

The strategies of perioperative management in orthopedic department during the pandemic of COVID-19

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Abstract

Background

Coronavirus disease 2019 (COVID-19) broken out and spread rapidly nationwide at the beginning of 2020, which has brought huge impacts to people and work. The current situation of prevention and control is severe and urgent guidance for clinicians, especially for the medical systems. In the hope of providing a reference and recommendation for the prevention and control of the epidemic, we carried out research to improve the quality of patients care and prevention during this epidemic.

Methods

All of the involved health care personnel were rapidly trained to use personal protection equipment in our department. The managements of the surgery patients and association of two periods were described and analyzed. We reviewed and compared the patients' discharged records in our database who underwent surgery in the Department of Bone & Joint Surgery at Peking University Shenzhen Hospital, who were discharged between January 1st to March 1st in 2019 and January 1st to March 1st in 2020. Both chi-squared test and Student's t-test were performed to determine the relationship between the two periods.

Results

Analysis revealed that gender, surgery class, duration, and anaesthetization had no significantly differences between two periods ($p \geq 0.05$). However, age and blood loss had significant relationship of the two periods ($p < 0.05$).

Conclusions

The results of the study imply that we have been benefited from the strict flow charts in management of perioperative for orthopedic patients, which could be a valid tool in routine clinical practice and a consultation during pandemic of the COVID-19.

Introduction

Since December 2019, unexplained type of coronavirus has appeared rapidly in Wuhan followed by bronchitis and pneumonia [1, 2]. It has been proven that the pathogen was Coronavirus disease 2019 (COVID-19), which seriously threatens surgical staff and patients, challenged the medical community to an unprecedented degree [3]. COVID-19 can induce not only mild to severe respiratory diseases, but also inflammation, high fever, cough, acute respiratory tract infection, and dysfunction of internal organs which may result in death [4]. The World Health Organization (WHO) declared it was a pandemic on 11

March 2020 because of its rapid worldwide spread [5]. The public health emergency caused by the pandemic has resulted in a significant reallocation of health resources with a consequent reorganization of the clinical activities in orthopedic department.

As secondary transmissions have occurred and the speed of transmission is accelerating, there are rising concerns about community infections and the overwhelming majority of cities have launched higher level response [6, 7]. The current prevention and control about the situation are grim.

Medical staff in our department make every effort in making correct diagnosis and treatment of specialized diseases by optimizing treatment process, providing proper medical advice, mastering indications of selective, confine, and emergency operation reasonably. In the hope of providing a reference and recommendation for the prevention and control for surgeons, we share our experience during the epidemic in the form of flow charts.

Study sample and patients

We built a dataset containing 96 surgery patients who underwent surgery between January 1st to March 1st of 2019 and January 1st to March 1st of 2020. Data were sourced retrospectively from the medical records. Each discharged abstract involved a multitude of variables. Characteristics of the patients were described and analyzed. Ethical review approval was obtained from the Human Subject Committee at Ethics Committee of Peking University Shenzhen Hospital (Ethics Committee of Peking University Shenzhen Hospital (research) [2020] 013th).

Methods

We searched the literature and assessed the certainty in the evidence using the recommendations based on the experience of health care systems in Asia and Europe, and recommendations were in the form of best clinical practice. Reasonable treatment strategies were changed and adopt timely to minimize the adverse effects on the treatment of orthopedic patients during the epidemic.

We reviewed many variables note in the literature and a set of recommendations and flow charts were created based on a review of the literatures and communications for surgeons with knowledge of safety procedures. We recommend inpatients during hospital stay should be provided with as many instructions as possible to stay in wards. Patients should be evaluated in details under stable condition to minimize the risk of readmission. It is advisable for us to reduce or reschedule post-discharge controls and implement an adequate system of communication for telemonitoring patients in order to reduce hospital visits.

Statistics analysis

Both chi-squared test and Student's t-test were performed to determine the relationship between the two periods. $p < 0.05$ were considered statistically significant. All statistical analyses were performed on IBM SPSS Statistics (version 23.0).

Practical flow charts

By summarizing the research progress and guidelines in recent years in the fields of orthopedic diseases, treatment strategies, and perioperative management were developed to provide more choices for patients to obtain the best treatment under the severe epidemic. COVID-19 brought huge impacts to people and work nationwide, the routine diagnosis and treatment of fractured patients was affected with varied degrees as well.

Instead of traditional diagnosis and treatment, a new system should be developed. Simplification of the diagnostic and staging pathway has to be prioritized in order to reduce hospital visits and consequently the risk of contagion. Orthopedic is not a front-line subject but fracture is a common injury and most of the patients are in trouble when diagnosed during the epidemic [8-10]. The regular diagnosis and treatment of patients were greatly affected and elective surgical activity of the hospital was rapidly reduced.

Some of orthopedics have agreed on possible strategies for the reorganization of orthopedic routine practice and on a set of recommendations that should facilitate the process of rescheduling both inpatient and outpatient activities during the pandemic and in the subsequent phases. Meanwhile, we hope that it could provide more treatment model schemes for colleagues and share the flow charts of managements for patients during the breakout of epidemic, including prevention and control measures for medical staff, operation rooms and surgical instruments, which may be beneficial for medical staff **(Fig.1)**. Meanwhile, we prepared measures for patients who were diagnosed with COVID-19 or the results of nucleic acid were positive **(Fig.2)**

Moreover, most of parts were involved during the special epidemic. As parts of epidemic response measures, the selection of surgical procedures and perioperative managements of orthopedic diseases require all staff work together to figure out a reasonable system of surgical treatment and emergent response. We concluded experience as followings and shared the experiences of the management of patients who are scheduled or emergent to be admitted **(Fig. 3)**.

Some of the surgeons and assistants who come from outside of Shenzhen but ought to enter the OR should obey the special flow chart as well **(Fig. 4)**.

Robots transport sterile materials in the OR without touch **(Fig. 5a)** and intraoperative photo of

Results

Analysis revealed that gender, surgery class, duration of the surgery, and anaesthetization had no significantly differences between two periods ($p \geq 0.05$). However, age and blood loss had significant relationship of the two periods ($p \geq 0.05$) (Table 1).

Table 1
Analysis of surgery patients between the two periods (N = 96)

Factors	Categories	2019	2020	<i>t</i> / χ^2 Value	<i>p</i> Value
Age	Year	61.48	52.11	2.346	0.021
Gender	Male	22	23	0.346	0.556
	Female	28	23		
Surgery class	1	1	7	7.641	0.054
	2	0	1		
	3	38	26		
	4	11	12		
Blood loss	ml	131.94	22.91	5.503	0.001
Duration	min	205.9	201.3	0.289	0.773
Anaesthetization	General	21	11	3.527	0.060
	Non-general	29	35		

ASA: American Society of Anesthesiologists

We can tell from the results of the two periods, both age and blood loss had reduced than the former year ($p < 0.05$). The reason may be individuals were advised to stay at home, which was helpful for the reduce of the old patients and the management of peri-operation is much easier than before when it was compared to the young patient.

Discussion

The current situation of prevention and control of COVID-19 epidemic is severe. All the involved health care personnel were rapidly trained to use personal protection equipment. Because of the enormous demand for respirators and protective clothing but insufficient production during the pandemic, COVID-19 could result in killing quantities of people and resources have been appropriately allocated towards combating this outbreak. Critical patients often occur in the elder with multiple comorbidities or lack of health care, which could progress to acute respiratory distress syndrome (ARDS), multi-organ dysfunction (MODS), or even death [11, 12]. Furthermore, besides clinical activities, continuously important research projects were carried out to explore new strategies and effective therapies to face the epidemic.

Based on the fully understanding of the characteristics of orthopedics diseases and COVID-19, our study aims to summarize and discuss available evidence for orthopedic practices in the form of flow charts. We provide the highest quality medical services in the form of flow charts as for the regular clinical practice.

We medical workers bearing important responsibilities and pressure through strict management strategy. Referring to the "Diagnosis and Treatment Scheme for COVID-19 (Trial Version 7)" and combining the actual practice situation, we surgeons performed the superiority of accurate diagnosis and treatment for patients and summarized how to carry out the clinical practice of orthopedic surgery under the situation of the prevention and control of the COVID-19 and minimize the risk of infection exposure during the epidemic.

In relationship with orthopedic diseases during the epidemic, related prevention and control, clinical recommendations, diagnosis and treatment, clinical management, healthcare personnel protection and disinfection were applied soon in our hospital. Responses to national recommendations, local infection control guidelines and tailored to the availability of medical resources are imminently adopted to against the pandemic [13, 14]. The epidemic of COVID-19 poses new challenges to diagnosis and treatment of the patients with orthopedic diseases.

To date, multiple statements and guidelines have been issued by various professional organizations to recommend practices in clinical procedures. The Department of Oral and Maxillofacial Surgery of Peking University School and Hospital of Stomatology shared their experience [15]. Luo introduced details of Renji experience as for parts of general surgery [16]. Italian urologists recommended on pathways of perioperative care for urological patients undergoing urgent procedures, which may be inspired for urological societies [17]. Anesthesiologists are required to adopt tailor anesthetic practices to individual patients will ensure the best outcomes [18]. Former researchers provide the views of related diseases and they believed that strategies were suitable for physicians, which is good for both patients and the perioperative management team.

The healthcare personnel of department of orthopedics are vulnerable to the infection due to their extensive and close exposure to patients. In consideration of the rapid spread of epidemic, health care staff are at added risk of exposure and infection during the practice of treatment [19]. The treatment strategy should be changed timely and appropriate methods should be adopted to minimize the adverse effect of the epidemic in orthopedics diseases' treatment.

It is still a difficult task how to maximize the protection for health of medical staff, and the safety of wards and hospitals. In our study, no of medical staff was infected during the clinical practice. Preserving a highly skilled health care workforce is a top priority for any community and health care system. To avoid the aggravation of COVID-19 or collapse of the health system, emergency department was emphasized in our hospital and several recommendations were issued to help support healthcare workers against pandemic.

There are several limitations in our study. First, we conducted this retrospective cohort study by using a database in our department within two years, particularly with new generation constructs. Prospective studies are needed to validate these calculators and refine over time. Moreover, the database was small and did not include information on long-term follow-up outcomes. Last but not least, the provided flow charts, which may evolve over time, could be used as guidance for health care workers who are involved

in the care of patients. When available, we will provide new evidence in further releases of these guidelines and we believe that future studies are necessary to define more flow charts briefly and clearly.

Conclusion

By following strict safety guidelines and adopting flow charts strictly, the risk of exposure and infection of health care workers and patients could be greatly reduced. Our results indicate that patients and medical staff in our department were influenced little with the help of flow charts above during the pandemic of COVID-19. Meanwhile, the flow charts could be valid tools in routine clinical practice. What's more, the provided flow charts, which may evolve over time, could be used as guidance for orthopedic peers.

Abbreviations

BRT: blood routine examination; CCT:chest Computed Tomography; MDT:multidisciplinary diagnosis and treatment model; COVID-19:Coronavirus disease 2019; OR:operation room; ID card:Identification Card; TKA:total knee arthroplasty; ASA:American Society of Anesthesiologists; ARDS:respiratory distress syndrome; MODS:multi-organ dysfunction.

Declarations

Availability of data and materials

Please contact the author for data requests.

Ethics approval and consent to participate

Ethical review approval was obtained from the Human Subject Committee at Ethics Committee of Peking University Shenzhen Hospital (Ethics Committee of Peking University Shenzhen Hospital (research) [2020] 013th).

Consent for publication

Not applicable.

Conflict of interest statement

All of the authors of this paper have disclosed potential or pertinent conflicts of interest, which may include receipt of payment, either direct or indirect, institutional support, or association with an entity in the biomedical field which may be perceived to have potential conflict of interest with the submitted article. Each author certifies that his or her institution approved the human protocol for this investigation and that all investigations were conducted in conformity with ethical principles of research. This work

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Authors' contributions

Guoqing Li, Jian Weng prepared the manuscript. Yifei Yang collected and inputted the data. Chang Xu carried out the statistical analysis. Ao Xiong assisted with the revision of the manuscript. Deli Wang and Hui Zeng initiated and designed the study. All authors read and approved the final manuscript.

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Figures

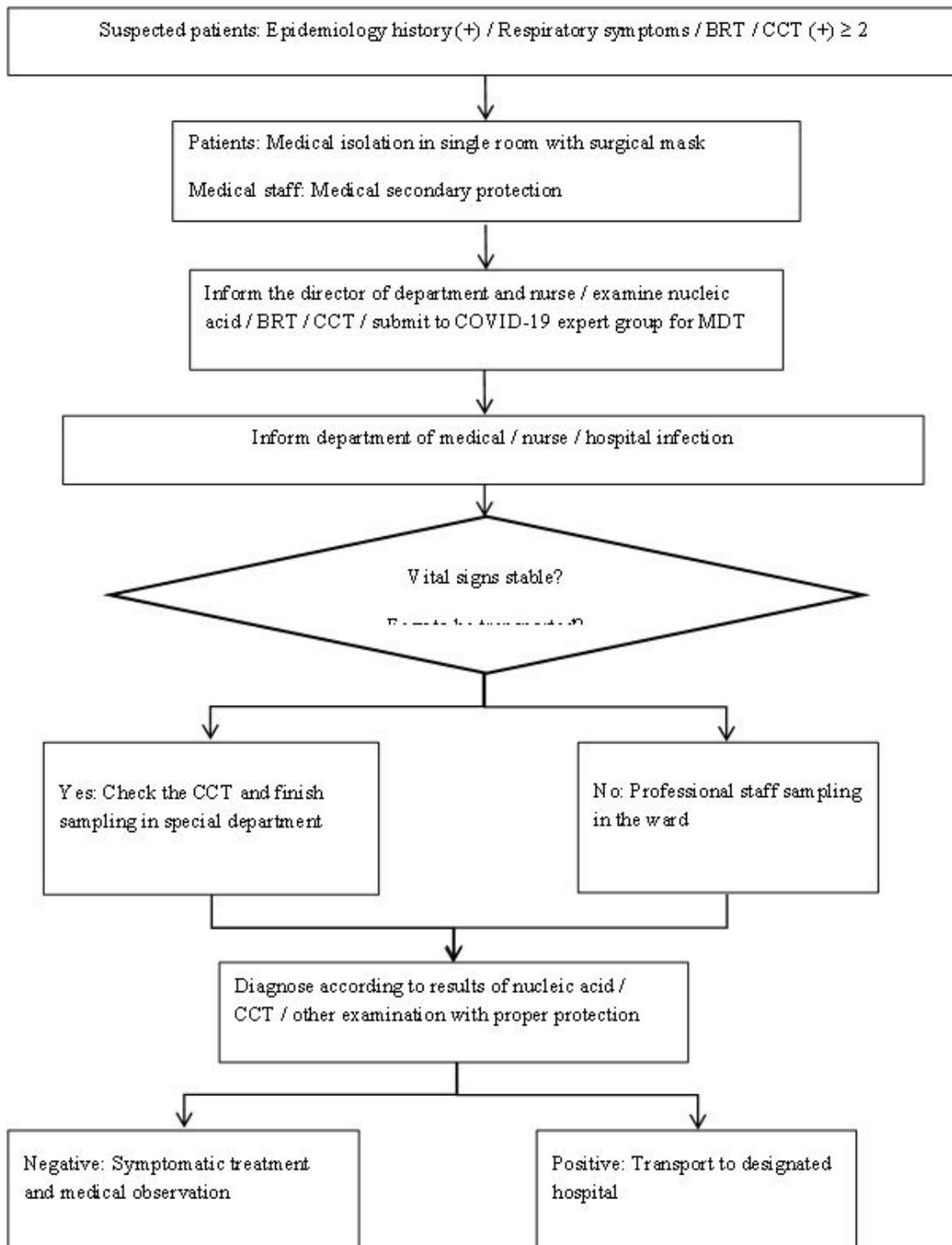


Fig.1 Suspected patient identification

Figure 1

Suspected patient identification

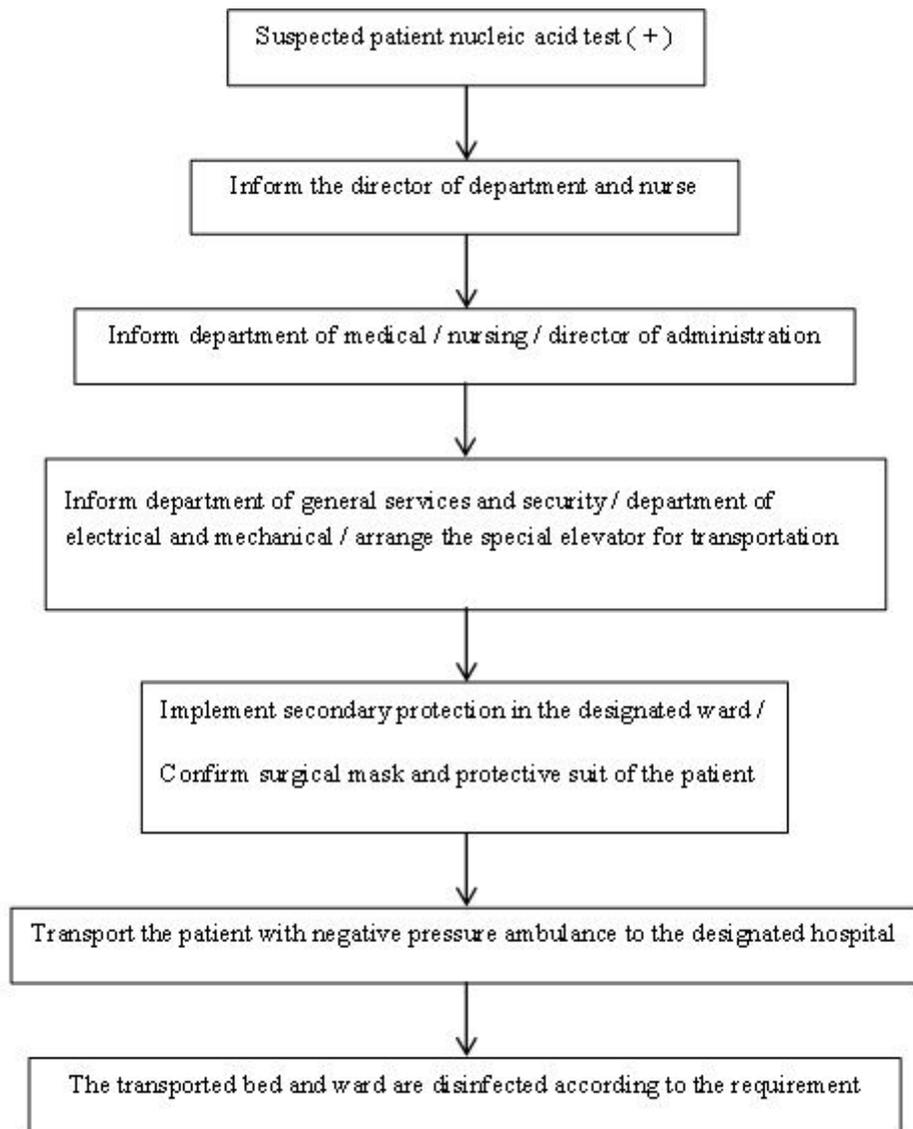


Fig. 2 Patient who were identified positive for nucleic acid test

Figure 2

Patient who were identified positive for nucleic acid test

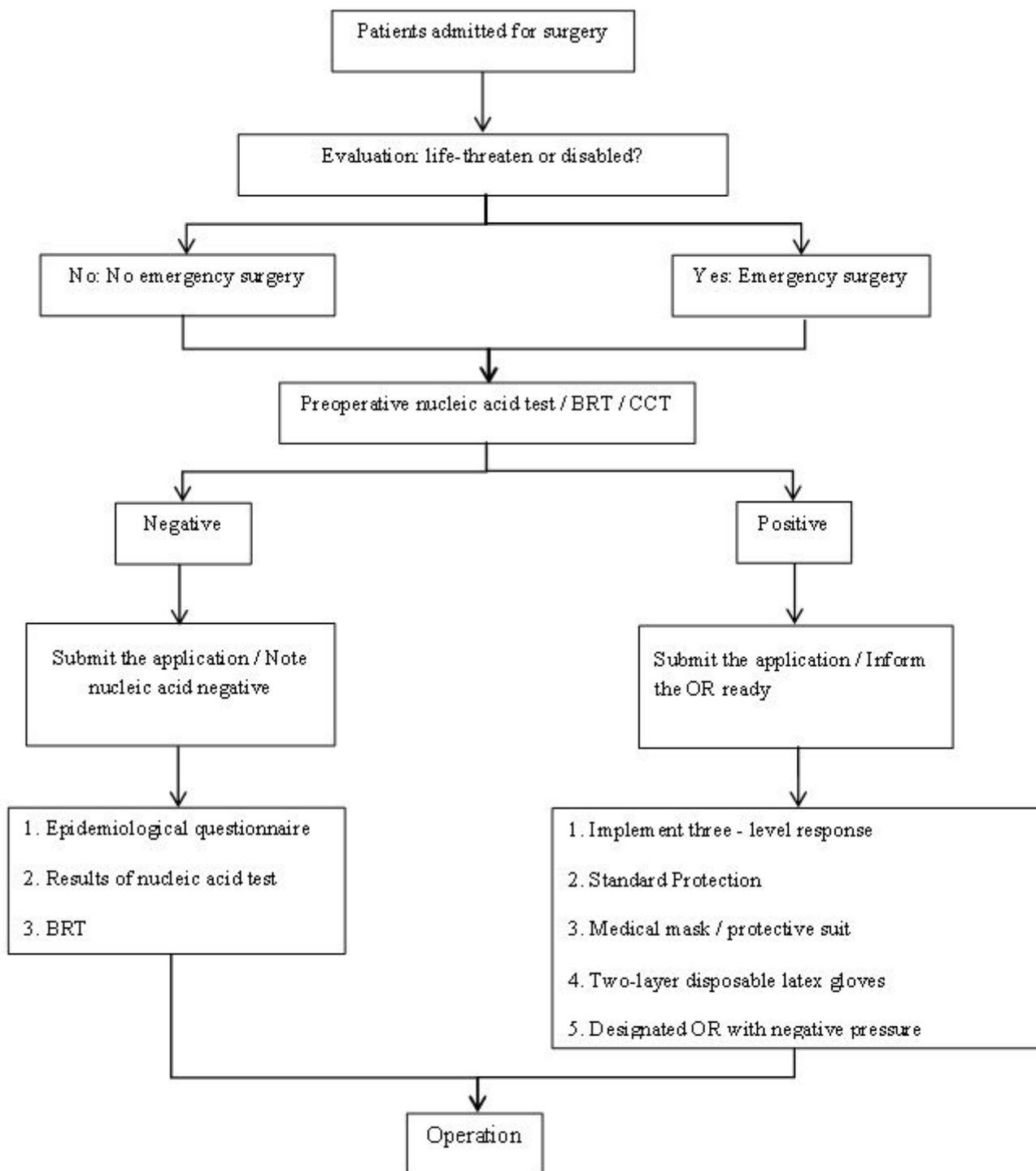


Fig. 3 Surgery management for inpatients

Figure 3

Surgery management for inpatients

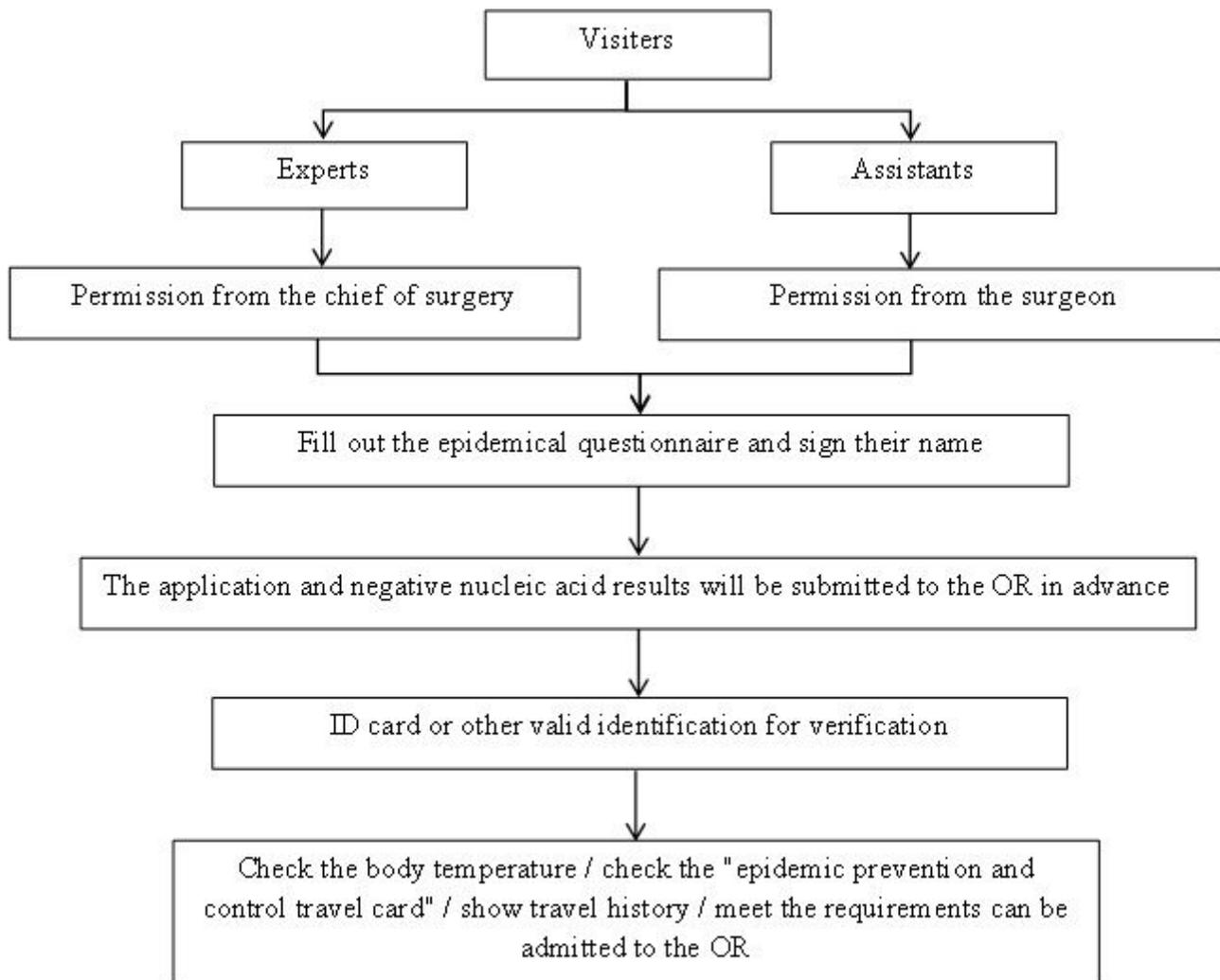


Fig. 4 Managements for visitors

Figure 4

Managements for visitors



Fig. 5 Transport robot(a) and intraoperative photo (b)

Figure 5

Transport robot (a) and intraoperative photo (b) selective surgery of total knee arthroplasty (TKA) (Fig. 5b).