

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.

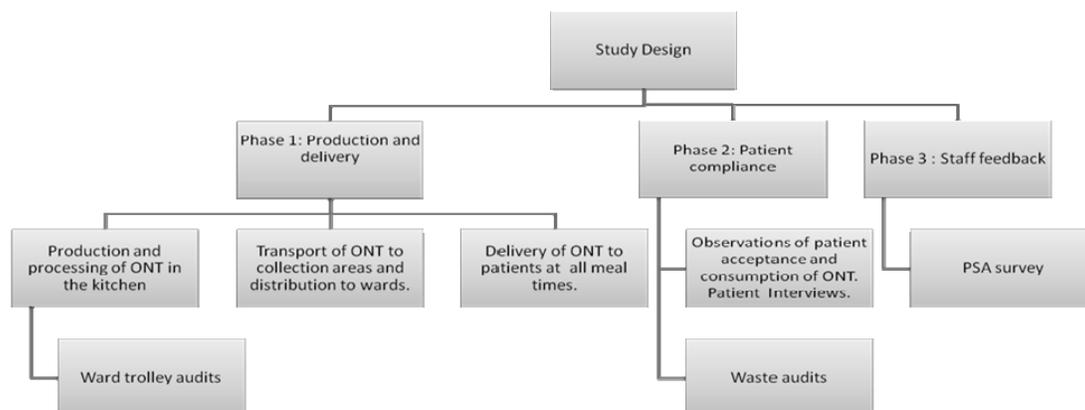
Phase one of the data collection in this study involved observing all stages of ONT production and delivery by food service assistant and PSA staff. ONT were categorized as nourishing snacks, diabetic snacks, soft snacks, stoma snacks, nourishing drinks, thickened drinks and oral pre-packaged drinks 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.

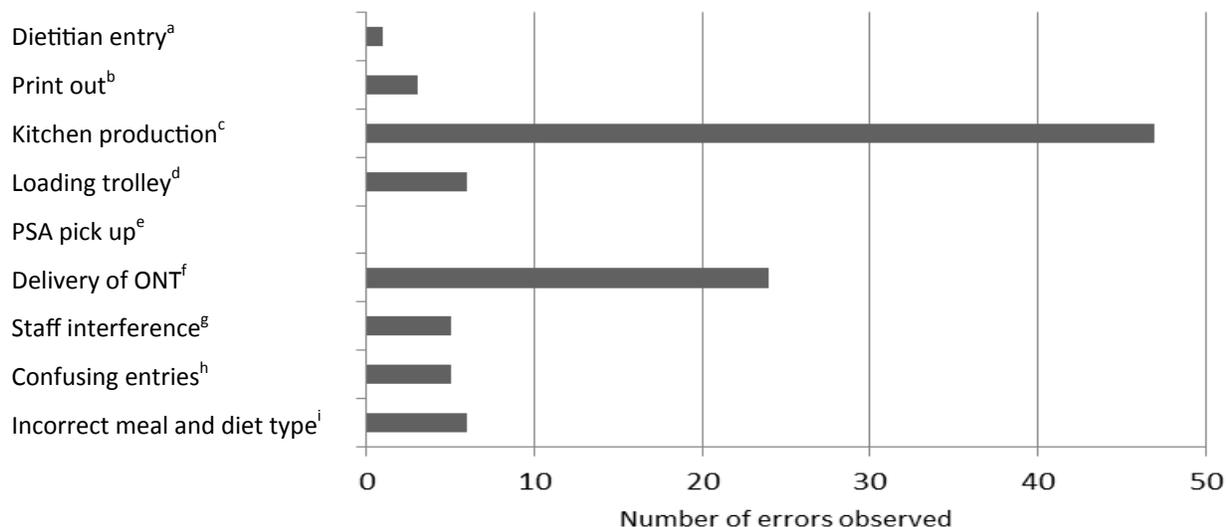
3. ONT Waste Chart

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

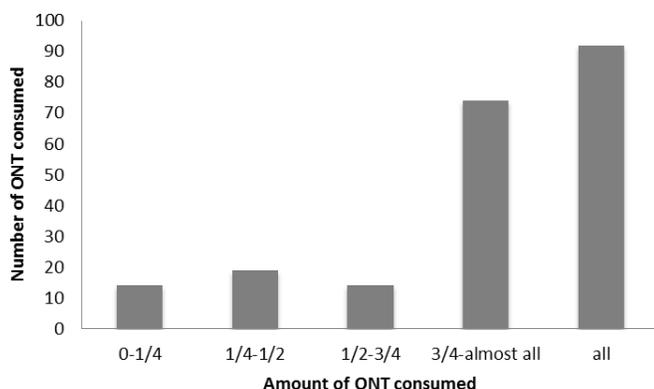
not consumed at all (16.8%). The key reasons for the non-consumption of the 43 snacks and drinks included difficulty self-feeding, difficulty swallowing and inability to open packaging (39.5%), lack of appetite (20.9%) and patient dislike of the taste, temperature or texture of the drink or snack (16.3%) (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

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



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.

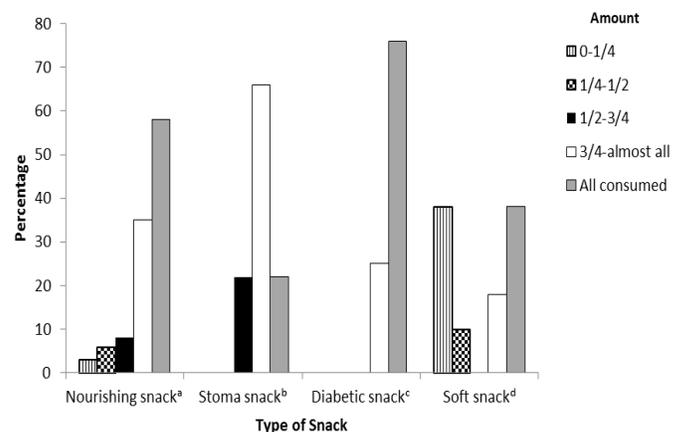
DISCUSSION

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



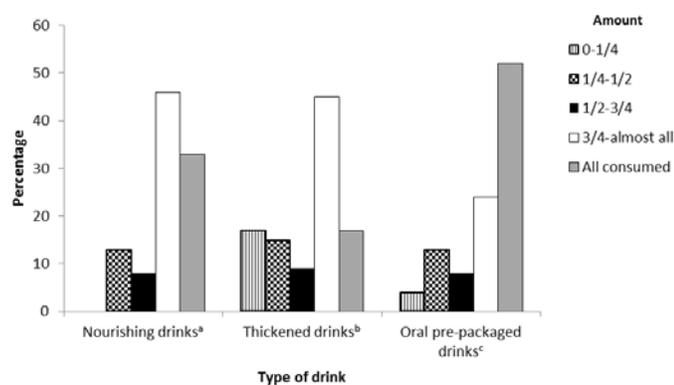
^a Nourishing snacks i.e. jelly, ice-cream, cheese and crackers, yoghurt

^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 pre-packaged 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 within 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 be 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.

REFERENCES

- Baldwin, C., & Parsons, T.J. (2004). Dietary advice and nutritional supplements in the management of illness-related malnutrition: systematic review. *Clinical Nutrition, 23*(6), 1267-1279.
- Banks, M., Bauer, J., Graves, N., & Ash, S. (2010). Malnutrition and pressure ulcer risk in adults in Australian health care facilities. *Nutrition, 26*(9), 896-901.
- Bauer, J., Capra, S., Battistutta, D., Davidson, W., & Ash, S. (2005). Compliance with nutrition prescription improves outcomes in patients with unresectable pancreatic cancer. *Clinical Nutrition, 24*(6), 998-1004.
- Brogden, B.J. (2004). Clinical skills: importance of nutrition for acutely ill hospital patients. *British Journal of Nursing, 13*(5), 914-920.
- Bruce, D., Laurance, I., McGuinness, M., Ridley, M., & Goldswain, P. (2003). Nutritional supplements after hip fracture: poor compliance limits effectiveness. *Clinical Nutrition, 22*(5), 497-500.
- Cawood, A.L., Elia, M., & Stratton, R.J. (2010). Meta-analysis shows reduced health care use and costs with oral nutritional supplements. *Clinical Nutrition Supplements, 5*(2), 123
- Correia, M.I.T.D., & Waitzberg, D.L. (2003). The impact of malnutrition on morbidity, mortality, length of hospital stay and costs evaluated through a multivariate model analysis. *Clinical Nutrition, 22*(3), 235-239.
- Darmon, P., Karsegard, V.L., Nardo, P., Dupertuis, Y.M., & Pichard, C. (2008). Oral nutritional supplements and taste preferences: 545 days of clinical testing in malnourished in-patients. *Clinical Nutrition, 27*(4), 660-665.
- Donini, L.M., Castellana, E., De Guglielmi, S., De Felice, M.R., Savina, C., Coletti, C., . . . Cannella, C. (2008). Improvement in the quality of the catering service of a rehabilitation hospital. *Clinical Nutrition, 27*(1), 105-114.
- Doughton, A., Febry, K., Jones, P., Latham, M., Lisle, S., Lloyd, E., & Thomas, D. (2011). *Hospital catering and patient nutrition*. Cardiff: Wales Audit Office.
- Douglas, C.H., & Douglas, M.R. (2004). Patient-friendly hospital environments: exploring the patients' perspective. *Health Expectations, 7*(1), 61-73. doi: 10.1046/j.1369-6513.2003.00251.x
- Duncan, P., & Jensen, J. (2011). *Professional Foodservice* (2nd ed.). Malaysia: Pearson.
- Glencorse, C., Edington, J., & Stelling, J. (2010a). A study to determine factors affecting patient compliance with oral nutritional supplements (ONS). *Clinical Nutritional Supplements, 5*(2), 171-172.
- Glencorse, C., Edington, J., & Stelling, J. (2010b). Study to improve understanding of sensory factors and taste and their impact on compliance of nutritional drinks. *Clinical Nutritional Supplements, 5*(2), 89-90.
- Grant, B. (2008). Chapter 37: Medical Nutrition Therapy for Cancer. In L. K. Mahan & S. Escott- Stump (Eds.), *Krause's Food and Nutrition Therapy* (12 ed.). St. Louis, Missouri: Saunders Elsevier.
- Gregoire, M., & Greathouse, K. (2008). Succession planning for hospital and school foodservice directors. *Journal of the American Dietetic Association, 108*(9, Supplement), A68.
- Kaspar, K.M., & Drawert, S.M. (2008). The Use of High Protein Oral Supplements Has the Potential to Drive Cost Savings in Rehabilitative Care of Geriatric Hip Fracture. *Journal of the American Medical Directors Association, 9*(3), B27.
- Lawson, R.M., Doshi, M.K., Ingoe, L.E., Colligan, J.M., Barton, J.R., & Cobden, I. (2003). Compliance of orthopaedic patients with postoperative oral nutritional supplementation. *Clinical Nutrition, 19*(3), 171-175.
- Lochs, H., Pichard, C., & Allison, S.P. (2006). Evidence supports nutritional support. *Clinical Nutrition, 25*(2), 177-179. doi: 10.1016/j.clnu.2006.02.002
- Milne, A.C., Potter, J., Vivanti, A., & Avenell, A. (2009). Protein and energy supplementation in elderly people at risk from malnutrition. *Cochrane Database of Systematic Reviews*(2).
- National Collaborating Centre for Acute Care. (2006). Nutrition support in adults: Oral nutrition support, enteral tube feeding and parenteral nutrition. Retrieved 19/3/2011, from <http://www.rcseng.ac.uk>
- Nuijten, M. (2010). The health economic impact of oral nutritional supplements in residential care in Germany. *Clinical Nutrition Supplements, 5*(2), 159.
- O'Hara, P.A., Harper, D.W., Kangas, M., Dubeau, J., Borsutzky, C., & Lemire, N. (1997). Taste, temperature, and presentation predict satisfaction with foodservices in a Canadian continuing-care hospital. *Journal of the American Dietetic Association, 97*(4), 401-405.
- Otani, K., Waterman, B., Faulkner, K.M., Boslaugh, S., Burroughs, T.E., & Dunagan, W.C. (2009). Patient satisfaction: focusing on "excellent". *Journal of Healthcare Management, 54*(2), 93-103.
- Persson, M., Hytter-Landahl, A., Brismar, K., & Cederholm, T. (2007). Nutritional supplementation and dietary advice in geriatric patients at risk of malnutrition. *Clinical Nutrition, 26*(2), 216-224.
- Rahemtulla, Z., Baldwin, C., Spiro, A., McGough, C., Norman, A.R., Frost, G., & Andreyev, H.J.N. (2005). The palatability of milk-based and non-milk-based nutritional supplements in gastrointestinal cancer and the effect of chemotherapy. *Clinical Nutrition, 24*(6), 1029-1037.
- Ravasco, P. (2005). Aspects of taste and compliance in patients with cancer. *European Journal of Oncology Nursing, 9*(Supplement 2), S84-S91. doi: DOI: 10.1016/j.ejon.2005.09.003
- Russell, C.A. (2007). The impact of malnutrition on healthcare costs and economic considerations for the use of oral nutritional supplements. *Clinical Nutrition Supplements, 2*(1), 25-32.
- Stratton, R.J., & Elia, M. (2007). A review of reviews: A new look at the evidence for oral nutritional supplements in clinical practice *Clinical Nutritional Supplements, 2*(1), 5-23.
- Stratton, R.J., & Elia, M. (2010). The skeleton in the closet: malnutrition in the community encouraging appropriate, evidence-based use of oral nutritional supplements. *Proceedings of the Nutrition Society, The Annual Meeting of the Nutrition Society and BAPEN Noeng, Cardiff, 69*(4), 477-487.
- Stroebele, N., & De Castro, J.M. (2004). Effect of ambience on food intake and food choice. *Nutrition, 20*(9), 821-838.
- Vivanti, A.P., & Banks, M.D. (2007). Length of stay patterns for patients of an acute care hospital: implications for nutrition and food services. *Australian Health Review, 31*(2), 282-287.

Appendix 1

Food service system observation tool

Observer: _____

Potential point area	Rating *		Comments #
	0	1	
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

Patient interview form

Observer: _____

Did the patient receive the ONT?			
Yes (0)		No (1)	
Did the patient accept the ONT		Patient reasons for non-delivery	
Yes (0)		No (1)	
Was the ONT consumed?		Reasons for not accepting?	
Yes (0)	No(1)	(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	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
	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		
Comments :			

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	0-¼	¼- ½	½- ¾	¾ - almost all	all	
	Oral Nutritional Therapy _____	N/P	0-¼	¼- ½	½- ¾	¾ - almost 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	0-¼	¼- ½	½- ¾	¾ - almost all	all	
	Oral Nutritional Therapy _____	N/P	0-¼	¼- ½	½- ¾	¾ -almost 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	0-¼	¼- ½	½- ¾	¾ - almost all	all	
	Oral Nutritional Therapy _____	N/P	0-¼	¼- ½	½- ¾	¾ - almost 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?
