



Improve the level of laboratory safety management through laboratory safety inspection system

Junge Li, Kai Zhu *

Changchun University of Chinese Medicine, Changchun, Jilin, 130117, China

*Corresponding author : zhukai@ccucm.edu.cn

Abstract. Niversity laboratory safety management has always been the primary and prominent problem that troubles university laboratory safety. Safety inspection is an important means to investigate the hidden danger of accidents and curb the occurrence of accidents. The laboratory safety inspection system, relying on the advantages of information technology, takes the inspection item list issued by the Ministry of Education as the inspection items and inspection points, and strengthens the information management and improves the inspection work efficiency according to the whole process safety management mode of safety inspection - discovery of hidden dangers - record hidden dangers - rectification within a specified period - review of safety hazards rectification - elimination of safety hazards. Improved the strength of hidden danger rectification, inspection records and hidden danger information can be statistically and analyzed, promoted the construction of laboratory safety risk control and hidden danger investigation and rectification mechanism, promoted the standardization and standardized management of laboratory safety, and improved the level of safety management.

Keywords: Laboratory safety; Safety inspection; Management system

1 Introduction

Colleges and universities are important positions for personnel training and scientific research. With the expansion of the scope of scientific research activities and the increase of types, scopes and frequencies of experimental activities, the problems of laboratory safety management have gradually become prominent. Laboratory safety in colleges and universities is complex and difficult, and it is the focus of the safety of education system. ^[1-3] One of the means to ensure the safety and effectiveness of the laboratory is to carry out laboratory safety inspection. Through the safety inspection, we can timely understand the status quo of the laboratory and find the problems existing in the laboratory. Through the rectification of the problems, we can achieve the purpose of eliminating security risks, so as to avoid the occurrence of laboratory safety accidents. Colleges and universities should build a laboratory safety inspection management system according to the actual situation, and take the revised "University Laboratory Safety inspection Project Table" as the inspection basis, use information

management means to improve the efficiency of laboratory safety inspection, effectively ensure that hidden dangers are implemented in place, and improve the modernization and scientific management level of laboratory safety.^[4-6]

2 Status quo of laboratory safety management

The difficulties of university laboratory safety inspection mainly include complexity, diversity, professionalism, timeliness and cooperation. In view of these difficulties, it is necessary to adopt a comprehensive and meticulous safety inspection method, strengthen safety knowledge and skills training, and ensure the smooth implementation of laboratory safety work.^[7-10]

2.1 Complexity

There are a large number of university laboratories with diverse types, and the scope and content of safety inspection are also very complex, which requires comprehensive and meticulous inspection of safety hazards and risks.

2.2 Diversity

The safety risks and hidden dangers of university laboratories are diverse, such as electrical safety, chemical safety, biological safety, physical safety and other different types of safety problems, which need to be checked and dealt with in a targeted manner.

2.3 Professional

Laboratory safety problems need professional personnel to evaluate and deal with, some laboratories may have high technical threshold, strong professionalism and other problems, need to have professional knowledge and skills to carry out inspection and treatment.

2.4 Timeliness

Laboratory safety issues are timeliness, and some safety hazards may have immediate hazards, which need to be dealt with quickly and in a timely manner to avoid accidents.

2.5 Degree of cooperation

Laboratory safety inspection requires the cooperation and cooperation of laboratories and employees. Some laboratories may conflict or not cooperate, which requires inspectors to adopt appropriate ways and methods to communicate and coordinate.

3 Check the basic information and main functions of the security system

3.1 System operating environment and characteristics

The operating environment of the system adopts cloud platform mode and does not require local deployment. The security check system is designed with two login ports, web terminal and wechat terminal, and data is synchronized in real time. On the web side, you can directly log in to the web page, and on the mobile side, you do not need to download any plug-in or app to the computer or mobile phone.

With the introduction of artificial intelligence into the cloud platform, the AI system can automatically identify potential risks through pictures and videos, significantly reduce the threshold of experts, and achieve national security supervision. In addition, through the AI training school's exclusive large language model, through natural language processing interaction to achieve professional knowledge Q&A, personalized data presentation, industry standard analysis, and automatic generation of security reports.

3.2 Security Check system modules

3.2.1 Basic Information Management Module.

In the basic information module, campus, college, building, laboratory name, security responsible person is taken as the basic information of the unit. Establish a three-linkage model of first-level management for schools, second-level management for colleges, and third-level management for laboratories, and implement safety responsibilities step by step according to this model. In addition, the system has built-in school-level manager, laboratory manager, department manager, laboratory manager, teacher, student and off-campus personnel. The system supports custom expansion of new roles. A single user can have multiple roles at the same time, the system can automatically merge their functional rights, and users can authorize others.

3.2.2 Hazard source management module

The laboratory hazard module divides all laboratories in the university into six categories according to the types of hazard sources: basic safety, chemical safety, biological safety, radiation safety, mechanical and electrical safety, special equipment and conventional cold and hot equipment, and analyzes and grades the actual situation and status of hazard sources. For example, the chemical laboratory will be classified into the chemical safety category; Laboratories that store flammable and explosive chemicals are defined as a Class I risk. Risk levels are dynamically adjusted according to laboratory conditions. In the laboratory hazard module, you can not only see the classification of hazard sources, but also see the rating of hazard sources, which provides clear guidance for the subsequent release of safety special inspection tasks, and also plays an important role in the daily safety management of the laboratory. For

example, laboratories that store flammable and explosive chemicals are classified as a Class 1 risk and need to be focused on. In daily management, safety administrators can focus on the receipt of drugs, storage methods, storage conditions, etc., according to the characteristics of such laboratories.

3.2.3 Personnel Rights management module

The security check system designs different roles based on check requirements and assigns different management rights to different roles. A super administrator has the highest rights to view all functions and information in the system, and assigns corresponding rights to security administrators at all levels to handle security check information in their respective jurisdictions. The school-level security administrator can release the safety inspection and review tasks of the superior department and the school level, and supervise the laboratory safety inspection information of the whole school. The college safety administrator releases the safety inspection and review tasks at the college level, and manages the laboratory safety inspection information of the college. The safety administrator of the laboratory publishes the safety inspection and review tasks of the laboratory, and manages the safety inspection information of the laboratory.

3.2.4 Check the security management module

The security check can be released by the PC end of the laboratory security check system or by the wechat end, and the data of the two ports are updated and synchronized in real time. According to the different levels of safety inspection management and inspection areas, the inspection items can be divided into four categories: higher department safety inspection, school-level safety inspection, college safety inspection and laboratory self-inspection. According to the different contents of safety inspection, it can be divided into comprehensive inspection, special inspection and safety inspection review three categories. Different check items are published by different roles. According to the different contents of the inspection, you can enter from the basic information management module and select a comprehensive inspection, or you can enter from the laboratory hazard management module and select a special safety inspection. Safety inspection items and key points according to the Ministry of Education issued by the university laboratory safety inspection items Table (2023). When the system is used for the first time, it will be screened by each laboratory safety manager against the check items in the checklist to clarify the applicable terms of the laboratory. The inapplicable terms will not appear in the safety check points of the laboratory after being reviewed by the College safety administrator. If the laboratory situation changes, the laboratory safety manager will make adjustments. In the process of on-site inspection, the inspectors will check the inspection items and inspection points after screening in the laboratory in the wechat terminal. The inspectors can record the safety hazards detected in the wechat terminal according to the actual situation. After the inspection is completed, the system will automatically generate the inspection report. When implementing the rectification, the safety administrator of each laboratory must correspond to the previous hidden danger items, upload the completion of the rectification,

rectification photos and other information to ensure that the safety hidden danger rectification is in place. When security administrators at all levels release security inspection review tasks, the system automatically matches and invokes the previously completed rectification ledger records, so that the hidden danger rectification is completed again.

3.2.5 Rectification Report Review Management module

After the completion of the rectification report, it will be transferred to the college security administrator for review and confirmation. If the rectification is not in place, the laboratory safety manager will make another rectification according to the audit opinions until the rectification is completed. After the rectification is complete, the system ends the check.

3.2.6 Checking the Data Statistics Management Module

In the data statistics module, not only the annual safety inspection report and rectification report can be summarized, but also the number and type of safety hazards found in the laboratory can be counted and analyzed, and the laboratory can be evaluated and managed according to the number of hidden dangers, the degree of danger of hidden dangers, and the completion of the implementation of rectification, etc. For the laboratory with serious problems, the laboratory can be evaluated and managed. If the laboratory fails to meet the standard after several corrections, it will be marked as unqualified laboratory. The school can stop the use of this kind of laboratory.

3.3 The whole process management of laboratory safety inspection system

In the safety check system or wechat mini program, according to the type of inspection, the inspection personnel choose to publish the inspection task in the basic information management module or the hazard management module. After the inspection items are initiated, the executioner shall conduct safety checks against the inspection items and inspection points in the inspection items management according to the inspection tasks in the wechat mini program. According to the actual situation of the inspection, the inspection pictures and records can be uploaded to the corresponding inspection items during the inspection. After the safety inspection, the system will automatically generate a detailed report of the laboratory safety inspection. Reports will be circulated to each laboratory security manager. The laboratory safety administrator must rectify the security risks in the report within a certain period of time, upload the rectification pictures and records, and generate the rectification report. The rectification report will be reviewed by the College security administrator. If the audit is not passed, the hidden danger rectification will continue until the hidden danger is eliminated and the inspection will end. The inspection report and rectification report will be automatically entered into the inspection data statistics module to provide data support for future safety management.

4 Check the effectiveness of the safety system

4.1 Prevention of accidents

The laboratory safety inspection system can effectively discover and eliminate safety hazards to avoid casualties and property losses caused by laboratory safety accidents. Through the laboratory safety inspection system, the safety facilities, safety systems and safety management of the laboratory can be inspected and maintained to reduce the safety risks of the laboratory, so as to prevent accidents.

4.2 Improve safety awareness

The laboratory safety inspection system can make teachers, students and staff pay more attention to laboratory safety and improve their safety awareness. Through the inspection and punishment of the laboratory safety inspection system, students and employees can realize the importance of laboratory safety, so as to pay more attention to laboratory safety and improve the level of laboratory safety management.

4.3 Improve safety management

The laboratory safety inspection system can evaluate and improve the laboratory safety management, and promote the improvement of laboratory safety management. Through the laboratory safety inspection system, the problems existing in the laboratory safety management can be found, and the corresponding improvement measures can be provided, so as to improve the overall level of laboratory safety management.

4.4 Ensure laboratory safety

The laboratory safety inspection system can ensure that the safety management of the laboratory is effectively implemented and ensure the safety of the laboratory. Through the inspection and maintenance of the laboratory safety inspection system, it can be ensured that the safety facilities and equipment of the laboratory are in good condition to ensure the safety and normal operation of the laboratory.

5 Conclusion

College laboratory safety is an important part of college campus safety and the focus of work, college laboratory safety supervision gradually strengthened, relying on the laboratory safety inspection information system, to investigate and rectify security risks as the starting point, to prevent and contain all kinds of safety accidents as the goal, to carry out the "whole process, all elements, full coverage" of laboratory safety risks. Grasp the initiative to prevent laboratory safety risks, promote the implementation of laboratory safety responsibilities, improve the university laboratory classification and hazard control classification management system, improve laboratory safety man-

agement capabilities, effectively avoid the occurrence of laboratory safety accidents, and create a safe and harmonious teaching and scientific research environment.

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