Clinical Nutrition 31 (2012) 637–646

Contents lists available at SciVerse ScienceDirect

Clinical Nutrition

journal homepage: http://www.elsevier.com/locate/clnu

Original article

# Food for patients at nutritional risk: A model of food sensory quality to promote intake☆

Janice Sorensen [a,*], Lotte Holm [a,b], Michael Bom Frøst [c], Jens Kondrup [a,d]

[a] Department of Human Nutrition, Faculty of Life Sciences, University of Copenhagen, 30 Rolighedsvej, 1958 Frederiksberg, Denmark
[b] Institute of Food and Resource Economics, Faculty of Life Sciences, University of Copenhagen, 25 Rolighedsvej, 1958 Frederiksberg, Denmark
[c] Department of Food Science, Faculty of Life Sciences, University of Copenhagen, 30 Rolighedsvej, 1958 Frederiksberg, Denmark
[d] Nutrition Unit 5711, Rigshospitalet, 9 Blegdamsvej, 2100 Copenhagen, Denmark

ARTICLE INFO

*Article history:*
Received 27 June 2011
Accepted 10 January 2012

*Keywords:*
Disease-related malnutrition in hospital
Qualitative food sensory quality
Low food intake
Low appetite
Early satiety

SUMMARY

*Background & aims:* The aim was to investigate food sensory quality as experienced and perceived by patients at nutritional risk within the context of establishing a framework to develop foods to develop foods to promote intake.

*Methods:* Patients at nutritional risk (NRS-2002; food intake ≤75% of requirements) were observed at meals in hospital (food choice, hunger/fullness/appetite scores). This was followed by a semi-structured interview based on the observations and focusing on food sensory perception and eating ability as related to food quality. Two weeks post-discharge, a 3-day food record was taken and interviews were repeated by phone. Interviews were transcribed, coded, and analysed thematically.

*Results:* Patients ($N = 22$) from departments of gastrointestinal surgery, oncology, infectious medicine, cardiology, and hepatology were interviewed at meals ($N = 65$) in hospital (82%) and post-discharge (18%). Food sensory perception and eating ability dictated specific food sensory needs (i.e., appearance, aroma, taste, texture, temperature, and variety defining food sensory quality to promote intake) within the context of motivation to eat including: pleasure, comfort, and survival. Patients exhibited large inter- and intra-individual variability in their food sensory needs.

*Conclusions:* The study generated a model for optimising food sensory quality and developing user-driven, innovative foods to promote intake in patients at nutritional risk.



## 1. Introduction

Undernutrition affects about a third of patients in hospital.[1] If nutritional therapy is not adequately provided, these patients have a higher risk of diminished physiological function, complications, longer length of hospital stay, decreased quality of life, and mortality.[1,2] Ordinary food is recommended as the first choice to prevent or correct undernutrition and the majority of patients at nutritional risk rely solely on food intake to meet their nutritional requirements.[3] However, in spite of sufficient food provisions, numerous studies have highlighted the problem of inadequate dietary intake in hospitalised patients.[4,5] This then leads to poorer clinical outcome in these patients[6,7] and large amounts of food waste.[8]

A large, comparative study on food intake in hospital found that nutritional needs were covered in only about a third of patients in 1999, which was unchanged in 2008 despite hospital wide initiatives to improve food service practice, e.g., declaring patient's alimentary rights, applying food recommendation, patient-self menu selection and change in meal times and cooking.[5] Low meal quality, as evaluated by patients on a 10-point visual analogue scale (VAS), was associated with low nutritional intake. A questionnaire with four predetermined categories showed in 2008 that patients that did not eat all of their food gave the following reasons: absence of menu selection (32%), inadequate taste (25%), inadequate cooking (10%) and/or inadequate mealtime (5%). This study demonstrates the challenge of improving hospital food intake. In contrast, two intervention studies[9,10] have shown that individual nutritional care in hospital, consisting predominantly of ordinary food, can significantly improve intake and clinical outcome. These

*Abbreviations:* NRS-2002, Nutritional Risk Screening-2002; VAS, visual analogue scale; IQR, interquartile range.

☆ Conference presentation: ESPEN Congress, Vienna, Austria, 2009.

* Corresponding author. Meal Science & Public Health Nutrition, Department of Development and Planning, Aalborg University, Lautrupvang 1A, 1-254, 2750 Ballerup, Denmark. Tel.: +45 99 40 25 19.
*E-mail address:* janice.m.sorensen@gmail.com (J. Sorensen).

0261-5614/$ – see front matter © 2012 Elsevier Ltd and European Society for Clinical Nutrition and Metabolism. All rights reserved.
doi:10.1016/j.clnu.2012.01.004

studies involved a dedicated individual[9] or team[10] that provided nutritional care for the intervention group. The studies provided very limited information on the characteristics of the ordinary food that helped to improve intake. Perhaps, hospital food prepared in accordance with patients' expectations and eating ability could lead to improved intake with a less costly staff requirement.

Few studies have prospectively investigated mediating factors affecting food intake in patients. One such study by Paquet et al.[11] in elderly patients reported that energy and protein intake was positively correlated to patient assessed 'food sensory quality', but not to 'food service quality' or any measure of satisfaction. The study defined 'perceived quality' by these 2 components: food sensory quality (i.e., tastefulness, appropriateness of food temperature and texture, palatability), and food service quality (i.e., staff attitude, service timeliness, duration, feeding assistance, sitting position). 'Satisfaction' was measured by satisfaction with the: 'service' (i.e., interaction with staff), 'food' and 'overall' (i.e., meal as a whole).

Food sensory quality has been suggested to comprise colour and appearance, odour, taste, textural properties, tactile properties, and sound of food.[12] Considering the potentially large complexity of food sensory quality studies in a clinical setting, a qualitative study approach may be an operational starting point since it is exploratory and flexible in nature and produces in-depth, descriptive data on the human experience from which new hypotheses can be generated. Qualitative methods have been used in specific patient groups (e.g., cancer,[13–15] gastrectomy,[16] heart failure,[17] and severely undernourished patients[18]) to describe the eating-related challenges faced by patients, including: inability to eat and lack of attention from hospital staff[13]; highly variable experiences of taste and smell changes[14]; struggles to eat and bodily estrangement[16]; feelings of burden and sorrow in relation to eating[17]; shift to conscious control over eating[15]; and passive versus active patients.[18] Also, patients were found to use a trial and error approach to find suitable food.[14,15] All of these studies focused on describing eating problems, rather than aiming at possible solutions to promote food intake in patients at nutritional risk.

In light of this, a systematic investigation of how food sensory quality can be optimised for patients at nutritional risk is needed. This study aimed at exploring food sensory quality as experienced and perceived by patients at nutritional risk during various meals. It was the initial phase of a project aimed at establishing a framework for developing appetising, energy- and protein-rich foods to promote intake in patients at nutritional risk and, in particular, served as the basis for a quantitative questionnaire study for further confirmation of the results.

## 2. Materials and methods

### 2.1. Participants

Study participants were recruited from medical and surgical units in the departments of oncology, gastrointestinal surgery, infectious medicine, cardiology, hepatology, and rheumatology at Copenhagen University Hospital (Rigshospitalet). All newly admitted adult patients (≥18 years old) who were at-risk according to nutritional risk screening (NRS-2002 ≥ 3), had an inadequate food intake (i.e., below 75% of usual intake in the last week), were allowed to eat orally without anatomical hindrances, and did not rely on enteral and/or parenteral nutrition were considered for inclusion in the study. Exclusion criteria were: one-day admissions, inability to communicate coherently, lack of consciousness, or language barriers. Patients not found at nutritional risk were rescreened by NRS-2002 on a weekly basis and reassessed for inclusion in the study. Recruitment was done consecutively until a suitable patient was found and completed the study. Patients that met the inclusion and exclusion criteria were invited to participate in the study by the first author and required to provide informed consent. The study protocol was approved by the local Biomedical Ethics Committee for The Capital Region of Denmark.

Recruitment aimed at including a diverse sample of patients in terms of age, sex and medical versus surgical diagnoses (Table 1). Patients were included in the study over a period of three months from June to August 2008. Sample size was determined to optimise diversity and based on saturation of the data, i.e., when additional observations and interviews provided diminished returns in terms of new information.

### 2.2. Hospital setting and foodservice

Rigshospitalet is an acute-care, tertiary hospital with 1200 beds divided into units comprised of 15–20 beds. All departments had a common dining room apart from the infectious medicine department, which was attributed to isolation procedures. Food is prepared centrally in the hospital kitchen by cook-chill, cook-freeze and cook-serve. Three main meals are served daily, buffet style and based on a 5-week menu rotation. The three main diet types

**Table 1**
Patient characteristics ($N = 22$).

| | N (%) |
|---|---|
| Age, years | |
| 20–39 | 6 (27) |
| 40–59 | 8 (36) |
| ≥60 | 8 (36) |
| Gender | |
| Male/Female | 11 (50)/11 (50) |
| Department | |
| Gastrointestinal surgery | 8 (36) |
| Oncology | 6 (27) |
| Infectious medicine | 6 (27) |
| Cardiology | 1 (5) |
| Hepatology | 1 (5) |
| Medical/Surgical | 17 (77)/5 (23) |
| Malignant/Benign | 14 (64)/8 (36) |
| Primary diagnosis[a] | |
| Cancer | 5 (23) |
| Infection | 5 (23) |
| Abdominal surgery | 5 (18) |
| G.I.-disorders/abdominal pain | 4 (9) |
| Hepatic cirrhosis | 1 (5) |
| Ischemic heart disease | 1 (5) |
| Observation | 1 (5) |
| NRS-2002 | |
| Rescreening[b] | 5 (23) |
| Body mass index, kg/m$^2$ | 20.2 (19.1–23.1)[c] |
| Weight loss ≥ 5%[d] | 9 (41) |
| Intake 0–25%[e] | 2 (9) |
| Intake 25–50%[e] | 18 (82) |
| Intake 50–75%[e] | 2 (9) |
| Length of stay in hospital, days | 14.5 (8.0–21.0)[c] |
| Length of stay at first interview, days | 7.5 (4.0–14.0)[c] |
| Discharge destination[f] | |
| Home | 19 (86) |
| Hospital | 3 (14) |

[a] Diagnoses were entered from a list of diagnosis categories based on Sorensen et al.[1]
[b] Patients assessed for inclusion in the study by NRS-2002 rescreening conducted ≥ 1 week after admission to hospital.
[c] Value expressed as median (interquartile range).
[d] Patients with weight loss of ≥5% of body weight within the 3 months prior to screening by NRS-2002.
[e] Patients with respective dietary intake 0–25%, 25–50% and 50–75% of normal requirements for weight maintenance in the week prior to screening by NRS-2002.
[f] Patients discharged to another hospital or health care institution, which did not allow for follow-up interviews post-discharge.