervisor communication	37 (92.5%)	21 (100.0%)	19 (100%)
Area which requires an SOP	37 (92.5%)	18 (85.7%)	19 (100%)
Emotional barrier to communication	36 (90%)	17 (85.0%)	19 (100%)
The usefulness of Standard Operating Procedures (SOPs) to management	33 (82.5%)	18 (85.7%)	19 (95%)
Situations which require food safety SOPs in a retail foodservice organization	33 (82.5%)	21 (100%)	17 (85.0%)
Minimum period for reviewing food safety SOPs with trained employees	27 (67.5%)	12 (57.1%)	9 (47.4%)
Factors of communication barrier	14 (35%)	12 (60%)	13 (68.4%)

[a]Percentage of correct responses was calculated based on the total number of participants who responded to specific questions; answered correctly/total number of responses. The total number of responses varied for each knowledge item due to missing data.

safe food handling practices and 95% indicated attending the workshop was a valuable experience.

Knowledge scores

Correct responses to knowledge based questions about Recognition and Discipline and Communication on the pre- and post-module assessments by method of workshop training are shown in Table 3. Knowledge scores about the usefulness of SOPs increased for all participants regardless of type of training used with 33 of the participants (82.5%) responding correctly pre-assessment and 37 (90.2%) providing the correct answer after the training. However, a higher percent of those using computer-based method of training answered correctly after the workshop with 95% compared to 85.7% of those in face-to-face group. An increase in knowledge about situations in which it was best to communicate using SOPs was also noted with 82.5% of all participants indicating the correct response on pre-module assessment compared to 92.7% on the post. Yet for this question, 100% of the face-to-face group responded correctly on the post-training assessment whereas only 85% in the computer group did so. Overall, a higher percentage of participants using computer-based method of training answered correctly most questions in Recognition and Discipline and Communication post-assessments as compared to those receiving face-to-face training.

Attitude ratings

In one section of the pre- and post-module assessment, participants rated their attitudes to positively and negatively phrased statements on the topics of recognition and discipline (15 items) and communication (17 items) using a 5-point Likert-type scale (1 = Strongly disagree; 5 = Strongly agree). Negatively phrased statements were reverse coded in calculation of overall mean ratings for categories and alpha reliability coefficient. Table 4 shows means and standard deviations for pre-module assessments for all workshop participants and mean ratings on post-module assessments by training method (face-to-face or computer-based instruction). An overall pre-assessment mean rating of 3.85 ± 0.33 with an alpha reliability coefficient of 0.68 was calculated for the Recognition and Discipline attitude statements. An overall mean rating of 3.80 ± 0.40 (with an alpha reliability coefficient of 0.72) was calculated from the post-workshop assessment data, indicating little change. However, the overall post-workshop mean rating of Recognition and Discipline attitude statements for those who received face-to-face training was 3.84 ± 0.41 while those in the computer-based training section had an overall mean rating of 3.73 ± 0.38. Participants indicated more favorable attitude toward Communication post workshop (mean rating for all 17 items of 4.07 ± 0.36 with alpha reliability coefficient of .75) than pre-workshop (mean rating of 3.99 ± 0.32 with alpha reliability coefficient of .67). Those in the face–to-face group provided an overall post-workshop mean rating of 4.13 ± 0.41 while participants receiving computer-based training had an overall mean rating of 4.00 ± 0.29.

Recognition and discipline module

The item rated most positively by all participants before completion of the recognition and discipline module was, "I like my job" (*M* = 4.59 ± .50) while the pre-assessment items rated lowest were two negative phrased statements: "I dislike the employees I supervise" (*M* = 1.33 ± 0.62) and "It does not matter how I behave at work because employees will do what they want to despite my actions" *(M* = 1.54 ± 0.60). These findings suggest most participants enjoyed a positive work environment, which may have impacted their perceptions of the module's effectiveness. Workshop participants in both groups rated the item of "I like my job" highest post-module, with a mean rating of 4.40 ± 0.68 by the face-to-face group participants and a mean rating of 4.36 ± 0.67 by those in the computer group.

Significant differences were found between participants' mean ratings pre- and post-workshop and between participants in each training group for two items. "The employees who work for me should be punished when they do something wrong" statement was rated significantly higher ($p \leq .05$) by all participants after the workshop (*M* = 3.15 ± 0.97) than before (*M* = 2.63 ± 0.88) and by those who completed computer-based training (*M* = 3.58 ± 0.52) than by those who received face-to-face training (*M* = 2.90 ± 1.09). The statement, "If employees were paid more for handling food

Table 4. Mean and Standard Deviations of Participants' Attitude Ratings by Delivery Method

	Mean ± standard deviation of attitude ratings[a]		
		Post-assessment by training method	
Attitude items	**Pre-assessment**	**Face-to-Face**	**Computer**
Recognition and Discipline Module	(n = 39)	(n = 21)	(n = 15)
1. I like my job	4.59 ± 0.50	4.40 ± 0.68	4.36 ± 0.67
2. I serve as a role model to my employees by my actions[c]	4.41 ± 0.64	4.38 ± 0.60	3.83 ± 0.94
3. If I had a good recognition system in place, all of my employees would be motivated	3.28 ± 0.79	3.43 ± 0.98	3.50 ± 0.80
4. I try to avoid disciplining my employees	2.67 ± 0.96	2.76 ± 1.04	2.46 ± 0.97
5. When something goes wrong, it is usually my fault, not my employees	2.66 ± 0.78	2.48 ± 0.81	2.58 ± 0.52
6. The employees who work for me should be punished when they do something wrong[bc]	2.63 ± 0.88	2.90 ± 1.09	3.58 ± 0.52
7. If I reward one employee, I feel like I need to reward them all	2.47 ± 0.83	2.38 ± 0.81	2.31 ± 0.86
8. It's easier to do something myself than to get one of my subordinates to do it	2.47 ± 0.80	2.19 ± 0.98	2.75 ± 0.75
9. If employees were paid more for handling food safely, they would do it[b]	2.46 ± 1.02	2.95 ± 1.16	3.57 ± 0.94
10. Every employee is motivated by the same rewards	1.87 ± 0.98	2.10 ± 1.04	1.77 ± 0.44
11. I believe that rewarding employees has no effect on their work performances	1.87 ± 0.80	1.70 ± 0.57	1.77 ± 0.44
12. It's impossible to give someone a reward at my workplace	1.77 ± 0.84	1.90 ± 0.70	1.92 ± 0.52
13. I plan to leave my job sometime within the next year	1.72 ± 0.94	1.76 ± 0.89	1.67 ± 0.89
14. It does not matter how I behave at work because employees will do what they want to do despite my actions	1.54 ± 0.60	1.67 ± 0.73	1.85 ± 0.56
15. I dislike the employees I supervise	1.33 ± 0.62	1.63 ± 1.01	1.60 ± 0.52
Overall mean attitude ratings[d]	**3.85 ± 0.33**	**3.84 ± 0.40**	**3.73 ± 0.32**
Communication Module	(n = 40)	(n = 21)	(n = 20)
1. Through my actions, I can serve as a role-model to my employees	4.58 ± 0.78	4.43 ± 0.93	4.41 ± 0.51
2. How I communicate with my employees can serve as a motivator for them	4.44 ± 0.50	4.33 ± 0.91	4.41 ± 0.51
3. I like my job	4.42 ± 0.69	4.43 ± 0.60	4.26 ± 0.56
4. Written Standard Operating Procedures (SOPs) will help me as a manager instill a culture of food safety in the work place	4.14 ± 0.42	4.19 ± 0.87	4.17 ± 0.38
5. I believe written policies help employees practice safe food handling	4.06 ± 0.67	4.33 ± 0.48	4.05 ± 0.71
6. I enjoy working with others who are different from me	4.00 ± 0.76	4.00 ± 1.10	4.18 ± 0.53
7. Availability of written SOPs will help me do my job as a supervisor better[b]	3.83 ± 0.89	4.33 ± 0.48	4.32 ± 0.48
8. I believe I can influence my subordinates by talking nicely to them	3.83 ± 0.88	4.05 ± 0.74	4.26 ± 0.56
9. Written SOPs make me more confident so safe food handling practices are followed in my work situation	3.78 ± 0.64	4.10 ± 0.77	3.95 ± 0.52
10. Use of written SOPs as a training tool caters to a variety of learning styles	3.75 ± 0.69	3.76 ± 1.04	3.68 ± 0.89
11. Self-training through review of written SOPs is as effective as face-to-face training for new employees	2.69 ± 1.24	2.90 ± 1.38	2.68 ± 1.00
12. It's easier to do something myself than to get one of my subordinates to do it	2.63 ± 1.00	2.29± 1.23	2.98 ± 0.81
13. Developing SOPs takes too much time rather than verbally tell each employee what needs to be done	2.26 ± 0.83	1.84 ± 0.76	2.11 ± 0.83
14. Written SOPs are not necessary because employees will not read them	1.91 ± 0.83	1.60 ± 0.68	1.89 ± 0.66
15. I plan to leave my job sometime within the next year	1.81 ± 0.98	1.81 ± 0.75	1.89 ± 0.94
16. Written SOPs for procedures such as handwashing are not needed	1.56 ± 0.72	1.70 ± 1.08	1.53 ± 0.51
17. I dislike the employees I supervise[c]	1.53 ± 0.65	1.45 ± 0.60	1.89 ± 0.74
Overall mean attitude ratings[d]	**3.99 ± 0.32**	**4.13 ± 0.41**	**4.00 ± 0.29**

[a]Ratings of 5-point scale used with 1 = Strongly disagree and 5 = Strongly agree
[b]Mean ratings for pre- and post-assessment are significantly different at $p < .05$
[c]Mean ratings for face-to-face and computer training methods are significantly different at $p < .05$
[d]Overall mean ratings were calculated based on reverse coding items

safely, they would do it" was also rated significantly higher ($p \leq .001$) after the workshop by all participants than before, with mean ratings of 3.20 ± 1.11 and 2.46 ± 1.02, respectively. The statement "I serve as a role model to my employees by my action" was rated significantly higher ($p \leq .05$) by those who received face-to-face workshop (M = 4.38 ± 0.60) than by those in the computer-based training (M = 3.83 ± 0.94).

Communication module

Items which showed the biggest change between pre- and post-module assessment ratings were related to SOPs. The item with the biggest change between pre- and post-assessment ratings was, "Availability of written SOPs will help me do my job as a supervisor better"; pre-module mean rating by all participants of 3.83 ± 0.89 and post-module assessment overall mean rating significantly higher ($p \leq .05$) of 4.32 ± 0.47. Those in the face-to-face group rated this item with a mean of 4.33 ± 0.48 while those in computer group rated the statement at 4.32 ± 0.48.

There were also improved mean ratings, although not significant, to the statement "Written SOPs will help a manager instill a culture of food safety in the work place" with pre-training mean rating of 4.14 ± 0.42 and post module rating of 4.18 ± 0.68 by all participants. Those in the face-to-face group had a post-workshop mean rating of 4.19 ± 0.87 while participants in the computer group rated this statement

with a mean of 4.17 ± 0.38. Managers rated the statement "Written SOPs make supervisors more confident so safe food handling practices are followed in the work situation" with a mean of 3.78 ± 0.64 before completion of the module. After the module, a mean rating by all participants of 4.03 ± 0.66 was shown, with those in the traditional group rating at 4.10 ± 0.77 and those in the computer group at 3.95 ± 0.52. Only one significant difference was found in this category of attitude statements between those receiving face-to-face method versus those who used computer-based instruction. The statement, "I dislike the employees I supervise" received significantly different ($p \leq .05$) post-workshop mean ratings from those in face-to-face instruction ($M = 1.45 \pm 0.60$) than from those using the computer -based modules ($M = 1.89 \pm 0.74$). The attitude of managers toward staff they supervise may be indicative of communication capabilities and employee intelligence, which literature suggests is key to success in management (Law, Wong & Song, 2004).

Additionally, emerging research is finding the workplace environment is linked to the food safety culture. Use of non-face-to-face instruction may be more appealing to those with lower emotional intelligence, or this finding may simply suggest differences in workplaces and collegiality in the respective participants' workplaces. Overall these findings suggest that the face-to-face method of delivery resulted in favorable attitudes toward having written SOPs. Past research has shown SOPs or other forms of employee communications in written and verbal forms provide the vision and structure needed to establish a work place culture that supports food safety (Henroid & Sneed, 2004).

CONCLUSION AND RECOMMENDATIONS

Findings from this study suggested that variations in delivery of information did not result in significant changes in managers' knowledge or attitudes on the two topic areas of Recognition and Discipline and Communication. Most pre and post-module assessment knowledge scores and attitude ratings did not change significantly, although results did show that a higher percentage of participants in computer-based training responded correctly to most of the post-knowledge assessment questions than those receiving face-to-face instruction. In addition, although information included in the modules was available from other sources, knowledge scores and attitude rating changes suggested continual reinforcement is helpful. Over 90% of workshop participants indicated they would use the SafeFood© Motivators Tool Kit either in the hard copy form (90%) or via the web (95%).

These findings suggest that tool kits with information provided in a structured and organized format by topic of information and with self-assessments such as checklists and other guidance documents available in multiple formats are considered helpful to managers in retail foodservices. Multiple forms of availability of the structured modules can address needs of various learning styles and delivery preferences of future managers or those currently working in a variety of retail foodservice settings. Current managers who participated in the workshop self-selected the method of training, similar to choices that could be made available in the workplace. Findings from pre- and post-module knowledge and attitude assessments, for topics of Recognition and Discipline and Communication, show both delivery methods were effective because there were favorable changes in knowledge scores and attitude ratings.

This workshop had few participants under the age of 30 (n = 4), thus comparisons by age group were not feasible. While it has been noted in previous research (Rajagopal & Strohbehn, 2011) that computer-based instruction is appealing to younger generations as they are considered "pre-skilled" in technology based learning, mixed findings from this study regarding effectiveness of delivery method show there is no "one best way" when providing continued education to practitioners. Another limitation is that there were few participants, it was held in one location only, and those that attended the workshop responded to an invitation to do so; thus participation was not representative of all managers in the retail foodservice industry. Manager participants in the workshop did represent various types of foodservices, levels of experience as managers, and gender; therefore findings do provide data regarding effectiveness of different training deliveries. Because of time constraints, not all components of the Recognition and Discipline module were completed in face-to-face instruction; thus this may have impacted post-module assessment attitude ratings and knowledge scores.

Given the multiple demands on managers in retail foodservice settings, multiple methods of delivery will provide many advantages, including convenience and appeal to various learning styles. Continual demand for anytime anywhere learning and increasing distance education supports availability of multiple methods of information delivery. With student interest in technology based learning, foodservice management educators might consider inclusion of content about the role of managers in influencing work culture and safe handling of food in addition to use of multiple methods of delivery in course curricula. Current managers are often faced with limited resources of time and money for professional development; packaging fundamental management concepts into modules available as tool kits (either in electronic or hard copy format) can provide resources to shape the workplace culture in a way that supports the practice of food safety knowledge. While findings from this study are not conclusive regarding which methods of delivery are most effective, it is clear there is a need for readily available tools for managers to use in developing and improving upon their skills to establish a culture supportive of safe food handling by employees, and tools for instructors to use in the classroom with future managers.

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Appendix A

Recognition & Discipline Pre- and Post-Module Assessment

Please circle the correct response.

1. Which of the following is an example of an external reward for an employee?
   a. supervisor smiles and says "good job"
   b. employee feels pride in doing a good job
   c. supervisor implements a new SOP on temperature taking
   d. supervisor disciplines employee for not following procedure
2. Which of the following is an example of an internal reward?
   a. supervisor smiles and says "good job"
   b. employee feels pride in doing a good job
   c. supervisor implements a new SOP on temperature taking
   d. supervisor disciplines employee for not following procedure
3. Discipline can serve as an employee motivator because employees will:
   a. be motivated to avoid discipline
   b. be motivated by inconsistent discipline
   c. be inspired if disciplinary action is never used
   d. all of the above
4. When using recognition or discipline as motivators, it is important to remember:
   a. Established SOPs
   b. Consistency in use
   c. Not all employees will be motivated by the same thing
   d. All the above
5. Rewarding employees for following safe food handling behaviors:
   a. always costs a lot of money
   b. can be relatively inexpensive
   c. should be at employee's discretion
   d. will take a lot of planning

What do you think?

Please rate your level of agreement with the following statements.
Circle your response using this scale: 1 = Strongly Disagree, 2= Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. If employees were paid more for handling food safely, they would do it.	1	2	3	4	5
2. I believe that rewarding employees has no effect on their work performances.	1	2	3	4	5
3. The employees who work for me should be punished when they do something wrong.	1	2	3	4	5
4. When something goes wrong, it is usually my fault, not my employees.	1	2	3	4	5
5. It does not matter how I behave at work because employees will do what they want to do despite my actions.	1	2	3	4	5
6. Every employee is motivated by the same rewards.	1	2	3	4	5
7. If I reward one employee, I feel like I need to reward them all.	1	2	3	4	5
8. If I had a good recognition system in place, all of my employees would be motivated.	1	2	3	4	5
9. I serve as a role model to my employees by my actions	1	2	3	4	5
10. It's easier to do something myself than to get one of my subordinates to do it.	1	2	3	4	5
11. I try to avoid disciplining my employees.	1	2	3	4	5
12. It's impossible to give someone a reward at my workplace.	1	2	3	4	5
13. I dislike the employees I supervise.	1	2	3	4	5
14. I like my job.	1	2	3	4	5
15. I plan to leave my job sometime within the next year.	1	2	3	4	5

What about you?

1. Gender
   _____Female
   _____Male
2. Age:
   _____18-21 years
   _____22-25 years
   _____26-30 years
   _____31- 40 years
   _____41-50 years
   _____51-60 years
   _____over 60 years
3. What is the total number of years of your work experiences in food-service?
   _____less than 1 year
   _____1-3 years
   _____4-7 years
   _____8-12 years
   _____13-20 years
   _____over 20 years
4. In which type of foodservice operation are you currently working?
   _____restaurant, quick service
   _____restaurant, table service
   _____hospital
   _____nursing home
   _____school
   _____college
   _____other
   (Please, specify type _____)
5. How long have you worked at this current foodservice operation?
   _____less than 1 year
   _____1-3 years
   _____4-7 years
   _____8-12 years
   _____13-20 years
   _____over 20 years
6. How long have you had supervisory or management responsibilities?
   _____ less than 1 year
   _____1-3 years
   _____4-7 years
   _____8-12 years
   _____13-20 years
   _____over 20 years
7. Prior to having supervisory or management responsibilities, were you working at the same foodservice operation as you are now?
   _____Yes
   _____No

Communication Pre- and Post-Module Assessment

Please circle the correct response.

1. Standard Operating Procedures (SOPs) can be useful to management by:
    a. Avoiding verbal repetition of organization policies
    b. Maintaining the organization's and required food safety standards
    c. Providing consistent communications to employees
    d. All of the above
2. A retail foodservice organization should have food safety SOPs for which of the following situations:
    a. Cleaning and sanitizing procedures
    b. Proper food tasting
    c. Visitors in the kitchen
    d. All of the above
3. At the minimum, it is recommended management review food safety SOPs with trained employees once:
    a. Every two weeks
    b. Each month
    c. Each year
    d. No need to review
4. Which of the following requires an SOP?
    a. Employee parking
    b. Break room conversations
    c. Employee Health
    d. Music playing
5. Which of the following steps in the flow of food would NOT require an SOP?
    a. Reheating
    b. Serving
    c. Cooling
    d. Eating
6. Which of the following would not be a barrier to communication?
    a. Perceptions
    b. Emotions
    c. Language
    d. Good listening skills
7. When a supervisor leaves a written note for an employee at his/her work station, this is considered which type of communication?
    a. One-way
    b. Two-way
    c. Verbal
    d. Active listening
8. Which of the following would be the best way to communicate proper handwashing to an employee who did not speak English as his/her first language?
    a. Place a poster near the handwashing sink detailing the steps in writing (English)
    b. Bring the employee to the handwashing sink and show how to properly hand wash by demonstrating this to him/her
    c. Reprimand the employee each time he/she did not wash hands properly
    d. Explain the steps verbally (in English) to the employee
9. An example of an emotional barrier to communication is illustrated by which of the following:
    a. Being upset because of what happened at home
    b. Using sign language in the workplace
    c. Speaking English as a second language
    d. Hearing difficulties due to noisy kitchen
10. One problem employees typically voice regarding supervisor communication is:
    a. Receiving too much communication from supervisors
    b. Receiving conflicting messages from different supervisors
    c. Receiving only positive communication
    d. Receiving clear and concise messages from supervisors

What do you think?

Please rate your level of agreement with the following statements.
Circle your response using this scale: 1 = Strongly Disagree, 2= Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Self-training through review of written Standard Operating Procedures (SOPs) is as effective as face-to-face training for new employees.	1	2	3	4	5
2. Use of written SOPs as a training tool caters to a variety of learning styles.	1	2	3	4	5
3. Written SOPs for procedures such as handwashing are not needed.	1	2	3	4	5
4. Availability of written SOPs will help me do my job as a supervisor, better.	1	2	3	4	5
5. Developing SOPs takes too much time – it is faster for me to just verbally tell each employee what needs to be done.	1	2	3	4	5
6. I believe written policies help employees practice safe food handling.	1	2	3	4	5
7. Written SOPs aren't necessary because employees won't read them.	1	2	3	4	5
8. Written SOPs will help me as a manager instill a culture of food safety in the work place.	1	2	3	4	5
9. Written SOPs make me more confident so safe food handling practices are followed in my work situation.	1	2	3	4	5
10. I believe I can influence my subordinates by talking nicely to them.	1	2	3	4	5
11. How I communicate with my employees can serve as a motivator for them.	1	2	3	4	5
12. Through my actions, I can serve as a role-model to my employees.	1	2	3	4	5
13. I enjoy working with others who are different from me.	1	2	3	4	5
14. It's easier to do something myself than to get one of my subordinates to do it.	1	2	3	4	5
15. I dislike the employees I supervise.	1	2	3	4	5
16. I like my job.	1	2	3	4	5
17. I plan to leave my job sometime within the next year.	1	2	3	4	5

What about you?

1. Gender
   _____Female
   _____Male
2. Age:
   _____18-21 years
   _____22-25 years
   _____26-30 years
   _____31- 40 years
   _____41-50 years
   _____51-60 years
   _____over 60 years

3. What is the total number of years of your work experiences in foodservice?

   _____less than 1 year

   _____1-3 years
   _____4-7 years
   _____8-12 years
   _____13-20 years
   _____over 20 years

4. In which type of foodservice operation are you currently working?

   _____restaurant, quick service

   _____restaurant, table service
   _____hospital
   _____nursing home
   _____school
   _____college
   _____other
   (Please, specify type _____)

5. How long have you worked at this current foodservice operation?

   _____less than 1 year

   _____1-3 years

   _____4-7 years

   _____8-12 years

   _____13-20 years

   _____over 20 years

6. How long have you had supervisory or management responsibilities?

   _____ less than 1 year

   _____1-3 years

   _____4-7 years

   _____8-12 years

   _____13-20 years

   _____over 20 years

7. Prior to having supervisory or management responsibilities, were you working at the same foodservice operation as you are now?
   _____Yes
   _____No

Research Contribution

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THE EFFECT OF HOSPITAL FOODSERVICE SYSTEMS ON PATIENT CONSUMPTION OF ORAL NUTRITIONAL THERAPY

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ABSTRACT

Poor consumption of prescribed oral nutritional therapy (ONT) is a common problem resulting in health and financial implications. We investigated whether a breakdown of food service systems, rather than patient non-compliance, could be the predominant cause of non -consumption of ONT, in an Australian hospital. Production, delivery and patient compliance was monitored for two days in 10 wards. Of the 431 prescribed ONT prepared in this time, 50.5 % were not consumed by patients. Delivery error accounted for 34% of non-consumption; only 10% was due to patient non-compliance. Our results suggest effective food service delivery is important for ONT consumption rates.

Keywords: oral nutritional therapy, oral nutritional supplement/s, hospital foodservice system, patient compliance, malnutrition, delivery

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INTRODUCTION

Between 20-40% of Australian hospital patients are reported to have protein energy malnutrition, increasing the risk of complications and length of stay (Banks, Bauer, Graves, & Ash, 2010). High energy and protein diets, and additional snacks and drinks prescribed to patients with suboptimal nutritional intake can reduce complications associated with malnutrition and shorten length of stay in hospital, decrease mortality rate, improve nutrient intake and in the short term prevent weight loss (Baldwin & Parsons, 2004; Lochs, Pichard, & Allison, 2006; Persson, Hytter-Landahl, Brismar, & Cederholm, 2007; Stratton & Elia, 2007). Aside from the treatment of malnutrition, oral nutritional therapy (ONT) has been utilized in the management of many other medical conditions, such as cancer, gastrointestinal problems, chronic kidney disease, pressure ulcers, and liver disease (Baldwin & Parsons, 2004; Banks et al., 2010; Correia & Waitzberg, 2003; Lochs et al., 2006; Stratton & Elia, 2007).

For the purpose of this study, ONT is defined as all nourishing fluids and snacks prescribed to patients by the hospital dietitians to enhance nutrient intake, excluding foods and drinks that are given to patients as part of the standard hospital menu. Despite the effectiveness of ONT for the acutely ill being well documented (Baldwin & Parsons, 2004; Stratton & Elia, 2010), benefits can be limited by low patient consumption rates. Lawson et al. (2003) conducted a trial to assess patient compliance with oral nutrition supplements, defined as all nourishing and therapeutic fluids. The median patient compliance rate was 14.9%, where patient compliance was the voluntary consumption of oral nutritional supplements over the course of the study. Reasons behind low patient compliance rates with ONT are thought to be patient dislike of taste, texture or flavour of the supplements and lack of appetite (Banks et al., 2010; Bruce, Laurance, McGuiness, Ridley, & Goldswain, 2003; Glencorse, Edington, & Stelling, 2010a; Lawson et al., 2003; Stratton & Elia, 2010). However, errors in the hospital food service system may be another plausible explanation for patients not being able to consume their prescribed ONT. Studies that have investigated faults in the food service system in relation to delivery of standard hospital menu meals (provided to all patients) have identified that lack of feeding assistance as well as incorrect ordering of meals can contribute to poor patient consumption rates (Donini et al., 2008; Doughton et al., 2011).

Non-consumption of prescribed ONT may not only affect nutritional status and health outcomes for patients, but may also have negative financial outcomes for the healthcare system. The non-consumption of ONT can increase waste as well as hospital length of stay, potentially amounting to a substantial cost for hospitals (Cawood, Elia, & Stratton, 2010; Kaspar & Drawert, 2008; Nuijten, 2010; Russell, 2007).

To our knowledge, no previously published study has reported on the potential impact of the food service system on ONT compliance rates. The purpose of this research was to observe and explore this relationship within a hospital setting. We hypothesized that a breakdown of the food service delivery system rather than patient non-compliance is the predominant cause of non-consumption of ONT by patients at a tertiary hospital in Western Australia. The study aimed to determine the extent that prescribed ONT are reaching the intended patients, the main reasons for failure of the food service system to deliver ONT to the intended patients and what impact patient compliance has on acceptance and consumption of prescribed ONT.

METHODS

This study involved physically tracking and mapping the process of prepared ONT through the food service system and conducting a staff survey and wastage audit. A food service system is defined as structure responsible for the production; transport and delivery of food and drink within an institution (Duncan & Jensen, 2011). This study was observational, with researchers observing all aspects of food preparation and delivery of ONT to patients. Ten wards were observed for two days each over a six week period. Researchers also conducted patient interviews, ward trolley audits and audited wastage.

The protocol and tools used in this study were approved by the Edith Cowan University Human Ethics Sub Committee prior to data collection. Patients were approached by the researchers and verbally asked to participate in the study and give consent.

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Setting

The study was conducted at a 24-hour acute-care public teaching hospital in Western Australia. Out of 14 wards at the hospital, 10 were included in this study: one oncology and haematology ward, one renal ward, one cardio-thoracic ward, one rehabilitation ward, one medical assessment/short stay medical unit, one supervised care ward, one long term stay ward (for general medical issues), one orthopaedics ward and two surgical wards (one being general surgery and the other gastrointestinal and head and neck surgery). The kitchen was also involved in this study. Wards that were not included were the emergency department, intensive care unit, psychiatric and paediatric wards. These wards were not included as patients were considered too medically unwell to participate, have psychological issues or were underage, limiting ability to consent to participate.

Participants

There were two groups of participants identified for inclusion in this study. The first group of participants was the primary focus of the study and were patients prescribed ONT by dietitians at the hospital. Patients prescribed ONT were identified by printing a list from the food service database, and the patients on two wards were selected to be observed each day of data collection. Patients were asked to participate in a short interview conducted by researchers. The production, delivery and waste of these patients' prescribed ONT were observed. Patients with poor communication skills (limited English skills or any other factors affecting communication), as well as verbally or physically abusive patients were excluded from interview but were still included in the study by means of observation. Patients who were not prescribed ONT, or patients who were medically unstable were excluded from the study.

The second group of participants identified for this study were staff working in food service or as patient service assistants (PSAs). Food service staff prepare meals and ONT, and PSAs conduct deliveries from the kitchen to the patient. Staff were observed as they worked to determine where errors in the food service system were occurring. PSAs were aware they were being observed, but were informed that the researchers were assessing patient taste preferences and consumption of ONT. PSAs were asked to participate in an anonymous written survey at the end of the data collection period. The participation of PSA and food service staff was dependant on which staff were working on the day of the study. Age, gender and ethnicity were not determining factors for inclusion in this study.

Data collection

Data collection took place between July 2011 and September 2011 by two researchers who were final year Master of Nutrition and Dietetics students. A one day data collection trial of the same data was undertaken by both researchers, to ensure consistent collection and assess inter-rater reliability. Each of the ten wards was observed for two days. Data collection occurred in three phases as seen in Figure 1.

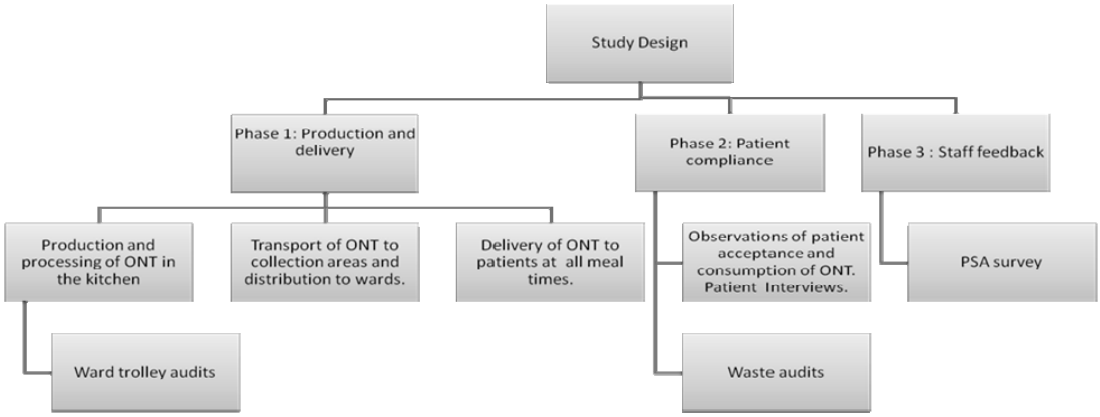
Phase one of the data collection in this study involved observing all stages of ONT production and delivery by food service assistant and PSA staff. ONT were categorized as nourishing snacks, diabetic snacks, soft snacks, stoma snacks, nourishing drinks, thickened drinks and oral pre-packaged drinks according to hospital classification. This phase involved auditing ward trolleys to determine that trolley contents matched requirements indicated by the hospital food service ordering system, and observation of delivery to the patient as indicated. Phase two of the data collection focused on patient compliance and consumption of ONT. During this phase, patients were interviewed about delivery, compliance and consumption of ONT. Phase two of the study also involved auditing patient ONT waste. Phase three involved distribution and collection of the PSA survey. This occurred in the last week of data collection.

Four data collection tools were developed for use in the different phases of the study, as no appropriate and validated tools were readily available to sufficiently evaluate areas of interest. Tools developed were (1) a food service observation tool, (2) an ONT wastage chart, (3) a patient interview form and (4) a PSA survey. In order to gain context validity, these tools were developed in consultation with academic dietetic staff at Edith Cowan University and ward dietitians at the hospital being studied. The tools were piloted in a one day trial in hospitalized patients in one of the hospital wards prior to data collection. Minor improvements to the data collection tools were made based on the findings of this trial, and final versions can be viewed in Appendices 1-4.

1. *Food service observation tool*

The food service observation tool (Appendix 1) was based on researcher inspection of the working of the food service system at the studied hospital. The observation tool listed all the steps involved in the preparation and delivery of ONT and was designed to allow identification of possible points of error and breakdown of the food service system along this route. Nine potential points of error were

Figure 1: Outline of the three phases involved in the study methodology



monitored: dietitian entry of orders into the automated menu system, printing out a list of ordered ONT in the kitchen by food service manager, kitchen production of the ordered ONT, kitchen staff loading ONT produced in the kitchen onto a trolley to be taken to a designated collection area, PSA pick-up of produced ONT from the collection area to be delivered to ward pantry, PSA pick-up of ONT and delivery of ONT to correct patients at designated meal or snack time, staff interference with delivery of ONT, confusing entries on the food service automated menu system by staff members (i.e. entries that resulted in the incorrect production of ONT or resulted in delivery error), incorrect meal/diet type of patient recorded on the food service automated menu computer system that resulted in delivery failure.

All errors observed during the delivery of ONT to patients were recorded, with the total number of times an error occurred at each point recorded over the 12 day period. Not all errors recorded resulted in non-delivery of ONT. All errors that resulted in the non-delivery of ONT were considered to be critical errors; while, errors in the food system that did not affect delivery were considered to be non-critical errors. For each point, researchers gave scores of 1 if an error occurred (both critical and non-critical errors) or 0 if the point was successfully completed without error.

2. Patient Interview Form

The patient interview form (Appendix 2) investigated patient compliance with the consumption of ONT when it was delivered. Based on advice from dietitians at the hospital, the interview form was administered verbally to patients by the researchers as a means of reducing participant burden and increasing the number of individuals willing to participate in the study. This interview asked three main questions: whether the prescribed ONT was delivered to the patient, whether the ONT was accepted (i.e. they did not refuse it or send it away) along with reasons for non-acceptance if applicable, and how much of the ONT was consumed by the patient (if it was accepted). The amount of ONT consumed by patients was determined by patient reports and researcher observations, followed by confirmation using the ONT waste chart.

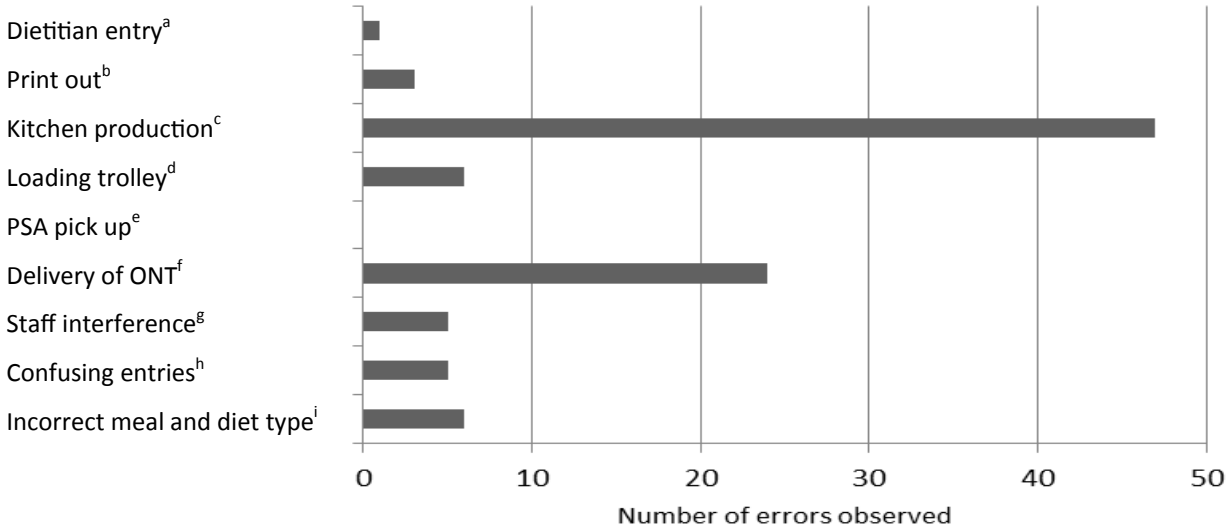
3. ONT Waste Chart

The ONT wastage chart (Appendix 3) quantified wastage of ONT at each meal time (breakfast, morning tea, lunch, afternoon tea, dinner and bedtime/supper) for each patient. Waste was quantified by the researchers as either none to one quarter of the ONT consumed, between a quarter and a half consumed, between a half and three quarters consumed, three quarters to almost all consumed, or all consumed. One chart was provided for each patient with a prescribed ONT on each day of data collection.

4. PSA Survey

The PSA survey (Appendix 4) aimed to identify difficulties or issues that may affect PSAs in delivering ONT to patients. The survey was anonymous and PSAs were asked to leave surveys in a box in ward pantries for collection two days later. The survey asked the PSAs how important they thought it was for patients to receive the prescribed ONT using a five point Likert scale (not very important, not important, unsure, important, very important). The survey also asked the PSAs to rank the top three reasons that ONT may not be delivered from a list with the following options: ONT not produced in the kitchen, incorrect ONT being sent from the kitchen, unsuitable ONT for the

Figure 2: Occurrences of oral nutrition therapy (ONT) errors in the hospital food service system by cause in order of observation (not all errors resulted in non-delivery of ONT)



[a] Dietitian entry refers the entry of prescribed snack and drinks into the hospital ordering system
[b] Print out refers to the printing out of the list of required snacks and drinks from the database to be used by the kitchen for production
[c] Kitchen production errors refer to an incorrect flavour, consistency or type of snack being prepared
[d] Loading trolley refers to loading trolleys with snacks and drinks produced in the kitchen for transport to collection area.
[e] PSA pick up refers to the collection of snacks and drinks from ward kitchens
[f] Delivery of ONT refers to delivery of ONT to patients by PSAs
[g] Staff interference refers to non-delivery of ONT as a result of the actions of staff members
[h] Confusing entries refers entries by nurses or other staff into the ordering system that results in failure to produce the correct snack or drink
[i] Incorrect meal and diet type refer to inconsistency of patient meal/diet type on automated menu system and print out that resulted in non-delivery of ONT

patient, patient fasting or being nil by mouth, patient being on clear fluid or nourishing fluids and ONT being unsuitable, patient not being in the room, PSA being too busy or forgetting to deliver them, and PSA being unaware that ONT needed to be delivered. The PSAs were also able to offer their own comments and suggestions on the survey form.

Data Analysis

Data were analysed using Predictive Analytics Software (PASW) for Windows, version 18.0 2009 (SPSS Inc., IBM, Chicago, IL, USA). Quantifiable data were derived from coding set observation. Quantifiable data were largely categorical. Descriptive statistical analysis was used and categorical data were analysed using frequencies and percentages.

RESULTS

The production, delivery, acceptance, consumption and waste of a total of 431 prescribed ONT were observed across all wards over the two days. Of the 431 ONT prepared, 213 were drinks, consisting of 91 oral pre-packaged drinks (for example Ensure Plus®, Nepro®, Two Cal® HN, Resource® Fruit Beverage and Enlive® Plus), 82 thickened fluids (for example thickened cordial, thickened juice, thickened tea, thickened soft drinks, thickened water)and 40 nourishing drinks (for example milkshakes, Sustagen® milkshakes, iced coffee). The remaining 218 snacks consisted of 164 nourishing snacks (for example jelly, ice-cream, cheese and crackers, yoghurt), 23 soft snacks (for example: custard, canned fruit, Sustagen® Pudding), 18 stoma snacks (for example creamed rice, chopped banana, plain cake with no icing), and 13 diabetic snacks (for example diet jelly, diet yoghurt, light ice-cream).

Points of error in the hospital food service system

Errors in kitchen production and PSA delivery of ONT to patients were the most frequently recorded, occurring 47 and 23 times respectively (Figure 2). Kitchen production errors included an incorrect flavour, consistency or type of snack being prepared, while PSA error refers to the failure of a PSA to correctly deliver ONT to a patient from the ward refrigerator. On 10 of the 12 days, ONT were served at inconsistent times; for example, afternoon tea was observed being served at 1-1:15pm after lunch was served at 12-12:30pm, whereas afternoon tea was scheduled for 2:30pm.

Errors in the delivery of ONT

Of the 431 ONT snacks and drinks tracked in this study, 284 were delivered to and received by the correct patient. One hundred and forty seven of the observed ONT snacks and drinks did not reach the specified patients. Thus, ONT was not correctly delivered 34.1% of the time. The three main reasons for this failure of delivery were PSA error (15.6%), 'other' (changes to meal type that made ONT inappropriate or unwarranted for patient, confusing entries by staff in the hospital computerized automated menu system or the system being down or inaccessible) (14.3%) and patients being discharged before they could be given their ONT (12.9%) (Table 1).

Errors in delivery of ONT by ward

The cardiothoracic, gastrointestinal and head and neck surgical wards had the highest rates of delivery failure, with ONT snacks and drinks not correctly delivered to patients more than 50% of the time (56.2% and 53.3% respectively). The leading reasons for failed delivery in these wards were patients being asleep and ONT not being left for them (33.2%) and patients being off the ward (22.6%). The lowest failure rate of 11.1% was recorded in the supervised care ward.

Acceptance of ONT

Over the course of the study, 284 ONT snacks and drinks were correctly delivered to patients. Of these, 256 (90.1%) were accepted by the patients. The reasons for patients not accepting ONT were as follows: patient belief that the snack or drink was inappropriate for them, not what they had asked for or wrongly prescribed (39.3%), patient dislike of ONT texture, taste or temperature (32.1%), lack of appetite (14.3%) patients having some ONT leftover from previous delivery and therefore not wanting anymore (10.7%) and patients having visitors and therefore not wanting to accept ONT while visitors were present (3.6%)

Consumption of ONT

Of the 256 ONTs that were correctly delivered to and accepted by the patients, 213 were at least partially consumed (83.2%) and 43 were

Table 1: Reasons for failure of delivery of ONT in relation to frequency and percentage of occurrence

Reason for failure of delivery	N	Percentage
PSA error[a]	23	15.6
Inappropriate meal type[b], automated menu system error[c]	21	14.3
Patient discharged	19	12.9
Patient asleep	15	10.2
Patient off ward[d]	15	10.2
Kitchen production error	11	7.5
Unknown reason[e]	11	7.5
Patient fasting	10	6.8
Patient still had unconsumed ONT from previous meal time	9	6.2
Health professional consultation[f]	8	5.4
Patient changed room	3	2.0
Visitors[g]	2	1.4
Total	147	100

[a] PSA error refers to non-delivery due to a failure of a PSA to correctly deliver ONT to a patient from the ward refrigerator
[b] Inappropriate meal type refers to changes to meal type that made ONT inappropriate or unwarranted for patient
[c] Automated menu system error refers to confusing dietitian/ nurse entries in the hospital computerised food service ordering system resulting failure of delivery and the system being down or inaccessible resulting in errors
[d] Patient off ward refers to patients not being in their rooms at time of delivery, thus they didn't receive ONT.
[e] Unknown reason refers to any reason resulting in ONT not being delivered to patients that could not be identified by researchers
[f] Health professional consultation refers to the presence of medical staff who disrupted the ONT delivery to the patient
[g] Visitors refers to the presence of any patient guests who disrupted the ONT delivery to the patient

Table 2: Reasons for non-consumption of ONT when snacks and drinks were correctly delivered to patients

Reason for non-consumption	N (%)
Difficulty self-feeding, difficulty swallowing and inability to open packaging	17 (39)
Lack of appetite	9 (21)
Dislike of taste, texture or temperature	7 (16)
Patient still had ONT left from previous delivery	5 (12)
Nausea and vomiting	2 (5)
Health professional consultation[a]	2 (5)
Visitors[b]	1 (2)
Total	43 (100)

[a] Health professional consultation refers to the presence of medical staff who disrupted the ONT delivery to the patient
[b] Visitors refers to the presence of any patient guests who disrupted the ONT delivery to the patient

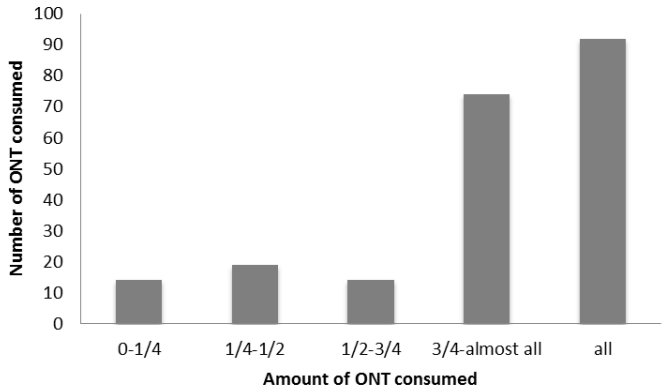
not consumed at all (16.8%). The key reasons for the non-consumption of the 43 snacks and drinks included difficulty self-feeding, difficulty swallowing and inability to open packaging (39.5%), lack of appetite (20.9%) and patient dislike of the taste, temperature or texture of the drink or snack (16.3%) (Table 2). In all wards studied, the majority of observed snacks and drinks consumed by patients in the study were either completely consumed leaving no waste 93 (43.7%) or over three quarters were consumed 74 (34.7%) (Figure 3).

Patient consumption rates of ONT differed by the type of snack or drink. For snacks, diabetic snacks (including diet jelly, diet yoghurt, light ice-cream) had the highest consumption rates with 100% of patients consuming at least three quarters of the snack, and soft snacks (including custard, canned fruit, Sustagen® Pudding) showed the lowest consumption rates (63.6%) (Figure 4). For drinks, nourishing drinks (including milkshakes, Sustagen® milkshakes, iced coffee) had the greatest consumption rate (96.1%); however, oral pre-packaged drinks (including Ensure Plus®, Nepro®, Two Cal® HN, Resource® Fruit Beverage and Enlive® Plus) were most likely to be completely consumed. Thickened fluids showed the lowest rate of consumption (81.2%) (Figure 5). Thus, of the total 431 ONT snacks and drinks observed throughout the study, 213 (49.4%) were consumed to some degree and, 218 (50.6%) were not consumed by patients. Of the ONT that were not consumed by patients this was due to ONT not being correctly delivered (34.1%), patients simply not consuming them (10.0%) and not consumed as patients did not accept the ONT 6.5%.

PSA survey

The PSA survey was distributed to 45 PSAs across the 10 wards. A total of 11 were completed (24.4% response rate), all of these were usable for data analysis. Responses were returned from eight of the 10 wards. Eight of the 11 responses (72.7%) considered patients receiving ONT to be 'very important', two (18.2%) as 'important' and 1 (9.1%) as 'somewhat important'. The key reasons PSAs cited for the failure of delivery of ONT were incorrect snacks or drinks being produced by the kitchen, patients fasting or snacks and drinks that were inappropriate for the patient. Nine of the 11 respondents felt that delivering ONT wasn't difficult, but several PSAs commented that this was provisional on the kitchen producing the correct snacks and drinks. Three respondents commented that thickened fluids were often incorrect consistencies, creating conflict with nursing staff. One respondent commented that greater communication between the kitchen, PSAs and dietitians would improve the ONT food service system.

Figure 3: Consumption rates of ONT snacks and drinks by patients when successfully delivered and accepted by patients



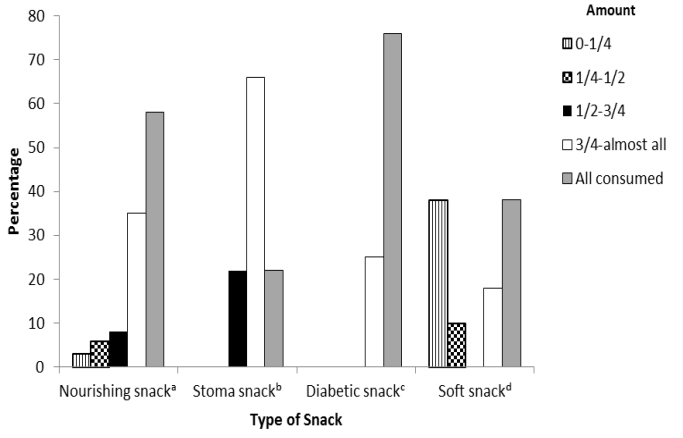
DISCUSSION

The data and observations collected in this study support the hypothesis that errors in the hospital food service delivery system rather than patient non-compliance was the predominant reason for non-consumption of ONT by patients at the studied hospital.

Points of error

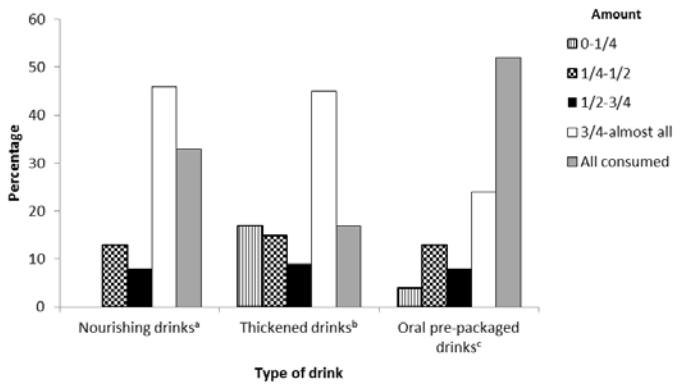
Kitchen and PSA errors were the most frequently recorded points of error; however, not all of these errors resulted in non-delivery. Of the 47 kitchen errors, only 11 resulted in non-delivery of ONT to the patients. The main kitchen error recorded was the wrong flavour being provided to patients. Although this may potentially reduce

Figure 4: Consumption rate by snack type



[a] Nourishing snacks i.e. jelly, ice-cream, cheese and crackers, yoghurt
[b] Stoma snacks i.e. cheese and crackers, creamed rice, chopped banana, plain cake with no icing
[c] Diabetic snacks i.e. diet jelly, diet yoghurt, light ice-cream
[d] Soft snacks i.e. custard, canned fruit, Sustagen® Pudding

Figure 5: Consumption rate by drink type



[a] Nourishing drinks i.e. milkshakes, Sustagen® milkshakes, iced coffee
[b] Thickened fluids i.e. thickened cordial, thickened juice, thickened tea, thickened soft drinks, thickened water
[c] Oral prepackaged drinks i.e. Ensure Plus®, Nepro®, Two Cal® HN, Resource® Fruit Beverage and Enlive® Plus

patient compliance with consumption of ONT (as the patient may not like the flavour provided), kitchen errors had less of an impact than other errors, such as PSA errors, on actual delivery of ONT. Other kitchen production errors observed to affect ONT delivery were ONT snacks or drinks not being delivered to ward refrigerator or items missing from the refrigerator and consistency of thickened fluids.

Delivery of ONT

The prescribed ONT was successfully delivered to patients 66% of the time during this study. Errors by PSA staff were found to be the main reason for ONT not being delivered to patients, and this omission involved prepared ONTs not being taken out from the ward refrigerator and taken to the patient. Potential for PSA error may be related to the experience level and literacy level of PSA staff. The automated menu system was not working during four days of the study, which meant that PSAs needed to rely on a paper system from the previous day. This paper system may have contributed to PSA errors, as the PSAs use it to identify the patients on ONT and the meal/diet types of patients, and any changes to patients' diet types or patient discharges would not be updated with the paper system.

The rate of successful ONT delivery to patients varied between the wards. The supervised care, rehabilitation and short stay medical assessment wards were found to have the highest rates of successful delivery of ONT to patients. The cardiothoracic, renal, long stay and general surgical wards had the highest rate of ONT not being successfully delivered to patients. The difference in delivery of ONT between wards may be explained by differences in the function of the ward, the patients and staff. Although PSAs are responsible for the delivery of ONT to patients, nurses were involved in patients receiving ONT. It was observed that nurses would sometimes follow-up on ONT that were not delivered to patients, by checking the ward refrigerator or contacting the kitchen or PSAs. The supervised care ward is a specialized ward for patients with dementia, delirium and confusion, and has a higher nurse to patient ratio, so nurses may be more aware of patient's specific needs compared to the medical wards which had lower nurse to patient ratios and shorter patient stays.

Acceptance of ONT by patients

The rate of acceptance of ONT by patients was high, with 90% of patients showing good compliance and accepting the ONT when it was delivered to them. The key reasons for patients not accepting ONT were that the patient believed that the snack or drink was either not appropriate, not what they had asked for, or was wrongly prescribed to them.

Dislike of taste, texture or temperature was the second most prevalent reason for non-acceptance. Patients may consume the same ONT for extended periods of time and may become bored or experience taste fatigue (Ravasco, 2005).

The texture of ONT is normally set for patient safety (for example thickened fluids for swallowing difficulties), unlike taste and temperature, which can be altered. PSAs involved in our study commented that thickened fluids sent from the kitchen were often not cold enough, and patients were less likely to accept them. Likewise, foods traditionally served hot (sausage rolls or party pies) being served cold were another reason for non-acceptance by patients. Some PSAs would reheat these items in a microwave prior to serving, but this action was dependent on the PSA and not done as part of general practice. Several studies evaluating patient satisfaction of hospital food found that the temperature at which food was served can affect satisfaction levels (Douglas & Douglas, 2004; Gregoire & Greathouse, 2008; O'Hara et al., 1997; Otani et al., 2009). For example, when foods or drinks that should be served cold were not perceived to be served cold enough, patient satisfaction decreased (Otani et al., 2009).

Consumption of ONT by patients

When ONT was delivered to and accepted by patients, 83% of patients in our study consumed at least some of the ONT, with 79% of patients consuming three quarters or more. This finding is very important, as it indicates that patients are usually compliant with consuming their prescribed ONT when it is delivered to them. Our finding contrasts with results of other studies that have found a low rate of compliance with ONT; however, these studies were based on anecdotal evidence rather than observational data, which may explain the difference (Bauer, Capra, Battistutta, Davidson, & Ash, 2005; Bruce et al., 2003; Glencorse, Edington, & Stelling, 2010b).

The main reason observed in this study for patients not consuming ONT was classified as "other" in our data collection tool. This category included difficulty opening packaging, ONT put out of reach of the patient, patients having difficulty feeding themselves and a lack of appetite. Previous research has found that some patients may need feeding assistance in order to consume their required nutrient intakes (Brogden, 2004; Donini et al., 2008; Vivanti & Banks, 2007). Future studies in the area would benefit from separating 'other' category into specific areas for more thorough analysis.

The second most frequent reason for patients not consuming ONT was found to be a lack of appetite, which may be related to patient illness (Grant, 2008). Another contributing factor may have been inconsistent timing of meal/snack times on the wards, particularly in regards to afternoon tea being served very close to lunchtime, and this routine may have contributed to a lack of appetite for ONTs. It was observed that on 10 of the 12 days that afternoon tea was served at 1-1:30 following lunch being served at 12-12:30, despite the hospital policy that afternoon tea was to be served at 2-2:30.

The third reason for patients not consuming ONT after acceptance was a dislike of taste, texture or temperature. This reason was also cited in the non-acceptance of ONT. It was observed that some ONT snacks that required heating prior to serving were not always heated by PSAs and this heating practice impacted patient consumption as well as initial acceptance. Patients on the orthopaedics and the oncology/haematology wards had the lowest consumption of ONT after acceptance. The general surgical ward had higher numbers of patients who were required to fast in preparation for surgery, or following surgery. Required fasting was the main reason for patients not consuming ONT on this ward, as they were medically not allowed

to consume them. On the oncology ward, the main reason found for patients not consuming ONT was patients being off the ward and this patient absence may be due to patients going for tests, treatments or going for walks. Cancer patients may have altered taste and appetites due to illness and treatment and this change may have contributed to low level of consumption (Grant, 2008). One study has reported that patients with gastrointestinal cancers prefer the taste of fresh milk-based supplements, and short-term preferences are not changed by chemotherapy (Rahemtulla et al., 2005).Various external factors such as social and physical surroundings, including the presence of other people, sound, temperature, smell, colour, time and distraction can also affect food and ONT intake and choice (Darmon, Karsegard, Nardo, Dupertuis, & Pichard, 2008; Glencorse et al., 2010a, 2010b; Lawson et al., 2003; National Collaborating Centre for Acute Care, 2006; Stroebele & De Castro, 2004).

Cost of undelivered ONT

Our study showed that errors in the food service delivery system were responsible for more ONT non-consumption than patient non-compliance. In the hospital studied, 431 ONTs were prepared in two days for 10 wards, or 21.55 ONT per ward per day. A total of 34% of observed ONT snacks and drinks, or 7.327 per ward per day, did not reach the specified patients. For 10 wards, this would equate to 26,744 prepared ONTs going unconsumed due to food service delivery failure over the year. The estimated cost to the hospital of each ONT was AUD $1.10-$1.77 within the hospital based on the tender price at the time of this study. Therefore, we estimate the cost of wasted ONTs due to delivery error to be AUD $29,418- $47,336, excluding staff time in the tertiary hospital in our study. In addition, unconsumed ONTs also affect patient health as they are not receiving the nutrition prescribed to them. Poor compliance with ONT can impact on clinical outcomes, resulting in a longer hospital length of stay and increased costs (Milne, Potter, Vivanti, & Avenell, 2009).

Strengths and limitations

This was a comprehensive study of all aspects of the ONT food service that followed ONTs over the entire day. For consistency, two researchers were involved with all stages of data collection. Although one researcher alone was not able to observe every error, reliability of data entry was verified by cross checking all entries. A potential limitation is that the days that each ward were observed may not have been representative of usual daily activity on the wards. Each ward was observed for two days however a longer period of study wards would have resulted in a more representative view. Waste was estimated from observation and some waste may have been missed if it was thrown out before the researcher was able to record it. Delivery errors may have been slightly underestimated as we included non-nourishing thickened fluids in this study and these may be more likely to be delivered to patients than nourishing fluids as these are the only fluids these patients can drink. As the study was observational, the behavior of the food service staff, PSA staff and patients may have altered due to researcher observation during the study. We aimed to minimize respondent bias by presenting as independent researchers and not as food service or hospital staff. However, as face-to-face contact was required, it was not completely anonymous and some patients may have not been entirely honest with their opinions. Likewise, some foodservice and PSA staff may have changed some aspects of their work practices and this is a potential limitation.

Although surveys were available in all ward pantries for PSAs to complete over the three day period, the survey response rate was low, at 24.4%. Therefore, the results of the survey may not have been representative of the PSA's opinions overall, and this is a potential limitation.

PRACTICAL APPLICATIONS

Based on the results of this study, we note the importance of the following factors in maximising consumption of ONTs in the hospital setting:

1. Specified times for the consumption of thickened fluids and other ONT. When ordering ONT via the automated menu system instructions to 'sip throughout the day' can be confusing to the PSAs and result in drinks not being offered.
2. Supplying patients with the prescribed flavour of drinks where possible. Patients were often given flavours they had not requested and for this reason these drinks were sometimes not consumed.
3. Refrigeration of all cold ONT drinks after production until they are transported to the wards. This staff practice will ensure that drinks are cold when served and may enhance acceptance by patients.
4. Heating directly prior to delivery for ONT which are meant to be served hot such as party pies, sausage rolls as well thickened teas/coffee
5. PSAs offering to open packaging for patients, including putting straws in prepacked drinks.
6. ONT placed with reach of the patient upon delivery.
7. Delivery of ONT even if patient is asleep, off ward, has visitors or is in consultation with health professionals.
8. Regular consultation between PSAs, dietitians and kitchen staff to improve and maintain communication between prescription and delivery.
9. Provision of training by the dietetics department to educate new PSA staff about the importance of ONT for patients.
10. Provision of training by the speech pathology department to kitchen staff to increase knowledge regarding thickened fluid consistencies.
11. Provision of morning tea, afternoon tea and bedtime/supper a minimum of 90 minutes away from main meals.
12. Replacement of ONT left over from previous meal time with a new ONT, even if the previous one has not been consumed.
13. Nursing staff assisting with feeding of ONT if required.
14. Minimize downtime and outages with the automated menu system to reduce errors in delivery, in conjunction with the information system and technology department.
15. Documenting of ONT in patient medical charts and/or nursing care plans to act as a reminder and assist delivery.
16. Encourage prompt communication between medical, allied health, food service and PSA staff whenever a diet change is made for a patient, or a patient is discharged. Where possible this could be done through immediate updating of the hospital computerized systems when changes or discharges are made.

To our knowledge, this is the first study to report on the food service system in relation to delivery, acceptance and consumption of ONT. Further research in the area is required in other hospital settings, to better assess whether our findings and recommendations may be applicable to the wider hospital community. Further observational studies may be beneficial to investigate the food service systems in different populations such as nursing homes and smaller rural hospital settings, where ONT is also frequently used. The findings of this study may useful to other healthcare operations (such as nursing homes, rehabilitation units and smaller hospitals) as a means of providing insight into areas where errors may potentially occur in their own food service system, although it may be to varying degrees. The

method we used in our study would be appropriate for these settings to investigate their own sources of errors, and assist in measuring improvements. The use of students as interviewers and observers may be less intimidating for patients and foodservice staff than dietetic or general hospital staff, and may provide an opportunity for facilities to link with universities for research support.

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Appendix 1

Food service system observation tool

Observer: _____

Potential point area	Rating *		Comments#
Dietitian entry Dietitian entry of prescribed oral nutrition supplements into the food service automated menu ordering system.	0	1	
Print out Print out of labels for oral nutritional supplements required for the day. Labels are printed from the food service automated menu system.	0	1	
Kitchen production Production of all non-commercially prepared oral nutritional supplements by hospital recipe. Collection commercially prepared oral nutrition supplements as determined by printed labels.	0	1	
Loading delivery trolley Loading of oral nutritional supplements onto ward trolleys as prepared in kitchen in accordance with ward requirements from the food service ordering system.	0	1	
PSA pick up from trolley PSA correct pickup of preloaded trolleys from dispatch room and collection of oral nutritional supplements.	0	1	
PSA pick up from ward refrigerator at MT, AT, and bedtime/ supper. Oral nutritional supplements not taken with main meals are stored in ward refrigerators. Correct pickup of these supplements by PSA's as required.	0	1	
Delivery oral nutritional supplements Correct delivery of oral nutritional supplements to correct patient at prescribed time.	0	1	
Staff interference Staff forgetting or refusing to give oral nutritional supplements to patient.	0	1	
Incorrect meal/diet type on the automated menu system (changes to diet type i.e. surgery) **Confusing entries on computer**	0	1	

*0=complete no problems and 1= not complete, problem occurred
# detail the error observed at the particular point in the food service system.
MT= Morning Tea
AT= Afternoon Tea

Appendix 2

Patient interview form

Observer: _____

<table>
<tr><td colspan="3">Did the patient receive the ONT?</td></tr>
<tr><td colspan="2">Yes (0)</td><td rowspan="2">No (1)

Patient reasons for non-delivery

Asleep

Visitors

Health professional consultation

Off ward

Changed room

Fasting

Unknown

Other

Patients discharged
Patient still has ONS left from earlier delivery
(9) Not able to Interview</td></tr>
<tr><td colspan="2">Did the patient accept the ONT</td></tr>
<tr><td colspan="2">Yes (0)</td><td rowspan="3">No (1)

Reasons for not accepting?

(2.1) Nausea/ vomiting
(2.2) Lack of appetite
(2.3) Visitors
(2.4) Health professional consultation

Dislike ONS taste/ texture or temperature

Other

Had some left over from earlier delivery

(9) Not able to interview</td></tr>
<tr><td colspan="2">Was the ONT consumed?</td></tr>
<tr><td>Yes (0)</td><td>No(1)

Reason for not consuming ONT

(3.1) Nausea/ vomiting

(3.2) Lack of appetite

(3.3) Visitors

(3.4) Health professional consultation

(3.5) Dislike oral nutritional supplement taste/ texture or temperature

(3.6) Difficulty consuming (swallowing difficulties)

(3.7) Difficulty feeding or opening oral nutritional therapy

(3.8) Other

(3.9) Still had some left from earlier delivery

(9) Not able to interview</td></tr>
<tr><td colspan="3">Comments :</td></tr>
</table>

Recording Sheet

Observer: _____
Date: _____
Patient code/ Patient Number: _____
Ward: _____

Interview/Observation

Number and type of Oral Nutritional Supplements (snacks and drinks) prescribed per meal/snack time
Breakfast _____
Morning Tea _____
Lunch _____
Afternoon Tea _____
Dinner _____
Bedtime/Supper _____

Code for reason non-delivery/acceptance/consumption of Oral Nutritional Supplement as per flow chart
1 _____
2 _____
3 _____
4 _____
5 _____
6 _____
*Please write N/A in blank spaces if not prescribed two- three types of Oral Nutritional Therapies

Appendix 3

ONT Wastage Record Chart

Observer: _____
Date: _____
Patient code/ Patient Number: _____
Diet / Fluid Type: _____
Ward: _____

Time	Prescribed ONT	Amount Consumed						Comments
	Breakfast							
	Oral Nutritional Therapy _____	N/P	0-¼	¼- ½	½- ¾	¾ - almost all	All	
	Morning Tea							
	Oral Nutritional Therapy _____ _____	N/P N/P	0-¼ 0-¼	¼- ½ ¼- ½	½- ¾ ½- ¾	¾ - almost all ¾ - almost all	all all	
	Lunch							
	Oral Nutritional Therapy _____	N/P	0-¼	¼- ½	½- ¾	¾ - almost all	All	
	Afternoon Tea							
	Oral Nutritional Therapy _____ _____	N/P N/P	0-¼ 0-¼	¼- ½ ¼- ½	½- ¾ ½- ¾	¾ - almost all ¾ -almost all	all all	
	Dinner							
	Oral Nutritional Therapy _____	N/P	0-¼	¼- ½	½- ¾	¾ - almost all	all	
	<u>Bedtime/ supper</u>							
	Oral Nutritional Therapy _____ _____	N/P N/P	0-¼ 0-¼	¼- ½ ¼- ½	½- ¾ ½- ¾	¾ - almost all ¾ - almost all	all all	

*N/P - not prescribed

Appendix 4

Patient Service Assistant Interview form

Observer: _____

Please rate your feelings on the following statement by circling the appropriate box	**Not important at all**	**Somewhat important**	**Neither agree nor disagree**	**Important**	**Very important**
How important do you feel it is that patients receive oral nutritional supplements and snacks?	1	2	3	4	5

Please rate the top three options from the following list about, Why do you think some patients do not receive oral nutrition supplements or snacks that have been ordered for them? Please select the top three reasons below by giving a rating of 1 to 3 (with 1 being the top reason, 2 the second top and 3 the third top).

Possibly reason for non-delivery	**Rating**
Not delivered from the kitchen	
Incorrect supplements or snacks being sent from the kitchen	
Unsuitable supplements or snacks for the patient	
Patient fasting or being nil by mouth	
Patient being on clear fluid or nourishing fluids and supplements or snack being unsuitable	
Patient not being in the room	
Too busy to deliver them (lacking time)	
Forgot to deliver them	
Unaware that they need to be delivered	

What aspect of delivering oral nutritional supplements and snacks to patients do you find most difficult?

_____

_____

Do you have any suggestions to improve the delivery of oral nutritional supplements and snacks?

_____

_____

Applied Solutions

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A PILOT STUDY TO DEVELOP NUTRITIONAL GUIDANCE SIGNAGE FOR A UNIVERSITY CAFETERIA BASED ON A TRAFFIC LIGHT DESIGN

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ABSTRACT

This study describes the creation and implementation of signage that provides guidance to students in making healthy food choices. Information regarding saturated fat, fiber, and sodium content of various cafeteria offerings is presented using a traffic light approach based on daily values, where green indicates that the meal/product is a healthy choice in regards to that nutrient, orange indicates that the food should be consumed in moderation, and red signifies that the food should be consumed sparingly. Daily values were used as the basis for color-coding. Calorie, sugar, and protein content per serving size are also presented. Student feedback indicated that use of the traffic light colors for key nutrients allowed them to make comparisons between choices and healthier decisions with a quick glance. The signage system is suitable for institutional cafeterias, but is readily adaptable to any food service setting.

Keywords: cafeteria, traffic light, nutritional signage, front of package labeling, point of purchase labeling

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INTRODUCTION

The Chapman University, Orange, CA, cafeteria is an on-site residential cafeteria that needed a new nutrition labeling system to address student requests for nutrition information. Prior to the creation of this pilot program, the signs available to students were small, hard to read, and only posted for certain items (Illustration 1). The campus's contract food service provider asked the director of the university's food science program for assistance in developing, implementing, and pilot testing a nutritional signage system for the campus cafeteria, which serves approximately 5,000 plates per day, 1,700 students per week, and where residential students eat most meals. The researchers evaluated a range of labeling schemes before developing a signage system for pilot testing. The goal was to not only provide information to students, but also provide guidance for making healthy food choices.

The food industry has launched multiple nutrition labeling systems within the last five years to help consumers make healthier dietary choices (Lytton, 2010). Front-of-Package (FOP) labeling, and to a smaller extent, Point-of-Purchase labeling in food service are becoming common. The diversity in their presentation, messaging, and nutritional basis highlights the divergent views on how nutritional information is presented and the efficacy of the various systems on consumer comprehension and food selection.

Three types of retail labeling systems

Currently used retail labeling systems can be categorized into three types: nutrient-specific systems, summary indicator systems, and food group information systems (Wartella, Lichtenstein, & Boon, 2010). Each one has distinct advantages and disadvantages.

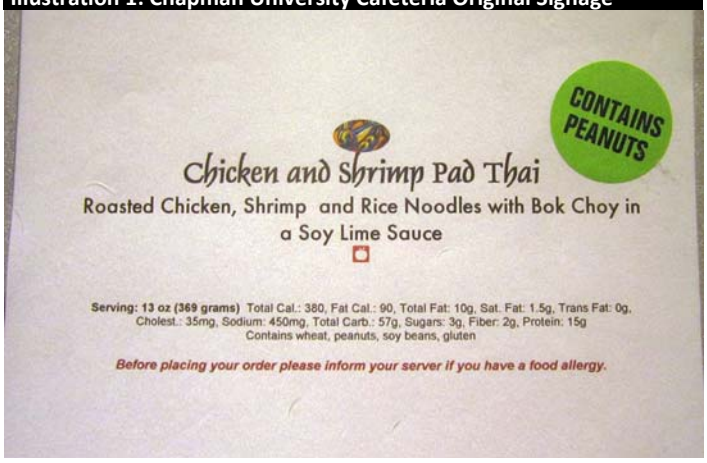
Nutrient-specific systems

Nutrient-specific systems present the amount per serving of certain nutrients from the Nutrition Facts Panel or use symbols based on claim criteria on the front of food packages. They indicate if the product contains "high", "medium", or "low" amounts of particular nutrients and give information in percent daily values (%DV) or guideline daily amounts (%GDA). Some systems also include traffic light colors corresponding to the amounts of specific nutrients. This system offers easy visualization of select nutrients according to their nutrient content claims and reduces the likelihood of overgeneralization that can happen with summary icons. In the United Kingdom (U.K.), a color-coded traffic light system is widely used (Wartella, Lichtenstein, & Boon, 2010). It includes amounts of fat, saturated fat, sodium, sugars, and calories and labels the product as low, medium, or high in each nutrient. The U.K. also launched a nutrient specific panel through Tesco PLC in 2009. A recent nutrient-specific system launched in the United States as a joint initiative by the Grocery Manufacturers Association (GMA) and the Food Marketing Institute is the *Facts Up Front* program, which lists calories, saturated fat, sodium and sugar contents – nutrients the Dietary Guidelines for Americans recommend limiting. The four nutrient facts of concern are always presented together as a coherent set and include serving size and percent daily value for saturated fat and sugar. Two additional nutrients such as fiber and certain vitamins are included on FOP labels if the program chooses to do so (GMA, 2011a).

Summary indicator systems

Summary indicator systems use only a single icon, symbol, or score to deliver a summary of the qualitative nutrient content of the product. They do not give any specific content information and are often based on nutrient algorithms, which consider the positive or negative impacts of various nutrients on health. The numeric score or type or number of symbols denotes the nutritional quality of the product, the

Illustration 1: Chapman University Cafeteria Original Signage



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single symbol purportedly making it easier for a consumer to identify a healthy food (Wartella, Lichtenstein, & Boon, 2010). The Smart Choices™ as well as the Walmart "Great for You" icons are examples of summary indicator systems. The main concern with these systems is that inferences about certain nutrients and the item's overall healthiness are implied with a single symbol. A product with an icon may be perceived healthier in general compared to a product with a nutrient-specific label or no icon at all. This leads to the idea that the summary icon could act as an implicit positive health claim (Wartella, Lichtenstein, & Boon, 2010). These concerns were partly responsible for the Food and Drug Administration (FDA) and United States Department of Agriculture halting the Smart Choices™ program in 2009 (Wartella, Lichtenstein, Yaktine & Nathan, 2011). Some indicator systems use a scientific algorithm to rate nutrient density. For example, Guiding Stars® includes symbols that give products a "grade" – the more stars the "healthier" the food (Fischer, Sutherland, Kaley, Fox, Hasler, Nobel, Kantor, & Blumberg, 2011). Similar to Guiding Stars® is the NuVal® system. This system scores food on a scale of 1-100 based on an algorithm that uses 30-plus nutrients, including protein, calcium, vitamins, sugar, sodium, and cholesterol (NuVal® LLC, 2012).

Food group information systems

Food group information systems use symbols based on the presence of a certain food group or ingredient (Wartella, Lichtenstein, & Boon, 2010). Some symbols indicate if the product includes a serving of a particular food group. The ConAgra Start Making Choices™ program uses MyPyramid food group icons to show the relative percentage of a food group consumed from one serving (based on a 2,000-calorie diet) (Start Making Choices, 2008). However, the program has not adapted to changes such as the shift from MyPyramid to MyPlate. Other programs specify if the food contains an important ingredient such as whole grains (The Whole Grains Council, 2011).

Components of an effective system

A successful labeling system, whether for retail or food service, would be readily noticed and understood, include one standard symbol in a consistent location across products, be practical to implement across the food supply, be accessible to people of all ages and educational levels, and be used for all foods healthy or not (Wartella, Lichtenstein, Yaktine & Nathan, 2011). Regardless of the system used, it is important to indicate nutrients that are linked to public health concerns in America and those that are known to be commonly deficient (fiber, vitamin D, calcium, and potassium) or in excess—calories, saturated fat, and sodium being the most critical. Other important nutrients include total fat, cholesterol, and sugar, (Wartella, Lichtenstein, & Boon, 2010). The nutrient specific system meets these criteria and offers information about key nutrients per serving in a relatively easy-to-read and understand format. It is more comprehensive than the specific nutrient system, which usually focuses on a single food group, and it provides details about key nutrients that a single number or symbol (as in the symbol system) is not able to provide. According to the FDA (2009), FOP labeling with this system is more consistent with the Nutrition Facts panel and provides consumers with readily accessible information about a product's nutritional profile at the point of purchase. It can be used for any food item and highlights both positive and negative attributes so that consumers can be more informed (Lytton, 2010). This system provides a snapshot of the nutrient content of a food and how it contributes to a person's daily diet. If a consumer wants a specific amount of protein or to limit sodium intake, a nutrient specific system can aid him or her in quickly doing that with one glance at the FOP label (Wartella, Lichtenstein, & Boon, 2010).

Nutritional signage in food service

The majority of label profiling systems focus on retail foods in the supermarket context rather than assessing menu items or meals in the foodservice context (Williams & Colyer, 2009). Because foods purchased in food service establishments are exempt from Nutrition Labeling and Education Act disclosure requirements, menu labeling in restaurants and other types of food service has been infrequent (Burton, Howlett, & Tangari, 2009). In 2008, however, California was the first state to pass a menu labeling law that requires that fast food and chain restaurants with more than 20 outlets in the state post calorie counts for standard items on menus and menu boards (Padilla & Migden, 2008). The FDA soon followed with The Patient Protection and Affordable Care Act, effective March 2010, which requires restaurants with 20 or more establishments nationwide to post calories on menus, menu boards, and food display tags (FDA, 2010). Food establishments with less than 20 outlets can voluntarily register to become subject to new federal menu labeling requirements, unless they make a health or nutrient content claim, in which case they must provide nutrition information whether or not they have 20 or more establishments (FDA, 1993). This act further requires covered food establishments to also provide other nutrient information in writing upon request – total fat, saturated fat, cholesterol, sodium, total carbohydrates, sugars, fiber, and total protein.

Menu labeling is important for consumers – average Americans spend close to half of their food budget eating away from home (Larson & Story, 2009). For some age groups, college students, for example, most of their diet is consumed in a captive or limited cafeteria setting; consequently, there is a great need for nutritional information in cafeterias. Without an effective nutrition labeling system, students do not have a means of comparing foods to make healthy dietary decisions. Many students adhere to specific diets (vegetarian, vegan, gluten free, among others) and some have special nutritional needs to address specific disease states such as celiac disease or lactose-intolerance (Frederick, 2011). At Chapman University, the food service director works with about 20-25 students per year who have food allergies or intolerances. Approximately 200-300 students each day choose to eat at the vegan station.

PILOT STUDY

Solution development for Chapman University's cafeteria

The Head Chef provided recipes for all items prepared in the cafeteria. Food Processor™ (Version 10.4.0, ESHA Research, Salem, OR) was used to analyze the recipes for nutrient content. Nutrition specifications were obtained for ingredients from vendors when available, and for other ingredients the Food Processor™ database was used.

Based on research of the three types of FOP labeling systems, the nutrient-specific signage system for the Chapman University cafeteria was determined to be the best option. The selection of nutrients was based on the *Facts Up Front* system, which includes four main nutrients on each label: calories, saturated fat, sodium and sugars. Two other "nutrients to encourage" are selected for each product and may include potassium, fiber, calcium, protein, iron, and vitamin A, vitamin C, or vitamin D (GMA, 2012b). For this project, calories, saturated fat, sodium, and sugars were selected as "nutrients to moderate." Protein and fiber were selected as the two "nutrients to encourage." These latter two were selected because they are most relevant to Chapman University's demographics. Protein is a nutrient many college-age students are interested in, due to perceptions about the effectiveness of protein on increased muscle gain and weight loss. Fiber was chosen as a nutrient to encourage due to its

Table 1: Assignment of traffic light colors based on %DV for saturated fat, sodium, and fiber and is based on a 2000-calorie diet.

	SAT. FAT	SODIUM	FIBER
Green	0-1 g 0-5% DV	0-120 mg 0-5% DV	6-25 g 20-100% DV
Orange	2-4 g 6-19% DV	121-456 mg 6-19% DV	2-5 g 6-19% DV
Red	5-20 g 20-100%DV	457-2400 mg 20-100% DV	0-1 g 0-5% DV

Values are based on 21 CFR 101.9 Nutrition Labeling of Food (FDA, 1993).

importance to health and low prevalence in the American diet (Steinborn, 2011).

The second step was to identify the best system to display the values for the nutrients. The traffic light labeling system was chosen due to its success in the U.K. (Food Standards Agency, 2009; Institute of Medicine, 2010). According to the U.K. Food Standards Agency, the comprehension of the FOP labels is highest (58-71%) when the information combines traffic light colors, text, and %GDA (Food Standards Agency, 2009). In focus groups surveyed by the FDA, most participants considered the traffic light symbol system to be better in conveying nutrition characteristics than summary symbols (Institute of Medicine, 2010). A successful food service approach of the traffic light system is described by Thorndike et al. (2012). During a three-month trial in the cafeteria at Massachusetts General Hospital (Boston), sales of healthy items, which were colored green, increased by 4.5% and those marked red fell by 9.2%. Due to its success, the cafeteria has continued to use the labels (Thorndike, Sonnenberg, Riis, Barraclough, & Levy, 2012).

In the traffic light system developed for Chapman's cafeteria, each color denotes a recommendation based on its saturated fat, sodium, and fiber content—green indicates that the meal/product is a healthy choice in regards to that nutrient, orange indicates that the food should be consumed in moderation, and red signifies that the food should be consumed sparingly if that nutrient is of concern. Daily values were used as the basis for color-coding (Table 1). According to the FDA, 5% or less of a daily value for all nutrients is considered low and 20% or more is high (FDA, 2004). Therefore, all food items containing sodium and saturated fat in amounts 5% or less of their DV per serving size were colored green, 6-19% of DV were colored orange, and 20-100% of DV were colored red. For fiber, because one wants to increase rather than limit amounts of fiber, all items with a daily value of 5% or less were colored red, 6-19% were colored orange, and 20-100% were colored green. The FDA Food Labeling Guide was used to find the appropriate daily values for each nutrient: 20 grams for saturated fat, 2400 milligrams for sodium, and 25 grams for dietary fiber (FDA, 2009). The serving sizes were based on Recommended Amounts Customarily Consumed as provided in the Code of Federal Regulations (FDA, 1993). Since calories, sugars, and protein do not have specific DVs, the amounts per serving for these nutrients were simply listed instead of arbitrarily assigning color codes.

The Chapman University residential cafeteria is configured with multiple stations—deli, soups, cereals, dressings, dessert, condiments, milk, sushi, American, Italian, vegan, salad bar, eurostation, and wok. A sign was created for each station, thus some signs included up to eight entrees or items per sign with one to two signs per station. The items included were those served on a regular basis, either daily or several times a week. Adobe Illustrator™ (CS4 Mac 14.8.0, Adobe Systems, San Jose, California) was used to create the signage.

To develop a hierarchy within each graphic, calorie and serving size information were made more prominent compared to the other nutrients because calories tend to be among the first thing most consumers look at when viewing nutritional information (Steinborn, 2011).

Soliciting Feedback

Once the data input for recipes and initial signage design was complete, the researchers presented the signs for feedback to the cafeteria dining committee, which includes seven members from Chapman's student board of directors. In addition, two focus groups were organized to solicit opinions from cafeteria users and to provide recommendations for the final design. The only criterion for their inclusion in the focus groups was that they should consume a majority of their meals in the cafeteria. To solicit participation in the focus groups, the researchers sent messages to three student organizations on campus. Students came voluntarily to either of the two focus group meetings, with six students in attendance at each meeting. A list of questions was prepared in advance to help the moderator facilitate the discussion and a scribe took notes. These focus groups provided beneficial advice and criticism that improved the final sign content and design. They gave the researchers an understanding of the food perceptions of this target audience. They provided information on the nutrients students are most interested in and an understanding of how students classify foods as "healthy" or "unhealthy". The researchers took note of the initial reactions of the students upon seeing the signage, and this feedback provided an indication of how the graphics could influence their food selection. The focus groups revealed that students are most interested in foods that are low in sodium, sugar, fat, and calories. They tend to look more at the amount of each nutrient in a serving rather than the daily value. They were also interested in knowing whether a food item is vegetarian, vegan, or gluten free due to dietary needs and preferences. The focus groups' feedback compelled the researchers to add vegetarian, vegan, or gluten free symbols to the signage, as well as a legend for the color codes to provide an explanation for each color. Also, the labels for saturated fat, sodium, and fiber were moved to the top to make them more prominent, the visibility of the calories icon was increased, and the distinction of low, medium, and high for each nutrient was taken out because it became confusing when low is green for sodium and fat, but red for fiber.

IMPLEMENTATION

Feedback from the focus groups and dining committee was taken into account and a final design was created (Figures 1 and 2). Each sign has up to eight food items or entrées. Each graphic includes the name of the item, its serving size, calorie content, sugars content, protein content, saturated fat content, sodium content, and fiber content if applicable. Gluten free, vegetarian, and vegan symbols were added next to the name of the item when applicable. The symbols and key

Figure 1: Cereals Sign

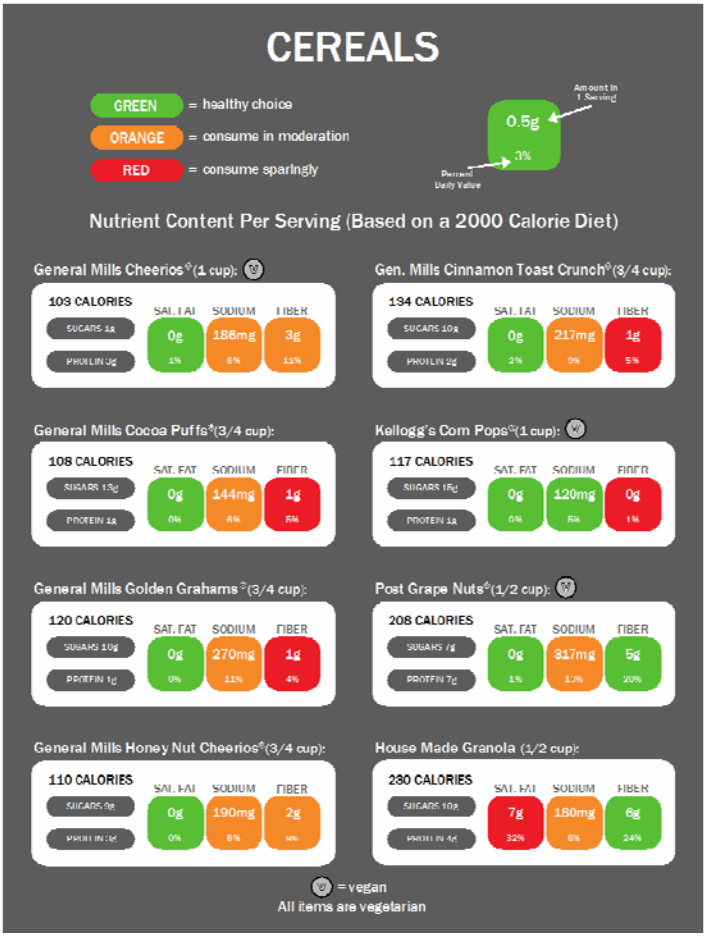

Figure 2: Soups Sign

are only included at the bottom of the sign if the items shown on that particular sign require these symbols. For example, at the vegan station all items listed are both vegetarian and vegan. Therefore, these symbols are not necessary. The only symbol used on this sign is the gluten free symbol. At the dessert station all items are meatless but still use animal products such as milk and butter, therefore they are vegetarian but not vegan. Like the vegan station, a statement is made at the bottom stating that all items are vegetarian rather than including symbols on every item on the sign. None of the items at the wok station were vegan or vegetarian but some were gluten free, consequently only this symbol is used.

The signs were created to have the maximum clarity possible while still providing enough detail to be useful. There is enough flexibility so that students not nutrition-literate can look at the colors and make a good decision. However, there is also enough information included in the design to be beneficial to those students who are familiar with nutrient amounts and %DV and can make a decision based on this additional information.

A total of seventeen signs were created and printed in color on 8.5" x 11" sheets and laminated to prevent damage from any spills and to make them last longer. The laminated sheets were adhered to the clear food shields above food items at their respective stations (Illustration 2) to ensure that they were easily and clearly accessible. After a few days of the signs being posted, the researchers administered a voluntary survey (Figure 3) to students eating at the cafeteria during a lunch period. This survey was conducted to gauge the utility of the signs. Eighteen students (not part of the original focus groups) agreed to complete the survey. Fourteen out of 18 students had noticed the signs within the first few days of them being posted in the cafeteria, and six used the signs to make food selections. While the feedback was positive, given the small sample size the researchers decided to conduct a larger survey at a later time once the signs had been posted for an extended period.

Unsolicited comments in the months following the release of the signage continued to be positive. Via direct feedback to cafeteria employees and the Student Board of Director's dining committee, or via Facebook and written responses on restaurant dining feedback

Illustration 2: New Nutrition Signage Implemented in the Chapman Cafeteria

Figure 3: Survey questionnaire administered to students a few days after the initial posting

	Student Questionnaire for New Nutrition Signage in the Cafeteria
1.	Are you interested in knowing the nutritional values of food items in the cafeteria?
2.	Did you notice the new signs with nutrition information posted this past week?
3.	What stood out the most on the signs if you did look at them?
4.	Did you use the sign to make your food selection(s)?
5.	Do you have any comments or suggestions regarding the signs?

cards, students have requested that the signage be kept in the cafeteria permanently. Due to the positive feedback, the cafeteria decided to keep them posted regularly and placed a re-positional adhesive on the back of each sign so that they remain affixed but can easily be removed for cleaning, updates, and addition of food items to the signage.

A surprising find was that several items considered "healthy" to most students, such as granola and soup, were in fact some of the least nutritional. The cafeteria house granola is high in fat, with 32% of the daily value for saturated fat in one serving, due to the use of large amounts of butter (Figure 1). Soup is often perceived as a "healthy" option, yet every soup in this cafeteria is high in sodium, and most are high in saturated fat and low in fiber (Figure 2). According to an article in *Healthy Eating Research*, underestimating the number of calories, fat, and sodium in foods is common (Larson & Story, 2009). Certain foods typically perceived as "healthy" may actually be higher in these nutrients than expected. Therefore, these labeling graphics work towards a key project objective: providing guidance to students to make healthy food choices using information grounded in science.

LIMITATIONS OF THE PILOT PROGRAM

The limitations to this program are similar to FOP labeling in general. Some students are confused about the color codes. Because a green color can indicate high amounts of fiber or low amounts of sodium or saturated fat, it can be misleading to some who expect a green color to indicate high levels of all nutrients. Also, protein and sugars were not color-coded because there is no daily value to classify an amount as high, medium, or low. Therefore, they were colored a neutral gray. While this removed any chance for bias, it also makes these nutrients less prominent compared to the color-coded nutrients. According to viewers, protein and sugars became the last nutrients they viewed. Certain food items seemed healthier options at first glance due to one or more green icons but on further analysis, taking into consideration the protein and sugars, these food items were actually less healthy choices compared to products with fewer green icons. For example on the condiments sign, peanut butter has two orange lights for sodium and saturated fat, while the raspberry and strawberry preserves are both green for those nutrients and might appear to be healthier at first glance. However, the sugar content for the preserves is much higher and the protein content is much lower compared to peanut butter. With these two nutrients taken into account, the peanut butter may arguably be the healthier alternative. Similarly, Sweet and Sour Chicken (331 calories, 25g sugars) has three orange lights while Thai Green Curry with Chicken (259 calories, 7g sugar) has one red (for saturated fat) and two orange lights. Thus, even though Thai Green Curry with Chicken has significantly lower calorie and sugar content and higher protein than Sweet and Sour Chicken, the single red light might suggest that it is the less healthy option. Therefore, a viewer may be challenged to determine whether three orange signs are healthier than one green, one orange, and one red or one red and two orange lights. The best option in such cases would rest on the nutrients the student is more interested in for their diet; however, this takes away from the "at-a-glance" idea.

The recipes included in these signs are only a portion of all those that are served at the cafeteria. For example at the Italian station, pasta with basil marinara sauce and cheese and pepperoni pizza are served daily, while other dishes such as the pasta with parmesan sage cream sauce may only be served once per week. Another seasonal dish or new dish may be served as the specialty item at that station for that particular day. Additional signs need to be made to include those items, even if they are not items served on a daily basis. If these signs were available for all foods available in the cafeteria, there would be greater use and the concepts would be reinforced and healthier choices could be made at every station. A digital signage system would be ideal and flexible, however, further research needs to be done on this concept.

This study did not measure the impact of the nutritional signage on actual food choices. Student feedback was positive but the evidence of the impact of the signage is anecdotal. The next phase of this project will include an intervention study to quantify the changes in eating habits of users of the cafeteria.

CONCLUSIONS AND APPLICATIONS

Since this signage system is grounded in daily values and nutrients already part of the nutritional facts panel, a traffic light signage for any food can be created as long as it has a nutritional facts panel. If this data is not available, software programs such as Food Processor™, Genesis R&D®, or Nutritional Pro™ by Axxya, or other inexpensive programs available online can be used to analyze each recipe and derive the necessary nutrient facts. A graphic design program such as Adobe Illustrator™ (San Jose, CA) or PowerPoint by Microsoft (Redmond, WA) is needed for creating signage. Nutrients can be added or removed as deemed important in a given situation. The costs associated with this pilot program include lamination of the signs, nutrition analysis software, and labor associated with analyzing recipes and designing the graphics.

The project took 40 hours to complete, however selecting the nutrients to depict, devising the basis for the color codes for each nutrient, and finalizing the design were the most time intensive elements of the process. Thus, if the same nutrient selection, basis for color-coding, and design are used in future projects, the time required would be a function of the number of recipes needed to be analyzed. Recipes took, on average, 15-20 minutes each to analyze, depending on the length and complexity of the recipe. This analysis can be performed by a manager or student assistant as long as such individuals have access to food analysis software and a graphic design program.

In addition to prepared entrees, nutritional signage for self-serve items such as cereals, condiments and salad dressings also serve an important purpose in helping students who create their own meals, at salad or hamburger stations for example, make healthy choices. For operations that do not serve a consistent menu each day (non-cycle), the signs would have to be rotated daily (not permanently affixed), assuming that the items are offered consistently. Complete menu changes or food items offered only occasionally might pose a challenge if not enough time is available for nutritional analysis.

This signage system developed for the Chapman University residential student cafeteria is especially suitable for institutional cafeterias but readily adaptable to any food service setting, as long as the signage can be prominently displayed and provides a comparison of the various options available on the menu. It is especially effective in the school cafeteria setting and could be used for various age groups, as it gives students the ability to make informed, self-directed choices. Feedback from student users of this cafeteria indicates that the use of the traffic light system, selection of nutrients, and the design of the graphics are helping them make healthier food choices.

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