Original article

# Assessment of nutritional status of older patients attending a tertiary hospital in Middle Eastern country

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## ARTICLE INFO

## SUMMARY

Background and purpose: In hospitals, poor nutritional status could be associated with a higher incidence of nosocomial infections, postoperative complications and mortality. Subsequently the costs of providing health care and social services will increase. Malnutrition has often been described as the skeleton in the hospital closet, as it is often ignored, undiagnosed and untreated. Our study aimed to describe the nutritional status of hospitalized patients aged 60 years or more and to evaluate the associated risk factors.

Materials and methods: This was an observational cross-sectional study conducted at a major tertiary teaching hospital in Beirut city. During a 7 months period, patients aged 60 and over and admitted in the medical and surgical units of the hospital were invited to participate in the study. Data were collected by means of a questionnaire including sociodemographic and medical characteristics, the Arabic version of the Mini Nutritional Assessment (MNA), the Activity of Daily Living (ADL) scale, and the American Society of Anesthesiologists (ASA) score.

Results: 171 participants aged $73.15 \pm 8.06$ years were included in the study. 52% of them were at risk of malnutrition and 13.5% were malnourished. Prevalence of malnutrition was higher in medical compared to surgical departments (16.2% vs. 10.5%, p = 0.003). Moreover, malnutrition was significantly associated with low level of education, high age, prolonged hospital stay, high number of medical comorbidities, polymedication, high ASA score and low ADL score (p < 0.05).

Conclusions: Malnutrition or risk of malnutrition are found in 2 out of 3 hospitalized patients aged 60 years or more, and is associated with several specific risk factors. Screening and management of malnutrition should be considered a priority in order to improve the overall medical status of older people, reduce hospital stay and improve outcome and quality of life.

## 1. Introduction

Malnutrition is a state resulting from lack of intake or uptake of nutrition that leads to altered body composition (decreased fat free mass) and body cell mass leading to diminished physical and mental function and impaired clinical outcome from disease. It can result from starvation, disease or advanced ageing [1]. Malnutrition remains a major public health problem and is widespread in developing countries. It could occur at any age, but older people are particularly vulnerable. It is particularly common in hospitalized older patients, and prevalence rates have been estimated to be between 29% and 61% [2—4]. In ageing patients, malnutrition is increasingly recognized as a serious problem with implications for both patient care and outcomes and health services utilization [5]. It contributes to the progressive decline of health, reduces the physical and cognitive functional status. In hospitals, poor nutritional status has been associated with a higher incidence of nosocomial infections,

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postoperative complications and mortality [2]. This would increase the hospital length of stay and readmission, the use of health services and the need for home care. Subsequently the costs of providing health care and social services will increase [5]. Data describing hospital discharges in the United States showed a three-fold increase in hospital costs when patients were malnourished [6].

Malnutrition has often been described as the skeleton in the hospital closet, as it is often ignored, undiagnosed and untreated. Hospital malnutrition is often not recognized and health professionals are usually unaware of nutritional problems as they inadequately address multifactorial problems that contribute to nutritional risk and malnutrition [7]. The development of strategies to prevent and manage malnutrition among hospitalized older people is crucial. Nutritional management of older people suffering from malnutrition reduces the risk of medical complications, the incidence of pressure ulcers and mortality [4]. Screening and management of undernutrition must subsequently be a priority for older people and their families, health care professionals, medical and paramedical teams [5].

Nutritional status of the older people is associated with the level of socio-economic development of the country. Literature has extensively studied the nutritional status of hospitalized elderly people living in developed countries but wasn't studied in developing country [1–4]. As a result, the development of nutritional care plans and nutritional support interventions for malnourished patients remains difficult. Therefore, we conducted this study that aimed to determine the prevalence of malnutrition in older Lebanese patients aged 60 and over hospitalized in a tertiary central hospital, and to evaluate the associated risk factors.

## 2. Materials and methods

### 2.1. Study population

This was an observational cross-sectional study. The ethics committee of the Faculty of Medicine at Saint Joseph University of Beirut approved the study protocol (tfem/2017/08), and a written informed consent was obtained from the participants.

A consecutive sample of hospitalized people aged 60 and over, admitted for more than 3 consecutive days in a medical or a surgical department of a major tertiary teaching hospital in Beirut city from January 15th 2017 till July 15th 2017, was selected.

Patients admitted in the intensive care unit, patients admitted for less than 3 consecutive days in a medical or surgical department, and patients with cognitive problems were excluded from the study. The Arabic version of the Mini-Mental State Examination was used for the assessment of patients' cognitive functions.

### 2.2. Data collection

Data were collected by means of a questionnaire administered to the participants by an interviewer. It included sociodemographic characteristics (age less or more than 75 years, gender, marital status, level of education, current work status and residency), number and type of chronic diseases (cardiovascular diseases, heart failure, stroke, diabetes, hypertension, liver cirrhosis, viral diseases such as hepatitis C, chronic obstructive pulmonary disease, asthma, pulmonary fibrosis, chronic renal failure, lymphoma, cancer, Crohn's disease, epilepsy, rheumatoid arthritis, depression, osteoporosis, dysthyroidism, gastric ulcer and bladder diseases), number of medication consumed per day, admission's department (medical v/s surgical departments), and length of hospital stay (time between the hospital admission till the assessment of nutritional status). It also included the Arabic version of the Mini Nutritional Assessment (MNA), the Arabic version of the Activity of Daily Living (ADL) scale and the American Society of Anesthesiologists (ASA) score.

The MNA was developed to assess the nutritional status of older adults in hospitals. The Arabic version of MNA was used and included 18 items classified into four categories: anthropometric measurements scored from 0 to 8 (included four items: body mass index, weight loss during the last 3 months, mid-arm and calf circumferences), dietary intake scored from 0 to 9 (included six items: full meals consumed per day, food and fluid intake, and autonomy of feeding), global health assessment scored from 0 to 9 (included six items: mobility, presence of acute stress, presence of dementia or depression, lifestyle, number of medication taken per day, and presence of skin ulcers), and self-assessment of health and nutrition scored from 0 to 4. Malnutrition indicator score was obtained by combining the four categories scores. A score of 17.0–23.5 points indicates a risk of malnutrition and a score below 17.0 indicates the presence of malnutrition [8,9]. The MNA score was the dependent continuous variable for the study.

The ASA score established by the American Society of Anesthetists (ASA) was used to assess the physical status of patients before surgery. Ranging from 1 to 5, it is an indicator of the probability of overall preoperative mortality. According to ASA score, normal healthy patient is coded 1, patient with mild systemic disease is coded 2, patient with severe systemic disease is coded 3, patient with severe systemic disease that is a constant threat to life is coded 4, moribund patient who is not expected to survive without the operation is coded 5 [10]. The ASA score was considered an independent explanatory continuous variable.

The functional autonomy is an additional approach to evaluate health status in older people and was quantified using the Arabic version of ADL questionnaire. It included a series of questions that assess the functional abilities of self-care functions: bathing, dressing and toileting, transferring, maintaining continence and feeding. The total ADL score lies on a numerical scale from zero to six where 6 indicates full function and 0 indicates that patient is highly dependent [11]. The ADL score was considered an independent explanatory continuous variable.

### 2.3. Statistical analyses

Statistical analyses were performed using a software program (SPSS for Windows, Version 22.0, Chicago, IL). The level of significance was set at $p \leq 0.05$. Univariate analyses were executed to assess the association between nutritional status and socio-demographic characteristics, medical features and health status. Chi-square and Fisher Exact tests were utilized for categorical variables. Analysis of variance and Kruskal-Wallis tests were used to compare continuous variables between three groups. Student t tests and Mann-Whitney tests were performed to compare continuous variables between two groups. Multiple regression logistic analysis was performed with the categorical MNA as the dependent variable and the normal nutritional status was the reference category. All variables presenting a $p < 0.200$ in univariate analyses were entered in multivariate model. Collinearity among independent variables was also tested and variables highly correlated with a correlation of 0.6 or more were excluded. Since the number of chronic diseases, polymedication and ASA score were highly correlated, polymedication and ASA score were not included in the model. Finally, one multivariate analysis was conducted and the independent variables included in the model were the dichotomized age, level of education, length of hospital stay, admission's department, number of chronic diseases and ADL score. The reference categories were the high educational level, aged more

than 75 years and the admission in a surgical department for independent variables.

## 3. Results

### 3.1. Characteristics of participants

One hundred and seventy-one participants aged 73.15 ± 8.06 years (103 men aged 72.52 ± 8.58 years and 68 women aged 74.10 ± 7.16 years) were included in the study. The majority of participants lived with at least one family member (90.1%). 97.7% had at least one chronic disease, and 95.3% were taking chronic medications: The average number of drugs consumed per participant was 5.85 drugs. Eighty-six patients were recruited from medical departments and 85 were recruited from surgical departments, and the mean number of hospital stay for all participants was 6.04 ± 9.53 days. The ASA score was four in 36.3% of participants and two in 51.5% of participants.

The study population comprises 71 patients aged less than 75 years old and 100 patients aged 75 years or more. A higher percentage of elderly aged 75 years or more were widowed (34% v/s 7.0%), have an intermediate education level or less (63% v/s 49.0%), live alone (14.0% v/s 4.2%), were inactive (44.0% v/s 19.7%) or took medication (98% v/s 91.5%) compared to participants aged 75 or less. The participants' characteristics are illustrated in Table 1, and the distribution of participants in medical and surgical departments is shown in Table 2.

### 3.2. Univariate analyses of the association between explanatory variables and MNA

89 (52.0%) were at risk of malnutrition and 23 (13.5%) were malnourished. The mean MNA score in our study population was 21.79 ± 4.152.

Gender, marital status, living alone and working were not significantly associated with the nutritional status (p > 0.05). However, more patients aged 75 years or more were at risk of malnutrition (p = 0.034). Moreover, more patients with normal nutritional status

had a university or secondary education level (59.3%), but more malnourished patients had intermediate or lower levels of education (65.2%) (p = 0.001). In addition, 67.8% of patients with normal nutritional status were hospitalized in a surgical ward, while 60.9% of malnourished participants and 59.6% of participants at risk of malnutrition were hospitalized in a medical unit (p = 0.003) (Table 3).

The average number of hospital stays was higher among malnourished patients (p = 0.012). Mean age (p = 0.008), mean number of chronic diseases (p < 0.001) and polymedication (p < 0.001), mean ASA score (p = 0.001) were higher in malnourished or patients at risk of malnutrition. Mean ADL score was significantly lower in patients with malnutrition (p < 0.001) (Table 3).

### 3.3. Multivariate analyses of the association between explanatory variables and MNA

Age was not associated with nutritional status (p > 0.05). However, the level of education was associated with the

**Table 2**
Distribution of participants in the various medical and surgical departments.

| Medical departments | |
|---|---|
| Cardiology | 15 (17.4%) |
| Gastroenterology | 14 (16.3%) |
| Infectious diseases | 4 (4.7%) |
| Internal medicine | 5 (5.8%) |
| Nephrology | 13 (15.1%) |
| Neurology | 5 (5.8%) |
| Oncology | 14 (16.3%) |
| Pneumology | 16 (18.6%) |
| **Surgical departments** | |
| Cardiovascular surgery | 13 (15.3%) |
| General surgery | 25 (29.4%) |
| Gynecology | 1 (1.2%) |
| Neurosurgery | 9 (10.6%) |
| Ophtalmology | 2 (2.4%) |
| ENT | 1 (1.2%) |
| Orthopedics | 15 (17.6%) |
| Urology | 19 (22.4%) |

**Table 1**
Sociodemographic characteristics of participants aged less or more than 75 years old.

| | Total | <75 years | ≥75 years | -p-value |
|---|---|---|---|---|
| **Marital status n(%)** | | | | |
| Single | 10 (5.8%) | 2 (2.8%) | 8 (8.0%) | <0.001 |
| Married | 122 (71.3%) | 64 (90.1%) | 58 (58.0%) | |
| Widowed or divorced | 39 (22.8%) | 5 (7.0%) | 34 (34.0%) | |
| **Level of education n(%)** | | | | |
| Illiterate/Preschool read and write | 16 (9.4%) | 3 (4.2%) | 13 (13.0%) | 0.034 |
| Elementary/Intermediate | 76 (44.5%) | 26 (36.7%) | 50 (50.0%) | |
| Secondary/University | 79 (46.2%) | 42 (59.1%) | 37 (37.0%) | |
| **Living n(%)** | | | | |
| Alone | 17 (9.9%) | 3 (4.2%) | 14 (14.0%) | 0.035 |
| With family members | 154 (90.1%) | 68 (95.8%) | 86 (86.0%) | |
| **Current work status n(%)** | | | | |
| Working | 50 (29.2%) | 31 (43.7%) | 19 (19.0%) | <0.001 |
| Inactive | 58 (33.9%) | 14 (19.7%) | 44 (44.0%) | |
| Retired | 63 (36.8%) | 26 (36.6%) | 37 (37.0%) | |
| **Number of chronic diseases Mean ± Std. Deviation** | 2.80 ± 1.41 | 2.63 ± 1.514 | 2.92 ± 1.331 | 0.154 |
| **Medication intake n(%)** | | | | |
| Yes | 163 (95.3%) | 65 (91.5%) | 98 (98.0%) | 0.049 |
| No | 8 (4.7%) | 6 (8.5%) | 2 (2.0%) | |
| **Number of medication taken per day Mean ± Std. Deviation** | 5.85 ± 3.69 | 5.14 ± 3.673 | 6.36 ± 3.631 | 0.033 |
| **ASA score n(%)** | | | | |
| 1 | 10 (5.8%) | 8 (11.3%) | 2 (2.0%) | 0.078 |
| 2 | 88 (51.5%) | 33 (46.5%) | 55 (55.0%) | |
| 3 | 11 (6.4%) | 4 (5.6%) | 7 (7.0%) | |
| 4 | 62 (36.3%) | 26 (36.6%) | 36 (36.0%) | |
| **ADL score Mean ± Std. Deviation** | 5.30 ± 1.30 | 5.52 ± 1.126 | 5.15 ± 1.392 | 0.013 |

**Table 3**
Univariate analyses of the association between explanatory variables and MNA.

| | Nutritional status | | | Sig. |
|---|---|---|---|---|
| | Normal (N = 59) | At risk of malnutrition (N = 89) | Malnutrition (N = 23) | |
| **Age** | | | | 0.034 |
| <75 years | 31 (52.5%) | 31 (34.8%) | 9 (39.1%) | |
| ≥75 years | 28 (47.5%) | 58 (65.2%) | 14 (60.9%) | |
| **Gender** | | | | 0.384 |
| Male | 38 (64.4%) | 54 (60.7%) | 11 (47.8%) | |
| Female | 21 (35.6%) | 35 (39.3%) | 12 (52.2%) | |
| **Marital status** | | | | 0.487 |
| Single | 3 (5.1%) | 5 (5.6%) | 2 (8.7%) | |
| Married | 46 (78.0%) | 63 (70.8%) | 13 (56.5%) | |
| Widowed or divorced | 10 (16.9%) | 21 (23.6%) | 8 (34.8%) | |
| **Level of education** | | | | 0.001 |
| Illiterate/Preschool read and write | 3 (5.1%) | 9 (10.1%) | 4 (17.4%) | |
| Elementary/Intermediate | 21 (35.6%) | 44 (49.4%) | 11 (47.8%) | |
| Secondary/University | 35 (59.3%) | 36 (40.4%) | 8 (34.7%) | |
| **Living** | | | | 1.000 |
| Alone | 6 (10.2%) | 9 (10.1%) | 2 (8.7%) | |
| With family members | 53 (89.8%) | 80 (89.9%) | 21 (91.3%) | |
| **Current work status** | | | | 0.100 |
| Working | 21 (35.6%) | 25 (28.1%) | 4 (17.4%) | |
| Inactive | 13 (22.0%) | 33 (37.1%) | 12 (52.2%) | |
| Retired | 25 (42.4%) | 31 (34.8%) | 7 (30.4%) | |
| **Admission's department** | | | | 0.003 |
| Medical | 19 (32.2%) | 53 (59.6%) | 14 (60.9%) | |
| Surgical | 40 (67.8%) | 36 (40.4%) | 9 (39.1%) | |
| Length of hospital stay (days) | 4.75 ± 8.302 | 5.51 ± 7.591 | 11.43 ± 15.925 | 0.012 |
| Number of chronic diseases | 2.19 ± 1.332 | 3.16 ± 1.305 | 3.00 ± 1.537 | 0.000 |
| Number of medications taken per day | 4.36 ± 3.117 | 6.71 ± 3.681 | 6.39 ± 3.997 | 0.000 |
| ASA score | 2.34 ± 0.958 | 2.96 ± 1.010 | 2.87 ± 0.968 | 0.001 |
| ADL score | 5.86 ± 0.309 | 5.20 ± 1.298 | 4.28 ± 2.016 | 0.000 |

nutritional status (p = 0.039); participants with low educational level were 2.096 more likely to be at risk of malnutrition than others.

The admission department was a risk factor for malnutrition (p < 0.05); older people admitted to a medical service were 3.056 times more likely to be malnourished and 2.72 times more likely to be at risk of malnutrition than those admitted to the surgical ward.

Moreover, malnutrition was significantly associated with prolonged hospital stay (p = 0.038), high medical comorbidities (p < 0.05), and low ADL score (p < 0.05) (Table 4).

Participants with high level of education had a better dietary intake and a better overall health rating than participants with low level of education. Also, participants admitted to surgical departments had better dietary intake, good general health and self-

assessment of health and nutrition compared to participants admitted to medical departments.

Anthropometric measurements, overall health assessment, dietary intake and self-assessment of health and nutrition were associated with the length of hospital stay, number of chronic diseases, ASA and ADL scores.

## 4. Discussion

This cross-sectional study was designed to assess the nutritional status of 171 patients aged 60 years and over, hospitalized in the medical and surgical departments of a major Lebanese university hospital in Beirut. It revealed that malnutrition was common among hospitalized patients as 52.0% were at risk of malnutrition

**Table 4**
Multivariate analyses of the association between explanatory variables and nutritional status.

| | B | Std. Error | Sig. | OR | 95% CI for OR | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Upper |
| **Risk of malnutrition**[a] | | | | | | |
| Age <75 years[b] | 0.295 | 0.393 | 0.452 | 0.744 | 0.345 | 1.608 |
| Level of education[c] | 0.740 | 0.358 | 0.039 | 2.096 | 1.039 | 4.228 |
| Length of hospital stay | 0.012 | 0.025 | 0.637 | 1.012 | 0.963 | 1.063 |
| ADL score | −1.088 | 0.446 | 0.015 | 0.337 | 0.141 | 0.808 |
| Number of comorbidities | 0.425 | 0.150 | 0.005 | 1.530 | 1.141 | 2.051 |
| Admission department[d] | 0.868 | 0.393 | 0.027 | 2.382 | 1.102 | 5.146 |
| **Malnutrition**[a] | | | | | | |
| Age <75 years[b] | 0.115 | 0.593 | 0.846 | 0.891 | 0.279 | 2.852 |
| Level of education[c] | 1.031 | 0.537 | 0.055 | 2.805 | 0.980 | 8.031 |
| Length of hospital stay | 0.053 | 0.026 | 0.038 | 1.055 | 1.003 | 1.109 |
| ADL score | −1.397 | 0.462 | 0.003 | 0.247 | 0.100 | 0.612 |
| Number of comorbidities | 0.401 | 0.204 | 0.050 | 1.493 | 1.001 | 2.228 |
| Admission department[d] | 1.117 | 0.542 | 0.039 | 3.056 | 1.056 | 8.846 |

[a] The reference category is normal nutritional status.
[b] The reference category is more than 75 years.
[c] The reference category is high educational level.
[d] The reference category is surgical department.

and 13.5% were malnourished. This is consistent with previous studies that reported a prevalence of malnutrition ranging from 10% to 60% [12−16]. In Asia, 16%−78% of older hospitalized people suffer from malnutrition or were at risk of malnutrition [17]. In the United Kingdom, 29%−61% of hospitalized older suffer from malnutrition [1]. Hospitalization is often synonymous with prolonged bed rest and lack of physical activity, resulting in loss of muscle mass [3]. Patients are less active, have less appetite with a reduced dietary intake and weakened immune system that decrease the healing process [18,19].

Our results showed that admission's department was significantly associated with the nutritional status. A higher number of malnourished patients (16.3% v/s 10.6%) or at risk of malnutrition (61.6% v/s 46.9%) were hospitalized in a medical department compared to surgical ward. The main cause of malnutrition of hospitalized patients is illness, which can interfere with adequate absorption and metabolism of food via a variety of mechanisms, such as infection-dependent changes in metabolism, loss of appetite, absorption/digestion disorders, and disease-specific catabolism. Surgery induces a physical stress and the healing process of an operative wound requires additional protein resources, and can lead to malnutrition in the absence of nutritional supplements [18]. However, patients hospitalized in a surgical unit leave the hospital earlier than those in a medical unit [18−20].

Extended bed rest in medical departments causes a lack of physical activity with a decrease in appetite. Nutritional care is not adequate, and no measures are adopted to prevent malnutrition. Caregivers do not frequently monitor the protein intake of patients. Patients are often seen wandering the hallways of the hospital without finding a suitable place to walk. The stresses of hospitalization in older patients and confusion with the loss of benchmarks play an important role in changing dietary habits and are therefore risk factors for malnutrition [18,20].

The problem of malnutrition indirectly increases hospital costs. A study showed a 6-day increase in the hospitalization of people at risk of malnutrition compared to those who do not present a nutritional risk [13]. Another study showed a 2.2-day decrease in hospitalization for patients who frequently used nutritional services compared to others [19]. Thus, the management of malnutrition in hospitalized patients, particularly in medical departments, should be a medical priority in order to minimize medical complications and increase the chances of recovery [21,22].

A low socioeconomic level can independently worsen the nutritional status of the patient or induce malnutrition. Our results showed that hospitalized patients with a lower level of education were undernourished or at risk of malnutrition compared to those with a higher level of education. Although previous studies have shown that social isolation and spousal loss can worsen the situation or induce malnutrition, our findings revealed the lack of association with marital status, living alone and working [23,24].

The situation is even worse for a dependent patients living alone. Patients who were malnourished or at risk of malnutrition were older, more dependent, had more comorbidities, were polymedicated, and spent more time in hospital than patients with normal nutritional status [16,19]. Moreover, the drug interaction in polymedicated patients could be considered a state of hypercatabolism, and patients can decompensate in case of reduced intakes, following a surgical procedure or an infectious process.

Our study was the first to assess the nutritional status of older persons hospitalized in a university hospital in Lebanon. The length of stay in the hospital was calculated from the time of admission of the patient to the time of assessment of his nutritional status. The

MNA commonly used in hospitals was used [25,26]; it's a simple, inexpensive, reproducible tool, with a sensitivity of 96% and a specificity of 98% in detecting the risk of malnutrition [8,9]. Future prospective studies should be performed to establish a causal link between nutritional status and associated factors.

Also, all patients aged 60 and over presenting in the medical and surgical departments of the tertiary hospital of Beirut during a seven months period, were recruited; our sample is therefore not representative of the Lebanese geriatric population. Also, hospitalized patients with a cognitive problem, and patients with psychiatric illness were not included in the study. It would be interesting to assess the nutritional status of these patients using objective methods of assessing nutritional status.

## 5. Conclusion

Malnutrition is a major problem for health facilities. Despite the growing interest of the medical and nursing body in the nutritional status of patients, malnutrition remains underestimated. This condition increases the risk of complications during hospitalization as well as the length of hospital stay, which in turn increases the cost of treating malnourished patients.

Awareness courses on hospital malnutrition should be organized; disclosure should focus on the high prevalence of malnutrition in hospitals, its impact on morbidity, length of stay and quality of life, but also on the economic impact of malnutrition. The consideration of malnutrition at the hospital should include early detection and the implementation of adequate nutrition intervention protocols. To be beneficial both medically and economically, the management of hospitalized malnourished patients should be extended before and after the hospitalization period. This nutritional support can only be achieved by a multidisciplinary team associating the skills of nurses, dieticians, doctors, dentists and pharmacists, who have received specific training in the field.

### Ethical approval and consent to participate

The protocol of the study was approved by the Committee of Ethics at Saint Joseph University of Beirut, (tfem/2017/08). Written informed consent was obtained from the participants.

### Competing interests

The authors declare that they have no competing interests.

### Funding

There are no financial or other relationships that might lead to a conflict of interest.

### Disclaimers

The views expressed in the submitted article are our own and not an official position of the institution or funder.

### Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.clnesp.2019.06.010.

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