

# How to Manage the Pediatric Nutritional Support Team: Updates

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Pediatric patients in hospital are at risk of malnutrition at admission and even during their hospitalization. Although the concept of nutritional support team (NST) was introduced to hospitals for optimal nutritional care since 1960s and the benefits of pediatric NST have been proven by many studies and reports in terms of patient clinical outcome and cost saving, the pediatric NST is not widespread yet. The pediatric NST composed of pediatricians, dieticians, pharmacist, and nutrition support nurses as core members dedicated to nutritional care in children should be independent of central NST or other disciplines, but closely cooperate with other teams in hospitals. There is no doubt that a multidisciplinary NST is an effective way to provide appropriate nutritional support to an individual patient. Therefore, the implementation of the pediatric NST in hospitals should be recommended to provide optimum nutritional support including enteral tube feeding and parenteral nutrition and to assess pediatric patients at risk of malnutrition. (**Pediatr Gastroenterol Hepatol Nutr 2012; 15: 79~84**)

**Key Words:** Malnutrition, Nutritional support team, Nutritional care, Pediatrician, Child

## INTRODUCTION

Since intravenous nutrition was developed by Dudrick et al. [1] in 1968, the concept of nutritional support team (NST) was introduced to provide nutritional therapy to patients who are in need for parenteral nutrition (PN) or enteral nutrition (EN) because of current or impending malnutrition during hospitalization [2].

Nutrition support is, by definition, supplying sufficient nutrients to hospitalized patients who cannot

take enough food to maintain optimum nutritional status [3]. Nutrition support in hospital can be provided step by step, basically starting from the provision of regular hospital meals, adding fortified foods or supplements, proceeding to enteral tube feeding, and then to PN [4].

Malnutrition is a common problem in hospitalized children, and children admitted to hospitals are at increased risk of developing malnutrition owing to inadequate nutrients intake or altered nutrient requirement or the dependency on doctors or caretakers for

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nutrients intake [5,6]. Malnutrition is closely associated with an increase in morbidity and mortality in hospitalized children, and nutritional status is significantly related to clinical outcomes including the length of hospital stay, the number of days on ventilation in the pediatric intensive care unit (ICU), the duration of total parenteral nutrition (TPN), and therefore hospital costs [7,8]. If abnormal nutritional status is not corrected in children, growth can be affected as a consequence of malnutrition; at first, the absence of normal weight gain, followed by significant weight loss, and a stunt in longitudinal growth subsequently [5]. Thus, nutrition support is regarded as an important issue in managing sick children admitted to a hospital.

The NST is a multidisciplinary team composed of many experts related to clinical nutrition such as clinicians, dietitians, nurses, and pharmacists, aiming at the provision of safe, optimal nutrition to all patients, particularly to hospitalized children requiring EN or PN [2,3,5]. In this article, the knowhow for setting up an NST in a hospital, the current status of the NST, especially focused on the pediatric NST, and how to manage the pediatric NST will be principally discussed with updates.

## **RATIONALE FOR THE ESTABLISHMENT OF NUTRITIONAL SUPPORT TEAM IN HOSPITALS**

According to the report from the Council of Europe in 2002, nutritional support in hospitals was not properly provided to the patients in Europe [9]. Nutritional risk screening of undernourished patients and nutritional assessment of the patients at risk of malnutrition were not routinely performed in hospitals [9]. Energy-dense menu is not widespread, and meal times were not flexible in favor of patients' preference [9]. The nutritional support was usually performed only in patients who are severely undernourished or in patients under special medical conditions, and was not routinely performed in all patients at nutritional risk [9]. Even responsibilities and tasks of personnel involved in the hospital nutri-

tional support were not clearly defined, and the educational programs and training courses regarding clinical nutrition were generally insufficient [9].

Regarding limitations in nutritional support in European hospitals, this report suggested that there are some major barriers including the lack of clear-up responsibilities in planning and managing nutritional management in hospitals, the lack of educational programs on nutrition for all staffs, the lack of knowledge of the patients, the lack of cooperation between different staff groups, and the lack of involvement from the hospital administration [9]. This is why the implementation of the NST is recommended for optimal nutritional care in hospitals.

## **NUTRITIONAL SUPPORT TEAM: CURRENT STATUS AND CLINICAL SIGNIFICANCE**

In 2003, Heyland et al. [10] reported the status of clinical practice regarding nutrition support in the ICUs of Canadian hospitals. According to this report, only 16 (24.2%) of 66 hospitals had a NST, and about 40% of ICU patients did not receive any form of nutrition support at all during their ICU stay [10].

According to the European survey reported in 2005, only 98 (3.2%) of 3,071 hospitals had a NST in Europe, and most NSTs were at university hospitals or teaching hospitals with average 1,132 beds [11]. Moreover, only 12% of the physicians were responsible for the NST in contrary to 37% of the nurses and 46% of the dietitians as the leaders of the NST [11]. Only 32% of the NST received funding support, and these NSTs were not independently operating units [11]. However, since the NST was established in hospitals, a significant reduction of complications (88%) and cost saving (98%) were reported [11].

A team approach of nutritional support for the hospitalized patients has some benefits because individualized nutritional prescription is possible that can meet patient's nutritional need more closely via NST activity and the NST improves patient care while reducing cost [12]. The increase in the utilization of more physiologic EN and the decrease in the number of TPN bags wasted are observed with the in-

roduction of the NST [12]. Cost benefits of the NST is not only the decrease of inappropriate PN but also the decrease in catheter-related infection, central vein thrombosis, the number of blood testing and faster insertion of EN and PN routes and faster patient discharge [13].

## SETTING UP A NUTRITIONAL SUPPORT TEAM IN A HOSPITAL

Because the NST is a group of health care professionals with interest and expertise involved in the identification, evaluation and management of the patients with current or impending malnutrition or nutritionally related problems, it is basically established in hospitals for effective nutritional support [5]. Main roles of the NST include the implementation of screening for nutritional risk, the identification of patients who require nutritional support, the provision of effective nutritional management for patients, the plan for home nutrition after discharge, the education of hospital staff related to nutritional care, and the audit of clinical practice on nutrition [5].

For these purposes, the NST should be a multidisciplinary team including clinicians, dietitians, pharmacist, and nutrition specialist nurses with a special interest in clinical nutrition [13]. In an extended concept of the NST, it can also include surgeon, social worker, physiotherapist, occupational therapist, psychiatrist, microbiologist, hematologist, urologist, and interventional radiologist to insert central lines for PN and some feeding tubes for EN, etc. [13]. Members of the NST should work in close cooperation with many different staffs from different medical or administrative departments working within the organization of nutrition steering committees in hospitals, including clinicians, nurses, and managers [14]. The magnitude of the NST can be determined according to the size or the scope of each hospital, the number of beds for hospitalized patients, and the budget for the NST [15].

Setup of the NST begins with the allocation of each staff to have sessions dedicated to nutritional support; full time staffs are basically recommended, however, part time workers can also be assigned at

the beginning of NST or according to the situation of each hospital. Ideally, the NST should be totally responsible for nutritional care of the patients, but it can also work as an advisory team for primary medical team in charge of medical treatment of the patients; sometimes, mixed type of the operation can be applied [13].

At the beginning of the NST, the assignment of tasks of the NST can be restricted to the patients on PN, then extending to EN; in this manner, the responsibilities of the NST can be limited to the ICU at the beginning, extending to general wards, then finally to the special units such as hematology-oncology core.

Routine ward rounds are recommended every day, particularly for daily checkup of the TPN order and compositions of PN solutions to supply safe, optimal PN in hospitals [13]. In addition to ward rounds, regular NST meeting is recommended at least once a week to discuss the patients and operation of the NST, monitoring of the practice, and profound education on nutritional care [13]. Educational programs and training courses should be provided to all medical staffs, caregivers and the patients. Furthermore, the establishment of individualized guidelines on nutritional risk screening, nutritional assessment and evaluation, nutritional management is recommended to set up standards of nutritional care in each hospital [13]. This guideline should be based on current scientific knowledge and medical guidelines for nutritional support [15].

To successfully set up a NST in hospital, there should be a robust team motivation and vision, a multidisciplinary and interdisciplinary team working, clinical audit program, research topics, strategies for sharing goals and team success [14].

## PEDIATRIC NUTRITIONAL SUPPORT TEAM: CURRENT STATUS

It is obvious that current education on clinical nutrition is not sufficient for pediatricians to assess the patient at nutritional risk properly and provide appropriate nutritional care [5,16]. Because the optimal nutrition management of the hospitalized children

can be achieved by a well-organized multidisciplinary team, the establishment of the pediatric NST became essential in clinical practice [5].

Despite of clinical significance, the pediatric NST is not so much widespread up to date, even in Korea [17]. However, once the NST is established in hospitals, significant decrease was noted up to 25% regarding case fatality [18]. According to a study performed in Brazil, there was a progressive increase in EN use and a significant decrease in PN use, mainly after implementation of NST [19]. Besides, a pediatric ICU (PICU) mortality rate was also significantly reduced when the mortality was compared among five different periods starting from the period without pediatric NST to the period with a multidisciplinary NST in the PICU [19].

According to the European survey on current strategies in nutritional management of PICUs in 2004, 73% of PICUs had a pediatric NST available and pediatricians were predominantly responsible for nutritional support in hospitals [20]. In addition, about 70% of PICUs were using a software for nutritional support and 70% of PICUs regarded nutrition to be important as a research topic and a part of training program [20].

There was another report about the NST in the PICU in France, comparing parameters before and after the introduction of the pediatric NST to PICUs [21]. According to this report, there were no clinical nutrition consultant intervention and dietician intervention prior to the implementation of the pediatric NST, and these interventions were regularly set up with the introduction of the NST although there was no difference between two periods regarding cumulative caloric deficits, cumulative protein deficits, and time to achieve a sustained optimal caloric intake [21].

With respect to the NST in NICUs, there are only a few reports including one study comparing factors related to nutritional support in a NICU before and after the establishment of the pediatric NST to evaluate the effects of the NST on the clinical course of preterm infants in the NICU [22]. According to this study, a significant reduction of fasting periods and the periods on TPN administration was observed

with the introduction of the NST to the NICU, and a significant increase of the doses of calories, protein, and lipids administered via TPN in the NST group [22]. A total period on antibiotic therapy also decreased in the NST group compared to the pre-NST group [22]. Thus, nutritional support mediated by the pediatric NST seemed to be beneficial to the clinical course of preterm infants in the NICU to some extent.

The effect of pediatric NST on patient outcome has not been well established yet due to the lack of data on the pediatric NST in hospitals. However, as suggested by the nutrition support guidelines in the critically ill children of the American Society for Parenteral Enteral Nutrition (ASPEN), a specialized NST in the ICU may enhance the overall delivery of nutrition, with shorter time to goal nutrition, increased delivery of EN, and decreased use of PN [23], and that is why the establishment of the independently operated, multidisciplinary, pediatric NST is strongly recommended in hospitals.

## HOW TO MANAGE THE PEDIATRIC NUTRITIONAL SUPPORT TEAM

The setup of a pediatric NST in hospital is essentially recommended to improve nutritional status of hospitalized children in both general wards and neonatal ICU (NICU) or PICU.

According to the recommendation by the European Society for Pediatric Gastroenterology Hepatology and Nutrition (ESPGHAN) committee on Nutrition in 2005, the main tasks of the pediatric NST include screening for nutritional risk, the identification of patients who are in need for nutritional support, the provision of adequate nutritional care, the education and training of hospital staff regarding clinical nutrition, and monitoring of practice [5].

To perform these nutrition support-related tasks, the pediatric NST should be multidisciplinary, with the experts in all aspects of nutrition care as core members of the NST [5]. The core members of pediatric NST should include an experienced pediatrician, pharmacist, dietician, and nutrition support nurse [5,24].

Pediatricians of the pediatric NST, especially pediatric gastroenterologists, should be the team leader of pediatric NST, responsible for the entire nutritional care provided by the NST because pediatricians should identify children at risk of malnutrition based on clinical information and should prescribe EN and PN solutions for their patients [5,13]. Pediatricians should predict and manage all possible complications related to nutritional care and should place routes for EN such as gastrostomy and jejunostomy or central line for TPN such as subclavian catheter insertion or peripherally inserted central catheter. Neonatologists should also be involved in pediatric NST as core members in the NICU, whereas pediatric hematologist or oncologist becomes a member of pediatric NST in the hematology-oncology unit.

Pediatric dieticians are basically the experts in nutrition, so they can provide appropriate advice and recommendation on optimal EN to improve malnutrition. As a part of nutritional care in terms of EN, dieticians evaluate the nutritional status and food intake of children who are referred to the NST, and calculate nutritional requirements to design optimal EN for pediatric patients with expertise on the EN solutions [5,13]. Because dieticians are entirely in charge of EN in hospital, they have to plan nutritional support via EN after discharge and educate patients or caregivers.

Pediatric pharmacists should be advisory on TPN solutions based on their professional knowledge to optimize the composition of TPN, considering drug-nutrient interaction or nutrient-nutrient interaction [5,13]. Pharmacists also produce specialized PN solutions according to the patients' nutritional need under sterile condition.

Nutrition specialist nurses or nutrition support nurses prepare intravenous lines for peripheral PN and place enteral feeding tubes for EN such as Levin-tube or nasogastric tube [5,13]. They also have to care enteral feeding tubes or gastrostomy sites and monitor the EN tube or central lines during the infusion of EN or PN solutions. In clinical practice of nutritional care, nurses should closely cooperate with pediatricians in the general wards or ICUs; thus, nutrition support nurses should also be the experts in

nutritional care with updated knowledge and information.

To execute the roles and tasks of pediatric NST regarding nutritional practice, the funds are needed to support the NST activity at least. If the NST has an enough budget, it can be equipped as a professional team with office and facilities and also do research work to collect audit data and to evaluate the clinical significance of the pediatric NST in hospital [5].

The final step of setting up a NST in hospital may be the coordination of nutritional care between hospital and home [13]. For optimal home nutritional management, homecare system should be set up at home supported by homecare nurses, and weekly nutritional support clinics by pediatric gastroenterologist and pediatric dietician working for pediatric NST should be provided in hospital [13].

## CONCLUSION

Ideally, a coordinated team approach is recommended for desirable nutritional care in hospitals. There is no doubt that a multidisciplinary NST with many nutrition experts is the most effective way to provide appropriate individualized nutritional support to each patient, especially to undernourished children in hospital. Therefore, the implementation of the pediatric NST aiming at optimal nutritional support for children admitted to the pediatric wards, NICU, or PICU should be fundamentally recommended for the provision of safe and effective enteral tube feeding and parenteral nutrition to pediatric patients.

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