Clinical Nutrition ESPEN 33 (2019) 294–300

Contents lists available at ScienceDirect

Clinical Nutrition ESPEN

journal homepage: http://www.clinicalnutritionespen.com

Short Communication

Characteristics of hospitalized patients prescribed oral nutrition supplements in Thailand: A cross-sectional nutrition day survey

Sornwichate Rattanachaiwong [a, *], Daruneewan Warodomwichit [b], Preyanuj Yamwong [c], Songsri Keawtanom [d], Michael Hiesmayr [e], Isabella Sulz [f], Pierre Singer [g]

[a] Division of Clinical Nutrition, Department of Medicine, Faculty of Medicine, Khon Kaen University, Thailand
[b] Division of Nutrition and Biochemical Medicine, Department of Medicine, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Thailand
[c] Division of Nutrition, Department of Medicine, Faculty of Medicine, Siriraj Hospital, Mahidol University, Thailand
[d] Research Center for Nutrition Support, Faculty of Medicine, Siriraj Hospital, Mahidol University, Thailand
[e] Division of Cardiac Thoracic Vascular Anesthesia and Intensive Care, Department of Anesthesia, General Intensive Care and Pain Control, Medical University of Vienna, Austria
[f] Institute of Medical Statistics, Medical University of Vienna, Austria
[g] Department of General Intensive Care, Rabin Medical Center, Petah Tikva and Sackler School of Medicine, Tel Aviv University, Israel

ARTICLE INFO

Article history:
Received 8 January 2019
Accepted 21 May 2019

Keywords:
Malnutrition
Oral nutrition supplement
Hospitalized patients
Outcome
Thai

SUMMARY

Background and objectives: Despite the proven benefits of oral nutrition supplements (ONS), its prescription in Thailand are far less than it should mainly due to limitation of reimbursement. Our aim was to compare hospital outcomes between hospitalized patients receiving only hospital food to those receiving hospital food with ONS.

Methods and study design: An annual cross-sectional survey, NutritionDay (nD), in Thailand was conducted in 2 hospitals from 2010 to 2015. The hospital outcomes were followed at day 30 after first evaluation. Logistic regression and Cox regression were performed to compare outcome between groups.

Results: 524 hospitalized patients, 472 with only hospital food and 52 with ONS, were included. Patients with ONS had longer hospital stay prior to recruitment, reported more physical dependencies, and ate less food. The ONS group was less likely to be discharged within 30 days as compared to hospital food group (unadjusted OR 0.28, 95% CI 0.16–0.52) but this effect was not significant after adjustment for length of stay before nD and PANDORA score (adjusted OR 0.62, 95% CI 0.3–1.34). Cox regression showed a trend to decreased rate of discharge within 30 days in the ONS group.

Conclusions: This cross-sectional study showed a trend of worse outcomes associated with ONS prescription which might be related with higher mortality risk according to PANDORA score and longer previous hospital stay of the patients in the ONS group. Since the 2 studied groups were not comparable, further studies in this specific population should be performed.

1. Background and rationale

Oral nutrition supplements (ONS) are considered to be a fundamental approach in nutritional intervention for patients who are able to eat orally but not meet their requirements [1]. When ONS is given between meals, it has been shown to improve calorie and protein intakes [2–4] without suppression of energy intake in the following meal [5]. Many studies addressed its benefits on nutritional parameters and clinical outcomes in both inpatient and outpatient settings. It has been shown to improve body weight [6–11], triceps skin fold, arm muscle circumference [12,13], nutritional status [8,10], decrease hospital length of stay [14,15], complication [3,16–18], reduce readmission rate [3,19–21], decrease mortality [2,10,11], as well as cost effectiveness [20,22].

Despite increasing number of reports showing that ONS is beneficial, the current Thai health policy lists ONS as optional and does not include it as a treatment that can be fully reimbursed by most health coverages. As a result of it, some patients deny ONS prescription in order to avoid additional charge even their conditions are clearly indicated. This is considered as one reason that

* Corresponding author. Division of Clinical Nutrition, Department of Medicine, Faculty of Medicine, Khon Kaen University, Muang, Khon Kaen 40002, Thailand. Fax: +66 43204159.
E-mail addresses: srattnamd@gmail.com, sornra@kku.ac.th (S. Rattanachaiwong), Daruneewan@yahoo.com (D. Warodomwichit), preyanuj.yam@mahidol.ac.th (P. Yamwong), keawtanom@gmail.com (S. Keawtanom), michael.hiesmayr@meduniwien.ac.at (M. Hiesmayr), isabella.sulz@meduniwien.ac.at (I. Sulz), psinger@clalit.org.il (P. Singer).

https://doi.org/10.1016/j.clnesp.2019.05.012
2405-4577/

hinders the achievement of nutritional care in Thailand and may need to be changed. To overcome this bar, the proven benefits of ONS in the local context is needed to convince Thai authorities for approval of ONS reimbursement. We conducted a cross-sectional study based on Thai data from the nutritionDay (nD) survey to assess the association between ONS use in adult hospitalized patients and clinical outcomes.

2. Materials and methods

The nD study is a worldwide cross-sectional study auditing nutritional status and management of patients in nursing homes, hospitals, and intensive care units annually [23]. All the patients hospitalized in the participating units at the time that nD was performed were included if they agreed to participate. The written consents were obtained according to local regulations. The data was collected by local staff members using four standardized questionnaires. Hospital outcomes were followed 30 days after the questionnaires had been filled out. The collected data were entered online by local staff members and sent to the coordinating center in Vienna for analysis.

The questionnaires were composed of 2 major domains, the unit and patient domains. The unit domain was available for nursing home, general wards, and intensive care unit separately, mainly aimed at describing unit's characteristics, facilities, staffs, and nutrition screening and assessment routinely practiced in the unit. The patient domain collected their demographic data, medical diagnosis, The Patient And Nutrition-Derived Outcome Risk Assessment Score (PANDORA) [24], self-rated health status, and those required for evaluate their nutritional status including history of weight change, nutritional intervention they had received, as well as their actual intakes reported by patients.

In Thailand, 69 units from two university hospitals participating in the nD study since 2010. The study had been approved by their own ethics committee. Before each annual nD survey, the nutrition care team including physicians, nurses, pharmacists, and dietitians were instructed how to fill out the questionnaires prior to data collection day. The filled questionnaires were handed to each institute's representatives to enter the data online.

2.1. Subjects

All records from Thai nD survey were reviewed. The hospitalized adult patients aged 18 years old and over who received hospital food with or without ONS on the day that nD was performed were eligible for our study. All participants were divided into 2 groups according to the presence or absence of ONS prescription on the day that the nD survey was performed. In order to address the effects of ONS, we excluded patients who concomitantly received other artificial nutrition (i.e. enteral tube feeding, parenteral nutrition). We excluded patients that where terminally ill because ONS treatment may be withheld.

2.2. Outcomes

Our primary outcome was to determine whether provision of ONS has effects on rate of discharge and readmission within 30 days after the day when nD survey was performed.

2.3. Statistical analysis

Continuous variables are presented in mean with standard deviation or median with interquartile range (IQR). The categorical parameters are described in absolute number and percentage. Logistic regression and cause specific Cox regression were applied to assess the effect of ONS on outcome. Patients at risk for analysis on discharge were all patients that had not been discharged home up to a given day. Analyses were performed using R 3.3.1. Statistics significance was considered at level of $p < 0.05$.

3. Results

Thai data from the one-day cross-sectional nD audit from the years 2010–2015 were reviewed. There were 958 patient records from 69 units in 2 university hospitals available. Eight-hundred and seventy-six patients met the inclusion criteria. After exclusion of patients receiving enteral tube feeding and/or parenteral nutrition (333 patients) or not receiving any hospital food (19 patients), 524 patients were included for analysis. Four-hundred and seventy-two patients received only hospital food and 52 patients received hospital food and ONS. Patients' demographics are summarized in Table 1. Patients in ONS group had a more than 2 times longer hospital stay (5 vs 17 days) before they were recruited into the study, less proportion of patients who were able to walk on their own, and a higher PANDORA score than those without additional ONS. Length of stay after nD was 5 times higher in patients with ONS (Table 3). Patients' diagnoses categorized by organ affected and comorbidities are described in Table 2. The ONS group had significant higher proportions of patients with disease affecting lungs, liver, endocrine system, and diagnosis of diabetes mellitus, cancer, and infection more than the group that received only hospital food.

Within 30-days after nD, 384 (82.8%) in control group and 30 (57.7%) in ONS group were discharged home respectively. Seven (1.5%) in control group and 2 (3.8%) patients in the ONS group died. Due to the low event rate no statistical test was applied. Length of stay after nD and overall hospital length of stay were longer in the ONS group than those of control group (24.5, IQR 6.75–32 days VS. 5, IQR 2–15 days and 38, IQR 21–49 days VS. 12, IQR 6–26 days respectively, $p < 0.0001$ for both). Among the 422 patients that were discharged from hospital by day 30, 31 (7.9%) patients in control group and 3 (10%) patients in the ONS group were readmitted. Other hospital outcomes are summarized in Table 3. Analyses with logistic regression on discharge until 30 days after nD revealed that, before adjustment, the ONS group was less likely to be discharged than control group (OR 0.28, 95% CI 0.16–0.52, $p < 0.001$). The odds ratio increased (adjusted OR 0.62, 95% CI 0.3–1.34, $p = 0.206$) after adjustment for length of hospital stay before nD and PANDORA score. Thus the effect of ONS is confounded by length of stay and in-hospital mortality risk. ONS group usually showed a higher risk of readmission within 30 days but the effect was not significant neither before nor after adjustment (Table 4).

Similar findings were found with Cox regression on length of stay after nD until discharge. As the full length of stay could suffer from the cross-sectional bias, only length of stay after nD were used for the analysis. The probability to be discharged was lower in the ONS group than the group receiving only hospital food (HR 0.43, 95% CI 0.3–0.63, $p < 0.001$) but this effect was reduced to a trend after adjustment for length of hospital stay before nD and PANDORA score (adjusted HR 0.72, 95% CI 0.48–1.04, $p = 0.0791$) (Figs. 1 and 2).

4. Discussion

Our serial cross-sectional data revealed lower prevalence of ONS prescription in Thai hospitalized patients than those reported in other literature [25,26]. Overall rate of ONS use in this study was only 9.92%. However, rate of its prescription was higher in malnourished group than those well-nourished and with mild

Table 1
Study population characteristics.

Variables	Hospital food ($N = 472$)	Hospital food + ONS ($N = 52$)	p-value
Age (years)	59.21 (17.8)	60.3 (18.6)	0.70
Female, *n* (%)	206 (43.6%)	24 (46.2%)	0.77
Height (cm)	163 (9)	161.8 (8.5)	0.86
Weight (kg)	64.8 (16.1)	64.2 (20.7)	0.33
BMI (kg/m^2)	24.3 (5.5)	24.4 (7)	0.89
Hospital stay before nD (days), median (IQR)	5 (2–11)	17 (9.5–30.5)	<0.0001
Any ICU stay, *n* (%)	420 (89%)	45 (86.5%)	0.64
Weight loss within 3 months, *n* (%)			0.40
Yes	192 (41.5%)	23 (45.1%)	
No	184 (39.7%)	15 (29.4%)	
No, gained	44 (9.5%)	6 (11.8%)	
Do not know	43 (9.3%)	7 (13.7%)	
Weight decrease			0.33
<5 kg	129 (27.9%)	14 (27.5%)	
5–10 kg	31 (6.7%)	7 (13.7%)	
>10 kg	25 (5.4%)	1 (2%)	
Unknown	7 (1.5%)	1 (2%)	
No intentional weight loss	271 (58.5%)	28 (54.9%)	
Self-rated health, *n* (%)			0.78
Excellent	14 (3%)	1 (2%)	
Very good	66 (14.3%)	7 (13.7%)	
Good	171 (37%)	17 (33.3%)	
Fair	147 (31.8%)	21 (41.2%)	
Poor	64 (13.9%)	5 (9.8%)	
Able to walk alone, *n* (%)			<0.0001
Yes	264 (57.4%)	15 (28.8%)	
With assistance	134 (29.1%)	20 (38.5%)	
No	62 (13.5%)	17 (32.7%)	
Amount eaten the week before nD, *n* (%)			0.25
Normal	271 (58.5%)	24 (46.2%)	
Less than normal	84 (18.1%)	10 (19.2%)	
Less than half of normal	63 (13.6%)	11 (21.2%)	
Less than quarter to nothing	45 (9.7%)	7 (13.5%)	
Amount eaten on nD, *n* (%)			0.07
All	195 (42.4%)	13 (25%)	
Half	141 (30.7%)	20 (38.5%)	
Quarter	80 (17.4%)	15 (28.8%)	
Nothing	43 (9.3%)	4 (7.7%)	
PANDORA score, median (IQR)	26 (20, 32)	34.5 (24.5, 38.5)	0.0001

Data are presented in mean (SD) otherwise indicated. *ONS* oral nutrition supplement, *nD* nutritionDay, *IQR* interquartile range.

Table 2
Patient diagnoses according to affected organ and comorbidities.

Variables	Hospital food ($N = 472$)	Hospital food + ONS ($N = 52$)	p-value
Affected organ, *n* (%)			
Brain, nerves	88 (18.6%)	6 (11.5%)	0.25
Eye, ear	8 (1.7%)	2 (3.8%)	0.26
Nose, throat	16 (3.4%)	2 (3.8%)	0.70
Heart, circulation	110 (23.3%)	15 (28.8%)	0.39
Lung	71 (15%)	17 (32.7%)	0.003
Liver	17 (3.6%)	6 (11.5%)	0.02
Gastrointestinal tract	88 (18.6%)	7 (13.5%)	0.45
Kidney/urinary tract	79 (16.7%)	13 (25%)	0.18
Endocrine system	97 (20.6%)	21 (40.4%)	0.002
Skeleton/bone/muscle	100 (21.2%)	13 (25%)	0.59
Blood/bone marrow	33 (7%)	11 (21.2%)	0.002
Skin	18 (3.8%)	2 (3.8%)	0.99
Ischemia	9 (1.9%)	3 (5.8%)	0.11
Cancer	68 (14.4%)	16 (30.8%)	0.005
Infection	72 (15.3%)	17 (32.7%)	0.003
Postoperative	127 (26.9%)	19 (36.5%)	0.15
Others	14 (3%)	4 (7.7%)	0.09
Comorbidities, *n* (%)			
Diabetes mellitus	112 (23.7%)	20 (38.5%)	0.03
Stroke	30 (6.4%)	2 (3.8%)	0.76
COPD	19 (4%)	4 (7.7%)	0.27
Myocardial infarction	21 (4.4%)	2 (3.8%)	0.99
Cardiac insufficiency	33 (7%)	3 (5.8%)	0.99
Others	177 (37.5%)	28 (53.8%)	0.02

Table 3
Hospital outcomes.

Variables	Hospital food ($N = 472$)	Hospital food + ONS ($N = 52$)	p-value
30 days outcomes, *n* (%)			0.0004
Still in hospital	65 (14%)	20 (38.5%)	
Transferred to another hospital	6 (1.3%)	0 (0%)	
Transferred to long-term care	1 (0.2%)	0 (0%)	
Rehabilitation	1 (0.2%)	0 (0%)	
Discharge home	384 (82.8%)	30 (57.7%)	
Death	7 (1.5%)	2 (3.8%)	
Length of stay after nD, median (IQR)	5 (2, 15)	24.5 (6.75, 32)	<0.0001
Overall length of stay, median (IQR)	12 (6, 26)	38 (21, 49)	<0.0001
Readmission,[a] *n* (%)	31 (7.9%)	3 (10.0%)	0.44

[a] Only patients who were discharged from hospital, $N = 390$ for hospital food group and 30 for hospital food with additional ONS group. *ONS* oral nutrition supplement, *nD* nutritionDay, *IQR* interquartile range.

Table 4
Logistic regression on being discharged and on being readmitted within 30 days if receiving ONS in addition to regular hospital food.

Outcomes	Odds ratio (95% CI)	p-value
Discharge within 30 days		
Unadjusted	0.28 [0.16,0.52]	<0.0001
Adjusted[a]	0.62 [0.3,1.34]	0.206
Readmission within 30 days (if discharged from hospital) ($N = 422$)		
Unadjusted	1.48 [0.34,4.55]	0.537
Adjusted[a]	1.1 [0.24,3.7]	0.887

[a] Adjusted for length of stay before nD and PANDORA score.

weight loss. To be more specific, from data in Table 1, rates of prescription of ONS were 14.29% among those who ate less than half before nD vs. 8.74% of those who ate more than half before nD and 12.5% of those who experienced weight loss more than 5 kg vs. 9.5% of those who lost weight less than 5 kg or gained weight.

Interestingly, our study revealed different results related with ONS. Before adjustment for baselines, patients receiving ONS was almost 3.6 times less likely to be discharged within 30 days (odds of discharge 0.28) compared to those who did not receive ONS. However, when we analyzed with adjustment of unbalanced baseline characteristics between groups, the apparent effect of ONS was lost. In a retrospective study on using ONS and length of stay over the 75% percentile in heart failure patients demonstrated that higher length of stay was associated with 2.43 times increased proportion of ONS prescription [27]. We corrected for length of stay before evaluation and the unfavorable effect of ONS disappeared. Deutz et al. published a randomized trial studying effect of ONS in hospitalized adult patients. They found no benefits of ONS regarding readmission rate or length of stay [10]. Snider et al. [20] and Philipson et al. [22] conducted retrospective studies comparing effect of hospital use of ONS by retrieving data from research database. Significant longer hospital stay was observed in the ONS group (8.7 days vs. 6.9 days, $p < 0.0001$ in Snider et al. study and 11.2 days vs. 8.3 days, $p < 0.0001$ in Philipson et al. study). However, after further statistical adjustment to counteract selection bias, the negative effect of ONS on hospital length of stay was reversed and showed that ONS group had 1.9 days and 2.3 days shorter hospital stay than non-ONS group in Snider et al. and Philipson et al. study respectively. These findings, together with our results, are highlighting that patients who receive ONS prescription had higher PANDORA score than those who did not received ONS. In Philipson et al. study, the patients in ONS group were older, less healthy, and had more episodes of admission within 6 months prior to the study than those in non-ONS group [22]. Our patients in the ONS group had a longer hospital stay before they were recruited by the nD survey than patients who did not receive ONS. This might reflect a more complex hospital course in the ONS group. PANDORA score, the scoring system developed based on data from the European nD survey in 2006–2009, was validated for risk stratification in non-ICU hospitalized patients as well as shown to predict mortality [24]. The higher PANDORA score in the ONS group indicates that they were more severe and possessed a higher mortality risk when they were recruited to our study. These between-group differences can influence the results when they are not taken account in the

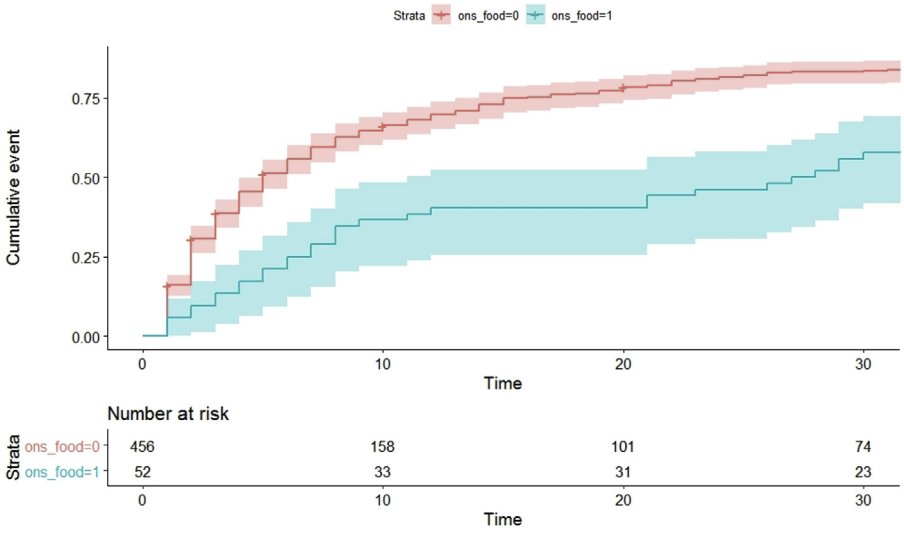

Fig. 1. Cumulative Incidence Function for discharge (unadjusted), population at risk is all non-discharged.

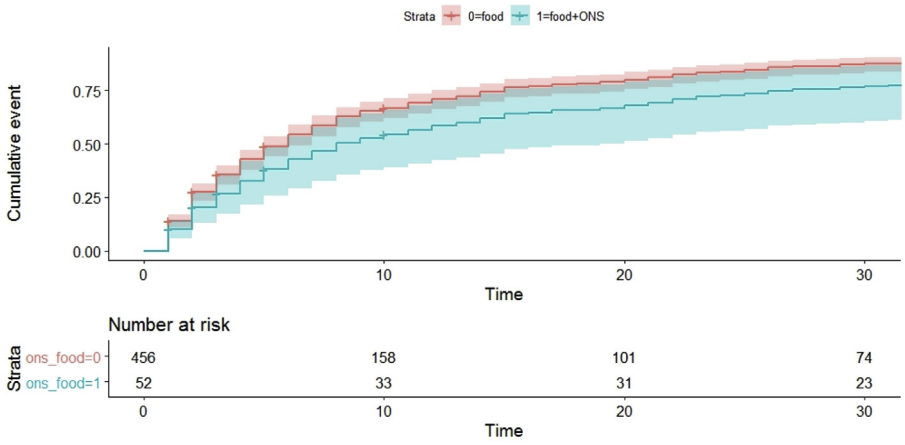

Fig. 2. Estimated Cumulative Event Curve from Cox Regression for discharge, adjusted with length of stay before ND and PANDORA score, population at risk is all non-discharged.

analysis plan particularly in non-randomized trials. Both Snider et al. study and Philipson et al. study used propensity score and an instrumental variables analysis method to address any effects of nonrandom selection that directed patients toward ONS or non-ONS group. In our study, we adjusted the odds ratio with the variables that showed significant difference between groups at baseline, the length of stay before nD and PANDORA score, which took 7 domains of patients' characteristics into scoring including age, body mass index, ability to walk, amount of food eaten, main group of diagnosis, presence of cancer, and hydration status together. It is also possible that our attempt had left some confounders unadjusted. Therefore, we did not see our results being turned toward significantly positive as it was in the Snider et al. and Philipson et al. studies but being reduced from significantly negative to a negative trend after adjustment (See: Table 5).

Our study did not find any significant difference in readmission rate within 30 days between both groups even after adjustment that again decreased the effect to large extent, indicating again confounding. These findings, again, emphasize that, to some degrees, our outcomes suffer from selection bias of nonrandomized design, though the analysis results for readmission showed no statistical significance neither before nor after adjustment. The overall low death rate of 9/524 (1.7%) and only 2 death in the ONS group does not permit a statistical analysis.

Our findings opposed to 2 recent systematic review and meta-analysis studies that documented a decrease of readmission rate in patients using ONS in mixed community and hospital settings. Both reported 41% reduction of readmission rate in the ONS group (OR 0.59, 95% CI 0.41–0.84, $p = 0.004$ and OR 0.59, 95% CI 0.43–0.80, $p = 0.001$) [3,19]. Meanwhile, conflicting results were reported regarding effect of ONS on mortality. A randomized controlled study comparing ONS to hospital diet alone reported decrease in mortality only in severe undernourished group [2]. Another recent randomized study in hospitalized elderly patients found significant lower mortality rate in patients receiving ONS compare to placebo (RR 0.49, 95% CI 0.27–0.90, $p = 0.018$) [10]. On the other hands, there were studies that failed to demonstrate benefits of ONS on mortality reduction [6,12,14,18].

Table 5
Cox Regression on time to discharge if receiving ONS in addition to regular hospital food.

Outcomes	Hazard ratio (95% CI)	*p*-value
Discharge within 30 days		
Unadjusted	0.43 (0.3–0.63)	<0.0001
Adjusted[a]	0.72 (0.48–1.04)	0.0791

[a] Adjusted for length of stay before nD and PANDORA score.

Our non-significant outcomes might be explained by many factors. First, as mentioned above, the patients in ONS group had higher mortality risk according to PANDORA score and more than 2 times higher hospital stay than the non-ONS group at baseline data collection which subsequently resulted in poorer hospital outcomes. In Thailand, ONS is usually prescribed by nutrition care team. Scarcity of clinical dietitian employment in the hospital makes nutrition care teams disproportionately much smaller as compare to number of hospital beds. This problem results in more reactive roles of nutrition care team, i.e. provide nutritional consultation upon request, rather than proactive management. Data from 2012 showed that 60% of hospital units in Thailand did not even perform nutritional screening as a routine [28]. It might happen that only the obviously severely malnourished, complicated patients were sent for nutrition consultation and hence received ONS prescription. Late identification of malnutrition leads to late nutritional management and hence increase probability of death. Second, we found surprisingly low mortality rate in our study, an overall mortality of 1.7%, comparing to other reports from nD series [23,29]. Two randomized controlled trials that addressed mortality reduction effect of ONS reported mortality rate of ONS group vs. non-ONS group as 14.7% vs. 35% [2] and 4.8% vs. 9.7% [10] whereas ours were only 3.8% vs. 1.5%. Larger sample size may be needed to detect such small differences between groups. However, the observed mortality rates in our study were close to those predicted from their PANDORA score (probability of death by PANDORA score were 4.44% in ONS group and 1.85% in non-ONS group). The lower death rate in our study was probably caused by the exclusion of patients who received enteral feeding or parenteral nutrition which might preclude those with higher severity, hence mortality. Lastly, our study included participants with normal nutritional status. The overall prevalence of malnutrition in our study, defined as history of weight loss for more than 5 kg, eating less than half of normal, were 12.7 and 27.2% respectively which could be considered lower than, or comparable to, recent Thai report by Chittawatanarat et al. [30]. As ONS was shown to have prominent benefits in severe malnourished host [2,11] while its effect was less clear in normally nourished patients [31], we might expect for different outcome when analyzing data obtained from mixed well-nourished and malnourished population [11]. Nevertheless, many publications which also included non-malnourished patients in their studies were able to demonstrated positive outcomes of ONS [3,4,14,20,22].

The main limitation of our study is the cross-sectional design. Patients were grouped according to the presence or absence of ONS on the day when the nD survey was performed which leaded to unbalance between studied groups. The cross-sectional design has also the advantage to recruit more severely ill patients than a cohort study because staying longer in hospital mostly due to higher severity or comorbidities increases the chance to be recruited but needs to be adjusted in the analysis [32]. We found a considerable disproportion between numbers of patients of 2 groups. Though we tried to counteract the effects of selection bias with adjusting factors, there might be other factors that were not be able to be documented from the standard questionnaires we used due to country-specific conditions. For example, in Thailand, ONS prescription has to be co-paid by patients, therefore, patients in ONS group might represent a group with higher socioeconomic status, hence higher affordability, than non-ONS group who might not be able to pay and received only hospital food. In addition it is not known how these factors delay the ordering ONS. Delayed use of ONS may jeopardize a beneficial effect. The randomized trial would be the best option for an interventional study, however it may be considered unethical in this context. Furthermore, the nature of cross-sectional design did not allow us to trace back for the compliance of ONS in intervention group. The compliance of ONS in literature were reported to vary widely. Data from a systematic review reported mean of actual consumed amount ranged from 37 to 100% of those prescribed [33]. Almost one-third of patients were reported with low compliance, ingested less than 50% of given doses or even discontinued ONS at some point during the observation [9,34]. Roberts et al. showed that even though the calorie and protein intake increased with ONS prescription in hospitalized patients, only half of them were able to catch up with their minimal requirements [34]. In our study, we did not know whether the patients in ONS group received higher calorie and protein as we expected or how long they continued to receive ONS after the survey. As the actual amount of ONS intake showed positive correlation with degree of clinical improvement [9], when the actual amount of consumed ONS is unknown, the benefits of ONS is hardly anticipated. Therefore, our results might reflect the effect of ONS "prescription" rather than that of calorie and protein supplement.

5. Conclusion

Data from cross-sectional study showed trend of worse outcome associated with ONS prescription in adult hospitalized Thai patients which might related to higher PANDORA score of the patients receiving ONS. Due to the unbalance between 2 groups in this study, randomized trials are needed to address the effect of ONS in this specific population.

Author's contributions

SR was the principal investigator, and the manuscript was written by him. SR and PS were responsible for the study conceptualization and design. PY, SK, and DW collected the data. MH and IS analyzed the results. PS, MH, and IS read, edited, and approved the final manuscript.

Conflict of interest

The authors declared no potential conflicts of interest with respect to the authorship and/or publication of this article. The study results were presented as poster at the European Society of Parenteral and enteral nutrition society (ESPEN) Congress on September 3, 2018, in Madrid, Spain (MON-P306).

Acknowledgments

This study is a collaboration between NutritionDay survey team of European Society of Clinical Nutrition and Metabolism (ESPEN) and members of Society of Parenteral and Enteral Nutrition of Thailand (SPENT). We thank all nutrition care team members at Siriraj hospital and Ramathibodi hospital for data collection in Thailand.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.clnesp.2019.05.012.

References

[1] Gomes F, Schuetz P, Bounoure L, Austin P, Ballesteros-Pomar M, Cederholm T, et al. ESPEN guidelines on nutritional support for polymorbid internal medicine patients. Clin Nutr 2018;37(1):336–53.
[2] Potter JM, Roberts MA, McColl JH, Reilly JJ. Protein energy supplements in unwell elderly patients – a randomized controlled trial. J Parenter Enteral Nutr 2001;25(6):323–9.
[3] Cawood AL, Elia M, Stratton RJ. Systematic review and meta-analysis of the effects of high protein oral nutritional supplements. Ageing Res Rev 2012;11(2):278–96.
[4] Hegerová P, Dědková Z, Sobotka L. Early nutritional support and physiotherapy improved long-term self-sufficiency in acutely ill older patients. Nutrition 2015;31(1):166–70.
[5] Boudville A, Bruce DG. Lack of meal intake compensation following nutritional supplements in hospitalised elderly women. Br J Nutr 2005;93(6):879–84.
[6] Baldwin C, Weekes CE. Dietary counselling with or without oral nutritional supplements in the management of malnourished patients: a systematic review and meta-analysis of randomised controlled trials. J Hum Nutr Diet 2012;25(5):411–26.
[7] Sezer S, Bal Z, Tutal E, Uyar ME, Acar NO. Long-term oral nutrition supplementation improves outcomes in malnourished patients with chronic kidney disease on hemodialysis. J Parenter Enteral Nutr 2014;38(8):960–5.
[8] Abizanda P, López MD, García VP, de D. Estrella J, da Silva González Á, Vilardell NB, et al. Effects of an oral nutritional supplementation plus physical exercise intervention on the physical function, nutritional status, and quality of life in frail institutionalized older adults: the ACTIVNES study. J Am Med Dir Assoc 2015;16(5). 439.e9–439.e16.
[9] Jobse I, Liao Y, Bartram M, Delantonio K, Uter W, Stehle P, et al. Compliance of nursing home residents with a nutrient- and energy-dense oral nutritional supplement determines effects on nutritional status. J Nutr Health Aging 2015;19(3):356–64.
[10] Deutz NE, Matheson EM, Matarese LE, Luo M, Baggs GE, Nelson JL, et al. Readmission and mortality in malnourished, older, hospitalized adults treated with a specialized oral nutritional supplement: a randomized clinical trial. Clin Nutr 2016;35(1):18–26.
[11] Milne AC, Potter J, Vivanti A, Avenell A. Protein and energy supplementation in elderly people at risk from malnutrition. Cochrane Database Syst Rev 2009;(2):CD003288.
[12] Baldwin C, Weekes CE. Dietary advice with or without oral nutritional supplements for disease-related malnutrition in adults. Cochrane Database Syst Rev 2011;9:CD002008.
[13] Pereira da Silva R, Santos Borges de Araújo IL, Coelho Cabral P, Pessoa de Araújo Burgos MG. Effects of oral nutritional support in hospitalized patients with AIDS. Nutr Hosp 2013;28(2):400–4.
[14] Gariballa S, Forster S, Walters S, Powers H. A randomized, double-blind, placebo-controlled trial of nutritional supplementation during acute illness. Am J Med 2006;119(8):693–9.
[15] Somanchi M, Tao X, Mullin GE. The facilitated early enteral and dietary management effectiveness trial in hospitalized patients with malnutrition. J Parenter Enteral Nutr 2011;35(2):209–16.
[16] Lawson RM, Doshi MK, Barton JR, Cobden I. The effect of unselected postoperative nutritional supplementation on nutritional status and clinical outcome of orthopaedic patients. Clin Nutr 2003;22(1):39–46.
[17] Beattie AH, Prach AT, Baxter JP, Pennington CR. A randomised controlled trial evaluating the use of enteral nutritional supplements postoperatively in malnourished surgical patients. Gut 2000;46(6):813–8.
[18] Liu M, Yang J, Yu X, Huang X, Vaidya S, Huang F, et al. The role of perioperative oral nutritional supplementation in elderly patients after hip surgery. Clin Interv Aging 2015;10:849–58.
[19] Stratton RJ, Hébuterne X, Elia M. A systematic review and meta-analysis of the impact of oral nutritional supplements on hospital readmissions. Ageing Res Rev 2013;12(4):884–97.
[20] Snider JT, Jena AB, Linthicum MT, Hegazi RA, Partridge JS, LaVallee C, et al. Effect of hospital use of oral nutritional supplementation on length of stay,

hospital cost, and 30-day readmissions among Medicare patients with COPD. Chest 2015;147(6):1477–84.
[21] Norman K, Kirchner H, Freudenreich M, Ockenga J, Lochs H, Pirlich M. Three month intervention with protein and energy rich supplements improve muscle function and quality of life in malnourished patients with non-neoplastic gastrointestinal disease – a randomized controlled trial. Clin Nutr 2008;27(1):48–56.
[22] Philipson TJ, Snider JT, Lakdawalla DN, Stryckman B, Goldman DP. Impact of oral nutritional supplementation on hospital outcomes. Am J Manag Care 2013;19(2):121–8.
[23] Hiesmayr M, Schindler K, Pernicka E, Schuh C, Schoeniger-Hekele A, Bauer P, et al. Decreased food intake is a risk factor for mortality in hospitalised patients: the NutritionDay survey 2006. Clin Nutr 2009;28(5):484–91.
[24] Hiesmayr M, Frantal S, Schindler K, Themessl-Huber M, Mouhieddine M, Schuh C, et al. The Patient- And Nutrition-Derived Outcome Risk Assessment score (PANDORA): development of a simple predictive risk score for 30-day in-hospital mortality based on demographics, clinical observation, and nutrition. PLoS One 2015;10(5):e0127316.
[25] Wong S, Graham A, Green D, Hirani SP, Forbes A. Nutritional supplement usage in patients admitted to a spinal cord injury center. J Spinal Cord Med 2013;36(6):645–51.
[26] Hébuterne X, Lemarié E, Michallet M, de Montreuil CB, Schneider SM, Goldwasser F. Prevalence of malnutrition and current use of nutrition support in patients with cancer. J Parenter Enteral Nutr 2014;38(2):196–204.
[27] Babb EB, Rohrer J. Oral nutritional supplement use in relation to length of stay in heart failure patients at a regional medical center. J Eval Clin Pract 2017;23(6):1211–7.
[28] Chittawatanarat K, Tosanguan K, Chaikledkaew U, Tejavanija S, Teerawattananon Y. Nationwide survey of nutritional management in an Asian upper-middle income developing country government hospitals: combination of quantitative survey and focus group discussion. Clin Nutr ESPEN 2016;14:24–30.
[29] Lainscak M, Farkas J, Frantal S, Singer P, Bauer P, Hiesmayr M, et al. Self-rated health, nutritional intake and mortality in adult hospitalized patients. Eur J Clin Investig 2014;44(9):813–24.
[30] Chittawatanarat K, Chaiwat O, Morakul S, Kongsayreepong S. Outcomes of nutrition status assessment by Bhumibol Nutrition Triage/Nutrition Triage (BNT/NT) in multicenter Thai-SICU study. J Med Assoc Thai 2016;99(9):184.
[31] Botella-Carretero JI, Iglesias B, Balsa JA, Zamarrón I, Arrieta F, Vázquez C. Effects of oral nutritional supplements in normally nourished or mildly undernourished geriatric patients after surgery for hip fracture: a randomized clinical trial. J Parenter Enteral Nutr 2008;32(2):120–8.
[32] Frantal S, Pernicka E, Hiesmayr M, Schindler K, Bauer P. Length bias correction in one-day cross-sectional assessments – the nutritionDay study. Clin Nutr 2016;35(2):522–7.
[33] Hubbard GP, Elia M, Holdoway A, Stratton RJ. A systematic review of compliance to oral nutritional supplements. Clin Nutr 2012;31(3):293–312.
[34] Roberts M, Potter J, McColl J, Reilly J. Can prescription of sip-feed supplements increase energy intake in hospitalised older people with medical problems? Br J Nutr 2003;90(2):425–9.