CASE STUDY

Using quality improvement to address asepsis during intravenous procedures among neonates at Swami Dayanand Hospital, Delhi

Summary

In May 2016, the USAID ASSIST Project began collaborating with the neonatal intensive care unit (NICU) at Swami Dayanand Hospital to increase the capacity of their staff to improve the quality of care in that department. The Swami Dayanand NICU serves around 120 infants per month, and many of these babies require intravenous (IV) procedures as part of their medical treatment. However, at the start of the improvement intervention, there were no standard protocols in place for any of the IV procedures being performed in the NICU and, therefore, the risk of infection was quite high. The quality improvement team, as their initial aim, decided to improve the use of aseptic technique while performing IV procedures in the NICU from 0% to 30% within four weeks. When the team met this aim, they continued and expanded their efforts. By using QI approaches, SDH achieved asepsis in 80% of phlebotomy and cannulation procedures carried out in the NICU within three months and initiated improvement work on central venous lines.

Background

Swami Dayanand Hospital (SDH) is a tertiary level care hospital that serves a population of 300,000 and performs 7,000 deliveries every year. The 15-bed neonatal intensive care unit (NICU) has a bed occupancy rate of 50% and is staffed by five pediatricians, six general doctors, 12 nurses, and two paramedical staff who provide around-the-clock services for the 120 newborn infants admitted on average per month. SDH had previously used quality improvement (QI) approaches to improve hand hygiene in other departments. The positive results of this work, as well as the positive results that other local hospitals had demonstrated through their QI efforts, motivated SDH NICU to try quality improvement methods to improve care of neonates in the NICU.

Intervention

In early May 2016, a senior consultant in the NICU requested that staff from the USAID Applying Science to Strengthen and Improve Systems (ASSIST) Project help train the NICU staff on using an improvement approach to address gaps in care. After this on-site training, the staff formed a QI team that consisted of two senior consultants – one of whom held the role of team leader – two senior residents, two junior residents, two staff nurses, and two technicians. The team decided, as their first aim, to improve the use of aseptic technique while performing intravenous (IV) procedures in the NICU from 0% to 30% within four weeks.

JUNE 2017

This case study was authored by Nigel Livesley, Ankur Sooden, and Parika Pahwa of University Research Co., LLC (URC) and Surender Bist of Swami Dayanand Hospital for the United States Agency for International Development (USAID) Applying Science to Strengthen and Improve Systems (ASSIST) Project, made possible by the generous support of the American people through USAID’s Bureau for Global Health, Office of Health Systems. The authors would like to recognize Dr. ML Jaipal, Medical Superintendent, and the entire team of the Neonate Intensive Care Unit (NICU) of Swami Dayanand Hospital for their support of the improvement work described in this case. The USAID ASSIST Project is managed by URC under the terms of Cooperative Agreement Number AID-OAA-A-12-00101. URC’s global partners for USAID ASSIST include: EnCompss LLC; FHI 360; Harvard T. H. Chan School of Public Health; HEALTHQUAL International; Initiatives Inc.; Institute for Healthcare Improvement; Johns Hopkins Center for Communication Programs; and WI-HER, LLC. For more information on the work of the USAID ASSIST Project, please visit www.usaidassist.org or write assist-info@urc-chs.com.
The team identified three common IV procedures being performed in the NICU:

- **phlebotomy**, which is a simple, quick blood draw;
- **cannulation**, a technique used for venous access for blood sampling and administration of fluids, medication, nutrition or any other blood products (not recommended for longer than two days); and,
- **central lines**, a procedure done in very sick babies who need an infusion of fluids, medicine, etc. for a longer period of time, usually several weeks or more. (This is a more complicated IV procedure, and chances of infection are very high.)

The team realized that there were no standard protocols in place for any of the IV procedures being performed in the NICU, and they worried that the risk of asepsis was, therefore, quite high.

Of the three IV procedures identified, phlebotomy was done in the largest numbers and seemed the easiest to fix. As a first step, the team decided to review the available literature to develop an appropriate asepsis protocol for phlebotomy. The team also agreed to record the number of blood samples taken during the following day shift to get a more accurate idea of how many of these procedures occurred in the NICU per day. The team also prepared a checklist to allow them to measure which steps of the protocol were carried out in each blood sampling procedure.

The team tested the draft protocol by trying it out in all blood samples taken in the next morning shift. Team members also thought to pre-arrange the sampling tray so that all the necessary items required to perform aseptic procedures were easily available. Discussion regarding the items to be kept in the tray happened via WhatsApp, and one of the team members volunteered to get it ready for the next morning shift.

Within a week of starting the QI intervention, the team had collected four days’ worth of data and found that, on average, eight blood samples were being taken each day. They had also finalized the asepsis protocol and developed an accompanying checklist that measured: 1) the availability of equipment and supplies in the phlebotomy (blood sampling) tray and 2) provider adherence to the key process steps. A team member prepared a drop box in which to collect the completed checklists.

They planned to test the new protocol among all the babies requiring phlebotomy during the day shift for the next three days to learn:

- How easy or difficult is it to complete the checklist?
- What is the current performance level on each different step of the asepsis protocol?
- Are the current items in the tray sufficient to do the new procedure?
- Are there any negative, unintended effects of the new process for drawing blood samples?

A plan-do-study-act (PDSA) cycle is a process by which quality improvement teams can organize and try out a given change and then reflect on the usefulness of that change prior to implementing it on a larger scale. Together, the team reviewed the results of the changes they had tested through conducting PDSA cycles and observed that out of the 10 blood samples taken over the previous three days, the checklist was filled in eight cases, and the aseptic process adhered to in seven of the eight (87%) documented cases. These results were shared and discussed via WhatsApp, and the team leader and coach both expressed appreciation for the efforts taken. The coach asked about the lessons learnt from the PDSA cycles and next steps to be taken.

Over the course of several weeks, the team tried out various changes through 16 PDSA cycles that addressed steps in the blood sampling process, data collection, supplies, and communication among team members. Figure 1 lists the changes tested and relates them to generic change concepts that have proven effective as strategies for improvement of any process.
Despite repeated requests for information from the coach and team leader, no one replied about what they learned from the tests, so the coach planned a visit to the hospital. In the meeting, all the team members were very satisfied with the results and performance obtained and decided to continue to apply the new aseptic protocol (shown in Figure 2) and fill the checklist (shown in Figure 3) for all the samples taken. The team also thought of expanding their work from simple phlebotomy to cannulation and decided to test changes to the cannulation procedure over the next few days. The team leader requested first to get data on the number of cannulations performed daily.
The next week, the QI coach visited the hospital and helped the team to review their data from the previous week. One team member shared the previous day’s data showing that phlebotomy was carried out in seven babies and cannulation in two babies. However, they observed that there were some checklists in which “no” was marked for all the steps of process. Some of the team members revealed that this could not be possible as the supplies were available at all times last week, so staff should have been able to do the procedure. At that time, the team realized that some staff were simply marking all “no” on the checklist without regard and this likely indicated some resistance among staff to the new process. The team could not figure out for certain why there was resistance to the new process, but they thought that perhaps there were some unnecessary steps in the process and that people were unhappy with these extra steps. The team decided to try to make the process easier for people to do.

**Figure 2: Asepsis protocol for phlebotomy (blood sampling)**

At the meeting, the coach asked the QI team members to suggest which steps of the aseptic process they thought NICU staff found difficult to do, but the team was not able to guess. As an analysis exercise, the coach suggested that they test all the steps on a dummy patient. One of the team members volunteered to do that and realized that removing the unsterile lid of the jar to pick cotton was difficult to do. The team then discussed possible solutions for this and decided to test three different ideas on the dummy patient to identify the easiest method for picking cotton from jar. The three ideas were:

1) Sanitizing hands before opening the cotton bowl instead of washing hands
2) Using forceps to pick cotton from jar
3) Shaking the container to drop the cotton buds

After testing all three ideas on the dummy patient, the team felt that the most convenient solution was to sanitize the hands before opening the cotton bowl. Using forceps required yet another procedure to maintain the sterility of the forceps, and shaking the container caused the lid of the jar to fall onto the tray, making it cumbersome to arrange and identify the items in the tray. They decided to test this option the following day on one baby.
The team member who tested this revealed that sanitizing one’s hands before opening the cotton bowl is possible to do and it did not greatly increase the difficulty of taking a blood sample. The team decided to continue to test this new change over next three days. They also continued to have staff fill the checklist during blood sampling and cannulation procedures. They wanted to study whether the new process would be feasible to do by everyone in all different kinds of situations. This message was communicated to all the team members via WhatsApp.

The following week, the team leader met with team members to discuss recently tested changes and to review the data. The data showed that checklists were being filled for only 25% of IV procedures, but of the filled checklists, adherence to the new aseptic process was 92%. Team members suggested some reasons why the checklists were not being completed, such as preoccupied staff, forgetfulness, staff on leave, and instances where practitioners had filled the checklist, but not submitted it in the drop box. The team also observed that during last week, tray supplies were inadequate. After the discussion, the team decided that the following actions should be taken:

- Plan to have the duty nurse refill the trays at the start of every shift
- Separate the trays for cannulation and blood sampling and identify a specific space for keeping those trays
- Record the number of cannulas used and check patient notes to ascertain the number of procedures and compare it with number of forms filled
- Set a target to achieve asepsis in at least 50% of cannulation procedures
In early July, the QI team met in person to review the data and discuss their performance (see Figure 4). They observed that checklists were completed in almost all procedures and asepsis steps were adhered to in almost all cases. Given the improvement they observed from the data, the team decided to share lessons learnt with other doctors and nurses, celebrate their success, and expand the intervention to the last IV procedure: central venous lines.

**Figure 4: Percentage of IV procedures performed with aseptic technique**

![Figure 4: Percentage of IV procedures performed with aseptic technique](image)

In addition, the team leader wanted to ensure that they were able to sustain their performance after the end of the improvement intervention, and so he posed this challenge to the rest of the QI team. The team decided on the following actions, via WhatsApp, to sustain the improvement process:

- The QI team will post the asepsis protocol on several notice boards in different locations;
- Separate orientations will be planned to demonstrate the protocol to newcomers;
- The nursing staff was designated to ensure supplies in trays. A substitution plan was also developed for days when the designated nurse would be on leave or off duty.

**Conclusion**

Hospital-acquired infections are a major risk in the newborn intensive care unit (NICU). Prior to the improvement intervention, the staff in the NICU of Swami Dayanand Hospital were not confident that the aseptic measures taken in the unit were sufficient to prevent infection and therefore avoided placing central venous lines. By using QI approaches, SDH achieved asepsis in 80% of phlebotomy and cannulation procedures carried out in the NICU within three months and even expanded the work to central lines.

In addition to the improvement in asepsis, the team also observed that repeated pricks for IV procedures and umbilical arterials, as well as repeated pricks for sampling, had decreased. The team believes that until practitioners started collecting and using data to measure improvement, they did not realize how often repeated pricks were occurring. Now that they have the information, they are more conscious that it is occurring – and, consequently, more careful.

The QI coach and team leader were also impressed with how use of the messaging application, WhatsApp, provided the team with a simple mode of communication through which they and the other team members could share their ideas and thoughts at any time and speedily take next actions.

As a result of the effort, the QI team members, as well as the whole unit staff, are more confident, motivated, and looking forward to taking up more QI projects for the improvement of their facility.