Physician practice variation in head and neck cancer therapy: Results of a national survey

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Word count: 3096 words

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INTRODUCTION

Head and neck cancer (HNC) account for about 4% of cancers in developed countries. Worldwide, HNC accounts for more than 650,000 cases and 330,000 deaths annually [1]. In 2020, in Europe, 104,500 people (74% men) will develop HNC and that will cause 43,300 deaths [2].

There are significant racial and socioeconomic disparities among HNC patients [3–5]. Affected patients tend to be older than before, have co-morbidities and less social support [6]. The influence of social factors on the incidence of these cancers has been highlighted, the risk of developing oral cancer being almost twice as high in the lower socio-economic classes and in patients with a low level of education [7]. In France, the risk of having HNC is higher in disadvantaged populations (1.89 and 1.56 times higher respectively for men and women) [8]. These social disparities have been found to impact survival rates [3,9]. In France, the 5-year survival differential between the most advantaged and least advantaged is 16% and 27% for men and women respectively [10].

The management of HNC is complex and often requires a combination of treatment, including surgery, radiotherapy, chemotherapy and/or targeted therapy [11,12]. Some tumor locations and stages have equivalent outcomes with medical (radiochemotherapy) and surgical treatment in terms of cure rates and functional impact. This is particularly the case for glottic cancers accessible to endoscopic surgery [13,14] or oropharynx cancers, in particular those induced by the human papilloma virus (HPV) [15,16]. Locally advanced tumors can be operated with often major functional impact (mutilating surgery) or treated by frontline radiochemotherapy with organ preservation intent [17]. In certain clinical situations, the choice between surgery and medical treatment leads to a totally different prognosis in terms of survival and locoregional control, i.e. recurrence in irradiated territory [18] or oral cavity cT4 cancer in elderly subjects [19,20].

In France, since 2003, the law has required each case to be discussed at a multidisciplinary consultation meeting, bringing together at least 3 doctors from different specialties dealing with head and neck cancer [21]. While medical decision making in HNC has been investigated by a single center qualitative study [22], no study has yet assessed the potential impact of the following: a) the practitioner's profession (surgeon or oncologist or radiotherapist); b) the patient's socio-professional context (gender, marital status and profession). However, the therapeutic choice may have an impact on survival and control of the disease, with the patient preferentially complying with the choice proposed by the practitioner [23–25].

We conducted a cross-sectional national study, investigating whether the practitioner's profession and certain characteristics of the patient, in particular profession, marital status and gender, could lead to heterogeneity in therapeutic decisions despite identical co-morbidities and tumors.

MATERIALS AND METHODS

We conducted a cross-sectional, national study among otorhinolaryngologist (ENT) surgeons, maxillo-facial surgeons, medical oncologists and radiotherapists, who treat patients with HNC, in France. Using an anonymized online questionnaire, on the SPHINX platform, data have been collected. Practitioners were invited to respond via a link sent to their professional or personal mailboxes. The e-mail addresses were collected thanks to the collaboration of Head and Neck Intergroups, the practitioners having previously agreed to participate in the project.

Data collection took place from 14/12/2018 to 31/03/2019. The study was registered at clinicaltrials.gov with the identifier NCT03663985.

The online questionnaire had two main sections. The first provided an assessment of the practitioner's characteristics, and the second consisted of seven clinical cases evaluating the practitioner's professional practice.

Questionnaire evaluating professional practice:

This questionnaire section consisted of seven clinical cases from cases actually treated:

- Clinical case 1: 52-year-old patient, in good general condition, with cT2N1M0 oral cavity squamous cell carcinoma. This was a consensual scientific scenario, which made it possible to verify that the guidelines were respected. The case was used as an internal quality control, a non-surgical response to this item resulting in the exclusion of the practitioner from further study. This case was not used for analysis in the rest of the study.
- Clinical case 2: 88-year-old patient with locally advanced but resectable oral cavity squamous cell carcinoma cT4aN2bM0.
- Clinical case 3: 64-year-old patient with base of tongue squamous cell carcinoma contact with the midline cT4aN3bM0.
- Clinical case 4: 47-year-old patient with laryngeal squamous cell carcinoma accessible to partial laryngectomy cT1bN0M0.
- Clinical case 5: 59-year-old patient with hypopharyngeal squamous cell carcinoma, in contact with the vertebral plane cT3N2bM0.
- Clinical case 6: 82-year-old patient with oropharyngeal squamous cell carcinoma HPV+ cT2N1M0.
- Clinical case 7: 75-year-old patient with oropharyngeal squamous cell carcinoma HPV- cT2N0M0, context of recurrence in irradiated territory, i.e. history of supraglottic squamous cell carcinoma treated by surgery and radiotherapy (R).

A total of 36 scientific scenarios were created by crossing the six previous clinical cases (scientific scenarios 2 to 7) with six patient profiles with a variable social context, defined by a "profession/sex/marital status" set: single male manager, married male manager, single male blue-collar worker, married male blue-collar worker, female manager, married woman.

Each clinical case / socio-professional context (SPC) association was performed with a Latin Square design, ensuring that all factors were presented in a balanced and random fashion to all participants.

In the first phase, the online questionnaire including the scientific scenarios was evaluated within the promoting center and by two ENT surgeons from two other centers that had agreed to participate in the project, in order to check its feasibility before it was sent out to all participants.

The scientific scenarios were then grouped into three categories according to the prognostic and functional impact of the choice between surgical or medical treatment i.e. radio (chemo) therapy:

- Scientific scenarios 4 and 6: Surgical or medical treatment is possible without any difference in terms of locoregional control and survival, regardless of the treatment chosen, according to the data in the literature, with the two treatments carrying similar functional prognosis [14,26].
- Scientific scenarios 3 and 5: Surgical or medical treatment is possible without any difference in terms of locoregional control and survival regardless of the treatment chosen according to the data in the literature [27,28]. However, the proposed surgery is mutilating, i.e. total glossectomy (scientific scenario 3) and total pharyngolaryngectomy (scientific scenario 5).
- Scientific scenarios 2 and 7: For scientific scenario 2, the actual curative treatment modality is surgery followed by radiation. Chemotherapy or definitive radiotherapy are associated with significant reduced disease control in view of the age of the patient and the stage of the tumor (3 years disease free survival around 69% with surgery and adjuvant radiotherapy, and 21% with radical radiotherapy) [19,20,29]. Concerning scientific scenario 7, a case of relapse squamous cell carcinoma in an irradiated field, the choice will be made between curative surgery, palliative chemotherapy or re-irradiation alone with a low cure rate [18] (survival rate of 39% can be expected at 5 years after salvage surgery and 15.2% at 2 years for re-irradiation).

Questionnaire on practitioners' personal and professional characteristics:

The data collected concerned age, sex, specialty, type of institution, position held in the organization, number of patients treated per year.

Statistical analysis

We investigated whether the social profile of patients influenced the choice of treatment based on a logistic model taking into account the interactions between the social profile of patients, their clinical profile, and the specialty of physicians. The model was fitted to the physicians' characteristics in terms of age, gender, position, annual activity and type of center. We were thus able to assess whether the social profile of patients influenced the choice of treatment, and if so, whether this choice depended on the physician's clinical profile and/or specialty. We used the contrasts between the marginal probabilities provided by the multivariate model, which we present in graphical form, as follows:

1: the difference between the probability of choosing surgery for each of the clinical case groups, among all practitioners (Figure 2);

2: the difference between the probability of choosing surgery for each of the SPC and the probability of choosing surgery for "a married male blue-collar worker", differentiating between the choices of surgeons (figure 3A) and those of medical oncologists or radiotherapists (figure 3B);

3: the difference between the probability of choosing surgery for each of SPC and the probability of choosing surgery for "a married male blue-collar worker" in each clinical case group, differentiating between the choices of surgeons (Figure 4A) and those of medical oncologists or radiotherapists (Figure 4B).

The absence of statistically significant inter-physician variability led us to select fixed-effect logistic models for our models. Statistical significance was evaluated at the 5% threshold. The analyses were performed with STATA release 14 software (StataCorp LP, College Station, TX).

RESULTS

Of the 624 e-mails sent, we obtained 206 completed questionnaires and 202 questionnaires were usable for inclusion. Four participants were excluded, three because of missing data (sex and specialty), and one which was excluded due to his answer (other than surgery) to scientific scenario 1.

After survey administration, 247 e-mails were deemed ineligible for inclusion because 164 physicians were not in practice or did not perform head and neck oncology and 83 e-mails were not delivered.

Adjusted overall response rate calculated according to the American Association of Public Opinion Reporting (AAPOR) guidelines was 54.6%.

Characteristics of respondents

Most respondents were men (64.9%), under 60 years of age (93.1%), surgeons (65.8%), working in university hospitals and cancer centers (72,8%). Their activity exceeded 100 patients treated per year in 39.6% of cases (Table 1).

Professional practice

Concerning the responses to clinical cases, we obtained a total of 1212 observations from the 202 individuals included in the study who responded to the 6 scientific scenarios. Among these 1212 responses, 1208 were usable, as 4 responses had missing data, so they were therefore excluded from the analysis.

The impact of the practitioner's specialty on therapeutic decision-making is shown in Figure 1A. Surgeons proposed surgery in 49% of cases, whereas medical oncologists and radiotherapists opted for it in 34% of cases only (cf. Figure 1A). These differences were significant (20 percentage points) for scientific scenarios 2,4,6 and 7.

The impact of the patient's SPC on therapeutic decision-making is shown in Figure 1B. Married male blue-collar workers had the lowest probability of being offered surgery by surgeons (42%). Medical oncologists and radiotherapists made the same percentage of surgery proposals (42%) but were higher than all other categories.

Results of the multivariate model results (Figure 2) showed that differences in therapeutic decision-making between medical specialties varied according to the patient's clinical profile. Significant differences in the likelihood to offer surgery were observed for scientific scenarios 2, 4, 6 and 7, with surgery always being proposed more frequently by surgeons.

Figure 3 showed differences in the likelihood to offer surgery according to the SPC of patients. For surgeons, the "single male manager" was significantly more likely to be offered surgery than the "married male blue-collar worker". The differences were not significant for the other SPC (figure 3A). Among oncologists, the differences between SPC were less marked and not significant, but the single male blue-collar worker had the lowest probability of being offered surgery (figure 3B).

Finally, figure 4 showed differences in therapeutic management, according to social profile for each scientific scenario.

Medical oncologists and radiotherapists (figure 4B), more often offered surgery to the "single male manager" than to the "male married blue collar worker", for scientific scenarios 3 and 5. No significant difference in the likelihood to offer surgery was observed between medical oncologists and radiologists based on the patients' SPC for the other scientific scenarios.

For surgeons (figure 4A), there was a lower tendency to propose surgery to the "single male blue-collar worker" than to the reference category "married male blue-collar worker", for scientific scenarios 3 and 5. However, no significant difference in the likelihood to offer surgery was observed among surgeons.

DISCUSSION

Head and neck cancer rank fourth overall in terms of incidence and fifth in terms of cancer mortality [30]. Improving the quality of care in HNC requires better multidisciplinary management in the elderly, who often suffer from co-morbidities and social isolation.

The purposes of clinical practice guidelines (CPG) are to improve the quality of patient care and health care outcomes [31]. Treatment decisions may be different for specific situations such as the elderly, where the difference between patient's real age and physiological age raises debates on the proposed treatment [32,33]. In the same way, cases of locally advanced cancers may receive different treatment depending on the center [34,35]. Differences can even be found according to which guideline is used [36,37]. In order to improve the quality of patient care and health care outcomes, we aimed to assess factors influencing our decision making beyond the evaluation of the tumor and patient co-morbidities alone.

In this national study of practitioners, based on clinical vignettes from routine practice, we find practice variations, related to the practitioner's profession and to the patient's SPC (socio-professional context) defined by a “profession/sex/marital status” set.

Overall, medical oncologists and radiotherapists offer less surgical management than surgeons, but the difference in practice between surgeons and oncologists varies according to the clinical context. The discrepancy is marked in situations where the oncologic outcome of surgery and the medical approach are equivalent (scientific scenarios 4 and 6) and when surgery appears to be superior in terms of curative potential but burdened by a significant functional impact (scientific scenarios 2 and 7). These variations could be explained by differences in behavioral profiles between practitioners [38], i.e. differences in risk and uncertainty attitudes among surgeons, oncologists and radiotherapists as assessed by another part of the study (Cros et al, in process). For scientific scenarios 3 and 5 (preservation protocol vs. mutilating surgery) there is no significant difference in therapeutic choice

between specialists, illustrating that surgeons do not propose more surgery than oncologists and radiotherapists when the surgery is mutilating.

These findings underline the importance of multidisciplinary tumor board (MTB), which use has spread rapidly around the world, starting more than 20 years ago in the USA and spreading to most European countries. It currently represents one of the criteria considered by the Organisation of European Cancer Institutes (OECI) in the accreditation process of a Comprehensive Cancer Center [39]. However, the practice is less widespread in Asia [40,41]. In France the modus operandi is defined by the French National Cancer Institute recommendations that require the participation of 3 practitioners from 3 different specialties, including at least one surgeon from the specialty and one oncologist [21].

A study emphasized the crucial importance of these meetings by showing that 27% of patients had some change in tumor diagnosis, stage, or treatment plan following MTBs [42].

The strength of MTBs lies in the fact that they bring together multi-discliplinary competences. Although this issue has not yet been addressed in HNC cancer, Hussain and al. [43] found that collaboration between surgeons and oncologists could improve the survival of patients with stage III rectal cancer and reduce the overall cost of their management. In thoracic oncology, Hopmans et al. [44] showed that surgeons, oncologists and pneumologists were not influenced by the same criteria in their therapeutic choices, i.e. WHO-PS and co-morbidities for pneumologists vs. age and co-morbidities for oncologists and surgeons. Shapiro et al. [45] showed that disparities in the utilization of surgical resection for patients with resectable pancreatic cancer are associated with socioeconomic variables.

In the present study, the SPC of patients also influences the therapeutic choice according to the scientific scenario. When surgical or medical treatment is possible without any difference in terms of oncologic outcomes, but with mutilating surgery, the choice "mutilating surgery" was preferred in isolated patients with a lower SPC. We may postulate that such patient would be deemed less

observant to follow a close clinical follow-up after organ preservation therapy whose objective is an early detection of residual cancer authorizing salvage surgery.

This hypothesis was assessed in a qualitative study conducted by Loretti [22] looking at the social dimension of medical prescription in HNC. The author analyzed the debates of 355 MTB in a French university center to try to identify whether some therapeutic choices were made on the basis of non-clinical criteria. The SPC proved to be an important determinant of therapeutic choices. In this study, the patient accompanied by a next of kin could attend the discussion of his case. It allowed practitioners to gauge the patient's understanding of the disease and his involvement for example in the treatment or the weaning process [22]. This practice is spreading among various specialties but remains anecdotal in most of the teams. For example, in breast oncology, only 9% of the patients were invited to participate in a MTB. Among invited patients, only 49% of them actually participated in a MTB [46] . Patients' participation in these meetings is receiving mixed support from the medical teams. Indeed, less than a third of surgeons, medical, and radiation oncologists were supportive of involving women in the MTB. In contrast, the vast majority of breast cancer advocates and breast cancer nurses were supportive of this approach [47]. There is a social demand in France for more patient and healthcare user information as well as greater participation to the medical decision making process [48]. However some factors such as age, education and so SPC have been identified as influencing factors for decision comprehension [49].

Other authors have evaluated the impact of patients' SPC on treatment choices in different types of cancer. Thus, adult patients with acute leukemia, harboring low economic status, are less likely to be offered chemotherapy or bone marrow transplantation [50]. Patients with digestive, thoracic or breast cancer belonging to the lowest SPC category were also less likely to be offered maximal curative treatment [45,51–54]. However, in these retrospective studies, co-morbidities or social support received by the patient were not considered, which could have influenced the therapeutic choice.

Our model limited the presence of such biases. The use of scientific scenarios has already been validated for exploring variations in practice [55,56]. We used scientific scenarios with various clinical

profiles, distributed according to a Latin square design, to ensure the balanced independent distribution of social context and gender across the practitioners. We were thus able to directly test the influence of these parameters on the evaluation of the scientific scenarios by the practitioners and their therapeutic proposal.

In addition, several studies investigating the link between SPC and treatment decisions were performed by teams in North America, where SPC is defined by access to private insurance [57–60]. This represents a confounding bias, as uninsured patients are unlikely to choose to undergo expensive surgery. The French health system allows free access to care for all, particularly in oncology. In a retrospective cohort study conducted in Canada, where medical care is freely available, the most disadvantaged women with breast cancer were less likely to receive maximalist treatment [61]. Therefore, despite equal access to care for the entire population, differences in therapeutic care persist between patients from different social classes.

Regarding the influence of patients' gender, surgeons in our study, tended to offer more surgical management to women regardless of their clinical profile (figure 4A), with an inverse relationship among oncologists and radiotherapists (Figure 4B). Gender disparity in HNC treatment has recently received attention. Katzel et al in 2019 [62,63] found a significant difference in survival between women and men in HNC that was directly related to lower intensity treatment in women, i.e. women received less intensive chemotherapy and radiotherapy. Further analysis is needed to fully understand why some patients benefit from more aggressive measures than others. One of the factors to be studied is perhaps the therapist himself, as suggested by the present findings.

One of the main limitations of our study is the decision to interview practitioners on an individual basis, whereas each case being discussed in MTB [21] in order to reduce inter-individual variability [64,65]. A review of the literature on MTB shows that although most decisions are based on existing recommendations, 30% of them are made outside of any guidelines [66,67]. This complexity was illustrated by highlighting clinical cases inviting discussion. However, not all participants had the same influence during these meetings. Castel et al [66] found that in 50 out of 219 discussions on

sarcoma management, the therapeutic decision was influenced by the information provided by the referring doctor about the patient's physical or psychological condition.

It is important to detect all factors that may potentially influence survival and functional outcomes in patients with HNC. This study could serve as a starting point to show that disparities in clinical practice may depend on the specialty of the healthcare professional and on the patient's SPC and marital status. We now intend to compare individual treatment choices to choices made at the end of MTB in order to establish whether our findings concerning treatment decisions and SPC persist.

CONCLUSION:

To our knowledge, this is the first study showing that in HNC, a specialty where social inequalities are marked, therapeutic decisions are influenced by patients' socio-economic status, their gender and the clinician's specialty, even though they may have identical tumor and identical co-morbidities. All possible efforts to improve the quality of care for these patients should be put in place, and the use of data on the SPC and the patient's marital status when making therapeutic choices should be discussed.

Collaboration between surgeons, oncologists and radiotherapists should be strengthened with a view to harmonizing the decision-making process.

Funding: This research was funded by the Groupement Inter-Régional de Recherche Clinique et d'Innovation du Sud-Ouest (GIRCI SOHO).

Acknowledgement:

This research was funded by the Groupement Inter-Régional de Recherche Clinique et d'Innovation Sud-Ouest (GIRCI SOHO).

GETTEC/GORTEC/GERCOR/SFORL/SFCCF/UNICANCER intergroup

Pr Emmanuel Babin, Dr Dominique De Raucourt, Dr Michel Rives and Dr Christian Borel who have evaluated the online questionnaire including the scientific scenarios.

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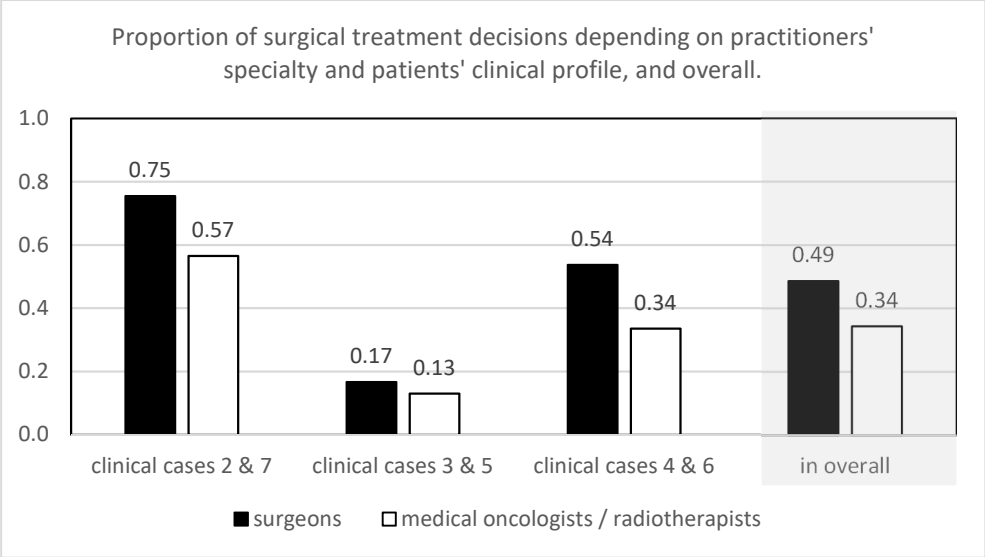
Figure 1: Response rate in favor of surgery, for oncologists and surgeons, according to:

A- Clinical case
B- Social profile

A



B

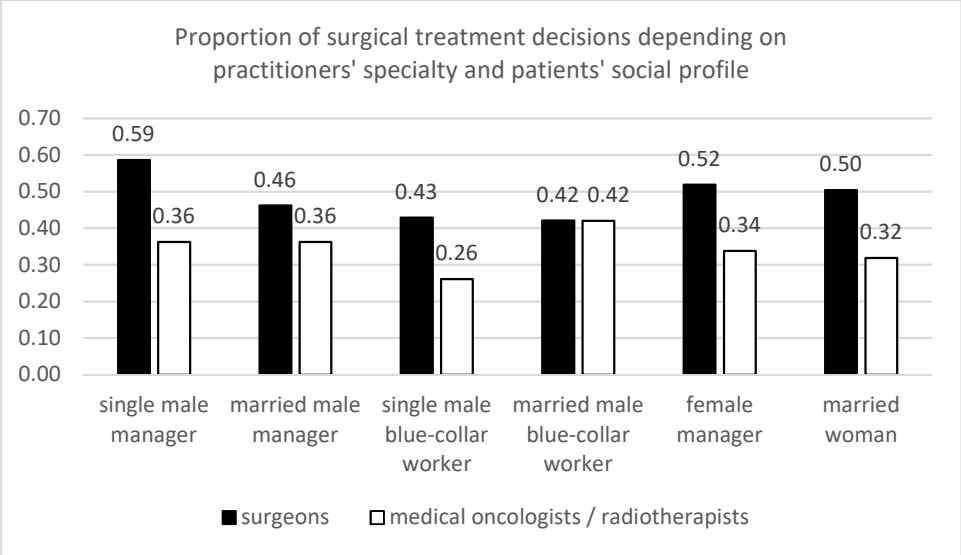


Table 1: Practitionners' description from analyzable questionnaires (N=202)

		Surgeon (n=133)		**Medical oncologist / Radiotherapist** (n=69)		**Total**	
		N	**%**	N	%	N	%
Sex	Female	91	*31.6*	29	*42.0*	71	*35.2*
	Male	42	*68.4*	40	*58.0*	131	*64.9*
Age	25 to 39 years	60	*45.1*	34	*49.3*	94	*46.5*
	40 to 59 years	62	*46.6*	32	*46.4*	94	*46.5*
	60 years over	11	*8.3*	3	*4.4*	14	*6.9*
Center	Cancer center / University hospitals	95	*71.4*	52	*75.4*	147	*72.8*
	Hospital center	22	*16.5*	5	*7.3*	27	*13.4*
	Clinic	16	*12.0*	12	*17.4*	28	*13.9*
Fonction	University professor/ Hospital practitioner	95	*71.4*	47	*68.1*	142	*70.3*
	Assistant	20	*15.0*	10	*14.5*	30	*14.9*
	Private activity	18	*13.5*	12	*17.4*	30	*14.9*
Number of patients with HNC cancer treated per year	Incomplete	0	*0.0*	1	*1.5*	1	*0.5*
	Fewer than 10	4	*3.0*	0	*0.0*	4	*2.0*
	10 to 50	47	*35.3*	16	*23.2*	63	*31.2*
	51 to 100	30	*22.6*	24	*34.8*	54	*26.7*
	More than 100	52	*39.1*	28	*40.6*	80	*39.6*

Figure 2: Difference in probability of choosing surgery, for each predefined clinical case association, among all specialists

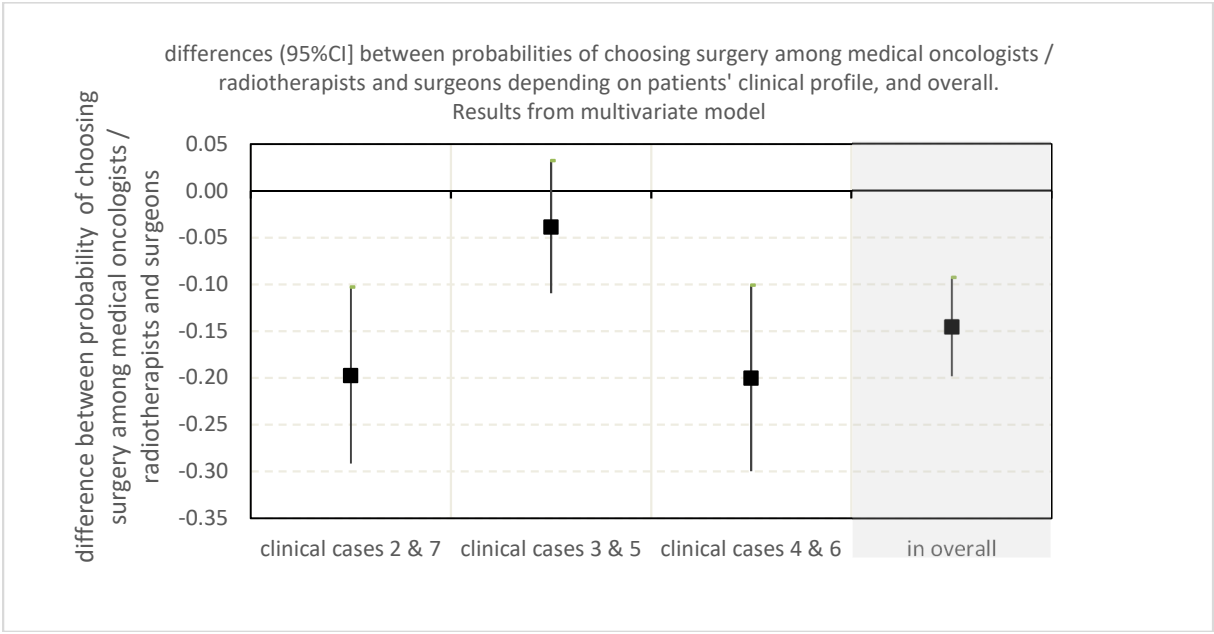
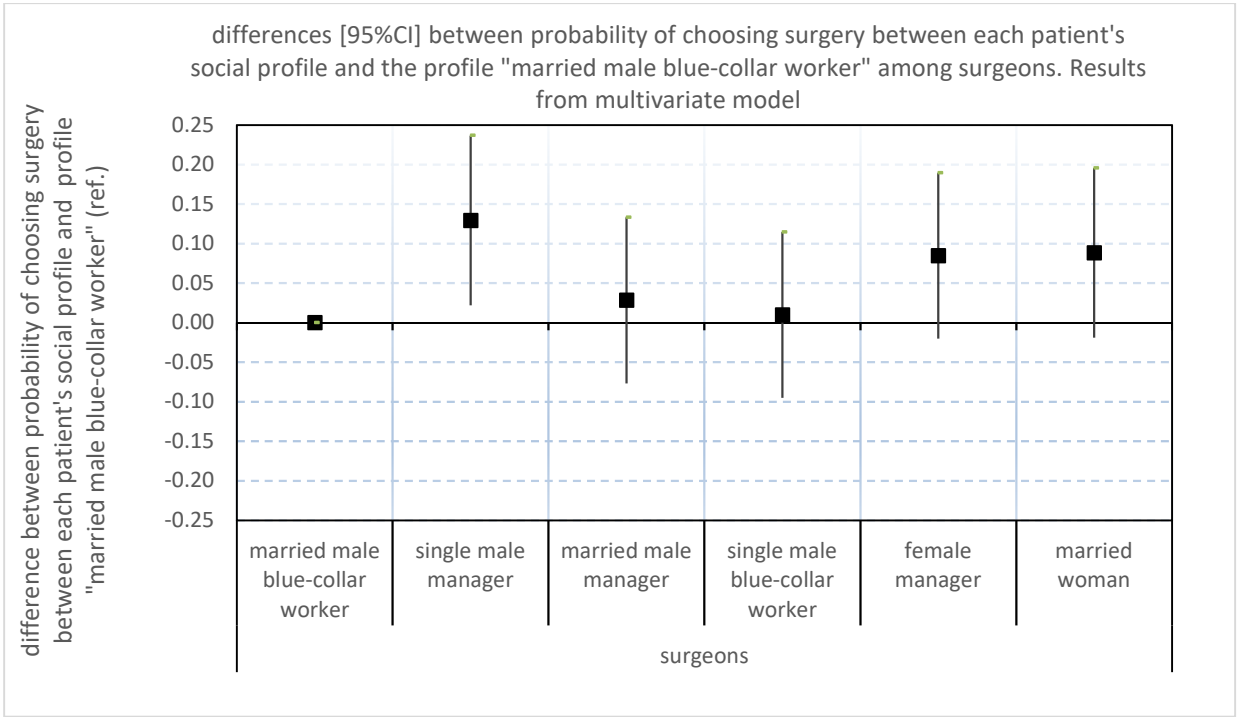


Figure 3: Difference in probability of choosing surgery, for each social profile in comparison with the "married male blue-collar worker" for:

A- Surgeons

B- Medical oncologists and radiotherapists

A



B

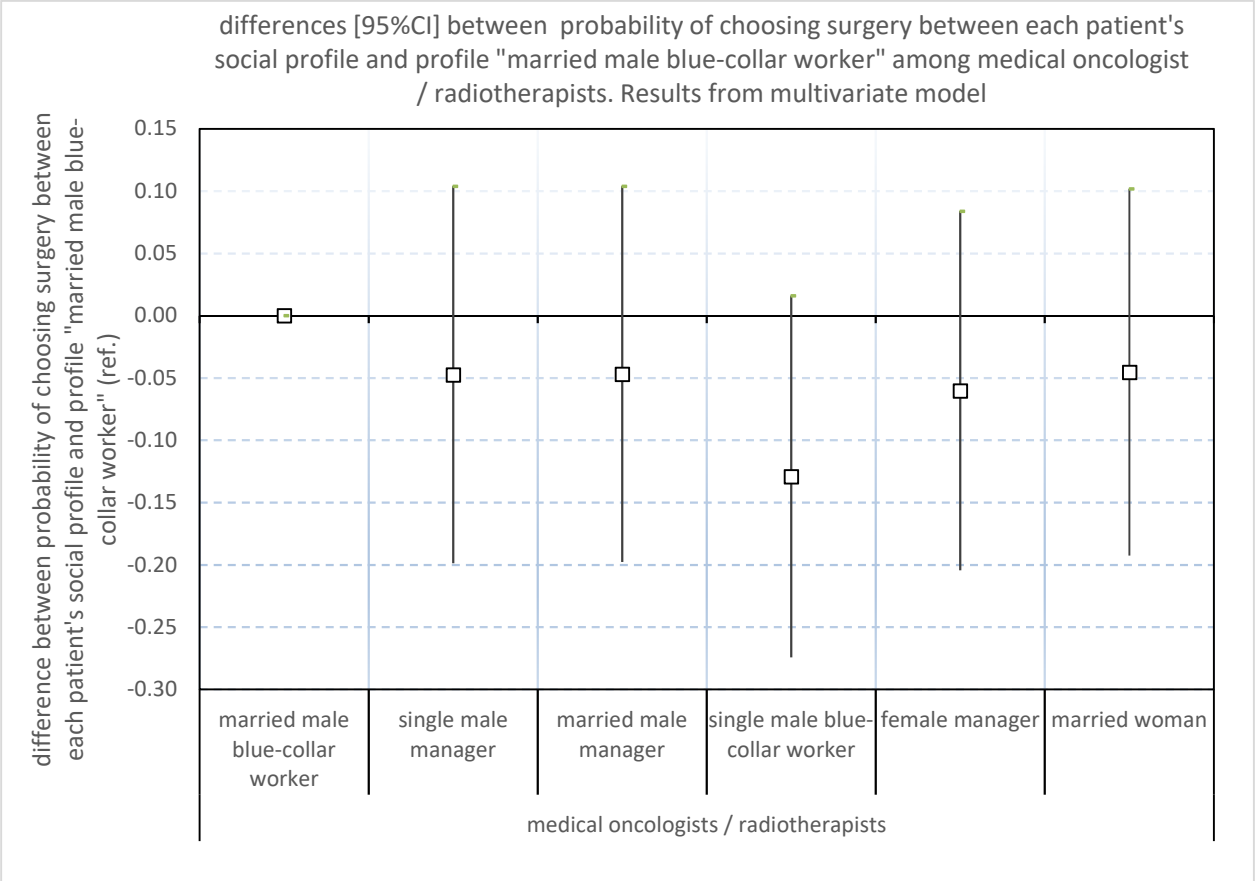
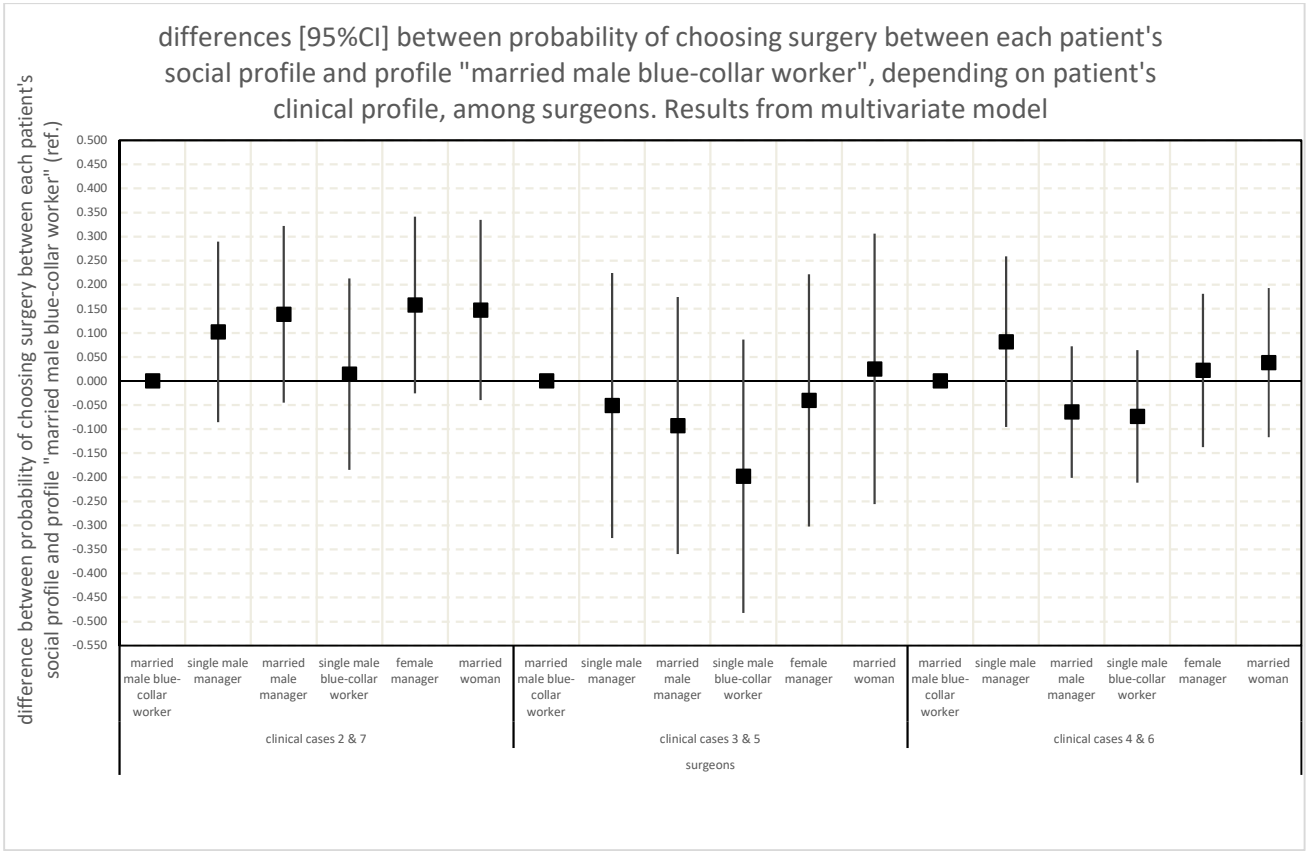

differences [95%CI] between probability of choosing surgery between each patient's social profile and profile "married male blue-collar worker" among medical oncologist / radiotherapists. Results from multivariate model
difference between probability of choosing surgery between each patient's social profile and profile "married male blue-collar worker" (ref.)
0.15
0.10
0.05
0.00
-0.05
-0.10
-0.15
-0.20
-0.25
-0.30
married male blue-collar worker
single male manager
married male manager
single male blue-collar worker
female manager
married woman
medical oncologists / radiotherapists

Figure 4: Probability of choosing surgery, for different social profiles in comparison with "married male blue-collar worker" according to clinical cases for:

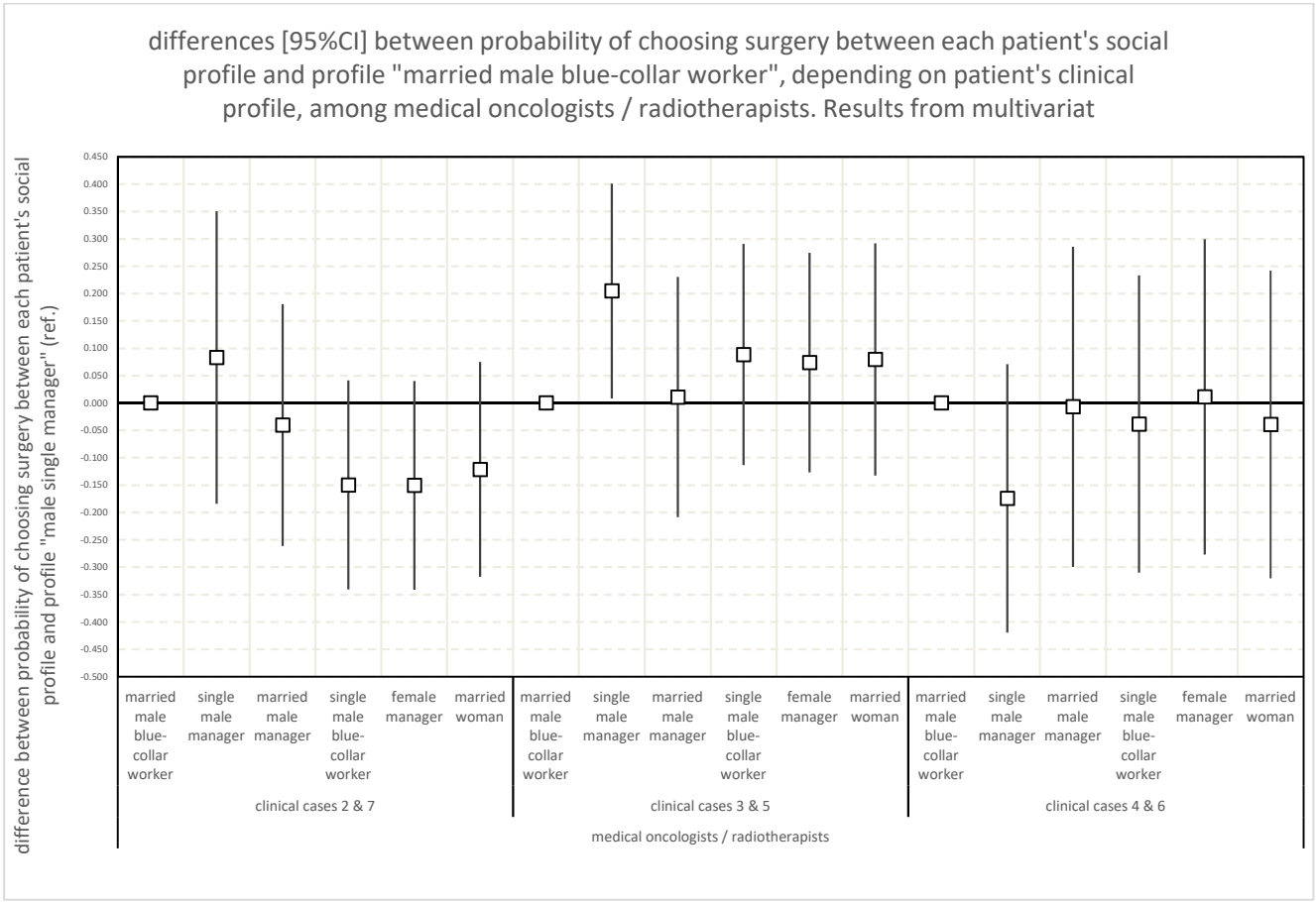
A- Surgeons

B- Medical oncologists and radiotherapists

A



B


differences [95%CI] between probability of choosing surgery between each patient's social profile and profile "married male blue-collar worker", depending on patient's clinical profile, among medical oncologists / radiotherapists. Results from multivariat
difference between probability of choosing surgery between each patient's social profile and profile "male single manager" (ref.)
0.450
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
-0.050
-0.100
-0.150
-0.200
-0.250
-0.300
-0.350
-0.400
-0.450
-0.500
married male blue-collar worker
single male manager
married male manager
single male blue-collar worker
female manager
married woman
clinical cases 2 & 7
clinical cases 3 & 5
clinical cases 4 & 6
medical oncologists / radiotherapists