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Letter to Editor

Creating a safe, efficient, and fast packaging solution for novel coronavirus 2019 sampling

Dear editor,

Given the nature of COVID-19 samples, China has introduced a wholly integrated process of collection, transfer, testing, and reporting in this context. Local and territory-wide nucleic acid screening for COVID-19 is being conducted for all residents to block the chain of transmission, while rapidly improving nucleic acid testing capabilities in pandemic areas are key to controlling the virus.1 Due to the potentially infectious nature of the samples (e.g., the blood of patients with COVID-19), existing stored samples should be protected using sealing devices, which currently require manual disinfection and packaging.

Generally, the samples collection and testing sites are in different locations and, as such, the collected samples will require transportation, it is prone to pollution in the process. Therefore, manual methods should be implemented in this regard. However, during the process of collection, packaging, and transportation, manual operations may result in the misplacement and omission of samples, increasing the risk of infection among medical staff as shown in Fig. 1A. In this study, the investigation results of an efficient and fast packaging solution are reported as follows.

An information system for processing samples taken from patients with a confirmed or suspected diagnosis of COVID-19 was designed and developed.4,5 This method provided a sample packaging machine and packaging solution that comprised five parts, i.e., transportation, identification, disinfection, sealing, and control devices (see Fig. 1B–E) with the following functions.

1) The system could be connected with the hospital information system to obtain outpatient and inpatient data and sample information, match the sample barcode, and determine the processing method.

Fig. 1A. The traditional nucleic acid sampling mode. This method comprises issuing medical orders, patient preparation, and sample collection, transportation, processing, analysis and testing, as well as result analysis, clinical diagnosis, and treatment.

Fig. 1B. Key technical description. The computer control system, code-scanning template, sampling tube transportation module, sampling tube grabbing manipulator module, wrap-around alcohol sandblasting module, specimen bag storage box, sample bag opening and closing manipulator module, sample surface labeling and recycling transportation modules, and the network contribution function.

https://doi.org/10.1016/j.asjsur.2022.11.015
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Fig. 1C. Key technical description. The transportation devices: transporting sample; Identification devices: Identify the identification information of the sample and determine the processing method; Disinfection devices: Disinfecting the sample automatically; Sealing devices: Sorting and packing the sample; Control devices: It is electrically connected with the transportation, disinfection, sealing and identification device. According to the identification information, the target processing method is determined, then the sample is transmitted to the disinfection and sealing device, and the sample is disinfected and sealed in accordance with the target processing method.

Fig. 1D. A structural diagram of the sample packaging machine: disinfection, transportation, identification, sealing, and control devices.

Fig. 1E. A process diagram of the sample packaging solution. At the start, the corresponding case information was obtained according to the identification information verified by the identification devices. The target processing method was determined according to the case information. The transportation devices were controlled to transport the samples to the disinfection and sealing devices, which, in turn, were organized to conduct the disinfection and sealed packaging of the samples according to the target treatment method.
2) In the present system, pre-sampling checking could, however, be conducted using presets, on-site face recognition, and information data linking.

3) Concerning disinfection and sealing devices, the present system can preset the type of sample in advance, identify the processing method and testing area according to the barcode, and automatically disinfect, sort, and pack the sample to reduce the workload of clinical medical staff, thereby decreasing the risk of infection and improving the processing accuracy of samples.

4) Regarding the control and transportation device for the present study, this will be electrically connected to the disinfection, sealing, and identification devices. Based on the identified information, the target processing method will be determined, the sample will be transported to the disinfection and sealing devices, and the sample will be disinfected and sealed according to the target processing method.

The creation of the present automatic information-based sample packaging mode reflected innovation, feasibility, practicability, and timeliness. This packaging mode was the first new specimen packaging solution proposed according to the disease specificity and sample management characteristics of patients with COVID-19 as a means for addressing issues related to sample loss, leakage, and infection that could be caused by manual checking, sorting, and packaging using current technology. The present packaging mode can help to minimize the risk of staff being exposed to biological samples, reduce the risk of staff infection, and improve the overall level of personnel safety.

Funding

Shenzhen Key Medical Discipline Construction Fund; Shenzhen Fund for Guangdong Provincial High-level Clinical Key Specialties (No: SZGSP011).

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.asjsur.2022.11.015.

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21 October 2022
Available online 9 November 2022