ORIGINAL ARTICLE

Measuring hospital food service quality: Adaptation and validation of the SERVQUAL–HF scale

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ABSTRACT

Objective: To adapt and psychometrically evaluate the SERVQUAL for Hospital Food Service (SERVQUAL-HF) instrument for hospital food service quality assessment by validating its dimensional structure, reliability, and ability to identify key predictors of patient satisfaction.
Methods: This study uses the SERVQUAL framework to assess hospital food service quality, adding variables geared toward meal-specific aspects. A 7-point Likert-scale survey was performed in two hospitals to compare patient expectations to actual reality.
Results: Statistical validation, including multilinear regression and correlation analysis, revealed that responsiveness, food quality, perceived value, empathy, and meal variety are all significant predictors of customer satisfaction. SERVQUAL-HF's dependability in assessing service quality across hospital settings was proven by a psychometric examination. The study emphasizes methodological modifications, such as the significance of empathy and perceived value, and suggests directions for future research in healthcare service measuring.
Conclusions: The findings add to the literature by improving the use of SERVQUAL in non-traditional hospital settings, ensuring comprehensive evaluation of patient-centered food service models.

Key Words: Food perception, Hospital food service, Instrument validation, Patient experience, Patient satisfaction, Service quality, SERVQUAL

1. INTRODUCTION

Despite its critical role in patient recovery and satisfaction, hospital food service remains under-measured by validated instruments tailored to healthcare settings.[1,2] While tools such as HCAHPS (Hospital Consumer Assessment of Healthcare Providers and Systems), PROMIS (Patient-Reported Outcomes Measurement Information System), the Mealtime Audit Tool, and other satisfaction surveys are widely used,[1,3–5] they frequently focus on operational metrics such as delivery time and dietary compliance, ignoring critical service quality dimensions such as empathy, responsiveness, and perceived value.[6,7]

Furthermore, the majority of validated patient satisfaction frameworks come from general service industries or non-clinical contexts, limiting their applicability to hospital food service.[8] As a result, healthcare organizations continue to struggle with identifying important drivers of patient satisfaction and matching services to patient expectations.[9,10]

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To address this gap, we adapted the SERVQUAL for Hospital Food Service (SERVQUAL-HF) framework,[11] a healthcare-specific instrument designed to measure patient experience and satisfaction with hospital food service. The scale incorporates both core service dimensions and meal-specific elements such as food quality, variety, and timeliness. By validating SERVQUAL-HF in a hospital setting, this study demonstrates its utility not only as a measurement tool but also as a strategic resource for improving service delivery and supporting patient-centered care.

This study distinguishes between patient satisfaction (an evaluative response following service delivery) and patient experience (expectations and perceptions formed throughout the care process). These distinctions informed the development and validation of the SERVQUAL-HF scale. The following sections outline the adaptation process, psychometric testing, and factor structure, providing a replicable framework for measuring hospital food service quality. Barros et al.[12] present a complementary analysis of patient satisfaction drivers and applied service delivery insights.

1.1 Literature review

Parasuraman et al.'s SERVQUAL scale[11] measures service-quality gaps across five dimensions: reliability, responsiveness, assurance, empathy, and tangibles.[13, 14] Its versatility allows researchers to adapt the instrument to different areas and purposes.

Researchers have successfully adapted SERVQUAL to diverse healthcare contexts — e.g., private hospitals in Nepal[15] and critical-care units in China[16] — to identify actionable improvements in patient satisfaction. Aside from healthcare, SERVQUAL has been used to assess cultural variations in service perception, consumer behavior, and service loyalty. Lee and Salciuviene[17] found that perceived value and trust had a substantial impact on loyalty outcomes, reinforcing SERVQUAL's relevance for user-centered service evaluation. These findings align with Brown et al.,[18] who advocate for its use in improving customer retention and service quality.

However, no study has yet applied SERVQUAL to hospital food service, where operational metrics (meal timing, nutritional compliance) dominate and core dimensions (empathy, perceived value) are neglected.[7, 17, 18] This paper bridges that gap by developing and validating SERVQUAL-HF, that integrates food-quality and menu-variety factors alongside the five core dimensions. We then evaluate its psychometric performance via content validity assessment, exploratory and confirmatory factor analysis, internal consistency (Cronbach's α), and convergent/discriminant validity tests in two acute-care hospitals.

1.2 Problem statement

Hospital food service often relies on operational measures, such as meal delivery logistics or dietary compliance, while overlooking patient-centered service quality dimensions. Although SERVQUAL has been widely used in a variety of healthcare contexts to assess service quality, its use in hospital food service remains limited and methodologically underdeveloped. This study addresses that gap by adapting SERVQUAL to include domain-specific components such as food quality, meal timing, variety, convenience, and perceived value, alongside its original dimensions: tangibles, reliability, responsiveness, assurance, and empathy. The resulting instrument, SERVQUAL-HF, was tested across two hospital settings to support the development and preliminary validation of a structured, psychometrically informed approach for measuring food service quality in inpatient care.

1.3 Purpose

The purpose of this study was to modify and evaluate the SERVQUAL-HF instrument for hospital food service quality assessment. The study aimed to compare patients' pre-hospitalization expectations with their reported experiences, evaluate the relationships between SERVQUAL-HF variables and patient satisfaction, and analyze the instrument's dimensional structure. This study expands the application of SERVQUAL in patient-centered hospital food service settings by focusing on both the instrument's psychometric performance and content adaptation.

1.4 Research questions

1) What are the psychometric properties of the adapted SERVQUAL-HF instrument in hospital food service?

2) How do individual SERVQUAL-HF dimensions relate to patient satisfaction with hospital food service?

3) To what extent do patients' expectations differ from their perceived experiences across SERVQUAL-HF dimensions?

2. MATERIALS AND METHODS

Figure 1 shows the schematic of the cross-sectional study and questionnaire application used to measure the quality of hospital food service.

2.1 Study design

A cross-sectional study was conducted using primary data collected over a single ten-hour period across two acute-care hospitals in Southern California. The survey questionnaire included five original SERVQUAL dimensions (reliability, responsiveness, assurance, empathy, and tangibles) and five

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food-specific attributes (food quality, meal timeliness, variety, convenience, and value).

Eligible participants were adult inpatients ($\geq$ 18 years) receiving standard hospital meals with consistent texture and menu offerings. Inclusion required English proficiency and independent questionnaire completion. Exclusion included patients with cognitive/physical impairments, feeding assistance needs, or specialized diets (i.e., nothing by mouth [NPO], clear liquid, full liquid, diabetic 15 g and 30 g carbs, dysphagia 1 and 2 diets), or those on safety trays, or those on infection isolation measures (contact, droplet, airborne) or in intensive care units.

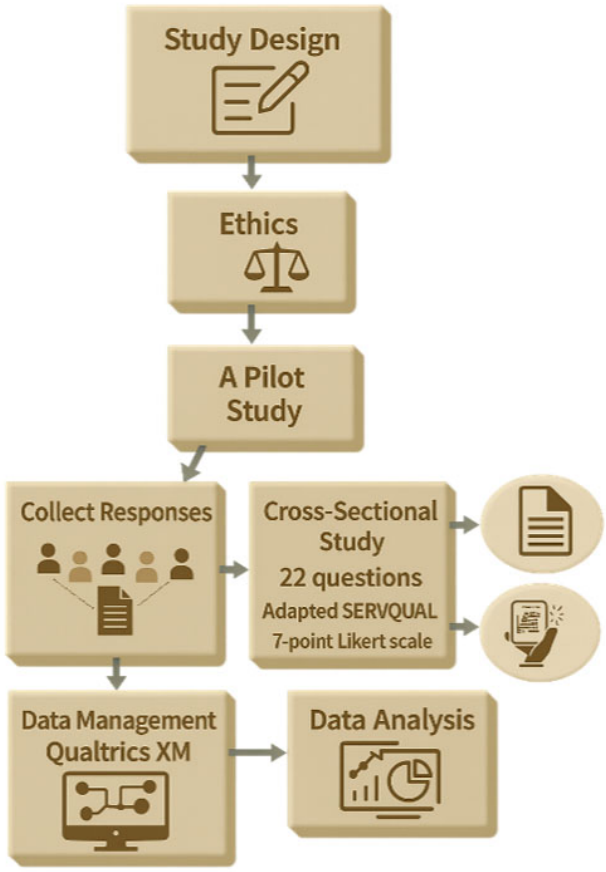

Figure 1. Flux diagram, from study design to the data analysis, of the cross-sectional study and questionnaire application used to measure the quality of hospital food service

2.1.1 *Survey administration*

Eligible inpatients were identified using Computrition software (`https://www.computrition.com`), which screened for dietary status and room assignment while maintaining confidentiality. Each participant was assigned a unique study ID linked to their room number to prevent duplication and ensure anonymity. Surveys were offered in paper or electronic format via QR code. Responses were collected by trained staff following a standardized protocol. Average completion time ranged from 2 to 5 minutes.

Survey administration was conducted by a team of diet technicians and a registered dietitian trained in Good Clinical Practice (GCP), conflict of interest (COI), and biomedical research procedures. All personnel followed a scripted protocol to ensure consistency, minimize response bias, and maintain adherence to eligibility screening and unit-based allocation.

2.1.2 *Study setting*

This study was conducted across two hospitals within the same healthcare system. Hospital A is a tertiary academic medical center with approximately 320 licensed adult beds. It serves a diverse inpatient population with access to advanced specialty care, including transplant services, oncology, and trauma. Hospital B is a specialty facility with 134 beds focused on rehabilitation and short-term care, such as orthopedic injuries, neurological recovery, and complex pain management. Both sites operate independent nutrition services and provide standardized meal trays to eligible inpatients. These distinct settings enabled evaluation of the SERVQUAL-HF instrument across varied clinical environments.

2.2 Ethics

This study was deemed exempt from Institutional Review Board (IRB) review under 45 CFR 46.104(d)(2) for minimal-risk survey research (IRB #5240007; approved January 31, 2024). All procedures adhered to the ethical principles of the Declaration of Helsinki. Authorization was also obtained from the executive director of nutritional services, the senior vice president of patient care services, and the chief nursing officer of the participating institutions.

2.3 Adapted SERVQUAL dimensions

2.3.1 *Pilot*

A pilot study was conducted at one facility within a Southern California healthcare system to refine the questionnaire and standardize data collection procedures. Three hospitals were excluded due to operational differences, while the selected sites shared similar food service models. The pilot assessed interview duration, identified logistical challenges, and established protocols for use at Hospitals A and B. Its purpose was to improve the survey instrument, not to contribute to the final dataset. All participating hospitals followed consistent inclusion and exclusion criteria.

2.3.2 *Sample size*

To determine the sample size, we used the following Cochran's modified formula (see Equation 1):[19]

$$n_1 = \frac{n_0}{1 + \frac{n_0 - 1}{N}} \quad (1)$$

To achieve a reliability level of 95%, we needed to reach a minimum of 127 patients through this survey, and we aimed for 80% power.

2.4 Instrumentation

2.4.1 *Survey format and scaling*

The SERVQUAL-HF instrument employed a 7-point Likert scale to capture patient expectations and perceptions of hospital food service. Items were rated from 1 ("Strongly Disagree") to 7 ("Strongly Agree"), providing a continuous scale for assessing service quality across both general SERVQUAL dimensions and food-specific attributes. This format enabled standardized data collection and supported psychometric analysis of the instrument's reliability and construct validity.

2.4.2 *Core SERVQUAL dimensions*

The instrument included the five basic SERVQUAL dimensions, tangibles, reliability, responsiveness, assurance, and empathy, established by Parasuraman et al.[20] and later refined by Babakus and Boller.[21] These core dimensions assess interpersonal and environmental components of service, which have been widely validated across industries, including healthcare.

2.4.3 *Added hospital food service dimensions*

To tailor SERVQUAL to hospital food service, we added five dimensions: food quality, meal timeliness, variety, convenience, and value. These additions reflect patient-specific expectations and support a more targeted assessment of service quality in healthcare settings. Unlike the original SERVQUAL tool,[20] which applies broadly across industries, SERVQUAL-HF was developed specifically for hospital food service.

2.4.4 *Rationale and construct definitions*

This tailored instrument, SERVQUAL-HF, was designed to give a context-specific assessment of hospital food service. Below, each extra dimension is defined and justified:

• Food Quality: Flavor, visual presentation, palatability, and freshness are important factors in determining perceived food quality.[22–24] Patients' health and rehabilitation may be dependent on their willingness to consume meals.[8]

• Meal Timeliness: Meal timing supports medical regimens and therapeutic intake.[25]

• Variety: Patients' preferences and nutritional demands differ depending on their health status; menu diversity boosts satisfaction.[26,27]

• Convenience: The ease of accessing meals and navigating food alternatives affects operational efficiency and influences satisfaction.[26]

• Perceived Value: Patients evaluate not only cost-effectiveness but also the perceived value of food service in terms of expectations and recovery.[28,29]

2.5 Data management

The study's data analysts had exclusive access to survey responses, ensuring maximum data security. All electronic documents and data were securely stored in a folder on a password-protected laptop, and hard copies of paperwork were housed in a locked cabinet within a secure office.

2.6 Data analysis

Data were analyzed using SPSS software.[30] Normality of SERVQUAL-HF ratings was assessed using the Shapiro-Wilk test.[31] Non-parametric tests were planned for variables that violated normality assumptions.

To evaluate RQ1's psychometric properties, Spearman's rank correlation coefficients were used to explore inter-item relationships across SERVQUAL-HF domains, with high, positive, and statistically significant correlations indicating dimensional coherence. Internal consistency was examined using Cronbach's α, and overall scale reliability was evaluated via a dependability coefficient. Predictive validity was tested using multilinear regression, construct validity through between-hospital comparisons of dimension scores, and criterion validity via expectation–perception gap analyses.

To explore RQ3 (differences between expectations and post-service experiences), descriptive statistics were calculated for Q11 (expectation), Q12 (satisfaction versus expectations), Q13 (expectation change), and Q14 (satisfaction). Between-group comparisons (Hospital A vs. B) were conducted using independent-samples *t*-tests and Mann-Whitney *U* tests, depending on distribution characteristics.

Chi-square tests were used to compare categorical variables between hospitals, including age, gender, race/ethnicity, dietary plan, hospitalization time, and delivery technique. These variables were also used as covariates in regression models when appropriate. Statistical significance was set at $p < .05$ throughout.

3. RESULTS

3.1 Sample characteristics and descriptive statistics

During the study period, 188 eligible inpatients were admitted to Hospitals A and B. Of those, 129 inpatients participated, while 59 were excluded due to non-interest ($n = 6$),

inability to consent (n = 9), sleep (n = 9), communication barriers (n = 5), clinical unavailability (n = 6), Spanish-only speakers (n = 20), or severe pain (n = 4). Low-count categories (i.e., < 5) were merged across hospitals to enable comparison. The survey consisted of 22 questions. Hospital A had more male participants; Hospital B had more females (see Table 1). Diet type and length of stay were comparable across sites; however, Hospital B had more patients receiving four or more meal trays (93% vs. 76%).

No significant differences were found in dietary plan (p = .34); most patients received a regular diet (55.2% at Hospital A; 46.3% at Hospital B). Hospital B had more patients on a diabetes diet (26.8% vs. 13.8%). Length of hospitalization was similar (p = .09), though Hospital B had more patients hospitalized for four or more days (90.2% vs. 75%).

Most patients received four or more trays; the difference neared significance (p = .07); this was more prevalent at Hospital B (92.7%) than at Hospital A (75.6%). Meal delivery staff differed significantly (p < .01). Patients at Hospital A more often received meals from food service staff (58% vs. 20%), whereas nurse-delivered meals were more common in Hospital B (37.5% vs. 15.9%).

Table 1. Descriptive analysis for demographic variables in the patient expectations and experience in the healthcare food service study in two hospitals

Parameters	**Hospital A, % (n = 88)**	**Hospital B, % (n = 41)**	***p*-value**
Age (years)			.16
18-34	22.7	4.9	
35-44	20.5	22.0	
45-54	15.9	19.5	
55-64	17.0	24.4	
65 or more	23.9	29.3	
Gender			**.02**
Male	65.5	43.9	
Female	34.5	56.1	
Hispanic or Latino			.84
No	58.0	56.1	
Yes	42.0	43.9	
Race			.62
Black or African American	15.9	14.6	
White	37.5	26.8	
Others	11.4	14.6	
Missing data	35.2	43.9	

3.2 Psychometric properties of SERVQUAL-HF (RQ1)

Spearman's correlations showed strong inter-item relationships across most SERVQUAL-HF domains. Exceptions were noted for Q11 (expectation), which did not significantly correlate with Q1–Q14 in Hospital B or with Q5 and Q8 in Hospital A. The instrument demonstrated strong internal consistency, with a Cronbach's α of 0.85 across items Q1–Q18, indicating excellent dependability. Regression analysis (see Table 2) confirmed that several domains predicted satisfaction (Q14), supporting construct validity.

In Hospital A, empathy (β = 0.48, p < .001) and perceived value (β = 0.46, p < .001) were the strongest predictors. Responsiveness (β = –0.24, p < .05) had a negative impact. SERVQUAL-HF effectively distinguishes service attributes linked to satisfaction, validating its use in hospital food service.

Table 2. Predictive validity: Multilinear regression analysis of SERVQUAL-HF on patient satisfaction at hospitals A and B

Independent Parameter	Hospital A			Hospital B		
	β	CI (0.95)		*β*	CI (0.95)	
		Lower	Upper		Lower	Upper
Dependent = Question 11: Expectations						
Q1: Tangibles	–0.04	–0.26	0.19	–0.01	–0.41	0.39
Q2: Reliability	–0.02	–0.27	0.23	–0.02	–0.66	0.63
Q3: Responsiveness	0.25	–0.06	0.41	0.64	–0.10	1.13
Q4: Assurance	0.13	–0.26	0.48	0.20	–0.24	0.53
Q5: Empathy	–0.04	–0.31	0.23	–0.31	–1.04	0.37
Q6: Food Quality	0.18	–0.19	0.51	–0.52	–0.88	0.16
Q7: Meal Timeliness	–0.11	–0.32	0.17	0.14	–0.28	0.49
Q8: Variety	–0.10	–0.35	0.19	0.13	–0.47	0.63
Q9: Convenience	0.16	–0.14	0.39	–0.23	–0.75	0.39
Q10: Value	0.09	–0.29	0.42	0.17	–0.57	0.78
Q15: Dietary plan	–0.04	–0.27	0.19	0.03	–0.51	0.58
Q16: Length of hospitalization	0.07	–0.32	0.47	0.52*	0.04	2.73
Q17: Meal tray numbers	0.04	–0.37	0.49	0.04	–1.21	1.41
Q18: Who delivers	0.13	–0.15	0.54	–0.41	–0.75	0.03
Dependent = Question 14: Experience						
Q1: Tangibles	–0.06	–0.14	0.06	0.23	–0.04	0.40
Q2: Reliability	0.02	–0.11	0.12	–0.16	–0.50	0.21
Q3: Responsiveness	–0.24*	–0.25	–0.03	–0.04	–0.37	0.31
Q4: Assurance	–0.01	–0.18	0.17	0.02	–0.20	0.22
Q5: Empathy	0.48***	0.19	0.44	–0.06	–0.45	0.33
Q6: Food Quality	0.17	–0.04	0.28	0.32	–0.07	0.50
Q7: Meal Timeliness	0.05	–0.09	0.14	0.01	–0.21	0.21
Q8: Variety	0.23*	0.02	0.27	0.05	–0.27	0.33
Q9: Convenience	–0.09	–0.18	0.07	–0.07	–0.37	0.26
Q10: Value	0.46***	0.13	0.45	0.68*	0.05	0.79
Q15: Dietary plan	–0.03	–0.13	0.08	0.06	–0.24	0.36
Q16: Length of hospitalization	–0.21*	–0.37	–0.01	–0.03	–0.81	0.68
Q17: Meal tray numbers	0.30**	0.12	0.52	0.01	–0.69	0.76
Q18: Who delivers	–0.10	–0.28	0.03	0.09	–0.14	0.28

Note. ***: $p < .001$; **: $p < .01$; *: $p < .05$; CI: Confidence interval.

The following demographic variables were used as a control: age group, gender, ethnicity, and race.

Caption: Q1) Trays and utensils are attractive and well-maintained; Q2) Food service is dependable and meets your expectations; Q3) Food service staff responds promptly to your needs; Q4) Staff has knowledge and skills; Q5) Staff genuinely cares for your well-being and comfort; Q6) Food satisfying, safe, healthy, and meets my preferences; Q7) Food delivered on time and at the desired temperature; Q8) Food service offers a variety of menu options for my preferences; Q9) Food service accessible and easy to use, convenient hours/options; Q10) Food service offers good value, quality, and variety; Q11) Before hospitalization, how would you rate your expectations regarding the food service in the hospital? Q14) How satisfied are you with the food service you received during your hospitalization at the hospital? Q15) What is your current prescribed dietary plan? Q16) How long have you been hospitalized this time? Q17) Quantify the number of meal trays you have received, and Q18) Who typically delivers your meal tray?

3.3 Multivariate predictors of patient satisfaction from SERVQUAL-HF dimensions (RQ2)

T-tests and Mann-Whitney *U* (MWU) showed similar ratings across most SERVQUAL-HF dimensions. According to Table 3, RQ2 presents each dimension's mean score, standard deviation, gap score (A–B), and both *p*-values.

Food quality was the only dimension with a statistically significant difference (gap 0.56; *t*-test: $p = .02$; MWU: $p = .022$). Hospital A scores higher (mean = 6.10, SD = 1.15) than Hospital B (mean = 5.54, SD = 1.54).

Meal timeliness exhibited the sole negative gap (–0.35, $p > .05$), suggesting faster service at Hospital B. All other dimensions yielded small, non-significant differences (gaps ranging from 0.01 to 0.37).

Table 3. Discriminant and criterion validity: SERVQUAL-HF dimension scores and expectation–satisfaction measures with gap scores (A–B) and significance tests across hospitals A and B

Measure	Hospital A n = 88	Hospital B n = 41			Mann-Whitney U
	Mean ± SD	Mean ± SD	Gap (A – B)	p-value[1]	p-value[2]
RQ2: SERVQUAL-HF Dimensions					
Q1: Tangibles	6.13 ±1.36	5.90 ± 1.28	0.23	0.38	0.089
Q2: Reliability	5.94 ± 1.36	5.93 ± 1.15	0.01	0.95	0.539
Q3: Responsiveness	5.95 ± 1.44	5.76 ± 1.32	0.19	0.46	0.131
Q4: Assurance	6.05 ± 1.25	5.73 ± 1.45	0.32	0.21	0.142
Q5: Empathy	6.06 ± 1.23	5.90 ± 1.00	0.16	0.48	0. 089
Q6: Food Quality	6.10 ± 1.15	5.54 ± 1.54	0.56	0.02	0.022
Q7: Meal Timeliness	5.48 ± 1.64	5.83 ± 1.40	–0.35	0.24	0.363
Q8: Variety	5.93 ± 1.43	5.56 ± 1.73	0.37	0.20	0.209
Q9: Convenience	6.05 ± 1.33	5.76 ± 1.32	0.29	0.25	0.051
Q10: Perceived Value	5.95 ± 1.30	5.59 ± 1.64	0.36	0.17	0.265
RQ3: Patients' expectations vs. satisfaction					
Q11: Expectation	3.19 ± 1.05	2.90 ± 1.11	0.29	0.15	0.184
Q12: Satisfaction (before service)	4.12 ± 1.02	3.80 ± 0.93	0.32	0.10	0.027
Q13: Expectation change	2.47 ± 0.63	2.34 ± 0.73	0.13	0.30	0.390
Q14: Overall Satisfaction	4.32 ± 0.82	3.88 ± 1.05	0.44	0.01	0.017

Note. [1] p-values based on t-test; [2] p-value non-parametric test Mann-Whitney U-test

Caption **RQ2:** SD is the standard deviation, Q1) Trays and utensils are attractive and well-maintained; Q2) Food service is dependable and meets your expectations; Q3) Food service staff responds promptly to your needs; Q4) Staff has knowledge and skills; Q5) Staff genuinely cares for your well-being and comfort; Q6) Food satisfying, safe, healthy, and meets my preferences; Q7) Food delivered on time and at the desired temperature; Q8) Food service offers a variety of menu options for my preferences; Q9) Food service accessible and easy to use, convenient hours/options; Q10) Food service offers good value, quality, and variety. To interpret the value of the means for each question, the Likert scale coded is: 1 = strongly disagree; 2 = disagree; 3 = somewhat disagree; 4 = neutral; 5 = somewhat agree; 6 = agree; and 7 = strongly agree. **RQ3:** Q11: Before hospitalization, how would you rate your expectations regarding the food service in the hospital facility? Q12: How satisfied are you with the food service at the hospital compared to your expectations before hospitalization? Q13: Did your expectations regarding the food service change during your hospitalization? and Q14: How satisfied are you with the food service you received while hospitalized? Expectations: 1 = very low expectations; 2 = low expectations; 3 = moderate expectations; 4 = high expectations; and 5 = very high expectations. Satisfactions: 1 = very unsatisfied, 2 = dissatisfied, 3 = neutral, 4 = satisfied, and 5 = very satisfied. Expectation changes: 1 = yes, they decreased; 2 = no, they remained the same; and 3 = yes, they increased.

All other dimensions, including tangibles, reliability, responsiveness, assurance, empathy, meal timeliness, variety, perceived value, and convenience, showed no significant differences ($p > .05$).

Convenience approached significance (MWU: $p = .051$), warranting further study. Meal-specific attributes, especially food quality, were stronger predictors of satisfaction than general service traits.

Spearman's correlation analysis revealed strong positive relationships across dimensions. Most inter-item correlations were statistically significant ($p < .05$), except for Q11, which did not correlate significantly with Q1–Q14 in Hospital B and with Q5 and Q8 in Hospital A.

3.4 Expectation–perception gaps and patient satisfaction outcomes (RQ3)

Table 3, RQ3, reports expectation scores, satisfaction measures, gaps, and p-values. Patient expectations (Q11) were statistically similar across hospitals (t-test $p = .15$; MWU $p = .184$), with small, non-significant expectation gaps (0.13–0.29).

However, satisfaction during hospitalization (Q14) showed a substantial gap of 0.44 in favor of Hospital A (mean = 4.32) over Hospital B (mean = 3.88), supported by both t-test and MWU results ($p = .01$ and $p = .017$, respectively).

Hospital A scored higher on pre-service satisfaction (gap = 0.32; MWU: $p = .027$), though not significant by t-test ($p =$

.10). Changes in expectations over time (Q13) did not differ between hospitals (gap = 0.13; $p > .30$). Despite similar expectations, Hospital A more often exceeded them, leading to higher satisfaction.

4. Discussion

4.1 Sample characteristics

Demographic differences influenced patient expectations and satisfaction. Significant gender variation between Hospitals A and B ($p = .02$), as shown in Table 1, highlights the need to consider demographics in service evaluation.

Prior studies offer mixed findings: some link demographics to expectations,[32] while others found no impact on satisfaction.[33] These findings support tailoring food service strategies to diverse patient populations.

4.2 Psychometric properties of SERVQUAL-HF (RQ1)

Hospital A reported significantly higher satisfaction (14) (see Table 3 RQ3), with delivery method emerging as a contributing factor.

Satisfaction increased when food service staff delivered meals (58% in Hospital A) compared to nurse-led delivery (37.5% in Hospital B), supporting prior evidence that delivery roles affect patient perceptions over time.[25]

Longer hospital stays in Hospital A were associated with reduced satisfaction ($\beta = –0.21$, $p < .05$), potentially due to menu fatigue, consistent with prior findings on the effects of prolonged hospitalization and meal repetition.[33]

Conversely, receiving more meal trays improved satisfaction ($\beta = 0.30$, $p < .01$), suggesting that frequent delivery enhanced familiarity and improved perceptions of food service over time.

The dietary plan did not affect satisfaction ($p = .34$). Indicating that service quality aspects such as attentiveness and consistency had greater influence than specific dietary restrictions. These findings are consistent with prior research showing minimal impact of therapeutic diets on satisfaction.[34]

4.3 Multivariate predictors of patient satisfaction from SERVQUAL-HF dimensions (RQ2)

Regression and descriptive analyses revealed that food quality, empathy, perceived value, meal variety, and responsiveness were stronger predictors of satisfaction than assurance or tangibles.

Hospital A, which operates on a room service basis, received higher food quality ratings than Hospital B, which uses a traditional tray line with 3 set meals per day and a 7-day cycle menu. This is further supported by the largest positive gap in Table 3, RQ 2 (0.56), confirming food quality's unique role in differentiating hospital experiences and reinforcing its predictive strength. This finding aligns with prior research identifying food quality and service style as consistent predictors of patient satisfaction.[7,35,36]

Empathy (see Table 2) was the most significant predictor of positive patient experience at Hospital A ($\beta = 0.48$, $p < .001$). Its positive gap in Table 3, RQ2 (0.16), though not statistically significant, aligns with this regression result and further supports its relevance.[37]

Responsiveness had a negative effect on satisfaction ($\beta = –0.24$, $p < .05$), indicating that inattention or delays decreased the entire patient experience. Consistent with findings that emphasized the importance of staff attentiveness in shaping patient perceptions.[32,33]

Meal variety significantly impacted satisfaction in Hospital A ($\beta = 0.23$, $p < .05$), consistent with findings that flexible menu options enhance patient experience and reduce dissatisfaction linked to repetition.[7,25] These findings support the implementation of personalized, patient-centered menus, potentially backed by digital platforms, to satisfy and meet diverse dietary needs and preferences.

Perceived food service value demonstrated strong associations in both hospitals (Hospital A: $\beta = 0.46$, $p < .001$; Hospital B: $\beta = 0.68$, $p < .05$). Indicating that patients evaluate food service in the context of their overall hospital experience.[28,29] Its positive gap in Table 3, RQ2 (0.36), though not statistically significant, reinforces its practical relevance.

Convenience did not reach statistical significance (MWU $p = .051$; see Table 3, RQ2), but its proximity to the threshold suggests potential relevance, aligning with literature on service flexibility and patient satisfaction.[38,39]

Despite Hospital A's higher overall satisfaction, meal timeliness showed a negative gap (–0.35, $p > .05$), indicating a need for improvement.

Strong interrelationships among adapted SERVQUAL-HF dimensions ($p < .001$) indicated that improving one dimension can positively influence others. This supports the view that satisfaction arises from the interplay of multiple service attributes rather than isolated factors.[40]

4.4 Expectation–perception gaps and patient satisfaction outcomes (RQ3)

Patients had similar expectations across hospitals (Q11); Hospital A showed significantly higher satisfaction (Q14). In Table 3, RQ3, confirms this: the Q11 gap (0.29) was small and non-significant, while Q14 showed a substantial positive

gap (0.44, $p < .05$).

Pre-service satisfaction (Q12) also favored Hospital A (gap = 0.32), reaching significance on the MWU test ($p = .027$), despite the t-test falling short ($p = .10$).[13,41]

Expectation changes during hospitalization (Q13) were moderate and did not differ significantly among sites. However, satisfaction with food service during hospitalization (Q14) was significantly higher in Hospital A, as validated by the t-test and MWU ($p = .01$ and $p = .017$, respectively), reinforcing the role of food service in shaping patient experience.[7,34]

This pattern aligns with prior studies emphasizing the importance of managing the expectation-performance gap.[8,32] Positive Spearman's correlations between expectations and satisfaction indicate that patients with higher initial expectations reported higher satisfaction, suggesting that setting and meeting reasonable expectations is a viable strategy for improving food service experiences.

4.5 Summary of key findings

Findings across all three research questions support SERVQUAL-HF as a reliable, context-sensitive instrument for assessing hospital food service quality.

RQ1 confirmed strong psychometric performance, including internal consistency, inter-item coherence, and construct validity.

RQ2 revealed that food quality, perceived value, empathy, and meal variety were stronger predictors of satisfaction than tangibles. Meal timeliness showed a negative gap, indicating a clear area for improvement.

RQ3 revealed that patients had similar expectations, but Hospital A reported significantly higher satisfaction. This confirms that exceeding expectations improves the overall care experience.

These findings position SERVQUAL-HF as a valid instrument for hospital managers to evaluate and improve food service from a patient-centered perspective.

4.6 Implications for measurement practice

SERVQUAL-HF provides a validated framework for assessing hospital food service quality from the patient's perspective.

It adapts the original SERVQUAL model by incorporating food-specific dimensions that reflect patient priorities. The instrument enables standardized evaluation of non-clinical care for research, benchmarking, and accreditation.

Hospital administrators can use SERVQUAL-HF to identify service gaps and realign food delivery with patient expectations.

Gap scores pinpoint where improvements are most needed. Hospital A should prioritize faster meal delivery, clearly signaling a process improvement target.

This kind of targeted feedback enables precise process improvements that enhance both experience and recovery.

SERVQUAL-HF also informs strategic planning and performance monitoring across inpatient services, linking food service quality to clinical outcomes and operational efficiency.

Future studies should explore how food service improvements affect recovery trajectories and perceived service quality across diverse patient populations.

5. Conclusions

This study developed and validated SERVQUAL-HF, a patient-centered instrument for measuring the quality of food service in hospitals. The tool demonstrated strong reliability, internal consistency, and construct validity.

By incorporating food-specific traits such as meal variety, perceived value, and empathy, SERVQUAL-HF reflects patient priorities. It also captured satisfaction differences across hospital settings, reinforcing its sensitivity to contextual variation.

SERVQUAL-HF enables rigorous evaluation of non-clinical care and underscores the role of nutrition in recovery and service perception. These findings establish its utility for both research and institutional performance improvement.

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Authors contributions

Concept — T.S.G.B., K.J.M.; definition of intellectual content — T.S.G.B., K.J.M.; content — T.S.G.B.; literature search — T.S.G.B., K.J.M.; clinical studies — T.S.G.B., C.E.H., G.S.B.; experimental studies — T.S.G.B.; data acquisition — T.S.G.B.; data analysis — T.S.G.B., W.L.B.; statistical analysis — T.S.G.B., W.L.B.

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CONFLICTS OF INTEREST DISCLOSURE

The authors declare they have no conflicts of interest.

INFORMED CONSENT

Because the research involved anonymous survey responses, formal written consent was not required. Instead, patients received an informational form outlining the study's purpose, procedures, and voluntary nature prior to participation.

ETHICS APPROVAL

The Publication Ethics Committee of the Association for Health Sciences and Education. The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

PROVENANCE AND PEER REVIEW

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DATA AVAILABILITY STATEMENT

All data generated for this study were used exclusively to address the stated research question and are not intended for public archiving. However, all analyzed data are transparently reported within the manuscript through summary statistics and response distributions. No additional datasets are available.

DATA SHARING STATEMENT

The raw survey data underlying this study are not publicly available due to the anonymous nature of data collection and institutional confidentiality requirements. De-identified datasets cannot be shared to ensure participant privacy.

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