PROTECTIVE MEASURES FOR BURN CARE PROFESSIONALS DURING THE CORONAVIRUS DISEASE 2019 PANDEMIC: SYSTEMATIC REVIEW

MESURES DE PROTECTION POUR LES PROFESSIONNELS DE SANTÉ EN CTB PENDANT LA PANDÉMIE COVID19: REVUE DE LA LITTÉRATURE

Al-Benna S.✉

Division of Plastic and Reconstructive Surgery, Faculty of Medicine and Health Sciences, Stellenbosch University and Tygerberg Academic Hospital, Cape Town, South Africa

SUMMARY. The emergence of a novel human β coronavirus, severe acute respiratory syndrome coronavirus 2, which causes coronavirus disease 2019 (COVID-19), has developed into a global pandemic and public health emergency. The management of patients with burns must be adapted to this context. The aim of this systematic review is to identify the optimal protection measures during the COVID-19 pandemic and provide guidance of protective measures for burn surgeons. A systematic search of PubMed was performed for articles about COVID-19. "Burn units", "burns", "COVID-19", "health personnel", "protective devices", "severe acute respiratory syndrome coronavirus 2", "surgeons" and "telemedicine" were reviewed during the entire diagnosis and management process of burn patients. Eight articles were included, and five articles emphasized that burn care professionals should pay attention to prevent cross-infection. Only three articles reported in detail how burn care professionals should be protected during surgery in the operating room. These experiences and strategies can help burn care professionals work safely and effectively, and prevent both nosocomial infections and burn care professional infections during the global pandemic of COVID-19.

Keywords: burn units, burns, COVID-19, health personnel, protective devices, severe acute respiratory syndrome coronavirus 2, surgeons, telemedicine

RÉSUMÉ. *La survenue de la pandémie COVID19 a entraîné une urgence pour les services de santé, et nécessité une adaptation des soins aux brûlés. Le but de cette revue est d'identifier les mesures de protection optimales dans ce contexte afin de publier un guide pour les chirurgiens brûlologues (sic!!!, NDRLF). Une recherche PubMed a été effectuée avec les termes "COVID19", "burn units", "burns", "health personnel", "protective devices", "severe acute respiratory syndrome coronavirus 2", "surgeons" et "telemedicine". Huit articles ont été parmi lesquels 5 insistaient sur le fait que les professionnels de santé devaient faire attention aux contaminations croisées. Seuls trois détaillaient les mesures per opératoires. Ces stratégies et expériences peuvent aider les professionnels de la brûlologie à travailler efficacement et sans risque de contamination (personnelle et aux patients) aussi bien par COVID que par d'autres pathogènes.*

Mots-clés: *CTB, brûlés, COVID19, personnel de santé, mesures de protection, SARS COV2, chirurgiens, télémédecine*

✉ Corresponding author**:** Sammy Al-Benna, Division of Plastic and Reconstructive Surgery, Faculty of Medicine and Health Sciences, Stellenbosch University and Tygerberg Academic Hospital, Francie van Zijl Drive, PO Box 241, Cape Town, 8000, South Africa. Tel.: +27 21 938 9432; email: albenna@sun.ac.za
Manuscript: submitted 25/08/2020, accepted 06/09/2020

Introduction

Human coronaviruses are enveloped, positive-sense, single-stranded RNA viruses that belong to the coronaviridae family.[1] Coronaviruses are named for the crown-like spikes on their surface. The recent emergence of a novel human β coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes coronavirus disease 2019 (COVID-19), has rapidly developed into a global pandemic and public health emergency.[2-4] As of 18th August 2020, a total of 18,716,965 accumulated cases and 704,632 deaths have been reported worldwide, with an overall mortality rate of about 1%.[5] COVID-19 primarily produces fever and respiratory symptoms, although involvement of other organ systems has been reported.[1,6] There is a pressing urgency to understand the pathogenesis of SARS-CoV-2, and clinicians must integrate the rapidly evolving evidence base to understanding the disease.[2-4] SARS-CoV-2 is highly infectious. The source of infection can be COVID-19 patients and asymptomatic infected people mainly via respiratory droplets, close contact and aerosol transmission.[1,6] Furthermore, COVID-19 has a latent period of 1–14 days, up to 24 days.[7,8] Therefore, in the process of patient diagnosis and management, there is a high risk of cross-infection to healthcare professionals.[8,9] A recent article demonstrated the limited availability of information from national and international burn society websites.[4]

The pandemic of COVID-19 has brought great challenges at every step in the patient pathway, from pre-hospital, emergency diagnosis and management, emergency surgery, anaesthesia, and perioperative management.[7,8] In every step of management, the strategies for the management of burn patients should be formulated and protective measures should be taken.[7,8] What personal protective equipment should be worn, and what preventive steps should be undertaken by burn care professionals in different areas of the patient pathway? The aim of this systematic review is to identify the optimal protection measures during the COVID-19 pandemic and provide guidance of protective measures for burn surgeons.

Materials and methods

A systematic review of the available literature was performed for articles published up to 2nd July 2020 using the MESH terms “severe acute respiratory syndrome coronavirus 2”, “COVID-19”, “burn units”, “burns”, “surgeons”, “health personnel”, “protective devices”, and “telemedicine” in several combinations, using the PubMed database.[9-11] All the publications were searched. The search was limited to English articles only. Articles in other languages were not included in this review.

Study selection

All peer-reviewed articles were considered. Randomized controlled trials (RCTs), prospective trials and retrospective articles as well as reviews and case reports were included in this systematic review. The author independently screened the titles and abstracts of all the articles identified. If the abstract and the full-text were unavailable, the paper was excluded. In the event of disagreement, a consensus was reached by discussion, if needed with the intervention of a senior colleague. This systematic review was conducted in accordance with the established guidelines from Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA). However, due to the heterogeneity of available data, it was decided to present the review in a narrative manner.

Data extraction

One author extracted data from all the selected original articles. Where required, the corresponding authors were contacted for additional information. This review focused on protective measures in the entire diagnosis and management process. Pertinent information extracted included author, date and journal of publication, study design (and level of evidence). Descriptive statistics, such as the means, ranges, and measures of variance (e.g., standard deviations (SD)), are presented where applicable.

Results

The initial literature search found 127 articles. After removing 9 duplicates, 116 articles were

screened. Of the 116 articles, 94 were excluded after screening of the title and abstract. An additional 15 articles were excluded after full-text review. Thus, 8 articles were finally eligible for data extraction. Based on the analysis of levels of evidence, five articles were classified as level IV and the remaining three articles (all correspondence) were classified as level V. Due to study design heterogeneity, it was not possible to pool results across articles and perform a meta-analysis.

No articles published admission and outcome data for burn patients during the COVID-19 pandemic. All articles indicated the significant challenges to treat patients with burns during the COVID-19 pandemic. Four articles reported that using video or teleconference for morning rounds, electronic consultations, videoconferencing, digital outpatient and other telemedicine methods to provide medical guidance and follow-up instruction for patients can reduce unnecessary contact, limiting the spread of the virus, and save protective materials.[12-16]

Delaying and cancelling elective surgery, and the exact definition of emergency surgery, are still under debate.[12-15] Emergency burn surgery in the context of the current crisis can be defined as urgent burn injuries that could result in long-term disability if surgery is postponed.[12-15] The WHO and evidence-based literature have not given any detailed recommendations for emergency burn management during the COVID-19 pandemic.

There were no articles concerning the explicit management of an outpatient clinic and surgical activities and the challenges in handling a high-volume burn practice during the epidemic. Five articles offered important points and strategies to provide the highest level of safety to burn care professionals during the start-up phase.[12-16]

Five articles emphasized that burn surgeons should pay attention to personal protection when facing the COVID-19 pandemic to prevent cross-infection.[12-16] Four articles reported in more detail on personal protection[12-15] (*Table I*). There are no articles about the level of protection that should be recommended for burn care professionals from on-site emergency to patient discharge. No article gave an evidence-based recommendation on which PPE should be used to avoid occupational transmission of COVID-19 during surgery. One article proposed rapid enzymatic debridement.[17] Two articles emphasized the need for necessary precautionary and response measures as an integral part of overall preparedness strategy.[18,19]

Table I - Summaries of main points of the article

Authors	Level of evidence	Main points of the article
Ma et al.	IV	Share their experience of medical practices for burns during the outbreak of COVID-19
Li et al.	IV	Make recommendations for management strategies for the burn ward during the COVID-19 pandemic
Barret et al.	IV	Share international multi-burn center strategies and experience during the COVID-19 pandemic
Saha et al.	IV	Make recommendations for managing burns during the COVID-19 pandemic

Discussion

During the COVID-19 pandemic, burn patients as well as burn care professionals may be infected with SARS-CoV-2 when they are exposed to people infected with COVID-19 during their work. Transmission from health care professional to health care professional, patient to health care professional, as well as health care professional to patient, has been demonstrated.[8] The most commonly suspected area of exposure for burn care professionals during the entire diagnosis and management process is the burn ward, followed by public places at the hospital, operating rooms, the burn intensive care unit, and the outpatient clinic.[8,12,13] To avoid occupational transmission of COVID-19 to burn care professionals, appropriate protective measures taken by burn care professionals during the pandemic in different sites from pre-hospital, emergency diagnosis and management, emergency surgery, anaesthesia, and perioperative management are of great importance.[8,12,13]

On-site first aid

No articles made reference to on-site first aid. In principle, all burn patients should be treated as suspected COVID-19 cases. The ambulance requires sufficient protective equipment and rescue equipment. All health

care professionals should be familiar with the symptoms of COVID-19 and should have received professional training in level-three PPE. In addition, all should be educated well in donning and doffing a disposable hat, disposable protective clothing, long shoe cover, N95/FFP2 mask, goggles, double-layer gloves and protective face screen. PPE is important to minimize the chance of contact with body fluids of the burn patients. Before arriving at the scene, all the health care professionals and drivers involved in the pre-hospital emergency should take level-two PPE. For burn patients with contact with COVID-19 patients or exhibiting the symptoms of fever and/or respiratory symptoms, the pre-hospital emergency health care professionals and drivers in the non-pandemic area should take level-two PPE in advance.

Transportation of the burn patient to hospital

One article made reference to transportation of the burn patient to hospital.[12] In principle, it is critical that all patients with burn injuries should be transported to the nearest burn hospital that can manage their burn injuries.[12,20,21] The hospital should have proper isolation facilities, adequate levels of PPE, and the ability to diagnose and manage COVID-19 burn patients.[12] The ambulance is exposed to high concentration of aerosol for a long time in a relatively closed environment, and must be cleaned and disinfected thoroughly. Negative pressure ambulances are preferred.[12,22] Only patients with excluded infection of COVID-19 can be sent to the general emergency department, the rest should be sent to the COVID-19-designated part of the emergency department for management.

Protection of health and burn care professionals in the emergency room

All staff who receive patients with suspected or confirmed COVID-19 need at least level-two PPE in the emergency room (ER)[12,13] (*Table II*). If the patient is unconscious, or their family members cannot describe the epidemiological history, the suspected cases should be treated as COVID-19 positive. During the COVID-19 pandemic, all patients should be treated as suspected COVID-19 positive cases (*Table III*). Adequate PPE and disinfection of medical equipment is paramount.

Table II - PPE levels available

Protection level	PPE
Level one	Disposable surgical cap Disposable surgical mask Disposable latex gloves or/and disposable isolation clothing if necessary
Level two	Disposable surgical cap Medical protective mask (N95) Disposable medical protective uniform Disposable latex gloves Goggles
Level three	Disposable surgical cap Powered air purifying respirator (PAPR) or full-face respiratory protective devices Disposable medical protective uniform Disposable latex gloves Goggles

Table III - Clinical classifications of patients with a confirmed diagnosis of COVID-19 and indications for emergency surgery

Clinical classifications	Clinical symptoms	Indication for emergency surgery
Mild	The clinical symptoms are mild and no pneumonia manifestations can be found in imaging	No contra-indication due to COVID-19
Moderate	Patients have symptoms such as fever and respiratory tract symptoms, etc. and pneumonia manifestations can be seen in imaging	No contra-indication due to COVID-19
Severe	Adults who meet any of the following criteria: respiratory rate ≥ 30 breaths/min; oxygen saturation ≤ 93% at a rest state; arterial partial pressure of oxygen (PaO2)/oxygen concentration (FiO2) ≤ 300 mmHg. Patients with > 50% lesions progression within 24–48 h in lung imaging should be treated as severe cases	Relative contraindication
Critical	Meeting any of the following criteria: occurrence of respiratory failure requiring mechanical ventilation; presence of shock; other organ failure that requires monitoring and treatment in the ICU	Absolute contraindication

Diagnosis of COVID-19

All patients admitted should be screened for SARS-CoV-2.[12-16] On admission, the burn care professionals should take sputum, nasopharynx swab or blood samples using real-time fluorescent RT-PCR to rapidly detect viral nucleic acid or gene sequencing to make the final diagnosis. According to the guidelines, the burn surgeons should make a suspected or confirmed diagnosis of COVID-19.[12,15]

In the pandemic area, the patients who do not need emergency surgery are admitted to the emergency

buffer ward in single room isolation, and treated as suspected cases of COVID-19. After screening for COVID-19, COVID-19 negative patients can be transferred to the general ward in a single room, minimizing the number of family caregivers (at most 1 member) and forbidding other family members from visiting.[13] Caregivers should be screened for COVID-19, and must be negative.[13] Confirmed cases can be admitted in the same negative-pressure isolation ward with multiple persons.[12,22] Severe or critical patients can be admitted to the burn intensive care unit as soon as possible.[12]

Protection of health and burn care professionals in the ward

All patients will be screened on admission for risk factors such as fever, upper respiratory tract and contact/travel history.[12-16] Patients deemed to be high risk for COVID-19, and patients with a possible pneumonia on chest X-ray will be admitted to an isolation ward.[12-16] All other patients will be admitted to the general ward.[12-16] All burn care professionals are mandated to wear a surgical mask when in contact with patients, such as in clinics and during rounds in the general ward.[12,13] With increasing rates of community transmission of SARS-CoV-2, and the wide range of clinical severity and presentation, it is inevitable that COVID-19 patients may slip through the admission safety net and get admitted to a non-isolated general ward before diagnosis. In such situations, rapid diagnosis and isolation is imperative to break potential chains of transmission. Upon confirmation of COVID-19, all burn care professionals in contact with the patient and not in full PPE protection will be swabbed and sent on home quarantine until the swabs are negative.[15]

Indications for emergency surgery

The criteria for emergency surgery is "threat to the patient's life if surgery or procedure is not performed, threat of permanent dysfunction of an extremity or organ system, risk of rapidly worsening to severe symptoms".[12,15] Patients with mild to moderate COVID-19 are treated as above, whereas those with severe COVID-19 are more likely to be treated non-operatively (*Table IV*). In other words, severe COVID-19 is a rela-

Table IV - PPE and protective measures by burn care professionals in different areas of the patient pathway

Sites	Prior to COVID-19 pandemic		During the COVID-19 pandemic	Specific advice/important knowledge
	No history of epidemiological exposure	History of epidemiological exposure		
On-site first aid	Level one	Level two	Level two	Beware: all body fluids can contain COVID-19 virus (vomit, urine, blood, sputum)
Ambulance	Level one	Level two	Level two	Beware: the ambulance environment receives a high level of aerosol Negative pressure ambulances are preferred
Emergency Room	Level one	Level two	Level two	Test for COVID-19 ASAP
Patient transfer in hospital	Level one	Level two	Level two	Use special transfer, a special channel and a special lift
Burn theatre	Level one	Level two	Level three	Severe COVID-19 is a relative contra indication to emergency orthopedic surgery and critical COVID-19 is an absolute contra indication Level 3 PPE for all staff except runners who are level-two Label door with COVID-19 Minimal staff numbers in the OR Conversion of a positive pressure to a negative pressure of − 5 Pa should be confirmed prior to starting surgery All patients should have masks if awake or exhaust filters if under general anesthesia Remove the smoke from electrocautery quickly. Reduce irrigation. Minimize splashing of the patient's body fluid Hand disinfection is done before removing PPE
Burn isolation ward	Level two	Level two	Level two	Beware: a high level of aerosol when performing high-risk procedures such as sampling from respiratory tract, intubation, using a powered dermatome, etc., Level three PPE is required
Burn ward	Level one	Level one	Level two	Pay attention to body temperature, respiratory symptom, and screening when necessary Small probability that incubation period may be as long as 24 days
Outpatient clinic	Level one	Level two	Level two	Online outpatient clinic is preferred Pay attention to body temperature, respiratory symptom and epidemiological exposure history Pay attention to the possibility of positive viral etiology test results in patients recovered from COVID-19

tive contraindication for emergency burn surgery.[12,13] Patients with critical COVID-19 or those who are intolerant to operation or anesthesia are an absolute contraindication.[12,15]

Examination and dressing of burns

Burn care professionals should wear the recommended PPE based on the level of risk (*Table IV*) and perform hand hygiene before and after the procedure. For regular burn dressings, the frequency of dressing change should be appropriately reduced according to the level of wound exudation and stage of healing. Newer and advanced foam-based dressings and negative pressure wound therapy may be employed.[17] To reduce the risk of infection during hospital visits, the patients can get dressings changed at a local primary health care facility.[12,13,15]

Emergency pre-operative plan

According to the patient's condition, trauma, injury type, stability, neurological function, medical equipment and technical conditions, the purpose of operation should be completed in a single approach as far as possible, such as tracheotomy, escharotomies, debridement and skin grafting for larger areas of deeper dermal/full thickness burn wounds or infected burn wounds, debridement and coverage of necrotic tissue, including blood vessels, nerves, tendons, etc..[12-16] The team should take measures to reduce the influence of time, trauma, haemorrhage and anaesthesia on patients with COVID-19. Disposable surgical instruments should be used where possible and non-operative management should be strongly considered.[12,13] It is recommended to shorten the time of a single operation for necessary surgery. Non-surgical treatment, including rapid enzymatic debridement, has been proposed to significantly reduce the utilization of burn surgery and blood loss, improving both the ability to cope with the pandemic situation and the unpredictable acute and severe shortages in blood products due to the decrease in donation.[7] Minor burns and uncomplicated wounds in stable patients should be managed as an outpatient.[12,13,16] Wherever possible, wound management in patients with minor burns should be decentralized to the nearest primary health care facility to minimize exposure risk for both patients and burn care professionals.[12,13,16]

Patient transfer to the operating room

COVID-19 testing is difficult to get quickly enough in an emergency setting. All emergency patients are protected according to suspected or confirmed patients.[12-16] All medical personnel should take level-two protective measures, using the special transfer vehicle with disposable sheets to lead patients to transfer to the negative pressure operation room through a special channel and a special lift.[12-16]

Protocols for surgery

Patients undergoing essential elective surgery are screened on arrival to the hospital for fever, upper respiratory tract symptoms and contact/travel history. Patients with symptoms will be turned away from surgery and sent to the emergency department for further investigations.

Full tier 2 PPE is mandatory for burn care professionals involved in potentially aerosolizing procedures such as tracheostomy. For all burn surgeries, the anaesthesia team intubates all patients in full PPE, while the burn surgical team waits outside the operating theatre for 3 minutes before entering. The 3-minute rule is based on the air recycle rate of 25–30 cycles per hour in our operating theatre. Essential elective surgery for non-suspect cases are performed in a conventional OT with positive pressure ventilation.

Emergency surgery for confirmed COVID-19 patients or suspect cases are performed in a dedicated operating theatre.[12-16] Operations done on COVID-19 patients are performed with full PPE and N95 mask, or powered air-purifying respirator in aerosolizing procedures. Surgical teams are kept to minimal numbers and are consultant led in order to minimize exposure.[12,13,16] Most operations can be performed in full PPE and N95 masks, but experience suggests that powered air-purifying respirator may be more ideal for prolonged surgery beyond 3 hours as it is more comfortable for the surgeon, resulting in less fatigue.[7,8]

PPE in the operating room

The door of the operating room should be marked with a COVID-19 sign. Staff numbers should be minimized in the operating room.[12,15] Visitors to the OR should be restricted and medical personnel should not enter or leave the operating room to avoid interrupting the negative pressure. Level-three PPE is required in the operating room for all staff,[12,15] except patrol nurses/runners who can use level-two PPE. The operating room must be in a state of negative pressure (−5 Pa) before the operation.[12,15,22] The buffer room should be closed, and equipment should be minimized in the operating room. Staff wearing PPE in the operating room are forbidden to leave the operating room until the PPE has been removed and the operation has finished.

Patients with non-general anaesthesia should wear surgical masks throughout the operation.[12,15] For patients under general anaesthesia, a breathing filter should be installed between the anaesthetic mask and the respiration loop, and a breathing filter should be installed at the inhalation and exhalation end of the anaesthesia machine, respectively.[12,15]

Operating room management

No article made reference to operating room management. In principle, high-efficiency particulate air filters must be in use and the theatre room should have a negative pressure.[12,15] After surgery, the room should be disinfected by spraying peracetic acid or hydrogen peroxide for more than two hours, and the laminar flow should be off and air supply closed.[12,15] Sampling of the surfaces and air in the operation room should be tested by the hospital infection control team after the disinfection process. The next operation can be continued only after the monitoring results are qualified.[15]

Prevention of surgical aerosol during burn surgery

Surgery using the electrocautery and any high-speed powered equipment, such as the dermatome, will result in aerosolization of blood and tissue fluid.[12,15] COVID-19 is present in all body fluids and so will be present in this aerosol. Limitation of the use of these procedures will minimize the aerosol.[12,15] Burn debridement and split thickness skin graft harvest both produce vast amounts of aerosols when any high-speed powered equipment, such as the dermatome, are used, and burn surgeons should use FFP3 or N95 respirator masks.[12,15]

The ability for the aerosol to cause infection of the surgical team is not known and dependent on the PPE worn by the surgical team. Smoke generated should be removed by an aspirator; it must be noted that suction also generates an aerosol.[15] During the operation, normal saline for flushing should be minimized, splashing of the patient's body fluids should be avoided, and the residue of the fluid should be reduced as much as possible to prevent the pollution of the surrounding environment.[12,15] The surgical team need to cooperate closely to prevent smoke from electrocautery, splashing of the patient's body fluid, and sharp instrument injury.[12,15]

Disinfection and sterilization of surgical instruments

Disinfection of surgical instruments and other medical supplies and the operating room should be performed strictly in accordance with the management requirements of Class A infectious diseases.[12] Therefore, all surgical instruments that have been directly exposed to the patient's body fluid should be immediately scrubbed with 1000–2000 mg/L chlorine-containing preparation and then placed into double-layer yellow medical waste bags, labelled with SARS-CoV-2, and the central sterile services department immediately informed to take them away.[12]

Postoperative management

Burn care professionals are advised to take appropriate protective measures according to the COVID-19 positive/negative patient and the environment they are exposed to in their work (*Table IV*). Nevertheless, nucleic acid testing for COVID-19 or virus sequencing should be done as soon as possible after surgery. The body temperature of patients should be monitored at least three times a day after operation. For patients with COVID-19, wound infection should not be judged only by the results of blood tests and body temperature.[12-16] Consider whether fever is caused by a wound infection or COVID-19.[12,13]

Management of elective surgery

Two articles made reference to management of elective burn surgery and both recommended stopping the elective surgery of burns completely.[12,13]

Only elective surgeries that may influence the prognosis significantly or for threat to life should proceed. For patients undergoing a routine operation, if COVID-19 has been excluded, the surgery should be arranged with the normal management procedure according to the patient's priority; burn care professionals should take level 1 protective measures at least during surgery. For patients with surgery contraindicated in the early stage or other reasons such as conservative management failure, fear of hospitalization during the pandemic, etc., surgery can be performed according to management experience for delayed/non-healing burn wounds, referring to the aforementioned protective measures. During the transition period, it is necessary to strengthen the monitoring and protection of patients and family caregivers.[12,13]

Discharge and post-discharge management

For COVID-19 negative patients, discharge should be scheduled for soon after surgery to reduce cross-infection in the hospital.[12,13] Post hospital discharge, telemedicine can be used to guide the patient's follow-up management.[12-16] At the same time, it is necessary to continue to strengthen the monitoring and protection of patients and family caregivers, and pay attention to the possibility of positive viral aetiology test results in patients recovered from COVID-19.[12,13]

Reduction of non-essential gatherings

Important clinical decision-making meetings, such as handover, mortality, and morbidity conferences and multidisciplinary team meetings, have been continued either on electronic platforms such as MS Teams, or in small groups with everyone wearing a surgical mask and with social distancing observed (sitting 1–2 m apart).[7,8,23] Social gatherings greater than several people have also been discouraged.[7,8] All non-essential burn meetings such as academic meetings and journal clubs have been continued on electronic platforms such as MS Teams. All non-essential overseas travel for burn care professionals, including planned holidays, workshops and conferences were cancelled to reduce the risk of inadvertent importation of COVID-19.

Care for burn care professionals

Working on the frontlines of the COVID-19 pandemic can be both physically and emotionally draining, especially when there is no end in sight.[4,7,8] Burn care professionals must be allowed breaks to rest and recharge.[4,7,8] However, burn care professionals on breaks must not travel overseas and need to remain contactable and recallable in the event of a surge of COVID-19 patients, or having to return to cover burn care professionals who have fallen unwell in the line of duty. Unwell burn care professionals are also given mandatory time off to recuperate at home.[4,7,8]

Conclusion

The COVID-19 pandemic has changed the world and exacerbated health crisis management in large parts of the world.[24] In these times, the value of a capable and reliable leadership becomes evident, since not only physical and organizational hurdles, but also emotional challenges have to be overcome.[25,26] The way back out of the pandemic will be long and hard, but strict burn care protective measures at every stage in the pathway of COVID-19 positive and negative burn patients is critical to decreasing the risk of nosocomial infection and protecting burn care professionals providing care from cross-infection.

BIBLIOGRAPHY

1 Al-Benna S: Pathophysiology of coronavirus disease 2019 for wound care professionals. Int Wound J (in press), 2020.

2 Al-Benna S: Availability of COVID-19 information from national and international aesthetic surgery society websites. Aesthetic Plast Surg, 44: 1043-1046, 2020.

3 Al-Benna S, Gohritz A: Availability of COVID-19 information from national plastic surgery society websites. Ann Plast Surg, 85: S171-S172, 2020.

4 Al-Benna S: Impact of COVID-19 on surgical registrars' education and training. S Afr J Surg, 58: 10-13, 2020.

5 Worldometer: COVID-19 coronavirus pandemic. Available at: https://www.worldometers.info/coronavirus/ Accessed: 25th August 2020.

6 Al-Benna S: Association of high level gene expression of ACE2 in adipose tissue with mortality of COVID-19 infection in obese patients. Obes Med, doi.org/10.1016/j.obmed.2020.100283

7 Al-Benna S: Concepts of management of plastic surgery services during the coronavirus disease 2019 pandemic. Eur J Plast Surg,

doi.org/10.1007/s00238-020-01704-1
8 Al-Benna S: Management of hand surgery services during the coronavirus disease 2019 pandemic. J Hand Microsurg, doi.org/10.1055/s-0040-1714440
9 Al-Benna S, Alzoubaidi D, Al-Ajam Y: Evidence-based burn care - an assessment of the methodological quality of research published in burn care journals from 1982 to 2008. Burns, 36: 1190-1195, 2010.
10 Al-Benna S: A discourse on the contributions of evidence-based medicine to wound care. Ostomy Wound Manage, 56: 48-54, 2010.
11 Al-Benna S: Construction and use of wound care guidelines: an overview. Ostomy Wound Manage, 58: 37-47, 2012.
12 Ma S, Yuan Z, Peng Y, Chen J et al.: Experience and suggestion of medical practices for burns during the outbreak of COVID-19. Burns, 46: 749-755, 2020.
13 Li N, Liu T, Chen H, Liao J et al.: Management strategies for the burn ward during COVID-19 pandemic. Burns, 46(4), 756-761, 2020.
14 Barret JP, Chong SJ, Depetris N, Fisher MD et al.: Burn center function during the COVID-19 pandemic: an international multicenter report of strategy and experience. Burns, 46(5), 1021-1035, 2020.
15 Saha S, Kumar A, Dash S, Singhal M: Managing burns during COVID-19 outbreak. J Burn Care Res, https://doi-org.ez.sun.ac.za/10.1093/jbcr/iraa086
16 Ilenghoven D, Hisham A, Ibrahim S, Mohd Yussof SJ: Restructuring burns management during the COVID-19 pandemic: a Malaysian experience. Burns, 46(5), 1236-1239, 2020.
17 Ranno R, Vestita M, Verrienti P, Melandri D et al.: The role of enzymatic debridement in burn care in the COVID-19 pandemic. Commentary by the Italian Society of Burn Surgery (SIUST). Burns, 46(4): 984-985, 2020.
18 Al-Benna S, Gohritz A: Availability of COVID-19 information from national and international burn society websites. Ann Burns Fire Disasters, (in press), 2020.
19 Kamolz LP, Schiefer JL, Horter J, Plock JA: COVID-19 and burns: lessons learned? Burns, https://doi-org.ez.sun.ac.za/10.1016/j.burns.2020.05.015, 2020
20 Al-Benna S: Adequate specialised burn care services are essential at major trauma centres. Burns, 39: 1495-7, 2013.
21 Al-Benna S: Burn care facilities are lacking at major trauma centres in England. Burns, 39: 533, 2013.
22 Al-Benna S: Negative pressure rooms and COVID-19. J Perioper Pract, Accepted.
23 Al-Benna S, Al-Ajam Y, Alzoubaidi D: Burns surgery handover study: trainees' assessment of current practice in the British Isles. Burns, 35: 509-512, 2009.
24 Al-Benna S: Sword of Damocles: application of the ethical principles of resource allocation to essential cancer surgery patients requiring beds in limited supply during the COVID-19 pandemic. Eur Surg, 2020, https://doi.org/10.1007/s10353-020-00655-y
25 Al-Benna S: The paradigm of burn expertise: Scientia est lux lucis. Burns, 40: 1235-1239, 2014.
26 Al-Benna S, O'Boyle C: Burn care experts and burn expertise. Burns, 40: 200-203, 2014.

Conflict of interest and sources of funding: None