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Use of remote blood releasing system for red cell transfusion in hospice care center

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Abstract

Objectives: It is quite common to have advanced cancer or end-stage renal disease patients for regular or even frequent blood transfusion in palliative care. However, due to geographical reason in some hospice centers, blood transfusion is sometimes difficult if blood bank is closed during non-office hour or not available.

Methods: Here, we reported a new blood releasing system, that is, remote blood releasing system, that could be used safely by nursing staff alone when the blood bank was closed during the night time and holiday.

Results: On-call nursing staff could collect red cells successful in these two cases.

Conclusion: The new blood releasing system seems useful. However, larger sample sizes and longer period of study are required to estimate its efficacy and safety. The provision of antibody-positive red cells and platelet remained a limitation of this system.

Keywords

Remote blood releasing system, blood releasing system, blood transfusion, palliative care

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Introduction

The introduction of electronic cross-match, for instance, has become a well-established technique in blood banks and hematology laboratories.[1] More recently, electronic cross-matching has been extended with the addition of networked blood storage and labeling equipment to provide electronic remote blood issue (ERBI), including electronic cross-matching, remote blood storage, blood unit labelling, and electronic verification and tracking of units.[2] Implemented typically within operating suites, ERBI is intended to facilitate access to blood units closer to the point of transfusion while providing safety and efficiency gains.[3] However, the adoption, implementation, use, and outcomes associated with ERBI are not fully understood,[4] and there is no such system existing for providing red cell collection in hospice care center so far.

It is not uncommon to have advanced cancer or end-stage renal disease (ESRD) patients for regular or even frequent blood transfusion in palliative care (PC). However, due to geographical reason in some hospice centers, blood transfusion is sometimes difficult if blood bank is closed during non-office hour or not available. Here, we reported two cases in which a new blood releasing system (remote blood releasing system (RBRS)) that could not release antibody-positive red cells could be used by our nursing staff alone when the blood bank was closed during the night time and holiday.

Case

A 76-year-old woman, with history of ESRD was referred to our PC unit for symptom control and psycho-social care.[5] Her past medical history included hypertension, diabetes mellitus, and hyperlipidemia on medications. She was cared by a maid at home; however, her children were busy and seldom visited her during weekdays. She had repeated admission for anemic and uremic symptoms. Her blood transfusion requirement was 2–3 U of pack cells per 2 months. She failed with erythropoiesis stimulating agent (ESA) due to uncontrolled hypertension. In July 2014, she was admitted to our unit because of dizziness again. This time, her hemoglobin level was dropped to only 3.4 g/dL. Thus, urgent blood transfusion was required, and RBRS was utilized by the on-call nursing officer who successfully collected the red cells. The whole procedure only took about 5 min. The patient's condition improved after blood transfusion with most of her symptoms reduced.

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However, she was deteriorated gradually because of declining of renal function and finally passed away peacefully.

Another elderly gentleman, aged 87 years, with history of ESRD and multiple myeloma, had previously admitted to our unit for pain control and fluid overload. He was opted for conservative treatment of ESRD and myeloma because of his age and co-morbidities. He had anemia but failed to respond to ESA injection. He finally decided for blood transfusion only. Once, he was admitted to our unit because of anemic symptoms and was found to pass tarry stool for few days at home. Since he refused for further investigations including endoscopy and biopsy, he was planned for supportive treatment including rehydration, blood/blood products transfusion, and proton-pump inhibitor injection. After baseline investigation, his hemoglobin level was only 5.1 g/dL. In view of significant hemoglobin drop and gastrointestinal bleeding, urgent cross match and blood transfusion were then arranged. Our on-duty nursing officer was informed about the management plan and then decided to use the RBRS when our blood bank was closed during that holiday. Again, he could easily handle the operation of RBRS and collect the red cells successfully. After transfusion, the patient became well and then discharged uneventful after the holiday. There was no adverse report or incident as noted from these two cases.

Figure 1. Set-up and security of remote blood release system (RBRS).

Discussion

Our RBRS started to work since January 2014 with adoption of the concept of operation theater blood transaction system which is similar to ERBI.[6] RBRS is an extension of the computer cross-match and allows the safe release of blood by trained non-blood bank staff at hospitals after non-office hour of blood bank. The RBRS relies on software and hardware integrity, staff training procedures, and the traceability of transactions for its operation. It comprises four modules including blood issue, blood return, blood stock enquiry, and reprint function. Hardware requirement included desktop computer, laser printer, and bar-code scanner.

The computer contains logic to prevent assignment and release of ABO-incompatible blood. The methods for a computerized cross-match follow the standard operating procedures recommended by the American Association of Blood Banks.[7] At the hospice ward, the patient's personal data are entered into the computer and stored in the central record database. The patient's identity number on the specimen label and blood group are entered into the blood bank computer using a bar-code reader. Upon entry of the patient's identification bar code, the full name, age, sex, date of birth, ward, and hospital admission number are retrieved from the central record database and appear on the blood bank computer screen. These are checked against the patient's personal data on the blood specimens and request.

As a requirement for using RBRS, there should be no clinically significant antibodies detected in the recipient's serum/plasma, and there is no record of previous detection of such antibodies. Regarding the cross-match process, there are concordant results of at least two determinations of the recipient's ABO type on record, one of which is from a current sample. Each patient's ABO grouping is done independently by two technicians. The results are entered into the computer separately and counter-checked against each other. Critical elements including blood issue, blood return, blood stock enquiry, and reprint function of the system have been validated on-site, and there are mechanisms to verify the correct entry of data prior to release of blood.[8]

The blood bank stocks group O, A, and B units in the refrigerators of RBRS. The number of units stocked is estimated before the establishment of RBRS. Usually, 2–3 U each of groups O, A, and B will be sufficient. The blood bank staff retypes the ABO blood group of these units and checks it against the ABO type stated by Hong Kong Red Cross Blood Transfusion Services. Older units are placed near the front of the refrigerator to facilitate their selection by the nurses. The night nurse inspects the blood with the same protocol as daytime. The stocks are inspected every day and renewed earlier if the stock level drops below 2 U for any blood group. Untransfused units that are near their expiration dates at the end of the week are used for transfusion at daytime since there were more red cell blood transfusion for hospice patients in the working hours of blood bank.

The security system of our blood bank was strengthened. It is locked after work hours, and there is an alarm system linking the refrigerators with the blood bank. We installed new blood fringes, closed-circuit television, and digital lock (Figure 1) in our blood bank during our implementation which occurred in stages, and each step was validated

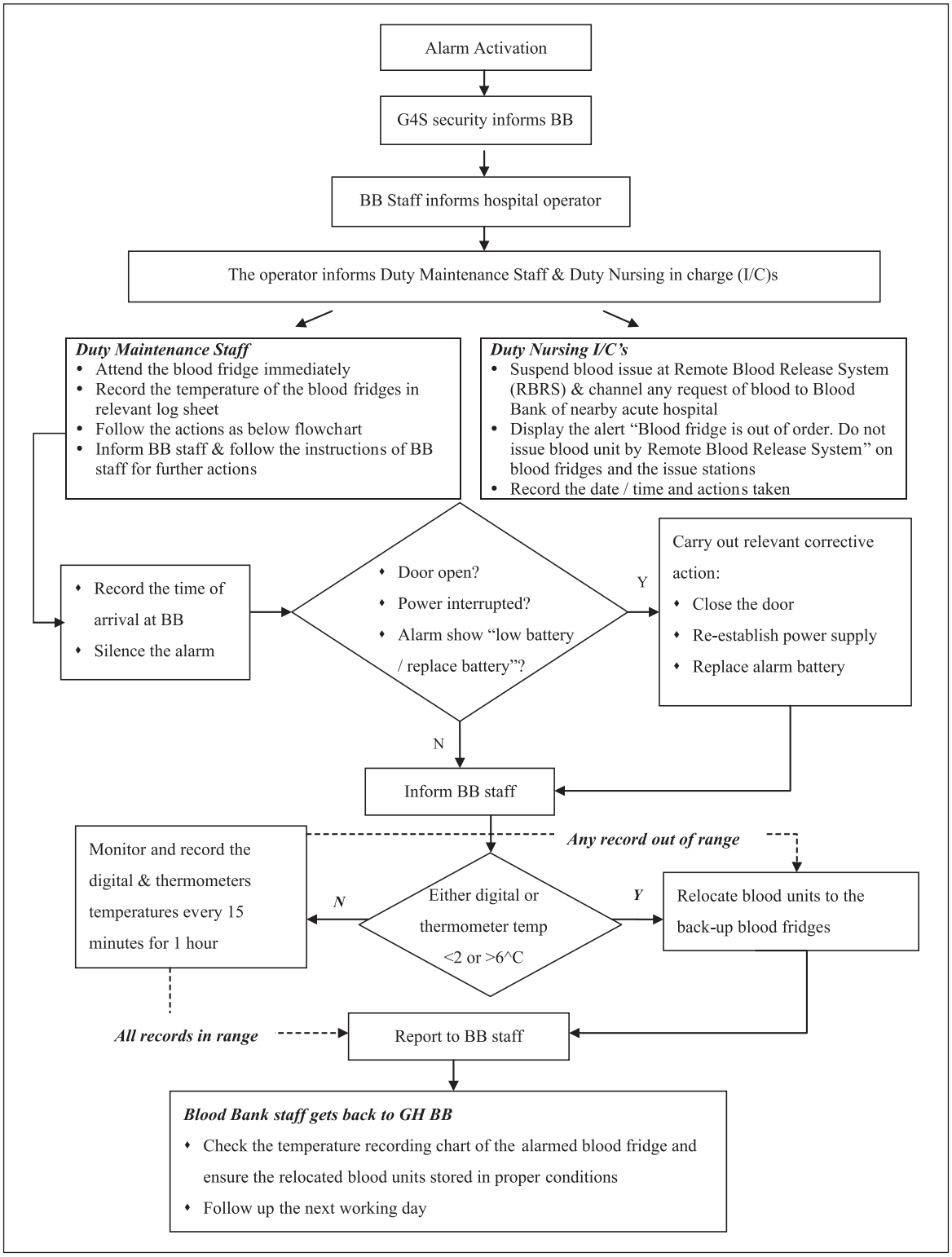

Figure 2. Contingency plan—handling of blood fridge alarm activation during blood bank (BB) off-hours.

according to an established protocol. The RBRS was designed and validated using the laboratory information system connected to blood bank of local acute hospital. All records were monitored by a project officer, and implementation was closely controlled by a committee that included technical and medical staff members of our hospital.

There were six important ways for implementation of this new service system. First, the remote blood release

system shall be at a site that is accessible to clinical staff. We have chosen our blood bank because it was near both our PC and non-PC wards. Second, the security setup of the site shall be enhanced since operation of the RBRS may require access to blood storage facilities during blood bank off-hours. Third, the blood storage facilities shall be monitored under the same policy as satellite blood bank for blood storage in same cluster hospitals, fulfilling the same requirements on alarm connection. Thus, all blood fridges at our blood bank are maintained and monitored under the standard policies and monitored 24 h through connection with external monitoring agent. Fourth, the new system shall streamline with current blood bank workflow in our hospital. Furthermore, contingency plan (Figure 2) shall be in place when the RBRS does not function or when blood fridge alarm goes off during off-hours. Finally, but not at least, staff shall be well-trained and competent to carry out the relevant procedures. Therefore, regular refreshment for training for users (i.e. designated nursing staff and all blood bank technical staff) on operation of RBRS and the contingency plan should be reviewed.[3]

In conclusion, these two cases illustrated that our nursing staff could safely collect antibody-negative red cells for blood transfusion during non-office hour of our blood bank by RBRS. However, larger sample sizes and longer period of study are required to estimate its efficacy and safety. The provision of antibody-positive red cells and platelet remained a limitation of this system.

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