



Roadmap for Restarting Elective Surgery During/After COVID-19 Pandemic

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The worldwide COVID-19 pandemic has already resulted in more than 5.3 million infections and > 3,42,000 deaths, and this number is increasing [1] with equally distressing socio-economic consequences for the affected countries and the whole world [2]. Many health care professionals (HCPs) have caught and succumbed to infection while looking after COVID patients. The classic line from Odes by the Roman lyric poet Horace: “Dulcē et decōrum est prō patriā mōrī” (“it is sweet and befitting to die for the homeland”) has been used to describe this ultimate sacrifice while fighting this war [3]. This crisis has placed unprecedented demands on resources leading to repurposing of surgical wards/ICU beds/ORs, and relocation of anesthesiologists, nurses, and surgeons to help with workload of COVID-19 cases. This has resulted in complete stoppage of elective surgery in most countries [4].

Such cancellation of all elective operations has already created a huge backlog of patients deferred or simply not done [4, 5]. It is a worldwide challenge to restart elective surgery during/after COVID-19 pandemic. Various stages of an epidemic crisis are well known, and it is prudent to minimize or postpone elective surgery during stages of pre-peaking, peak, and plateau stage of epidemic [6, 7]. However, preparations have to be made for gradually resuming services that can be offered by the time normalcy is reached. The famous

Benjamin Franklin Quote—“By failing to prepare, you are preparing to fail”—comes to mind.

Lack of definitive treatment, high contagiousness of COVID-19 virus via respiratory droplets/body fluids, fear of airborne transmission via aerosols produced during various surgical procedures, and safety needs of HCPs have forced a tectonic change in current surgical practice (Table 1) [8–13]. Initial practical lessons on safe conduct of surgery were learned from the experience of Chinese and Italian surgeons working in the early epicenters of this pandemic in Asia and Europe [14–18]. Similarly, experience with emergency surgery and Cancer surgery has shown that workloads can be tackled safely in these challenging times [19–23]. Such safe and successful surgical programs have set examples, which can be emulated when starting elective surgery.

Surgeons had, typically, always focused on patient safety during surgery; advent of Hepatitis B/C and HIV taught them to think of their own safety and adopting “universal precautions.” Current COVID-19 pandemic has taken their protection to another level with special *personal protection equipment* (PPE) [24, 25]. Realization of transmission risks through droplets and aerosolization has prompted coining of term “universal *respiratory* precautions” and its widespread implementation among the HCPs [26]. Many measures during the current outbreak were adopted from lessons learnt during the 2003 SARS (*severe acute respiratory syndrome*) outbreak [27].

There has been uncertainty about risks of COVID-19 transmission via “chimney effect” of surgical smoke and CO₂ leakage from pneumoperitoneum. Hence, some early guidelines advised avoiding laparoscopic surgery altogether. However, these potential hazards can be tackled (Table 1) and advantages of minimally invasive surgery need not be sacrificed in the current crisis [11, 13, 28, 29]. Similarly, caution has to be exercised with surgical smoke produced with use of electrocautery/ drills/lasers in open surgery (Table 1).

Most important decision during the on-going pandemic is the “prioritization,” which depends upon the degree of

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Table 1 Anticipated changes in surgical practice due to COVID-19

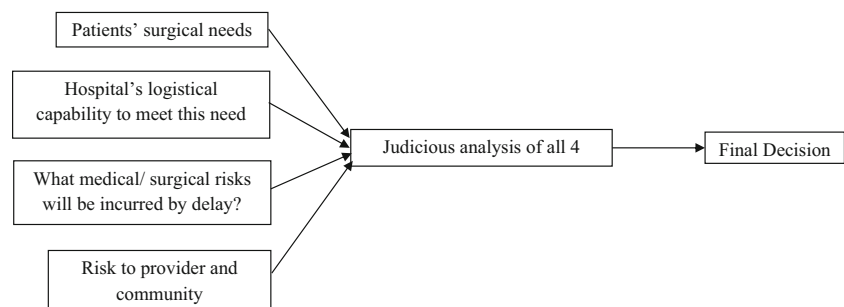
For patient	Additional worries about procedure prioritization, safety, additional preoperative testing for virus, added risk in consent for surgery, isolation issues after surgery, change in visitor policy (no visitors/attendants), and extra charges for COVID-19 tests/PPEs/disposables/sanitization.
For surgical team	Additional worries about surgery prioritization protocol and its transparency; safety of team members due to infectivity of the aerosolized, blood, or fluid-contain viral particles (fear of exposure from patient, training with new safety protocols/clear communications/availability of PPEs); staying out of OR at the time of intubation and extubation and working with minimum numbers of team; avoid CO ₂ /aerosol risks during open surgery (lowest possible settings for electrosurgery units, minimal use of energy devices, laser and drills, use of diathermy handles with attached smoke evacuators) and during laparoscopy (smallest possible incisions for ports, minimum CO ₂ insufflation pressure, avoid use of sutures with extra-corporeal knots for which ports need to be opened, ultra-filtration for smoke, safe evacuation of pneumoperitoneum via a filtration system before closure, trocar removal, specimen extraction, or conversion to open); minimal use of laparoscopy; consider gasless laparoscopy; minimal use of surgical drains; special attention and re-evaluation if patient has had COVID 19-related illness; compliance with surgery checklists regarding COVID 19; and being aware of changing guidelines.
For anesthesia team	Safety/protection of team members, cleaning/sterilization of anesthesia equipment, extra care during maximum exposure to high aerosol procedures (intubation/extubation in negative pressure room, resuscitation in ICU/OR, non-invasive ventilation, high-flow nasal oxygen provision, bronchial suctioning, bronchoscopy), avoid positive pressure ventilation, use mechanical ventilation, proper filtration of exhaled air/gases, use of regional anesthesia as much as possible, compliance with new anesthesia checklists regarding COVID 19, exposure to equipment fomites, testing/sanitization as needed of anesthesia machines as and when returned from COVID-19 and non-COVID ICU use, and being aware of changing guidelines.
For OR	If possible separate dedicated ORs with infrastructure and pathways for positive/suspected cases; provision of donning and doffing areas and provision of ante room for intubation and extubation; new time schedule as ORs need to be sanitized specifically between cases; ventilation issues like negative flow/frequent air exchange; effective smoke extraction; supply of desufflation filters for laparoscopy; working with minimum numbers of team; adjust with minimum coming/going of staff, minimum surgical/anesthesia instruments inside OR; use of waterproof OR sheets; proper sterilization of un-disposable material in OR between two cases; and equipment to be sanitized separately if used in suspected/positive patient
For hospital management	Separate dedicated hospital for COVID-19 patients—if possible; worries about community's COVID-19 numbers and COVID-19 diagnostic testing availability and policies for use; worries about health care facility capacity (surgical/ICU beds, separate dedicated wards/OR/day care surgery facilities, sanitization of all areas, sterilization of all un-disposable material, availability of ancillary staff and material for surgery); assessing anticipated surgical workload; availability and quality of PPEs; additional financial burden of new infrastructure/equipment/disposables in wards and ORs; monitor all staff for signs and symptoms of COVID-19 infection; planning of staff rota/contingency planning if staff gets infected; en issues like ventilation in wards and ORs; creation of multidisciplinary review/governance committee for real-time governance, decisions (prioritization of surgery/ resources), and monitoring of quality control; support for well-being, post-traumatic stress/mental health issues, and work hours of staff; staff quarantine facilities; collection/analysis of new data; and worries about “second wave” of pandemic.

All of these are not official recommendations; these are authors' ideas of future changes that may become common practice

OR operation room, ICU intensive care unit

urgency: patient should be operated immediately (emergency = within 24 h)/early (urgently = 1–2 days)/within 3–7 days (semi-urgent) or can be put on non-operative treatment/feasibility of alternative procedures that have shorter OR time, or can be deferred for 1 month/3 months/> 3 months. Such decisions, depending upon availability of resources (personnel: surgeons/anesthesiologists/nurses, technology:

ventilators, supplies: PPE/blood products, and postoperative resources: ICU beds), are easy to make with logic and sound surgical judgment (Fig. 1) [30–32]. In case of any doubt, help can be sought from a specially created in-hospital surgical review committee and/or objective guidelines/algorithms published by several apex academic organizations [30, 31]. Recently, a medically necessary time-sensitive (MeNTS)

Fig. 1 Prioritization for surgery

scoring system has been published, which incorporates resource limitations as well as COVID-19 transmission risk to providers and patients to the decision making process [33]. Guidelines also have comprehensive recommendations/algorithms for various sub-specialties, special consent to be taken from patient in view of COVID pandemic, advice for patients, risks with aerosol generating procedures (AGP), protection needed for OR staff, good practice in OR, and debate on open versus laparoscopy approach [25, 34–37]. The Association of Surgeons of India has from time to time guided its members and the international surgical community. Equally, the Indian Journal of Surgery is bringing out the views of surgeons in its publications Indian Journal of Surgery and has already published special consent form for COVID-19 patients [38].

Most guidelines agree that elective surgery on positive COVID-19 patients should be deferred, until they have been asymptomatic for 72 h and have at least 2 negative COVID-19 tests separated by at least 24 h. Similarly, they also recommend preoperative COVID-19 testing for each patient because if an asymptomatic carrier undergoes surgery or if a perioperative patient contacts COVID-19; relative immunocompromise after major surgical intervention may worsens the prognosis and overall outcome with unacceptable mortality rate and a high rate of severe complications [14, 39]. It is wise and safe to follow the current axiom: “most effective way to prevent viral exposure is to avoid performing non-essential surgical procedures” as this limits the exposure to patients and clinicians, conserves PPEs, and preserves health system capacity [24].

Lately, there is a new found awareness of mental health well-being of HCPs. Helplessness of dealing with a highly infectious, untreatable, seemingly omnipresent virus with such high mortality added to uncertainty about the duration and extent of COVID-19 pandemic has such deleterious effects on mental health of HCPs that it has been called the *hidden/parallel* pandemic. Fatigue from using PPE kits, donning and doffing of PPEs, and side effects of using mask for prolonged periods are added considerations. Associations and organizations have taken cognizance of this new variety of PTSD (post-traumatic stress disorder), and many institution level programs are now available to ensure psychological safety of HCPs [40, 41]. Widespread incorporation of such programs is the need of the hour.

Presently, when even the developing countries are struggling to provide sufficient number of PPEs to their HCPs [42], resource constraints of lower and middle-income countries can lead to troubling shortcomings in the face of this pandemic especially for provider infection prevention and control behaviors like hand hygiene and disinfection [43, 44]. However, this opportunity has prompted many frugal innovative responses; these low cost ideas may not be ideal but have the

potential to provide good enough healthcare in the best way possible under given constraints [45, 46].

All surgeons are concerned about pending work load and resuming the elective surgeries. Guidelines and checklists for same are available and include a comprehensive list of considerations before resuming elective services. These encompass assessing surgical workload and patient population, ensuring adequate hospital capacity and facilities, supporting the surgical workforce with their protection and mental needs, and continuously supporting training in the face of rapidly changing scenario [9, 47].

There is no precedence of crisis of this magnitude, so everyone is learning as they plod along. At the moment the academic world is trying to repurpose available medicines (anti-malarials, antivirals) against this virus, trawling through preprint servers for any effective treatment, and scrambling for a successful vaccine to prevent the infection. Currently, the system is logistically overwhelmed with this on-going war against uncertainty of yet-to-peak COVID-19 pandemic and starting full-fledged elective surgery is challenging. Many patients have approached their surgeons to utilize the lockdown period for their surgery. Surgeons can surely utilize this waiting period in planning/preparing from the sideline in keeping up to date with many online education initiatives and simulation training for preparedness [48, 49]. They have to be vigilant and keep track of rapidly emerging evidence, and frequent revisions of guidelines. Surgeons are battle-scarred warriors, always ready to take up a challenge head on; based upon availability of resources a gradual, very guarded resumption may be possible for hospitals in districts labeled as “green zones”; but for others discretion would be better than valor.

References

- 1 COVID-19 Dashboard by the Centre for Systems Science and Engineering at Johns Hopkins University. Available at <https://coronavirus.jhu.edu/map.html>. Accessed 23 May 2020.
- 2 Tandon PN (2020) COVID-19: impact on health of people & wealth of nations. *Indian J Med Res* 151:121–123 Available from: <http://www.ijmr.org.in/text.asp?2020/151/2/121/281110>
- 3 Lane T (2020) Dulce et decorum est. *Ann R Coll Surg Engl* 102(5): 321–322
- 4 CovidSurg Collaborative, Nepogodiev D, Bhangu A (2020) Elective surgery cancellations due to the COVID-19 pandemic: global predictive modelling to inform surgical recovery plans. *Br J Surg* 12. <https://doi.org/10.1002/bjs.11746>
- 5 Søreide K, Hallet J, Matthews JB, Schnitzbauer AA, Line PD, Lai PBS, Otero J, Callegaro D, Warner SG, Baxter NN, Teh CSC, Ng-Kamstra J, Meara JG, Hagander L, Lorenzon L (2020) Immediate and long-term impact of the COVID-19 pandemic on delivery of surgical services. *Br J Surg*. <https://doi.org/10.1002/bjs.11670>

6. Mayol J, Fernández PC (2020) Elective surgery after the pandemic: waves beyond the horizon. *Br J Surg*. <https://doi.org/10.1002/bjs.11688>
7. Tuech JJ, Gangloff A, Schwarz L (2020) Our challenge is to adapt the organization of our system to the six stages of the epidemic to go beyond the COVID-19 crisis. *Br J Surg*. <https://doi.org/10.1002/bjs.11639>
8. American College of Surgeons: Local resumption of elective surgery guidance. Online April 17, 2020. Available from <https://www.facs.org/covid-19/clinical-guidance/resuming-elective-surgery>. Accessed on 12th May 2020
9. Royal College of Surgeons of England: Recovery of surgical services during and after COVID-19. Online April 29, 2020. Available from https://www.rcseng.ac.uk/coronavirus/recovery-of-surgical-services/?utm_campaign=1394169_COVID-19%20Special%20Update%3A%20Issue%204&utm_medium=dotmailer&utm_source=emailmarketing&dm_i=4D4N,TVQX,1182R1,3MHS7,1. Accessed on 12th May 2020
10. Dexter F, Parra MC, Brown JR, Loftus RW (2020) Perioperative COVID-19 defense: an evidence-based approach for optimization of infection control and operating room management. *Anesth Analg*. <https://doi.org/10.1213/ANE.0000000000004829>
11. SAGES and EAES recommendations regarding surgical response to COVID-19 crisis. 2020 March 29. Available from <https://www.sages.org/recommendations-surgical-response-covid-19/>. Accessed on 14th May 2020
12. Malhotra N, Joshi M, Datta R, Bajwa SJS, Mehdiratta L (2020) Indian Society of Anaesthesiologists (ISA National) advisory and position statement regarding COVID-19. *Indian J Anaesth* 64(4): 259–263
13. Vigneswaran Y, Prachand VN, Posner MC, Matthews JB, Hussain M (2020) What is the appropriate use of laparoscopy over open procedures in the current COVID-19 climate? *J Gastrointest Surg*. <https://doi.org/10.1007/s11605-020-04592-9>
14. Spinelli A, Pellino G (2020) COVID-19 pandemic: perspectives on an unfolding crisis. *Br J Surg* 107:785–787. <https://doi.org/10.1002/bjs.11627>
15. Di Saverio S, Pata F, Gallo G, Carrano F, Scorza A, Sileri P et al (2020) Coronavirus pandemic and colorectal surgery: practical advice based on the Italian experience. *Color Dis*. <https://doi.org/10.1111/codi.15056>
16. Cai M, Wang G, Zhang L, Gao J, Xia Z, Zhang P et al (2020) Performing abdominal surgery during the COVID-19 epidemic in Wuhan, China: a single-centred, retrospective, observational study. *Br J Surg* 27:e183–e185. <https://doi.org/10.1002/bjs.11643>
17. Lei S, Jiang F, Su W, Chen C, Chen J, Mei W, Zhan LY, Jia Y, Zhang L, Liu D, Xia ZY, Xia Z (2020) Clinical characteristics and outcomes of patients undergoing surgeries during the incubation period of COVID-19 infection. *EClinicalMedicine*. 5:100331. <https://doi.org/10.1016/j.eclinm.2020.100331>
18. Di Marzo F, Sartelli M, Cennamo R, Toccafondi G, Coccolini F, La Torre G et al (2020) Recommendations for general surgery activities in a pandemic scenario (SARS-CoV-2). *Br J Surg*. <https://doi.org/10.1002/bjs.11652>
19. Whiteside T, Kane E, Aljohani B, Alsamman M, Pourmand A (2020) Redesigning emergency department operations amidst a viral pandemic. *Am J Emerg Med*. <https://doi.org/10.1016/j.ajem.2020.04.032>
20. Orthopoulos G, Fernandez GL, Dahle JL, Casey E, Jabbour N (2020) Perioperative considerations during emergency general surgery in the era of COVID-19: a U.S. experience. *J Laparoendosc Adv Surg Tech A* 30(5):481–484
21. De Simone B, Chouillard E, Di Saverio S, Pagani L, Sartelli M, Biffi WL et al (2020) Emergency surgery during the COVID-19 pandemic: what you need to know for practice. *Ann R Coll Surg Engl* 102(5):323–332
22. Tuech JJ, Gangloff A, Di Fiore F, Michel P, Brigand C, Slim K, Pocard M, Schwarz L (2020) Strategy for the practice of digestive and oncological surgery during the Covid-19 epidemic. *J Visc Surg*. <https://doi.org/10.1016/j.jviscsurg.2020.03.008>
23. Pramesh CS, Badwe RA (2020) Cancer management in India during Covid-19. *N Engl J Med* 382:e61. <https://doi.org/10.1056/NEJMc2011595>
24. Brat GA, Hersey S, Chhabra K, Gupta A, Scott J (2020) Protecting surgical teams during the COVID-19 outbreak: a narrative review and clinical considerations. *Ann Surg*. <https://doi.org/10.1097/SLA.0000000000003926>
25. Intercollegiate general surgery guidance on COVID-19, 2nd Revision, 7 April 2020. Available from <https://news.rcpsg.ac.uk/news/updated-general-surgery-guidance-on-covid-19-2nd-revision-7-april-2020/>. Accessed on 15th May 2020
26. Livingston EH (2020) Surgery in a time of uncertainty: a need for universal respiratory precautions in the operating room. *JAMA* 7. <https://doi.org/10.1001/jama.2020.7903>
27. Yeo D, Yeo C, Kaushal S, Tan G (2020) COVID-19 & the general surgical department—measures to reduce spread of SARS-COV-2 among surgeons. *Ann Surg*. <https://doi.org/10.1097/SLA.0000000000003957>
28. Mowbray NG, Ansell J, Horwood J, Cornish J, Rizkallah P, Parker A, Wall P, Spinelli A, Torkington J (2020) Safe management of surgical smoke in the age of COVID-19. *Br J Surg*. <https://doi.org/10.1002/bjs.11679>
29. IAGES COVID Surgery Recommendations (2020) Online April 11. Available from <https://www.iages.in/file/IAGES-COVID-FINAL-PDF-12.pdf>. Accessed on 14th May 2020
30. NHS Clinical guide to surgical prioritisation during the coronavirus pandemic 11 April 2020 Available from <https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/03/C0221-specialty-guide-surgical-prioritisation-v1.pdf>. Accessed on 15th May 2020
31. American College of Surgeons COVID-19: Guidance for triage of non-emergent surgical procedures. Available from <https://www.facs.org/covid-19/clinical-guidance/triage>. Online March 17, 2020. Accessed 12th May 2020
32. Argenziano M, Fischkoff K, Smith CR (2020 May 22) Surgery scheduling in a crisis. *N Engl J Med*. <https://doi.org/10.1056/NEJMc2017424>
33. Prachand VN, Milner R, Angelos P, Posner MC, Fung JJ, Agrawal N et al (2020) Medically necessary, time-sensitive procedures: scoring system to ethically and efficiently manage resource scarcity and provider risk during the COVID-19 pandemic. *J Am Coll Surg*. <https://doi.org/10.1016/j.jamcollsurg.2020.04.011>
34. American College of Surgeons COVID-19: Elective case triage guidelines for surgical care. Available from <https://www.facs.org/covid-19/clinical-guidance/elective-case>. Online March 24, 2020. Accessed 12th May 2020
35. NCPS guide for prioritisation of urgent scheduled surgical conditions. 2020 May 11. Available from https://royalcollegeofsurgeonsireland.newsweaver.ie/icfiles/1/14181/88945/6355974/27cb7d5f116381f1ae3d408a/ncps%20guide%20for%20prioritisation%20of%20urgent%20schedule%20surgical%20conditions%20_5.pdf. Accessed on 15th May 2020
36. NCPS guide for consenting in the COVID situation. 2020 May 11. Available from <https://royalcollegeofsurgeonsireland.newsweaver.ie/icfiles/1/14181/88945/6355974/00d554e4e057db11545ba7ce/ncps%20guide%20for%20consenting%20in%20the%20covid%20situation%20v1%20rev%202.pdf>. Accessed on 15th May 2020
37. American College of Surgeons; COVID-19 and surgical procedures: a guide for patients. 2020 Online March 31. <https://www>

- [facs.org/covid-19/clinical-guidance/patient-guide](https://www.facs.org/covid-19/clinical-guidance/patient-guide). Downloaded on 14th May 2020
38. Bhattacharya N, Bhattacharya K (2020) Informed consent for surgery during COVID 19. *Ind J Surg*. <https://doi.org/10.1007/s12262-020-02283-y>
 39. Nahshon C, Bitterman A, Haddad R, Hazzan D, Lavie O (2020) Hazardous postoperative outcomes of unexpected COVID-19 infected patients: a call for global consideration of sampling all asymptomatic patients before surgical treatment. *World J Surg*:1–5. <https://doi.org/10.1007/s00268-020-05575-2>
 40. Shanafelt T, Ripp J, Trockel M (2020) Understanding and addressing sources of anxiety among health care professionals during the COVID-19 pandemic. *JAMA*. 323:2133. <https://doi.org/10.1001/jama.2020.5893>
 41. Dzau VJ, Kirch DG, Nasca TJ (2020) Preventing a parallel pandemic—a national strategy to protect clinicians’ well-being. *N Engl J Med*. <https://doi.org/10.1056/NEJMp2011027>
 42. Jessop ZM, Dobbs TD, Ali SR, Combella E, Clancy R, Ibrahim N, Jovic TH, Kaur AJ, Nijran A, O’Neill TB, Whitaker IS (2020) Personal protective equipment (PPE) for surgeons during COVID-19 pandemic: a systematic review of availability, usage, and rationing. *Br J Surg*. <https://doi.org/10.1002/bjs.11750>
 43. Roder-DeWan S (2020) Health system quality in the time of COVID-19. *Lancet Glob Health*. [https://doi.org/10.1016/S2214-109X\(20\)30223-0](https://doi.org/10.1016/S2214-109X(20)30223-0)
 44. Powell-Jackson T, King JJC, Makungu C, Spieker N, Woodd S, Risha P et al (2020) Infection prevention and control compliance in Tanzanian outpatient facilities: a cross-sectional study with implications for the control of COVID-19. *Lancet Glob Health*. [https://doi.org/10.1016/S2214-109X\(20\)30222-9](https://doi.org/10.1016/S2214-109X(20)30222-9)
 45. Harris M, Bhatti Y, Buckley J, Sharma D (2020) Fast and frugal innovations in response to the COVID19 pandemic. *Nat Med*. <https://doi.org/10.1038/s41591-020-0889-1>
 46. Agarwal V, Sharma D (2020) Frugal solutions for operating room during COVID-19 pandemic. *Br J Surg* in Press
 47. Guerci C, Maffioli A, Bondurri AA, Ferrario L, Lazzarin F, Danelli P (2020) COVID-19: how can a department of general surgery survive in a pandemic? *Surgery*. 167:909–911. <https://doi.org/10.1016/j.surg.2020.03.012>
 48. Balakumar C, Montauban P, Rait J, Iqbal S, Burr T, Taleb K, Featherstone B, Zarsadias P, Fernandes R, Basnyat P, Shah A (2020) Surgeons’ response to COVID-19—preparing from the sideline. *Br J Surg* 107:e192. <https://doi.org/10.1002/bjs.11647>
 49. Tong QJ, Chai JX, Tan LH, Singh P, Ong LT, Wu MY et al (2020) Assessing operating room preparedness for COVID-19 patients through in-situ simulations. *Anesth Analg*. <https://doi.org/10.1213/ANE.0000000000004935>

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