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4 **Knowledge, attitudes, representations and declared practices of nurses and**  
5 **physicians about obesity in a university hospital: Training is essential**

6  
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34 WHAT IS ALREADY KNOWN ABOUT THIS SUBJECT

- 35 • Individuals living with obesity experience stigmatization and multiple forms of discrimination  
36 because of their weight in various settings including health care.
- 37 • Despite their crucial role in prevention and treatment of excess weight, some health-care providers  
38 feel a lack of competence in taking care of patients with obesity.

39 WHAT THIS STUDY ADDS

- 40 • Participating physicians and nurses lacked knowledge to diagnose obesity in adults and children, as  
41 well as confidence and training to care of patients with obesity
- 42 • The revised version of the questionnaire may be used to assess knowledge, attitudes, representations  
43 and declared practices of health-care providers regarding patients with obesity.
- 44 • This study highlights the need of training for first line health-care providers.

45

46 ABSTRACT

47 **Background:** In the context of a worldwide epidemic, health care providers play a key role in obesity  
48 management. Knowledge of current guidelines and attitudes to prevent stigmatization are especially  
49 important.

50 **Objective:** This study aimed to assess knowledge, attitudes, beliefs, perception of opportunity for  
51 intervention, declared practices and need for training and material of nurses and physicians about obesity  
52 in a Swiss University hospital.

53 **Methods:** 834 physicians and nurses filled an online survey. The questionnaire was based on literature,  
54 exploratory interviews and expert committee review. It was pre-tested with 15 physicians and nurses.

55 **Results:** Participants declared a low level of negative attitudes toward individuals living with obesity.  
56 However, the results highlighted a lack of knowledge to diagnose obesity in adults and children, as well  
57 as confidence and training to care of patients with obesity. One third of providers did not know how to  
58 calculate body mass index. Half of providers felt it was part of their role to take care of patients with  
59 obesity, even if 55% of them had the feeling that they didn't have adequate training.

60 **Conclusions:** Nurses and physicians working in a university hospital showed a low level of negative  
61 attitudes but a lack of knowledge and skills on obesity management. Training should be improved in this  
62 population to insure adequate and coherent messages and equal access to evidence-based treatment for  
63 patients living with obesity.

64

65 **Introduction**

66 In the context of a worldwide obesity epidemic, Switzerland is not spared, with 11% of men and 9% of  
67 women living with obesity, and a total of 41% of adults with a body-mass index equal or over 30 kg/m<sup>2</sup>  
68 [1]. In children, the prevalence of overweight and obesity is 19% [2]. In comparison, the prevalence of  
69 obesity was 36.5% in U.S. adults and 17.0% among U.S. youth 2 to 19 years old in 2011-2014 [3]. In  
70 Europe, over 50% of adults were living with overweight in 2008 and the prevalence of obesity was 23%  
71 for women and 20% for men [4]. Big body size and fatness are impregnated with cultural meanings in  
72 human societies reflecting and shaping identities and the broader social order. A number of ethnographic  
73 studies performed in the 1970-1980s have detailed social contexts in which obesity express beauty,  
74 marriageability, attractiveness, and positive moral attributes such as fertility, control of selfish desires,  
75 closeness to God, generosity, familial responsibility, and social belonging [5]. However, the fast  
76 globalization of slim-body ideals since 1980 conducted to negative moral meanings of fat and increase fat  
77 stigma, adding increased social costs to obesity, in addition to medical and economic ones [6]. In most of  
78 high-income countries, slimness is now associated with health, beauty, intelligence, youth, wealth,  
79 attractiveness, grace, self-discipline, and goodness . By contrast, fatness and obesity are related with  
80 ugliness, sexlessness, and undesirability, but also with specifically moral failings, such as a lack of self-  
81 control, social irresponsibility, ineptitude and laziness [7].

82 Individuals living with overweight or obesity experience stigmatization and multiple forms of  
83 discrimination because of their weight in various settings such as education, media, employment, and also  
84 health care [8]. The prevalence of weight discrimination in the general population has been shown to  
85 increase [9]. Individuals suffering from obesity have less career and educational access, lower pay, and  
86 worse health care service, and they are significantly more likely to be fired, bullied, teased, and  
87 romantically rejected [8]. Health-care providers (HCP), including physicians, nurses, psychologists,  
88 dietitians, medical students, and even professionals who specialize in obesity, have been documented to  
89 have weight bias [8, 10]. Studies in several countries have revealed negative stereotypes ascribing  
90 patients with obesity such as lazy, noncompliant, undisciplined or having low willpower [11, 12].  
91 Students and trainees in several professional health disciplines also suffer from weight bias [13].

92 Heavier patients are less likely to obtain preventive health services and exams, like cancer screens, pelvic  
93 exams or mammograms, and are more likely to avoid, cancel, or delay appointments for those important  
94 preventive services [14-16]. Patients with obesity described barriers at various levels, including

95 disrespectful treatment and negative attitudes from HCP, unsolicited advice to lose weight,  
96 embarrassment about being weighed, and bad experiences with medical equipment that is too small for  
97 them [17, 18]. Weight bias has serious consequences at the psychological, medical and social levels. [19].  
98 Individuals with obesity who report being teased or victimized because of their weight have an increased  
99 risk of depression, low self-esteem, poor body image, psychological and physical stress, and other  
100 psychiatric disorders [20-22]. Globally, weight bias reduces quality of life [23] and may also increase  
101 vulnerability to maladaptive eating behaviors, like binge eating disorder, and physical activity avoidance,  
102 reinforcing a vicious circle for patients with obesity [24-27]. A longitudinal study found indeed that  
103 weight discrimination increased the likelihood that individuals would become or remain obese [28].  
104 Therefore, reducing weight stigma in HCP is essential to improve the quality of care and promote equal  
105 treatment.

106 The management of obesity generally includes clinical counseling focused on diet, physical activity,  
107 behavior change, pharmacotherapy and bariatric surgery [29]. In spite of their crucial role in prevention  
108 and treatment of excess weight, some HCP feel a lack of competence in taking care of patients with  
109 obesity and sometimes doubt of the long-term efficacy of their actions [30, 31]. A first step would be that  
110 all HCPs are aware of current recommendations regarding regular physical activity, healthy eating,  
111 danger of very restrictive diets and other fads, and treatment goals and approaches for adults and children  
112 with obesity, in order to avoid cacophony and insure coherent messages. Attitudes and belief about  
113 persons with obesity have been evaluated using qualitative studies [30, 32] or various questionnaires and  
114 scales [33-36]. Other researchers have developed questionnaires assessing attitudes and practices of HCP  
115 [37-39] or have used vignette-driven approaches [40]. However, none of these questionnaires investigated  
116 all components together, and data on knowledge are lacking. Therefore, we developed a comprehensive  
117 questionnaire, based on existing scales.

118 The primary aim of this study was to assess HCP' knowledge, attitudes, beliefs, reported practices and  
119 perceived role, self-efficacy and needs, related to obesity and patients suffering from obesity. A  
120 secondary objective was to compare these outcomes between physicians and nurses. We aimed also to  
121 validate the online questionnaire.

122

123

124 **Materials and methods**

125 **Questionnaire development**

126 Existing questionnaires were searched. Items related to the study objectives were used to develop a first  
127 draft of the questionnaire. Qualitative exploratory interviews with 2 physicians and 2 nurses allowed  
128 collecting information on representation, important concepts to investigate and vocabulary used.

129 Based on this qualitative exploration, the questionnaire was divided in four parts: 1) Professional and  
130 personal characteristics, including training related to obesity, 2) Knowledge of current recommendations  
131 regarding nutrition, physical activity, definitions, and treatment goals, 3) Attitudes toward obesity and  
132 patients with obesity, 4) Reported practices. Several questions were created to evaluate each concept. A  
133 group of experts revised the questions and eliminated those which were deemed difficult to understand or  
134 without relevant content validity. The expert group was composed of 1 physician, 1 psychiatrist, 1  
135 psychologist, 3 dietitians, 1 physical activity teacher, all with expertise in obesity, and 1 statistician. The  
136 first version of the questionnaire was pre-tested with 15 nurses and physicians for clarity, length and  
137 relevance.

138 The group of experts revised the finalized version of the questionnaire (final version of the questionnaire  
139 in appendix 1). Questions on knowledge aimed to evaluate participants' awareness of the definitions,  
140 recommendations and messages used and disseminated in the hospital. Correct answers, defined  
141 according to national and international guidelines, were: Body Mass Index (BMI) calculations: weight  
142 [kg] / (height [m])<sup>2</sup> and cut-off (adults): >25 for overweight and >30 for obesity , body weight reduction  
143 sufficient to improve significantly medical complications: 10% [41], healthy balanced meals (in  
144 proportion of the plate): ¼ meat, fish, eggs or cheese, 1/3 grains, 1/3 vegetables, small amount of fats  
145 [42], fruit and vegetable consumption: 5 portions per day [42], fatty and/or sweet foods: 0 to 1 per day  
146 [42], physical activity for children: 60 min/day or 2x30 min/day [43], physical activity for adults: 30  
147 min/day or 3x10 min/day [44], maximum screen time for children (after 2 years old): 1 to 2h/day [45], no  
148 effectiveness of very restrictive diet for long term weight loss [46], importance not to force children to  
149 finish their plate [47].

150 Scores were calculated for each section or dimension of the questionnaire. For the score on knowledge,  
151 the number of correct answers was divided by the total number of questions on knowledge. For attitudes  
152 and beliefs about obesity, the mean score was calculated for each dimension, attributing a score for each

153 ordinal answers. (strongly agree =5, agree =4, neither agree or disagree =3, disagree =2, strongly disagree  
154 =1).

155

#### 156 Population and survey procedure

157 The questionnaire was sent to all nurses and physicians (n = 3452) of the following departments of the  
158 university hospital: surgery, rehabilitation and geriatrics, internal medicine, psychiatry, gynaecology-  
159 obstetrics, communitarian medicine, paediatrics, clinical neurosciences, anaesthesia, genetic medicine,  
160 medical imaging. All participants received an email explaining the study and inviting them to follow a  
161 link to the electronic questionnaire. First mailing held in August 2010 with reminders after 2 and 8 weeks.  
162 The questionnaire was anonymous and the ethical commission of the University Hospital of Geneva  
163 approved the study protocol.

164

#### 165 Data analysis

166 For each question, we examined the proportion of missing values as well as potential floor and ceiling  
167 effect. To improve the questionnaire for future use, we estimated the dimensionality of psychometric  
168 scale (attitudes, beliefs, opportunity, practices) using principal component analysis (PCA). Questions that  
169 component loading lower than 0.4 were dropped. The reliability of each scale was then assessed using  
170 Cronbach alpha. Mean scale scores were then computed, attributing each answer a value of 5 to 1 and  
171 construct validity was estimated using Spearman or Pearson correlations. Physician's and nurses' mean  
172 scores were compared using a Wilcoxon test.

173

### 174 **Results**

#### 175 Participants' characteristics

176 Characteristics of the subjects are detailed in Table 1. A total of 834 HCP participated to the survey  
177 (response rate 24.2%). The majority of participants was females (72%) and nurses (61%). Almost 10% of  
178 subjects were under 30 years old and 73.2% were aged between 31 and 50 years. More than half of  
179 subjects had a long work experience in our hospital. The representation of medical departments was: 51.3  
180 % internal and general medicine, 24.2% pediatrics, 19.3% surgery and 5.3% gynecology and obstetrics.  
181 Mean ( $\pm$  standard deviation) BMI was 23,3 ( $\pm$  4.0 kg/m<sup>2</sup>) for women and 24,5 ( $\pm$  3.2 kg/m<sup>2</sup>) for men. The  
182 prevalence of overweight (BMI  $\geq$  25.0) was 22.4% and 38.4% in female and male, respectively. The rate

183 of obesity was 6.3 and 4.3%, respectively. During their studies, almost 70% of the participants declared  
184 either having never received any education related to obesity (46.1%) or didn't remember having received  
185 such training. Only 13% (n=108) received a postgraduate training related to obesity: three quarter of them  
186 attended a short training (< 1 week) and a quarter a long training. On the total, less than 5% of physicians  
187 had a good training for obesity (> 1 week), 49.8% had a medium training (undergrad and/or short  
188 training), 45,6% had no specific training or did not remember. For nurses, these percentages were  
189 respectively 1.2%, 26.3% and 72.5%.

#### 190 Knowledge of actual recommendations

191 Interestingly, 31% of HCP did not know how to calculate BMI. The same proportion did not know the  
192 cut-off of overweight or obesity. For children, 52% of responders did not know how to diagnose obesity.  
193 About 75% of participants over-estimate the weight loss needed to prevent or improve co-morbidities in  
194 adults. A majority (71%) considered very restrictive dieting as an inefficient method to lose weight.  
195 Regarding nutrition guidelines, 60% of subjects knew how to compose a healthy balanced meal, 81% did  
196 know the recommended fruit and vegetable intake and 53% did know the recommended frequency of  
197 high-density food consumption. Three quarters of participants knew that children should not be forced to  
198 finish their plate. Concerning physical activity, 72% and 31% of responders knew the current  
199 international guidelines for adults and children. Ten percent indicated the current recommendation for  
200 screen time, and 60% thought that children should spend 30 minutes or less per day in front of TV or  
201 computers. The mean score for knowledge was 0.57 ( $\pm 0.16$ ), with a possible range between 0 and 1.  
202 Physicians had a higher score ( $0.64 \pm 0.01$ ) than nurses ( $0.52 \pm 0.01$ ) (Table 2).

#### 203 Representations

204 Obesity was well recognized as a health problem (95.7%) and chronic illness (71.0%). A small proportion  
205 of respondents (11.8%) thought that obesity was a problem only if medical complications were present.  
206 Almost all participants knew that obesity could lead to medical complications (96.8%). Among the  
207 proposed causes of obesity, subjects indicated the following items: excess of food intake (93.9%), lack of  
208 physical activity (86.5%), beverage consumption (73.1%), psychological problems (69.2%), screen time  
209 (68.6%), fast food consumption (66.7%), environment (65.2), lack of nutritional knowledge (64.6%),  
210 stress (61.8%), endocrinological disorders (48.8), genetic factors (46.6%), advertising and marketing  
211 (45.0%), lack of willpower (32.3%), lack of time (29.4%). Physicians had a slightly higher score for  
212 recognizing obesity as a health problem that can lead to complications ( $4.74 \pm 0.03$  vs.  $4.64 \pm 0.03$ ,

213 p<0.01). Nurses had a higher score for beliefs regarding genetic and endocrinologic factors causing  
214 obesity. There was no difference between physicians and nurses for beliefs regarding behavioral factors  
215 causing obesity.

#### 216 Attitudes

217 Questions investigating positive stereotypes and characteristics such as happy, energetic, gourmand, or  
218 motivated had low factor loadings and did not correlate very well with other questions related to  
219 stereotypes. On the contrary, questions related to negatives adjectives such as neglected, lazy, socially  
220 isolated, depressed, reserved, awkward showed a good internal consistency. Participants indicated that  
221 they had empathy for patients with obesity. Half of them did not pity patients with obesity and 5% were  
222 disgusted. However, they felt comfortable in treating such patients and declared not changing their  
223 practices in comparison to patients without obesity. HCP participating in this study considered that  
224 motivation is not sufficient to retrieve a normal weight. They were conscious that changing established  
225 lifestyle habits is not easy and that it is difficult to maintain long-term motivation. More than half (56.7%)  
226 of respondents admitted that counseling is not enough for treating obesity. The mean score for the  
227 attitudes regarding persons with obesity was 2.54 ( $\pm$  0.42). Physicians declared attitudes slightly more  
228 negative ( $2.61 \pm 0.02$ ) than nurses ( $2.49 \pm 0.02$ ) toward patients with obesity.

#### 229 Opportunity

230 Hospitalization or ambulatory consultations for any medical reason were considered as an optimal time  
231 for addressing the question of obesity. The majority of participants were convinced that an  
232 interdisciplinary and specialized team is needed for the treatment of obesity. They declared that a  
233 physician or a nurse alone could not treat patients. More than 80% disagreed that surgery is the only  
234 effective method for weight loss. Motivation of patients was an important determinant of success for  
235 69.1% of HCP. Surprisingly, they believed that most efforts should be concentrated on adults and not on  
236 children (61.7%). They felt comfortable addressing the question of obesity and did not fear to increase  
237 potential patient's guilt. They did not feel that talking about obesity is more difficult than talking about  
238 tobacco cessation or sexuality.

#### 239 Practices

240 Practices and perceived role of respondents are summarized in Figure 1. If they referred a patient,  
241 respondents would send patient to their family physician (57.2%), to a dietitian (57.0%) or to a  
242 specialized physician (46.9%). Participants declared having the material needed to assess patients with



243 obesity. However, they did not have specific documentation (brochure, flyers) and did not use educational  
244 tools. In daily practice, they declared that there was no difference for taking care of overweight patients,  
245 though they admitted an increased workload. Respondents were not sure whether obesity care should be a  
246 team objective or not. Physicians scored higher than nurses in the practice dimension, indicating practices  
247 following more closely the current recommendations. Nurses expressed more difficulties engaging in a  
248 discussion about weight with patients with obesity. However, there was no difference between them in  
249 the opportunity of the hospital visit to talk about weight issues.

#### 250 Need for specific education and materials

251 The vast majority of HCP considered that there was a need for specific training for obesity care.  
252 However, more than half declared that they were not trained enough. Participants were not sure whether  
253 they knew how to detect eating disorders. According to them, the following tools would be useful: list of  
254 specialized health professionals (99%), specific education program (95%), treatment plan (92%),  
255 educational documents (90%), BMI curves for children (85%) and BMI calculation disk (80%).

#### 256 Questionnaire adaptation for future use

257 The first version of the questionnaire included 110 items. Most items had less than 5% of missing values.  
258 Two questions had more than 60% of respondents giving the highest value (“Obesity is a health problem”  
259 and “Obesity lead to serious medical complications”), but these questions were left in the questionnaire as  
260 a good general introduction. The first section with professional and personal characteristics, including  
261 training related to obesity was left with 10 items. The section on knowledge of current recommendations  
262 regarding nutrition, physical activity, definitions, and treatment goals was left with 13 items (initially 14).  
263 Based on the screeplot and eigenvalues, the results of the PCA suggested that some of the theoretical  
264 domains were composed of several dimensions and the number of items per dimension was reduced: 1)  
265 Beliefs (initially 18 items) was divided in beliefs around obesity (2 items), beliefs around genetic and  
266 endocrinological causes (2 items), beliefs about other causes (8 items); 2) Attitudes (initially 25 items)  
267 was reduced to 9 items; 3) Opportunity (initially 15 items) was divided in moment of opportunity (3  
268 items) and barriers to intervene (4 items); 4) Practices (initially 15 items) was reduced to 7 items); 5)  
269 Needs stayed at 9 items but was divided in need for training (3 items) and need for material (6 items). The  
270 revised questionnaire and internal consistency are presented in Table 3. Most of the new dimensions with  
271 a reduced number of items had Cronbach’s alpha greater than 0.74. The dimension “Beliefs about other

272 causes” has a lower internal consistency (Cronbach’s alpha 0.69) but include items that experts judged  
273 important to keep for the future use of the questionnaire.

274 The construct validity of the questionnaire was analyzed by comparing the mean score of dimensions  
275 with the BMI (Pearson correlation), training and age (Spearman correlation) of the respondents. As could  
276 be expected, participants with a higher BMI expressed a more positive attitude toward individuals with  
277 obesity (correlation -0.08,  $p=0.03$ ). They considered obesity less as a health problem with potential  
278 comorbidities (correlation -0.14,  $p<0.01$ ), and attributed obesity more to genetic and endocrinological  
279 factors (correlation 0.11,  $p<0.01$ ). Participants with more training declared less barriers to intervene  
280 (correlation 0.13,  $p<0.01$ ), better practices (-0.21,  $p<0.01$ ) and less need for training (correlation -0.29,  
281  $p<0.01$ ). Older participants declared more barriers to intervene (correlation -0.09,  $p<0.01$ ) and practices  
282 less in line with current recommendations (correlation 0.10,  $p<0.01$ ).

283

## 284 **Discussion**

285 We assessed knowledge, representations and declared practices of nurses and physicians regarding  
286 obesity using a newly developed questionnaire. Results showed a low level of negative attitudes toward  
287 individuals with obesity, and highlighted a lack of knowledge to diagnose obesity in adults and children,  
288 as well as confidence and training to care of patients with obesity.

289 The expression of negative stereotypes was linked with pity feeling, though only few participants  
290 expressed it. For example, only 3.4% thought that patients with obesity were lazy. In contrast, a similar  
291 study showed found that 30% of dental students judged those patients lazier than normal weight people  
292 [48]. In addition, around 30% of French general practitioners were found to have negative attitudes  
293 toward patients with obesity [31]. Our findings may be explained by increased awareness about the cause  
294 of obesity and improved pre-graduated and continuous training in therapeutic education. Indeed, our  
295 hospital is a WHO collaborating center for therapeutic education for chronic diseases. Moreover, the  
296 prevalence of obesity is much lower in Switzerland compared to North America and Europe. Especially,  
297 the prevalence of severe obesity ( $BMI > 40 \text{ kg/m}^2$ ), in adults, is lower in Switzerland with less than 2%  
298 [49] compared to the U.S.A (6.6%) [50] and may explain that we found less negative attitudes.

299 The definition of obesity, BMI calculation method or adult weight loss objectives were not known by one  
300 third of participants. Yet, these elements are crucial for the assessment, diagnosis and establishment of a  
301 therapeutic plan. On the other hand, a majority of responders knew recommendations on nutrition and

302 physical activity. Knowledge related to childhood obesity and lifestyle guidelines for children were  
303 generally less acquired. A recent survey among 1119 primary health clinicians showed similar finding  
304 with 22%, 18% and 44% of them lacking knowledge to correctly identify childhood obesity, to talk about  
305 physical activity or to talk about nutrition, respectively [51]. In a systematic review of primary care  
306 physicians' knowledge, attitudes, beliefs and practices regarding childhood obesity, Van Gerwen et al.  
307 found that the awareness of using body mass index as an indicator of obesity increased over the years  
308 among physicians [52]. In Geneva, following this survey, we modified pre-graduate and postgraduate  
309 curriculum for medical students and doctors, as well as health care professionals.

310 In our survey, a vast majority (93.8%) of participants were convinced that an interdisciplinary team is  
311 needed for the treatment of obesity. This might explain why HCP often perceived themselves, at the  
312 individual level, as lacking competence to take care of patients with obesity. For example, a systematic  
313 literature review found that only 5 to 33% of physicians declared themselves competent to treat children  
314 with obesity [52]. Almost half of participants agreed that taking care of patients with obesity is part of  
315 their role. In practice, however, only few declare to calculate BMI, give advice or use therapeutic  
316 education techniques. Some clinicians seem not to be aware of the importance of their role to motivate  
317 patients with obesity to make lifestyle changes and improve adherence to treatment.

318 In our study, a major proportion of nurses and physicians requested specific training and educational  
319 material for their patients. Indeed, increasing knowledge and professional skills may improve the quality  
320 of care of patients with obesity. Buffart et al. showed that general practitioners' attendance at continuing  
321 professional development clearly increased their confidence to manage adult or childhood obesity [53].  
322 Furthermore, a meta-analysis of three studies pointed out that educational interventions for general  
323 practitioners could reduce the average weight of patients by 1.2 kg in 1 year, compared to standard care  
324 [54]. In fact, the level of implementation of pre- and postgraduate training on obesity seems inadequate in  
325 several countries. Recent papers have concluded that HCP are insufficiently prepared to address obesity  
326 [55]. The authors have indicated that the absence of training in behavioral change techniques, the lack of  
327 experience working within interprofessional teams and of networks of obesity management centers  
328 impair the care of patients with obesity [56-58].

329 For all dimensions, differences in mean score between physicians and nurses were small, but almost  
330 always significant. Physicians participating in this study had better knowledge than nurses. They also  
331 declared practices more coherent with current recommendations. However, they showed higher negative

332 attitudes toward individuals with obesity. Nurses expressed more difficulties than physicians to engage a  
333 discussion about weight issues with patients with obesity. These results are in line with results from a  
334 systematic literature review analyzing 11 studies and finding that if physicians agreed on the necessity to  
335 treat childhood obesity, they doubted about the efficacy of the treatment and expressed negative feelings  
336 regarding obesity management [52].

337 The strength of this study was to evaluate at the same time all dimensions, which may influence the care  
338 of overweight patients. In addition, our survey was disseminated among all nurses and physicians of a  
339 large university hospital and 834 of them completed it. However, the response rate was low (24.2%) and  
340 we cannot exclude a selection bias. Participants worked in many different areas of medical expertise  
341 ranging from geriatrics to pediatrics; this heterogeneity may complicate the interpretation of some results,  
342 especially in the “knowledge” section of the questionnaire. Female and males participants had a similar  
343 prevalence of overweight compared to the Swiss reference data, but a lower rate of obesity in both gender  
344 (6.3% vs 9.4% in female and 4.3% vs 11.2% in male) [1]. These findings may be explained by a healthier  
345 lifestyle in HCP compared to the general population, or by the fact that overweight subjects did not  
346 participate to the survey. In addition, attitudes toward patients with obesity are difficult to measure.  
347 Despite the anonymity of the questionnaire, we cannot exclude that social desirability played a role in  
348 answering. To assess attitudes and beliefs, we could have used validated questionnaires with established  
349 psychometric proprieties such as the Attitudes Toward Obese Person Scale or the Beliefs About Obese  
350 Person Scale [36]. However, to our knowledge, these questionnaires were not available in French at the  
351 time of the study, and we chose to integrate questions from these questionnaires into a global  
352 questionnaire intended to assess several components, including knowledge and practices specific to the  
353 Swiss context. Lastly, to calculate scores of the several dimensions, we attributed a value from 5 to 1 to  
354 ordinal answers, assuming that the distance between each step of the scale was equal.

355 The worldwide epidemic of obesity is fully recognized as a major public health burden. HCP are in the  
356 front line to assess, diagnose and manage patients with obesity. However, our study demonstrates that  
357 health-care professionals working in a renowned European university hospital are lacking the knowledge  
358 to diagnose obesity in adults and children, as well as the confidence and training to care of patients with  
359 obesity. These findings highlight the urgent need to improve education on overweight and obesity among  
360 health-care workers. In this context, the revised version of the questionnaire may be used to assess  
361 knowledge, attitudes, representations and declared practices of health-care providers regarding patients

362 with obesity in order to establish the need for training, as well as to evaluate changes after educational  
363 programs.

364

#### 365 **Conflicts of interest statement**

366 All authors declare no conflict of interest.

367

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369 SBDT, XM and NFL designed the study. SBDT, AP, XM and NFL were involved in the study  
370 implementation. SBDT, DC and NFL analysed data. All authors were involved in writing the paper and  
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507 **Table 1: Characteristics of study population completing the questionnaire**

	n	%
<b>Sex</b>		
Male	232	27.8
Female	602	72.2
<b>Profession</b>		
Nurse	505	60.6
Physician	329	39.4
<b>Experience working in same hospital</b>		
< 2 years	81	9.7
2-4	97	11.6
5-9	213	25.5
> 10 years	433	51.9
<b>BMI categories</b>		
< 25.0	616	73.9
25.0 – 29.9 (overweight)	171	20.5
>30.0 (obesity)	47	5.6
<b>Initial training related to obesity</b>		
Yes	260	31.2
No	382	45.8
Don't remember	186	22.3
<b>Continuing education related to obesity</b>		
Yes	108	12.9
No	720	86.3

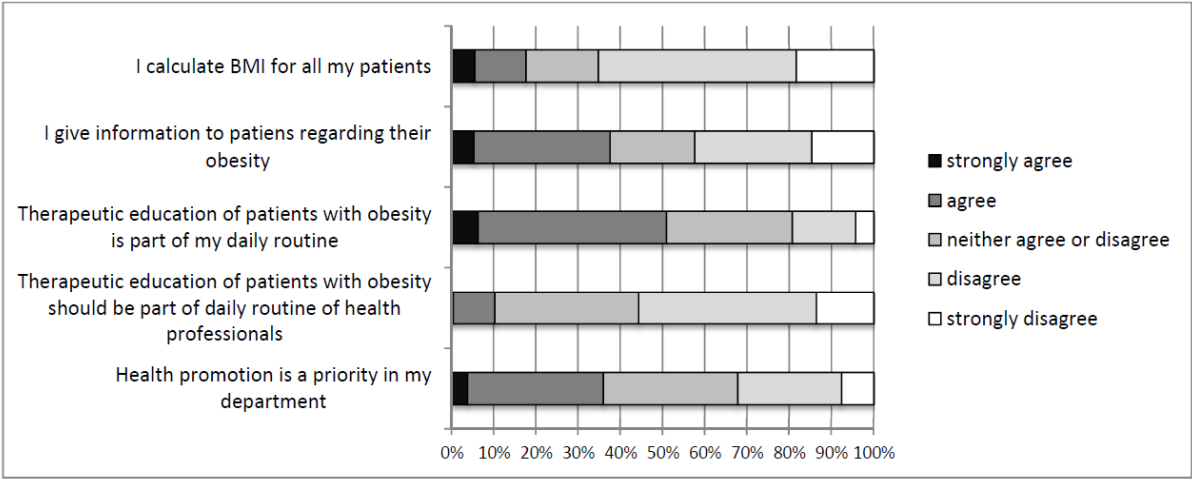
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**Table 2: Mean ( $\pm$  SD) score for each dimension (total sample, physicians, nurses) and comparison of scores between physicians and nurses**

	Total sample	Physicians	Nurses	<i>p</i>
Knowledge (min 0, max 1)	0.57 ( $\pm$ 0.16)	0.64 ( $\pm$ 0.01)	0.52 ( $\pm$ 0.01)	<0.01
Beliefs 1 (min 1, max 5)	4.68 ( $\pm$ 0.61)	4.76 ( $\pm$ 0.03)	4.64 ( $\pm$ 0.03)	<0.01
Beliefs 2 (min 1, max 5)	3.41 ( $\pm$ 0.80)	3.14 ( $\pm$ 0.04)	3.58 ( $\pm$ 0.03)	<0.01
Beliefs 3 (min 1, max 5)	3.78( $\pm$ 0.43)	3.78 ( $\pm$ 0.02)	3.78 ( $\pm$ 0.02)	0.96
Attitudes (min 1, max 5)	2.54 ( $\pm$ 0.42)	2.61 ( $\pm$ 0.02)	2.49 ( $\pm$ 0.02)	<0.01
Opportunity – moments (min 1, max 5)	3.74 ( $\pm$ 0.76)	3.79( $\pm$ 0.04)	3.71( $\pm$ 0.03)	0.10
Opportunity – barriers (min 1, max 5)	2.57 ( $\pm$ 0.76)	2.47 ( $\pm$ 0.04)	2.64 ( $\pm$ 0.04)	<0.01
Practices (min 1, max 5)	2.99 ( $\pm$ 0.50)	3.08 ( $\pm$ 0.03)	2.93 ( $\pm$ 0.02)	<0.01
Need – training (min 1, max 5)	3.27 ( $\pm$ 0.57)	3.37 ( $\pm$ 0.03)	3.21 ( $\pm$ 0.02)	<0.01
Need – material (min 1, max 5)	3.36 ( $\pm$ 0.42)	3.29 ( $\pm$ 0.02)	3.40 ( $\pm$ 0.02)	<0.01

**Figure 1: Declared practices related to obesity and its treatment. Participants were asked whether they strongly agreed, agreed, neither agreed or disagreed, disagreed or strongly disagreed with each statement.**



**Supplementary Table 1: Revised questionnaire with internal consistency**

Dimensions	Items		
<b>Demographic information</b>			
	1	Sex	Female, male
	2	Profession	Nurse, physician
	3	Field of activity	Adult surgery, gynecology-obstetrics, adult medicine, pediatrics
	4	How long have you been working in this hospital?	≤ 2 years, 2-4 years, 5-9 years, > 10 years
	5	Age	≤ 30 years, 31-40 years, 41-50 years, 51-60 years, > 60 years
	6	What is your current height?	
	7	What is your current weight?	
<b>Training</b>			
	8	During your undergraduate studies, did you follow any courses on obesity?	Yes, no, I don't remember
	9	After your graduation, have you followed training on obesity?	Yes, no
	10	If yes: Short training – less than a week (congress, conference), long training – more than a week, courses that included this topic	
<b>Beliefs about the disease and causes</b>			

Belief about illness ( $\alpha = 0.82$ )	11	Obesity is a health problem.	Strongly agree, agree, neither agree nor disagree, disagree, strongly disagree
	12	Obesity lead to serious medical complications	
Regarding causes of obesity, what is the importance of the following factors:			
Genetic and endocrinological causes ( $\alpha = 0.75$ )	13	Genetic factors	Not at all important, low importance, moderately important, very important, extremely important
	14	Endocrinological disorders	
Other causes ( $\alpha = 0.69$ )	15	Lack of physical activity	Not at all important, low importance, moderately important, very important, extremely important
	16	Excess food intake	
	17	Lack of willpower	
	18	Psychological problems	
	19	Advertising and marketing	
	20	Screen time (TV, computer, etc.)	
	21	Stress	
22	Type of beverage intake		
Knowledge			
	23	How does one calculate the body mass index? (W = weight, H = height)	$H[\text{cm}]-100, W[\text{kg}] / (H[\text{m}]^2,$ $(H[\text{m}]^2)/W[\text{kg}], W[\text{g}] / (H[\text{m}]^2,$

			W[kg] / H[cm], I don't know
	24	In adults, from which body mass index cutoff do we talk about overweight?	> 23, > 25, > 30, > 35, I don't know
	25	In adults, from which body mass index cutoff do we talk about obesity?	> 23, > 25, > 30, > 35, I don't know
	26	In children, what is the method to use to diagnose excess weight	<ol style="list-style-type: none"> <li>1. Calculate BMI using a specific formula for children</li> <li>2. Calculate BMI and report on a age-specific curve</li> <li>3. Calculate BMI and use the same cutoff as adults</li> <li>4. Calculate the number of excess kilos compared to height</li> <li>5. I don't know</li> </ol>
	27	In adults, which reduction of weight is sufficient to improve significantly obesity complications?	Stabilization, -10%, -15%, -20%, > -30%, I don't know
	28	What is composition of a healthy meal (in proportion of the plate)?	<ol style="list-style-type: none"> <li>1. ¼ meat, fish or cheese, 1/3 grains, 1/3 vegetable, small quantity of good fats</li> <li>2. ¼ meat etc, ¾ vegetables</li> <li>3. ¼ meat etc, ½ grains, ¼</li> </ol>

			vegetables, small quantity of good fats 4. ¼ meat, 1/3 grains, 1/3 vegetables
	29	How many daily fruit (F) and vegetables (V) servings are recommended?	0 F and V, 1 F and 1 V, 3 F and/or V, 5 F and/or V, 5 F and 5 V, 10 F and/or V, I don't know.
	30	How many daily servings of fatty and/or sweet food are recommended?	0, 0-1, 2, 3 or more, I don't know
	31	What are the current recommendations for physical activity in children?	15 min, 3x10min, 30 min, 60 min, there is no recommendation, it depends on age, I don't know
	32	What are the current recommendations for physical activity in adults?	15 min, 3x10min, 30 min, 60 min, there is no recommendation, it depends on age, I don't know
	33	What is the maximum amount of time children should spend in front of a screen?	15 min/d, 30 min/d, 60 min/d, 2h/d, 3h/d, 3h/w, there is no recommendation, I don't know
	34	Restrictive diets are effective to lose weight in the long term.	Yes, rather yes, rather no, neither yes nor not, no, I don't know

	35	Children should finish their plate.	Yes, rather yes, rather no, neither yes nor not, no, I don't know
Attitudes			
Attitudes ( $\alpha = 0.79$ )	36	In your opinion, people with obesity are in general... awkward	Strongly agree, agree, neither agree nor disagree, disagree, strongly disagree
	37	In your opinion, people with obesity are in general... lazy	
	38	In your opinion, people with obesity are in general... neglected	
	39	I can easily understand the difficulties of patients with obesity.	
	40	I like working with patients with obesity.	
	41	I feel uncomfortable when I have to examine or take care of a patient with obesity.	
	42	I have difficulty to feel empathic with patients with obesity.	
	43	In work setting, I would prefer that my patients wouldn't be obese.	
	44	I feel disgust regarding patients with obesity.	
Opportunity			
Moment of opportunity ( $\alpha = 0.76$ )	45	Time of a hospitalization is ideal to discuss with the patient of his/her weight problem.	Strongly agree, agree, neither agree nor disagree, disagree, strongly disagree
	46	At the time of an ambulatory consultation, for another problem than obesity, it is appropriate to discuss this problem.	
	47	Every visit in this hospital is an opportunity to discuss weight problem with a patient.	
Barriers to intervene	48	I'm afraid to make my patient feel guilty if I discuss his/her obesity.	
	49	It is easier for me to help a patient stop smoking than to help him/her to lose weight.	



$(\alpha = 0.80)$	50	I have as much difficulties to discuss obesity as to discuss sexuality with a patient.	
	51	I feel comfortable to discuss with a patient of his/her obesity.	
Practices			
$(\alpha = 0.74)$	52	I have documentation at my disposal (brochures, flyers, etc.)	Yes, no, just a few of, I don't know
	53	I use specific intervention tools such as food diaries, decision balance, etc.	
	54	I calculate body mass index (BMI) for all my patients.	Strongly agree, agree, neither agree nor disagree, disagree, strongly disagree
	55	I give information to patients regarding their obesity.	
	56	Therapeutic education of patients with obesity is part of my daily routine.	
	57	Health promotion is a priority in my department.	
58	Therapeutic education of patients with obesity should be part of daily routine of health professionals.		
Perceived needs			
Need for training	59	Taking care of patients with obesity require a specific training.	Strongly agree, agree, neither agree nor disagree, disagree, strongly disagree
	60	I feel trained enough to intervene with patients with obesity.	
	61	I know how to screen for eating disorders.	
Need for material	62	Would the following be useful to take care of a patient with obesity: educational material	Very useful, useful, not useful, not at all useful
	63	Would the following material be useful to take care of a patient with obesity: training on obesity	

	64	Would the following material be useful to take care of a patient with obesity: protocols to deal with patients with obesity.	
	65	Would the following material be useful to take care of a patient with obesity: BMI curves	
	66	Would the following material be useful to take care of a patient with obesity: disk to calculate BMI	
	67	Would the following material be useful to take care of a patient with obesity: list of competent professionals for referrals	