Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Letter to the Editor

Monkeypox-infected patients in the perioperative context: Recommendations from an expert centre

To the Editor,

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Over the past decade, several emerging infectious diseases (EIDs) have disrupted health care organisations worldwide, such as Ebola, Zika, Chikungunya, SARS-CoV-2 and, more recently, human Monkeypox virus (MPXV) [1]. These infections are caused by emerging or re-emerging viruses that induce fear among populations and health care workers (HCWs), partly due to knowledge gaps regarding transmission routes and effective protective measures. Any patient with an EID could require emergency surgery or intensive care unit (ICU) admission while they are supposedly contagious. Each centre should establish a local procedure focusing on all perioperative steps at the beginning of an outbreak to protect HCWs and prevent infection dissemination [1].

On the 27th of June 2022, 3,413 MPXV-infected patients were reported in 50 countries, 86% of which belonged to the European region [2]. Monkeypox virus is an enveloped double-stranded DNA virus that belongs to the Orthopoxvirus genus of the Poxviridae family. On May 2022, the current outbreak was linked to the West African clade, which is thought to be poorly virulent [3]. The virus is transmitted via direct contact with skin or mucocutaneous lesions, via respiratory droplets, through contact with contaminated objects or with mother-to-child transmission [4]. It is established that close physical contact can lead to transmission, while the role of body fluids is still unknown. The wide geographic spread of cases might indicate a high transmission rate, although nothing has been established so far [5]. Although rare, some nosocomial cases have been reported [6,7].

The incubation period for MPXV infection is usually 7–14 days but can range from 5 to 21 days. The infection usually starts with common influenza-like symptoms, including fever, headache, back and muscle aches, fatigue and swollen lymph nodes. Patients are presumed to become contagious at first symptom onset. One to three days later, a skin rash appears, first localised on the face before spreading to all body parts, including mucosal areas. The rash starts as flat red spots before progressing through several stages (macules, papules, vesicles) and then turning into pustules and scabs over the whole body, including the palms and soles. The skin rash typically lasts for 2–4 weeks. Severe forms have been described, including extensive cutaneous lesions, eye lesions, extrinsic throat compressions, infections, sepsis, and pneumonia. However, most cases during this outbreak do not present with this classical clinical presentation [2]. Atypical presentation can include absence of influenza-like symptoms, single genital or anal lesion, few skin lesions or that appear at asynchronous stages of development. At the end of June 2022, nearly all cases had been observed in men having sex with men.

In the African region, from January up to the 10th of June 2022, a case fatality rate of 4.5% was reported (https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON392). It is expected to be lower in high income countries (only 1 death among 3,413 confirmed cases [2]).

MPXV-infected patients are at risk of infection of their dermatologic lesions, such as paronychia or mucosal abscess, which might require urgent surgical procedures. Any elective surgery should be postponed in MPXV-infected patients until recovery of dermatologic lesions, meaning that patients are no longer contagious. If any hospitalisation or surgery is needed, it is recommended to address the patient in a referral centre.

All perioperative steps must be considered for patients with suspected or confirmed cases [8]. Although WHO has issued on the 10th of June 2022 a clinical management and infection prevention and control for monkeypox guide (https://apps.who.int/iris/rest/bitstreams/1432076/retrieve), this document does not provide any recommendation on the perioperative context. There are nine referral centres in France with expertise to manage emerging infections so far. Based on our experience, we suggest the following procedures to the community to ensure the safety of HCWs and other patients (Fig. 1).

1 Hydroalcoholic solutions: the use of hydroalcoholic solution is mandatory at each step of this checklist, for patients as for HCWs.
2 Organisation: Avoid any unnecessary contact between the infected patient and other patients and materials. The surgical procedure and indication have to be confirmed by a senior surgeon. The patient should be brought directly from his room to the operating theatre, without any stop in the waiting room.
3 Additional patient protection: Infected patients must wear face surgical masks and cover all cutaneous lesions with dressings and disposable pyjamas before being brought to the operating theatre (OT). Infected patients should be postponed for elective surgery.
4 Health care workers: All HCWs, including porters and personnel in the OT need to wear appropriate personal protective equipment (PPE), including an FFP2/N95 mask, disposable gloves, eye protection, isolation gown, and addi-

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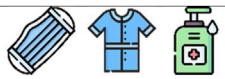
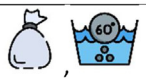
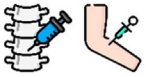
Patient isolation	
Health care workers' protection	Complete PPE:  Additional disposable plastic protective apron in case of any potential fluid contact:  For the operating theatre: 
Transfer to and from the operating theatre	Complete PPE,  , disposable sheets, bio cleaning after transfer  Direct transfer from the patient room to the operating theatre, without going in the waiting room
Sheets and clothes	Cautious manipulation, sealed plastic bag 
Time of surgery	Minimum staff and equipment, staff confinement in the operating theatre  If required, remove PPE in the appropriate order.
Anaesthesia procedure	Only for emergency procedures  (postpone any elective surgery) Promote locoregional and spinal anaesthesia 
Recovery room	Promote recovery in the operating theatre or in a dedicated closed room 
Bio cleaning	 NF EN14476
Trash	Infectious waste bags 

Fig. 1. Checklist of perioperative steps measures for MPXV-infected patients requiring urgent care to prevent infection dissemination.

tional disposable plastic protective apron, in case of any potential fluid contact. One pair of gloves is enough in this context.

5 Transfer to the operating theatre: The stretcher-bearer needs to wear the complete PPE. Bed sheets have to be removed and replaced by disposable sheets before transfer. Once the patient is in the OT, the trolley should be cleaned appropriately (see below). The sheets have to be discarded to prevent anyone from touching potential infectious materials and should be replaced by clean sheets. Sheet manipulation must be done cautiously, with all recommended PPE: they should never be shaken to avoid spreading infectious particles. If the patient had personal clothes or used washable sheets, they should be placed in a closed water-soluble bag before being washed at 60 °C.

6 Time of surgery: The OT must be cleared with all unnecessary equipment and supplies removed. Non-essential HCWs should leave the OT. The anaesthesiology and surgical teams should be

dedicated to the infected patient and should not go from one OT to another to prevent particle transmission. If any HCW has to leave the OT, all specific PPEs must be removed in the appropriate order (gloves and gown, hands washing, eye protection, hands washing), followed by a new careful hands scrubbing. New specific PPE would have to be worn before entering the OT again.

7 Anaesthesia procedure: Locoregional and spinal anaesthesia should be preferred to lower droplet exposure.

8 Postoperative care: Recovery in the OT is the best option and should always be considered. If not possible, the only alternative option is a closed dedicated place in the postoperative care unit, with a dedicated nurse equipped with the recommended PPE (the patient must have the same protection as described above).

9 Bio cleaning: All surfaces have to be cleaned using a virucidal detergent and disinfectant, with the equivalent of the European label NF EN14476, and a minimum 5-minute exposure time. The regular staff should perform the cleaning, equipped with the cited PPE.

10 Trash: All materials (even wipes) must be placed in infectious waste bags.

11 Bacteriological sampling should be performed and considered as dangerous materials. Biologists have to be informed before.

Similar recommendations would be applicable for a patient who would require intensive care during his contagious stage (although acute manifestations induced by the MPXV infection are highly unlikely). Similarly, MPXV infection should not be *per se* the cause of prolonged mechanical ventilation, and no specific recommendations exist so far on the topic. If mechanical ventilation is required during the surgical procedure, we suggest displaying all ventilators filters and circuits. However, this prevention recommendation might change over time.

In conclusion, MPXV-infected patients might require urgent surgery, especially related to abscessed cutaneous and mucosal lesions. Despite a low fatality rate, this infection might be highly contagious. A local procedure should be established focusing on each perioperative step to adapt to the environment and lower the risk of transmission. This proposed checklist is intended to ensure HCW safety.

Disclosure of interest

The authors declare that they have no conflicts of interest.

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Author contributions

All authors have approved the submitted material.

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