CORONAVIRUS DISEASE COVID-19: EBMT RECOMMENDATIONS VERSION 16 – May 27, 2021

The Coronavirus Disease 2019 (COVID-19) pandemic is still highly active in many countries. In Europe, there have been an ongoing 3rd wave during the spring. and although the transmission rate in many countries has been decreasing for the last weeks partly due to vaccinations, the activity is still significant and can be a threat to severely immunocompromised patients. Restrictions are being eased in many countries and societies are opening in stages. On the negative side, new mutated variants might result in new increases in transmission due to higher transmissibility and lower protection by existing vaccines. .

COVID-19: Time from exposure to symptom development is between 2-14 days (median 5 days). Symptoms vary from no or very mild symptoms of an upper respiratory infection to severe pneumonia resulting in the need for intensive care and death from Acute Respiratory Distress Syndrome (ARDS). The risks both for infections and for severe disease are much lower in children. Increasing age and the presence of comorbidities, such as hypertension, cardiovascular disease, diabetes, obesity, and pulmonary disease, are reported risk factors for severe disease and mortality.

Several mutated strains have emerged in different parts of the world (United Kingdom, California, South Africa, Brazil, India)[1]. Some of these mutated variants spread more rapidly than the original type and has become the main variant detected in some countries. Recent data suggest an increased risk for hospitalization and requirements of intensive care from some of these variants[2]. There is also ongoing research regarding the implications of these strains on protection by vaccination (please, see the vaccine part of these guidelines).

EBMT guidelines: Due to fast spreading of SARS-CoV-2 a panel of experts of EBMT recommends the following guidelines for transplant units, recipients, and donors of hematopoietic cells. This is now the 16th version of the guidelines and we plan to continue to update them when new information is obtained about COVID-19 epidemiology and clinical outcome impacting on stem cell transplant (HCT) recipients or patients treated with CAR T cells.

EBMT registry: The EBMT started early in the pandemic to collect data regarding the impact of COVID-19 on HCT recipients and on CAR T cell treated patients. This was done in close collaboration with the Spanish group (GETH). Currently more than 1100 patients have been registered and results from the 1st wave will be shortly published in Leukemia. The 6-week mortality in the 1st wave was approximately 25%. Preliminary data from the 2nd wave (August 1 – December 31 supports an improvement in outcome preliminary showing a mortality of a bit below 20%. However, the data has not yet been formally analyzed regarding distribution of risk factors. The data collection is ongoing, and we urge centers to continue to report their patients and send us follow-up information. We have updated the follow-up form to collect data also on vaccination and the new SARS-CoV-2 variants while deleting other variables to make the forms more up-to-date. Please, use this form available from the EBMT website (www.ebmt.org).

GENERAL CONSIDERATIONS

Prevention policies and procedures: Since the COVID-19 situation varies substantially between and within countries, we recognize that centers are mandated to follow guidelines, policies, and procedures decided by national authorities as well as local and institutional policies.

Avoiding exposure by adhering to recommended hygiene procedures, isolation of SARS-CoV-2 infected individuals, and social distancing, especially for risk groups, are currently the main prevention strategies utilized in most European countries. Face mask use has been mandatory in most countries but are now being lifted in several countries. However, immunocompromised patients should continue to use protective measures even after having been vaccinated

Healthcare personnel have worked very hard for a long time and it is important to mitigate the psychological consequences of altered and stressful working conditions to ensure that appropriate capacities remain available to treat patients long-term.

Staff with any symptoms of infection should stay at home. Testing for SARS-CoV-2 is strongly recommended since symptoms can be uncharacteristic and very mild. There are now different types of tests including PCR and rapid antigen detection tests. The latter are less sensitive; therefore, PCR tests remain as the recommended option in this document. The antigen tests have varying performance and can give both false negative and false positive results. The advantages are speed and the possibly to be used "point-of-care". Some authors therefore recommend that confirmatory testing with a nucleic acid amplification test (e.g., RT-PCR) should be considered after negative antigen test results in symptomatic persons and positive antigen test results in asymptomatic persons[3]. Therefore, PCR tests remain mandatory for screening patients prior to admission to a transplant ward. However, antigen tests can have their place in emergency rooms and for screening of staff as long as the test has been evaluated and approved for the purpose by the proper national or regional authority.

Vaccinated health care staff has lower risk for carrying infectious virus, but a high level of caution is still recommended since the protection is not 100%, especially not against new variants. In a retrospective analysis, 27/5593 (0.5%) of completely vaccinated health care workers with the Pfizer/BioNTtech vaccine had documented COVID-19[4]. Of note is that two thirds were asymptomatic. Return to work by staff members who have recovered from COVID-19 should follow national guidelines. Currently, there are no strong recommendations to regularly test asymptomatic healthcare workers. However, testing of an asymptomatic health care worker is recommended in case of contact with a suspected or documented case of proven SARS-CoV-2 infection. Regular screening is undertaken in many healthcare systems, and, where available, adherence to such policies should be encouraged to protect patients, even when staff are vaccinated.

Training of staff in proper procedures, including caring for those with suspected or confirmed infection, ensuring adequate access to personal protection equipment and planning for possible staff shortage are critical. Personal protective equipment especially masks are important to limit the spread and to reduce the risk for health care workers to become infected. Surgical masks protect mainly for transmission of the virus from an infected individual while certain masks of the FFP2/3 class (those with an exhalation valve) protect the wearer of the mask but may not prevent from transmitting the virus. An FFP2/3 mask without exhalation valve also prevents from transmitting and is an alternative. Thus, correct selection of the mask and correct use are crucial.

Outpatient visits and visitors: Outpatient visits should be substituted with telemedicine visits if deemed appropriate and feasible. For necessary out-patient visits, it is important that appropriate measures to reduce the risk for nosocomial transmission continue to be applied. Staff should preferably be dedicated to a COVID-19 free transplant unit and not used interchangeably to care for COVID-19 positive patients. It is critical that proper protective equipment is used as recommended by national and international competent authorities.

In countries or regions within countries where there is substantial COVID-19 activity, it is recommended to maintain visitor restrictions to transplant units even though they have been vaccinated. Testing, preferably by PCR, is still recommended if visitors are allowed into the transplantation unit.

Patients after HCT or CAR T cell therapy: HCT and CAR T cell recipients still being regarded as immunosuppressed or having significant organ dysfunction should limit their risk of exposure to infected individuals as much as possible and strictly adhere to prevention practices such as hand hygiene and social distancing. These patients should refrain from travel and if travel is deemed necessary, travel by private car instead of any public transportations system including train, bus, or plane is recommended if feasible. Vaccination is covered by a separate part of these guidelines but it is recommended that vaccinated patients continue to follow guidelines aiming to decrease the risk of contracting SARS-CoV-2 especially early after transplantation and with ongoing immunosuppression or active GVHD.

Physical and social isolation, although a usual practice for many transplant patients, will now extend further and for a longer period of time and local services and practices need to be explored by the nursing staff to ensure that patients have adequate provision to be cared for at home.

All patients, including those without symptoms, should be triaged and tested before being admitted to a transplant ward. Adequate space for symptomatic patients while awaiting the results of COVID-19 testing should be allocated preferably separate from the transplant unit. Furthermore, appropriate protocols for their care should be in place.

Patients planned to be admitted for a transplant or to undergo CAR T-cell therapy should try to minimize the risk by home isolation 14 days before the start of the transplant conditioning. Unnecessary clinic visits should be avoided.

Transplant candidates: It is recognized that patients might suffer harm if transplant and other treatment procedures are delayed due to COVID-19. It is not possible to give clear guidelines regarding if procedures should still be delayed since the epidemiological situation of SARS-CoV-2 circulation in the communities is highly variable between transplant centers. Patients should be adequately informed that the risk for severe complications is higher if the patient gets infected with SARS-CoV-2 during or after the transplantation. Before starting the transplant procedure, availability of adequately trained staff, ICU beds, ventilators, as well as availability of the stem cell product should be ensured.

All patients should be tested for SARS-CoV-2 by PCR and the test results should be negative before start of the conditioning regardless of whether any symptoms are present.

A difficult question based on lack of data is deferral of transplant candidates if they become infected with COVID-19. Patients, who have acquired COVID-19 immediately before HCT should be deferred due to the risk for progression to severe disease. The other situation is patients, who have acquired COVID-19 some weeks before planned transplant and who are still PCR-positive but who either never developed symptoms or have resolved their symptoms. In the general population it is recognized that after 10 days from the onset of symptoms only few PCR positive patients can transmit a viable virus, and asymptomatic patients might be PCR positive for several weeks, alternating positive and negative PCR results. There have been reports of viable SARS-CoV-2 for several weeks or months in severely immunocompromised patients who are repeatedly PCR-positive. Furthermore, recurrence of symptoms when a patient became severely immunocompromised has been described.

In general, if a transplant candidate is diagnosed with COVID-19, a deferral of the transplant procedure is recommended. However, this is not always possible due to the risk for progression of the underlying disease. This might be particularly pertinent for patients waiting for CAR T cell therapy since this is frequently performed in patients refractory to other therapies and therefore being at a very high risk for progress of the underlying disease. This is a difficult risk-benefit assessment and must be made individually with a complete information given to the patient about the risks for transplant complications vs. the risk for progression of the underlying disease. The decision must be made considering the risk of the patient associated with on one hand the delay of the procedure and on the other proceeding with conditioning and the risk for COVID-19 associated complications,

especially pulmonary, as well as the risk for nosocomial spread of COVID-19 within a transplant unit. An ongoing study by the EBMT is currently addressing this issue.

In patients with high-risk disease, stem cell transplantation should be deferred until the patient is asymptomatic and has two negative virus PCR swabs taken at least 24 hours apart. It is also important to take the severity of COVID-19 into account. In patients with moderate to severe COVID-19 disease it advisable to allow enough time for the lung function and general performance to have returned to pre-COVID-19 values or at least have improved compared to the situation during the COVID-19 disease.

In patients with low-risk disease, who were asymptomatic or only mildly symptomatic with upper respiratory tract symptoms, deferral of 14 days after first negative PCR is a minimum and a new PCR is recommended before the start of conditioning, while in patients with moderate to severe COVID-19 disease, it is recommended to defer the transplantation for at least three months.

In case of close contact with a person diagnosed with COVID-19 any transplant procedures (PBSC mobilization, BM harvest, and conditioning) shall not be performed within at least 14, days from the last contact. Patient should be closely monitored for the presence of COVID-19, with confirmed PCR negativity before any transplant procedure is undertaken.

Donor considerations: Access to a stem cell donor might be restricted either due to the donor becoming infected, logistical reasons at the harvest centers in the middle of a strained health care system, or travel restrictions across international borders. During the early phase of the pandemic, it was therefore strongly recommended to have secured stem cell product access by freezing the product before start of conditioning. This policy was questioned since there were also several reports of cryopreserved products never infused. Furthermore, there have been reports of poor stem cell yield after freezing and this will require further investigations. If there is concern that the donor is at high risk of community-acquired infection between work-up and collection, pre-planned cryopreservation is recommended since it will allow patient conditioning to be withheld until successful donation and delivery are confirmed. Stem cell products can also be frozen at the collection site if there is a possibility of significant transport delay. It is more complicated to cryopreserve bone marrow so a change to peripheral blood stem cells should be considered if feasible. The emergence of a new variants have made different countries to continually re-appraise travel restrictions and this should be taken into

account with assessing the need for cryopreservation. Each center has therefore to address this issue on an individual basis depending on where the center and the intended harvest center are located.

In case of diagnosis of COVID-19, the donor must be excluded from donation. Collection should be deferred for at least 14 days after recovery. If the patient's need for transplant is urgent, the donor is completely well and there are no suitable alternative donors, an earlier collection may be considered if local public health requirements permit, subject to careful risk assessment. Risk assessment should be based on the date of full recovery, the duration and severity of COVID-19, and the results of post-recovery testing.

In case of donor contact with a person diagnosed with SARS-CoV-2, collection shall be deferred for at least 14 days after the last contact. The donor should be closely monitored for the presence of COVID-19. If the patient's need for transplant is urgent, the donor is completely well, a test is negative for SARS-CoV-2 and there are no suitable alternative donors, earlier collection may be considered subject to careful risk assessment.

Donors within 14 days of donation should practice good hygiene and be as socially isolated as feasible during this period. Unnecessary travel should be avoided. It is recommended that donors are tested for COVID-19 so that results are available prior to their admission for the collection procedure, and the staff of the pheresis unit and other donors and patients at the unit can be protected from an infected but asymptomatic donor.

WMDA has produced recommendations regarding unrelated donors and the EBMT endorses these guidelines. More details regarding recommendations for donor management during the COVID-19 pandemic can be found at their website. It should be recognized that the EBMT has to consider the situation in family donors such as children and elderly donors, who might be in a different situation than unrelated donors. The situation in many countries is likely to change rapidly over the near future and the function and recommendations from the individual registries can be accessed at:
https://share.wmda.info/display/LP/COVID-19+-+Impact+on+Registry+Operations

DIAGNOSIS AND GENERAL MANAGEMENT OF COVID-19 PATIENTS
Diagnosis of COVID-19: Diagnostic procedures for COVID-19 should follow national or local guidelines. It is important to note that a test for SARS-CoV-2 in nasopharyngeal swab can be falsely negative and needs to be repeated if there is a strong clinical suspicion of COVID-19. Sequencing for mutated SARS-CoV-2 variants is recommended if such are

present in the surrounding community. It is also important to test for other respiratory viral pathogens including influenza and RSV preferably by multiplex PCR.

SARS-CoV-2 infected patients: Patients, who are positive for SARS-CoV-2 should not be treated in rooms with laminar air flow or other rooms (HEPA) with positive pressure unless the ventilation can be turned off since airborne transmission is increasingly becoming a concern[5]. All patients positive for SARS-CoV-2 in an upper respiratory tract sample should undergo chest imaging, preferably by CT, and evaluation of oxygenation impairment. Routine bronchoalveolar lavage (BAL) is not recommended if a patient tested positive for SARS-CoV-2. Co-pathogens should be evaluated and treated.

In the general population, post-acute COVID-19 syndrome is well documented. While the definition of the post-acute COVID-19 is evolving, a recent interdisciplinary group defined it as persistent symptoms and/or delayed or long-term complications of SARS-CoV-2 infection beyond 4 weeks from the onset of symptoms. It is further divided into two categories: (1) subacute or ongoing symptomatic COVID-19, which includes symptoms and abnormalities present from 4–12 weeks beyond acute COVID-19; and (2) chronic or post-COVID-19 syndrome, which includes symptoms and abnormalities persisting or present beyond 12 weeks of the onset of acute COVID-19 and not attributable to alternative diagnoses[6]. Particularly frequent are the pulmonary sequelae, seen in 40-65% of the cases. A reduction in diffusion capacity, the most commonly reported physiologic impairment in post-acute COVID-19, is related to the severity of acute illness. The frequency and severity of post-acute COVID-19 syndrome in HCT patients is still unknown. Studies to address this topic is being initiated by the EBMT. Other community-acquired respiratory viruses can cause late respiratory dysfunction in HCT recipients. It is therefore recommended to perform spirometry in HCT patients, who have resolved COVID-19. It is also important to be watchful for other late consequences that might occur.

TREATMENT OF COVID-19 POSITIVE HCT AND CAR T CELL PATIENTS
Antiviral drugs: No antiviral drug has showed a significant impact in the death rate of COVID-19 [7].

Remdesivir has demonstrated *in vitro* and *in vivo* activity in animal models against the viral pathogens MERS and SARS, which are also coronaviruses and are structurally similar to SARS-CoV-2. Remdesivir has been approved in the EU for treatment of severe COVID-19. Interim results from the so called WHO Solidarity trial reported on

hospitalized patients in 405 hospitals in 30 countries showed no or marginal benefit of remdesivir[8]. The combination of the data of 4 trials with remdesivir vs control [8-11], showed no significant impact in the death rate ratio (0.91, 95% CI 0.79-1.05)[8]. Based on these data, the WHO released a weak or conditional recommendation against the use of remdesivir in hospitalized patients with COVID-19[7] as the evidence suggests no important effect on mortality, need for mechanical ventilation, time to clinical improvement, and other patient-important outcomes. Two systematic reviews have failed to show benefit of remdesivir treatment for COVID-19[12,13]. However, this does not exclude that there might be a potential benefit in immunocompromised and other high-risk populations particularly in the early phase of the infection. The combination of remdesivir and baricitinib (a JAK 1 and 2 inhibitor) was in a randomized trial shown to be superior to remdesivir alone in reducing the time of recovery (primary endpoint) especially in patients receiving high-flow oxygen or non-invasive ventilation but did not improve survival[14].

Lopinavir/ritonavir has also been used but a published trial failed its primary endpoint[15,16]. A combination of lopinavir/ritonavir with ribavirin and interferon-beta was reported to improve viral clearance and alleviation of symptoms compared to lopinavir/ritonavir given alone[17]. Chloroquine and hydroxychloroquine have also been used with early data suggesting reduction of viral load [18-22]. In the WHO Solidarity trial[23], hydroxychloroquine, lopinavir/ritonavir and interferon did not definitely reduced mortality (in unventilated patients or any other subgroup of entry characteristics), initiation of ventilation or hospitalisation duration. Hydroxychloroquine given as post- or pre-exposure prophylaxis in randomized trials did also not reduce the risk for COVID-19[24,25]. Neither lopinavir/ritonavir or chloroquine/hydrochloroquine is recommended for treatment of COVID-19.

Convalescent plasma and monoclonal antibodies: Several neutralizing IgG1 monoclonal antibodies that target the receptor binding domain of the spike protein of SARS-CoV-2 are available for use within the EU with conditions (bamlanivimab, the combination of casirivimab and imdevimab, the combination of bamlanivimab and etesevimab, and regdanvimab). Their use resulted in lower rate of hospital admission and SARS-CoV-2 infection progression in patients with mild to moderate COVID-19 who are non-hospitalized for COVID-19 but who are at risk for severe COVID-19[26-28]. The effect seems to be better in patients early in the cause of the disease and with the combination of two vs. use of a single antibody. Unpublished data has been presented with the combination of casirivimab and imdevimab given as post-exposure prophylaxis to household contacts (https://investor.regeneron.com/news-releases/news-release-

details/phase-3-prevention-trial-showed-81-reduced-risk-symptomatic-sars).There is, however, concern that the neutralizing effect of at least some of these monoclonal antibodies could be reduced against infections with mutated SARS-CoV-2 variants. Furthermore, there have been cases showing selection of immune escape variants in bamlanivimab treated immunocompromised patients[29].

Another option for COVID-19 treatment, if available, is convalescent plasma that has in non-controlled trials suggested some positive effect in a proportion of patients[30]. Eleven randomized trials have already been reported. The RECOVERY study is the largest with 11,558 patients randomised[31]. In this trial a high titer plasma was used in all patients (EUROIMMUN IgG ≥ 6.0). The RECOVERY study clearly shows that the use of high titer convalescent plasma, in a non-immunosuppressed hospitalized COVID-19 population, does not improve survival at day 28 or other prespecified clinical outcomes, even if administered very early in the course of the disease. In the meta-analysis of the other 10 randomized trials, convalescent plasma was associated with a non-significant reduction in mortality (rate ratio 0·77, 95% CI 0·57–1·04; p=0·08). After inclusion of the results from RECOVERY study into the meta-analysis, the mortality rate ratio from the eleven trials was 0·98 (95% CI 0·91–1·06; p=0·63)[31]. Recently, the Clinical Trial of COVID-19 Convalescent Plasma in Outpatients, a multi-center randomized trial (C3PO), was halted by National Institutes of Health when the independent data and safety monitoring board determined that while the convalescent plasma intervention caused no harm, it was unlikely to benefit this group of patients (NIH new release, March 2, 2021). A recent systematic review and quantitative analysis concluded that most studies were of poor quality but that there might be a place for convalescent plasma in critically ill patients or those mechanically ventilated and resistant to antiviral therapy and supportive care [32].

Of note, both types of passive antibody therapies may influence immune response to COVID-19 vaccines SARS-CoV-2. It is recommended to defer vaccination for at least 90 days as a precautionary measure to avoid potential interference of the antibody therapy with vaccine-induced immune responses.

Anti-inflammatory treatment: Since an important part of the pathology includes cytokine release, different therapies addressing this syndrome have been tested. Short-term corticosteroid therapy was associated with lower mortality in immunocompetent patients with COVID-19 associated ARDS[33,34] and has been shown to be effective in randomized trials and summarized in a metaanalysis[35] and there is a WHO guideline regarding this

treatment (WHO. Corticosteroids for COVID-19. Living guidance. 2 September 2020. WHO reference number: WHO/2019-nCoV/ Corticosteroids/20201.2020).

Tocilizumab, which is approved for cytokine release syndrome after CAR T cell therapy, has been studied in nine randomized studies in COVID19 patients [36-43]. Two randomised trials have shown a survival benefit with the use of tocilizumab[41,43]. In these two studies, nearly all patients received systemic corticosteroids (82% and 93%). The RECOVERY included 4,116 randomised patients. In the RECOVERY study, the use of tocilizumab in hospitalised COVID-19 patients with hypoxia (oxygen saturation <92% on air) and systemic inflammation (C-reactive protein ≥75 mg/L), improved survival (rate ratio 0·85; 95% CI 0·76–0·94; p=0·0028) and other clinical outcomes (discharged from hospital within 28 days, less mechanical ventilation). These benefits were seen regardless of the amount of respiratory support and were additional to the benefits of systemic corticosteroids[41]. In a meta-analysis of the other 8 randomized trials, tocilizumab was associated with a non-significant 11% reduction in mortality (rate ratio 0·89, 0·72–1·11). After inclusion of the results from the RECOVERY study into the meta-analysis, the mortality rate ratio from the nine trials was significantly reduced (rate ratio 0·86 (0·78–0·94, p=0·0017)[22]. The use of systemic corticosteroid plus tocilizumab seems to reduce the mortality further. In the REMAP-CAP study, the use of tocilizumab or sarilumab in critically ill patients was associated with an improved survival at day 90 (HR 1.61,95% credible interval, 1.25 to 2.08)[43]. A recent Cochrane analysis concluded that tocilizumab reduced all-cause mortality in patients with COVID-19 [44] . In the UK, there is now a recommendation to use tociluzumab in hospitalized patients treated with respiratory support.

Three randomized trials, one with more than 4000 patients showed a positive effect of colchicine in COVID-19 clinical outcome with a 20% decrease of death/hospitalization for COVID-19 in non-hospitalized patients (Tardif, medRxiv. 2021:2021.01.26.21250494). In hospitalised patients with moderate to severe COVID-19, colchicine reduced the length of given supplemental oxygen therapy and hospitalization[45]. In the 3rd study including hospitalized patients, colchicine had statistically significant improved time to clinical deterioration compared with a control group that did not receive colchicine, although the benefit relied on a narrow margin of clinical significance[46]. A recent meta-analysis confirmed the reduction in mortality by colchicine[47].

Preliminary results from a randomized SAVE-MORE study showed that early, urokinase plasminogen receptor guided treatment with IL-1 receptor antagonist anakinra reduced the

mortality, ICU admission and increased the likelihood of full recovery in 594 patients with moderate/severe COVID-19 pneumonia (Kyriazopoulou et al, medRxiv. 2021:2021.05.16.21257283)

Another potential strategy to treat COVID-19 is the use of antibodies targeting GM-CSF. Preliminary data from a randomized, double-blind, placebo-controlled trial showed that lenzilumab improved "survival without ventilation" in hospitalized patients with COVID-19 [48]. On the other hand, another antibody targeting GM-CSF (mavrilimumab) failed in a small, randomized trial to improve outcome [49]. Additional studies are needed.

Vaccination will be covered in a separate guidelines document (WEBLINK).

Current status of therapeutic possibilities against COVID-19: At this point no clear recommendations can be made on specific therapies in HCT patients due to limited data and unknown risk vs benefit. Even less data is available for pediatric patients. There is support for use of monoclonal antibodies in selected patients particularly early during the infection. Therapy should be given in close collaboration with specialists in infectious diseases. Anti-inflammatory therapy with corticosteroids has been shown to be of value in non-transplant patients. The use of tocilizumab combined with systemic corticosteroids increase survival in hospitalized COVID-19 patients with hypoxia and systemic inflammation, and in critically ill patients. Data regarding other anti-inflammatory therapies are inconsistent but there is support for the use of colchicine and anakinra in selected patients with COVID-19.

Supportive care is crucial. Use of anti-coagulants to prevent thromboembolic complications, which can be frequent and severe in patients with COVID-19, have been shown to reduce mortality. Treatment of viral, bacterial, and fungal co-pathogens should be optimized. There is some information suggesting that individuals with low vitamin-D levels are more prone to develop more severe COVID-19 and it is therefore logical to supplement HCT individuals with vitamin D to achieve normal levels during the pandemic. It is currently recommended that immunosuppressive prophylaxis/treatment is continued since there is no data supporting reducing immunosuppression and it might instead cause harm.

MAINTAINING QUALITY STANDARDS IN THE PANDEMIC: EBMT-JACIE SELF-ASSESSMENT

Since the start of the COVID-19 pandemic significant modifications to usual practice have been necessary within clinical, collection and processing facilities of HCT programs, alongside those in the broader healthcare organizations, including hospitals, transfusion services and public health. Adaptation of quality manuals, policies and procedures has been necessary to maintain quality of care and protect patients, donors, and healthcare professionals to according to JACIE accreditation standards.

The EBMT-JACIE self-check offers HCT programmes a framework by which to assess and adapt their critical processes and services to minimise COVID-19 transmission and other risks within HCT programmes. These include COVID-19 minimised pathways for inpatient and outpatient patient care and support services (such as ITU), testing of patients, donors and staff and modifications to laboratory processing practice (such as cryopreservation). With increased experience and evidence base, procedures to diagnose and treat HCT patients infected with COVID-19 should be progressively updated.

The checklist will not be formally assessed by JACIE but the submissions and certification can be made available for future inspections to assess crisis management and how centres responded. JACIE may aggregate anonymised responses into the survey data to analyse how centres are managing their processes during the restoration, recovery, and re-surge phases of the COVID-19 pandemic. This will help inform future planning for delivery of JACIE accreditation throughout the ongoing pandemic. The self-assessment exercise has now been sent to all currently accredited centers but will shortly be opened to all EBMT member centres. Please contact jacie@ebmt.org for more information.

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CORONAVIRUS DISEASE COVID-19: EBMT RECOMMENDATIONS

VERSION 16 – May 27, 2021

Table 1.

Summary of EBMT RECOMMENDATIONS for SARS-CoV-2

General considerations
• **Avoiding exposure** by adhering to recommended hygiene procedures, isolation of SARS-CoV-2 infected individuals, and social distancing, especially for risk groups, are currently the main prevention strategies utilized in most European countries. Face mask use is also mandatory in most countries
• All patients including those vaccinated should continue to follow these procedures to limit the risk for contracting SARS-CoV-2.
• **Correct selection of the mask** and correct use are crucial (see text)
• Sequencing for mutated SARS-CoV-2 variants is recommended

Healthcare workers
• **Staff with any symptoms of infection** should stay at home 　○ Testing for SARS-CoV-2 is strongly recommended since symptoms can be uncharacteristic and very mild. PCR is the test recommended in this document. However, antigen tests can have their place in screening of staff before work as long as the test has been evaluated and approved for the purpose by the proper national or regional authority. 　○ Return to work by staff members who have recovered from COVID-19 should follow national guidelines, usually requiring the resolution of symptoms and two negative PCR results.
• **Testing asymptomatic healthcare workers:** there are no general recommendations to regularly test asymptomatic healthcare workers. Nonetheless, Regular screening is undertaken in many healthcare systems, and, where available, adherence to such policies should be encouraged to protect patients, even when staff are vaccinated
• **Training of staff in proper procedures**, including caring for those with suspected or confirmed infection, ensuring adequate access to personal protection equipment and planning for possible staff shortage are critical.
• **Staff should preferably be dedicated to a COVID-19 free transplant unit** and not used interchangeably to care for COVID-19 positive patients.

Outpatient visits and visitors
• **Outpatient visits** should be substituted with telemedicine visits if deemed appropriate and feasible.
• **For necessary out-patient visits,** it is important that appropriate measures to reduce the risk for nosocomial transmission continue to be applied.
• **Visitor to transplant units.** When there is substantial COVID-19 activity, it is recommended to maintain visitor restrictions to transplant units 　○ There might be exceptions for parents to transplanted children 　○ Testing for SAR-CoV-2 should then be considered before entering the ward. Repeated testing might then be necessary

Transplant patients

- **Patients planned to be admitted for a transplant or to undergo CAR T-cell therapy** should try to minimize the risk by home isolation 14 days before the start of the transplant conditioning. Unnecessary clinic visits should be avoided

- **Transplant candidates that become infected by SARS-CoV-2**
  - Patients, who have acquired COVID-19 immediately before HCT should be deferred due to the risk for progression to severe disease. The other situation is patients, who have acquired COVID-19 some weeks before planned transplant and who are still PCR-positive but who either never developed symptoms or have resolved their symptoms (see text)
  - The decision to defer or not the transplant must be made taking into account several factors (see text)
    - If a transplant candidate is diagnosed with COVID-19, a deferral of the transplant procedure is recommended. However, this is not always possible due to the risk for progression of the underlying disease
  - **In patients with high-risk disease**
    - SCT should be deferred until the patient is asymptomatic and has two negative virus PCR swabs taken at least 24 hours apart
  - **In patients with low-risk disease**
    - who were asymptomatic or only mildly symptomatic with upper respiratory tract symptoms, deferral of 14 days after first negative PCR is a minimum and a new PCR is recommended before the start of the conditioning.
    - for those with moderate to severe COVID-19 disease, it is recommended to defer the transplantation for at least three months

- **In case of close contact with a person diagnosed with COVID-19**
  - Any transplant procedures (PBSC mobilization, BM harvest, and conditioning) shall not be performed within at least 14 days from the last contact
  - Patient should be closely monitored for the presence of COVID-19, with confirmed PCR negativity before any transplant procedure is undertaken

- **Before starting the transplant procedure**
  - Patients should be adequately informed that the risk for severe complications can be higher if the patient get infected with SARS-CoV-2 during or after the transplantation
  - Availability of adequately trained staff, ICU beds, ventilators, as well as availability of the stem cell product should be ensured
  - All patients, including those without symptoms, should be triaged and tested before being admitted to a transplant ward
    - Adequate space for symptomatic patients while awaiting the results of COVID-19 testing should be allocated preferably separate from the transplant unit
  - All patients should be tested for SARS-CoV-2 by PCR and the test results should be negative before start of the conditioning regardless of whether any symptoms are present

- **Patients after HCT or CAR T cell therapy.**
  - Those being regarded as immunosuppressed or having significant organ dysfunction should
    - limit their risk of exposure to infected individuals as much as possible and strictly adhere to prevention practices such as hand hygiene and social distancing
    - refrain from travel and if travel is deemed necessary, travel by private car instead of any public transportations system is recommended if feasible.
  - Physical and social isolation, although a usual practice for many transplant patients, will now extend further and for a longer period of time

Donors
WMDA has produced recommendations regarding unrelated donors and the EBMT endorses these guidelines. It should be recognized that the EBMT has to consider family donors such as children and elderly donors, who might be in a different situation than unrelated donors.   **Social isolation before donation:** donors within 14 days of donation should practice good hygiene and be as socially isolated as feasible during this period. Unnecessary travel should be avoided   **Donors with close contact or diagnosed with COVID-19**   **Diagnosed with COVID-19:** Collection should be deferred for at least 14 days after recovery   **In case of close contact with a person diagnosed with COVID:** the donor shall be excluded from donation for at least 28 days after the last contact   **If the patient's need for transplant is urgent,** the donor is completely well, a test is negative for SARS-CoV-2 and there are no suitable alternative donors, earlier collection may be considered subject to careful risk assessment   **Testing before collection**   - It is recommended that donors are tested for COVID-19 and that results are available prior to starting the collection procedure, in order to protect the staff of the pheresis unit and other patients that can be at the unit at the same time from an infected donor   **Cryopreservation of stem cells**   - If there is concern that the donor is at high risk of community-acquired infection between work-up and collection, pre-planned cryopreservation is recommended since it will allow patient conditioning to be withheld until successful donation and delivery are confirmed   - Stem cell products can also be frozen at the harvest site if prolonged transport time is expected

DIAGNOSIS AND GENERAL MANAGEMENT OF COVID-19 PATIENTS

• **Diagnostic procedures for COVID-19**
    o Should follow national or local guidelines
    o Test for SARS-CoV-2 in nasopharyngeal swab can be falsely negative and needs to be repeated if there is a strong clinical suspicion of COVID-19
    o The performance of testing is better in samples from the lower than from the upper respiratory tract (sputum or bronchoalveolar lavage)
    o It is also important to test for other respiratory viral pathogens including influenza and RSV preferably by multiplex PCR
 	
• **SARS-CoV-2 infected patients**
    o Patients, who are positive for SARS-CoV-2 should not be treated in rooms with laminar air flow or other rooms (HEPA) with positive pressure unless the ventilation can be turned off
    o All patients positive for SARS-CoV-2 in an upper respiratory tract sample should undergo chest imaging, preferably by CT, and evaluation of oxygenation impairment
    o Routine bronchoalveolar lavage (BAL) is not recommended if a patient tested positive for SARS-CoV-2.
    o It is recommended to perform spirometry in HCT patients, who have resolved COVID-19

TREATMENT OF COVID-19 POSITIVE HCT AND CAR T CELL PATIENTS

- Supportive care is crucial especially anti-coagulants to prevent thrombo-embolic events.
- Co-pathogens should be evaluated and treated
- At this point no clear recommendations can be made on specific therapies in HCT patients due to limited data or unclear risk vs benefit.

- **Antivirals drugs**
  - No antiviral drug has showed a significant impact in the death rate of COVID-19
  - Remdesivir has been approved in the EU for treatment of severe COVID-19

- **Convalescent plasma and monoclonal antibodies:**
  - **Monoclonal antibodies**
    - Recently several monoclonal antibodies against COVID-19 have become available for treatment of non-severe COVID-19
  - **Convalescent plasma**
    - In randomised trials no effect on mortality was observed.
    - A recent systematic review and quantitative analysis concluded that there might be a place for convalescent plasma in critically ill patients or those mechanically ventilated and resistant to antiviral therapy and supportive care.

- **Corticosteroids**
  - Short-term corticosteroid therapy (7-10 days) was associated with lower mortality in immunocompetent patients with severe and critical COVID-19, was shown to be effective in randomized trials and is endorsed by the WHO guideline.

- **Tocilizumab:**
  - Meta-analysis of randomized, controlled trials support a reduction of all-cause mortality.
  - In two large randomised trials, the use of tocilizumab combined with systemic corticosteroids increase survival in hospitalized COVID-19 patients with hypoxia and systemic inflammation, and in critically ill patients.
- Colchicine. A recent meta-analysis showed a reduction in mortality

- **Anakinra** guided by Urokinase Plasminogen Receptor, seems to improve clinical outcome, including reduced moratlity, in patients with moderate/severe COVID-19 pneumonia (preliminary report of a randomized trial)