

# Advancing Blood Transfusion Safety through Closed-Loop Management and Intelligent Transfusion Processes - Experience Sharing from a Medical Center in Northern Taiwan

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## INTRODUCTION

**Blood transfusion therapy is a critical medical intervention that relies heavily on manual identification due to its complex steps and the involvement of numerous personnel. Any error in this process can have severe consequences, potentially leading to patient mortality, making it inherently high-risk. Both JCAHO and SHOT recognize blood transfusion errors as sentinel events. In the annual medical quality and patient safety goals for 2022~2023 in Taiwan, there is a requirement for the implementation of safety inspections for surgical transfusions and blood preparation.**

**AIM**

We are integrating the Hospital Information System and blood bank management with the Laboratory Information System, Nursing Information System, and other systems. The blood transfusion process is being improved through the incorporation of automated equipment, computer information interfaces, and mobile app programs. Concurrently, a closed-loop management system for the blood transfusion process is being implemented to enhance safety and optimize the process.

## METHOD

**1. Through API integration connects HIS, LIS, NIS, SMS systems, allowing cross-checking and mutual transmission of information between medical orders, test results, blood product data, and nursing records. It is hoped that it can provide comprehensive and accurate information, including : equipped with error prevention mechanisms for medical orders, and actively alert for blood transfused quantity control, blood type matching and logical checks.**

**2. The entire blood transfusion process is barcode enabled, executed through mobile phones or tablets for specimen collection/transmission, blood product and transfusion verification, and reporting vital signs. This not only allows real-time monitoring of blood products, specimen transport, and the transfusion process but also includes proactive reminders for delayed transfusions and reduced artificial transfusion errors.**

**3. Computerized processes for transfusion informed consent signing and auditing the appropriateness of blood product use have been implemented.**

## ACKNOWLEDGEMENT

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## RESULTS



**Fig1. Blood transfusion procedure-Closed-Loop Management process:**The barcode system is utilized in conjunction with mobile phones, iPads, and other information technologies to facilitate specimen collection, inspection, blood storage, transportation. These measures aim to minimize manual verification and recording in the blood transfusion process while enhancing computer-initiated warnings and error-proofing features.

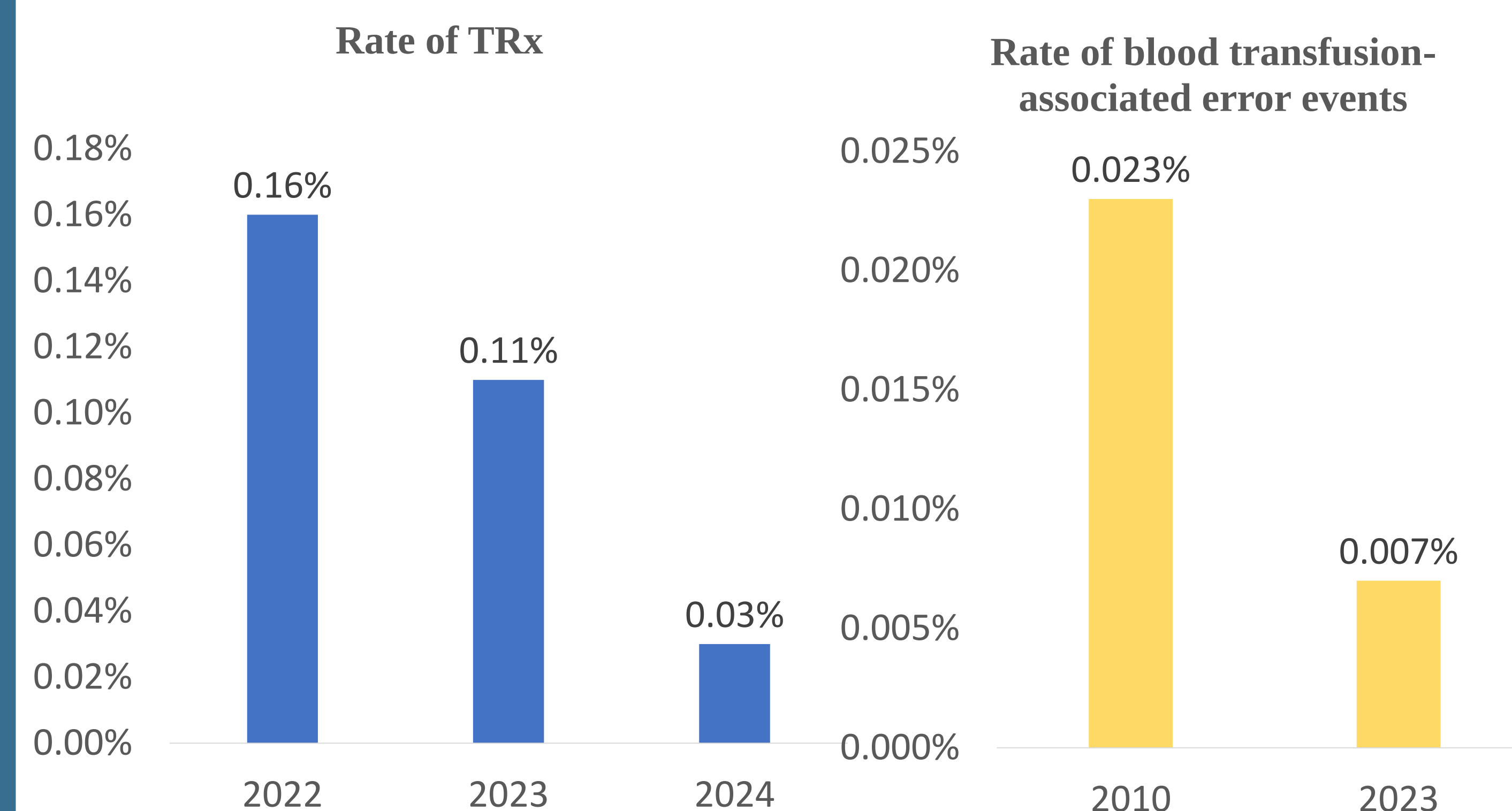
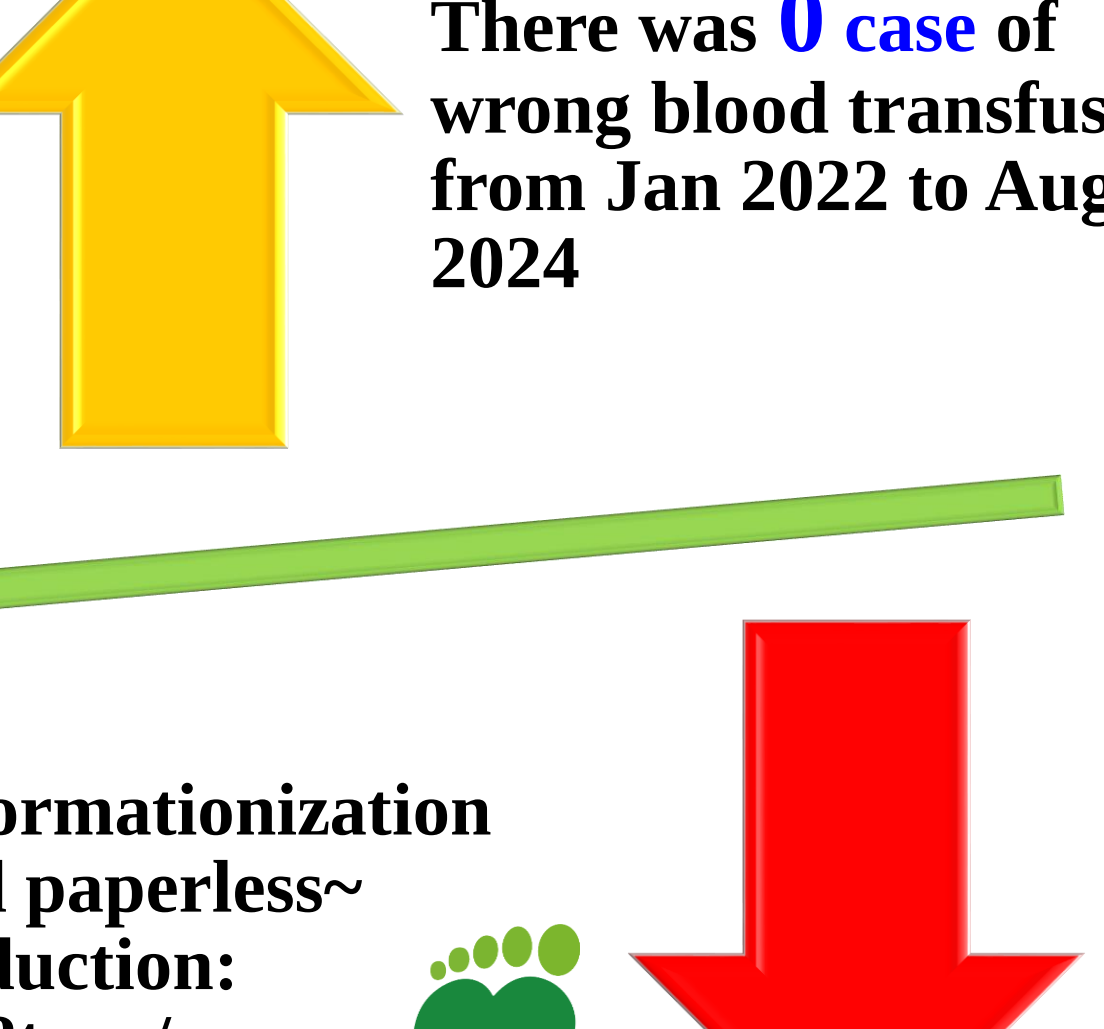


**Fig2.2022-2024 The rate of blood transfusion-associated adverse reactions.**

**Fig3.2011 and 2023 The rate of blood transfusion-associated error events.**



There was **0** case of wrong blood transfusion from Jan 2022 to Aug 2024

Informationization and paperless~  
Reduction:  
2.28tons/year

CO<sub>2</sub>

**Fig4.Benefit of the effectiveness of closed-loop blood transfusion management.**

**After the introduction of computerization, the incomplete rate of medical orders from January 2022 to August 2024 dropped to 0%, and the inconsistency between test orders and specimens during the same period also decreased to 0%. Meanwhile, the reporting rate of the blood transfusion monitoring system exceeded 99%.**

## CONCLUSIONS

Through computerized specimen collection, testing, blood storage, and transportation, as well as an intelligent closed-loop blood transfusion management system, not only can the blood transfusion process be monitored in real-time, but manual verification and recording can also be significantly reduced. Additionally, active warning and error-proofing functions have been integrated into the computer system. This not only directly minimizes human errors but enhances blood transfusion safety. Moreover, it contributes to the reduction of paper and ink cartridge usage, aligning with the goals of energy conservation, carbon reduction, and the pursuit of a sustainable world.

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## CONTACT INFORMATION

