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1           **Delivery of Oral Nutrition Supplement in hospital: evaluation of professional practices in**  
2           **evaluation of nutritional status and representations of ONS by the caregivers and patients**

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16           ***Introduction***

17           Patient malnutrition is currently a major concern for hospitals. It is estimated that 30% of  
18           hospitalized patients on average suffer from malnutrition [1], and figures range from 20% up  
19           to 60% in geriatrics departments. Malnutrition is associated with patient mortality and  
20           morbidity [2], the length of hospital stays [3] and incurs health care costs 45 to 102 % higher  
21           than for a non-malnourished patient [4]. Screening for malnutrition should be carried out  
22           systematically upon hospitalization in order to ensure that patients are managed in an  
23           adequate and appropriate manner. French National Authority for Health (HAS) has published  
24           diagnosis criteria in order to screen and take charge of malnutrition [5] (**tables 1a and b**). For  
25           screening, criteria used in France include BMI (Body mass Index), weight loss before hospital  
26           admission, albumin and prealbumin (these two values can be interpreted if the concentration  
27           of C-reactive Protein is below 15 mg/L), age and MNA for patients more than 70 years old  
28           (Mini Nutritional Assessment).

29           *Table 1a : criteria to evoke the diagnosis of malnutrition from "simple" diagnostic tools (ANAES,*  
30           *2003/ One criteria, among them, is necessary to classify the patients*

Criteria giving rise to a moderate malnutrition diagnosis based on "simple" diagnostic tools		
	Age < 70	Age ≥ 70
Anthropometric measurements	BMI ≤ 17 kg/m <sup>2</sup>	BMI ≤ 20 kg/m <sup>2</sup>
	Weight loss ≥ 10% over a 6-month period Weight loss ≥ 5% over a 1-month period	
Biochemical measurements	Albumin < 30 g/L Prealbumin < 110 mg/L	
Index Calculation		MNA-SF ≤ 11
Criteria giving rise to a severe malnutrition diagnosis based on "simple" diagnostic tools		
	Age < 70	Age ≥ 70
Anthropometric measurements	Weight loss ≥ 15% over a 6-month period Weight loss ≥ 10% over a 1-month period	
	Albumin < 20 g/L	Albumin < 25 g/L
Biochemical measurements	Prealbumin < 50 mg/L	
Index Calculation		MNA-SF ≤ 11

31 *Table 1b : Revised criteria to evoke the diagnosis of malnutrition from "simple" diagnostic tools in*  
32 *older patients (≥70 years old) (HAS 2007). One criteria, among them, is necessary to classify the*  
33 *patients*

Moderate malnutrition	Severe malnutrition
<ul style="list-style-type: none"> <li>• Weight loss: ≥ 5 % over a 1- month period, or ≥ 10 % over a 6-month period</li> <li>• BMI &lt; 21</li> <li>• Albumin &lt; 35 g/l</li> <li>• MNA global &lt; 17</li> </ul>	<ul style="list-style-type: none"> <li>• Weight loss: ≥10 % over a 1- month period or ≥ 15 % over a 6-month period</li> <li>• BMI &lt; 18</li> <li>• Albumin &lt; 30 g/l</li> </ul>

34 We used the criteria of ANAES (2003) (Agence nationale d'accréditation et d'évaluation en  
35 santé, part of HAS) and HAS 2007 for older patients (≥ 70 years old) in order to classify patients

36 in two groups: moderate malnutrition and severe malnutrition. These criteria are used to  
37 classify patients for their nutritional status, but also to declare this status to medical insurance  
38 in order to obtain refund for care given during hospital stay. ESPEN (European Society for  
39 Clinical Nutrition and Metabolism) criteria are not used in current care in France until  
40 now [6]; [7]. In order to conform to the hospital reality, we used the same assessment criteria  
41 as those used in the hospital in which the study was conducted (HAS/ANAES criteria): BMI  
42 (kg/m<sup>2</sup>), percentage of weight loss before hospitalization, albumin (g/L), prealbumin (mg/L),  
43 and C-reactive protein (CRP) (mg/L), and MNA for patients older than 70. In practice, many  
44 doctors do not evaluate nutritional status of their patients whether because of a lack of time,  
45 faulty assumptions or hyper-specialized medical interests [8]. For example, in a study led by  
46 **Lennard-Jones et al.** [9] on 454 nurses and 319 junior doctors, two-thirds questioned  
47 patients about their food intake, and only 50 % asked about weight loss.

48 The aim of this study was to observe, during the in-hospital period of patients receiving ONS,  
49 the evaluation of the nutritional status of these patients and to highlight the different  
50 representations of ONS by the caregivers because these two things are correlated. Indeed,  
51 representations can have implications for practice and allow us to better understand the status  
52 of screening, management of undernutrition and the representations of ONS.

53 This study is part of a more comprehensive study on the prescription and monitoring of ONS  
54 consumption among hospitalized patients in this health facility. According to **Marine Fontas**  
55 [19], who is particularly interested in the nutritional management of patients with lung cancer:  
56 *“the disparity of nutritional management approaches observed in the literature can be*  
57 *observed.... We have seen changes from one department to another, going from preventive or*  
58 *therapeutic approaches to dietary disturbances to a purely therapeutic approach for weight*  
59 *loss, through the prescription of ONS”*.

## 60 ***Patients and Methods***

61 This research protocol is part of a larger study on the overall consumption and wasting of  
62 ONS at the Dijon University Hospital Center. This is why only patients who already have an  
63 ONS prescription were included whatever their nutritional status. This protocol has received a  
64 positive opinion from the committee for the protection of the population. All patients received  
65 an information note.

66 The data were collected in two departments at the Dijon University Hospital, belonging to the  
67 same pole with geographic proximity and same interest in nutritional problems from  
68 caregivers: digestive surgery and diabetes-endocrinology departments.

69 **Patients.** During 11 weeks, from January to march 2017, all the patients with a prescription  
70 for at least one ONS per day, no cognitive disorders, and hospitalized in the department for at  
71 least 4 days were included.

72 **Study Design.** The following data were retrieved from the medical records of our patients at  
73 study entry of hospital admission: age, BMI (kg/m<sup>2</sup>), percentage of weight loss before  
74 hospitalization, albumin (g/L), prealbumin (mg/L), and C-reactive protein (CRP) (mg/L), and  
75 MNA for patients older than 70 to determine the nutritional status of the patients in our study  
76 [5]. If the patients could not be classified with one of the simple criterion, other criteria were  
77 considered in order to determine nutritional status (i.e. Nutritional Risk Index (NRI) and Mini  
78 Nutritional Assessment long-form (MNA) for patients older than 70).

79 Changes in body weight were taken into account during hospitalization according to SFNCM  
80 (Société Française de Nutrition Clinique et Métabolisme) recommendations [10]. We also  
81 observed the implication of the team responsible for patient in the management of patient  
82 nutrition. Finally, post-hospitalization data was analyzed (prescription of ONS, follow-up for  
83 albumin levels, evaluation of malnutrition on the final patient report).

84 **Questionnaires and semi-structured interviews: prescription, ONS follow-up, and**  
85 **feelings about ONS.** Semi-structured interviews were also conducted with 11 medicine  
86 residents working in the two departments, and 11 nursing auxiliaries were asked to complete  
87 our questionnaire. The themes included: meal management, modalities for prescription, and  
88 attitude toward ONS (**appendices 1-2**). A semi-structured interview was also conducted with  
89 the 61 patients receiving ONS included in the study, to discuss their feelings and attitudes  
90 towards them (appendix 3). The average length of the interview was 10 minutes. All the  
91 interviews were transcribed and a thematic and qualitative analysis was conducted.

## 92 **Statistical analyses.**

93 A statistical analysis compared the averages obtained in the groups by Student's test  
94 (comparison between malnourished and no malnourished during hospitalization and post-  
95 hospitalization). The tests were performed bilaterally with a risk of the first species set at 5%.  
96 A  $p < 0.05$  was considered significant.

97 Statistical analysis were conducted on XLSTAT, software version 2017.4, developed by  
98 ADDINSOFT France, operating system Windows 7 professional.

## 99 **Results.**

100 **Study population.**Sixty-one patients were included in the study (32 men and 29 women)  
101 ranging from 24 to 96 years old. Sixty percent of patients came from the endocrinology  
102 department and 40% from digestive surgery. The average age was 65.4 years  $\pm$  16 years and  
103 the average stay was 10 days  $\pm$  4 days. At their admission, 39.35% were defined as suffering  
104 from severe malnutrition, 21.31% were suffering from moderate malnutrition, and 39.34%  
105 were not malnourished. All these patients received ONS because of their nutritional status  
106 (severe or moderate malnutrition) or because of their low food consumption during their  
107 hospitalization.

108 **Evaluation of nutritional status upon hospitalization.** On admission, BMI was measured  
109 for 87% of patients. Albumin levels were tested in 98.6% of patients, prealbumin levels were  
110 tested in 87.7% of patients, and CRP was tested in 97% of patients. Concerning percentage of  
111 weight loss upon hospitalization, these data were not collected on patient file.

112 **Nutritional evaluation of patients during hospitalization.** Over the course of  
113 hospitalization, patients with moderate malnutrition had their weight checked less often than  
114 patients with severe malnutrition (38.46 % vs 80 %) ( $p = 0.025$ ). Albumin levels were  
115 checked in 23.08 % of patients with moderate malnutrition, in 52% of patients with severe  
116 malnutrition and 25% of non-malnourished patients (severe malnutrition vs other groups,  
117  $p < 0.02$ ). Prealbumin levels were checked more systematically in patients with severe  
118 malnutrition (56%) than in patients with moderate malnutrition (23%) and non-malnourished  
119 patients (16,7%) ( $p < 0.02$ ). CRP levels were checked in 54% of patients with moderate  
120 malnutrition, in 56% of patients with severe malnutrition and in 41.6% of non-malnourished  
121 patients (no significant differences between the three groups).

## 122 **Representations around the status of ONS among caregivers and patients.**

123 Medicine residents, nurse auxiliaries and patients were asked about their attitude and  
124 representations towards ONS.

125 The semi-executive interviews and questionnaires with caregivers conducted as part of our  
126 studies have enabled us to promote a heterogeneous discourse according to the parties

127 (medicine residents, nursing auxiliaries, patients). We have made a thematic and qualitative  
 128 analysis in order to underline the main representations. (**Table 2**).

129 For medicine residents, ONS are mainly seen as medication. For nursing auxiliaries, ONS is  
 130 not considered as medication but as nutritional supplement. They harbor the impression that  
 131 ONS are only functional and useful if they are taken regularly. For patients, ONS are  
 132 described as a medication for some and as a food or a supplement for others:

133 A lack of information about ONS is also mentioned by residents medicine: *“Honestly, we  
 134 don’t know much about ONS – what else is in there? Is it just protein and a bunch of  
 135 calories? Why does it suppress the appetite?”*. We also questioned more precisely the nursing  
 136 about their knowledge of the ONS. Globally, there is a real lack of knowledge on behalf of the  
 137 nursing around the prescription and the observance of the ONS of patients. Besides, the  
 138 prescriptions do not take into account the tastes and the preferences of the patients. The  
 139 notions of cost and real efficiency are also little taken into account. The residents medicine  
 140 have no knowledge concerning the modalities of costs and refund.

141 *Table 2: Attitudes towards ONS and possible obstacles*

<i>Parties concerned</i>	<i>Representations towards ONS</i>	<i>Obstacles</i>
<b>medicine residents (responsible for prescribing ONS)</b>	medication, but in conjunction with other care methods “Helpful when providing richer food is not enough to treat malnutrition”; “Improves nutritional status when there are not issues with malabsorption and swallowing”; “Used until malnutrition is gone and there is a return to an appropriate diet”; “I don’t always explain when I prescribe a treatment. It depends what it is, but it is still a treatment”.	Lack of knowledge
<b>Nursing auxiliaries (responsible for delivering ONS)</b>	Food, nutritional support	Not convinced of usefulness
<b>Patients</b>	Food, supplement, medication “My doctor gave them to me, so they are certainly beneficial”; “That dietary thing that they bring us at 3pm, I’m not used to it and after I’m not really hungry for my evening meal”; “It’s a supplement, and so I’m categorical that it doesn’t replace anything”; “It’s to give us vitamins, to bring vitamins,	Not enough information, confusion about how ONS should be taken

	because we don't get enough exercise and vitamins and such".	
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143

144 **Post-hospitalization patient follow-up. We decided to observe the external prescriptions**  
145 **of all these patients having received ONS during their hospitalization.** Nutritional follow-  
146 up was recorded after the hospital stay for 61.3% of patients with severe malnutrition; it is  
147 better than nutritional follow-up for moderate malnourished patients (31.3%) and for non-  
148 malnourished patients (68%)

149 Albumin levels were monitored post-hospitalization for 8.2% of patients with severe  
150 malnutrition, and for 2.2% of patients with no malnutrition. None patient with moderate  
151 malnutrition had albumin prescription for post-hospitalization. Finally, a follow-up  
152 prescription for ONS was provided 68.5% of patients with severe malnutrition, 43.8% of  
153 patients with moderate malnutrition and 57.1% of non malnourished patients.

154 No significant difference was found between the three groups for follow-up in the post-  
155 hospitalization period.

156 ***Discussion:***

157 The aim of this study was to investigate, during the in-hospital period of patients receiving  
158 ONS, the evaluation of the nutritional status of these patients and . it was also about having a  
159 better understanding of the representations of the different stakeholders: medicine residents,  
160 nursing auxiliaries, patients.

161 The initial evaluation of nutritional status can be considered acceptable seeing as BMI was  
162 measured in 87 % of patients included in the study at admission. Laboratory testing at  
163 admission was also carried out almost systematically with rates of 98,6 % for albumin, 87.7%  
164 for prealbumin and 97 % for CRP. In a study by **Renoud-Grappin et al.** [11], including 50  
165 patients who were hospitalized for a short stay or in follow-up care and rehabilitation, and  
166 whose mean age was  $84 \pm 8$  years, BMI was calculated in 94 % of cases, and albumin and  
167 prealbumin in 100 % and 96 %, respectively. **Toze et al.** [12] studied the evaluation of  
168 nutritional status in 130 patients who were admitted to one of the geriatrics departments in the  
169 Mulhouse and Sud-Alsace region. They revealed that BMI was measured in 89.2 % of cases,  
170 whereas weight loss was only calculated in 8.1 % of cases during hospitalization. It was also



171 shown that albumin levels were among the most commonly used criteria, and that the MNA  
172 test was only used in 14.6% of cases. Our results were also similar to data exposed by  
173 **Hasselmann**<sup>1</sup>, from Strasbourg University Hospitals. In their study, patient weight was  
174 recorded and BMI or change in weight calculated for only 28% of cases in the Strasbourg  
175 University Hospitals and 25% of cases in other university hospitals. Otherwise, **Henriksen et**  
176 **al.** [13] shown that data on weight or length were frequently missing in the patient records,  
177 and BMI could only be calculated in two-thirds of the patients in Norwegian hospitals.

178 Anthropomorphic and biological laboratory evaluation is essential for the precise evaluation  
179 of nutritional status, follow-up, diagnosis of possible complications, and the implementation  
180 of appropriate care ([14]; [5]).

181 The ESPEN criteria seem easier to use on a daily basis because they contain only  
182 anthropometric criteria and no biological criteria such as albumin, which seems to pose  
183 problems of interpretation [15]. At the end of this year, new French criteria for assessing the  
184 nutritional status of patients will be proposed.

185 Though the average length of hospital stays in our study was 10 days  $\pm$  4 days, albumin levels  
186 were tested two times or more in 52% of patients with severe malnutrition and 25 % of  
187 patients with no malnutrition. However, albumin half-life is 21 days, so regular testing has  
188 limited interest in the evaluation of nutritional status of patients in mid-length or short stays  
189 (Aussel, 2013). The methods used by health care teams to follow-up on malnutrition are not  
190 always optimal and can lead to increased spending.

191 **Baron et al.** [16] implemented an online system to collect diet-related advice in order to  
192 meet the criteria of HAS health care quality and safety indicators in screening for nutritional  
193 issues and to enhance the work of dietitians. This online file had improved coding for  
194 malnutrition which encouraged better practices for recording of diet-related patient data [17].  
195 Finally, weight and BMI were recorded in 95.8% and 62.5% of patient files, respectively,  
196 versus 91.6% and 33.3% of files the year before.

197 The various representations of caregivers on ONS lead to confusion among patients. This  
198 study, in addition to a previous patient-centered study [18], raises the question of attitudes  
199 toward ONS. We investigated the attitudes of various different stakeholders: the medicine

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<sup>1</sup> *Hasselmann M, Piran F, Séry V. 10 ans après les premières recommandations, qui dépiste la dénutrition dans les établissements de santé ? AFDN, 2009. Consulté le 8 novembre 2017, at [http://www.afdn.org/fileadmin/pdf/0906-resumes-reims/090404-hasselmann-depistage\\_denutrition\\_en\\_etablissements\\_de\\_sante.pdf](http://www.afdn.org/fileadmin/pdf/0906-resumes-reims/090404-hasselmann-depistage_denutrition_en_etablissements_de_sante.pdf)*

200 residents who prescribe the ONS, the nursing auxiliaries who administer them, and the  
201 patients who consume them. ONS have a special status – they are prescribed by doctors but  
202 managed by nursing auxiliaries – and the opinions expressed by the three parties revealed that  
203 ONS are seen partly as food, as supplement and as medication. This unstable image has an  
204 impact on the perceived importance of ONS, the effort dispensed to use them in the care of  
205 malnutrition (preventatively or therapeutically) and patient compliance and follow-up.

206 For medicine residents that we interviewed, the status of ONS is clear: it is a medicine.  
207 Nevertheless, medicine residents, who have a good understanding of malnutrition (e.g. causes,  
208 diagnosis, consequences), have a lack of specific knowledge about ONS (e.g. drug  
209 deliverance, compliance, post-hospitalization follow-up). The interviews as a whole  
210 underscored the lack of information and training regarding ONS, which would explain the gap  
211 between the HAS recommendations and the realities in the hospital context.

212 For nursing auxiliaries, ONS are first and foremost a food product which has the advantage of  
213 supplementing nutritional intake, but they are not perceived as a medication. ONS are not  
214 seen as ‘medical’, and the nursing auxiliaries we interviewed wonder about the utility of ONS  
215 prescription.

216 For patients, the situation seems even more complex. ONS are described as being somewhere  
217 between a medication, because it is prescribed, a food and a supplement. **Uijl et al.** [20] also  
218 showed the ambiguity of ONS status by patients. For 80% of them, the ONS was a food rather  
219 than a medicine. The varying attitudes displayed by medicine residents and nursing auxiliaries  
220 mean that patients receive mixed messages. Overall, patients have an uncertain attitude  
221 toward ONS, which is corroborated by the lack of knowledge displayed by medicine  
222 residents.

223 The variability in the status of ONS has led to a complex situation. Today, there are a number  
224 of obstacles which must be removed in order to ensure better patient assessment and optimal  
225 follow-up. This must be done in view of the different stages of malnutrition (**Table 2**). The  
226 led interviews and questionnaires allowed underlining the lack of knowledge and different  
227 representations relative to the status of the ONS. These differences lead to an indistinctness as  
228 for the roles and the functions of the complementation, this one finding itself in the interface  
229 of the food and the medication. It seems then necessary that the medical profession have a  
230 holistic approach to think of the ONS in a global approach integrating the food habits of the  
231 patients, their tastes and their preferences to rethink the ONS prescription.

232 Each step, from the prescription to the consumption of ONS, has been rendered more difficult  
233 by vastly varying attitudes in the hospital setting. Norms, uses and perceptions differ  
234 according to whether the ONS is considered a medication, a food or a nutritional supplement.

235 Patients are exposed to many sources of information – from doctors, dietitians, or nursing  
236 auxiliaries – which result in an unclear message about ONS and the nutritional status of ONS.  
237 It is therefore necessary to align the various sources so that the information transmitted by the  
238 all clinicians including physicians can be properly understood by the patient, and so that  
239 patient compliance for ONS is satisfactory.

#### 240 *Conclusion:*

241 This study reveals that initial evaluation of nutrition status upon arrival is satisfactory for our  
242 patients, but the follow-up during the hospital stay and post-hospitalization were not optimal  
243 and differed according to the severity of patient malnutrition. The varying attitudes towards  
244 ONS, conveyed by medicine residents, nursing auxiliaries and patients, reveal their  
245 ambiguous status. An interdisciplinary approach between doctors, medicine residents,  
246 dietitians, nurses and nursing auxiliaries is needed to align their practices in the care of  
247 malnutrition and the messages they transmit to the patient. Lastly, evaluation and nutritional  
248 follow-up need to become a central axis in global patient management.

249 Clarifying the status of ONS for the health care team will lead to optimal practices in  
250 prescription and nutritional follow-up, as well as improvements in compliance thanks to the  
251 delivery of better quality information to patients and general practitioners.

252 Currently, nutritional status is not recorded on the final patient file at an optimal rate seeing as  
253 only 64% of patients had any type of recorded indication. The lack of information in patient  
254 records leads to a lack of information available to the general practitioner when the patient is  
255 discharged from the hospital.

256 **Limitations of the study.** We did not evaluate the effect of ONS on biological and  
257 anthropometric parameters. It was not the aim of our study. Our aim was to photography  
258 habits of departments concerning nutritional status evaluation, and its follow-up, and also  
259 opinion about ONS. Furthermore, we did not voluntarily evaluate the role of dieticians in this  
260 study. This specific evaluation is a part of another work we led. One another significant  
261 limitation is the definition of malnutrition used in the study methods. We used the we used the

262 classification used in the hospital in which we conducted this study. But the classification  
263 criteria vary and the one used may not be the most common one.

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268 **Conflicts of interest:** None.

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270 commercial, or not-for-profit sectors.

271

**Highlights:**

- Initial nutritional evaluation of hospital patients upon arrival is optimal.
- Follow up during the hospital stay was not optimal for moderately malnourished patients.
- Post-hospitalization testing for albumin is rare, whereas ONS are regularly prescribed.
- Medicine residents see ONS as a medicine and nursing auxiliaries see it as a food.

272

**Abstract:**

274 Background: Nutritional evaluation and detection of malnutrition are based on criteria  
275 recommended by French health authorities. In practice, doctors do not always ensure strict  
276 implementation of the recommendations. The aim of this study is to evaluate professional  
277 practices in France regarding nutritional follow-up on arrival, during and after the  
278 hospitalization of inpatients who have oral nutritional supplements (ONS) prescribed and to  
279 discuss how ONS are seen by medical staff and patients.

280 Methods: A prospective study including patients consecutively admitted to digestive surgery  
281 and endocrinology units of the Dijon university hospital was conducted. Malnutrition risk at  
282 hospital admission was identified using anthropometric and biological criteria: Body Mass  
283 Index, percentage of weight loss, albumin, prealbumin, C-reactive protein and Mini  
284 Nutritional Assessment. Nutritional evaluation and monitoring of inpatients on arrival, during  
285 and after hospitalization was analyzed. Interviews were held with caregivers and patients to  
286 raise the question of their attitudes toward ONS.

287 **Results:** The sample was composed of 61 patients. At the beginning of hospitalization,  
288 nutritional evaluation of patients was satisfactory. Follow-up during hospitalization was not  
289 optimal and depends on the degree of malnutrition. Post-hospitalization testing for albumin  
290 was rare, whereas ONS were regularly prescribed. ONS was viewed differently by caregivers  
291 and inpatients, which makes the status of ONS ambiguous.

292 **Conclusion:** Our results show good evaluation of nutritional status of inpatients at the  
293 beginning of hospitalization but low follow-up during and after hospitalization.  
294 Representation of ONS differed between caregivers and patients leading to a confusion  
295 around them. Therefore, interdisciplinary work is necessary to encourage systematic  
296 assessment of nutritional status in patients and standardize the message regarding ONS.

297 **Keywords:** malnutrition, nutritional status, oral nutritional supplements, representation,  
298 hospitalization.

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