The impact of the SARS-COV-2 pandemic on the quality of breast cancer care in EUSOMA certified breast centers

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ABSTRACT

Aims: We analyzed the impact of the SARS-CoV-2 pandemic (COVID-19) on the quality of breast cancer care in certified EUSOMA breast centers

Materials and methods:

The results of the EUSOMA quality indicators (QIs) were compared, based on pseudonymized individual records, for the periods 1 March 2020 till 30 June 2020 (first COVID19 peak in most countries in Europe) and 1 March 2019 till 30 June 2019. In addition, a questionnaire was sent to the participating Centres for investigating the impact of the COVID-19 pandemic on the organization and the quality of breast cancer care.

Results

Forty-five Centers provided data and 31 (67%) responded to the questionnaire. There was a small significant higher tumour (p=0.003) and lymph node (p=0.011) stage at presentation. Comparing QIs (12736 patients) by multivariable analysis showed non-significant differences. Surgery could be performed in a COVID-free zone in 94% of the Centres, COVID testing was performed before surgery in 96% of the Centres and surgical case load was reduced in 55% of the Centres. Modifications of the indications for neoadjuvant endocrine therapy, chemotherapy and targeted therapy were necessary in 23%, 23% and 10% of the Centres; changes in indications for adjuvant endocrine, chemo-, targeted, immune and radiotherapy in 3%, 19%, 3%, 6% and 10%, respectively.

Conclusion

Quality of breast cancer care was well maintained in EUSOMA breast Centres during the first wave of the COVID-19 pandemic. A small but significantly higher tumour and lymph node stage at presentation was observed.

Keywords (MESH terms): breast neoplasms, COVID-19, data warehousing, quality indicators, health care, SARS-CoV-2, surveys and questionnaires

Introduction

The outbreak of the SARS-CoV-2 (COVID-19) pandemic has overwhelmed health care systems in many countries [1]. At the epicenter the main focus of medical activities was on treating patients with severe COVID-19 disease, implicating that other forms of non-urgent medical care were often partially or completely halted [2]. Guidelines and recommendations were provided by multidisciplinary panels for prioritization, triage and treatment of breast cancer patients in these difficult circumstances [3-6]. Several surveys showed that this pandemic had a significant impact on patients with cancer, often delaying their diagnosis and causing modifications in treatment [7-9]. In the present study we performed a survey in EUSOMA certified breast centers on adaptations of breast cancer care during the first and second wave of the COVID-19 pandemic, and compared quality indicators (QIs) from March to June 2020 with those observed from March to June 2019. We hypothesize that the observed results depend on the certification process. It was previously shown that the EUSOMA certification process improves the quality of breast cancer care, and the present study suggests that EUSOMA certification creates robust structures capable to maintain high level standards of care in difficult circumstances [11].

Materials and Methods

Forty-six EUSOMA centers (45 already certified and one in progress) were asked to participate in the project and to fill in a questionnaire about the measures taken in their hospital/country during the COVID19 pandemic. All centers but one provided data via the eusomaDB and 31/46 (67%) additionally responded to the questionnaires focusing on the impact of the first wave of COVID19 on the quality of breast cancer care in their centers.

The EUSOMA data warehouse (eusomaDB): The eusomaDB is a central data warehouse of prospectively collected information that includes pseudonymized individual records on primary breast cancer patients diagnosed and treated at European Breast Centres that have provided their data according to EUSOMA requirements during the course of certification [11]. The database was started in 2006 and includes at December 2021 over 200,000 data sets on cancers from European breast centres. It collects 166 variables by patient record, including patient and tumour

characteristics, information about preoperative work-up, multidisciplinary management and follow-up data. No personal identifiers exist on the entire database. Data upload from each breast centre is performed yearly through an online application and represents a requirement to obtain and maintain certification. Participating centres agree to use the database for certification purposes, benchmarking and for cooperative clinical research [10-13]. Breast centres participating in this project are located in Germany (n=2), Switzerland (n=2), Belgium (n=7), Austria (n=1), The Netherland (n=1), Spain (n=1), Portugal (n=3), France (n=1), Italy (n=25), Sweden (n=1) Croatia (n=1), and Cyprus (n=1).

Quality Indicators and the certification process: Overall 17 main QIs have been identified by EUSOMA by systematic search of the evidence and consensus by experts, respectively seven on diagnosis, four on surgery and loco-regional treatment, two on systemic treatment and four on staging, counselling, follow-up and rehabilitation, all with the specification, by consensus, of the desirable target and of the minimum standard [10,13]. Several of the EUSOMA QIs were listed in the National Quality Measures Clearinghouse of the US Agency for Health Care Research and Quality. EUSOMA has so far included 17 quality indicators in the certification process, 15 of which are included in this analysis (Table 1) [10,13]. Before starting the certification process breast centres must validate their clinical database by uploading consecutive patients with primary breast cancer diagnosed in at least six months before, to the central eusomaDB in the required format.

Table 1. EUSOMA quality indicators which were assessed in the present analysis

1	Cancers with a pre-operative diagnosis (B5 or C5)
2	Invasive ca with histological type; grading; ER/Her2; pN; margins; vascular invasion & size recorded
3	Non-invasive ca with histological pattern; grading; size; margins & ER recorded
4	M0 invasive ca receiving postoperative RT after BCT
5	Invasive ca <= 3 cm (incl. DCIS component) treated with BCT
6	Non-invasive ca <= 2 cm treated with BCT
7	DCIS with no axillary clearance
8	Endocrine sensitive invasive ca receiving HT
9	ER- (T > 1 cm or N+) invasive ca receiving CT
10	Invasive ca receiving just 1 operation (excl. reconstruction)
11	DCIS receiving just 1 operation (excl. reconstruction)
12	SLNB in cN0 invasive ca (without neoadjuvant)
13	Immediate reconstruction after mastectomy
14	No more than 5 nodes excised in invasive ca with SLNB
15	Invasive Her2+ (T>1 cm or N+) with adjuvant chemotherapy who received adjuvant biological drug

ER: estrogen receptor; HER: human epidermal growth factor receptor; RT: radio therapy; BCT: breast conserving therapy; DCIS: ductal carcinoma in situ; HT: hormonal therapy; CT: chemotherapy; SLNB: sentinel node biopsy

Statistical analysis: All QIs are proportions. Univariable and multivariable analyses were performed for the before-after comparison, combining all breast centers. Given that the outcome of each indicator is binomial (fulfilled vs. not fulfilled), a logistic regression analysis was performed with two covariates: time period (2019 vs. 2020) and continuous age. The resulting odds ratios (ORs) for the two covariates were both included in the tables. The effect of age was separately studied by adjusting the OR for age by time period. Heterogeneity between results was assessed by using the χ^2 test. Statistical analyses were performed with program R (version 2.10.1).

Results

Questionnaire on adaptations on breast cancer care between February and June 2020 during the first wave of COVID-19

All 31 centres responding to the questionnaire reported that the COVID-19 pandemic had a severe impact on their functioning. Adaptations in the work flow were

implemented during the first wave of COVID-19, respectively taking place in February (1 breast centre, 3%), March (29 breast centres, 94%) and April (1 breast centre, 3%) 2020. Surgery could be performed in a COVID-19- free zone in 94% of the breast centres, COVID-19 testing was performed before surgery in 96% of centres and surgical case load was reduced in 55% of the centres. Reconstructive surgery was stopped or reduced in 55% of centres. Modifications in the indications for neo-adjuvant endocrine therapy, chemotherapy and targeted therapy were necessary in 23%, 23% and 10% of the centres, while indications for adjuvant endocrine, chemo-, targeted, immune and radiation therapy were changed in 3%, 19%, 3%, 6% and 10% of the centres, respectively. Breast cancer screening was frequently suspended either on a national level (58%) or regional level (39%). Altogether, in 52% of the 31 centres patients requested more interaction by phone or video call with breast nurses, and in 26% of the 31 centres more psychological support was necessary. One third of the centres (10 of 31) organized virtual informative events or produced informative material on the implications of COVID-19 on breast cancer. Palliative care was affected in 23% of the centres.

Comparison of March till June 2020 vs March till June 2019

The 45 centres providing data, collected a total of 12736 patients to the study, 9962 having an invasive carcinoma and 2774 a ductal carcinoma in situ. The total number of patients registered in the EUSOMA database dropped from 7035 to 5701 (minus 19%) when comparing the 4-month 2020 period versus the same 4-month period of the previous pre-pandemic year (2019). A slightly stronger drop was seen for DCIS (1546 vs 1228, minus 21%) as for invasive breast cancers (5489 vs 4473, minus 19%). We observed a small but significant higher tumour ($p=0.003$) and lymph node ($p=0.011$) stage at presentation in 2020 (Table 2).

Comparing of the QIs in the two time periods by multivariable analysis shows mostly no-significant differences). In fact, quality of pathology reporting (QI2: 94.6% vs 98.1%, $p<0.0001$), endocrine sensitive invasive breast cancer receiving endocrine treatment (QI8: 93.7 vs 95.1%, $p=0.013$) went up, while the percentage of patients with no more than five lymph nodes excised (QI14: 98.5% vs 97.6%, $p=0.027$) went down during the first wave (Table 3).

Correction for age in the multivariable model showed that changes in the indications for mastectomy, adjuvant radiotherapy, chemotherapy and endocrine treatment were observed in patients aged over 70 (Table 3). In addition, a univariable analysis of the performance of 15 EUSOMA QIs during these time periods was performed in patients younger than 70 years confirming that in this group there was only a small difference in the number of patients with mandatory histological reporting (96.5% vs 98.1%, p=0.001) and no more than five axillary lymph nodes excised with invasive cancer (98.5 vs 97.4%, p=0.029) were observed (Table 4). A similar univariable analysis in the patients above 70 years old (3628 patients) showed that the percentage of patients with endocrine sensitive invasive breast cancer receiving hormonal treatment (90.6% vs 93.5%, p=0.018) and patients with ductal carcinoma in situ receiving just one operation (94.9% vs 85.2 %, p=0.033) differed significantly (Table 5).

Table 2. Characteristics of patients with invasive cancer included in the EUSOMA database comparing the registration 2020 to 2019

Invasive		Total			2019			2020			
		N	%	Missing	N	%	Missing	N	%	Missing	
	Total	9962	100,0%		5489	100,0%		4473	100,0%		p-value *
	Median age (range)	62 (20-100)			62 (20-97)			62 (24-100)			
	Missing	18		0,2%	16		0,3%	2		0,0%	
pT	yT0-yTis-yTmic	455	4,9%		235	4,6%		220	5,3%		**0.003**
	yT1a-yT1b-yT1c	575	6,2%		320	6,3%		255	6,2%		
	yT2	221	2,4%		108	2,1%		113	2,7%		
	yT3-4	61	0,7%		38	0,7%		23	0,6%		
	T1mic	114	1,2%		63	1,2%		51	1,2%		
	T1a	506	5,5%		273	5,3%		233	5,6%		
	T1b	1662	18,0%		915	17,9%		747	18,1%		
	T1c	3340	36,2%		1935	37,9%		1405	34,1%		
	T2	2001	21,7%		1077	21,1%		924	22,4%		
	T3-4	300	3,2%		145	2,8%		155	3,8%		
	Unknown	727		7,3%	380		6,9%	347		7,8%	
PN	yN0	831	10,4%		434	9,8%		397	11,3%		**0.011**
	N0	4614	58,0%		2632	59,2%		1982	56,4%		
	yN1	234	2,9%		137	3,1%		97	2,8%		
	N1	1184	14,9%		675	15,2%		509	14,5%		
	yN2-3	174	2,2%		99	2,2%		75	2,1%		
	N2	306	3,8%		150	3,4%		156	4,4%		
	N3	214	2,7%		112	2,5%		102	2,9%		
	Nmi(sn)	404	5,1%		209	4,7%		195	5,6%		
	Unknown	2001		20,1%	1041		19,0%	960		21,5%	
ER	-	1121	13,4%		608	13,0%		513	13,9%		0.221
	+	7226	86,6%		4060	87,0%		3166	86,1%		
	Unknown	1615		16,2%	821		15,0%	794		17,8%	
PgR	-	2080	24,9%		1154	24,7%		926	25,2%		0.641
	+	6264	75,1%		3512	75,3%		2752	74,8%		
	Unknown	1618		16,2%	823		15,0%	795		17,8%	
Her2	0/1+	6065	73,6%		3423	74,1%		2642	72,9%		**0.002**
	2+ (Fish -)	11	0,1%		9	0,2%		2	0,1%		
	2+ (Fish +)	7	0,1%		5	0,1%		2	0,1%		
	2+ (Fish ?)	1439	17,5%		751	16,3%		688	19,0%		
	3+	720	8,7%		429	9,3%		291	8,0%		
	Unknown	1720		17,3%	872		15,9%	848		19,0%	
Ki67+	0-14	3154	42,0%		1764	41,7%		1390	42,3%		0.614
	15+	4360	58,0%		2464	58,3%		1896	57,7%		
	Unknown	2448		24,6%	1261		23,0%	1187		26,5%	
Grade	I	1498	16,9%		845	17,2%		653	16,4%		0.622
	II	5081	57,2%		2794	56,9%		2287	57,6%		
	III	2302	25,9%		1271	25,9%		1031	26,0%		
	Unknown	1081		10,9%	579		10,5%	502		11,2%	
Neoadjuvant CT	No	7229	82,3%		4055	83,1%		3174	81,3%		**0.026**
	Yes	1551	17,7%		822	16,9%		729	18,7%		
	Unknown	1182		11,9%	612		11,1%	570		12,7%	
Surgery	BCS	6322	67,1%		3525	67,8%		2797	62,5%		0.212
	Mastectomy	3099	32,9%		1675	32,2%		1424	31,8%		
	Unknown	541		5,4%	289		5,3%	252		5,6%	

* All p-values are from chi-squared test, except for Her2 where Fisher's exact test was used.

Table 3. Multivariable analysis of 15 EUSOMA quality indicators between March and June 2020 compared to March and June 2019

	Eligible cases		Cases meeting the requirement		Effect of timing (being treated in 2020 vs. 2019) adj. by age			Effect of age adj. by timing		
Indicator #	**2019**	**2020**	**2019**	**2020**	**OR ***	**IC 95%**	**p-value**	**OR §**	**IC 95%**	**p-value**
1	4190	3267	94,3%	95,1%	1,14	(0,92-1,40)	0,214	1,01	(0,99-1,01)	0,189
2	4014	3210	96,6%	98,1%	1,77	(1,30-2,40)	<0,001	1,00	(0,99-1,01)	0,478
3	504	375	90,5%	92,0%	1,22	(0,75-1,96)	0,419	0,99	(0,97-1,01)	0,349
4	2148	1446	92,5%	94,0%	1,32	(0,99-1,76)	0,056	0,89	(0,87-0,90)	<0,001
5	2311	1631	84,5%	85,7%	1,09	(0,91-1,30)	0,336	1,01	(0,99-1,01)	0,135
6	285	240	90,2%	89,6%	0,95	(0,53-1,68)	0,853	1,03	(1,00-1,06)	0,011
7	499	396	99,2%	99,2%	1,06	(0,23-4,80)	0,935	1,08	(1,00-1,16)	0,041
8	3480	2717	93,7%	95,1%	1,33	(1,06-1,65)	0,013	0,97	(0,96-0,98)	<0,001
9	315	281	86,3%	87,9%	1,29	(0,73-2,25)	0,376	0,88	(0,85-0,90)	<0,001
10	3787	3006	95,2%	94,6%	0,89	(0,71-1,10)	0,280	1,02	(1,01-1,02)	<0,001
11	514	401	91,8%	89,8%	0,77	(0,48-1,20)	0,253	1,01	(0,98-1,02)	0,563
12	2606	1905	95,3%	95,2%	0,93	(0,68-1,25)	0,632	0,87	(0,85-0,88)	<0,001
13	1344	1181	61,9%	63,8%	1,12	(0,91-1,36)	0,259	0,90	(0,89-0,90)	<0,001
14	2778	2180	98,5%	97,6%	0,63	(0,41-0,94)	0,027	1,00	(0,98-1,01)	0,878
15	205	133	96,1%	97,7%	1,72	(0,44-6,62)	0,430	1,01	(0,96-1,06)	0,543

* An OR > 1 means that it is more probable to meet the requirement in 2020, controlling per different age distributions in the two years. An OR < 1 means that it is less probable.

§ An OR > 1 means that it is more probable for older patients to meet the requirement, controlling the effect of being treated in different years. An OR < 1 means that it is less probable.

See table 1 for indicators definition.

Table 4. Univariable analysis of 15 EUSOMA quality indicators between March and June 2020 compared to March and June 2019 in patients up to 70 years old

	Eligible cases		Cases meeting the requirement		Effect of timing (being treated in 2020 vs. 2019)		
Indicator #	**2019**	**2020**	**2019**	**2020**	**OR**	**IC 95%**	**p-value**
1	2869	2217	94,4%	95%	1,13	(0,88-1,45)	0,332
2	2667	2143	96,5%	98,1%	1,90	(1,31-2,76)	0,001
3	403	291	91,6%	92,1%	1,07	(0,62-1,86)	0,801
4	1423	927	97,3%	98,1%	1,39	(0,79-2,44)	0,260
5	1491	1016	85,2%	85,3%	1,01	(0,81-1,27)	0,913
6	226	182	90,7%	87,9%	0,75	(0,40-1,40)	0,362
7	403	306	99%	99%	1,01	(0,22-4,56)	0,987
8	2301	1798	95,2%	96%	1,20	(0,89-1,63)	0,232
9	225	196	97,3%	95,4%	0,57	(0,20-1,63)	0,294
10	2560	2032	94,5%	93,9%	0,90	(0,70-1,15)	0,391
11	412	313	91,3%	91,1%	0,97	(0,58-1,63)	0,922
12	1774	1287	98,8%	98,8%	1,02	(0,52-1,98)	0,963
13	957	858	78,7%	80,5%	1,12	(0,89-1,41)	0,329
14	1926	1526	98,5%	97,4%	0,58	(0,36-0,95)	0,029
15	158	93	96,8%	96,8%	0,98	(0,23-4,20)	0,979

See table 1 for indicators definition.

An OR > 1 means that it is more probable for older patients to meet the requirement, OR < 1 that it is less probable.

Table 5. Univariable analysis of 15 EUSOMA quality indicators between March and June 2020 compared to March and June 2019 in patients older than 70 years

	Eligible cases		Cases meeting the requirement		Effect of timing (being treated in 2020 vs. 2019)		
Indicator [#]	2019	2020	2019	2020	OR	IC 95%	p-value
1	1308	1048	94,5%	95,2%	1,16	(0,8-1,68)	0,425
2	1331	1065	96,8%	97,9%	1,54	(0,92-2,6)	0,103
3	99	84	85,9%	91,7%	1,81	(0,69-4,72)	0,224
4	716	517	83%	86,7%	1,33	(0,97-1,84)	0,078
5	813	614	83,3%	86,2%	1,25	(0,93-1,68)	0,136
6	58	58	87,9%	94,8%	2,52	(0,62-10,2)	0,198
7	93	90	100%	100%	1,00		1,000
8	1167	917	90,6%	93,5%	1,49	(1,07-2,06)	0,018
9	89	85	58,4%	70,6%	1,71	(0,91-3,2)	0,095
10	1215	972	96,7%	96,2%	0,86	(0,55-1,36)	0,517
11	98	88	94,9%	85,2%	0,31	(0,11-0,91)	0,033
12	823	616	87,6%	87,7%	1,01	(0,73-1,38)	0,975
13	382	323	20,2%	19,5%	0,96	(0,66-1,39)	0,829
14	844	652	98,5%	98%	0,77	(0,35-1,67)	0,507
15	47	40	93,6%	100%	-	-	0,995

[#] See table 1 for indicators definition.

An OR > 1 means that it is more probable for older patients to meet the requirement, OR < 1 that it is less probable.

Discussion

This is the first multicentre international analysis on the effect of the COVID-19 pandemic on breast cancer care. The present analysis shows that although some adaptations had to be made, quality of breast cancer care was well maintained in EUSOMA centres during the first wave of the COVID-19 pandemic.

In our study, the number of patients newly diagnosed with invasive breast cancer was 19% in 2020 compared to a similar period in 2019. A reduction of new breast cancer diagnosis during the first wave of the SARS-CoV-2 pandemic, varying between 16% to 52%, has also been reported by several other authors at both sides of the Atlantic [9,14,15,16]. The above findings can be mainly explained by stopping breast cancer screening, but also the reduced availability of non-COVID medical care and fear of patients to attend clinics and hospitals may have played a role [14]. The EUSOMA centres reported that screening was temporally halted on a national level in 59% or on

a regional level in 38% in their neighbourhood. The psychological impact of the first wave of the COVID-19 pandemic on the cancer patients was high and many centres tried to relieve this by setting up a system of tele-consultations (56%) and extra psychological support. Particularly the use of telemedicine became an important tool to keep contact with the patients and to continue medical care during the COVID-19 pandemic [17,18].

Surgery could be performed safely after the introduction of SARS-CoV-2 polymerase chain reaction testing in nearly all EUSOMA units (96%). A monocentric study in Rome by Pelle et al showed that a patient ascertainment for their COVID-19 status prior to hospital admission and hospital discharge, in association with protective measures allowed for a “no-COVID-19 status” in their hospital with none of their health care providers developing any infection [17], although (controllable) cluster infections have been reported by others [19].

The National Cancer registry from the Netherlands showed that mastectomy or breast conserving surgery was less common, primary hormonal treatment more common and chemotherapy less common during the beginning of the first wave of the pandemic (weeks 9-11,13-15) but more frequent for patients diagnosed at the end (weeks 14-17) [9]. Specifically, ductal carcinoma in situ (DCIS) and stage I disease was less likely to be treated within 3 months (p 0.01) [9]. Surgical case load and particularly reconstructive surgery was reduced by an average of 55% in the EUSOMA centres. We observed a reduction in mastectomy rate in older patients above the age of 70 years. In order to postpone surgery as safely as possible, the indications for neo-adjuvant endocrine therapy, chemotherapy and targeted therapy were altered in 23%, 23% and 10% of the EUSOMA certified centres. Except for a change in the indication for adjuvant chemotherapy during the first wave, only very few changes were made on the decision making and delivery of adjuvant endocrine, targeted, immune and radiotherapy in EUSOMA centres during the first wave of the pandemic.

Comparing of the performance of QIs in the 45 EUSOMA-certified centres between March and June 2019 versus March and June 2020 by multivariable analysis mostly shows small and non-significant differences. An analysis according to age in the multivariable model showed that adaptations of treatment were especially seen in the indications for mastectomy, adjuvant radiotherapy, chemotherapy and endocrine treatment in the older patients above 70 years of age.

The question remains whether the changes made in breast cancer management during the COVID-19 pandemic have any impact on breast cancer specific survival. It is well known that treatment delay is associated with both lower overall and disease-specific breast cancer survival, particularly for the tripple negative and Human Epithelial Growth Factor receptor (Her)-2 amplified breast cancer subtypes. [20]. Papautsky and Hamlish showed that 44% of breast cancer patients, participating in a survey, reported cancer care treatment delays during the pandemic [21]. Excluding patients with a confirmed SARS-CoV-2 infection Satish et al, in New York found that 42 % out of 350 patients treated for breast cancer between February 1 2020 and April 20 2020 experienced a delay/or change and 51% a change of practice [22]. Toss et al demonstrated that a two-month stop in breast cancer screening in Emilia Romagna (Italy) produced a significant decrease in in situ (-10.4%) breast cancer diagnosis and an increase in node positive (+11.2%) and stage III breast cancer diagnosis (+10.3%) [23]. Not surprisingly, the highest impact was seen in the patients with breast cancer at high proliferation rates. A similar observation on a shift of nodal status was reported by Vanni et al in a multicentric analysis of 432 patients having breast cancer surgery between March 11 2020 and May 30 2020 which showed on univariable analysis that lymph node involvement and tumour differentiation differed significantly [24]. These authors identified waiting time on list as a significant predictive factor for lymph node involvement by multivariable analysis. Despite a large sample size, we could only detect a small, but significant, increase in tumour stage and increased lymph node involvement in our population. Its clinical relevance is questionable and most probably very low, if any. Future follow-up analysis will clarify this issue.

Currently there is no evidence that patients with early-stage breast cancer are at higher risk to develop life-threatening COVID-19 infection. Zhang et al could not identify differences in disease severity and outcomes between the COVID-19 patients with breast cancer and the other COVID-19 patients [25]. A prospective registry at the

Institute Curie in Paris suggests that the COVID-19 mortality rate in breast cancer patients depends more on comorbidities than prior radiation therapy or current anti-cancer treatment [26]. Although modelling is very difficult in the present circumstances, Alagoz et al concluded that it is likely that prolonged pandemic related disruptions of breast cancer care will have a small long-term cumulative impact on breast cancer mortality [27]. Regardless, it remains particularly difficult to entangle all possible factors involved, and only long-term nation-wide breast cancer specific mortality statistics will allow us to have an insight on the impact COVID-19 on breast cancer outcome.

In the present analysis, we do not have any direct evidence that breast cancer care was inferior during the first wave in EUSOMA certified centers. Neoadjuvant treatment was used safely to delay surgery, and there was no reported underuse of various treatment modalities resulting in normal breast cancer quality of care standards in the entire breast cancer population treated in EUSOMA centers. Our study has limitations as follow-up data are lacking and it is not clear whether the results of high level EUSOMA-certified centers can be translated to breast cancer care in other situations. However, it is encouraging that this large data set proves that the quality of breast cancer care was well maintained in EUSOMA certified centers during the first wave the COVID-19 pandemic. This confirms the underlying hypothesis that the certification process creates robust structures, audit and quality control mechanisms capable of facing even unforeseen challenges.

Conclusion

This is the first multicentre international analysis on the effect of the COVID-19 pandemic on breast cancer care. Quality of breast cancer care was well maintained in EUSOMA certified breast Centres during the first wave of the COVID-19 pandemic. A small but significantly higher tumour and lymph node stage at presentation was observed.

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Declaration of interests

☐ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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