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Nutritional Risk Assessment in Children with Cancer: A Longitudinal Study in North East of Iran

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Abstract

Background

Children with cancer are in risk of malnutrition. Nutritional risk assessment is more importance in developing countries. The aim of present study was to investigate the nutritional risk in admitted children with cancer.

Materials and Methods

One hundred admitted children newly diagnosed with cancer were studied at the time of admission, after 3 and 6 months. Demographic characteristics and anthropometrics indexes were recorded via standard and calibrated tools. Nutritional risk assessed according to modified Screening Tool for Assessment of Malnutrition in Pediatrics (STAMP). Statistical analysis was performed using SPSS software (version 16.0).

Results

Of the 100 children 55 patients (55%) were female. The average age was 3.46±3.3 years. Hematologic tumors constituted 73.5% of patient. All patients were in nutritional risk. There was no patient with low nutritional risk during study; 17 patients (17%), 53 patients (56.4%), and 41 patients (43.6%) diagnosed with medium nutritional risk at the time of admission, after 3 and 6 months, respectively; 83 patients (83%), 41 patients (43.6%), and 40 patients (43%) diagnosed with high nutritional risk at the time of admission, after 3 and 6 months, respectively. Difference was significant ($p<0.001$). After 6 months, weight, height, mid-upper arm circumference (MUAC), and body mass index (BMI) increased compared with the time of admission ($p<0.05$).

Conclusion

According to modified STAMP results, all studied patients were in the nutritional risk. Nutritional risk decreased during study. The nutritional risk decreased after 6 months in children newly diagnosed with cancer compared with the time of admission.

Key Words: Cancer, Child, Neoplasm, Nutritional risk.

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1- INTRODUCTION

Cancer is one of the important causes of morbidity and mortality in children (1, 2). The survival of children with cancer has been increased over the last years because of early detection, supportive care and on-time treatment (3). In spite of significant developments, cancer itself associated with several problems and complications including malnutrition (4-6). Malnutrition is associated with many problems in children with cancer such as reduced response to treatment, survival reduction, increased adverse effects, increased risk of infections, increased behavioral problems and poor quality of life (7). In other hand malnutrition even can lead to increased mortality (8, 9). Therefore, nutritional status in children with cancer is one of the most considerable issues. Several approaches are available to improvement nutritional status, decrease drug toxicities and survival increment (8, 10, 11). The frequency of malnourished children with cancer is various according to cancer type, treatment protocol, involved factors for malnutrition determination including body mass index (BMI), Z- score, etc. (12, 13).

In developing countries children are in nutritional risk. Children undergoing anticancer treatment are at higher nutritional risk. There are not many studies evaluated and followed up the nutritional status in children with cancer (3, 8, 14-16). Unfortunately, there is not any document in Iranian children as a developing country. To offer new insight into the nutritional status in children newly diagnosed with cancer, present study was carried out for nutritional risk assessment in children with cancer according to modified Screening Tool for Assessment of Malnutrition in Pediatrics (STAMP).

2- MATERIALS AND METHODS

2-1. Method

This, one-year, prospective, descriptive analytical study was performed in hematology ward at Dr. Sheikh hospital, Mashhad University of Medical Sciences, Mashhad, Iran. The study participants included was 100 children newly diagnosed with cancer, aged less than 18 years diagnosed between 2016 and 2017. The data were collected at the time of admission, after 3 and 6 months. Patients and parental informed consent were obtained prior to the study. Demographic characteristic and anthropometry indexes including weight (kg), height (cm), Mid-Upper Arm Circumference (MUAC) (cm), and BMI (kg/m^2) was recorded via standard and calibrated tools by same nurse.

In patients weighed less than 10 kg, weight measured by digital scales (Seca, Germany, precision 5 gr) in supine position and in patients weighed more than 10 kg, weight measured by scales (Seca, Germany, precision 15 gr) in stand position. Height was measured in supine position in patients aged less than 2 years and in stand position in patients aged more than 2 years old. Nutritional risk in children was assessed according to STAMP (**Figure.1**). STAMP is one of the tools which apply for assessment of nutritional risk. Reliability and validity of STAMP was proved in several studies (17, 18). It has 5 steps. Each steps scored according to diagnosis, nutritional intake, weight and height, overall risk of malnutrition and care plan according to the standard protocol (18). In present study anthropometrics indexes including weight and height at the time of admission and after 3 and 6 months was measured by single operator. According to scores, the admitted children classified as low risk (0-1), medium risk (2-3) and high risk (≥4). This was repeated after 3 and 6 months.

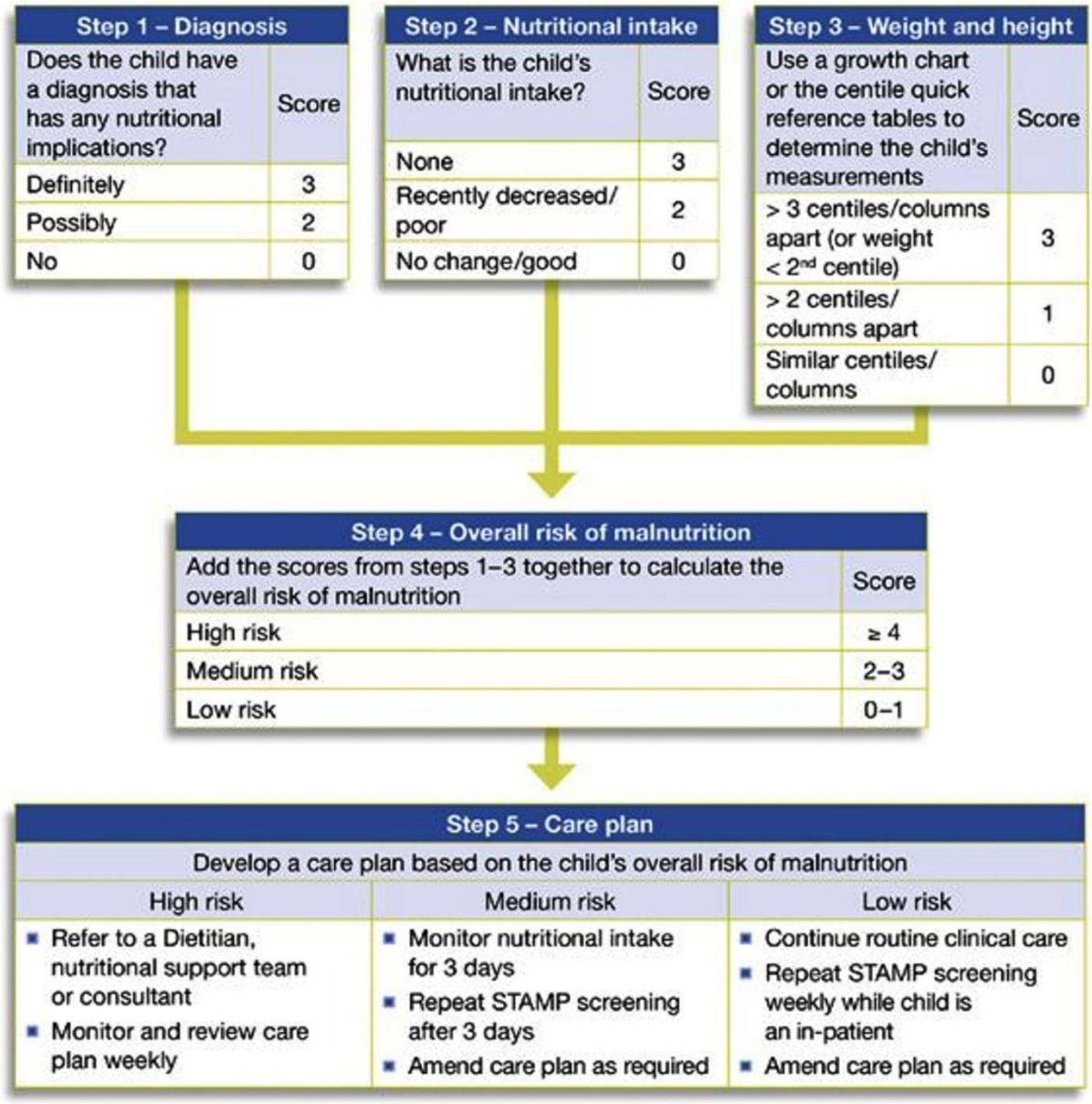

Fig1: Screening Tool for Assessment of Malnutrition in Pediatrics (STAMP) (22).

2-2. Sample size

All patients with cancer which were admitted in Dr Sheikh hospital between 2016 and 2017 were included in the study which was 100 cases.

2-3. Analysis

Statistical analysis was performed using SPSS windows program version 16.0 (SPSS Institute, Inc., Chicago, IL, USA). All experimental values are presented as Mean ± standard deviation (SD). Chi-squared test were used to screen associations of symptoms. Repeated measure or nonparametric equivalent was used for comparison of nutritional status. P- value less than 0.05 were considered significant.

2-4. Ethics

All procedures performed in studies including human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the Helsinki. Present

study was approved by Mashhad University of Medical Sciences ethics committee, Mashhad University of Medical Sciences, Mashhad, Iran (ID-number: IR.MUMS.fm.REC.1395.292). The study was started after the ethics committee acceptance. All patients' information was private. Written informed consent was obtained from parents of all included patients.

3- RESULTS

3-1. Demographic characteristic

Of the 100 children, 55 patients (55%) were female; six patients were expired during the study and one patient transfer to another hospital. The average age of patients was 3.46±3.3 years. The age range was 6 months to 15.5 years old. Baseline characteristics of patients are presented in **Figure.2**. Hematologic tumors constituted 72% of patients. Hematologic tumors with more frequency were including standard risk acute lymphoblastic leukemia (38%), low risk acute lymphoblastic leukemia (15%), and acute myelogenous leukemia (11%). Solid tumors constituted 28% of patient. Solid tumors with more frequency were including neuroblastoma (8%), ewing sarcoma (4%), osteosarcoma (3%), and wilms tumor (3%). Details were presented in **Figure.3**.

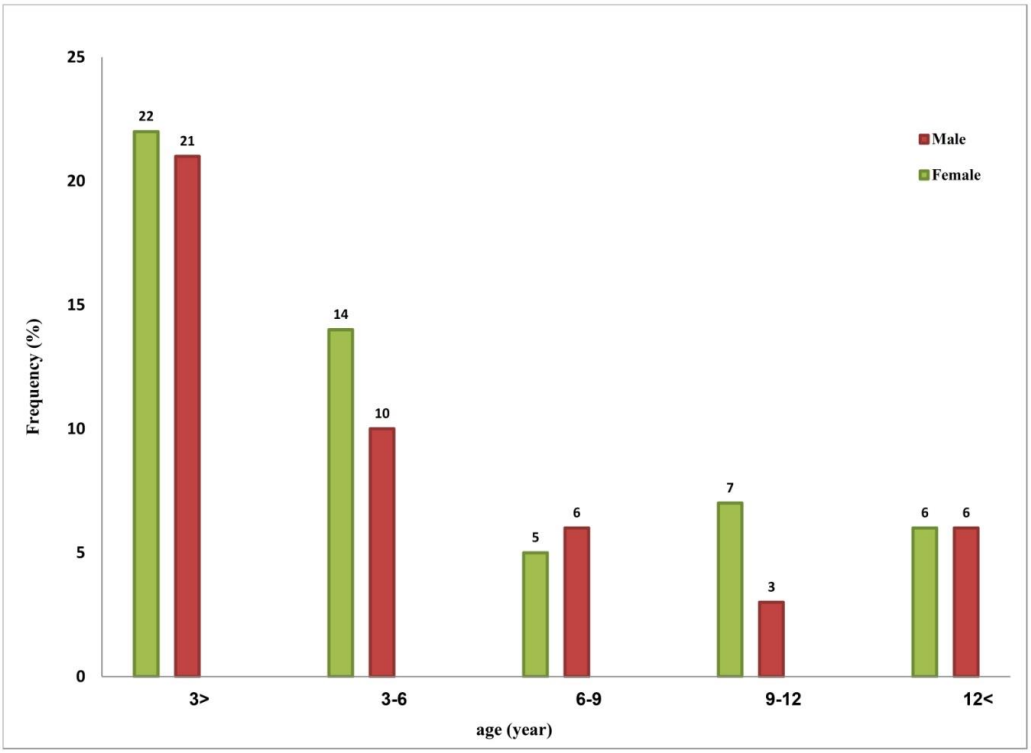

Fig.2: Demographic characteristics of 100 children newly diagnosed with cancer in Iran.

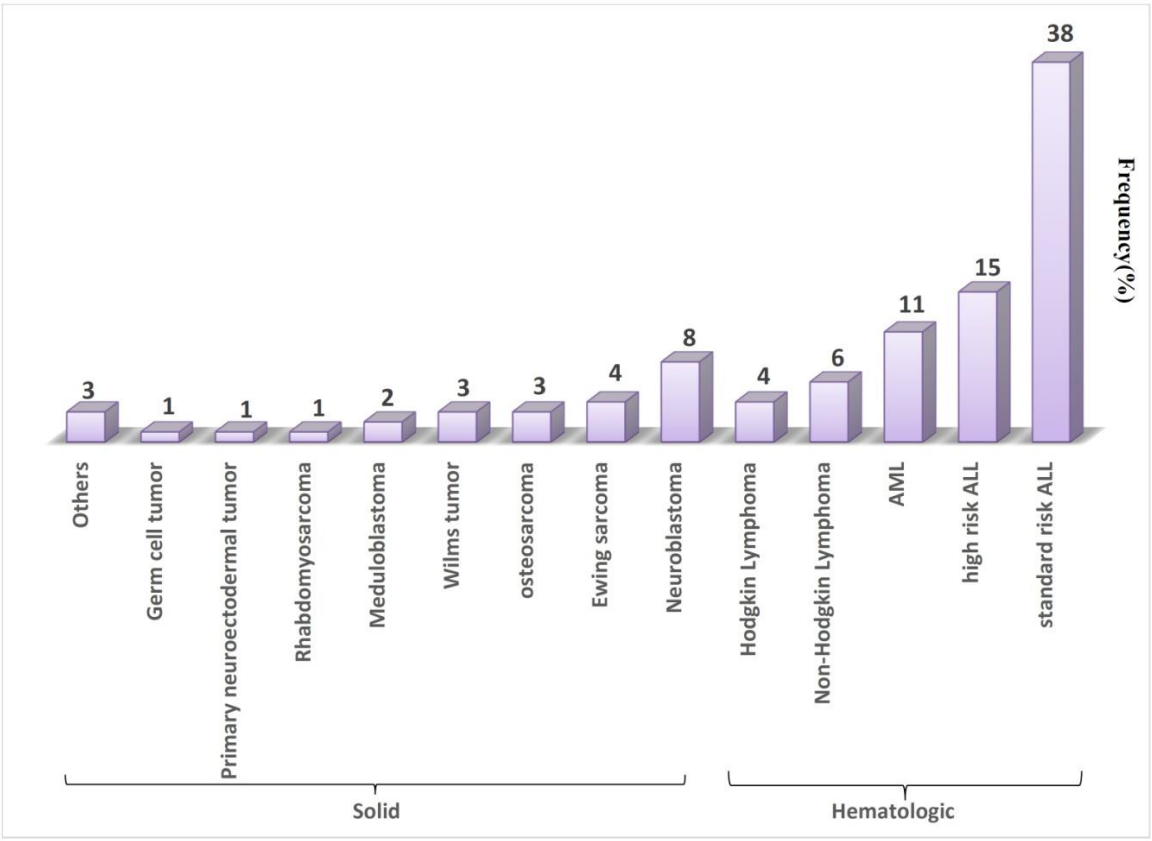

Fig.3: Type of cancers in studies population.

3-2. Nutritional status

The nutritional risk was assessed by modified STAMP. There was no patient with low risk of malnutrition at the time of admission, after 3 and 6 months; 17 patients (17%), 53 patients (56.4%), and 41 patients (43.6%) diagnosed with medium risk of malnutrition at the time of admission, 3 and 6 months after diagnosis respectively. Eighty-three patients (83%), 41 patients (43.6%), 40 patients (43%) diagnosed with high risk of malnutrition at the time of admission, 3 and 6 months after diagnosis respectively. Difference was significant ($p<0.001$). There was no significant difference in nutritional status according to age and gender ($p>0.05$). Results were presented in **Table 1 and Table 2.**

3-3. Anthropometrics indices

Anthropometrics indices including height, weight, body mass index (BMI), and MAUC were compared at the time of admission, 3 and 6 months after diagnosis. The mean of weight was 19.73±11.33 kilogram (kg), 20.97±11.59 kg and 21.78±11.69 kg at the time of admission, 3 and 6 months after diagnosis, respectively. Difference was significant ($p<0.001$). The mean of height was 105.96±24.08 cm, 107.42±24.2 cm and 108.96±24.1 cm at the time of admission, 3 and 6 months after diagnosis, respectively. Difference was significant ($p<0.001$). The mean of BMI and MAUC increased significantly at the time of admission, 3 and 6 months after diagnosis, respectively. Results were showed in **Table.3**. Pairwise comparison showed that difference of mean of weight, height and MAUC were significant at the time at admission compared to 3 months after diagnosis as well as 3 months after

diagnosis compared to 6 months after diagnosis. The difference of BMI at the time of admission compared with 3 rd month after diagnosis as well as 6 rd month after diagnosis was significant (p= 0.03 and 0.009, respectively), but not 3 rd month after diagnosis in comparison with 6 rd month after diagnosis (p= 0.62). Pairwise comparison results were presented in **Table.4**.

Table-1: Nutritional risk assessment in 100 children newly diagnosed with cancer according to modified STAMP.

Time	Low Risk Frequency (%)	Medium Risk Frequency (%)	High risk Frequency (%)	P-value Repeated measure test
At the time of admission	0	17 (17%)	83 (83%)	<0.001
3 months after diagnosis	0	53 (56.4%)	41 (43.6%)	
6 months after diagnosis	0	41 (43.6%)	40 (43%)	

Table-2: Nutritional risk assessment in 100 children newly diagnosed with cancer according to age and gender

Age (year)		Time of admission			3 months after diagnosis			6 months after diagnosis		
		Low risk	Medium risk	High risk	Low risk	Medium risk	High risk	Low risk	Medium risk	High risk
< 3	Male	0	4(%)	17(%)	0	12(%)	7(%)	0	12(%)	7(%)
	Female	0	4(%)	18(%)	0	13(%)	8(%)	0	13(%)	7(%)
3_6	Male	0	1(%)	9(%)	0	7(%)	3(%)	0	6(%)	4(%)
	Female	0	1(%)	13(%)	0	9(%)	4(%)	0	9(%)	4(%)
6_9	Male	0	0	5(%)	0	1(%)	2(%)	0	1(%)	2(%)
	Female	0	2(%)	4(%)	0	3(%)	3(%)	0	3(%)	3(%)
9_12	Male	0	1(%)	2(%)	0	1(%)	2(%)	0	1(%)	2(%)
	Female	0	1(%)	6(%)	0	2(%)	5(%)	0	3(%)	4(%)
>12	Male	0	2(%)	4(%)	0	3(%)	3(%)	0	3(%)	3(%)
	Female	0	1(%)	5(%)	0	2(%)	4(%)	0	2(%)	4(%)

Table-3: Anthropometrics indices assessment in 100 children newly diagnosed with cancer at the time of admission, after 3 and 6 months.

Variables	At time of admission Mean ± SD	3 months after diagnosis Mean ± SD	6 months after diagnosis Mean ± SD	*P- value
Weight (kg)	19.73±11.33	20.97±11.59	21.78±11.69	<0.001
Height (cm)	105.96±24.08	107.42±24.2	108.96±24.1	<0.001
BMI (kg/m^2)	16.49±2.76	17.23±2.84	17.39±2.65	<0.001
MAUC (cm)	15.89±2.57	16.6±2.86	17.06±2.69	<0.001

*Repeated measure; BMI: body mass index, MAUC: mid upper arm circulation.

Table-4: Pair wise anthropometrics indices assessment in 100 children newly diagnosed with cancer at the time of admission, 3 and 6 months after diagnosis.

Variables	*P-value
Weight (kg)	
Weight (at the time admission versus 3 month after diagnosis)	<0.001
Weight (at the time admission versus 6 month after diagnosis)	<0.001
Weight (3 month after diagnosis versus 6 Month after diagnosis)	<0.001
Height (cm)	
Height (at the time admission versus 3 month after diagnosis)	<0.001
Height (at the time admission versus 6 month after diagnosis)	<0.001
Height (3 month after diagnosis versus 6 Month after diagnosis)	<0.001
BMI (kg/m^2)	
BMI (at the time admission versus 3 month after diagnosis))	0.03
BMI (at the time admission versus 6 month after diagnosis)	0.009
BMI (3 month after diagnosis versus 6 Month after diagnosis)	0.62
MAUC (cm)	
MAUC (at the time admission versus 3 month after diagnosis)	<0.001
MAUC (at the time admission versus 6 month after diagnosis)	<0.001
MAUC (3 month after diagnosis versus 6 Month after diagnosis)	<0.001

* Bonferroni post-hoc test; BMI: body mass index, MAUC: mid upper arm circulation.

4- DISCUSSION

One hundred Iranian children with cancer were studied and followed up evaluating the nutritional risk according to modified STAMP. The mean age was 3.46±3.3 years, and 55% were female. 83%, 43.6% and 43% of patients detected with high nutritional risk at the time of admission, 3 and 6 months after diagnosis, respectively. Patients with medium nutritional risk at the time of admission, after 3 and 6 months were 17%, 56.4% and 43.6%, respectively. There was no patient with low nutritional risk. To our knowledge present study is the first report evaluated the nutritional risk in Iranian children with cancer as a developing country as well as present study is one of the very few studies followed up patients with cancer for 6 months prospectively. Nutritional status assessment is very important in children because they need to more energy intake. Children undergoing anticancer treatment are at higher nutritional risk. This needs to more attention especially in developing countries. Nutritional risk in children with or without cancer was studied in different countries with different tools including STAMP, anthropometrics indexes, laboratory parameters, etc. (14, 15, 19). Prevalence of under nutrition in hospitalized children is different between 5% in developed countries, and 80% in developing countries (15). In present study, the rate of children with high nutritional risk at the time of admission (83%) was in agreement with existing data. Six months after diagnosis, the rate of children with high nutritional risk was decreased to 40%. Most of children with high nutritional risk were younger than 3 years old as reported in other studies (18). Moeeni et al. in a study in New Zealand on 162 admitted children compared with healthy ones according to STAMP tool reported that the rate of under nutrition is more in admitted children (9.9% versus 3.7%); while both groups had similar rate in obesity or over weight (18). Moeeni et al. reported that undernourished children had longer hospital stay than other cases.

In another study in UK, it has been reported that 44% of inpatients children detected with high risk, 28% with medium and 28% were detected with low risk of malnutrition (20). In present study almost 80% of patients diagnosed with high nutritional risk at the time of admission. The high rate of patients with high nutritional risk in present study may be because of selected population that involved admitted children with cancer. According to present study the rate of high nutritional risk were decreased to 40% after 3 months and 6 months that may be due to standard care in hospital compared with the time of admission. In another study on a large population (2,167 patients) of European admitted children, 23% categorized as high risk according to STAMP (21). There is no study evaluated the nutritional risk in Iranian children with cancer. In a retrospective cohort study in Switzerland, the prevalence of nutritional risk in children with cancer according to BMI was 5.8% at the time of diagnosis and rose to 22% after 30 days (16).

5- CONCLUSION

According to STAMP, all studied patients were in the nutritional risk. Nutritional risk decreased during study. The nutritional risk decreased 6 months after diagnosis in children newly diagnosed with cancer compared with the time of admission. Future studies were suggested to confirm present results in other centers.

6- CONFLICT OF INTEREST: None.

7- ACKNOWLEDGMENT

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