TITLE: Nutrition team supervision on nutrient intake in critical care patients: report of a ten-year experience in the Philippines (years 2000 to 2011)

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ABSTRACT

OBJECTIVE: To determine the value of a nutrition team in the management of critically ill ICU patients through adequacy of energy intake

METHODOLOGY: Energy requirements with actual intake records of ICU patients referred to the nutrition team were gathered for a ten year period which was separated to four stages: Period 1 (year 2000 to 2001), Period 2 (year 2002 to 2003), Period 3 (year 2005 to 2007), and Period 4 (year 2010 to 2011). Only patients with 7-day stay in the ICU were included. Calorie intake on days 1, 3, 5 and 7 were reported and the percent adequacy was determined on these specific days, which were then compared per time period. Differences in percent intake per ICU day were analyzed using T-Test for normal distributed data and Wilcoxon or Mann Whitney U Test for non-normal distributed data.

RESULTS: Day one intake on period 1 was the lowest (29%) compared to the same days on periods 2, 3 and 4. This improved on day 3 but was still inadequate (63%). Adequate levels on days 5 and 7 were achieved in all time periods. Analysis of intake in the fourth period (year 2010 to 2011) showed better intake in calories and protein when the patient was referred to the nutrition team.

CONCLUSION: A nutrition team is able to achieve adequate energy intake for ICU patients on day 3 of ICU stay and there is an increasing degree of adequacy for most ICU days as the practice progresses through time.
INTRODUCTION

Adequate nutrient intake of critical care patients in the intensive care unit (ICU) makes a big difference in morbidity and mortality outcomes. The ACCEPT trial in 2004 showed a reduction of hospital stay and “trend towards reduced mortality” in ICU patients in Canada [1] while another study done in the same critical care system (2008) later showed reduction of mortality when an increase of 1,000 kcal was delivered to the ICU patients [2]. Achieving adequate intake in critical care patients is thus considered a practice standard, but it is also a challenge [3]. Reports from critical care units in Canada [2], Switzerland [4], Belgium [5] and France [6] have stressed the problem of inadequate intake in the ICU [7,8] and its impact on clinical outcomes of organ function recovery, infectious complications and hospital stay. Our own experience in ICU nutrition (Philippines) also showed inadequate intake in critical care geriatric patients, which persisted even on the third day of ICU stay [9].

Since delivery of nutrition to the critical care patient is a complex process a multidisciplinary nutrition team is believed to be the best solution to achieve this goal of adequate intake in the ICU patients [10-14]. This is the report of the ten-year experience of a nutrition team from the Philippines in working at achieving this goal.

METHODOLOGY

The nutrition team: The team of St. Luke’s Medical Center (a private tertiary care hospital in Manila, Philippines) was organized based on ASPEN guidelines [15] and became formally active in 1998. It is composed of a physician, dietitian, nurse, and pharmacist. The ability of the team to follow up and track the nutrient intake of patients was enhanced by the computerization of the nutrition management process in 2000. [16,17] The development of a training program in clinical nutrition practice was also started in 2000 and it was instrumental in providing personnel (clinical nutrition physician specialists) who run the daily activities of the team. Initially the team was called Nutrition Support Team (NST) but due to its expanding role in patient care it was renamed Clinical Nutrition Service. [18]

Mechanics of team function: Nutrition screening on all patients was done by the nurses on admission and when the patient is classified as “nutritionally at risk” nutritional assessment was done by the Clinical Nutrition Service personnel. All ICU patients are classified as “high risk” will have the following services: a) nutrition care plan, b) formulation and delivery of the designed nutrition regimen (whether oral, enteral or parenteral), and c) monitoring of the nutrition care delivery including nutrient intake.

Adequate intake: The cut-off value for declaring adequacy of intake is 75% of the computed calorie and protein requirement of the patient. This is used as the main indicator of the nutrition team performance. Adequate intake data of ICU patients during the following major time periods are determined as follows: a) Period 1 (years 2000-2001): representing initial experience
of the team, b) Period 2 (years 2002-2003): to show if progress was made in the goal of adequate intake, c) Period 3 (years 2005-2006): to show the long term effects of nutrition team activity, and d) Period 4 (years 2010-2011): to show current outcomes. To show if the team is still effective comparisons with non-referrals to the team are made for Period 4.

**Measured parameters:** These are the records of oral, enteral and parenteral nutrition and the number of patients who achieved adequacy levels. The sources of these records were retrieved from the Clinical Nutrition Service computer database archives. Inclusion criteria are: a) patients who stayed in the ICU for at least seven (7) days, b) complete records from days 1, 2, 3, 5 and 7, and c) these patients were admitted in the four different time period analysis. The statistical analysis used T-Test for independent groups of normally distributed data and Wilcoxon test for non-normal distributed data. Significance is set at P < 0.05.

**RESULTS**

**Profile of patients** (Table 1 and 3): Mean age is from 57y to 71y; more than 60% are above 60 yrs old and 8% to 20% were above 80 yrs old; 55% to 71% are males. By Subjective Global Assessment (SGA) all are at “high risk of developing nutrition related complications”. The organs involved were documented during the fourth period (year 2010 to 2011, Table 3): one organ was involved in 18% of all cases (=pulmonary) while two to three organs were involved in 70% of cases (cardiac, pulmonary, renal, or gastrointestinal).

<table>
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<tr>
<th>Table 1: Patient Profile (N=155)</th>
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<tbody>
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<td>Period</td>
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<tr>
<td>Period 1 (y2000-2001)</td>
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<td>Period 2 (y2002-2003)</td>
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<td>Period 3 (y2005-2007)</td>
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<td>Period 4 (y2010-2011)</td>
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SD = standard deviation
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Calorie counts for the four time periods (Figure 1): Day one had the lowest percent intake for all the periods – not able to reach adequate levels of 75%. On the initial year of implementation (2000-2001) day one had the lowest intake compared to the rest of the periods (periods 2 to 4). Day two intake adequacy was also not reached on period 1, but for the rest of the periods (periods 2 to 4) adequate intake was achieved, meaning improvement in the goals on period 2 up to 4 was achieved. On Day 3 onwards – all periods showed adequate levels of intake.

<table>
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<tr>
<th>Table 2: Computed (TCR) and Actual Energy Intake</th>
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<td>Period 1 (y2000-2001)</td>
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<td>Period 2 (y2002-2003)</td>
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<td>Period 3 (y2005-2007)</td>
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<td>Period 4 (y2010-2011)</td>
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<td>Total</td>
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TCR = Total Calorie Requirement; EN = Enteral Nutrition; PN = Parenteral Nutrition

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<th>Table 3: Organs Affected (Period 4: year 2010 to 2011)</th>
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Median Total Calorie Requirement (TCR) (Table 2) and actual intake in patients referred versus not referred to the nutrition team (Figure 2): The computed median TCR was 1500 to 1700 kcal/day while the median intake for all periods was 1100 to 1400 kcal/day. The overall intake was 84% for the four periods with the lowest percentage occurring in the fourth period (=74%; year 2010 to 2011). The comparison of intake in referred versus not-referred patients showed better intake in Days 1 and 7 in patients supervised by a nutrition team.

Distribution of intake (Table 2): Almost 90% of nutrient delivery was through the enteral route; 9% to 35% were through the parenteral route; while the utilization of mixed enteral nutrition (EN) and parenteral nutrition (PN) was only 8%.

Nutrition team outcomes: (a) The team was able to reach goals, i.e. adequate intake, within the first three days of ICU stay and the trend was improving through the years of practice of clinical nutrition (Figure 1 and 2), (b) Adherence to guidelines are evident through the utilization of the gastrointestinal tract as access point in feeding in most cases (71%, Table 2), (c) Computerization of intake data – vital to the success of the delivery process [16], and (d) More consistent intake of patients with team supervision compared to non-referrals (Figure 2).
DISCUSSION

ICU patients achieved adequate intake within 24 to 48 hours of admission when nutrition was managed by a nutrition team. Although this goal was not immediately achieved at the start of the program (Period 1: year 2000 to 2001), the consistent presence of the nutrition team gradually made it a reality when this program was sustained up to the current study period (from 2003 to 2011). This finding reflects what was reported on the positive effects of nutrition teams: better delivery of nutrition with corresponding improvement in the nutrition process through the presence of the nutrition team and its implementation of protocols and guidelines. [16,17,18] The population shows the predominance of the geriatric age group (>60yr old: 61% to 85% and >80yr old: 8% to 35%) with more than one organ dysfunction involved (Table 3) all of which increased the complexity of the care process. A study done in this institution [4] showed the reality of this problem of actual nutrient intake – geriatric patients reached only 70% of computed requirement even on day 3 of ICU stay. Only a nutrition team can achieve this goal rationally and competently and this study shows it achieved this goal. De Jonghe asked this question – are ICU patients receiving the intended prescription? [6] Their study showed physicians needed to focus on achieving adequate intake. This study shows that the presence of a nutrition team will help achieve this purpose of achieving adequacy of intake in both calorie and protein although in the last period (Period 4: year 2010 to 2011) the presence of more than one organ dysfunction where the gastrointestinal tract is involved has lowered the adequacy level (74%). But it is also in this period that the comparison of intake between referred and non-referred patients showed better nutrition delivery by the nutrition team again underscoring the
value of a nutrition program and team in achieving this purpose (Figure 2).

Nutrition delivery showed adherence to the guideline and principle, “if the gut works, use it”, through a high enteral nutrition usage (48% to 90%, Table 2) and use of parenteral nutrition as a supplement (9% to 34%, Table 2). This indicates the adoption and utilization of enteral and parenteral nutrition guidelines from ESPEN and ASPEN on critically ill patients. [19,20,21] This is another proof to the observation that a structured system of nutrition management will achieve the seemingly impossible goal of achieving consistent adequate intake in the ICU. [1]

Outcome variables were not included in this study, but two studies done in other centers showed that adequate and consistent nutrient intake in the ICU improves outcomes like reduction of infectious complications [4] and mortality [2] which also translated to reduced costs [22,23]. Future follow up of these patients will come up with definite outcomes like morbidity and mortality in this institution.

CONCLUSION

A nutrition team with implementation of nutrition care protocols and guidelines achieved consistent adequate intake in critical care patients in the long term.

REFERENCES

8. Heyland D, Cook DJ, Winder B, Brylowski L, Van demark H, Guyatt G. Enteral nutrition in the