



Characteristics and outcomes of patients with breast cancer diagnosed with SARS-Cov-2 infection at an academic center in New York City

Kevin Kalinsky¹ · Melissa K. Accordino¹ · Kristina Hosi¹ · Jessica E. Hawley¹ · Meghna S. Trivedi¹ · Katherine D. Crew¹ · Dawn L. Hershman¹

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Previous reports of patients with Coronavirus disease 2019 (COVID-19) showed higher severity of disease in cancer patients, including the intubation rate [1]. These series focused on those with symptoms from COVID-19 requiring hospitalization, with lung cancer being the most frequent malignancy [1, 2]. We report characteristics and outcomes of COVID-19 + patients with breast cancer (BC) at an academic center in New York City.

Methods

We collected demographic, treatment, and outcome data from established patients with stage I-IV BC at Columbia University Irving Medical Center (CUIMC) and COVID-19 + from 3/10/20 to 4/29/20 (data cut off). COVID-19 + was determined by reverse transcription-polymerase chain reaction (RT-PCR) by nasal swab and/or high clinical or radiographic suspicion. Initially, all outpatients with symptoms were referred to the emergency department (ED) for testing; however, outpatient testing, including at an ambulatory referral-based CUIMC fever clinic, was rapidly expanded with cobas® SARS-CoV-2 testing (Roche). This study was CUIMC Institutional Review Board approved.

Results

Of the 4515 COVID-19 + total patients at CUIMC, 27 (0.6%) were established patients with a history of BC (Table 1). Twenty-six (96%) were female; 15 (56%) White, 6 (22%) Black, and 12 (44%) identified as Hispanic. The

median age was 56 years (range: 32–87), median body mass index was 28.5 kg/m² (range: 21–47), and 7 (26%) were current/former smokers. Co-morbidities included 15 (56%) with hypertension, 6 (22%) diabetes, and 6 (22%) pulmonary disease. The majority had stage I-III BC and 5 (19%) metastatic disease. In the 6 months prior to COVID-19 +, 16 (59%) received chemotherapy, 12 (44%) hormone therapy, 6 (22%) HER2-directed therapy, 1 (4%) checkpoint inhibitor, 6 (22%) breast surgery, and 2 (7%) radiation therapy. Prior to COVID-19 +, the last received therapy was chemotherapy for 14 patients [52%, median: 12 days (range 7–749)], 10 (37%) hormone therapy [median: 1 day (range 1–81)], and 3 (11%) HER2-directed antibodies without chemotherapy [median: 21 days (range 20–34)]. Treatment disruptions occurred in 20 patients (74%) due to COVID-19 +.

Most common symptoms were cough (70%), fever (52%), shortness of breath (52%), fatigue (30%), diarrhea (22%), and myalgia (19%), with 30% having ≥ 4 symptoms (Fig. 1). Twenty-two patients (81%) had COVID-19 + confirmation by RT-PCR, 4 (15%) presumed COVID-19 + per clinical symptoms, and 1 (4%) based on imaging and symptoms. Eight (30%) were initially tested in the ED, of whom 3 were not admitted. The majority were tested in the outpatient setting: ambulatory oncology clinic (6 patients; 22%) or CUIMC fever clinic (8 patients; 30%).

Of the 7 patients requiring hospitalization (26%), 3 were non-Hispanic Black, 3 Hispanic White, and 1 non-Hispanic White. Two received recent chemotherapy without targeted agents for early stage BC and 5 single-agent hormone therapy (1 for metastatic disease). Five admitted patient had at least 1 co-morbid disease, and 3 were former smokers. Five admitted patients required supplemental oxygen, and none needed intensive care-level support, including intubation or dialysis. All were discharged from the hospital. With a median follow-up from COVID-19 + diagnosis of 26 days (range 1–38), all patients were alive, except for an 87-year-old male with coronary artery disease, hypertension, and

✉ Kevin Kalinsky
kk2693@cumc.columbia.edu

¹ Columbia University Irving Medical Center, New York, NY, USA

Table 1 Baseline demographics, treatments, and outcomes in COVID-19+ patients with a history of breast cancer (*n* = 27)

Pt #	Age	Gender	Stage	Smoker	Co-morbidity	Last treatment	Time from last treatment to COVID-19+, days	COVID-19+determination	COVID-19 RT-PCR test location	Admitted	Treatment disruption	Alive
1	65	F	III	Never	Htn	Nab-paclitaxel	7	RT-PCR	ED	N	Y	Y
2	32	F	IV	Never	N/A	Nab-paclitaxel/atezolizumab	12	RT-PCR	ED	N	Y	Y
3	39	F	II	Never	N/A	Goserelin/aromatase inhibitor	1	RT-PCR	Onc clinic	N	Y	Y
4	87	M	II	Former	Cad, Htn	Carboplatin/paclitaxel	7	Presumed (Imaging)	N/A	N	N	N
5	68	F	I	Never	Cad, Pulm	Cytosol/methotrexate/5-FU	16	RT-PCR	ED	Y	Y	Y
6	41	F	III	Never	Pulm	Goserelin/aromatase inhibitor	81	RT-PCR	Fever clinic	N	Y	Y
7	62	F	I	Never	Htn	Pertuzumab/trastuzumab	21	RT-PCR	Onc clinic	N	Y	Y
8	54	F	II	Former	N/A	Aromatase inhibitor	1	RT-PCR	Fever clinic	Y	Y	Y
9	46	F	II	Never	N/A	Trastuzumab/pertuzumab/goserelin/aromatase inhibitor	20	RT-PCR	Fever clinic	N	Y	Y
10	80	F	III	Former	Htn, Pulm	Doxorubicin/cyclophosphamide	22	RT-PCR	ED	Y	Y	Y
11	48	F	II	Never	Htn	Taxol	56	RT-PCR	Fever clinic	N	Y	Y
12	54	F	I	Never	DM, Htn	Aromatase inhibitor	1	Presumed (symptoms)	N/A	N	N	Y
13	49	F	I	Never	DM, Htn, Pulm	Tamoxifen	1	RT-PCR	ED	Y	N	Y
14	78	F	II	Never	DM, Htn	Taxotere/cytosol	11	RT-PCR	ED	N	Y	Y
15	46	F	IV	Never	DM	Fulvestrant	47	RT-PCR	Fever clinic	N	Y	Y
16	55	F	IV	Current	Htn, Pulm	Nab-paclitaxel	749	Presumed (symptoms)	N/A	N	N	Y
17	56	F	II	Never	N/A	Paclitaxel	7	RT-PCR	Onc clinic	N	Y	Y
18	62	F	I	Never	Htn, Cad	Paclitaxel/trastuzumab	7	RT-PCR	Onc clinic	N	Y	Y
19	73	F	IV	Never	DM, Htn	Oral selective estrogen receptor downregulator	1	RT-PCR	Fever clinic	Y	Y	Y
20	49	F	II	Current	N/A	Taxotere/carboplatin/trastuzumab/pertuzumab	8	RT-PCR	Fever clinic	N	Y	Y
21	79	F	II	Former	Htn	Paclitaxel/trastuzumab	9	Presumed (symptoms)	N/A	N	Y	Y
22	47	F	III	Never	Htn, DM	Trastuzumab	34	RT-PCR	Fever clinic	N	Y	Y
23	58	F	II	Former	N/A	Aromatase inhibitor	1	RT-PCR	ED	Y	N	Y
24	59	F	II	Never	Htn	Aromatase inhibitor	1	RT-PCR	ED	Y	N	Y
25	74	F	II	Never	N/A	Aromatase inhibitor	1	Presumed (symptoms)	N/A	N	N	Y
26	75	F	IV	Never	Htn, Pulm	Carboplatin/etoposide	19	RT-PCR	Onc clinic	N	Y	Y
27	51	F	III	Never	N/A	Carboplatin	21	RT-PCR	Onc clinic	N	Y	Y

Cad coronary artery disease, *DM* diabetes mellitus, *ED* emergency department, *F* female, *HTN* hypertension, *M* male, *N* no, *N/A* not applicable, *Onc Clinic* oncology clinic, *Pulm* pulmonary disease, *RT-PCR* reverse transcription polymerase chain reaction (nasal swab), *Y* Yes

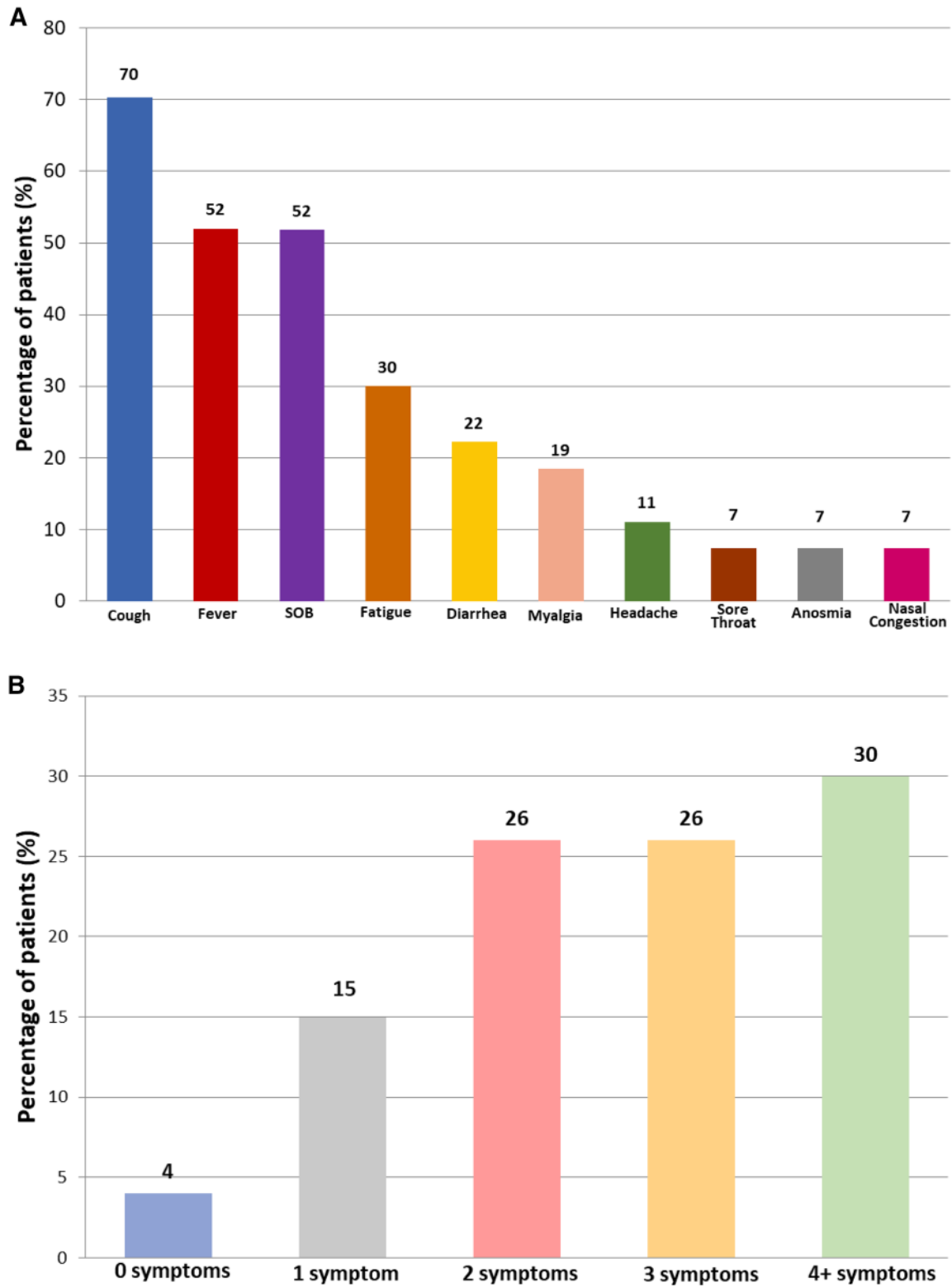


Fig. 1 **a** Percentage of COVID-19-related symptoms with which patients presented who had a history of stage I-IV breast cancer ($n=27$). **b** Percentage of these patients who presented with 0, 1, 2, 3, or at least 4 COVID-19-related symptoms

former smoker who received taxane-based chemotherapy for stage II BC seven days before symptoms.

Discussion

In our racially/ethnically diverse population of 27 COVID-19+ patients with BC, the majority (74%) did not require hospitalization, and one male with multiple co-morbidities died. This is of interest, as COVID-19+ males have reported worse outcomes than females [3]. While treatment disruptions occurred in most patients (74%), it is unknown whether this represents a deviation from other patients who develop infections on therapy. While larger series are needed to understand the impact of COVID-19 in patients with BC, these initial data are reassuring that a substantial number recover from their infection.

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Compliance with ethical standards

Conflict of interest No conflicts are related to this particular study. For unrelated conflicts, Kevin Kalinsky served as a consultant/advisory board member for Immunomedics, Biotheranostics, Pfizer, Novartis, Eisai, Eli-Lilly, Amgen, and AstraZeneca. He has received institutional grants from Immunomedics, Novartis, Incyte, Genentech/Roche, Eli-Lilly, Pfizer, Calithera Biosciences, Acetylon, Seattle Genetics,

Amgen, Zentaris Pharmaceuticals, and CytomX Therapeutics. Served on speakers' bureau for Eli-Lilly. Received travel expenses from Lilly and Astra Zeneca. Spouse was previously employed by Novartis, Array Biopharma, and Pfizer.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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