



## Factors influencing HACCP implementation in Taiwanese public hospital kitchens

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### ABSTRACT

This study investigated the potential factors which may influence implementation of the HACCP system in hospital catering operations in Taiwan. A total of 132 catering managers and operators at 23 hospitals affiliated with the Department of Health (DOH) participated in the study. Three structured questionnaires were used to collect data concerning employee satisfaction, difficulties, and benefits related to HACCP implementation. The results show that differences in gender, age, and job position are factors that may influence HACCP implementation in Taiwanese hospitals. Most of the catering staff in the observed hospitals agreed that HACCP was very beneficial for hospital catering.

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### 1. Introduction

According to the report by the Department of Health (DOH) (2009), a total of 1295 cases of food borne disease occurred from 2004 to 2008 in Taiwan. These involved 18,067 people who were ill and 3 who died as a result of consuming contaminated food. Among all of the cases, 7 took place in patient care settings and involved a total of 56 victims. Since the level of food hygiene is a very important issue for inpatients, personnel in all patient care settings need to pay close attention to preventing food contamination so as to ensure patient safety.

Food safety has received an increasing amount of attention recently around the world. To prevent contamination of food supplies, various groups in public health, industry, regulatory agencies, and academia must play important roles. Measures are also needed to reduce or eliminate contamination between the farm and the table. Since end-product testing alone is unable to assure safe food production, the hazard analysis critical control point (HACCP) system has been adopted in order to eliminate identified hazards or reduce them to an acceptable level (Ehiri, Morris, & McEwen, 1995; Walker, Pritchard, & Forsythe, 2003). HACCP is a management system in which food safety is addressed through the analysis and control of biological, chemical, and physical hazards from raw material production, procurement and handling, to manufacturing, distribution and consumption of the

product (NACMCF, 1997). It is based on a logical, structured exploration of potential hazard points in a food operation, and on the introduction of control and monitoring measures (Richards, Parr, & Riseborough, 1993).

The HACCP system evolved from standards that were set up in the 1960s by Pillsbury in cooperation with the National Aeronautics and Space Administration (NASA), the U.S. Army, and the U.S. Air Force Space Laboratory with the goal of providing astronauts with safe foods (Goldmann & Kaushal, 2002; Ten Eyck, Thede, Bode, & Bourquin, 2006). The system provides a careful review of the entire food production process and identifies principal hazards and control points where contamination can be prevented, limited, or eliminated. HACCP safety principles have been applied in the food industry for over 30 years, and the system has been accepted universally as a powerful tool for evaluating the control of risk in foods and ensuring food quality and safety (Richards et al., 1993). The system is also an ideal tool for hospital infection control and food hygiene practices. Baird, Henry, Liddell, Mitchell, and Sneddon (2001) studied the application of HACCP principles to prevent infection following intraocular surgery. Their results showed that medical safety was improved following the implementation of HACCP in healthcare processes. Richards et al. (1993) also found that HACCP implementation in hospital kitchens enabled operators to produce guidelines for their catering departments which were applicable to other hospital kitchens as well.

The HACCP system was introduced into Taiwan in 1998 and since then has been applied in the food industry to prevent large-scale food borne illnesses. It was integrated into the Governing Food Sanitation Act in 2000. To promote food hygiene and hospital catering safety, Taiwan's DOH has encouraged DOH-affiliated

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**Table 1**  
Sample characteristics (n = 132).

Characteristics	Hospitals which had implemented HACCP		Hospitals which had not implemented HACCP		Total	
	n	%	n	%	n	%
<i>Gender</i>						
Female	84	80.0	20	74.1	104	78.8
Male	21	20.0	7	25.9	28	21.2
<i>Age</i>						
≤30	12	11.4	5	18.5	17	12.9
31–50	75	71.4	20	74.1	95	72.0
≥51	18	17.1	2	7.4	20	15.1
<i>Position</i>						
Manager	44	41.9	27	100.0	71	53.8
Operator	61	58.1	0	0.0	61	46.2

hospitals to implement HACCP and obtain DOH certification since 2001. Hospitals in Taiwan are classified into different categories according to their type of ownership (public, private, or corporate); the type of medical treatment they provide (general, chronic disease, or psychiatric), their instructional capability (teaching or non-teaching hospital); and their level of accreditation (medical center, regional hospital, or district hospital). DOH-affiliated hospitals belong to the category of public hospitals, so they are ahead of all other Taiwanese hospitals in implementing HACCP. Most DOH-affiliated hospitals are equipped with kitchens so that they can provide inpatient catering, which is designed and prepared under the supervision of registered dietitians in each hospital's nutrition department.

The purpose of this study was to investigate factors which may influence the implementation of HACCP in public hospital catering in Taiwan. Therefore, in this study, we surveyed catering personnel at DOH-affiliated hospitals to determine their level of satisfaction with HACCP implementation, the difficulties they encountered, and perceived benefits of HACCP. According to DOH records, 12 out of 29 DOH-affiliated hospitals implemented HACCP in 2007 and obtained HACCP certification from the DOH. Among the DOH-affiliated hospitals that did not implement HACCP, 6 were excluded from the study because they are not equipped with kitchens and, therefore, provide their inpatients with purchased meals.

## 2. Methods

In order to obtain insights into the possible factors influencing HACCP implementation in the kitchens of DOH-affiliated hospitals, we developed three different structured questionnaires: (1) One questionnaire was used to survey managers of 12 hospitals which had implemented HACCP. This questionnaire contained 13 items

regarding satisfaction levels, 9 items regarding implementation difficulties, and 9 items regarding the benefits of implementing HACCP. (2) The second questionnaire was used to survey operators at the same 12 hospitals that had implemented HACCP. This questionnaire had 13 items regarding satisfaction levels. (3) The third questionnaire was used to survey managers at 11 hospitals which had not implemented HACCP. This questionnaire contained 9 items regarding expected difficulties with HACCP implementation and 9 items regarding the anticipated benefits of implementing HACCP.

In total, 138 staff members (45 managers and 65 operators of hospitals which had implemented HACCP, and 28 managers of hospitals which had not implemented HACCP) participated in the study from November to December, 2007. A total of 132 staff members (44 managers and 61 operators of hospitals which had implemented HACCP, and 27 managers of hospitals which had not implemented HACCP) returned fully completed and valid questionnaires, representing a 95.7% response rate. Each item was scored on a 5-point Likert scale: 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), 5 (strongly agree). The reliability of the instrument was substantiated with a Cronbach's alpha coefficient higher than 0.70 for all variables.

The data obtained from the survey form were evaluated using the package program SPSS 12.0 for Windows. The frequency distributions of the sample were determined with respect to gender, age (by class: ≤30 years; 31–50 years; ≥51 years), and position (manager; operator). Independent samples *t*-tests were conducted to determine whether or not there were significant differences in the perceived benefits and level of difficulty of implementing HACCP between managers of hospitals which had implemented HACCP and managers of hospitals which had not. A pair of independent samples *t*-tests was also conducted to determine whether or not there were significant differences in satisfaction levels between females and males, and between managers and operators after hospitals had implemented the HACCP system. A one-way ANOVA was conducted to determine whether or not there were significant differences in satisfaction levels among three age groups (i.e., ≤30 years, 31–50 years and ≥51 years) in hospitals which had implemented HACCP. In addition, Scheffé post hoc tests were used to perform multiple comparisons. For all the analyses performed in this study, a level of  $p < 0.05$  was used to determine statistical significance (two-tailed).

## 3. Results

### 3.1. Characteristics of the sample

As shown in Table 1, there were more females than males and more managers than operators in the study. The age group between 31 and 50 years old comprised the majority of the study sample in

**Table 2**  
Analysis of the difficulty of HACCP implementation from the perspective of managers in hospitals which had implemented HACCP and in hospitals which had not.

Items	HACCP-implemented	HACCP-unimplemented	t
	(n = 44) Mean (SD)	(n = 27) Mean (SD)	
<i>Hospital</i>			
Difficulty of getting support from the hospital	2.68 (0.97)	3.74 (0.98)	-4.30***
Difficulty of getting funds from the hospital	3.14 (0.89)	4.30 (0.82)	-5.33***
Difficulty of coordinating with related departments in the hospital	2.92 (0.89)	3.85 (0.86)	-4.18***
<i>Operation procedure and facility</i>			
Difficulty of setting up standard operating procedures for HACCP	2.95 (0.91)	3.81 (1.11)	-3.43***
Insufficient manpower allocation	3.08 (0.98)	4.37 (0.74)	-5.73***
Difficulty of changing operating procedures	3.16 (1.01)	3.96 (0.98)	-3.16**
Difficulty of filling in paperwork for HACCP	3.11 (1.02)	3.96 (0.98)	-3.36***
Difficulty of running the kitchen during facility improvement	3.11 (0.94)	4.00 (0.92)	-3.79***
Difficulty of allocating funds for facility improvement	3.41 (0.90)	4.56 (0.64)	-5.69***

Items were scored on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree); SD: standard deviation; \*\* $P < 0.01$ , \*\*\* $P < 0.001$ .

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