



Original article

Energy and protein intake increases with an electronic bedside spoken meal ordering system compared to a paper menu in hospital patients

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ARTICLE INFO

Article history:

Received 23 February 2015

Accepted 15 May 2015

Keywords:

Nutrition care

Nutrition informatics

Health information technology

Electronic meal ordering

ABSTRACT

Background and aims: Electronic bedside spoken meal ordering systems (BMOS) have the potential to improve patient dietary intakes, but there are few published evaluation studies. The aim of this study was to determine changes in the dietary intake and satisfaction of hospital patients, as well as the role of the Nutrition Assistant (NA), associated with the implementation of an electronic BMOS compared to a paper menu.

Methods: This study evaluated the effect of a BMOS compared to a paper menu at a 210-bed tertiary private hospital in Sydney during 2011–2012. Patient dietary intake, patient satisfaction and changes in NA role were the key outcomes measured. Dietary intake was estimated from observational recordings and photographs of meal trays (before and after patient intake) over two 48 h periods. Patient satisfaction was measured through written surveys, and the NA role was compared through a review of work schedules, observation, time recordings of patient contact, written surveys and structured interviews.

Results: Baseline data were collected across five wards from 54 patients (75% response rate) whilst using the paper menu service, and after BMOS was introduced across the same five wards, from 65 patients (95% response rate). Paper menu and BMOS cohorts' demographics, self-reported health, appetite, weight, body mass index, dietary requirements, and overall foodservice satisfaction remained consistent. However, 80% of patients preferred the BMOS, and importantly mean daily energy and protein intakes increased significantly (paper menu versus BMOS): 6273 kJ versus 8273 kJ and 66 g versus 83 g protein; both $p < 0.05$. No additional time was required for the NA role, however direct patient interaction increased significantly ($p < 0.05$), and patient awareness of the NA and their role increased with the BMOS.

Conclusions: The utilisation of a BMOS improved patient energy and protein intake. These results are most likely due to an enhancement of existing NA work processes, enabling more NA time with patients, facilitating an increase in patient participation and satisfaction with the service.

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1. Introduction

Hospital malnutrition is a serious clinical issue, associated with adverse clinical outcomes and increased costs [1]. Consequently, it is essential hospitals identify and implement dietetic interventions to address the contributors to sub-optimal dietary intake to support the provision of optimal nutrition care to patients. Health information technology (HIT) is becoming integral in healthcare and is

associated with improving healthcare delivery, patient safety, clinical decision-making and curtailing increasing healthcare costs [2–4]. In parallel to the rise in technology, a paradigm shift from a paternalistic medical model to a personalised patient-centred approach [5,6], often referred to as participatory medicine, is gaining momentum [7]. The electronic bedside spoken meal ordering system (BMOS) embraces both, utilising technology to enable increased patient interaction with a Nutrition Assistant (NA) to make preferred and suitable menu selections, answer questions, resolve issues and initiate appropriate dietetic referrals.

In the complex system of healthcare, a variety of factors influence dietary intake, however very few studies have investigated the patient meal ordering component. The recent introduction of electronic systems for meal ordering offers an alternative to the traditional process of a paper menu. These new models enable patient meal selections to be collected at the bedside on handheld electronic devices with the assistance of a NA creating opportunities to increase patient/staff interaction and engage patients in the meal ordering process.

In the few studies on BMOS, the focus has been on improving patient satisfaction [8,9]. However, some studies have also demonstrated increased tray accuracy [8], increased efficiency and effectiveness [9] and labour savings [10,11]. One study identified the potential of a BMOS to optimise dietary intake [11], and another demonstrated patient weight gain [12]. The aim of this study was to determine changes in the dietary intake and satisfaction of hospital patients, as well as the role of the NA, associated with the implementation of an electronic BMOS compared to a paper menu.

2. Methods

The quasi-experimental pre-test post-test cohort study was conducted at a 210-bed private hospital with an average length of stay of 6.0 days for the eligible study wards (which excluded Maternity and day stay patients). The prevalence of nutritionally at-risk patients is not routinely recorded, however the other hospitals within the organisation identified malnutrition prevalence by Subjective Global Assessment (SGA) as 42% [13]. The foodservice and nutrition departments provide a cook-fresh, 7-day menu and utilise the CBORD[®] Food Management System (FMS) software to manage all of the foodservice and diet office operations. The NAs take menu selections for dinner the same day, and breakfast and lunch for the following day. During the paper menu phase the NAs delivered and collected personalised printed patient menus from the wards, and then entered the selections into the FMS in the diet office. In contrast, during the BMOS phase, the NAs visited all patients and discussed their menu selections at the bedside, entering them directly into FMS on a wireless mobile device. The menu, recipes and food items offered to patients did not change between the two study periods. However, the fact that the BMOS is electronic enables access to all of the available menu items for that meal and potentially more choices to be offered to the patient, compared to the printed personalised menus.

All patients admitted to the orthopaedic, orthopaedic rehabilitation, cardiology, oncology, general medical and gynaecology wards during the two weeks of data collection periods were eligible for inclusion. Maternity wards, day stay patients and patients who were nil by mouth or restricted to fluids only were excluded. Baseline pre-implementation data were collected from eligible consenting participants in September 2011 whilst using the paper menu service (paper menu cohort). The BMOS was introduced in May 2012, and the post-implementation data were collected from eligible consenting participants in November 2012 (BMOS cohort). Data were collected by the primary researcher and five final year University dietetic students during a foodservice placement. The

data collection processes and tools utilised were the same for both the paper menu and BMOS cohorts. The study proposal received ethics approval (11/119) through the St. Vincent's and Mater Health Human Research Ethics Committee.

A simplified version of the '24-h diet observation/recall' tool used in the Australasian Nutrition Care Day Survey [14] (48hr Diet Observation Chart Supplementary File) was used to estimate food intake over two 48 h periods, encompassing all meals over four days of the seven day menu. Participants were visited after each main and mid meal by student dietitians and their meal consumption was recorded as 0, 25, 50, 75 or 100 percent of all the food served. In addition, each main meal tray was photographed before delivery and after consumption, and in-between meal details were observed and recorded on paper. The nutrition analysis was performed using FMS, which contains the AusNut Special Edition database, and contains nutritional analysis of the menu items and recipes. Based on the photographs, the percentage consumed of each menu item was entered to obtain the energy and protein intake values. The Schofield equation was utilised to calculate estimated energy requirements, and protein requirements were based on 1 g/kg for all patients based on being in the medical classification of minor surgery or rehabilitation.

All consenting participants were provided with two surveys to complete after they had been admitted greater than 24 h and had received at least the three main meals. The validated Foodservice Patient Satisfaction Survey [15] was utilised to gather patient demographic data and measure food service satisfaction (covering meal quality and enjoyment, autonomy, staff consideration, and hunger and food quality). The survey uses an 'always' to 'never' 5-point rating scale for the 38 questions relating to food service satisfaction. However, as this survey only includes one question on the meal ordering service ('I am asked about my food and drink preferences'), a specifically designed Meal Selections Survey was developed to assess patient satisfaction with the meal ordering service and about their interaction with the NA (such as were they visited by a NA and were they provided advice regarding the menu and meal choices). The survey encompassed 5 questions, including yes/no (4 questions), multiple-choice (1 question) and opportunities for further comments (Patient Questionnaires Supplementary File). The survey was piloted and tested for content validity by five dietitians. The survey was modified based on the feedback received, which included a couple of word modifications, and re-tested once more as the dietitians then reached a consensus.

The NA role was compared through a review of work schedules, observation, time recordings of patient contact, written surveys and structured interviews. NA patient contact during menu delivery and pickup was observed and recorded by student dietitians to determine the time spent face-to-face with patients, and to document the communication themes. All NAs were provided with written pre (paper menu) and post-(BMOS) implementation surveys to determine their preferred service model, and to assess if there were changes in the utilisation of their nutrition knowledge; patients' awareness of the NA role; and the level of menu selection assistance provided to patients. The survey encompassed 13 questions, including short answer (6 questions), multiple-choice (4 questions), yes/no (3 question) and opportunities for further comments (Nutrition Assistant Questionnaires Supplementary File). The NAs were also invited to participate in a short structured interview with the primary researcher after the BMOS was introduced to discuss their overall thoughts about both services.

Statistical analysis was performed using SPSS software (version 22, 2013, SPSS Inc., Chicago, IL, USA). The Shapiro–Wilk test was performed to test for normality. Descriptive statistics (mean, count and percentages), Mann–Whitney U and independent *t*-tests were performed to determine significant differences between the two

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