Hematology Patient Protection During the COVID-19 Pandemic in Italy: A Nationwide Nursing Survey

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Abstract. Background: Italy has been one of the first European countries hit by the COVID-19 pandemic, with many patients dying from severe respiratory issues, especially frail subjects. Hematology patients are generally thought to be at high risk of developing severe COVID-19-associated complications. The aim of this work was to describe the infection control measures adopted in Italian hematology settings to protect patients and health-care professionals.

Materials and Methods: On behalf of the Nursing Campus in Hematology Group, a nationwide nursing survey was conducted. Questionnaire items included general information, infection control measures, patient and health-care professional protection, information management, and participants' opinion on critical issues. Data have been analyzed by center location (Northern, Central, or Southern Italy) and by patient age (adult vs pediatric).

Results: Forty-four Italian hematology centers participated, representing 52.4% of those invited. Patients underwent nasopharyngeal swabs (93.2%) generally the day before admission (43.2%), though less frequently in Southern centers (p = 0.0377). Visitor restrictions were implemented in all centers: 65.9% barred all visitors, while 25.0% allowed visitors only for patients with specific conditions, especially in Central Italy. Deficiency of personal protective equipment, including masks (45.5%) and gloves (22.7%), was reported, although the nurses' opinion was that the emergency was nevertheless well managed to protect patients and professionals. Almost all health-care institutions (97.7%) provided recommendations on emergency management. No significant differences were found between adult and pediatric centers in terms of infection prevention and control.

Discussion: Low variability in patient protection strategies was observed, meaning that national recommendations were effective. However, some critical issues emerged regarding the management of infected health-care professionals and their contacts.

Keywords: COVID-19; SARS-CoV-2; Coronavirus; Infection spread; Hematology; Infection control; Patient safety; Patient Protection; Nursing.
Introduction. Most individuals infected with the novel coronavirus disease (COVID-19) will experience mild to moderate respiratory illness and recover without requiring special treatment. Older people and those with underlying medical problems, like cardiovascular disease, diabetes, chronic respiratory disease, and cancer, are more likely to develop a serious form of the COVID-19 disease named Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2).1,2,3,4

In Italy, the number of COVID-19 cases began to increase exponentially in the second half of February 2020.5 However, it has been hypothesized that the virus was already circulating in the population in late January.6

Over the weeks following the initial outbreak, clusters of SARS-CoV-2 infection began to appear in Northern Italy,7 and many people developed life-threatening conditions that required admission to an intensive care unit (ICU).8 Despite several actions undertaken by the Italian health authorities, a rapid spread of the virus was observed throughout March, leading the Italian Government to issue strict containment measures to limit individuals' free circulation throughout the country.9,10,11,12 Considering the number of infected cases and the mortality rate, Italy was initially one of the worst-hit countries in Europe.13

Initially, COVID-19 mortality, expressed as fatality rate (FR), was higher in Italy than in other European countries and in China due to various factors, such as demographic aging, screening, and testing strategies, and the definition of death adopted.9 Examining the cohort of patients who died before March 30, 2020, a higher prevalence was observed in people over age 70 years (FR = 23.8%) and in males (FR 13.3% vs. 7.4%). The presence of comorbidities appears to be associated with mortality, especially among older patients,14 as documented by previous publications.15,16,17

Although there are few and controversial data on COVID-19 patients with malignant hematological conditions,18,19 it is reasonable to consider them at a high risk of death because they are immunocompromised.20,21,22,23,24 The Italian Society of Hematology (SIE) and the Italian Group for Bone and Marrow Transplantation (GITMO), the Italian Bone Marrow Donor Registry (IBMDR), the Italian Blood Center (CNS), and the National Italian Transplant Center (CNT) have all published several suggestions and recommendations25,26,27,28 on how to manage hematological patients in different settings.

However, the practical application of those suggestions and recommendations may have fallen short due to the still limited knowledge of the virus's transmission mechanisms,29,30 the lack of reliable screening tests and strategies,15,16 and the high speed of contagion.31 Hospital departments and wards had very little time to put emergency measures in place to contain the spread of infection. A proactive approach adopting strict isolation precautions as well as surveillance and control strategies appeared to be the best method to prevent the spread of the virus, thereby protecting and ensuring hematology patients' safety.32,33

This paper describes the main organizational and contextual issues in Italian hematology units and how they have protected their patients and staff during the COVID-19 pandemic.

The aims of the survey were: a) to explore real-life practices for containing the spread of SARS-CoV-2 in hematology settings; b) to analyze significant differences according to each center’s location (Northern, Central, Southern Italy) and patient age (adult, pediatric); c) to investigate nurses’ opinions on how well his/ her local health authority managed the crisis.

Materials and Methods. A cross-sectional study was conducted from April 17 to May 8, 2020, on behalf of the Nursing Campus in Hematology (NCH) project, a cooperative network of nurses working in Italy's hematology settings. Data focused on different clinical settings of hematology were previously provided by our organization without concerning nursing issues.34,35,36,37

Hematology nurses involved in our group's various activities were invited to participate via email and were provided with a link to the online survey. Participation was voluntary, and consent was assumed upon completion of the questionnaire. Data were collected anonymously. Given the exploratory objectives of the survey, only one questionnaire per center was required.

The questionnaire was developed by the multidisciplinary NCH team composed of hematology nurses, physicians, and research methodologists, who took into account the suggestions provided in the available literature and focused on the major areas of...
interest for practice. The questionnaire was tested for clarity and comprehension in 8 centers before the formal start of the study.

The nurse survey consisted of 39 items: 5 investigating details of the hematology center, the remaining 34 covering general information (organization, local epidemiology), infection control measures adopted, patient and Health Care Professionals (HCPs) protection (COVID-19 testing strategies, safety behaviors, etc.), information management, and nurses' perception of infection control management (evaluated with a 10-point Likert scale).

**Statistical analysis.** The adopted strategy for data analysis was based on the epidemiology items, i.e., the spread of infection throughout the geographical areas (Northern, Central, Southern Italy) and the variable incidence in different age groups (Adult, Pediatric). Clustering analysis was done to explore any behavioural differences due to the virus' spread characteristics and / or timing and the different regional health care organizational systems.

The statistical analysis was performed by Matlab statistical toolbox version 2008 (MathWorks, Natick, MA, USA) for Windows at 32 bits, on a sample of 44 different centres.

Data are presented as numbers and percentages for categorical variables, and continuous data are expressed as the mean ± standard deviation (SD) unless otherwise specified. The χ² test and Fisher's exact test were performed to evaluate significant differences in proportions or percentages between groups. A binomial test was performed to compare two mutually exclusive proportions or percentages. The multiple comparison chi-square test was used to defined significant differences between percentages for unpaired data; if the chi-square test was positive (p-value less than 0.05), then post-hoc with Z-test was performed to locate the highest or lowest significant presence. Multiple comparison Cochran's Q tests were used to compare the differences between percentages for paired data, considering the null hypothesis that there were no differences between the variables or modalities. When the Cochran's Q test was positive (p<0.05), a minimum required difference for a significant difference between two proportions was calculated using the minimum required differences method with Bonferroni p-value corrected for multiple comparisons. One-way ANOVA test was used in multiple comparisons between means; a post-hoc Scheffe test for pairwise comparison of subgroups was performed. The Mann-Whitney test, the alternative to the independent samples t-test when the samples' distribution is non-normal, was used to test the significance of the difference between two independent samples. All tests with p-value (p)<0.05 were considered significant.

**Results.** Eighty-four hematology centers were invited to complete the survey; 44 centers (52.4%) completed the survey, 26 of which (59.1%) were in the North of Italy (NIT), 6 (13.6%) in the Center of Italy (CIT), and 12 (27.3%) in the South of Italy and Islands (SITI).

Thirty-one centers (70.4%) provide care to adult patients, 7 (15.9%) to pediatric patients, and 6 (13.6%) to both pediatric and adult patients. Only two adult centers (1 in the North and 1 in the South) did not perform stem cell transplants.

As is known, the SARS-CoV-2 virus has spread throughout Italy, starting from the North to the South, with different characteristics of severity. Furthermore, the incidence and severity of clinical manifestations in adult and pediatric patients appear to differ. We performed our analysis assuming differences in patient protection strategies by geographic area and patient age.

First, three groups corresponding to the three macro areas of Italy (North, Central, and South and Islands) were considered. **Table 1** summarizes the survey items, answer frequencies, and univariate and multivariate analyses both in and between groups of each item. The participating centers were then grouped as follows: adult patients (AP) centers, pediatric centers, and those who treat both adults and pediatrics (PAP). Results are shown in **Table 2 (Supplementary materials)**.

**General information.** Almost all the participating hematology centers (Table 3 supplementary materials) were located in hospitals with a dedicated COVID-19 ward (96.1%, 100%, and 83.3% in NIT, CIT, SITI, respectively). Hematology patients positive to SARS-CoV-2 were generally admitted in these wards (90.9%), with no differences between groups. Many hospitals organized COVID-19 pre-triage pathways (77.3%) performed by physicians and/or nurses in order to filter patients' access at hospital gates. These pre-triage pathways were less present in NIT (65.4%) than in CIT (100%) and SITI (91.7%), although the differences were not statistically significant (p=0.072). Body temperature, respiratory frequency, and oxygen saturation measurements, and rapid diagnostic tests for COVID-19 were included in these pathways.

**Infection control measures.** The number of beds was reduced in 22.7% of hematology centers, with no statistically significant difference between groups. Three centers stopped stem cell transplant activity.

The proportion of hematology wards who have had COVID-19-positive patients differed between
Table 1. Geographic areas: univariate and multivariate analyses in and between subgroups.

| Items and answers | Total | Northern Italy (NIT) | Central Italy (CIT) | Southern Italy and Islands (SITI) | Statistical analysis between subgroups |
|-------------------|-------|----------------------|---------------------|-----------------------------------|---------------------------------------|
| % (Nr)            | % (Nr) | % (Nr)               | % (Nr)              | p values                          |
| 100 (44)          | 59.1 (26) | 13.6 (6) | 27.3 (12) | p=0.20 (Cm) |
| Type of patient cared for |       |          |          |                                   |
| A – Pediatric     | 15.9 (7) | 23.1 (6) | 16.7 (1) | 0.0 (0) | p=0.13 (Cm) |
| B – Adult         | 70.5 (31) | 65.4 (17) | 50.0 (3) | 91.7 (11) | p=0.31 (Cm) |
| C – Both          | 13.6 (6) | 11.5 (3) | 33.3 (2) | 8.3 (1) | p=0.0019* (Cm) |
|                    |         |          |          | p=0.0001* (Cm) | Answer B**, p=0.0078 (Z) |
|                    |         |          |          | p=0.61 (Cm) | Answer C ***, p=0.0362 (Z) |
| 1. In your hospital, are there wards reserved for COVID-19 patients? |       |          |          |                                   |
| A - Yes           | 93.2 (41) | 96.1 (25) | 100 (6) | 83.3 (10) | p=0.27 (Cm) |
| B - No            | 6.8 (3) | 3.9 (1) | 0.0 (0) | 16.7 (2) | — |
|                    |         |          |          | Answer A**, p=0.0001 (B) | Answer A**, p=0.0156 (B) |
|                    |         |          |          | Answer A**, p=0.0225 (B) | Answer A**, p=0.0001 (B) |
| 2. In your center, is there a stem cell transplantation unit? |       |          |          |                                   |
| A - Yes           | 95.5 (42) | 96.1 (25) | 100.0 (6) | 91.7 (11) | p=0.70 (Cm) |
| B - No            | 4.5 (2) | 3.9 (1) | 0.0 (0) | 8.3 (1) | — |
|                    |         |          |          | Answer A**, p=0.0001 (B) | Answer A**, p=0.0156 (B) |
|                    |         |          |          | Answer A**, p=0.0034 (B) | Answer A**, p=0.0034 (B) |
| 3. In your center, were the number of beds reduced during the COVID-19 pandemic? |       |          |          |                                   |
| A - Yes           | 22.7 (10) | 19.2 (5) | 33.3 (2) | 25.0 (3) | p=0.74 (Cm) |
| B - No            | 68.2 (30) | 69.2 (18) | 50.0 (3) | 75.0 (9) | p=0.55 (Cm) |
| C - Other         | 9.1 (4) | 11.5 (3) | 16.7 (1) | 0.0 (0) | p=0.41 (Cm) |
|                    |         |          |          | Answer B**, p=0.0027 (Z) | Answer C ***, p=0.0362 (Z) |
|                    |         |          |          | p=0.61 (Cm) | Answer B**, p=0.0244 (Z) |
|                    |         |          |          | Answer B**, p=0.0244 (Z) | Answer B**, p=0.0012 (Z) |
| 4. In your center, did you have any COVID-19-positive patients? (swab or serology or rapid test positivity) |       |          |          |                                   |
| A - Yes           | 43.2 (19) | 46.2 (12) | 83.3 (5) | 16.7 (2) | p=0.0238 * (Cm) |
| B - No            | 56.8 (25) | 53.8 (14) | 16.7 (1) | 83.3 (10) | — |
|                    |         |          |          | p=0.70 (B) | p=0.125 (B) |
|                    |         |          |          | Answer B**, p=0.00225 (B) | Answer B**, p=0.00225 (B) |
| 5. In your center, did you have any patients with signs or symptoms associated with COVID-19? |       |          |          |                                   |
| A - Yes           | 31.8 (14) | 30.8 (8) | 83.3 (5) | 8.3 (1) | p=0.0055 * (Cm) |

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6. In your hospital, was there a separate pre-triage area for patients with COVID-19 signs or symptoms?

| Option                  | Yes (%) | No (%) | p-value (Cm) | p-value (B) | Answer A** p-value (B) |
|-------------------------|---------|--------|--------------|-------------|------------------------|
| A - Yes                 | 77.3 (34) | 65.4 (17) | 100.0 (6) | 91.7 (11) | p=0.072 (Cm) |
| B - No                  | 22.7 (10) | 34.6 (9) | 0.0 (0) | 8.3 (1) | — |

7. Who worked in the triage area?

| Option                  | Nurses only | Nurses and Doctors | p-value (B) | p-value (Cm) | Answer A** p-value (B) |
|-------------------------|-------------|--------------------|-------------|--------------|------------------------|
| A - Nurses only         | 43.2 (19)   | 46.2 (12)          | 50.0 (3) | 33.3 (4) | p=0.71 (Cm) |
| B - Nurses and Doctors  | 56.8 (25)   | 53.8 (14)          | 50.0 (3) | 66.7 (8) | — |

8. Which tests were performed in the triage area?

| Option                  | Body temperature only | Body temperature with additional tests | p-value (B) | p-value (Cm) | Answer A** p-value (B) |
|-------------------------|-----------------------|---------------------------------------|-------------|--------------|------------------------|
| A - Body temperature only | 15.9 (7)              | 19.2 (5)                             | 0.0 (0) | 16.7(2) | p=0.51 (Cm) |
| B - Body temperature with additional tests | 84.1 (37) | 80.8 (21) | 100.0 (6) | 83.3 (10) | — |

9. Were nasopharyngeal swab tests performed before patient admission?

| Option                  | Yes (%) | Only for patients with signs/symptoms (%) | Other (Type of treatment) (%) | p-value (B) | p-value (Cm) | p-value (Z) |
|-------------------------|---------|----------------------------------------|-------------------------------|-------------|--------------|-------------|
| A - Yes                 | 93.2 (41) | 96.2 (25)                             | 83.3 (5)                                         | 91.7 (11) | p=0.52 (C)  |
| B - Only for patients with signs/symptoms | 4.5 (2) | 3.8 (1)                              | 16.7 (1)                                         | 0.0 (0) | p=0.27 (C)  |
| C - Other (Type of treatment) | 2.3 (1) | 0.0 (0)                              | 0.0 (0)                                         | 8.3 (1) | p=0.26 (C)  |

10. If so, when were they tested?

| Option                  | The day before admission | Some days before admission | Before and repeated at admission | At admission | Some days before and then repeated the day before admission | p-value (Cm) | p-value (Z) |
|-------------------------|--------------------------|----------------------------|-------------------------------|--------------|------------------------------------------------------------|-------------|-------------|
| A - The day before admission | 43.2 (19)              | 53.8 (14)                   | 66.7 (4)                            | 8.3 (1)                    | 0.0143 * (Cm)                      | 0.0143 * (Cm) |
| B - Some days before admission | 29.5 (13)              | 26.9 (7)                     | 0.0 (0)                             | 50.0 (6)                    | p=0.082 (Cm)                      | p=0.082 (Cm) |
| C - Before and repeated at admission | 11.4 (5)               | 15.4 (4)                     | 16.7 (1)                            | 0.0 (0)                     | p=0.35 (Cm)                       | p=0.35 (Cm) |
| D - At admission         | 13.6 (6)                | 3.8 (1)                      | 16.7 (1)                            | 33.3 (4)                    | p=0.047 * (Cm)                     | p=0.047 * (Cm) |
| E - Some days before and then repeated the day before admission | 2.3 (1) | 0.0 (0)                       | 0.0 (0)                             | 8.3 (1)                    | p=0.26 (Cm)                       | p=0.26 (Cm) |
11. When did you receive the tests results after nasopharyngeal swab?

| A - Within 12 hours | 45.5 (20) | 57.7 (15) | 16.7 (1) | 33.3 (4) | p=0.12 (Cm) |
|---------------------|-----------|-----------|----------|----------|--------------|
| B - From 12 to 24 hours | 45.5 (20) | 38.5 (10) | 66.7 (4) | 50.0 (6) | p=0.43 (Cm) |
| C - After 24 hours | 9.0 (4) | 3.8 (1) | 16.7 (1) | 16.7 (2) | p=0.35 (Cm) |

12. Where were COVID-19-positive hematology patients needing hospitalization admitted?

| A - In a COVID-19 ward | 90.9 (40) | 88.5 (23) | 100.0 (6) | 91.7 (11) | p=0.67 (Cm) |
|------------------------|-----------|-----------|----------|----------|--------------|
| B - In hematology ward | 4.5 (2) | 3.8 (1) | 0.0 (0) | 8.3 (1) | p=0.70 (Cm) |
| C - Other: medical-oncological ward | 4.5 (2) | 7.7 (2) | 0.0 (0) | 0.0 (0) | p=0.48 (Cm) |

13. Were more restrictive measures for visitor access to the hematology ward taken to prevent the spread of infection?

| A - Yes | 100 (44) | 100 (26) | 100 (6) | 100 (12) | P=1.0 (Cm) |
|---------|---------|---------|-------|--------|------------|
| B - No | 0.0 (0) | 0.0 (0) | 0.0 (0) | 0.0 (0) | — |

14. If so, what measures were taken?

| A - Visitors were not allowed | 65.9 (29) | 76.9 (20) | 33.3 (2) | 58.3 (7) | p=0.10 (C) |
|--------------------------------|-----------|-----------|----------|----------|-------------|
| B - Only visitors of patients with particular clinical conditions were allowed | 25.0 (11) | 19.2 (5) | 66.7 (4) | 16.7 (2) | p=0.0395 * (C) |
| C - Visitors of patients in particular clinical conditions were allowed, though for a reduced time | 9.1 (4) | 3.8 (1) | 0.0 (0) | 25 (3) | p=0.077 (Cm) |

15. Were screening tests for healthcare professionals performed?

| A – Yes | 79.5 (35) | 76.9 (20) | 83.3 (5) | 83.3 (10) | p=0.87 (Cm) |
|---------|---------|---------|-------|--------|------------|
| B – No | 20.5 (9) | 23.1 (6) | 16.7 (1) | 16.7 (2) | — |

16. Which screening tests were performed?

| A - Not applicable (No to question 15) | 20.5 (9) | 23.1 (6) | 16.7 (1) | 16.7 (2) | p=0.87 (Cm) |
|--------------------------------------|---------|---------|-------|--------|-------------|
| B - Nasopharyngeal swab | 22.7 (10) | 23.1 (6) | 33.3 (2) | 16.7 (2) | p=0.73 (Cm) |
| C - Blood tests (blood samples or rapid tests) | 9.1 (4) | 11.5 (3) | 0.0 (0) | 8.3 (1) | p=0.80 (Cm) |
| | D – Both | 47.7 (21) | 42.3 (11) | 50.0 (3) | 58.3 (7) | p=0.65 (Cm) |
|---|---|---|---|---|---|---|
| 17. Were the tests routinely repeated? | A - Yes | 68.2 (30) | 73.1 (19) | 66.7 (4) | 58.3 (7) | p=0.86 (Cm) |
| | B – No | 11.4 (5) | 3.8 (1) | 16.7 (1) | 25.0 (3) | p=0.15 (Cm) |
| | C - Not applicable (No to question 15) | 20.4 (9) | 23.1 (6) | 16.7 (1) | 16.7 (2) | p=0.87 (Cm) |
| | | p<0.0001* (Cm) | p=0.22 (Cm) | p=0.17 (Cm) |
| | Answer A**, p=0.0008 (Z) | Answer B***, p=0.0055 (Z) |
| 18. Please describe characteristics of screening | A – Structured screening | 65.9 (29) | 65.4 (17) | 66.7 (4) | 66.7 (8) | p=1.00 (Cm) |
| | B – one-off test | 9.1 (4) | 7.7 (2) | 16.7 (1) | 8.3 (1) | p=0.78 (Cm) |
| | C - No test | 18.2 (8) | 19.2 (5) | 16.7 (1) | 16.7 (2) | p=0.98 (Cm) |
| | D - Not specified | 6.8 (3) | 7.7 (2) | 0.0 (0) | 8.3 (1) | p=0.77 (Cm) |
| | | p<0.0001* (Cm) | p=0.11 (Cm) | p=0.0101* (Cm) |
| | Answer A**, p=0.0001 (Z) | Answer B***, p=0.0499 (Z) | Answer A**, p=0.0094 (Z) |
| 19. Were any healthcare professionals COVID-19-positive? | A – Yes | 47.7 (21) | 57.7 (15) | 66.7 (4) | 16.7 (2) | p=0.0380 * (Cm) |
| | B – No | 52.3 (23) | 42.3 (11) | 33.3 (2) | 83.3 (10) | p=0.44 (B) |
| | | p=0.45 (B) | p=0.0225 (B) |
| 20. Were the COVID-19-positive healthcare professionals in self-isolation? | A - Yes | 100.0 (44) | 100.0 (26) | 100.0 (6) | 100.0 (12) | p=1.00 (Cm) |
| | B - No | 0.0 (0) | 0.0 (0) | 0.0 (0) | 0.0 (0) | — |
| | | Answer A**, p=0.0001 (B) | Answer A**, p=0.0156 (B) | Answer A**, p=0.0001 (B) |
| 21. Please specify how the healthcare professionals or patients who had contact with COVID-19-positive healthcare professionals/patients were managed | A - Alerting competent authorities | 15.9 (7) | 23.1 (6) | 16.7 (1) | 0.0 (0) | p=0.19 (Cm) |
| | B - Education | 2.3 (1) | 0.0 (0) | 16.7 (1) | 0.0 (0) | p=0.0392 * (Cm) |
| | | CIT, **, p=0.0279 (Z) |
| | C - Screening tests | 40.9 (18) | 46.2 (12) | 16.7 (1) | 41.7 (5) | p=0.42 (Cm) |
| | D - Not managed | 20.4 (9) | 19.2 (5) | 33.3 (2) | 16.7 (2) | p=0.69 (Cm) |
| | E – Not specified/unknown | 18.2 (8) | 11.5 (3) | 16.7 (1) | 33.3 (4) | p=0.27 (Cm) |
| | F – PPE | 2.3 (1) | 0.0 (0) | 0.0 (0) | 8.3 (1) | p=0.26 (Cm) |
| | | p=0.0003* (Cm) | p=0.85 (Cm) | p=0.052 (Cm) |
22. Did self-isolated COVID-19-positive healthcare professionals repeat the nasopharyngeal swab before returning to work?

| Option | A - Yes | B - No |
|--------|---------|--------|
| Yes | 93.2 (41) | 6.8 (3) |
| No | 6.8 (3) | 93.2 (41) |

Answer C**, p=0.0006 (Z)
Answer B***, p=0.0202 (Z)
Answer F***, p=0.0202 (Z)

23. What personal protective equipment (PPE) was used during daily care of (COVID-19-negative) hematology patients?

| PPE                | A | B | C | D | E | F | G | H | I |
|--------------------|---|---|---|---|---|---|---|---|---|
| Surgical mask      | 86.4 (38) | 88.5 (23) | 100.0 (6) | 75.0 (9) | p=0.31 (Cm) |
| FFP2               | 27.3 (12) | 19.2 (5) | 33.3 (2) | 41.7 (5) | p=0.33 (Cm) |
| FFP3               | 2.3 (1) | 3.8 (1) | 0.0 (0) | 0.0 (0) | p=0.70 (Cm) |
| TNT gown           | 36.4 (16) | 23.1 (6) | 33.3 (2) | 16.7 (2) | p=0.73 (Cm) |
| Water-resistant gown | 22.7 (10) | 23.1 (6) | 33.3 (2) | 16.7 (2) | p=0.73 (Cm) |
| Full suit          | 0.0 (0) | 0.0 (0) | 0.0 (0) | 0.0 (0) | p=1.00 (Cm) |
| Visor              | 11.4 (5) | 11.5 (3) | 16.7 (1) | 3.8 (1) | p=0.87 (Cm) |
| Safety glasses     | 25.0 (11) | 26.9 (7) | 16.7 (1) | 25.0 (3) | p=0.87 (Cm) |
| Both visor/glasses | 15.9 (7) | 7.7 (2) | 33.3 (2) | 25.0 (3) | p=0.18 (Cm) |

24. Were masks lacking during the acute phase of COVID-19?

| Option | A - Yes | B - No |
|--------|---------|--------|
| Yes | 45.5 (20) | 54.5 (24) |
| No | 54.5 (24) | 45.5 (20) |

Answer A**, p<0.05 (MRD)
Answer A>C*, p<0.05 (MRD)
Answer A>F*, p<0.05 (MRD)

25. Were any other PPEs lacking?

| PPE                | A | B | C | D | E |
|--------------------|---|---|---|---|---|
| Surgical mask      | 43.2 (19) | 43.3 (11) | 50.0 (3) | 50.0 (6) | p=0.88 (Cm) |
| Gowns              | 45.5 (20) | 46.1 (12) | 33.3 (2) | 50.0 (6) | p=0.79 (Cm) |
| Safety glasses/Visors | 34.1 (15) | 34.6 (9) | 33.3 (2) | 33.3 (4) | p=1.00 (Cm) |
| Gloves             | 22.7 (10) | 19.2 (5) | 0.0 (0) | 41.7 (5) | p=0.11 (Cm) |
| Other (shoe cover, cap) | 4.5 (2) | 3.8 (1) | 0.0 (0) | 8.3 (1) | p=0.70 (Cm) |

26. When were masks worn?
| | A - Only in patients’ rooms or during patient care | B - Everywhere and all the time in the ward/hospital | C - Other |
|---|---|---|---|
| | 4.5 (2) | 100.0 (26) | 0.0 (0) |
| p | 0.06 (Cm) | 0.06 (Cm) | 1.00 (Cm) |

| | Answer A**, p=0.0001 (Z) | Answer B**, p=0.0001 (Z) | Answer C***, p=0.0018 (Z) |
|---|---|---|---|
| | p=0.0001 (Cm) | p=0.0001 (Z) | p=0.0018 (Z) |
| ** | p=0.0025* (Cm) | p=0.0133 (Z) | p=0.0244 (Z) |
| | Answer A***, p=0.0025 (Z) | Answer B***, p=0.0060 (Z) | Answer C***, p=0.0244 (Z) |

27. How often were masks changed?

| | A - At every shift | B – Regularly, according to manufacturer’s instructions | C - Other |
|---|---|---|---|
| | 29.5 (13) | 43.2 (19) | 27.3 (12) |
| p | 0.06 (Cm) | 0.06 (Cm) | 0.13 (Cm) |
| ** | p=0.0001* (Cm) | p=0.0162 (Z) | p=0.0030* (Cm) |
| ** | p=0.0475 (Z) | p=0.0060 (Z) | p=0.0060 (Z) |
| ** | p=0.0018 (Z) | p=0.00244 (Z) |

28. Was access to any work environment limited during daily practice? (e.g., not over 2 HCPs in the same room, if not needed)

| | A - Yes | B - No | C - No, but instruction on safety distance was provided | D - Other |
|---|---|---|---|---|
| | 61.4 (27) | 13.6 (6) | 25.0 (11) | 0.0 (0) |
| p | 0.44 (Cm) | 0.57 (Cm) | 0.16 (Cm) | 1.00 (Cm) |
| ** | p=0.0392* (Cm) | p=0.0279 (Z) | p=0.0279 (Z) | p=0.0279 (Z) |
| ** | p=0.0055 (Z) | p=0.0055 (Z) |

29. Did your hospital/department provide any official recommendations or directives on COVID-19 emergency management?

| | A - Patient management | B - Access Management (visitors) | C - Personal protective equipment (PPE) management | D - Infection control of workers | E – Other |
|---|---|---|---|---|---|
| | 100.0 (44) | 93.2 (41) | 95.5 (42) | 100.0 (44) | 11.4 (5) |
| p | 1.00 (Cm) | 0.40 (Cm) | 0.06 (Cm) | 0.08 (Cm) | 0.65 (Cm) |
| ** | p=0.0392* (Cm) | p=0.0279 (Z) | p=0.0279 (Z) |
| ** | p=0.0018 (Z) | p=0.00244 (Z) |

No significant post hoc test
31. Did your hospital/department provide any recommendations/instructions to patients and their families to prevent contagion?

|            | A - Yes | B - No | C - I don’t know |
|------------|---------|--------|------------------|
| p<0.001* (Q) | 63.6 (28) | 22.7 (10) | 13.6 (6) |
| Answer E***, p<0.05 (MRD) | 73.1 (19) | 19.2 (5) | 7.7 (2) |
| p=0.009* (Q) | 66.7 (4) | 16.7 (1) | 16.7 (1) |
| Answer E***, p<0.05 (MRD) | 41.7 (5) | 33.3 (4) | 25.0 (3) |
| p=0.001* (Q) | 41.7 (5) | 33.3 (4) | 25.0 (3) |
| p<0.001* (Q) | 41.7 (5) | 33.3 (4) | 25.0 (3) |
| p<0.001* (Q) | 41.7 (5) | 33.3 (4) | 25.0 (3) |

32. Did your center provide any specific recommendations or instructions to hematology patients?

|            | A - Yes | B - No | C - I don’t know |
|------------|---------|--------|------------------|
| p=0.17 (Cm) | 50.0 (22) | 43.2 (19) | 6.8 (3) |
| Answer A**, p=0.0008 (Z) | 61.6 (16) | 34.6 (9) | 3.8 (1) |
| Answer C***, p=0.0149 (Z) | 33.3 (2) | 66.7 (4) | 0.0 (0) |
| p=0.0055 (Z) | 33.3 (2) | 66.7 (4) | 0.0 (0) |
| p=0.0015* (Cm) | 61.6 (16) | 34.6 (9) | 3.8 (1) |
| Answer A**, p=0.0203 (Z) | 33.3 (2) | 66.7 (4) | 0.0 (0) |
| Answer C***, p=0.0055 (Z) | 33.3 (2) | 66.7 (4) | 0.0 (0) |

33. In your hospital, how was information provided and managed?

|            | A - Emails received at institutional email address | B - Through an app | C - Hospital intranet | D - In the ward from head nurses or medical directors | E - Word of mouth | F - Other |
|------------|--------------------------------------------------|-------------------|----------------------|--------------------------------------------------|------------------|----------|
| p=0.58 (Cm) | 77.3 (34) | 6.8 (3) | 75.0 (33) | 13.6 (6) | 6.8 (3) | 6.8 (3) |
| Answer A**, p=0.05 (MRD) | 80.8 (21) | 7.7 (2) | 92.3 (24) | 11.5 (3) | 3.8 (1) | 11.5 (3) |
| p=0.14 (Cm) | 83.3 (5) | 0.0 (0) | 50.0 (3) | 0.0 (0) | 33.3 (2) | 0.0 (0) |
| Answer C***, p=0.05 (MRD) | 66.7 (8) | 16.7 (2) | 50.0 (6) | 25.0 (3) | 0.0 (0) | 0.0 (0) |
| p=0.37 (Cm) | 66.7 (8) | 16.7 (2) | 50.0 (6) | 25.0 (3) | 0.0 (0) | 0.0 (0) |

34. What is your personal opinion on how the following issues were managed by your hospital/institution?

|            | A – availability of PPEs | B - Patient protection |
|------------|--------------------------|------------------------|
| p=0.21 (KW) | mean ±SD = 7.2±2.3 | mean ±SD = 7.4±2.3 |
| median = 8 | median 95% CI = 6.5-8 | median 95% CI = 7.5 |
| KS: p=0.0002 (nN) | KS: p>0.10 (aN) | KS: p>0.10 (aN) |
| reject Normality(KS), p>0.05 | reject Normality(KS), p>0.05 | reject Normality(KS), p>0.05 |

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|                | Median 95% CI         | KS: *p*-value | Median 95% CI         | KS: *p*-value | Median 95% CI         | KS: *p*-value | Reject Normality(KS), p>0.05 |
|----------------|-----------------------|---------------|-----------------------|---------------|-----------------------|---------------|--------------------------------|
| **C – HCP protection** | mean ±SD = 6.6±2.7 | p=0.0237 (rN) | mean ±SD = 6.2±2.6 | p>0.10 (aN)   | mean ±SD = 6.5±1.9 | p>0.10 (aN)   | p=0.89 (KW)                          |
|                | median = 7            |               | median = 6.5          |               | median = 6           |               |                                |
|                | median 95% CI =5-8    |               | median 95% CI =2.6-9.4|               | median 95% CI =6-8   |               |                                |
|                | KS: p=0.10 (aN)       |               | KS: p>0.10 (aN)       |               | KS: p=0.076 (aN)     |               |                                |
| **D – Quality of communication (rapidity, clarity)** | mean ±SD = 6.7±2.7 | p=0.0065 (rN) | mean ±SD = 6.7±3.1 | p=0.0386 (rN)  | mean ±SD = 6.4±2.5 | p>0.10 (aN)   | p=0.94 (KW)                          |
|                | median = 7.5          |               | median = 8            |               | median = 6           |               |                                |
|                | median 95% CI =5.5-8  |               | median 95% CI =1.8-9  |               | median 95% CI =5-9   |               |                                |
|                | KS: *p*-value         |               | KS: *p*-value         |               | KS: p>0.05           |               |                                |
|                | **=significant test (p<0.05)** |          | **=significant most frequent |               | **=significant low frequent |               |                                |
|                | **=significant most frequent |          | **=significant low frequent |               | **=significant low frequent |               |                                |
|                | Z=Z-test              |               | Z=Z-test              |               | Z=Z-test              |               |                                |
|                | Cm=Multiple chi square test |           | Cm=Multiple chi square test |               | Cm=Multiple chi square test |               |                                |
|                | B=Binomial test      |               | B=Binomial test      |               | B=Binomial test      |               |                                |
|                | (rN)=reject Normality |               | (aN)=accept Normality |               | (aN)=accept Normality |               |                                |
|                | KW=Kruskal-Wallis test |             | KW=Kruskal-Wallis test |               | KW=Kruskal-Wallis test |               |                                |
|                | D=Dunn test for pairwise comparison |       | D=Dunn test for pairwise comparison |         | D=Dunn test for pairwise comparison |       |                                |
|                | F=Fisher's exact test |             | F=Fisher's exact test |               | F=Fisher's exact test |               |                                |
|                | —=equal to previous result |           | —=equal to previous result |           | —=equal to previous result |           |                                |
|                | MRD=minimum required differences method with Bonferroni p-value corrected |       | MRD=minimum required differences method with Bonferroni p-value corrected |       | MRD=minimum required differences method with Bonferroni p-value corrected |       |                                |

*+= 10-point Likert scale where 1 means “in the worst manner” and 10 means “in the best manner”

KS= Kolmogorov-Smirnov test for Normal distribution

p=p-value

** *=significant test (p<0.05)

** *=significant most frequent

*** *=significant low frequent

Z=Z-test
geographic groups (46.2% in NIT vs. 83.3% in CIT vs. 16.7% in SITI centers); PAP centers with COVID-19-positive cases were significantly more (p = 0.0239). In addition, CIT had a higher percentage of centers reporting patients with COVID-19 clinical signs or symptoms (83.3%; p=0.0118) without laboratory confirmation.

Almost all centers (93.2%) performed swab tests before patient admission: the day before admission in 43.2% of centers, more frequently in NIT and CIT centers (53.8% and 66.7%, respectively), less frequently in SITI centers (8.3%, p = 0.0377). Both AP and PAP centers performed swabs the day before admission (41.9% and 46.2%), or, less frequently, some days before (35.4% and 15.4%). The test results were available within 12 hours (45.5%) or between 12 to 24 hours (45.5%) or after 24 hours (9.0%). Protective measures were locally adopted: limiting access to the hematology wards (100%), not allowing visitors in 65.9% of centers (especially but not significantly in NIT centers, p = 0.10). CIT centers preferred to allow visitors based on the patient's clinical condition (66.7%), differing significantly from the other geographic areas (p = 0.0395). COVID-19 testing was performed on HCPs in 79.5% of centers, most commonly with both nasopharyngeal swab and blood tests (47.7%); tests were repeated routinely in 68.2% of centers. There were no statistical differences by geographical area or type of patient assisted.

Patient and health care professional protection. Personal protective equipment (PPEs) are routinely used in the hematology setting during patient care. Surgical masks (86.4%), TNT gowns (36.4%), and safety glasses (25.0%) were the first choices. HCPs wore masks at all times, whether during patient care or not (95.5%), especially in NIT (100%) and CIT (100%) than SITI centers (83.3%; p = 0.06); masks were changed at every shift, especially in SITI centers (66.7%, p = 0.0162), while they were more frequently changed according to manufacturer's instructions in NIT centers (57.7%), without any significant differences (p = 0.06).

A shortage of PPEs during the initial phase of the COVID-19 pandemic in Italy was observed: 45.5% of centers reported a lack of masks, while 43.2% reported there was no problem with PPE availability (gowns, visors, safety glasses, gloves, etc.). There were no differences between groups except for lack of gloves in AP centers than the PAP ones (p = 0.0239).

Regarding infected HCPs, there was a significant difference among the three geographic areas (p = 0.0380). In particular, Northern and Central Italy had more centers with diagnosed cases among HCPs (57.7% and 66.7%, respectively); home isolation (varying from 10 days to 5-6 weeks) and various strategies of readmission to work (after 1 to 3 negative swab tests, or after symptom resolution, without a test) were adopted. Swab test negativity was required before work readmission in 93.2% of centers. The management of patients and HCPs who had contact with COVID-19-positive individuals was based on alerting the competent authorities and performing diagnostic tests (56.8%). However, in 38.6% of centers, this issue was not managed or not specified/unknown. In Northern Italy, management's first choice was performing a diagnostic test (46.2%; p = 0.0003). Other infection control strategies were reported; for example, limiting access to the work environment (e.g., no more than 2 HCPs in a patient room if not needed) was adopted by 61.4% of centers, and 25.0% provided only safety distance norms.

Information management. All centers referred to the official instructions or recommendations for situation management provided by their local institutions (hospital/department directives); only one center in the CIT group reported a delay in receiving any instructions. These recommendations mainly concerned “patient management” (100%), “access management” (92.3%, 83.3%, and 100% in NIT, CIT, and SITI, respectively), “PPE management” (100% in NIT and CIT, 83.3% SITI), and “infection protection of HCPs” (88.5%, 50.0%, 66.7%, respectively). Instructions for patients and families aimed at preventing the spread of the virus were provided by local health authorities, mainly in NIT (73.1%), but with no significant differences between the three areas. Hematology units provided specific recommendations for hematology patients and their relatives in 61.6% of NIT centers and in 33.3% of both CIT and SITI centers.

A significant difference was seen in the modality of providing updated information. The majority of centers provided updated information in real-time through the official institutional email service (80.8%, 83.3%, and 66.7% in NIT, CIT, and SITI, respectively) and the local hospital intranet (92.3%, 50.0%, and 50.0%), especially in NIT centers (p = 0.0062). Information transmission by word of mouth was significantly adopted in CIT centers (p = 0.0195).

Nurses' perception. Responders' subjective opinion on PPE availability, patient protection, HCP protection, and communication quality was generally better in NIT centers than in CIT and SITI centers. However, there were no significant differences between groups.

Discussion. Our work suggests that local health institutions approached the problem in agreement with Italian health authorities' recommendations and Government laws, without any significant differences between geographic areas or type of patients cared for. More restrictive measures on outpatient and visitor accesses, for example, not allowing visitors any access...
at all or only in particular cases, were adopted in all centers. In pediatric centers, one parent or caregiver was always permitted. A reduction in beds was applied in a few centers while maintaining the recommended routine activity on malignant diseases.24,25

However, differences in specific issues and some critical aspects emerged. There were fewer hematology centers with COVID-19-positive patients in Southern regions, in accordance with the lower incidence of the infection. CIT centers reported higher percentages of COVID-19-positive patients, but the low number of collected answers from this area is likely to be a confounding factor. Considering the virus' aggressiveness, hematology patients' immunocompromised status, and the severity of the pandemic, especially in Northern Italy, the number of hematology centers with no SARS-CoV-2-positive patients suggest that safety procedures were applied and adhered to. Fewer pre-triage zones were organized in the NIT hospitals than in the other geographic groups. However, this did not seem to affect the infection's spread, probably due to other strategies adopted such as remote working or screening procedures. In addition, at the time this survey was conducted, the severity of the pandemic in the Northern regions may have delayed the implementation of some containment measures.41

Patients admitted to hematology wards were tested before or at admission and were considered infected and thus isolated until test results were available, as required by the SIE/GITMO and EBMT recommendations;24,25 almost all centers were in line with the recommendations. However, in this context, a laboratory response time of more than 12 hours for swab tests does not appear appropriate.

Different strategies were adopted regarding the management of infected HCPs and their contacts. Rapid identification and isolation of infected subjects as well as contact tracing appear to be crucial,42,43,44 although there are still some unresolved issues, such as the management of the return to work of previously infected HCPs. The timing of viral shedding after symptom onset in infected subjects appears variable and likely depends on many factors, including the host's immunological features, the severity of illness, and viral load.45,46 A limited number of centers based on their approach to patient and HCP safety on a time frame only, reporting that COVID-19 positive HCPs returned to work without performing any further tests. This approach appeared incautious, given what has been stated above and the variability in readmission timing as reported by the centers in this survey.

Significant difficulties were registered in managing both patients and HCPs who have had contact with COVID-19-positive patients or HCPs. Tracing and managing contacts should be considered one of the critical measures to contain the spread of SARS-CoV-2 infection.43,44 Our results showed that screening tests were performed in just over a third of hematology centers on this population of contacts and that compliance with alerting the competent authorities of these exposed contacts was scarce.

The lack of PPEs, including face masks and gloves, was reported in the survey. The lockdown measures adopted affected the circulation of materials and commerce, resulting in supply problems. International guidelines have recommended both extensive adoption of at least standard precautions and optimizing the use of PPEs in order to ensure their availability;43,44,47 strategies to make more efficient use of PPEs may have been perceived as a lack of them, especially by HCPs working in hematology settings, where PPEs are commonly used.

HCPs in almost all hospitals were provided with recommendations and directives on patient management, visitor access, PPEs, and infection prevention and control among workers. However, specific recommendations for hematology patients and their families on preventing the spread of the virus and aimed to reduce misinformation exposure 48 were less frequently available. As hematology HCPs apply infection control measures in their daily practice, this may have allowed them to contain the spread of the virus in their setting more effectively. The strategies described by almost all centers, such as the maximum length of time a mask could be worn, the surgical masks as the first choice, and applying strict measures to limit environmental contact between HCPs, may be considered a reasonable translation of recommended measures into practice.

Our study has some limitations. As the sample represents just over half of the invited centers, the results cannot, therefore, be said to represent all hematology centers in Italy. Some specific issues, such as HCPs' exposure without PPEs, home isolation follow-up practices, environmental hygiene practices, and waste management, were not investigated. The survey provided insight into practices put in place during the acute phase of the COVID-19 pandemic (lockdown), and qualitative feedback assessed issues felt to be pertinent to nursing. However, this research methodology does not provide an in-depth understanding of these issues. Qualitative research could be conducted to complement this investigation. However, substantial compliance of Italian hematology centers with National health authorities' recommendations and Government laws to control the spread of SARS-CoV-2 was observed, and hematology HCPs' skills in infection control may have contributed to having many COVID-19-free hematology centers. Our data do not allow us to evaluate the impact of acted measures on patients' outcomes or on the epidemic.38,49 However, they could provide gained information on what occurred in our hematology ward during the COVID-19 pandemic, such as activities limitation,
variability in swab practices, reduced PPEs availability as well as outpatient, visitors, and contacts management. Our findings could be useful to face a better further round of infection.

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**Supplementary data.**

**Table 2.** Type of patients cared: univariate and multivariate analyses in and between subgroups.

| Items and answers | Adult patients only (AP) | Pediatrics/Adults-Pediatrics patients (PAP) | Statistical analysis among groups |
|-------------------|--------------------------|-------------------------------------------|----------------------------------|
|                   | % (Nr.)                  | % (Nr.)                                   |                                  |
| **Centers location** |                          |                                           |                                  |
| A – Northern Italy | 54.8 (17)                | 69.2 (9)                                  | p=0.38 (C)                       |
| B – Central Italy  | 9.7 (3)                  | 23.1 (3)                                  | p=0.34 (F)                       |
| C – Southern Italy | 35.5 (11)                | 7.7 (1)                                   | p=0.08 (F)                       |
|                                 | p=0.0084* (C)            | p=0.0183* (C)                             |                                  |
|                                 | Answer B***, p=0.0148 (Z) | Answer A**, p=0.0453 (Z)                 |                                  |
| **1. In your hospital, are there wards reserved for COVID-19 patients?** | | | |
| A – Yes | 90.3 (28)                | 100 (13)                                  | p=0.80 (F)                       |
| B – No  | 9.7 (3)                  | 0.0 (0)                                   |                                  |
|                                 | Answer A**, p=0.0001 (B) |                                        | Answer A**, p=0.0001 (B)         |
| **2. In your center, is there a stem cell transplantation unit?** | | | |
| A – Yes | 93.5% (29)               | 100% (13)                                 | p=1.00 (F)                       |
| B – No  | 6.5% (2)                 | 0.0% (0)                                  |                                  |
|                                 | Answer A**, p=0.0001 (B) |                                        | Answer A**, p=0.0001 (B)         |
| **3. In your center, were the number of beds reduced during the COVID-19 pandemic?** | | | |
| A – Yes | 19.4% (6)                | 30.8% (4)                                 | p=0.45 (F)                       |
| B – No  | 71.0% (22)               | 61.5% (8)                                 | p=0.72 (F)                       |
| C – Other | 9.6% (3)                 | 7.7% (1)                                  | p=1.00 (F)                       |
|                                 | p<0.0001* (C)            | p=0.058 (C)                               |                                  |
|                                 | Answer B**, p=0.0005 (Z) |                                        | Answer C***, p=0.0148 (Z)        |
| **4. In your center, did you have any COVID-19 positive patients? (swab or serology or rapid test positivity)** | | | |
| A – Yes | 32.3% (10)               | 69.2% (9)                                 | p=0.0239* (C)                    |
| B – No  | 67.7% (21)               | 30.8% (4)                                 |                                  |
|                                 | p=0.0501 (B)             |                                        | p=0.18 (B)                       |
| **5. In your center, did you have any patients with signs or symptoms associated to COVID-19?** | | | |
| A – Yes | 22.6% (7)                | 30.8% (4)                                 | p=0.71 (F)                       |
| B – No  | 77.4% (24)               | 69.2% (9)                                 |                                  |
|                                 | Answer B**, p=0.0021 (B) |                                        | Answer B**, p=0.0021 (B)         |
| **6. In your hospital, was there a separate pre-triage area for patients with COVID-19 signs or symptoms?** | | | |
| A – Yes | 77.4% (24)               | 76.9% (10)                                | p=1.00 (F)                       |
| B – No  | 22.6% (7)                | 23.1% (3)                                 |                                  |
|                                 | Answer A**, p=0.0021 (B) |                                        | Answer A**, p=0.0021 (B)         |
|                                 | p=0.057 (B)              |                                        | p=0.057 (B)                      |
7. Who worked in the triage area?

| Option               | Yes (%) | No (%) | P-value | Significance |
|----------------------|---------|--------|---------|--------------|
| A - Nurses only      | 41.9% (13) | 58.1% (18) | 0.80 (C) |              |
| B - Nurses and Doctors | 58.1% (18) | 41.9% (13) | 0.79 (B) |              |

8. Which tests were performed in the triage area?

| Option                                | Yes (%) | No (%) | P-value | Significance |
|---------------------------------------|---------|--------|---------|--------------|
| A - Body temperature only             | 16.1% (5) | 83.9% (26) | 1.00 (F) |              |
| B - Body temperature with additional tests | 84.6% (11) | 15.4% (2) | 0.38 (B) | 0.79 (B) |

Answer B**, p=0.0001 (B)
Answer B**, p=0.0129 (B)

9. Were nasopharyngeal swab tests performed before patient admission?

| Option                                | Yes (%) | No (%) | P-value | Significance |
|---------------------------------------|---------|--------|---------|--------------|
| A - Yes                               | 96.8% (30) | 3.2% (1) | 0.51 (F) |              |
| B - Only for patients with signs/symptoms | 0.0% (0) | 99.0% (30) | 0.30 (F) |              |
| C - Other (Type of treatment)         | 3.2% (1) | 0.0% (0) | 1.00 (F) |              |

Answer A**, p=0.0005 (Z)
Answer B***, p=0.0006 (Z)
Answer C***, p=0.0020 (Z)

10. If so, when were they tested?

| Option                                | Yes (%) | No (%) | P-value | Significance |
|---------------------------------------|---------|--------|---------|--------------|
| A - The day before admission          | 41.9% (13) | 58.1% (18) | 0.80 (C) |              |
| B - Some days before admission        | 35.4% (11) | 64.6% (18) | 0.28 (F) |              |
| C - Before and repeated at admission  | 9.7% (3) | 90.3% (27) | 0.62 (F) |              |
| D - At admission                      | 9.7% (3) | 90.3% (27) | 0.34 (F) |              |
| E - Some days before and then repeated the day before admission | 3.2% (1) | 96.8% (29) | 1.00 (F) |              |

Answer A**, p=0.0114 (Z)
Answer E***, p=0.0221 (Z)

11. When did you receive the tests results after nasopharyngeal swab?

| Option                                | Yes (%) | No (%) | P-value | Significance |
|---------------------------------------|---------|--------|---------|--------------|
| A - Within 12 hours                   | 48.4% (15) | 51.6% (17) | 0.55 (C) |              |
| B - From 12 to 24 hours               | 41.9% (13) | 58.1% (18) | 0.47 (C) |              |
| C - After 24 hours                    | 9.7% (3) | 90.3% (27) | 1.00 (F) |              |

Answer C***, p=0.0148 (Z)

12. Where were COVID-19-positive hematology patients needing hospitalization admitted?

| Option                                | Yes (%) | No (%) | P-value | Significance |
|---------------------------------------|---------|--------|---------|--------------|
| A - In a COVID-19 ward                | 87.0% (27) | 13.0% (4) | 0.42 (F) |              |
| B - In hematology ward                | 6.5% (2)  | 93.5% (29) | 1.00 (F) |              |
| C - Other: medical-oncological ward   | 6.5% (2)  | 93.5% (29) | 1.00 (F) |              |

Answer A**, p=0.0001 (Z)
Answer B***, p=0.0202 (Z)
Answer C***, p=0.0202 (Z)

13. Were more restrictive measures for visitor access to the hematology ward taken to prevent the spread of infection?

| Option | Yes (%) | No (%) | P-value | Significance |
|--------|---------|--------|---------|--------------|
| A - Yes | 100% (31) | 0.0% (0)  | 1.0 (F)  |              |
| B - No  | 0.0% (0)  | 100% (31) | 0.0 (F)  |              |

Answer A**, p=0.0001 (B)
Answer A**, p=0.0001 (B)
14. If so, what measures were taken?

| Measure                                                                 | Yes (%) | No (%) | P-value |
|------------------------------------------------------------------------|---------|--------|---------|
| A - Visitors were not allowed                                           | 61.3%   | 76.9%  | p=0.49  |
| B - Only visitors of patients with particular clinical conditions were allowed | 25.8% | 23.1% | p=1.00 |
| C - Visitors of patients in particular clinical conditions were allowed, though for a reduced time | 12.9% | 0.0% | p=0.42 |

A - p=0.0029* (Cm), Answer A**, p=0.0111 (Z)  
B - Answer A**, p=0.0033 (Z)  
C - Answer A**, p=0.0202 (Z)

15. Were screening tests for healthcare professionals performed?

| Screening Test                                                                 | Yes (%) | No (%) | P-value |
|--------------------------------------------------------------------------------|---------|--------|---------|
| A - Visitors were not allowed                                                  | 77.4%   | 22.6%  | p=0.71  |
| B - Only visitors of patients with particular clinical conditions were allowed | 22.6% | 77.4% | p=1.00 |
| C - Visitors of patients in particular clinical conditions were allowed, though for a reduced time | 41.9% | 58.1% | p=0.80 |

A - Answer A**, p=0.0021 (B)  
B - Answer A**, p=0.0119 (B)

16. Which screening tests were performed?

| Test                                                                 | Yes (%) | No (%) | P-value |
|---------------------------------------------------------------------|---------|--------|---------|
| A - Structured screening                                            | 67.7%   | 32.3%  | p=0.74  |
| B - One-off test                                                     | 6.5%    | 93.5%  | p=0.57  |
| C - No test                                                         | 22.6%   | 77.4%  | p=0.41  |
| D - Not specified                                                    | 3.2%    | 96.8%  | p=0.20  |

A - Answer A**, p=0.0001* (C), Answer A**, p<0.0001 (B)  
B - Answer B**, p=0.0043 (Z)  
C - Answer C**, p=0.0335 (Z)

17. Were the tests routinely repeated?

| Repeated Tests                                                                 | Yes (%) | No (%) | P-value |
|--------------------------------------------------------------------------------|---------|--------|---------|
| A - Structured screening                                                      | 64.5%   | 35.5%  | p=0.50  |
| B - One-off test                                                              | 12.9%   | 87.1%  | p=1.00  |
| C - No test                                                                   | 22.6%   | 77.4%  | p=0.71  |

A - Answer A**, p=0.0043 (Z)  
B - Answer B**, p=0.0335 (Z)

18. Please describe characteristics of screening

| Characteristic                                                                 | Yes (%) | No (%) | P-value |
|--------------------------------------------------------------------------------|---------|--------|---------|
| A - Structured screening                                                      | 67.7%   | 32.3%  | p=0.74  |
| B - One-off test                                                              | 6.5%    | 93.5%  | p=0.57  |
| C - No test                                                                   | 22.6%   | 77.4%  | p=0.41  |
| D - Not specified                                                             | 3.2%    | 96.8%  | p=0.20  |

A - Answer A**, p=0.0001* (C), Answer A**, p<0.0001 (B)  
B - Answer B**, p=0.0043 (Z)  
C - Answer C**, p=0.0335 (Z)

19. Were any healthcare professionals COVID-19-positive?

| Healthcare Professionals COVID-19-positive | Yes (%) | No (%) | P-value |
|--------------------------------------------|---------|--------|---------|
| A - Yes                                    | 41.9%   | 58.1%  | p=0.23  |
| B - No                                     | 58.1%   | 41.9%  | p=0.42  |

A - Answer A**, p=0.0029 (Cm)  
B - Answer A**, p=0.0001 (B)

20. Were the COVID-19-positive healthcare professionals in self-isolation?

| COVID-19-positive Healthcare Professionals | Yes (%) | No (%) | P-value |
|-------------------------------------------|---------|--------|---------|
| A - Yes                                    | 100%    | 0.0%   | p=1.00  |
| B - No                                     | 0.0%    | 100%   | p=1.00  |

A - Answer A**, p=0.0001 (B)  
B - Answer A**, p=0.0001 (B)

21. Please specify how the healthcare professionals or patients who had contact with COVID-19-positive healthcare professionals/patients were managed

| Management                                                                 | Yes (%) | No (%) | P-value |
|---------------------------------------------------------------------------|---------|--------|---------|
| A - Alerting competent authorities                                         | 12.9%   | 87.1%  | p=0.40  |

A - Answer A**, p=0.0023* (Cm), Answer A**, p=0.0111 (Z)  
B - Answer A**, p=0.0131 (Z)  
C - Answer A**, p=0.0202 (Z)
### 22. Did self-isolated COVID-19-positive healthcare professionals repeat the nasopharyngeal swab before returning to work?

| Option   | Yes (%) | No (%) | p-value |
|----------|---------|--------|---------|
| A - Yes  | 90.3% (28) | 9.7% (3) | p=0.80 (F) |
| B - No   | 9.7% (3) | 92.3% (12) | --- |

Answer A**, p<0.0001 (B)

### 23. What personal protective equipment (PPE) was used during daily care of (COVID-19-negative) hematology patients?

| PPE               | Yes (%) | No (%) | p-value |
|-------------------|---------|--------|---------|
| A - Surgical mask | 83.9% (26) | 16.1% (5) | p=0.69 (F) |
| B - FFP2          | 29.0% (9) | 71.0% (21) | p=1.00 (F) |
| C - FFP3          | 3.2% (1) | 96.8% (29) | p=1.00 (F) |
| D - TNT gown      | 35.5% (11) | 64.5% (21) | p=1.00 (F) |
| E - Water-resistant gown | 22.6% (7) | 77.4% (23) | p=1.00 (F) |
| F - Full suit     | 0.0% (0) | 100.0% (3) | p=1.00 (F) |
| G - Visor         | 6.5% (2) | 93.5% (28) | p=0.14 (F) |
| H - Safety glasses | 29.0% (9) | 71.0% (21) | p=0.46 (F) |
| I - Both visor/glasses | 22.6% (7) | 77.4% (23) | p=0.10 (F) |

Answer A**, p=0.001 (B)

### 24. Were masks lacking during the acute phase of COVID-19?

| Option   | Yes (%) | No (%) | p-value |
|----------|---------|--------|---------|
| A - Yes  | 48.4% (15) | 51.6% (16) | p=0.75 (C) |
| B - No   | 51.6% (16) | 48.4% (15) | --- |

### 25. Were any other PPEs lacking?

| PPE               | Yes (%) | No (%) | p-value |
|-------------------|---------|--------|---------|
| A - No             | 38.7% (12) | 61.3% (21) | p=0.36 (C) |
| B - Gowns          | 48.4% (15) | 51.6% (21) | p=0.75 (C) |
| C - Safety glasses/Visors | 35.5% (11) | 64.5% (21) | p=1.00 (F) |
| D - Gloves         | 32.3% (10) | 67.7% (20) | p=0.0239* (F) |
| E - Other (shoe cover, cap) | 6.5% (2) | 93.5% (28) | p=1.00 (F) |

Answer A=E*, p=0.05 (MRD)

### 26. When were masks worn?

| Option                                         | Yes (%) | No (%) | p-value |
|------------------------------------------------|---------|--------|---------|
| A - Only in patients’ rooms or during patient care | 6.5% (2) | 93.5% (28) | p=1.00 (F) |
| B - Everywhere and all the time in the ward/hospital | 93.5% (29) | 6.5% (2) | --- |
| 27. How often were masks changed? | \[27. How often were masks changed?\]
|----------------------------------|----------------------------------|
| **A** – At every shift           | 67.7% (21)                       |
| **B** – Regularly, according to manufacturer’s instructions | 29.0% (9)                       |
| **C** – Other                    | 3.2% (1)                         |
| **Answer A**                     | \ p<0.0001* (Cm)                 |
| **Answer B**                     | \ p=0.0001 (Z)                   |
| **Answer C**                     | \ p=0.0001 (Z)                   |
|                                  | \ p=0.18 (C)                     |
|                                  | \ p=0.72 (F)                     |
|                                  | \ p=0.20 (F)                     |

| 28. Was access to any work environment limited during daily practice? (e.g., not over 2 HCPs in the same room, if not needed) | \[28. Was access to any work environment limited during daily practice? (e.g., not over 2 HCPs in the same room, if not needed)\]
|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| **A** – Yes                                                         | 67.7% (21)                       |
| **B** – No                                                         | 9.7% (3)                         |
| **C** – No, but instruction on safety distance was provided           | 22.6% (7)                       |
| **D** – Other                                                      | 0.0% (0)                         |
| **Answer A**                                                        | \ p<0.0001* (Cm)                 |
| **Answer B**                                                        | \ p=0.34 (F)                     |
| **Answer C**                                                        | \ p=0.71 (F)                     |
| **Answer D**                                                        | \ p=1.00 (F)                     |
| **Answer A**                                                        | \ p=0.12 (Cm)                     |
| **Answer B**                                                        | \ p=0.0001 (Z)                   |
| **Answer C**                                                        | \ p=0.0001 (Z)                   |
| **Answer D**                                                        | \ p=0.0030 (Z)                   |

| 29. Did your hospital/department provide any official recommendations or directives on COVID-19 emergency management? | \[29. Did your hospital/department provide any official recommendations or directives on COVID-19 emergency management?\]
|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| **A** – Yes                                                         | 100% (31)                        |
| **B** – No                                                         | 0.0% (0)                         |
| **C** – Other                                                      | 0.0% (0)                         |
| **Answer A**                                                        | \ p=1.00 (F)                     |
| **Answer B**                                                        | \ p=1.00 (F)                     |
| **Answer C**                                                        | \ p=1.00 (F)                     |
| **Answer A**                                                        | \ p=0.0001* (Cm)                 |
| **Answer B**                                                        | \ p=0.0001* (Cm)                 |
| **Answer C**                                                        | \ p=0.0001* (Cm)                 |
| **Answer B**                                                        | \ p=0.0001 (Z)                   |
| **Answer C**                                                        | \ p=0.0001 (Z)                   |
| **Answer A**                                                        | \ p=0.0020 (Z)                   |
| **Answer B**                                                        | \ p=0.0020 (Z)                   |
| **Answer C**                                                        | \ p=0.0020 (Z)                   |

| 30. Which areas did these recommendations/directives cover? | \[30. Which areas did these recommendations/directives cover?\]
|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| **A** – Patient management                                           | 100% (31)                        |
| **B** – Access Management (visitors)                                 | 90.3% (28)                       |
| **C** – Personal protective equipment (PPE) management               | 74.2% (23)                       |
| **D** – Infection control of workers                                 | 6.5% (2)                         |
| **E** – Other                                                        | \ p=0.001* (Q)                   |
| **Answer A**                                                        | \ p=0.05 (MRD)                   |
| **Answer B**                                                        | \ p=0.05 (MRD)                   |
| **Answer C**                                                        | \ p=0.05 (MRD)                   |
| **Answer D**                                                        | \ p=0.05 (MRD)                   |

| 31. Did your hospital/department provide any recommendations/instructions to patients and their families to prevent contagion? | \[31. Did your hospital/department provide any recommendations/instructions to patients and their families to prevent contagion?\]
|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| **A** – Yes                                                         | 58.1% (18)                       |
| **B** – No                                                         | 25.8% (8)                        |
| **C** – I don’t know                                               | 16.1% (5)                        |
| **Answer A**                                                        | \ p=0.31 (F)                     |
| **Answer B**                                                        | \ p=0.70 (F)                     |
| **Answer C**                                                        | \ p=0.69 (F)                     |
| **Answer A**                                                        | \ p=0.0131* (Cm)                 |
| **Answer B**                                                        | \ p=0.0036* (Cm)                 |
| **Answer A**                                                        | \ p=0.0258 (Z)                   |
| **Answer A**                                                        | \ p=0.0131 (Z)                   |

| 32. Did your center provide any specific recommendations or instructions to hematology patients? | \[32. Did your center provide any specific recommendations or instructions to hematology patients?\]

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|   |   |   | p=0.32 (C) | p=0.36 (C) | p=1.0 (F) |
|---|---|---|---|---|---|
| A - Yes | 54.8% (17) | 38.5% (5) |   |   |   |
| B - No | 38.7% (12) | 53.8% (7) |   |   |   |
| C - I don’t know | 6.5% (2) | 7.7% (1) | p=0.0035* (Cm) | p=0.12 (Cm) |   |

**33. In your hospital, how was information provided and managed?**

|   | A - Emails received at institutional email address | 74.2% (23) | 84.6% (11) | p=0.70 (F) |
|---|---|---|---|---|
| B - Through an app | 6.5% (2) | 7.7% (1) |   |   |
| C - Hospital intranet | 74.2% (23) | 76.9% (10) |   |   |
| D - In the ward from head nurses or medical directors | 19.4% (6) | 0.0% (0) | p=0.19 (F) |   |
| E - Word of mouth | 3.2% (1) | 15.4% (2) | p=0.20 (F) |   |
| F - Other | 3.2% (1) | 15.4% (2) | p=0.20 (F) |   |

**Answer C***, p=0.0035* (Cm)

**34. What is your personal opinion on how the following issues were managed by your hospital/institution?**

|   | A – Availability of PPEs | mean ±SD = 6.9±2.0 | mean ±SD = 7.2±2.4 | p=0.61 (MW) |
|---|---|---|---|---|
|   | median = 7 | median = 8 | reject Normality (KS), p=0.05 |   |
|   | median 95% CI =6-8 | median 95% CI =5-9.5 | KS: p=0.0323 (rN) | KS: p=0.0248 (rN) |
| B - Patient protection | mean ±SD = 7.2±2.3 | mean ±SD = 7±2.4 | p=0.91 (MW) | reject Normality (KS), p=0.05 |
|   | median = 7 | median = 8 | KS: p=0.0033 (rN) | KS: p=0.10 (aN) |
|   | median 95% CI =7-8 | median 95% CI =5-9 |   |   |
| C – HCP protection | mean ±SD = 6.5±2.5 | mean ±SD = 6.7±2.5 | p=0.67 (MW) | reject Normality (KS), p=0.05 |
|   | median = 6 | median = 7 | KS: p=0.0380 (rN) |   |
|   | median 95% CI =6-8 | median 95% CI =4.5-8.5 | KS: p>0.10 (aN) | KS: p=0.0325 (rN) |
| D – Quality of communication (rapidity, clarity) | mean ±SD = 6.5±2.6 | mean ±SD = 6.8±2.8 | p=0.75 (MW) | reject Normality (KS), p=0.05 |
|   | median = 7 | median = 8 | KS: p>0.10 (aN) | KS: p=0.0325 (rN) |
KS: p=0.0045 (rN)

| + = 10-point likert scale where 1 means “in the worst manner” and 10 means “in the best manner” | KS= Kolmogorov-Smirnov test for Normal distribution |
| p=p-value | = equal to previous result |

*=significant test (p<0.05) ** =significant most frequent ***=significant low frequent 
Z= Z-test C=chi square test F=Fisher's exact test 
B=Binomial test (rN)= reject Normality (aN)=accept Normality 
MW= Mann-Whitney test Q=Cochran's Q test 
MRD= Minimum Required Differences method with Bonferroni p-value corrected
### Northern Italy

| Nº | Department/Ward                                                                 | Hospital/Institute                                | City          |
|----|--------------------------------------------------------------------------------|---------------------------------------------------|---------------|
| 1  | Hematology and Transplant center                                                | ASO SS Antonio e Biagio e Cesare Arrigo            | Alessandria  |
| 2  | Division of Hemato-Oncology                                                    | Istituto Oncologico della Svizzera Italiana       | Bellinzona    |
| 3  | Division of Hematology                                                         | Sant'Orsola Malpighi Hospital                      | Bologna       |
| 4  | Oncology, Hematology and HSCT Pediatric Program                                | Sant'Orsola Malpighi Hospital                      | Bologna       |
| 5  | Division of Medical Oncology                                                   | Sant'Orsola Malpighi Hospital                      | Bologna       |
| 6  | Division of Hematology                                                         | ASST Spedali Civili                                | Brescia       |
| 7  | Division of Hematology                                                         | ASST Valleolona                                    | Busto Arsizio |
| 8  | Division of Hematology                                                         | AO S. Croce e Carle                                | Cuneo         |
| 9  | Division of Hematology and Transplant                                          | Azienda Ospedaliera Universitaria                 | Ferrara       |
| 10 | Department of Pediatric Hemato-Oncology                                        | IRCCS G. Gaslini                                   | Genova        |
| 11 | Hematology Unit                                                                | AULSS 3 Serenissima                                | Mestre        |
| 12 | Division of Hematology                                                         | European Institute of Oncology                     | Milan         |
| 13 | Department of Medical Oncology 1-Hematology                                    | Istituto Nazionale Tumori                          | Milan         |
| 14 | Division of Hematology and Transplant                                          | IRCCS Policlinico                                  | Milan         |
| 15 | Pediatric Onco-Hematology                                                      | Azienda Ospedaliera                                | Padova        |
| 16 | Division of Hematology and Transplant                                          | Ospedale Guglielmo da Saliceto AUSL               | Piacenza      |
| 17 | Hematology Unit                                                                | Azienda USL-IRCCS                                  | Reggio Emilia |
| 18 | Hematology Unit                                                                | AUSL Romagna                                       | Rimini        |
| 19 | Stem Cell Transplant and Cellular Therapy Center                                | Ospedale Infantile Regina Margherita               | Turin         |
| 20 | Hematology and Cellular Therapy Center                                         | AO Mauriziano                                      | Turin         |
| 21 | Hematology and Transplant                                                       | Città della Salute e della Scienza                 | Turin         |
| 22 | Pediatric Hemato-Oncology and BMT Unit                                          | IRCCS Burlo Garofolo                               | Trieste       |
| 23 | Hematology and BMT Center                                                      | Azienda Ospedaliera Universitaria                  | Udine         |
| 24 | Pediatric Hemato-Oncology                                                       | Azienda Ospedaliera Universitaria                  | Verona        |
| 25 | Hematology Division Out-patient section                                        | AULSS 8                                          | Vicenza       |
| 26 | Hematology Division In patient section                                         | Aulss 9 Berica Ospedale San Bortolo                | Vicenza       |

### Central Italy

| Nº | Department/Ward                                                                 | Hospital/Institute                                | City          |
|----|--------------------------------------------------------------------------------|---------------------------------------------------|---------------|
| 1  | Hematology and Transplant Center                                                | AORMN San Salvatore                               | Pesaro        |
| 2  | Department of Hematology                                                        | Ospedale Civile                                   | Pescara       |
| 3  | Division of Hematology                                                         | Policlinico Tor Vergata                            | Rome          |
| 4  | Onco-Hematology Department                                                      | Bambino Gesù Pediatric Hospital                    | Rome          |
| 5  | Division of Hematology                                                         | Fondazione Policlinico Gemelli IRCCS, Roma         | Rome          |
| 6  | Division of Hematology and Stem Cell Transplantation                            | Fondazione Policlinico Gemelli IRCCS, Roma         | Rome          |

### Southern Italy

| Nº | Department/Ward                                                                 | Hospital/Institute                                | City          |
|----|--------------------------------------------------------------------------------|---------------------------------------------------|---------------|
| 1  | Division of Hematology and Hemopoietic Transplantation                        | AORN – S. Giuseppe Moscati                         | Avellino      |
| 2  | Hematology and Transplant Division                                             | Policlinico                                       | Bari          |
| 3  | Oncology Department, Hematology Division                                       | Ospedale Vito Fazzi                               | Lecce         |
|   | Department/Division                      | Institution/Location                         |
|---|----------------------------------------|-----------------------------------------------|
| 4 | Hematology and HSCT Division           | FEDERICO II University Hospital Naples        |
| 5 | Hematology and HSCT Division           | AORN A. Cardarelli Naples                     |
| 6 | Hematology Division                    | ASL Salerno Salerno                           |
| 7 | Oncology Department, Hematology Division | Ospedali Riuniti Villa Sofia Cervello Palermo |
| 8 | Division of Hematology                 | AOR S. Carlo Potenza                          |
| 9 | Division of Hematology                 | AO Bianchi Melacrino Morelli Reggio Calabria  |
| 10| Division of Hematology and HSCT        | Aou S. Giovanni di Dio e Ruggi D’Aragona Salerno |
| 11| Division of Hematology                 | AOU Sassari Sassari                           |
| 12| Hematology and BMT Center              | Pia Fondazione Ospedale Cardinale G. Panico Tricase |