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Early Impact of the COVID-19 Pandemic on Psycho-Oncological Support: A Latent Class Analysis

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Abstract

Introduction: Research suggests a global shortfall of psycho-oncological assessment and care during the COVID-19 pandemic in addition to delayed diagnosis of cancer. The present study is the first to explore the effect of the pandemic on the provision of psycho-oncological care, stage of cancer at first diagnosis, and duration of hospitalizations. ***Method:*** Retrospective latent class analysis of 4,639 electronic patient files with all types, treatment types, and stages of cancer, 370 of which were treated during the pandemic prior to availability of vaccinations. ***Discussion:*** Latent class analysis identified four subgroups based on differences in screening for distress, provision of psycho-oncological support (consultation with a psychiatrist or clinical psychologist), administration of psychotropic medication, use of 1:1 observation, stage of cancer at first diagnosis, and duration of hospitalizations. Yet, the pandemic had no effect on subgrouping. Thus, the COVID-19 pandemic had no effect on the provision of psycho-oncological support. ***Conclusion:*** Results are contrary to prior research. The efficiency and quality of procedures implemented to provide psycho-oncological support during and prior to the pandemic are critically reflected.

Introduction

Distress, an unpleasant, overwhelming, or threatening emotional or psychological experience including mental illness, troubles 30–50% of patients with cancer, with symptoms persisting beyond complete remission in 20–40% of these patients [1–3]. Apart from a decline in patients' subjective quality of life, untreated distress also has a significant negative effect on physical health outcomes [4] and can induce nonadherence with regard to necessary treatments [5]. Unfortunately, health care professionals habitually underestimate both frequency and severity of, or misclassify distress and psychiatric morbidity in cancer patients, which suggests an underdiagnosis and ensuing lack of treatment in said patients [6–12]. It has therefore become a standard of care to screen all oncological patients for distress and explicitly offer psycho-oncological support [13–15].

However, due to the restrictions in place during the COVID-19 pandemic and work overload of health care professionals with psychiatrists being transferred to work

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in somatic medicine [16], many cancer treatment centers internationally have witnessed a sharp and significant decrease in screening and treatment of distress in cancer patients [17]. Simultaneously, many cancer patients' fear of catching COVID-19 and suffering a severe progression of the virus have subjected them to even more extreme isolation, hindering contact with health care providers including psycho-oncological support [18–20]. In addition, higher rates of distress in cancer patients were observable during the pandemic [21–25]. In response to this, many mental health treatment centers have adapted to the requirements of the pandemic by turning to remote modes of treatment, such as video calls. However, in light of the challenges for patients and providers engaging virtually [26, 27], it remains unclear if these measures were able to compensate for reduced availability of psycho-oncological support and simultaneously increased distress in patients with cancer. The novelty of the present study is to explore whether or not patients with cancer received less screening for distress and psycho-oncological support during the beginning of the COVID-19 pandemic on a large sample of patients – instead of merely questioning health care professionals on that topic. The present study explores which subgroups of patients may suffer from reduced rates of distress screening and psycho-oncological support, using diagnosis during the pandemic as one parameter.

As an additional consequence of the pandemic, health care providers suspect patients to have been diagnosed on average at a later stage in their cancer progression during the pandemic, due to the restrictions placed on clinical contact, as well as the widespread fear of seeking treatment at the risk of becoming infected with COVID-19 [28]. For the same reasons, and due to the shortage of hospital beds [25, 29], patients during the pandemic might have had shorter and/or fewer hospital stays, in comparison with the patients pre-pandemic. However, patients may have experienced longer hospital stays, if they were indeed diagnosed at a later stage of their illness, and therefore required more intensive care. Either way, these circumstances may have increased distress for patients, and it is possible that screening for distress and psycho-oncological support was increased as well. Exploration of these open questions is another objective of the present study.

Methods

Measures, Source of Data, and Preliminary Processing

In this study, we used pre-collected data from the University Hospital of Zurich's electronic files of patients who had not opposed the use of their data for research. The study has been approved by the Ethics Committee of the Canton of Zurich (Ref.-No. BASEC-NR 2020-01949). The present study is set at one of the largest cancer treatment centers of Switzerland, treating more than 15,000 patients of all types of cancers with all available treatment options per year. All types of cancer and internationally available treatments were considered (see Table 1).

Two timeframes were chosen: one to reflect the patient population during the height of the pandemic ("PAN") and one control group ("NPAN"). Patients belonging to the PAN group were first diagnosed between the 16 March 2020 and 30 June 2020. Each patient's data during the first 6 months after their diagnosis were included, in order to show the development of the patient's treatment, wherefore the latest timeframe for the PAN group spans from June 30, 2020, until December 31, 2020. These dates were chosen due to the fact that Switzerland's first and most serious COVID-19 lockdown period began on 16 March 2020, and the general population did not have access to COVID vaccines until the end of the year 2020, or the beginning of the year 2021 [30]. Hence, a patient diagnosed later than June 30, 2020, would have (on average) experienced less severe isolation and a safer environment than patients diagnosed before said date.

The NPAN group is comprised of all patients first diagnosed with cancer at the University Hospital of Zurich during the years 2017, 2018, and 2019. We decided to include patients from the entirety of the years in question, as opposed to using merely the same months as for the PAN group, so as to create as broad a base as possible for comparison to the effects of the pandemic – especially since latent class analysis (LCA) does not require a balancing of groups (see below). A total of 4,639 patients were included in the study, of which 370 belonged to PAN group and 4,269 belonged to NPAN group. We chose a statistical procedure which does not require balanced group sizes. The following variables were included in the statistical analysis of both groups.

Advanced Stage "Stage"

Staging refers to the (histologically confirmed) staging of each patient's cancer at first diagnosis, according to Union for International Cancer Control (UICC) guidelines. We differentiated between UICC stages, classifying stages three and four as advanced ("stage yes"), and earlier stages as not advanced ("stage no").

Duration of Hospitalization "Hospitalization"

"Hospitalization yes" refers to patients who underwent at least one hospital stay lasting at least 28 days during the first 6 months after their diagnosis.

Need for 1:1 Observation "Guard"

Patients who required 1:1 nursing at any point belong to the group "guard yes." A 1:1 direct observation is required for patients of particular frailty and/or mental instability, needs to be prescribed by a physician, and incurs significant costs.

Administration of Psychotropic Medication "Psychotropic Medication"

This variable indicates whether psychotropic medication was administered or prescribed (yes/no). Psychotropic medication included antidepressants, antipsychotics, benzodiazepines, and mood stabilizers.

Table 1. Types of cancer in patients studied

ICD-10 (3-digit diagnosis code)	Type of cancer	During pandemic *N* (PAN)	Percent (PAN)	2017–2019 *N* (NPAN)	Percent (NPAN)
C00-C14	Malignant neoplasms of lip, oral cavity, and pharynx	28	7.57	250	5.86
C15-C26	Malignant neoplasms of digestive organs	63	17.03	598	14.01
C30-C39	Malignant neoplasms of respiratory and intrathoracic organs	56	15.14	680	15.93
C40-C41	Malignant neoplasms of bone and articular cartilage	0	0	8	0.19
C43	Melanoma and other malignant neoplasms of skin (without Basalioma)	49	13.24	527	12.34
C45-C49	Malignant neoplasms of mesothelial and soft tissue	3	0.81	90	2.11
C50	Malignant neoplasms of breast	20	5.41	351	8.22
C51-C58	Malignant neoplasms of female genital organs	24	6.49	184	4.31
C60-C63	Malignant neoplasms of male genital organs	24	6.49	438	10.26
C64-C68	Malignant neoplasms of urinary tract	13	3.51	139	3.26
C69-C72	Malignant neoplasms of eye, brain, and other parts of central nervous system	24	6.49	275	6.44
C73-C75	Malignant neoplasms of thyroid and other endocrine glands	4	1.08	97	2.27
C76-C80	Malignant neoplasms of ill-defined, other secondary, and unspecified sites	2	0.54	13	0.30
C81-C96	Malignant neoplasms of lymphoid, hematopoietic, and related tissue	59	15.95	574	13.45
D00-D09	In situ neoplasms	1	0.27	45	1.05
Total		**370**	100	**4,269**	100

Distress Screening "Screening"

"Screening yes/no" signifies whether a patient was screened for distress using the distress thermometer and problem list, as required in international cancer treatment guidelines.

Psycho-Oncological Support Consultation "Consult"

This variable signifies if patients had at least one consultation with a psychiatrist or clinical psychologist for assessment and treatment.

Follow-Up Psycho-Oncological Support Consultation "Follow-Up Consult"

This variable signifies if a patient received at least two psycho-oncological (psychiatric-psychotherapeutic) consultations during the first 6 months after their cancer diagnosis.

Statistical Analysis

In this study, we used LCA to process the collected data. This was done using the poLCA package within R Studio version 1.1.383. LCA detects correlation between multiple variables, rather than only two variables at a time, using the expectation maximization algorithm to maximize the log-likelihood (LL) function [31, 32]. This allows it to uncover (latent) groups of patients with group-specific variable values being similar within a group.

In this study, 8 dichotomous variables were submitted to the LCA (as previously described), with 4,639 observations for each variable, and 500 repetitions of each model calculation. This resulted in multiple available models, each with a different number of classes (1–7) identified by the algorithm. The final model was selected using the principle of parsimony, which states that the simplest explanation is most likely to be correct [33]. The analysis was conducted with the assumption of conditional independence between all variables, as error dependencies do not add much bias to such a model [34]. The following factors were used to evaluate the fit of each model:

Maximum LL

Maximum LL merely measures goodness of fit, with the lowest LL indicating the best fit within a specific number of classes.

Bayesian Information Criterion and Akaike's Information Criterion

Bayesian information criterion (BIC) and Akaike's information criterion (AIC) measure the parsimony of a model, which avoids over-fitting and limits the number of classes created by the LCA algorithm. Both BIC and AIC penalize high numbers of parameters; however, BIC's penalty increases with an increase in sample size, whereas AIC's penalty remains constant [35]. As a result, AIC has been reported to overestimate the correct number of components in a finite mixture model [36, 37]. For this reason, in this

Table 2. Descriptive statistics of patients

	PAN		NPAN	
Patients, *n*	370		4,269	
Sex, *N* (%)	F: 160, M: 210	F: 43.24, M: 56.76	F: 1,813, M: 2,456	F: 42.49, M: 57.53
Age, M, SD	63.5135	14.32307	62.1157	14.28942
Antidepressants, *N* (%)	49	13.2	495	11.6
Antipsychotics, *N* (%)	35	9.5	396	9.3
Benzodiazepines, *N* (%)	140	37.8	1,859	43.5
Antiepileptics, *N* (%)	46	12.4	470	11.0
Pain killers other than opioids, *N* (%)	302	81.6	3,392	79.5
Opioids, *N* (%)	172	46.5	1,748	40.9
Steroids, *N* (%)	124	33.5	1,355	31.7
Inpatient treatment in days, M, SD	15.2174	21.04904	14.7270	18.90666
Advanced stage of cancer at first diagnosis	162	43.78	1,719	40.27
Mental disorder diagnosed, *N* (%)	186	50.3	2,242	52.5

PAN, first diagnosis of cancer during pandemic; NPAN, first diagnosis before pandemic; sex, sex according to government documents; M, mean; SD, standard deviation.

study, BIC was prioritized over AIC in the selection of the final model.

Entropy

Entropy measures classification uncertainty; values of >0.8 signify an adequate separation between classes [37].

Results

The representative numbers of each type of cancer show similar percentages in PAN and NPAN (Table 1). Table 2 shows the descriptive statistics of all patients included in this study. The mean age at the time of diagnosis was 62.23, with a standard deviation of 14.30. The youngest patient was 18 years old and the oldest 96.

Table 3 shows the latent class model solutions and fit indices for 2-class through 6-class models. The 4-class model was chosen for further examination, as it had the lowest BIC of all class numbers evaluated, which indicates best model fit (see above).

Table 4 gives a breakdown of the selected 4-class model showing conditional item response probabilities for each variable. The max. interclass difference indicates the degree of separation between classes. In psychiatry, a 10% max. interclass difference is considered to have clinical relevance [34]. Figure 1 shows the graphic depiction of the 4-class model, in terms of outcome probability.

Surprisingly, being first diagnosed during the pandemic did not influence class membership. This can be seen in the max. interclass difference of 4% in Table 4 for treatment during versus before the pandemic. The four classes can be described as follows:

Class 1: 31%

Patients in this class have a low likelihood of having an advanced stage of cancer upon diagnosis. They are unlikely to be hospitalized for more than 28 days, unlikely to have a patient guard, or to receive psychotropic medication. The patients in class 1 have, however, the highest likelihood (of all classes) of being screened for distress and a high likelihood of receiving 2 or more psycho-oncological consultations.

Class 2: 18%

Patients in class 2 are likely to have an advanced stage of cancer upon diagnosis, to be hospitalized for more than 28 days, to have a patient guard, and to receive psychotropic medication. They have a likelihood of 40% for being screened for distress and a high likelihood of receiving one psycho-oncological consultation.

Class 3: 38%

Patients in class 3 have similar likelihoods with regard to most variables as the patients in class 1. However, patients in class 3 have a likelihood of zero for being screened for distress and also a very low likelihood of having psycho-oncological consultations.

Class 4: 13%

Patients in class 4 share some characteristics with those in class 2. They also have a higher likelihood of later stage cancer, patient guards, and psychotropic medication. However, patients in class 4 have the highest likelihood to receive a psycho-oncological consult, at nearly 73%, and also the highest rate of follow-up consultations, at 100%. The only class with a higher screening rate for distress than class 4,

Table 3. Latent class model solutions and fit indices for 2-class through 6-class solutions

Model solution	Residual degrees of freedom	LL	AIC	BIC	Entropy
2 classes	238	−17767.29	35,568.58	35,678.1	3.836458
3 classes	229	−17618.22	35,288.45	35,455.95	3.805254
4 classes (a)	220	−17553.43	35,176.85	35,402.33	3.785218
5 classes	211	−17524.04	35,136.08	35,419.54	3.778782
6 classes	202	−17508.47	35,112.95	35,464.38	

LL, maximum log-likelihood; AIC, Akaike's information criterion; BIC, Bayesian information criterion; entropy, measure of classification uncertainty; (a), final model chosen.

Table 4. Conditional item response probabilities of a patient within a particular class to provide a specific item response

Item	Class 1	Class 2	Class 3	Class 4	Max. interclass difference
PAN					
No	0.0909	0.0556	0.0754	0.0986	0.043
Yes	0.9091	0.9444	0.9246	0.9014	
Screening					
No	0.2478	0.5989	1.0000	0.4227	*0.7522*
Yes	0.7522	0.4011	0.0000	0.5773	
Consult					
No	0.8992	0.6648	0.9134	0.2712	*0.6422*
Yes	0.1008	0.3352	0.0866	0.7288	
Follow-up consult					
No	0.7261	1.0000	1.0000	0.0000	*1.0000*
Yes	0.2739	0.0000	0.0000	0.1000	
Psychotropic medication					
No	0.5702	0.2094	0.6438	0.1301	*0.5137*
Yes	0.4298	0.7906	0.3562	0.8699	
Guard					
No	0.9962	0.8029	0.9869	0.8320	*0.1933*
Yes	0.0038	0.1971	0.0131	0.1680	
Hospitalization					
No	0.9732	0.6121	0.9904	0.4088	*0.5644*
Yes	0.0268	0.3879	0.0096	0.5912	
Stage					
No	0.6975	0.4146	0.6526	0.4259	*0.2829*
yes	0.3025	0.5854	0.3474	0.5741	
Estimated class size (%)	0.3087 (30)	0.1763 (17)	0.3829 (38)	0.1321 (13)	

See methods section for definitions of variables explored.

which has a rate of 58%, is class 1, at 75%. Class 4 also has a significantly higher rate of long hospital stays than class 2.

Discussion

The results of this study suggest that the pandemic had almost no influence on screening for distress, provision of psycho-oncological support, stage of cancer at first diagnosis, or duration of hospitalizations. These results stand in contrast to prior research, indicating reduced screening for distress and psycho-oncological support during the pandemic [17, 26, 38]. Thus, measures such as remote psycho-oncological support and reminders to treatment teams for particular attention to patient distress during the pandemic seem to have balanced out additional

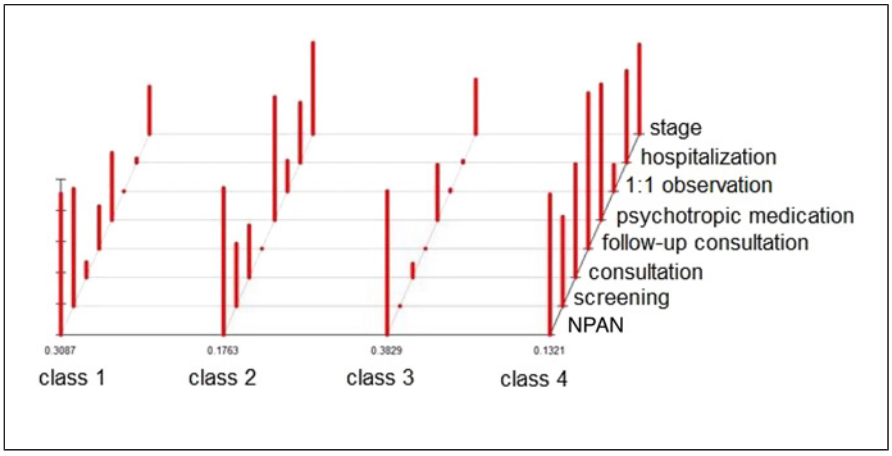

Fig. 1. Conditional item response probabilities for the 4-class solution. Note: Rows (top to bottom) represent probabilities for advanced stage of cancer (stage), duration of hospitalization (hospitalization), need for 1:1 observation (guard), administration of psychotropic medication (psychotropic medication), follow-up psycho-oncological support consultation (follow-up consult), at least one psycho-oncological support consultation (consult), distress screening (screening), control group membership (treatment before the pandemic). Columns represent (from left to right) class 1 (estimated population share 31%), class 2 (18%), class 3 (38%), class 4 (13%).

distress and reductions in availability of services. Insufficient economic resources along with reduced health care capacity and insufficient availability of technology in some geographic regions may provide one explanation. However, this would not explain reduced screening rates and provision of psycho-oncological support in industrialized countries, such as Canada [17]. Economic side effects of the pandemic on the individual patient level, such as unemployment and loss of health care insurance, were identified in one study on reasons behind reduced cancer screening rates in the USA [39]. Possibly, health care providers in industrialized countries should develop more trust in measures adopted to counteract effects of the pandemic [40, 41]. Since most prior studies on the topic are based on survey data from health care providers or patients, more "hard" data based on actual health care records (as provided in the present study) or national registers are needed. By using LCA with a predefined set of variables to be explored retrospectively, our study does just that. It answers the call to explore hidden effects of the pandemic on provision of care to patients with cancer [42, 43]. For a more differential investigation, research should evaluate the effectiveness of specific measures adopted to counteract negative effects of the pandemic on diagnosis and treatment of cancer as well as provision of psycho-oncological support [26]. Sufficient technological resources and training of providers of care in their use despite shortages in human resources may be key to counteracting negative effects [20].

Regardless of the impact of the pandemic, the present study reveals clinically relevant results. Patients with more advanced stages of cancer seem more probable to be hospitalized longer and to need psychotropic medication and 1:1 observation. However, screening for distress is most probable in patients with the lowest probability for an advanced stage of cancer at first diagnosis. This seems contradictory. One explanation is that staff may feel more comfortable with screening such patients. Similarly, psycho-oncological consultations seem only partially linked to advanced stage of cancer and prescription of psychotropic medication. One explanation may be that screening for distress is economized in patients where oncological treatment teams (nurses and physicians) feel certain that distress must be present due to the stage of cancer. Instead, these patients may be referred to psycho-oncological support without prior screening. Some research supports this approach, also known as case finding, as a more economical alternative to distress screening [44], especially if combined with human resource sparing technology. By contrast, the missing link between prescription of psychotropic medication and psycho-oncological evaluation raises concerns on the standard and quality of care and should trigger more research. While psychotropic medication may be prescribed off-label for nonpsychiatric indications, it may also be inadvertently considered to be a less cost-intensive substitute for psycho-oncological support by some health care providers [45–47].

Lastly, duration of hospitalizations was not affected by the pandemic, indicating little room for improvement on efficiency of inpatient treatment even during global crisis. Patients with increased somatic treatment needs (advanced stage of cancer) also had increased use of psychotropic medication and longer hospitalizations.

Study Limitations

First, there were unfortunately no data available on the extent to which patients received remote psycho-oncological support during the pandemic. However, it can be assumed remote support was preferred over face-

to-face contact during the pandemic whenever possible. Similarly, there are unfortunately no data available on what measures were most effective in transitioning psycho-oncological care provision to remote means.

Second, generalizability of results is limited. As prior research has shown, results are heavily impacted by the geographic region in which studies are set. Yet, the fact that results from this study contrast earlier reports highlights the importance of more studies on psycho-oncological support provision during the pandemic. In combination with studies reporting contrasting results, it may be possible to identify protective factors for future health care crises.

Finally, the present study did not directly explore patient distress due to the pandemic. For instance, there have been multiple studies confirming a general decline in mental health due to fear of getting infected with the corona virus or the increased isolation that movement restrictions [22, 48, 49] placed upon everyone. It is quite possible that preexisting disparities in mental health between certain demographics have been exacerbated by the pandemic [19, 23, 50].

Conclusion

In patients with cancer, screening for distress, provision of psycho-oncological support, administration of psychotropic medication, use of a direct 1:1 observation, stage of cancer at first diagnosis, and duration of hospitalizations were not affected by the pandemic. Yet, disparities between patients in terms of the variables examined indicate a need for further research on the efficiency and quality of procedures implemented to provide psycho-oncological support.

Statement of Ethics

The study has been approved by the Ethics Committee of the Canton of Zurich (Ref.-No. BASEC-NR 2020-01949). This study protocol was reviewed, and the need for informed consent was waived by the Cantonal Ethics Committee of Zurich, Switzerland (Ref.-No. BASEC-NR 2020-01949). The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Conflict of Interest Statement

The authors declare that they have no competing interests.

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Author Contributions

M.P.G., J.B.S., and S.E. conceived and designed the study. Data collection was performed by J.B.S. and M.P.G. Data preparation and analysis were performed by J.B.S., P.C., and M.P.G. The first draft of the manuscript was written by M.P.G. and P.C. R.K. provided senior advice for the study. All authors edited multiple drafts, supervised the statistical analyses, and read and approved the final manuscript.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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