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BRIEF COMMUNICATION

# Nutrition care practice patterns for patients with COVID-19—A preliminary report

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## Abstract

**Background:** Severe acute respiratory syndrome coronavirus 2 is a respiratory virus that poses risks to the nutrition status and survival of infected patients, yet there is paucity of data to inform evidence-based quality care.

**Methods:** We collected data on the nutrition care provided to patients with coronavirus disease 2019 (COVID-19) by registered dietitian nutritionists (RDNs).

**Results:** Hospitalized COVID-19 patients (N = 101) in this cohort were older adults and had elevated body mass index. The most frequent nutrition problems were inadequate oral intake (46.7%), inadequate energy intake (18.9%), and malnutrition (18.4%). These problems were managed predominantly with enteral nutrition, food supplements, and multivitamin-multimineral supplement therapy. Over 90% of documented problems required a follow-up.

**Conclusion:** This data set is the first of its kind to report on the types of nutrition diagnoses and interventions for COVID-19 cases used by RDNs and highlights the need for increased and continued nutrition care.

KEYWORDS
coronavirus infections, critical care, dietary supplements, dietetics, enteral nutrition, informatics, intensive care unit, nutrition, nutrition care process terminology, nutrition status, practice guidelines, research and diseases

## CLINICAL RELEVANCY STATEMENT

We describe for the first time that the most frequent nutrition problems in hospitalized patients with coronavirus disease 2019 (COVID-19) are inadequate oral and energy intake and malnutrition. Registered dietitian nutritionists manage these problems with interventions such as enteral nutrition, food supplements, and multivitamin-multimineral supplement therapy. Most documented problems required follow-up, which underscores the need for continued nutrition care in COVID-19 patients.

## INTRODUCTION

Coronavirus disease 2019 (COVID-19), the disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), poses great risks to the nutrition status and survival of infected patients. The Nutrition Care Process (NCP) is a systematic method for providing nutrition care and includes the 4 steps of assessment, diagnosis, intervention, and monitoring and evaluation. Each step has corresponding terminology that is used to standardize nutrition care documentation in electronic healthcare records and for data collection in research. The

**TABLE 1** Patient descriptive characteristics

| Variable | N | Mean ± SD (minimum, maximum) | Median |
|---|---|---|---|
| Age, y | 77 | 63.48 ± 14.98 (24.00, 88.00) | 65.00 |
| Glycosylated hemoglobin measurement, % | 19 | 9.35 ± 3.40 (5.80, 17.00) | 8.80 |
| Triglycerides, serum, mg/dl | 80 | 280.36 ± 156.81 (73.00, 817.00) | 239.50 |
| Weight, kg | 39 | 82.27 ± 21.22 (28.46, 147.5) | 79.64 |
| BMI, kg/m$^2$ | 127 | 29.57 ± 6.80 (16.50, 56.40) | 28.40 |
| BMI categories | | Percent distribution, %[a] | Test percent[b] |
| Underweight and normal | 26 | 20.47 | 28.40 |
| Overweight | 42 | 33.07 | 29.20 |
| Obese | 59 | 46.46 | 42.40 |

Abbreviations: BMI, body mass index, SD, standard deviation.
[a]*P*-value by $\chi^2$ test = 0.1384 (using estimates from US population for BMI groups.
[b]Estimated US population proportions for BMI groups that were used for comparison in chi-square analysis.

NCP has been altered during the global pandemic, with many hospitals and clinics installing policies that prevent registered dietitian nutritionists (RDNs) from performing key assessments.[1,2] This has led to great variation in nutrition care practices used to treat patients with COVID-19 and a paucity of data to inform evidence-based quality care. The data analysis described here uses a registry design, whereby, the RDNs document care into a web-based platform as they provide it without restriction or input from the research team. The assessments, nutrition diagnoses, and interventions the RDNs chose to enter into the repository reflected their individual nutrition care practice patterns.

## METHODS

To support outcome measurement of nutrition care delivery, the Academy of Nutrition and Dietetics has developed the Academy Health Informatics Infrastructure (ANDHII).[3] ANDHII is a Health Insurance Portability and Accountability Act (HIPAA)–compliant web-based platform intended to collect aggregated data entered directly by RDNs. The data are collected in structured and free text forms. The structured data are based on the NCP and its corresponding terminology. Because of the nature of this study design, the researchers did not dictate to the RDNs how to assess or diagnose malnutrition nor what interventions to recommend. The RDNs used their usual care practices and then documented them into ANDHII. Each patient entry was labelled with "COVID-19" within the patients' clinical history. One hundred and one patient entries were recorded between May 19 and July 2, 2020, utilizing a recently described methodology.[1,4]

This data collection is ongoing and will continue as the pandemic progresses. The American Academy of Family Physicians institutional review board determined that this study did not need to be submitted for either an exempt determination or for review and approval as it does not involve human subjects, intervention, or interaction with patients, and no identifiable information was sent to researchers.[5] This manuscript describes the initial findings, which were used to inform a larger prospective study titled "RESTORE: Nutritional Care Practices and Status of SARS-CoV-2 Patients." The RESTORE Study aims to identify standard nutrition care practices used by RDNs that may influence the burden of disease in patients with COVID-19 who are admitted to the intensive care unit.

## RESULTS AND DISCUSSION

Comprehensive nutrition assessments, proper identification of diagnoses, and evidence-based interventions are the foundation of quality care. With high patient census, patients who are in quarantined, enteral nutrition feeds, and equipment shortages, RDNs may face multiple challenges in providing quality care during the current pandemic. The virus impacts nutrition status in individuals. Reduced appetite and fevers may lead to malnutrition, weight loss, muscle wasting, and reduced immune resilience. Preexisting conditions such as overweight and obesity, hypertension, and diabetes increase patients' risk for manifesting moderate or severe symptoms.[6] Patients who are hospitalized with COVID-19 have a higher prevalence of malnutrition than their hospitalized counterparts without COVID-19.[7] This study is the first of its kind to report on the types of nutrition diagnoses and interventions for COVID-19 cases. Patients who were hospitalized COVID-19 in this cohort were older adults and, on average, had an elevated body mass index (BMI) (Table 1). Described below are cross-sectional relationships of how RDNs documented their assessment, diagnosis, intervention, and monitoring and evaluation of patients with COVID-19.

### Nutrition assessment

The most prevalent nutrition assessments documented by RDNs, aside from client history, were total energy estimated intake from oral nutrition in 24 hours, BMI, medical treatment/therapy, and triglycerides (Table 2).

**TABLE 2** Distribution of top 5 nutrition care process terminology (NCPT) (n = 2690) used in each nutrition care process (NCP) step in the national quality improvement—COVID-19 data set (N = 101 patients)

| NCPT used in NCP steps | | Frequency of NCPT | % |
|---|---|---|---|
| *Total* | NCPT domains | 2690 | |
| **Nutrition assessment (n = 1217)** | | | |
| Patient, client, family other history | Client history | 197 | 16.2 |
| Total energy estimated intake from ON in 24 h | Food/nutrition-related history | 151 | 12.4 |
| Body mass index | Anthropometric measurements | 125 | 10.3 |
| Medical treatment/therapy | Client history | 117 | 9.6 |
| Triglycerides, serum | Biomedical data | 80 | 6.6 |
| **Nutrition diagnosis (n = 652)** | | | |
| *Problem (n = 212)* | | | |
| Inadequate oral intake | Intake | 99 | 46.7 |
| Inadequate energy intake | Intake | 40 | 18.9 |
| Malnutrition (undernutrition) | Clinical | 39 | 18.4 |
| Increased nutrient needs | Intake | 16 | 7.5 |
| Inadequate protein intake | Intake | 9 | 4.2 |
| *Etiology (n = 212)* | | | |
| Custom etiologies | - | 137 | 64.6 |
| Inadequate energy intake | Intake | 24 | 11.3 |
| Altered gastrointestinal function | Clinical | 22 | 10.4 |
| Increased nutrient needs | Intake | 16 | 7.5 |
| Inadequate EN infusion | Intake | 4 | 1.9 |
| *Signs and symptoms (n = 228)* | | | |
| Total energy estimated intake from ON in 24 h | Food/nutrition-related history | 148 | 64.9 |
| Total energy estimated intake from EN in 24 h | Food/nutrition-related history | 28 | 12.3 |
| EN formula/solution | Food/nutrition-related history | 19 | 8.3 |
| Weight loss | Anthropometric measurements | 11 | 4.8 |
| Total energy estimated intake in 24 h | Food/nutrition-related history | 8 | 3.5 |
| **Nutrition intervention (n = 394)** | | | |
| Nutrition prescription | Nutrition prescription[a] | 118 | 29.9 |
| Modify composition of EN | Food and/or nutrient delivery | 102 | 25.9 |
| Insert enteral feeding tube | Food and/or nutrient delivery | 34 | 8.6 |
| Commercial beverage medical food supplement therapy | Food and/or nutrient delivery | 33 | 8.4 |
| Multivitamin, multimineral supplement therapy | Food and/or nutrient delivery | 18 | 4.6 |
| **Monitoring and evaluation (n = 427)** | | | |
| Total energy estimated intake from EN in 24 h | Food/nutrition-related history | 111 | 26.0 |
| Total energy estimated intake from ON in 24 h | Food/nutrition-related history | 75 | 17.6 |
| Finding of abdominal distension | Nutrition-focused physical findings | 60 | 14.1 |
| Gastric residual volume | Biochemical data, medical tests, and procedures | 39 | 9.1 |
| EN formula/solution | Food/nutrition-related history | 23 | 5.4 |

Abbreviations: EN, enteral nutrition; NCP, nutrition care process; NCPT, nutrition care process terminology; ON, oral nutrition.
[a]Parent term not a domain.

**TABLE 3** Nutrition care outcomes evaluation for top 5 monitored indicators, and nutrition diagnosis status

| Indicator | Improved, % | Not improved, % | Stable, % | Absence of monitoring upon follow-up, % |
|---|---|---|---|---|
| Total energy estimated intake from enteral nutrition in 24 h | 3 | 27.3 | 25.8 | 43.9 |
| Total energy estimated intake from oral nutrition in 24 h | 9.1 | 18.2 | 38.6 | 34.1 |
| Abdominal distention | 0 | 0 | 0 | 100 |
| Gastric residual volume | 0 | 0 | 25.8 | 74.2 |
| Diarrhea | 0 | 0 | 0 | 100 |

| Nutrition diagnosis status | Percent distribution, % |
|---|---|
| Resolved | 0.9 |
| Continued | 63.2 |
| Absence of monitoring upon follow-up | 32.5 |
| New | 3.4 |
| Removed | 0 |

## Nutrition diagnosis

A nutrition diagnosis is composed of 3 parts: problem (diagnostic term), etiology (free text entry on cause), and signs and symptoms (derived from the assessment terms). Inadequate oral intake, inadequate energy intake, and malnutrition (undernutrition) were the most frequently documented problem terms reported in this cohort. Custom etiologies, inadequate energy intake, and altered gastrointestinal function were the most common etiologies reported. The etiology portion is less structured; thus, many practitioners use terms unique to their practice and preferences. "Intubation" and "Poor PO [intake by mouth] due to intubation" were the most common custom etiologies. Total energy estimated from oral nutrition in 24 hours, total energy estimated intake from enteral nutrition, and enteral nutrition formula/solution were the most commonly documented signs/symptoms (Table 2).

## Nutrition intervention

Given the above nutrition diagnoses, it is reasonable that the most common nutrition interventions were nutrition prescription, modification of enteral nutrition composition, and insertion of a feeding tube. RDNs frequently reported use of multivitamin-multimineral supplement therapy and use of commercial beverages and medical food therapy as interventions (Table 2).

## Monitoring and evaluation

The terms selected for future monitoring and evaluation aligned with the most frequent diagnostic statements. Total energy estimated intake from enteral and oral nutrition and finding of abdominal distension were among the most frequently documented (Table 2).

## Longitudinal data collected at follow-up

When documenting follow-up visits into ANDHII, monitoring and evaluation terms selected during the initial visit automatically populate into the assessment fields. This triggers the practitioner to reassess these parameters, enabling them to demonstrate change (or lack thereof) in key parameters. Practitioners can also record whether the initially documented diagnoses(is) are (is) resolved, continued, new, or removed. If practitioners failed to select monitoring and evaluation terms that relate to their diagnosis or chose not to assess the terms prospectively, it is impossible to determine whether the initially documented diagnostic terms resolved or improved. Given the short duration of data collection during this pilot stage, a preponderance of "continued" diagnoses is reasonable. However, it is concerning that a large number of indicators are not documented in follow-up visits.

The time frame of this study was during a period in which COVID-19 was peaking. It is possible that because institutions were inundated with COVID-19 cases, documentation norms were altered. A limitation in this study, as is inherent with registry studies, is that clinicians record the data points they deem appropriate. Thus, we do not have complete information on various characteristics such as disease acuity, comprehensive drug treatment, or intubation status. It is also of interest that RDNs did not document diarrhea or other gastrointestinal problems as a symptom to be monitored given a high prevalence of gastrointestinal symptoms in patients with COVID. In addition, inadequate protein intake is a nutrition problem that was not frequently documented in this data, although it may be of interest in this population and could be more closely monitored. To ensure optimal

documentation and data collection, RDNs must diligently monitor and evaluate the indicators that require monitoring, as nutrition problems are prevalent in the patients with COVID-19 (Table 3). ANDHII has potential for showing the effectiveness of RDNs and the NCP, if documentation patterns are consistent.

## CONCLUSIONS

The data described in this research show that, through ANDHII, we can document important nutrition care patterns, determine the current, most frequently documented assessments, diagnoses, and interventions related to nutrition support, and demonstrate that RDNs' care has the potential to resolve important nutrition challenges faced by patients with COVID-19. However, to demonstrate the effectiveness of interventions, RDNs must diligently monitor and evaluate the indicators during follow-up visits. These data provide the basis for the design of the forthcoming RESTORE Study.

### FUNDING INFORMATION

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### AUTHOR CONTRIBUTIONS

Alison Steiber, Constantina Papoutsakis, Lindsay Woodcock, and Taylor C. Wallace equally contributed to the conception and design of the research; Velarie Ansu, Lisa A. Spence, Lindsay Woodcock, Kathryn Kelley, and Nana Gletsu-Miller contributed to the acquisition and analysis of the data; Alison Steiber, Constantina Papoutsakis, Taylor C. Wallace, Velarie Ansu, Lisa A. Spence, Lindsay Woodcock, Kathryn Kelley, and Nana Gletsu-Miller contributed to the interpretation of the data; and Alison Steiber drafted the manuscript. All authors critically revised the manuscript, agree to be fully accountable for ensuring the integrity and accuracy of the work, and read and approved the final manuscript.

### CONFLICT OF INTEREST

Constantina Papoutsakis, Lindsay Woodcock, Kathryn Kelley, and Alison Steiber are employees of the Academy of Nutrition and Dietetics, which has a financial interest in the ANDHII platform and the NCP terminology.

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