VOLUME 2

DISEASE CONTROL PRIORITIES • FOURTH EDITION

Investing in Pandemic Prevention, Preparedness, and Response

Chapter 12 Annexes

ANNEX 12A: DEFINITIONS OF HEALTH CARE DOMAINS INCLUDED IN SEMISTRUCTURED QUESTIONNAIRE

Domain	Brief description
Clinical site selection	*Discuss any designation for a particular facility as a "COVID-19 facility" or unit as a "COVID-19 unit," including criteria for designation, timing, epidemiology, resources, retrofitting, and expertise.*
Communications	*Describe intrafacility, interfacility, and external communication channels that were created (between health care systems, facilities, staff, providers, patients, media, general populations, and so on).*
Coordination of care/ governance	*Describe intrasystem coordination (across sites) or intersystem coordination (across regions/systems), including patient evaluations, transfer/acceptance criteria, and any emergency operations, task forces, or incident command systems implemented.*
Equipment and supplies	*Discuss changes to supply chain management, rationing, and utilization of supplies or equipment (oxygen, personal protective equipment, vaccines, ventilators, medications, and so on). Which equipment and supplies were readily available, and which were not?*
Financing	*Describe any emergency or catastrophic funding mechanisms implemented to support health care delivery during pandemic surges. What financial challenges did your health care facility or system face, and what was the response (effective or not)?*
Maintaining core functions	*Describe how core components of patient care were maintained, and which modifications were required (such as utilization of telehealth, reassigning clinical space or facilities to COVID-19 treatment or triage areas, and deferred operative cases or clinic visits).*
Post-acute case management	*Describe case management beyond acute hospitalization, including transition to long-term facilities, challenges with disposition from hospital, and management of "long COVID."*
Special patient populations	*Describe special considerations taken for certain at-risk patient populations (children, elderly, immunocompromised, pregnant, and so on).*
Staff	*Discuss task-sharing, recruitment, training, and transfers among staff members at various levels of care (administrative, clerical, clinical, and so on), and any efforts to prevent provider burnout.*

Source: Original table based on ASPR TRACIE 2020 and Haldane et al. 2021.

ANNEX 12B. DETAILED RESPONSES TO SEMISTRUCTURED QUESTIONNAIRE ON DOMAINS OF PATIENT CARE DURING COVID-19, BY COUNTRY

Domain	Brazil	China	Kenya	Mozambique	Nepal
Clinical site selection	The Ministry of Health oversaw creation of COVID-19-specific facilities and hospital units, with support from individual hospitals and local administrators guided by local interests.	Drawing from the prior SARS-1 pandemic in 2003, China has maintained Fever Clinics as screening and isolation centers for seasonal influenza outbreaks. These centers, isolated from main hospital campuses to reduce risk of transmission, were rapidly designated as primary triage sites for suspected COVID-19 cases based on commonly reported symptoms. Early in the pandemic, China adopted a novel strategy to permit rapid expansion of treatment facilities through development of Fangcang shelter hospitals, large-scale public venues temporarily converted to health care facilities to serve as isolation and treatment centers for patients with mild to moderate illness. All patients requiring a higher level of care were admitted to designated hospitals. This initial response permitted rapid control of COVID-19 cases with the initial pandemic surge. Initially, laboratory testing was performed at a central facility; later on, laboratory personnel were dispatched to various regions to strengthen the local capacity for nucleic acid amplification testing.	At the direction of the national governing body, COVID-19 facilities were established within each county. In response to surges, critical care units were expanded and staff were reassigned from other sites or units to fill gaps at designated COVID-19 facilities.	Upon declaration of the pandemic, the Ministry of Health designated a single hospital in Maputo City as the primary referral hospital for all COVID-19 patients in the province. All other health facilities in the province designated a single isolation unit with assigned staff and retrofitted units with oxygen cylinders for symptomatic patients awaiting results of laboratory testing before transfer to this central hospital. Maputo Central Hospital remained the country's main referral hospital for non-COVID-19 cases. With initial surges, this system adequately met case needs (n=16). In early 2021 with the emergence of the Delta variant, increased travel resulted in the first major surge in Mozambique and required conversion of multiple hospital units and hired tents to expand isolation unit availability 10-fold. Non-COVID-19 patients in these converted units were distributed to other departments. A designated COVID-19 treatment facility was identified in a major city within each of the 11 provinces. Patient triage transitioned from isolation units within hospitals to physically separated triage units near designated COVID-19 treatment facilities. All COVID-19 tests for the country were performed at a single laboratory, and patients remained in isolation units during the 3- to 5-day turnaround for results.	Immediately designated a primary hospital as an isolation center for case management and secondary hospitals for ongoing non-COVID-19-related care. Clinical management guidelines were prepared at the national level with support of WHO Nepal. As case numbers increased, additional public and private hospitals were designated as isolation centers to accommodate surges. Within hospitals, a color-coding system was implemented to differentiate isolation levels based on risk of transmission. In some provinces, secular facilities (for example, vacant factory spaces) were converted to COVID-19 treatment hospitals capable of acute and intensive care. Existing emergency and intensive care units were retrofitted to include negative pressure systems. Additional COVID-19 care centers were created exclusively for infected patients at the intensive care level. Testing facilities were expanded from a single, central laboratory to include public and private laboratories in all provinces to expedite early diagnosis by the second pandemic surge.

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Domain	Brazil	China	Kenya	Mozambique	Nepal
Coordination of care/ governance	Individual hospitals were primarily responsible for overseeing core functions with support from local government. Specifically, acceptance and patient transfer criteria were defined by local health agencies and required adaptation from hospital to hospital. Intersystem coordination was supported by state and local health secretaries.	During the initial COVID-19 outbreak in Wuhan, hospitals experienced severe shortages of resources and medical staff, particularly those with critical care expertise. National medical teams with necessary expertise were rallied from around the country and dispatched to Wuhan. With subsequent surges, a similar approach was taken to accommodate increasing case volume across different regions.	A COVID-19 national task force was established for case management with responsibility for developing and updating guidelines and training health care workers. County health directors oversaw coordination of treatment centers.	Care coordination in Mozambique presents a unique challenge because patients self-triaged and presented either to the nearest facility according to convenience or traveled further to Maputo Central Hospital to seek higher-level care. Hospitals adopted a reflexive approach as cases arrived and admitted all patients awaiting transfer to the primary referral hospital. Individual provinces and Maputo City held regular coordination meetings with key players, and the Ministry of Health also provided platforms to facilitate coordination across provinces, facilities, and providers seeking both clinical and material support.	Federal and provincial governing bodies oversaw development of health care policies and guidelines, whereas local governing bodies oversaw implementation of guidelines. Early in the pandemic, the federal government activated national committees with key players to coordinate the initial response mechanism in a centralized, top-down manner. Provinces established isolation and testing centers, and managed medications and other essential services. Local governments managed isolation centers and provided services with minimal deviation. An incident command system was developed and modified according to evolving needs during pandemic surges.
Equipment and supplies	Supply chain issues were prevalent during the initial COVID-19 surge because of a lack of regulation at the national or local level. To mitigate early challenges, hospitals worked together to lend critical supplies and equipment. As critical PPE and medications became unavailable, the Ministry of Health and local agencies stepped in to implement supply chain management guidelines.		Supply chain management was coordinated at the national level as an arm of the COVID-19 national taskforce.	Initially, COVID-19 numbers remained relatively low and available equipment (PPE, oxygen tanks, and so on) was sufficient. With the arrival of the 2021 Delta variant, the massive surge in case volume resulted in a sudden deficit in oxygen cylinders, ventilators, blood gas analyzers, radiography equipment, PPE, and more. The Ministry of Health sponsored the purchase of additional oxygen cylinders and supplies to retrofit isolation beds.	The incident command system performed daily reviews of supply chain, with coordination from designated individuals at the government and facility levels. During supply chain interruptions, novel sterilization approaches (UV ray), and alternative materials were used to permit recycling of PPE. Where possible, hospitals produced their own PPE to ameliorate shortages. Supply chain issues (PPE, essential equipment) were prevalent during initial surge. With subsequent surges, a COVID-19 relief fund was allocated from national and provincial budgets to maintain necessary resources. Simultaneously, PPE and essential equipment were stockpiled after the initial surge. In the second surge, oxygen availability was compromised and required development of oxygen plants in designated spaces, yet lack of necessary human resources impeded these efforts.

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Domain	Brazil	China	Kenya	Mozambique	Nepal
Post-acute case management	Post-acute care facilities were not created in most cities. Patients with "long COVID" were managed in existing long-term care facilities with sparse and isolated efforts to implement dedicated programs to care for this subset of patients.	A patient cohort for initial COVID-19 survivors with matched community controls was established and followed for 3 years to present. These patients completed symptom questionnaires, imaging (chest computed tomography), and pulmonary function testing to generate long-term follow-up data on post-COVID-19 conditions.	Hospital-based care was adopted for mild and moderate cases of COVID-19, as well as management of patients with "long COVID" who were discharged to home after post-acute management.		After the second COVID-19 surge, guidelines were developed in collaboration with international organizations for the treatment of "long COVID." A transdisciplinary team was established to apply guidelines locally and develop training modules. Post-COVID-19 clinics were established but remain inefficient because of a lack of human resources and registries to effectively identify and monitor cases.
Special patient populations			High-risk groups such as pregnant women, immunocompromised individuals, and the elderly received priority immunization status.	Most patients hospitalized with COVID-19 carried comorbidities such as diabetes, hypertension, COPD, asthma, and HIV/AIDS. Because of the unique medical needs of these populations, specialized staff from all units were reassigned to COVID-19 treatment units and an independent pharmacy was designated for COVID-19 patients.	At-risk populations such as pregnant women, immunocompromised individuals, and those with chronic diseases received priority COVID-19 care based on case severity. Similarly, these groups received priority access to vaccination. However, these populations also experienced significant delays in routine care due to fear of contracting COVID-19. Consequently, the numbers of home deliveries and neonatal deaths and the immunization dropout rate among children increased. During the second wave, improved access to telemedicine services resulted in fewer delays in care for these special populations.

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Domain	Brazil	China	Kenya	Mozambique	Nepal
Maintaining core functions	Telehealth care, previously not permitted in the country, was implemented at several institutions to provide routine health services. During peak surges, elective surgeries were deferred in several cities, particularly where ICU bed shortages required conversion of operating theatres. However, where possible, core functions were maintained in parallel to COVID-19 care.	From the initial pandemic surge, a "dynamic-zero" policy was adopted to permit continuation of routine medical care in regions unaffected by COVID-19. Large-scale nucleic acid amplification testing was carried out to screen for new cases and extensive contact tracing followed to identify potential new cases. Consequently, the number of confirmed COVID-19 cases remained low before December 2022 and most citizens were able to obtain full vaccination with booster(s) before natural infection.	At the national level, the Ministry of Health developed guidelines specific to continuity of essential health services to mitigate disruption of critical, non-COVID-19 health services.	During COVID-19 surges, most planned, non-COVID-19 care (excluding existing inpatient cases) was deferred. All elective surgery was canceled, and emergent or oncologic surgeries were handled on a case-by-case basis at the discretion of the operating surgeon. Two phenomena were noted: a reluctance of patients to seek care due to fear of contracting the virus, and a deficiency of providers due to reassignment to COVID-19 treatment centers or personal illness. To support resumption of non-COVID-19 care, telehealth visits were implemented and allowed providers to triage in-person visits on an as-needed basis. Patients with chronic conditions on stable home medication regimens could bypass routine physician visits and access prescriptions directly or received several months' supply of medications at once.	Designation of hospitals as isolation centers and prioritization of COVID-19 care resulted in routine services such as outpatient and elective care, including surgeries, being placed on hold. Routine care was managed by hospitals and emergency departments where necessary, with significant financial implications for private sectors. With subsequent surges, comprehensive services were provided in parallel to COVID-19-specific services at the outpatient and inpatient level, including resumption of elective surgery.
Health workforce	Staffing decisions were made at the individual hospital level. Burnout was prevalent. To address the issue of burnout, task sharing was implemented to recruit medical doctors from other specialties to high census areas (when technically suited) or reassign to clerical or administrative roles to support ongoing COVID-19-related care efforts.		The national government, with support from the COVID-19 Health Emergency Response Project, oversaw reassignment of surge staff across counties to maintain key staffing positions.	A team of local clinicians (8), nurses (10), and reassigned auxiliary personnel were assigned to the primary COVID referral hospital during the initial surge. With a rapid increase in case numbers during the 2021 Delta surge, massive expansion in staffing was achieved through mass hiring of general clinicians (58), nurses (108), auxiliary agents (48), drivers (4), and lab technicians (4), as well as seeking expertise from the Cuba Cooperation (3 intensivists and 3 intensive care nurses). Additional essential staff were serially recruited from all subspecialty units in the hospital, including medical and surgical residents. During this surge, all reassigned personnel ceased non-COVID-19-related care and training.	Significant staffing shortages were experienced at the provincial and local hospital levels. At the local level and with local funding incentives (communication allowance, hazard pay), temporary recruitment of health care workers was employed to fill gaps in coverage. At the same time, staff in private sectors experienced salary deductions as routine services were halted. Burnout was widespread due to task sharing (posting of medical doctors to COVID-19 units irrespective of expertise, administrators assigned to multiple roles). To minimize exposure and burnout, staff were posted to COVID-19 units on a rotating basis (2-week posts) during subsequent surges.

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Domain	Brazil	China	Kenya	Mozambique	Nepal
Communications	A centralized, national agency disseminated protocols related to patient care, which were then implemented at the state and local level. Intrafacility communication occurred largely remotely (email, telephone, teleconferencing). University hospitals developed technology to support telehealth initiatives for initial consultation and routine follow-up care.		A designated contact at each COVID-19 facility provided regular updates on hospital admissions, discharges, and deaths to county health directors and disease surveillance coordinators. These data were summarized in county-level line lists, which then informed national case lists.	Initially, triage hospitals reported COVID-19 cases to the primary referral hospital via telephone and arranged transfer via ambulance upon acceptance. Within facilities, daily meetings occurred to review case numbers, new admissions, transfers, discharges, and deaths. These metrics were summarized in daily and weekly reports shared with the Ministry of Health. Hospitals closed to visitors, and all communication surrounding patient care occurred via twice-daily telephone calls from providers.	A national coordination committee was immediately formed and oversaw development of an Incident Command Center and Health Emergency Operation Center. The committee was responsible for activation of isolation centers, defining periods of lockdown, and communicating hospital and facility-level data to the national government and media. Weekly cluster meetings were held between incident command representatives and public, private, and federal health officials to update on current situations, management protocols, case investigation, and contact tracing. Poor internet connectivity hindered online reporting of case data. Government-level, daily press briefings were held to support public awareness. Information was made readily available to the public via mobile applications, call centers, hotlines, and social media.
Financing	The Ministry of Health, supported by state and local agencies, redistributed budgets to increase the value paid by the public health system for COVID-19-related care. Health insurance companies also incentivized COVID-19 care by increasing the value of reimbursements. Salary incentives were implemented for certain members of the workforce (such as trainees) for providing COVID-19 care.		Funding was mobilized and distributed from the national government to county and local governments.		COVID-19 crisis funds were established at the local level with budgets provided by provincial and federal governments via diversion from lower-priority sectors. Funds were distributed by local governments toward COVID management on an as-needed basis. Most funding was diverted toward supply chain management during initial surges and occasionally required extreme measures such as reduction in staff salary with delayed and incomplete reimbursement. Supply chain issues arose in part because of delays in budget release and lack of expenditure guidelines.

Source: Original table created for this publication.

Note: COPD = chronic obstructive pulmonary disease; ICU = intensive care unit; PPE = personal protective equipment; SARS = severe acute respiratory syndrome; UV = ultraviolet; WHO = World Health Organization.

ANNEX 12C: COMPREHENSIVE NORMATIVE LITERATURE REVIEW OF HEALTH CARE INTERVENTIONS DURING THE COVID-19 PANDEMIC

	At home	Ambulatory services	Clinic	Emergency department	Acute care services	ICU	Reference
Diagnostic		**Basic lab testing** FLH18, RH3					FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock) RH3 (Management of refractory febrile illness including etiologic diagnosis at reference microbiological laboratory)
Diagnostic				**Advanced lab testing** HC68, FLH18, FLH58			HC68 (Health center pathology services) FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock) FLH 58 (First-level hospital pathology services)
Diagnostic	**POC Testing**						
Diagnostic		**CT Scan** FLH18, RH3		**CT Scan** FLH18, RH3			FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock) RH3 (Management of refractory febrile illness including etiologic diagnosis at reference microbiological laboratory)
Diagnostic				**Ultrasound/POCUS** FLH18			FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock)

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	At home	Ambulatory services	Clinic	Emergency department	Acute care services	ICU	Reference
Diagnostic				**MRI** FLH18, RH3			FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock) RH3 (Management of refractory febrile illness including etiologic diagnosis at reference microbiological laboratory)
Diagnostic		**X-ray**		**X-ray** FLH18, RH3			FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock) RH3 (Management of refractory febrile illness including etiologic diagnosis at reference microbiological laboratory)
Diagnostic		**Vital sign monitoring**		**Vital sign monitoring**			
Diagnostic				**EKG**			
Procedure/ Diagnostic				**Thoracentesis-Diagnostic, therapeutic** FLH18, RH3			FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock) RH3 (Management of refractory febrile illness including etiologic diagnosis at reference microbiological laboratory)

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	At home	Ambulatory services	Clinic	Emergency department	Acute care services	ICU	Reference
Therapeutic	**Supplemental oxygen**[a]			**Supplemental oxygen** FLH18, FLH22, FLH45			FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock) FLH22 (Management of acute exacerbations of asthma and COPD using systemic steroids, inhaled beta-agonists, and, if indicated, oral antibiotics and oxygen therapy) FLH45 (Resuscitation with advanced life support measures, including surgical airway)
Therapeutic				**PO/IV electrolyte supplementation** FLH23, FLH45			FLH23 (Medical management of acute heart failure) FLH45 (Resuscitation with advanced life support measures, including surgical airway)
Therapeutic				**IV fluids** FLH11, FLH18, FLH45, RH3			FLH11 (Full supportive care for severe childhood infections with danger signs) FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock) FLH45 (Resuscitation with advanced life support measures, including surgical airway) RH3 (Management of refractory febrile illness including etiologic diagnosis at reference microbiological laboratory)
Therapeutic					**IV corticosteroids** FLH18, RH3		FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock) RH3 (Management of refractory febrile illness including etiologic diagnosis at reference microbiological laboratory)

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	At home	Ambulatory services	Clinic	Emergency department	Acute care services	ICU	Reference
Therapeutic						**IV vasopressors**[b] FLH18, FLH45, RH3	FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock) FLH45 (Resuscitation with advanced life support measures, including surgical airway) RH3 (Management of refractory febrile illness including etiologic diagnosis at reference microbiological laboratory)
Therapeutic	**PO diuretics** HC44				**PO/IV diuretics** HC44, FLH23		HC44 (Medical management of heart failure with diuretics, betablockers, ACEi, and mineralocorticoid antagonists) FLH23 (Medical management of acute heart failure)
Therapeutic	**PO antibiotics** HC1, FLH22			**PO/IV antibiotics** HC1, FLH22, FLH18, RH3			HC1 (Early detection and treatment of neonatal pneumonia with oral antibiotics) FLH22 (Management of acute exacerbations of asthma and COPD using systemic steroids, inhaled beta-agonists, and, if indicated, oral antibiotics and oxygen therapy) FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock) RH3 (Management of refractory febrile illness including etiologic diagnosis at reference microbiological laboratory)

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	At home	Ambulatory services	Clinic	Emergency department	Acute care services	ICU	Reference
Therapeutic	**PO analgesics** HC47			**PO/IV analgesics** HC47, HC67			HC47 (Essential palliative care and pain control measures, including oral immediate release morphine and medicines for associated symptoms) HC67 (Expanded palliative care and pain control measures, including prevention and relief of all physical and psychological symptoms of suffering)
Therapeutic				**Thrombolytics**			
Therapeutic				**IV/SubQ anticoagulants**			
Therapeutic				**Blood and blood product transfusion** FLH18			FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock)
Therapeutic				**Agitation/anxiety[c]**			
Therapeutic	**Inhaled/nebulized beta agonists/bronchodilators** HC37, FLH22						HC37 (Low-dose inhaled corticosteroids and bronchodilators for asthma and for selected patients with COPD) FLH22 (Management of acute exacerbations of asthma and COPD using systemic steroids, inhaled beta-agonists, and, if indicated, oral antibiotics and oxygen therapy)
Therapeutic	**Insulin[d] (SubQ, IV)**						
Therapeutic				**IV inotropes[b]** FLH18, FLH45		**IV inotropes[b]** FLH18, FLH45	FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock) FLH45 (Resuscitation with advanced life support measures, including surgical airway)

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	At home	Ambulatory services	Clinic	Emergency department	Acute care services	ICU	Reference
Therapeutic				**IV chronotropes** FLH18, FLH45			FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock) FLH45 (Resuscitation with advanced life support measures, including surgical airway)
Therapeutic						**ECMO[e] (including cannulation)** FLH18	FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock)
Therapeutic	**Oral antivirals** P9, HC34, FLH18, RH3						P9 (Decentralize stocks of antiviral medications in order to reach at-risk groups and disadvantaged populations) HC34 (Stockpile and consider treating early high-risk patients with antiviral medications according to nationally endorsed guidelines) FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock) RH3 (Management of refractory febrile illness including etiologic diagnosis at reference microbiological laboratory)
Therapeutic				**IV monoclonal antibodies** FLH18			FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock)

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	At home	Ambulatory services	Clinic	Emergency department	Acute care services	ICU	Reference
Therapeutic	**Temperature management (for example, PO antipyretics, ice packs)** FLH18, FLH57, RH3			**Temperature management (pharmaceutical/nonpharmaceutical; for example, PO/IV antipyretics, cooling/ warming devices)** FLH18, FLH57, RH3			FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock) FLH57 (Prevention and relief of refractory suffering and acute pain related to surgery, serious injury, or other serious, complex, or life-limiting health problems) RH3 (Management of refractory febrile illness including etiologic diagnosis at reference microbiological laboratory)
Therapeutic		**Rehabilitation therapies: speech language, physical, occupational, cardio/pulmonary rehab programs** C52, C58, C59, FLH56, FLH55, FLH53					C52 (Cardiac and pulmonary rehabilitation programs) C58 (Training and retraining for disorders of speech, swallowing, communication, and cognition) C59 (Training, retraining, and exercise programs that address musculoskeletal injuries and disorders, including chronic low back and neck pain) FLH56 (Mobilization activities following acute injury or illness) FLH55 (Initial assessment, prescription, and provision of individualized interventions for musculoskeletal, cardiopulmonary, neurological, speech and communication, and cognitive deficits, including training in preparation for discharge) FLH53 (Evaluation and acute management of swallowing dysfunction)
Therapeutic				**Management of ileus, bowel obstruction, GI complications** FLH24, FLH34, FLH44			FLH24 (Management of bowel obstruction) FLH34 (Colostomy) FLH44 (Repair of perforations (for example, peforated peptic ulcer, typhoid ileal perforation)
Therapeutic	**Basic life suppport** HC61						HC61 (Resuscitation with basic life support measures)

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	At home	Ambulatory services	Clinic	Emergency department	Acute care services	ICU	Reference
Therapeutic	**Labor and delivery in COVID-19 patients** HC2, HC3, FLH2, FLH4, FLH5, FLH6, FLH7, FLH8						HC2 (Management of miscarriage or incomplete abortion and post abortion care) HC3 (Management of preterm premature rupture of membranes, including administration of antibiotics) FLH2 (Induction of labor post-term) FLH4 (Management of eclampsia with magnesium sulfate, including initial stabilization at health centers) FLH5 (Management of maternal sepsis, including early detection at health centers) FLH6 (Management of newborn complications, neonatal meningitis, and other very serious infections requiring continuous supportive care (such as IV fluids and oxygen)) FLH7 (Management of preterm labor with corticosteroids, including early detection at health centers) FLH8 (Management of labor and delivery in high-risk women, including operative delivery)
Therapeutic				**Other urgent/emergent surgical procedures** FLH33, FLH35, FLH40, FLH48, HC59			FLH33 (Burr hole to relieve acute elevated intracranial pressure) FLH35 (Escharotomy or fasciotomy) FLH40 (Management of osteomyelitis, including surgical debridement for refractory cases) FLH48 (Trauma laparotomy) HC59 (Drainage of superficial abscess)
Therapeutic				**Wound coverage** FLH46			FLH46 (Basic skin grafting) Surgical debridement of wounds Wound coverage

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	At home	Ambulatory services	Clinic	Emergency department	Acute care services	ICU	Reference
Procedure				**Tube thoracostomy, needle decompression** FLH18, FLH50			FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock) FLH50 (Tube thoracostomy)
Procedure				**NGT/Enteral tube insertion**			
Procedure				**Urinary catheter insertion**			
Procedure				**CVC insertion**			
Procedure				**GI tube placement (PEG, GJ)**			
Procedure				**Port placement**			
Procedure				**Intraosseus access placement**			
Procedure/ Respiratory support				**Surgical airway** FLH45			FLH45 (Resuscitation with advanced life support measures, including surgical airway)
Procedure/ Respiratory support				**Open thoracic surgical procedures for complications of pneumonia (including VATS versus sternotomy)** FLH18, FLH45			FLH18 (Evaluation and management of fever in clinically unstable individuals using WHO IMAI guidelines, including empiric parenteral antimicrobials and antimalarials and resuscitative measures for septic shock) FLH45 (Resuscitation with advanced life support measures, including surgical airway)
Respiratory support						**Invasive mechanical ventilation** FLH45, RH4	FLH45 (Resuscitation with advanced life support measures, including surgical airway) RH4 (Management of acute ventilatory failure due to acute exacerbations of asthma and COPD; in COPD use of bilevel positive airway pressure preferred)

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	At home	Ambulatory services	Clinic	Emergency department	Acute care services	ICU	Reference
Respiratory support				**Endotracheal intubation** FLH45, FLH22, RH4			FLH45 (Resuscitation with advanced life support measures, including surgical airway) FLH22 (Management of acute exacerbations of asthma and COPD using systemic steroids, inhaled beta-agonists, and, if indicated, oral antibiotics and oxygen therapy) RH4 (Management of acute ventilatory failure due to acute exacerbations of asthma and COPD; in COPD use of bilevel positive airway pressure preferred)
Respiratory support	**Proning** FLH45						FLH45 (Resuscitation with advanced life support measures, including surgical airway)
Respiratory support				**Basic airway management (including bag-valve-mask ventilation)** FLH45			FLH45 (Resuscitation with advanced life support measures, including surgical airway)
Cardiac support	**CPR (chest compressions)** FLH45						FLH45 (Resuscitation with advanced life support measures, including surgical airway)
Cardiac support		**Defibrillation-AED or otherwise** FLH45					FLH45 (Resuscitation with advanced life support measures, including surgical airway)
Population/ Systems	**Education for danger signs** HC12, HC30, HC33						HC12 (Detection and treatment of childhood infections with danger signs (IMCI)) HC30 (Evaluation and management of fever in clinically stable individuals using WHO IMAI guidelines, with referral of unstable individuals to first-level hospital care) HC33 (Identify and refer to higher levels of health care patients with signs of progressive illness)
Population/ Systems	**Immunization** P12, HC35						P12 (Ensure influenza vaccine security at national and subnational level) HC35 (Annual flu vaccination and pneumococcal vaccine every five years for individuals with underlying lung disease)

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	At home	Ambulatory services	Clinic	Emergency department	Acute care services	ICU	Reference
Population/ Systems	**Counseling about handwashing with soap + WASH services** P13, C51						P13 (Mass media messages concerning awareness on handwashing and health effects of household air pollution) C51 (WASH behavior change interventions, such as community-led total sanitation)
Population/ Systems	**Isolation for high-risk communicable diseases** P11						P11 (Develop plans and legal standards for curtailing interactions between infected persons and uninfected population and implement and evaluate infection control measures in health facilities)
Population/ Systems	**PPE**						

Source: Original table created for this publication.

Note: AED = automatic electric defibrillator; COPD = chronic obstructive pulmonary disease; CPR = cardiopulmonary resuscitation; CT = computed tomography; CVC = central venous catheter; ECMO = extracorporeal membrane oxygenation; EKG = electrocardiogram; GI = gastrointestinal; GJ = gastrojejunostomy; ICU = intensive care unit; IV = intravenous; MRI = magnetic resonance imaging; NGT = nasogastric tube; PEG = percutaneous endoscopic gastrostomy; PO = per os (by mouth); POC = point of care; POCUS = point of care ultrasound; PPE = personal protective equipment; SubQ = subcutaneous; WASH = water, sanitation, and hygiene; WHO IMAI = World Health Organization integrated management of adolescent and adult illness (refer to WHO 2011).

a. Banerjee et al. 2021; van Herwerden et al. 2021.

b. Maximous et al. 2021.

c. Wong et al. 2020.

d. Zahedi et al. 2023.

e. Aljishi et al. 2022.

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