

Management of COVID-19 Pandemic in the Intensive Care under Scarce of Resources with Palliative Care Approach

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ABSTRACT

Coronavirus has been shaking the world since 31 December 2019, with its world-wide pandemic impact since 11 March 2020. Although its impact on mortality rate against the total incidents is relatively small, the fatality rate against critical care admission due to the event of ARDS remains relatively high. The 2019 Coronavirus Disease (COVID-19) has a serious consequence in the Intensive Care Unit care, which leads to a high demand for more ICU staffs, isolation rooms, equipment (mainly ventilators). These limitations along with the recently unavailable definitive treatment require an adapted ICU care system for the provided services. ICU care should therefore more aimed at improving the quality of life (patients, families, and staff). This can be done by providing symptomatic therapy, advance care planning, and end of life / dying care in an unusual circumstances (isolation). All of these services may refer to the application of palliative care principles, which have not been extensively applied in the critical care. This review is aimed to offer application of palliative care in intensive care in during pandemic with scarce of resources.

Keywords: Intensive care, Palliative care, COVID-19, scarce resources.

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INTRODUCTION

The 2019 Novel Coronavirus Disease (COVID-19) is a highly infectious disease, which leads to a severely acute respiratory care crisis,¹⁻⁴ and an unpredictable duration to death.^{3,5} In 11 March 2020, the World Health Organization (WHO) has officially declared a pandemic for COVID-19.^{6,7} Since the respective period, over hundred thousand of people in the world are being infected; thousands are under critical condition and have lost their life.⁸ In order to encounter, every countries have been struggling to extensively lower the rate of transmission and mortality using different measures depending on population profile.^{1,6,9-11}

Although the general mortality rate of the disease is relatively low when compared to the outbreak of other similar diseases (e.g. SARS and MERS),^{1,2,8} the mortality rate of these patients under critical conditions and those that require respiratory assist devices has risen dramatically.^{1,2,5,12} There are numerous factors that contribute in the increase of mortality risk of patients with coronavirus stains in the Intensive Care Units (ICU), such as age, comorbid, immune status, disease severity, pathogenicity, availability of antiviral and its resistance, as

well as quality of the ICU care in managing these pandemic.^{2,3,5,6,9,13-17} Therefore, ICU plays a crucial role in the management of COVID-19 patients in its worst scenario.^{2,9,12,13,17}

ICU managers should be able to prepare their units to respond to this pandemic by adapting service capacity dynamically to the development of outbreak.^{2,13,18-20} Even though there have been many recommendations on the managements of COVID-19 issued by several healthcare / professional associations,²¹ these cannot always be merely applicable for every ICU.^{1,20} During the pandemic, even a well-prepared ICU will have limitations¹⁸ due to the surge of capacity, scarce resources.^{2,4} Both ICU and hospital managers should guard several fundamental aspects: development of regulations (policies and protocols),^{1,13,15,22} coordination (inter-unit, inter-hospitals, or higher levels),^{2,13,14,18,19,23} infection prevention and control (IPC),^{2,13,23} infrastructures preparedness (building, rooms, isolation area),^{2,13,23} logistics and stocks availability (equipment, pharmaceuticals),^{1,2,13,14,19,23} staffing control (mapping, distribution, education, evaluation)^{1,13,18}

Since definitive therapy has not been available,⁴ the care will be more focused on the treatment of any appearing symptoms to enhance the quality of life,^{4,16} with early advance care planning,^{13,16,24} advance directives,²⁴ and relieving stress (for patients, family, staffs, and community) taking into account on the wishes of the patient and family from the early care until ICU discharge (recovered or died) without neglecting the possibility of infection exposure during all of the processes.^{15,16,24} Even though the patients, families, and staff are isolated, the entire COVID-19 services must be provided with dignity and respect, that they never feel neglected.¹⁶ Therefore, even the role of palliative care in the intensive care has not yet been widely applied; its role during COVID-19 care is considered to be highly regarded.¹⁶ This review is aimed at giving recommendations on ICU services with limited resources in dealing with COVID-19 using a palliative care approach.

Search methodology

We performed Medline using search terms as 'COVID-19' and 'intensive care' or 'pandemic' and 'intensive care' or 'pandemic' and 'palliative care' or 'pandemic' and 'scarce of resources', we emphasis on recent ones, for the educational narrative review.

Management and coordination

The regulation of care of COVID-19 patients in the ICU must consist of guidelines of care that cover all aspects, including criteria for ICU admission, triage, screening, assessment, re-assessment, laboratory diagnostic procedures, care plan, advance directives and advance care plan, education and prognosis sharing to patient and family.^{13,14,16,20,24-29} All of the above mentioned regulations should recognize the limitations of staffs, equipment, pharmaceuticals and supply, physical environment.^{10,13,20} Task forces in ICU should be supplied with specific tasks and responsibilities to be plan and to create a solid command control structure in order to prepare services under limitations.^{14,18,19}

Under limited resources, coordination between the ICU internal (departments) and external (local, regional, national) parties must be executed continuously (Figure 1).^{13,14,18,19} Internal collaboration is crucial to determine the allocation of staffs,^{13,18} rooms, ICU equipment,^{9,13,14} and other equipment (e.g. tableware, transport)¹⁹ to support the quality of patient care. All units must have a proper inventory and marking of resources dedicated for COVID-19 patients, aimed to prevent the spread of nosocomial infections. Regular ICU reporting (e.g. total cases, incidences, workloads, other findings) is important for specific updates and evaluation.^{12,14,30} Hospital managers need to understand that staffs and equipment planned for elective may be more beneficial to contribute the ICU care ^{9,13,29} External collaborations become a necessity to facilitate a patient's referral process, in spite of to provide mutual assistance in scarce of resources.^{10,13,14,18,19} Data sharing can be the basis for coordination, evaluation, and research to evaluate a proper care and definitive COVID-19 treatment internally, locally, or nationally (Box 1).¹⁴

Scarce of Manpower

The lack of ICU staff quantity can be mitigated by delaying staff leave plans, and increasing the number of effective full-time working hours, while continuously adjusting the ratio of required ICU staffs and patients over time.¹⁴ Re-allocation from other units, and external recruitment from external parties (including recruiting volunteers) may be done with ^{12-14,18,30} a proper trainings and educations in order to improve competencies on critically ill care.^{1,12,13,18} Training can also be delivered on an ongoing basis involving staff for certain activities.³¹ Mandatory education or training for all staff are listed in the Box 2. Restricting their jobs only based on the current competencies is important to reduce the risk of missed care.^{1,12,18}

Human resource managers can participate in developing policies on risk protection and rewards for staff who works overtime. Staffs' immune status, preventing fatigue, stress, and the spread of infections resulted from increasing workload and services should always be regularly evaluated.^{14,15} Any staff should be asked to report and stay at home if they have developed fever or any respiratory illness.^{15,22,32-36}

A holistic ICU care requires cooperation of many staff from various disciplines. To provide a well-coordinated multidisciplinary service, the role and responsibilities of each individual, including the team leader.¹⁶ However, under workforce shortage, one division should be able to take on several responsibilities at the same time adjusted to workloads and competencies between combination of responsibilities.^{14,30,31}

Scarce of Equipment, Pharmaceutical, and logistic

During a pandemic, the amount of medical equipment (particularly for respiratory support), drugs, and other supplies might not be certainly sufficient. Personal Protective Equipment (PPE) supplies shall always be available, otherwise it leads to less strict personal protection for medical staff.^{7,12,13} Under condition of limited PPE, the hospital must innovate. Modification of raincoat, plastic boot, plastic helmet or any measures may protect the best or minimize the risk of infection (Figure 3). Reusable ICU equipment, more specifically mechanical ventilator equipment should be available. Reusing them might be the realistic option mainly because they are expensive and difficult to store, while hospital, or government-level facilities might have difficulties in providing these devices. ^{4,6,9,37-39} Inventory and planning of drugs that are commonly used in ICU services are necessary.^{1,2,14,17,22} In order to prevent shortage of drugs, pharmacies have to modify some medication procedures by authorizing certain medical personnel to prescribe scarce medications.¹³

Redistribution and storage of the equipment either inter or intra hospital have to be well planned.^{12,13,19} The equipment in this scenario is not only limited to what is available at the ICU, but also tableware, equipment for medical treatment that requires sterilization, linen and other so that these equipment will receive special treatment to prevent transmission of infection to other people.^{13,22} An alternative methods such as anesthetic ventilators, high-flow nasal cannula oxygenation, and non-

invasive positive pressure ventilation for certain patients may be considered to increase availability.^{12,13,23}

Scarce of ICU isolation rooms

An ideal room assigned for airborne diseases need to have negative air pressure, antechamber, and sufficient lighting and ventilation.^{2,19,40} However, such a room is unlikely available in a great number. ICU manager can look the possibility to extend ICU services outside the ICU walls to respond to the overcapacity by transforming other areas in the hospital as remote / mobile ICU.^{2,13,19} In order to manage critical care outside ICU, mobile equipment (oxygen cylinders, portable monitors, suction, and ventilators) have to be prepared, and if possible, connectors may be used for one wall-port for some equipment (multi-patient regulators),^{13,19} Whenever possible, the use webcams may improve monitor patients remotely (conditions, vital signs, and ventilator), so that medical personnel do not need to be exposed for a long time.^{13,19}

When the number of patients is tremendously increased, it is possible to evacuate the non-infected to other areas in the hospital or refer them to other hospitals.^{2,13,19} 41 Modification of the post anesthesia care unit area is a top priority as a remote ICU, coronary care units, transforming high-dependency beds into ICU, re-opening previously closed area, or perhaps remodeling a general inpatient ward for a remote ICU.^{12,13,19} Managers need to consider the ability to further expand the area should the number of patients is consistently increased.^{2,12,13,19} To reduce the risk of developing new infection chains, expansion of remote ICU should be in a centralized area, taking into account equipment availability, the competence the working staff, and the area nearby the ICU.^{12,13,19,40}

The "lockdown approach" system may be used to prevent development of new infection chain clusters.¹³ This allows every COVID-19 patient will be managed in a specified area from the admission until hospital discharge.^{13,16,24} This lockdown approach might be a better option rather than moving patient into a non-standard isolation room in a general ICU, which may increase the risk in developing a new infection clusters by at least the general inpatient ward staff and the ICU staff.¹² In this approach, opening and closing the area should be controlled in timely manner.⁷ If the patients should be importantly carried out for diagnosis to determine further medical therapy, transport process must be planned to consider specific routes aiming to minimize exposures, and followed by decontamination of pathway and equipment.⁴² Zonation and split rooms for suspected patients also should not be overlooked.^{10,12,13,19} If the isolation area does not allow to manage one room-one bed for patient placements,^{13,40} a separation at a distance of least 1-meter with a barrier and ventilation is necessary to reduce the risk of cross-contamination between patients.^{2,10,12}

Palliative care

The primary objective of care for COVID-19 patients in this critical condition is to provide holistic care from symptomatic therapy as well as treatments of comorbid condition,^{2,3,5,6,16} improvement of quality of life,²⁴ stress coping for both patients and relatives caused directly by

the diseases or isolation to control disease transmission, advance care planning,^{13,16,24} and advance directives,^{16,24} spiritual needs,²⁴ to care after death.^{15,16,24} Both advance directive and advance care planning are excellent method to be prepared at ICU admission,^{9,13,16} yet very beneficial when relatives are not allowed for close contact especially under highly urgent condition,^{12,13,16,24} considering the rapid deterioration in COVID-19 patients with acute respiratory distress syndrome (ARDS).

Palliative care principles to manage arising symptoms, with theoretical considerations for clinical and laboratory findings, and assessments and re-assessments by multidisciplinary staff.^{15,16,24} Treatment and care for infected patients who are dying must also be well carried out for critically non-infected patients who may also suffer from preventive measures such as isolation because they may receive benefit from palliative care.^{16,24} This principle encouraged patients, relatives, and those who may feel overburdened and may experience moral distress need to receive continuing optimal care support.^{15,16} As they may develop several clinical responds, such elderlies, frail patients, and/or patients with underlying chronic or severe illness require a unique skill and should receive greater attention in palliative care than younger and healthier population.^{3,16}

ICU Care

The COVID-19 ICU care under the absence of definitive treatment should follow protocols to improve quality and safety even with scarce of resources.^{15,16,21} Screening and ICU triage are subsequently performed to determine the severity of the disease and the placement of patients into the suspect group, or the confirmed COVID-19 group.^{5,9,13,16,20,24} These methods are used in conjunction with implementation of ICU admission and discharge criteria under a priority scale. All patients on the signs of respiratory illness, including fever ($\geq 38C$) and cough, or shortness of breath should be assessed and reassessed (twice daily, at least).^{4,5}

During a limited resources, triage will is more desirable to be performed for those who benefit the most, 'first come first served' principle intervention should only be performed for (a) patients who have high survival chance, (b) those who requires advanced equipment; and (c) those who need extensive staff or hospital resources.^{16,20,28,29,43-45} Criteria for COVID-19 triage plan in the ICU has been detailed elsewhere.⁴⁶ If the need for ICU resources surpass its availability, determination of ICU admission and triage needs to be stricter.^{13,19,40} Elderly patients with end-stage chronic diseases with repeated exacerbation will be more beneficial with palliative care management.^{3,9,16,20,24}

Figure 2 provides an algorithm for management of COVID-19 pandemic in the ICU with palliative care approach under scarce of resources.^{9,13} Screening and triage at the ICU should be performed by well protected staff from a suggested distance (at least 1-meter away) from the patient.^{10,12} It is important to ensure that the patient has already been tested for COVID-19 according to surveillance policy.^{4,6,37-39} Most importantly, all activities in dealing with COVID-19 must always adhere IPC principle throughout care by prioritizing the safety of the non-infected from the infected ones.^{7,12,23} PPE must be

properly used at all times, decontamination must be carried out as soon as possible as standard, and isolation must be performed not only to infected patients, but also to devices that have been used by infected patients to prevent exposure to infection.^{2,12,13,23,40}

Sufficient explanation should be given to patients and family at ICU admission about diagnosis, care plans, isolation, possible interventions, complications, prognosis, rapid deterioration, mortality, as well as limitations of resources (e.g. ventilators and isolations).^{2,9,22,23,40} Based on the information, staff can subsequently describe the advance care planning, and explain that it will always be adjusted from the regular findings of each caregiver from the multidisciplinary team. Patient and family may to discuss the acceptable or non-acceptable therapy, including to provide advance directives to withhold or withdraw therapy (e.g., intubation or other invasive actions), or decline resuscitation.¹⁶ They can express hopes and unique needs in dealing with the given information,^{15,16} and must understand from at the earliest that in critical conditions, a ventilator may not be available, and the ICU is only able to provide the best help the best possible without the device if the referral process cannot be carried out.^{13,23}

Furthermore, it is important to provide mental and spiritual support to patients and families who experience moral distress in dealing with recently incurable disease that must be isolated.^{14,22} Care team must be able to communicate with families if their expectations in the critical conditions and near-death processes cannot be carried out like non-isolated patients.¹⁵ Above all, ICU manager should ensure all activities on the COVID-19 patients are performed with dignity and respect even though they are in isolation due to highly infectious diseases.^{1,24}

To prevent transmission, families should not have physical contact with the patients since they are admitted to the isolation room to the ICU discharge (either dead or life),^{2,40} or after being confirmed non-infected.^{13,23} In general ICU care, families may witness or provide spiritual support to dying patients, but this does not apply to COVID-19 patients.^{4,6,37-39} Thus, the potential "good-bye moment" and other supports needs to be provided since the beginning of the patient entering ICU isolation.^{16,47-50} The use of HIT can help families to "meet" patients without making physical contact (depending on the local regulation).

Critically ill patients in the group of suspected should be separated from patients in the group of confirmed in a one-to-one rooms while waiting for laboratory confirmation.^{10,13,23} If single rooms are not available, cohorting patients with suspected or confirmed COVID-19 can be an alternative. But suspected or confirmed patients should not be placed next to immunocompromised patients.^{12,19,23,40} Following confirmation, the confirmed-negative COVID-19 patients should be transferred to the general (non-isolated) ICU, while the confirmed-positive patients are transferred to the room with the same case.^{2,12,23,40}

One of the most frequent questions to address in the care of patients with highly infectious diseases is whether or not the patient will be resuscitated,^{9,13,16} especially if the

used PPE is not standard.¹³ From the ethical perspective, medical treatment cannot be carried out only with the support of advanced directives.¹⁶ Futile treatment judgment may be a reason for refusing medical treatment, but only if the local medico legal allow such concept.

All the medical producers must be performed at the bedside to minimize transport of infected or potentially infected patients to other areas of the hospital. Every task should be executed only by skilled/trained personnel. High-risk procedures should be used only for those who need for optimum care. Generally, aerosol-generated procedures during endotracheal intubation, bag mask-ventilation (BMV), and cardiopulmonary resuscitation (CPR) can transmit the disease to the providers.^{13,21,23} If bag-valve mask ventilation needs to be done, two-rescuer need to perform this in order to seal the mask while providing positive pressure ventilation adequately.^{12,13,23} HEPA filtration should be equipped on BMV and other aerosol generating equipment.^{1,2,12,13,23}

In line with the etiology of COVID-19 with the risk of severe acute respiratory diseases,^{21,40} the management of mechanical ventilation ventilator support and rescue therapies becomes the main concern for medical treatment that hospital staff needs to prepare for inspired oxygen and positive end-expiratory pressure, several mechanical ventilation modes, prone positioning ventilation, and ECMO if possible.^{12,13,23} Protocols of mechanical ventilation may follow the general care protocol of patients with respiratory failure and depends on the patient's profile, severity, and other complications.^{5,15} The ICU staff must avoid disconnection of ventilator circuit. Before disconnected, ventilator should be on a "Standby" mode. ^{1,12} The staff needs to stay away from respiratory secretions, splashes of respiratory secretions, wear Venturi masks, and avoid diluted drugs.^{12,13,23} In addition, the closed suction system should be preferred if available. ^{12,13,23}

These procedures should be performed in an airborne infection isolation room by well-protected personnel.^{10,12,23} Also, the room should be disinfected following the procedure.¹³ Scarce resources, should not an excuse for not performing resuscitation for COVID-19 patients. A creative modification of PPE to the safest possible, and the recommendation of procedures is preferable to overcome limitations.¹⁶

Monitoring of patients in isolated room should be adjusted with the safety principle for both patients and staff. Video monitoring can be a useful alternative for direct monitoring to prevent direct contact. Slave monitors outside the room can be used for observing vital signs, electrocardiogram, etc. Assessments and procedures need to be integrated to optimize nursing contact and ensure efficiency (i.e., vital signs, position changes, bathing, etc.).^{28,29,51,52}

Transport out of the isolation room is only performed, in case it is impossible to conduct the medical procedure at the bedside. Special routes for infected patients should be prepared, coordination must be carried out with the destination area, security and other areas where the patient will pass, to clear the transport route, and then decontaminate the route according to IPC guidelines.^{7,29,42} If it is not possible, patients must be protected/covered

properly during the transport.^{7,23,29} When transporting with an ambulance, family members should not be in the same transport vehicle. Ambulance driver should be isolated from the patient compartment otherwise outside air vents in the driver area should be opened, and rear exhaust ventilation has to be turned on to the highest setting. A negative pressure gradient will be created with this concept.^{14,20,53}

Summary

Pandemics of COVID-19 alert the ICU across the world. In order to avoid the prepare this pandemic disease, planning and coordination need to be performed thorough fully. Lack of staff, PPE, equipment, infrastructures, pharmaceuticals and logistics could be prevented by a proper planning and modification of protocols based on the scarce resources. Creativity and modifications as well as a prepared care management play important role in this scene. However, since the primary aims of ICU care for COVID-19 is recently to treat any arising symptoms, improve quality of care, while still involving patient and family to the care plan based on their unique needs, therefore palliative care principles give a great benefit despite the risk of infectious disease. Early advance directives may also prepare for the possibility of a rapid deterioration as found in many critically ill COVID-19 patients.

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<p>Box 1. The role of HIT Collaboration, coordination, evaluation, and research. Automatic re-stock system. External staff recruitment. Referrals and evacuations. Long distance education and training or teleconferences. Distanced online consultations. View and hear patient and monitor remotely. Scientific resources. Video communication between patient and family.</p>	<p>Box 2. Mandatory knowledge to work in ICU during pandemic <i>Regular ICU care and protocols:</i> ICU screening and triage Frequent ICU care and monitoring ICU structure, command and control The use of ICU devices Emergency care for patients with COVID-19 Crisis management and control Legal documents, forms <i>Palliative care:</i> Patients and family care with dignity and respect despite the nature of infection Patients and family involvements Unique needs Early advance care planning Early advance directives Signs of distress, traumatic grief, psychosocial <i>Self-health monitoring</i> Personal Hygiene Preventing fatigue, Coping with pandemic-related stress <i>Infection prevention and control</i> Personal protective equipment principles Procedures with high risk of disease transmission Management and disposal of any contaminated items Isolation, zonation protocols Care to the deceased of COVID-19 <i>Health information and technology</i> Data collection and reporting Alert signs or specific warning signs</p>
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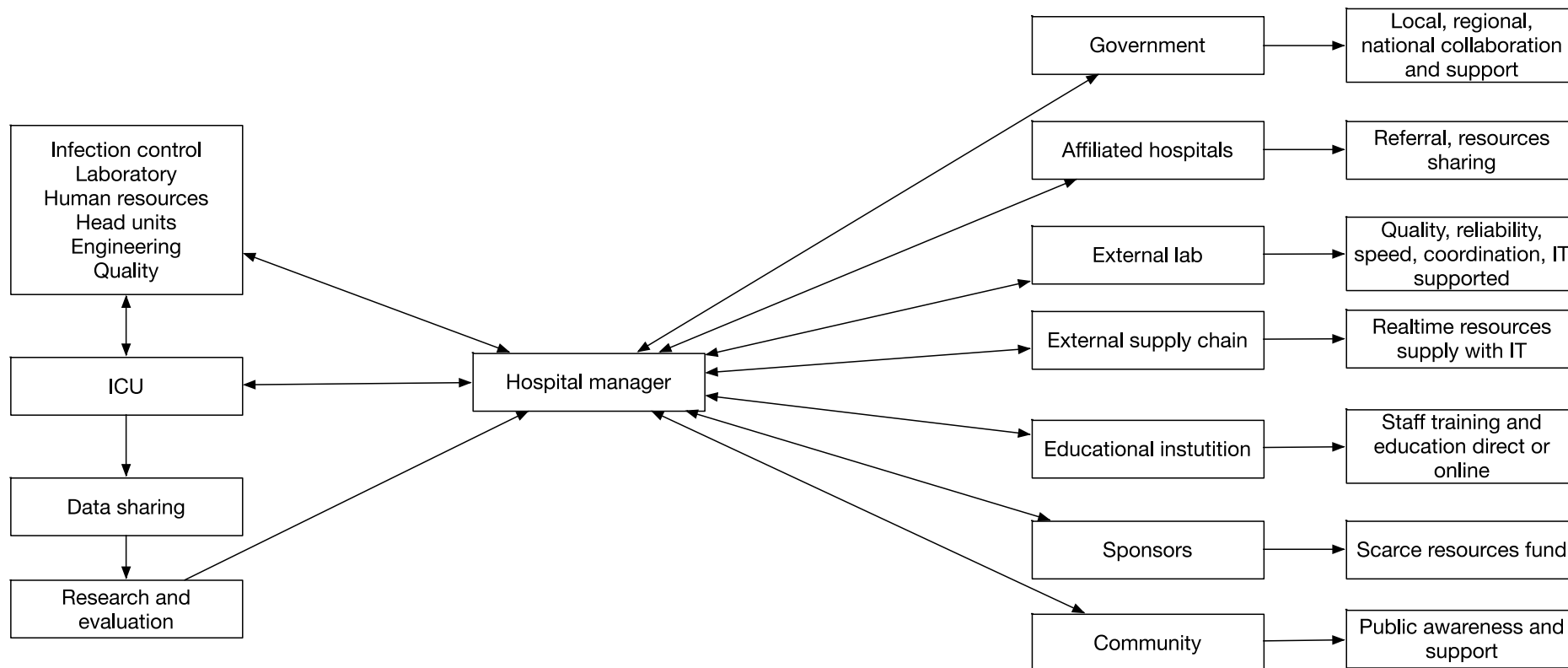


Figure 1. ICU and hospital management during COVID-19 pandemic

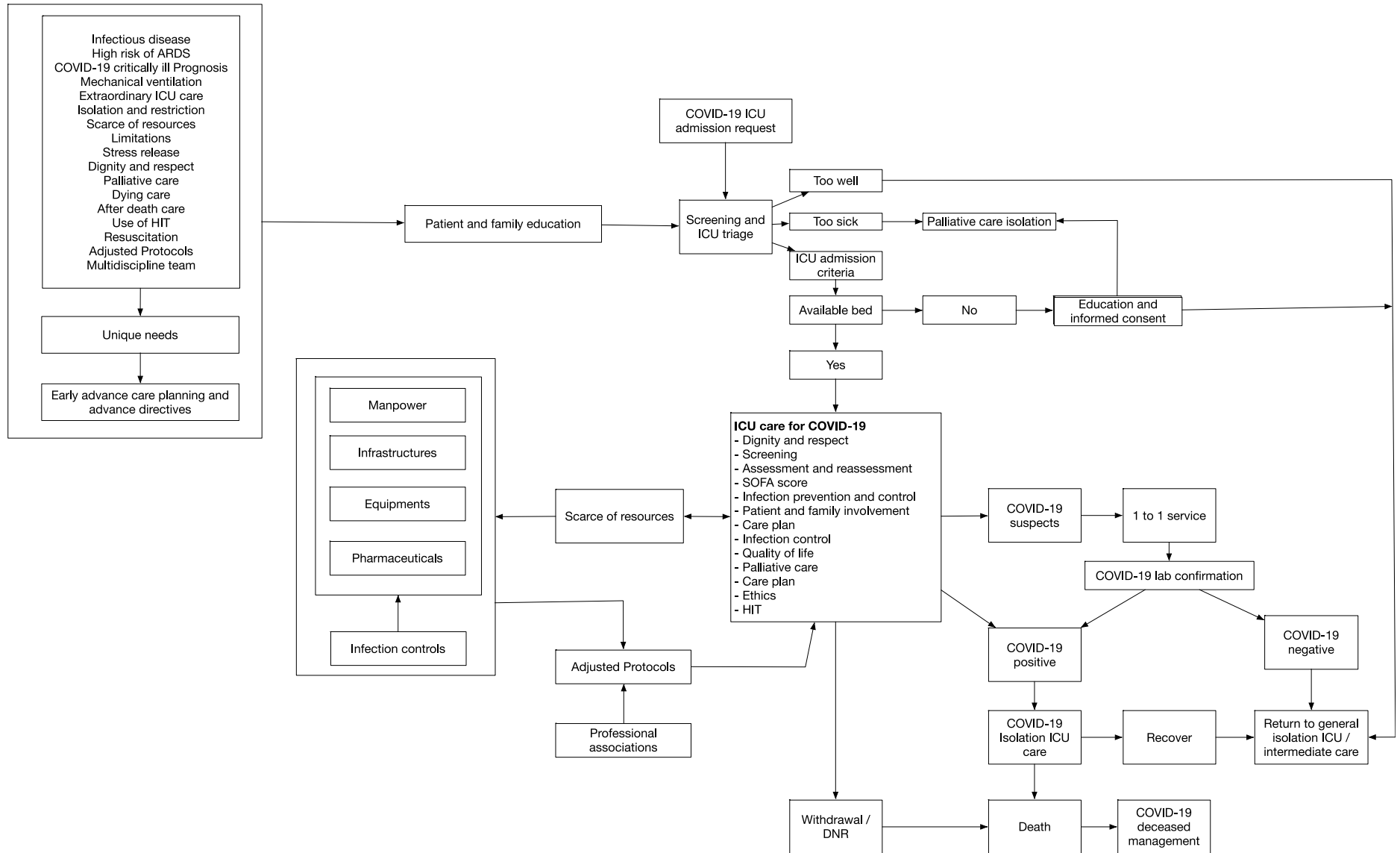


Figure 2. Intensive care management of COVID-19 pandemic with palliative care approach under scarce of resources



Figure 3. Modifications of PPE. Panel A: the use of raincoats and cleaning boots as PPE. Panel B: the glass box during airway management. Panel C: the use of plastic during airway management.