# CHAPTER III

## PROJECT EVALUATION

### 3.1 Introduction

The evaluation is the systematic assessment of the activities, the process and the results of the project. In addition, the evaluation also compares the meaning between "what is" and "what should be". Therefore, the appropriate project evaluation will lead to the success of the project development and continuity of the project in accordance with the set objectives. This study was to study the improvement of stock recording system of Somdejprasungkaraj hospital. Therefore, the project evaluation will indicate whether the project is successful and meets the objectives set by the work team.

### 3.2 Purpose

The purpose of the project was to assess whether the projects achieve the goals and objectives. The evaluation of the project focused on each phase of the project which in this case there were 2 phases as follows:

1. **Formative evaluation** is the evaluation during the implementation of the project. It provides information, which is a feed back during the development of the project improvement.

2. **Summative evaluation** is the evaluation after the project completion. It provides information about the effectiveness of the project which leads to the decision making whether the project is successful and further implementation of the project should be carried out or not.

## I Formative Evaluation

### 1. Plan

This is the first step of CQI process which consists of 4 sequences as follows: Define the system, Assess current situations, Cause analysis and Alternative analysis. Each of these four assists the evaluation team to clearly analyze causes of problems and then to come up with appropriate solutions to the problem. The outcome of each step is outlined below.

#### 1.1 Define the system

To conduct stock recording, practitioners and pharmacists who are in charge of monitoring usually rely on traditional practices and their previous experience. This study offers an opportunity for them to review together the process for drug management which has many steps in relation to recording system as shown in Figure 3.1

As transparency and accuracy are priorities in stock management, it needs to have 2 recording systems implemented all the times. In this study, computers and stock cards were used to control the stock and each of them was taken care of by different staff. The flow chart in Figure 3.1 shows the sequence of work; namely, ordering, examining delivered orders, stocking and storing and distribution. The researcher would like to point out at certain sequences which can cause errors in recording system as follows:

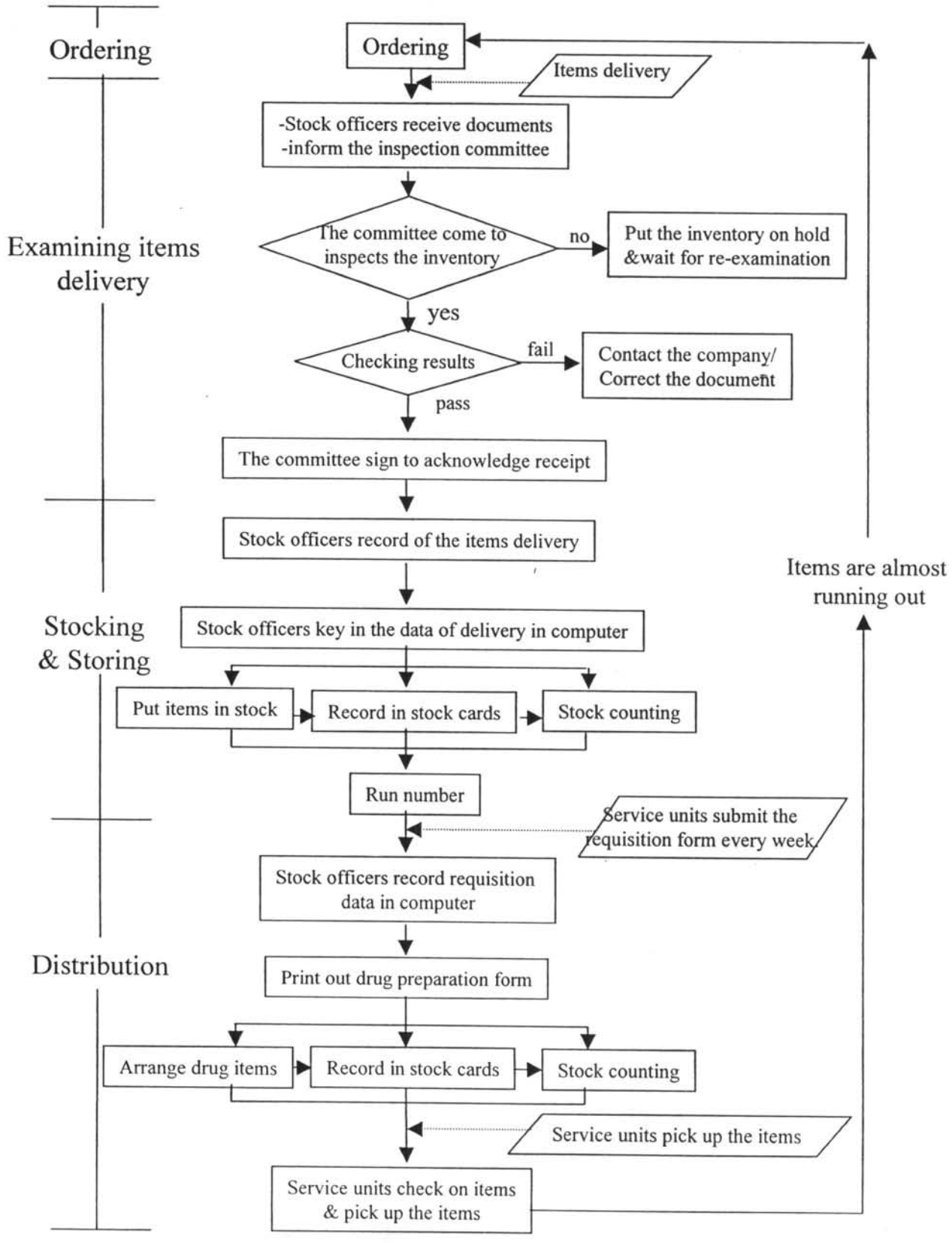


**Figure 3.1 : Inventory Management flowchart**

1. *Ordering:*

Pharmacists checked drug lists in stock in computers, calculated the number of needed orders, filled up the order form and contacted vendors for purchase.

2. *Examining items delivery:*

Once the items are delivered, three members of the acceptance and inspection committee who are appointed to examine the delivered items will be notified by stock officers. These three people would come to inspect the accuracy of ordered items and documents. They would then sign to acknowledge the receipt if everything was accurate. In case errors were found, the pharmacy section had to correct the errors first.

3. *Stocking and storing:*

After accepting the delivery, stock officer brought along the delivery form, marked in the computer that the items were put in stock, and then printed out the receive form. Another staff stored the delivery in the stock and wrote down the numbers in stock cards. This person had to make sure the quantity of the delivery matched with the stock cards and wrote the numbers on drug boxes, putting the boxes with the higher number in the front.

4. *Distribution:*

Service units sent the requisition form on weekly basis to the pharmacy section. The stock officers then keyed in the requisition form in the computer and printed out the stock preparation form. Another staff in the stock arranged drugs as requested and picked up the item which was marked the highest number first and recorded the movement in the stock cards. They also had to count the remaining physical stock if it matched the figure in the stock cards. Once all the

arrangements were done, the service unit examined the ordered items and took them. Counting the remaining items, the stock cards and the re-check of the service section were implemented to double check the accuracy of requesting and ordering items and stock recording. If errors were found, it was easier to investigate the cause and correct it, thus the stock record would be always accurate and updated.

However, due to past performance, it was found that some steps had certain obstacles. So, agreements were made to simplify the practice as follows:

1. *Drug receive*:

Three members of the acceptance and inspection committee often could not be present at the same time. They came in agreement to have at least 2 persons to check the items delivery. If the items passed the inspection process, the last member would agree to sign to acknowledge the receipt. This helped smoothen the process and in case of urgent need for any item, the committee agreed to authorize the pharmacist to open up the drug box to get the items first and sign his/her name on the box.

2. *Borrowing drugs*:

According to the hospital agreement that service units must order items in a sufficient number for an order round which is 1 week. However, in reality it was possible to face a shortage of supplies. As a result, service units could borrow items during the week by informing stock personnel who took note of this request on the whiteboard in drug stock. This receipt of items during the week would be recorded in the next week requisition order so that the stock personnel could update the stock data in the computer and stock cards and did not re-send the items. This is called "follow-up requisition".

3. *Spare stock keys:*

Usually key holders were the head of pharmacists and stock personnel. But because there were staff working after office hours in the drugs room and there might be an urgent need in case of shortage of items for patients, it was agreed to have a set of spare stock keys in the drugs room for staff on duty to get access to the stock after the office hours. This also enabled the staff in drugs room to enter to the stock during the office hours and did not have to ask for the keys from stock personnel

## 1.2 Assess current situation

Stock count was conducted in August 2001. The physical stock items were counted and compared with the remaining figures in stock cards and in computers. The term "correct record" refers to the record which had the same remaining quantity as the physical stock items. On the other hand, the record which had inconsistent number with the items in stock were treated as incorrect record as shown in Table 3.1

**Table 3.1 : Result of Total Stock Count in August 2001**

| Categories | No. of items | Record 1 (Computer) | | Record 2 (Stock cards) | |
|---|---|---|---|---|---|
| | | Correct | Incorrect | Correct | Incorrect |
| Drug | 321 | 265 | 56 | 266 | 55 |
| Medical supplies | 132 | 121 | 11 | 121 | 11 |
| Total | 453 | 386 | 67 | 387 | 66 |
| | **(100%)** | **(85.2 %)** | **(14.8 %)** | **(85.2 %)** | **(14.8 %)** |

Table 3.1 reveals the number and percentage of correct and incorrect records from two sources: computers and stock cards. Details are categorized as drugs and medical supplies.

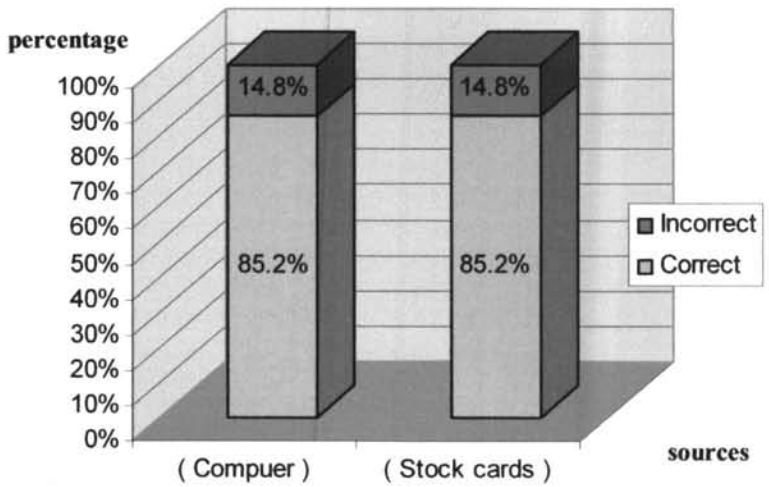


**Figure 3.2 : Percentage of correct and incorrect records from two sources : computer and stock cards**

Considering the results, these two categories had similar percentage of errors and if looking into details, these errors came from almost all the same records.

In these two categories 14.8% was reported as the total percentage of errors. Ideally the effective recording system must have zero for error percentage and the goal of this study is to reduce the error percentage to zero. It can be said that such error percentage was still a long way from the study's goal and this should be urgently corrected.

Concerning the two categories of correct data, it shows that there were two error types: first, over record referring to the stock quantity which was higher than physical items in stock and second, under record referring to the stock quantity lower than physical stock. These two types of error were different in proportion as shown in Table 3.2 and 3.3

**Table 3.2 : Proportion of over and under record in computer**

| Categories | Record 1 (Computer) | | |
|---|---|---|---|
| | Total Incorrect records | Over-record | Under-record |
| Drug | 56 | 50 | 6 |
| Medical supplies | 11 | 10 | 1 |
| Total | 67 | 60 | 7 |
| | **(100%)** | **(89.6 %)** | **(10.4 %)** |

**Table 3.3 : Proportion of over and under record in stock cards**

| Categories | Record 2 (Stock cards) | | |
|---|---|---|---|
| | Total Incorrect Records | Over-record | Under-record |
| Drug | 55 | 49 | 6 |
| Medical supplies | 11 | 10 | 1 |
| Total | 66 | 59 | 7 |
| | **(100%)** | **(89.4 %)** | **(10.6 %)** |

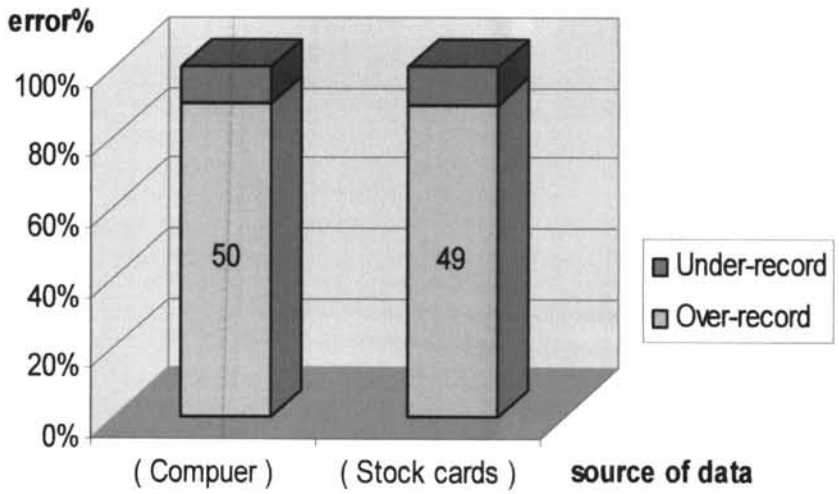


**Figure 3.3 :Proportion of over and under record of drugs in both sources**

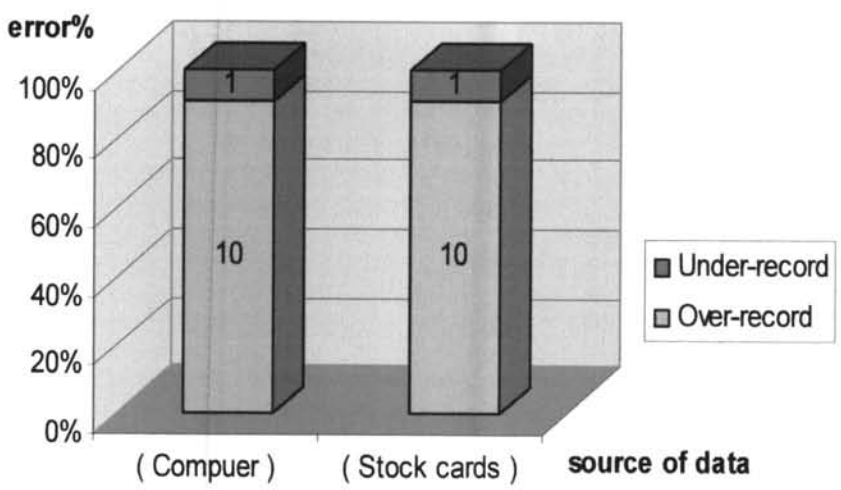


**Figure 3.4 : Proportion of over and under record of medical supplies in both sources**

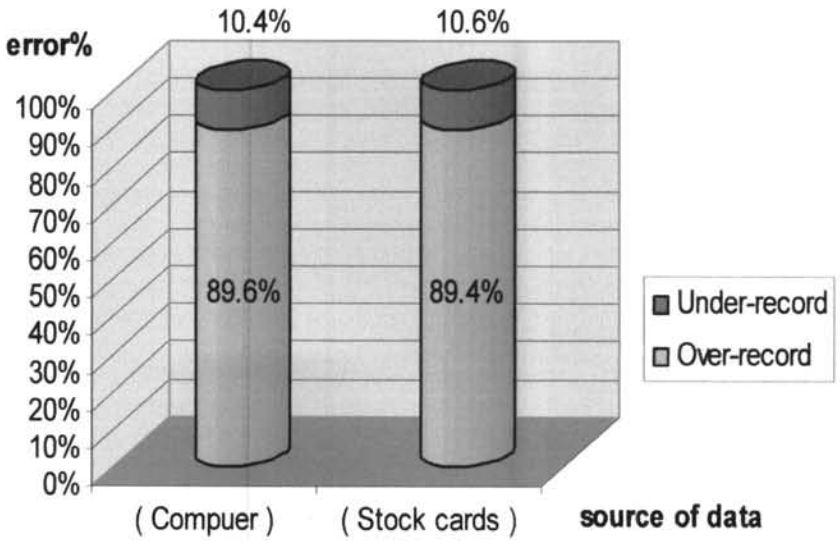


**Figure 3.5 : Proportion of over record and under record of items in two sources**

Based on these data, it can conclude that the numbers of errors in these two records are slightly different. This can be answered if looking at the working process because data to be put in the stock records came from printed documents in computer. Inconsistent data between two records could originate from human error in copying the figure from printed documents to stock cards. The issue to be taken for consideration for solution was how to correct the record in the computer to match with the physical stock items. Moreover, another interesting summary which has the same significance as the previous one is that, most of the errors from both types are over-record.

### 1.3 Cause Analysis

The study team realized that incorrect stock records occurred when the quantity of items in the records did not match with the movement of items in stock. Such error would hardly occur if staff followed the process as shown in the flow chart Figure 3.1

The workflow was well designed and clearly specified each step and most important it had two steps to double check the accuracy of work. The first one was to conduct physical counting every time there was a movement in stock and the second was to check the accuracy before sending off the items to the requestors.

After brainstorming, using "why" questions to investigate the root of the problems, the team draw the cause and effect diagram as shown in Figure 3.6

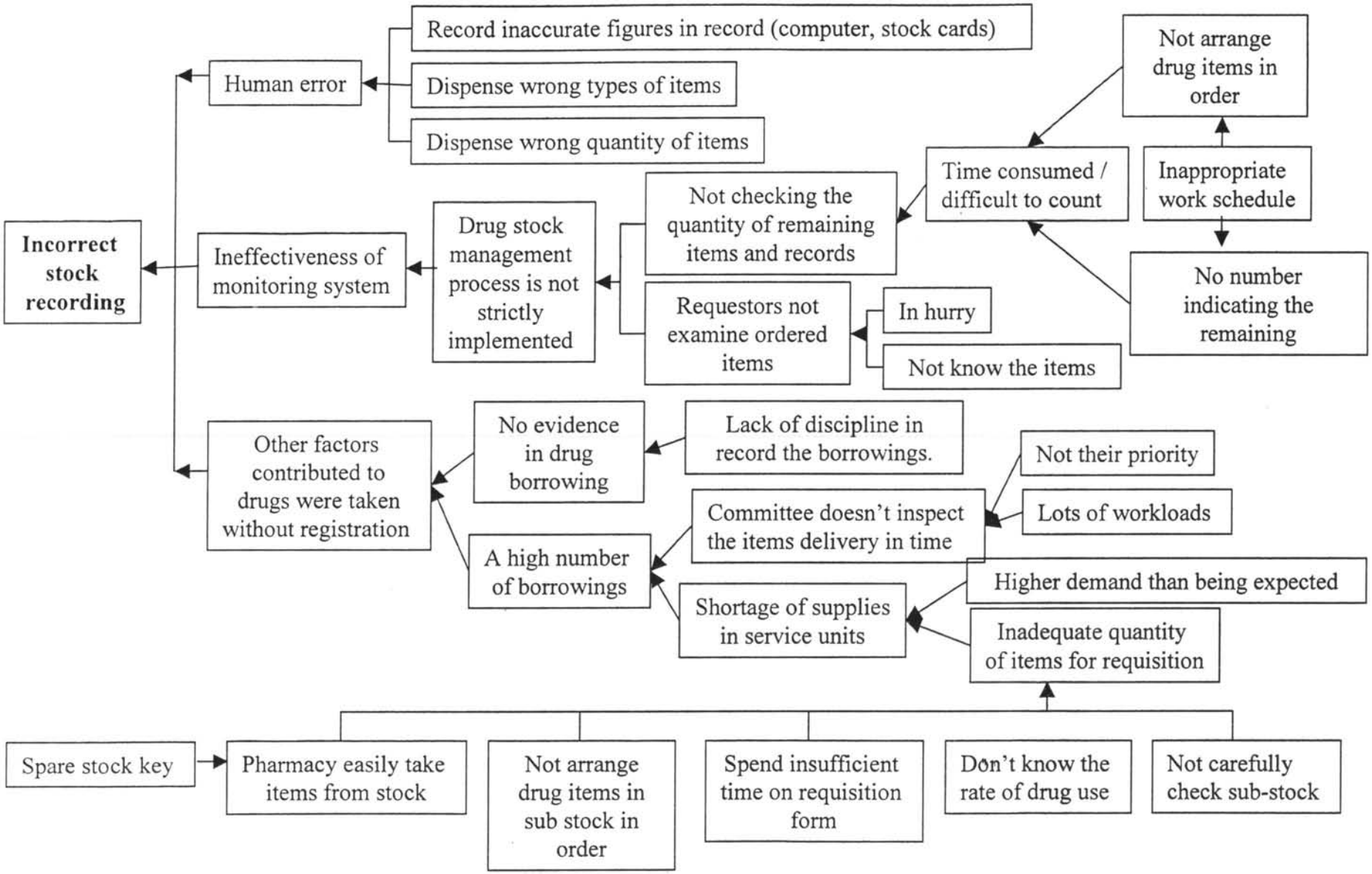


**Figure 3.6 : Cause Analysis**

Figure 3.6 show that inaccurate stock recording came from three main causes :

1. Human errors of staff
2. Ineffectiveness of monitoring system caused by many personnel not strictly following the process.
3. Other factors which contributed to drugs were taken without registration

**1. Human errors of staff : Mistakes caused by human errors can be characterized as follows :**

1.1 Recorded inaccurate figures in computer or stock cards
1.2 Dispensed wrong types of items
1.3 Dispensed wrong quantity of items

**2. Ineffectiveness of monitoring system**

From observation and interviews with practitioners, it was found that certain steps were ignored and not strictly nor completely practiced as shown in Figure 3.7

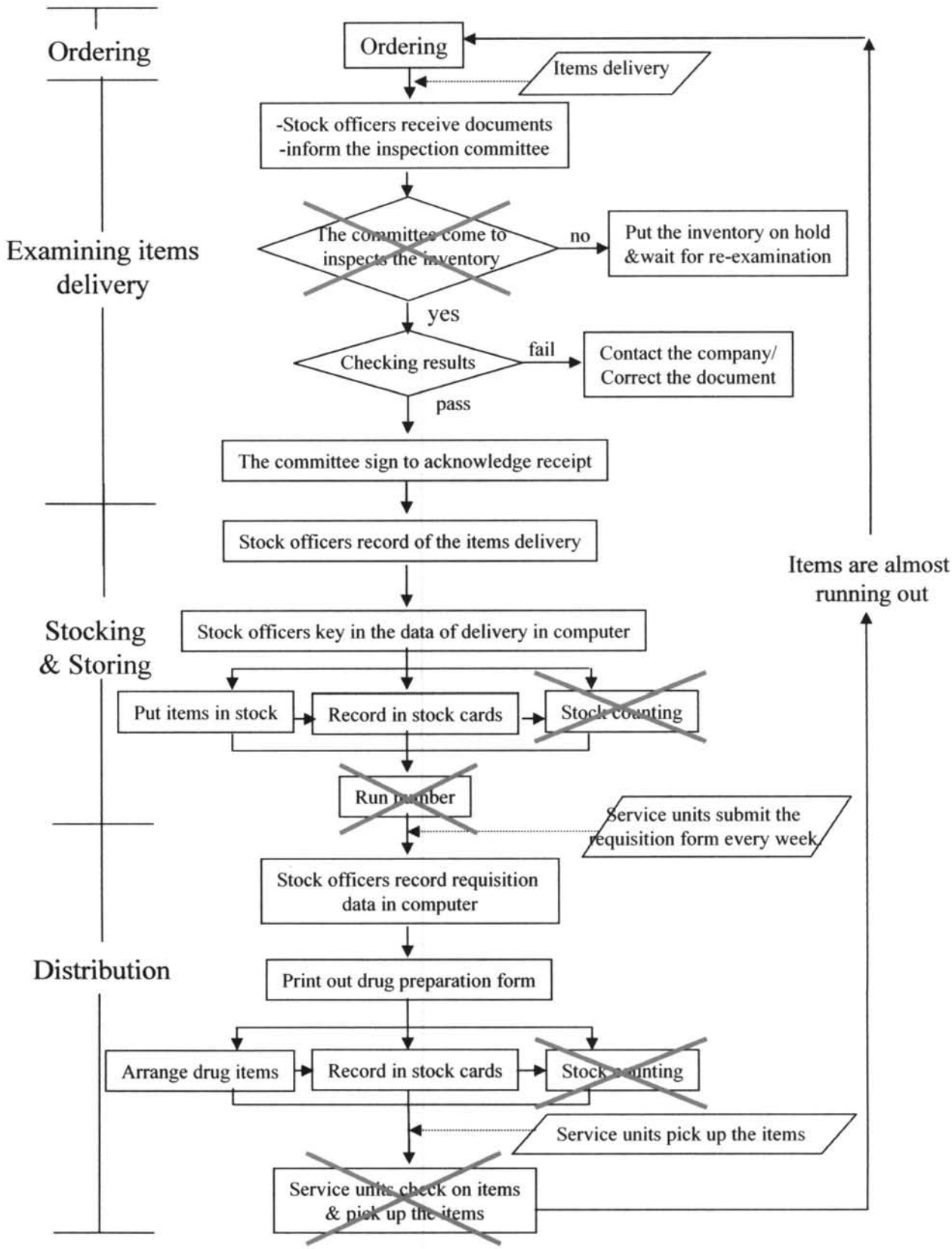


**Figure 3.7 : Inventory Management (Error) flowchart**

This might affect and cause incorrect stock records as explained as follow:

1. *Ordering:* -

2. *Examining delivered items:*

   The acceptance and inspection committee often had too much workload and could not come to inspect the delivery in time. Therefore, in certain circumstances drug was borrowed and/or dispensed before process of inspection has been completed.

3. *Stocking and storing:*

   3.1 Staff in charge of putting the items on shelves did not sort box systematically in descending order. Ideally, the box with highest number should be put on the front row in order to demonstrate the remaining stock. So it took time to count the remaining.

   3.2 Staff in charge of putting the items on shelves did not organize the boxes in the regular pattern that easily to count.

   3.3 Stock officers often did not count the physical items as compared to the remaining figure in stock cards after put the items in stock.

4. *Distribution:*

   4.1 Stock officers often did not count the physical items as compared to the remaining figure in stock cards after put the items out of shelve.

   4.2 Requestors did not communicate with the stock personnel about items they had already received (in case of borrowing items), so the stock officers sent off the same items.

4.3 Requestors did not examine types and quantity of requested items before leaving the stock because they were not the user of the ordered items, so s/he did not know the items.

The monitoring system had 2 steps. The first was to conduct physical counting. The second step referred to the checking process for accuracy of requestors.

According to interviews and observation, it was found that this process was often ignored and not strictly and completely implemented because it was time consuming, not practical nor possible for the time frame, so they tended to skip this process to complete all tasks in time (received items and put in stock and dispensed items to service units). Referring to in-depth interviews with staff, two causes which made the stock counting very time-consuming were :

- Stock officers in charge of putting items on shelves did not write a number on the drug box, so there was no number indicating the remaining stock items and it took a lot of time to count the total items in stock.

- Stock officers in charge of putting items on shelves did not arrange the items in order, so it was difficult to count.

The second step in the monitoring system referred to the checking process for accuracy of requestors. But in reality the requestors rarely checked the items in terms of type and quantity before leaving the stock because they were in hurry and were not users, so they did not know the items.

**3. Other factors which contributed to drugs were taken without registration were:**

3.1 Service units had borrowing drugs without giving neither documents nor notifications.

3.2 A high number of borrowings

**3.1 Services units had borrowing drugs without giving neither documents nor notifications.**

Borrowings could occur when service units ran into a shortage of supplies before the next requisition. So, they came to the drug stock and told the stock officer which items they wanted to borrow. The stock officer gave them such the items and take a note on a stock whiteboard. And when a next requisition was made, service units had to inform the stock officer which items they had already received. The stock officer would recheck with the borrowed items listed on his whiteboard and then updated the stock data in the computer and stock cards without sending the items. But it was founded that the stock officer often forgot to take a note on whiteboard or else when service units ordering new items, they failed to mention of the borrowed items because of faded memory and lack of evidence to remind them. This caused no movement in the record but in reality the number of stock items decreased.

Other cases were that service units submitted the follow-up requisition form but did not inform the stock officer that they had already received the items. So, there might be possibilities that the stock officers re-dispensed the drug items, making the number of physical stock present less than the figure in the record.

### 3.2 A high number of borrowings

In general, the cause of the shortage and the need to allow the borrow practices are various; such as,

1. Requestors had no data of drug use rate, so they could not make accurate estimation of drug use in a period of time.

2. Some items were in higher demand than being expected which was probably due to change of treatment patterns of doctors or the fact that more patients unexpectedly needed to use them.

According to interviews with stock personnel, pharmacy room was the unit that had the highest number of borrowings which was in line with the result from conducting total stock count that revealed inaccuracy of records occurred mostly with the drugs being requisitioned from the pharmacy room.

When asking the staff in pharmacy rooms the reason they often ran into a shortage of supplies and had to solve this problem by borrowing items from the stock, below are their answers:

1. They needed to perform their work as quickly as possible as they had heavy workload and lots of things to do like pre-packing drugs so they spent insufficient time when filling requisition form.

2. They did not pay much attention to the estimation because they knew they could easily get more from stock if they needed.

3. Their sub-stock was very limited in terms of space, causing them to stock the items in different places and they sometimes did not check all of the items carefully as it took a lot of time to check the remaining items.

In addition, it was found that the borrowings might be a factor to trigger incorrect stock records because the staffs in the pharmacy room were holding the stock keys and could get access to the stock while the stock officer was not around. Due to haste and poor recording system, it was reported that often the staff in drug rooms forgot to record the borrowed items and when ordering new items, they failed to mention of the borrowed because of faded memory and lack of evidence to remind them. This caused no movement in the record but in reality the number of stock items decreased.

Another cause which supports the need to allow the borrowings is the delay in delivery examination by the acceptance and inspection committee. Members of the committee often had heavy workloads and did not prioritize this task because it was not their primary work. So, the stock needed to keep the delivery examination on pending. When the items in stock was running out, pharmacists had to dispense the items to service units and when the committee had time to examine the delivery, the stock officers might have forgotten to record those items which had been taken away, resulting in less number of physical items compared to the record.

As mentioned above, the researcher can conclude all factors contributing to the stock management problem as follows:

**1. Personnel**

1.1 They unintentionally caused a number of human errors.

1.2 They not followed standard operating procedure related to stock management, therefore monitoring system was not functioned properly.

**2. System**

2.1 Allocation of work and work schedule for stock officer were inappropriate.

2.2 Recording system of drug borrowings was not strict.

2.3 Spare stock key made the stock become "open" system. And the staff of pharmacy room feel both were the same unit.

2.4 Services units did not examine types and quantity of requested items before leaving the stock.

2.5 The delivery examination of the acceptance and inspection committee was very late.

**3. Supporting factors**

3.1 A high number of borrowings especially from pharmacy room.

**1.4 Alternative analysis**

Research team consists of 2 pharmacists, 3 pharmacist assistants and 3 general employees, brainstorming to reach an agreement on the best solution to solve the problem as describe below:

Conclusion of practices as agreed by research team

1. Changing of staff in charge of drug stock.
2. Rearranging the staff's work schedule
3. Developing the borrowing system using a borrow form(see appendix)
4. Asking all service units for cooperation of examining accuracy of the requested items upon receipt.
5. Making agreement on the authority of spare stock key holder.
6. Increasing the number of the acceptance and inspection committee members in examining the delivery of ordered items.
7. Increasing effectiveness in requisition of pharmacy room

**2. Do**

Try out improvement alternatives

**1. Changing of staff in charge of drug stock.**

In order to reduce human error and improve monitoring system team agree to change job assignment of drug acceptance and distribution from general employee to pharmacist's assistance. Since, pharmacist's assistance has more responsibility and accountability. Pharmacist is delegated to record information in computerized system.

After the replacement of staff in charge of drug stock to pharmacist's assistant instead of general employee and assign pharmacist to enter information in computerized system, it was reported of improved performances and less human errors.

**2. Rearranged the staff's work schedule**

So that they had time to complete all steps in the process and reduced human errors. This was another factor to make monitoring system functioned properly. The schedule detail is shown in figure 3.8 and figure 3.9

After rearranging the work schedule, stock officers had more time to work, so they did not have to rush doing their work and then they could count the remaining physical items after each requisition as indicated in the work flow.

| | 08.00-09.00 | 09.00-10.00 | 10.00-11.00 | 11.00-12.00 | | 13.00-14.00 | 14.00-15.00 | 15.00-16.00 |
|---|---|---|---|---|---|---|---|---|
| Mon | | | | | | | | |
| Tue | Key computer / Wimarn-P'cist assis. / | | Requisition items and Counting remaining items / Arunsak / | | | Requestors Receive items | | |
| Wed | | | | | | | | |
| Thu | Key computer / Wimarn-P'cist assis. / | | Requisition items and Counting remaining items / Arunsak / | | | Requestors Receive items | | |
| Fri | | | | | | | | |

**Figure 3.8 : Old Work Schedule of Stock Personnel**

| | 08.00-09.00 | 09.00-10.00 | 10.00-11.00 | 11.00-12.00 | | 13.00-14.00 | 14.00-15.00 | 15.00-16.00 |
|---|---|---|---|---|---|---|---|---|
| Mon | | | | | | | | |
| Tue | Key computer / Daorung-P'cist / | | Requisition items /Wimarn-P'cist assis / | | | Counting remaining items / Wimarn-P'cist assis. / | | Requestors Receive items |
| Wed | | | | | | | | |
| Thu | Key computer / Daorung-P'cist / | | Requisition items /Wimarn-P'cist assis / | | | Counting remaining items / Wimarn-P'cist assis. / | | Requestors Receive items |
| Fri | | | | | | | | |

**Figure 3.9 : New Work Schedule of Stock Personnel**

**3. Developed the borrowing system using a borrow form(see appendix D) and below is the implementation process:**

3.1 Filled up the borrow form which has 2 copies.

3.2 The form must be authorized by the chief of the service unit.

3.3 The form must be submitted to the stock officer.

3.4 The stock officer had to sign in the form when he dispensed the borrowed items and kept one copy as evidence and the other for the borrowers.

3.5 When it was due for next requisition, the borrowers must fill in the requisition form and noted at the end the quantity of items taken to remind the stock officers.

3.6 Stock officers re-checked the borrow form in stock, took note in both records and did not dispense any item.

At first, some requestors did not strictly use the borrow form so the head of pharmacy department had to communicate with the supervisors of each section to remind and reiterate their staff to follow this process strictly. According to the stock officers, there was lack of communication about the borrowing in some sections which had staff rotating system like nurses. As the quantity of items taken cannot be found in the form, the stock officers had to rely on evidence of borrowed items kept in stock to double check on accuracy. Later this process was modified and adapted to require all service units to hand in the borrow form every time together with the requisition form.

The borrow form helps collecting the frequency of borrowings in each section as follows:

**Table 3.4: Frequency of Borrowings of Each Unit/Section from Drug Stock**

| Month | August | | September | | October | | November | | December | | January | | February | | March | | April | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Section | Drug | Med | Drug | Med | Drug | Med | Drug | Med | Drug | Med | Drug | Med | Drug | Med | Drug | Med | Drug | Med |
| Pharmacy room | 12 | 3 | 11 | 3 | 16 | 3 | 19 | 2 | 13 | - | 14 | 1 | 6 | 2 | 20 | 5 | 15 | 9 |
| WARD 1 | - | 1 | - | 1 | - | - | - | 1 | - | - | - | - | - | 2 | - | - | - | 2 |
| WARD 2 | 2 | 4 | - | - | - | - | 1 | - | 1 | - | 3 | - | - | - | 1 | - | 1 | - |
| ER | 1 | - | - | 1 | - | 1 | - | - | 2 | 2 | 2 | 2 | - | 1 | - | 2 | - | 2 |
| OR-LR | - | - | - | 1 | 1 | 1 | - | - | - | - | - | - | - | - | 1 | - | - | - |
| X-ray | - | - | - | - | - | 1 | - | 1 | - | - | - | 1 | - | - | - | - | - | 1 |
| Drug Preparation | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| SUPPLY | - | - | - | - | 1 | 1 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| Dent | - | - | - | - | - | 2 | - | 2 | - | - | - | - | - | - | - | - | - | - |
| Drug foundation | - | - | - | - | 1 | - | 4 | - | - | - | 2 | - | - | - | 3 | - | - | - |

Based on the result in Table 3.4 pharmacy room had the highest number of borrowings because it needed to use drugs and medical items the most. So, it was reasonable to say that the pharmacy room had a high tendency to face a shortage of supplies. In this study, the researcher then focused at the borrowing record of the pharmacy room in particular and below are details separating drugs and medical items in different graphs.

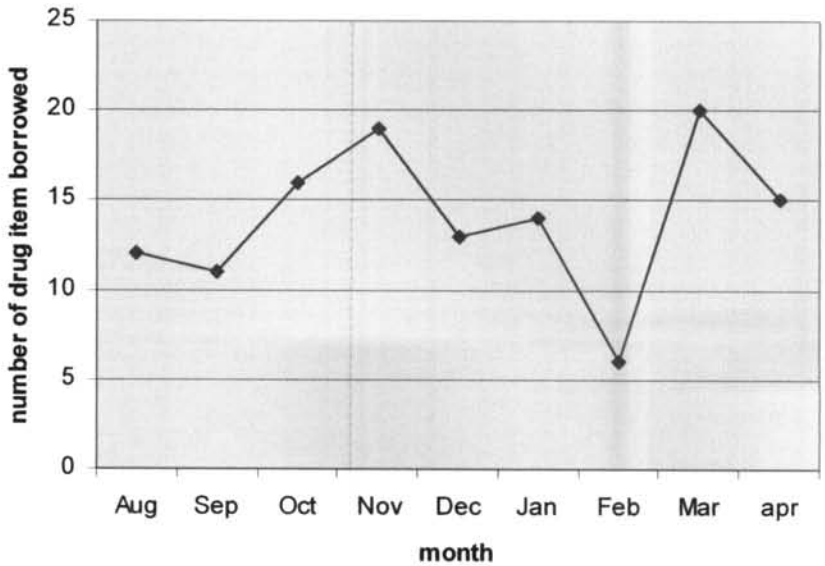


**Figure 3.10: Numbers of Drugs Borrowed by Pharmacy room**

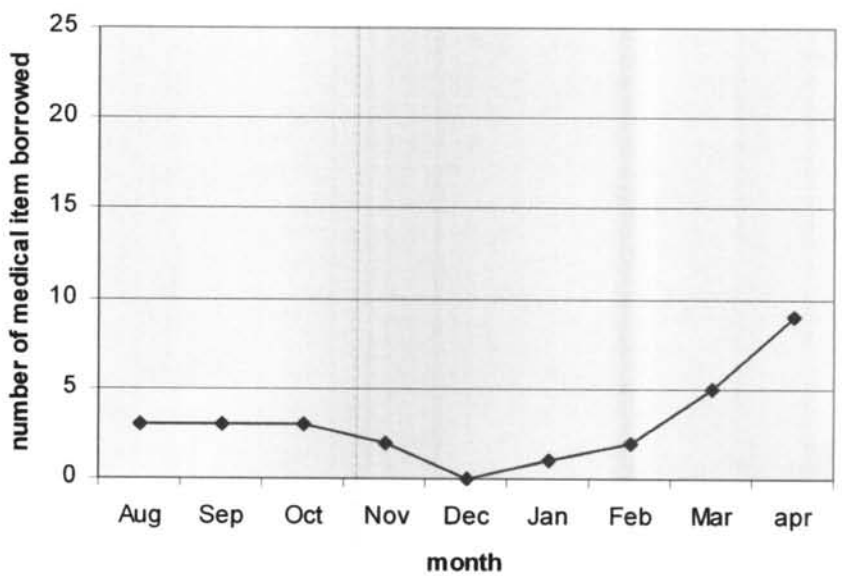


**Figure 3.11: Numbers of Medical supplies Borrowed by Pharmacy room**

According to these two graphs, it is clearly seen that the number of drugs and medical items borrowed by the pharmacy room vary from months to months. However, in recent months, medical items were in higher demand. This is probably because the staff was not as active as they were before. The seasoning effect might also play an important role in the higher frequency of the drug use in summer than the usual period as the number of patients in hospitals in summer was usually greater than other seasons.

**4. Asking all service units for cooperation of examining accuracy of the requested items upon receipt.**

Raising the issue of "examining the accuracy of the requested items" in an executive meeting and asked for cooperation from all service units which were related with the drug requisition to check accuracy before leaving the stock.

Though asking for cooperation in the meeting, it seemed like many service units were not cooperative in examining accuracy of requisitioned items because they did not want to spend too much time on this process but usually contacted the stock later when they found item defects.

**5. Making agreement on the authority of spare stock key holder.**

Terminate the authority of spare key holder. Chief of pharmacy department was authorized to hold the key and would put it in the drawer for staff on duty after office hours in the evening and they were required return it in the morning.

Separating the drug stock and pharmacy room could prevent the undocumented items taken by staff in pharmacy rooms because they had to contact the stock officer before they could get any items and the stock officer would remind them to hand in the borrow form.

This also helps smoothen the requisition process of the pharmacy room. A requestor from the pharmacy room who was interviewed by the researcher said he had to concentrate more when filling up the requisition form because the process to assess to stock was much more complicated and if he borrowed some drugs too often, his supervisor would ask him when she sign up the borrow form "what went wrong".

The spare stock key was ultimately in responsibility of chief of pharmacy department. Sending the key to the staff on duty after working hours and returning the keys in the morning was quite a burden. Quite often the chief forgot to send the stock key to the staffs on duty after working hours, so the duty staffs could not get access to the stock in case of emergency. The key then were sent to the chief to keep (because they did not use it regularly) and put in the locked drawer. And staffs on duty after working hours hold the keys of the drawer. The staffs were not allowed to use the keys in the locked drawer during working hours.

**6. Increasing the number of the acceptance and inspection committee members.**

This provides more flexibility in inviting the committee members.

It took time to identify qualified members for the acceptance and inspection committee and also for the process of committee appointment. Once there are more committee members, there should be changes in means of invitation for the members to examine the items delivery and the stock officers seemed to be very cooperative. However, when this is practiced on trial and the stock officers feel this way is not as practical as the previous means, it is time to think of new solutions.

**7. Increasing effectiveness in requisition of pharmacy room.**

Re-arranged the storage for sub-stock drugs by applying Five S and using data of drug usage from computer and drug requisition experience of service staff to allocate appropriate space.

Re-allocated the space for drug sub stock by applying the Five S concepts and by using data on drug use. This should help making the space more effective instead of asking for more space. The staff used cello tapes to draw the line to allocate the space to adequately stock the drugs which are requisitioned each week and also put on the label on the drugs to make it easier to check and monitor the number of drugs available and help ease the redundancies of drug orders.

However, due to fluctuations of some drug use in each time period, the frequency of drug use which was labeled on certain drugs might not be useful for requestors.

**3. Check**

Study the results by conduct total stock count and continuous stock counts.

**3.1 Total stock count**

According to the total stock count in October 2001, the results are shown in Table3.5, compare with the result in table 3.1

**Table 3.5 : Result of Total Stock Count in October 2001**

| Categories | No. of items | Record 1 (Computer) | | Record 2 (Stock cards) | |
|---|---|---|---|---|---|
| | | Correct | Incorrect | Correct | Incorrect |
| Drug | 321 | 321 | 0 | 321 | 0 |
| Medical supplies | 132 | 132 | 0 | 132 | 0 |
| Total | 453 | 453 | 0 | 453 | 0 |
| | **(100%)** | **(100 %)** | **(0 %)** | **(100 %)** | **(0 %)** |

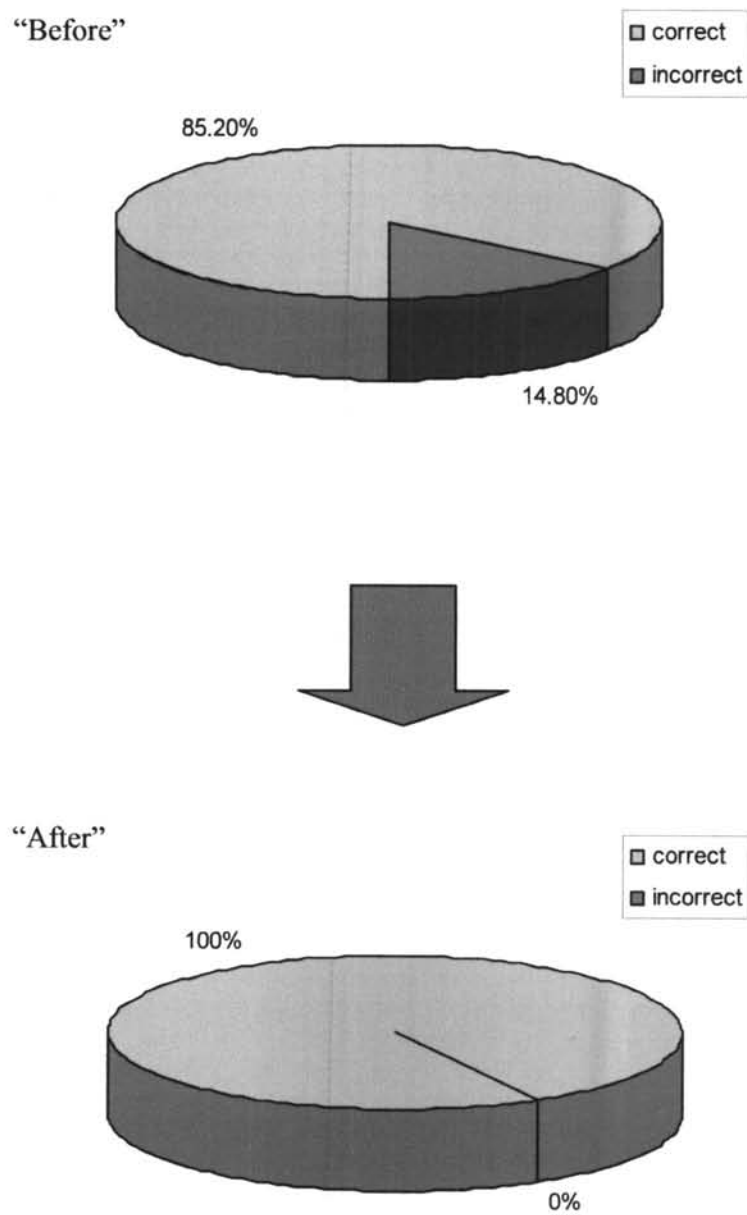


**Figure 3.12 : Show the Result of Total Stock Counts Before and After Implementation**

### 3.2 Continuous stock counts

One hundred and fifty items of drug and seventy five items of medical supplies with the highest value of dispense during the fiscal year 2001 (see Appendix A,B). These selections account for 95% of the total value of the item dispensed.

Based on the random sampling methodology described in Chapter 2, 15 sets of data were obtained from 20 counts in 10 months (see Appendix C), which corresponds to 1.3 count on average, and shown as follows:

**Table 3.6 : Results of continuous stock counts**

| No. | Date | Number of accurate records / Total items counted | | | |
|---|---|---|---|---|---|
| | | Drug | | Medical supplies | |
| | | Stock cards | Computer | Stock cards | Computer |
| 1 | 12 Nov 2001 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |
| 2 | 26 Nov 2001 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |
| 3 | 10 Dec 2001 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |
| 4 | 24 Dec 2001 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |
| 5 | 07 Jan 2002 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |
| 6 | 21 Jan 2002 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |
| 7 | 04 Feb 2002 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |
| 8 | 18 Feb 2002 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |
| 9 | 04 Mar 2002 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |
| 10 | 18 Mar 2002 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |
| 11 | 01 Apr 2002 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |
| 12 | 15 Apr 2002 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |
| 13 | 06 May 2002 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |
| 14 | 20 May 2002 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |
| 15 | 03 Jun 2002 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |
| 16 | 17 Jun 2002 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |
| 17 | 08 Jul 2002 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |
| 18 | 22 Jul 2002 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |
| 19 | 05 Aug 2002 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |
| 20 | 19 Aug 2002 | 10 / 10 | 10 / 10 | 5 / 5 | 5 / 5 |

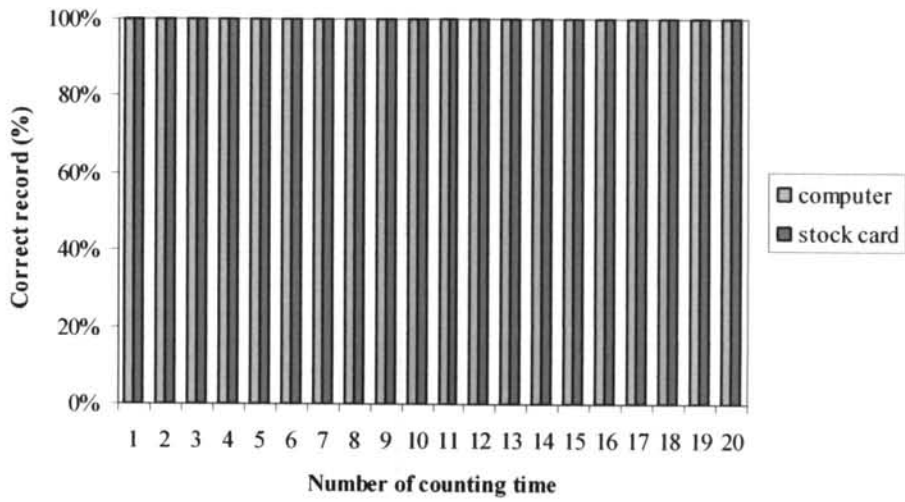


**Figure 3.13: Results of Continuous Stock Counts for Drugs**

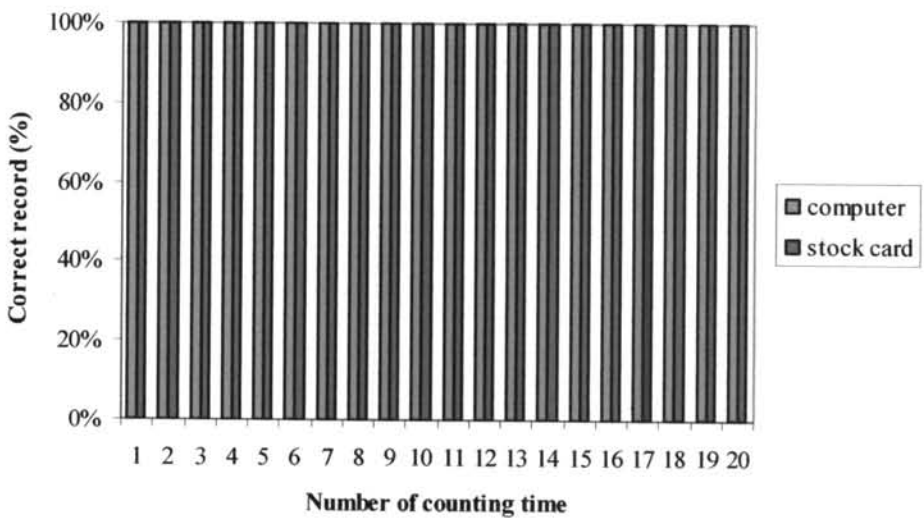


**Figure 3.14: Results of Continuous Stock Counts for Medical supplies**

The results showed consistence of data in stock cards and computers, so it can be concluded that the randomized total stock count yielded 100% accuracy.

## 4. Act

### 4.1 Improvement standardization

#### 4.1.1 Work instruction of stock recording system

Using several strategies defined from root cause analysis to solve incorrect stock record issue lead to reduce error to 0%. The procedure are as follows;

a) The same standard operating procedure as shown in figure 3.1 is used, the only change is performed by pharmacist's assistant and pharmacist is responsible for recording information in computerized data system. The work schedule of stock personnel is changed to new schedule as shown in figure 3.5.

b) Work instruction of drug borrowing
   1) Filled up the borrow form which has 2 copies.
   2) The form must be authorized by the chief of the service unit.
   3) The form must be submitted to the stock officer.
   4) The stock officer had to sign in the form when he dispensed the borrowed items and kept one copy as evidence and the other for the borrowers.
   5) When it was due for next requisition, the borrowers must hand in the borrow form every time together with the requisition form to inform the stock officers.
   6) Stock officers re-checked the borrow form in stock, took note in both records and did not dispense any item.

#### 4.1.2 Stock recording monitoring system

a) Total stock count must be done annually, in the end of fiscal year.(traditional annual count)
b) Continuous stock count should be done monthly by external committee.

### 4.2 Collecting indicators of stock management performances

Several indicators can be applied to evaluate the effectiveness of drug stock management but those indicators will be reliable only if the data in the records can be trusted. So after solving the stock recording problem, it was suggested to monitor stock management performances. If problems persist, things that needed to be improved should be identified and prioritized, and improvement plans for drug stock management should be sought.

Two dimensions of the indicator in drug stock management which were interesting and appropriate for community hospitals are as follows:

1. To measure the accuracy and inaccuracy

    1.1 Loss due to damage and theft

2. To measure efficiency

    2.1 Stock turnover rate

    2.2 Loss due to expired drugs in stock

    2.3 Service level

After implementation of CQI process, the data has been collected to evaluate stock performance indicators since October 2001 using method defined in chapter 2

**1. To measure the accuracy and inaccuracy**

**1.1 Loss due to damage and theft**

**Table 3.7 : Percentage of loss due to damage and theft**

| **Month** | Nov01 | Dec01 | Jan01 | Feb02 | Mar02 | Apr02 | May02 | Jun02 | Jul02 | Aug02 |
|---|---|---|---|---|---|---|---|---|---|---|
| **% loss** | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

## 2. To measure effectiveness

### 2.1 Stock turnover rate

**Table 3.8 : Turn over rate of drugs in stock from October 2001-June 2002**

| Quarter | | Month | Remaining | Usage / month | Usage / Quarter | Usage / Quarter x 4 | Turn over rate |
|---|---|---|---|---|---|---|---|
| 1 | 2001 | October | | 283,659.15 | | | |
| | | November | | 444,241.62 | | | |
| | | December | **1,655,473.60** | 250,237.80 | 978,138.57 | **3,912,554.28** | **2.36** |
| 2 | 2002 | January | | 460,688.82 | | | |
| | | February | | 347,651.13 | | | |
| | | March | **1,132,290.85** | 221,361.97 | 1,029,701.92 | **4,118,807.68** | **3.64** |
| 3 | 2002 | April | | 469,063.08 | | | |
| | | May | | 350,614.89 | | | |
| | | June | **1,362,739.63** | 149,541.36 | 969,219.33 | **3,876,877.32** | **2.84** |

**Table 3.9 : Turn over rate of medical supplies in stock from October2001-June2002**

| Quarter | | Month | Remaining | Usage / month | Usage / Quarter | Usage / Quarter x 4 | Turn over rate |
|---|---|---|---|---|---|---|---|
| 1 | 2001 | October | | 61,495.21 | | | |
| | | November | | 68,445.80 | | | |
| | | December | **390,839.05** | 84,512.84 | 214,453.85 | **857,815.4** | **2.19** |
| 2 | 2002 | January | | 75,870.51 | | | |
| | | February | | 63,674.10 | | | |
| | | March | **259,971.40** | 52,963.28 | 192,507.89 | **770,031.56** | **2.96** |
| 3 | 2002 | April | | 96,756.95 | | | |
| | | May | | 69,838.90 | | | |
| | | June | **329,097.51** | 52,508.38 | 219,104.23 | **876,416.92** | **2.66** |

The policy of Ayuddhaya public health provincial suggest that turn over rate of drugs should not less than 4 times/year and of medical supplies should not less than 3 times/year.

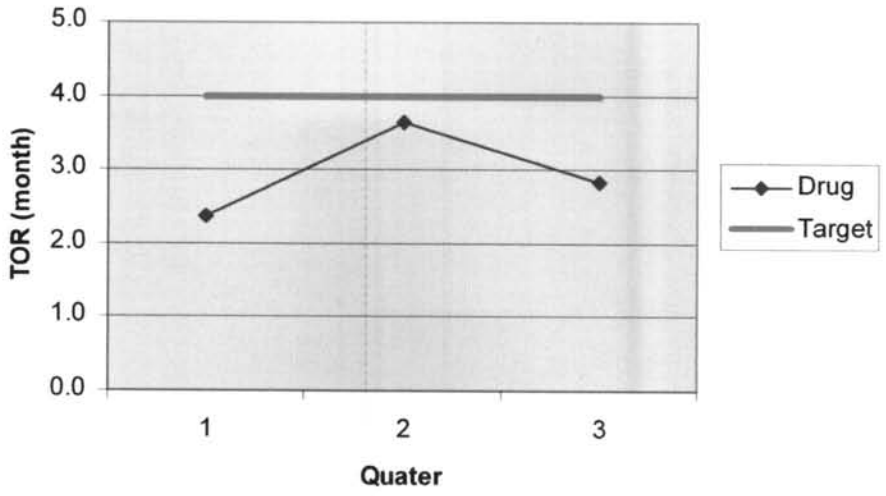


**Figure 3.15 : Turn over rate of drugs in stock from October 2001-June 2002**

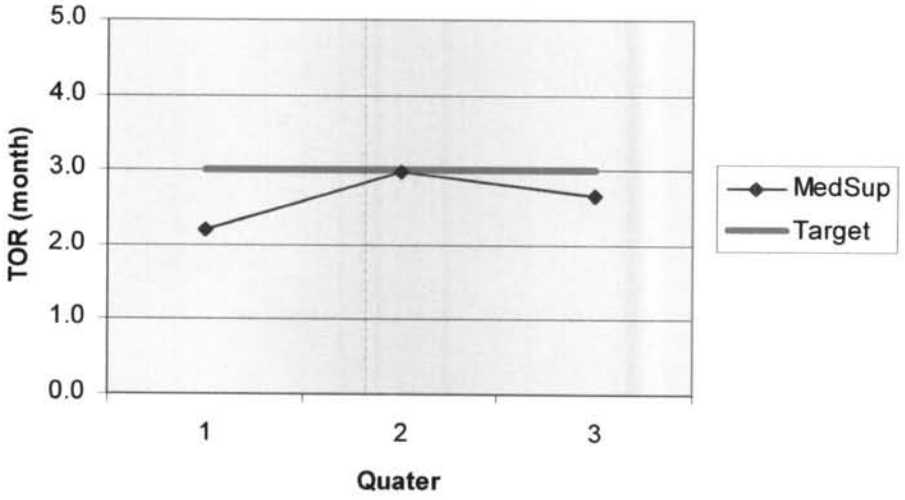


**Figure 3.16 : Turn over rate of medical supplies in stock from October2001-June2002**

## 2.2 Loss due to expired items in stock

The correct reports of stock amount and expired drug value can also be used to prevent loss from the drug expiration in the stock.

In the inspection of the quantity and the value of expired drug in October 2001, we found that, there was no drug which had already expired, but there were some drug being expired within 1 year as follows,

**Table 3.10 : Expiry status of drugs in stock in the next one year.**

| No. | Drug list | Dosage form | Manufacturer | Exp.date | Amount | Value |
|---|---|---|---|---|---|---|
| 1 | Narcan | inject | Olic | 31/5/2002 | 3 x 1 amp | 609.90 |
| 2 | Quinine sulfate tab 300 mg | tablet | GPO | 31/12001 | 1 x 1,000 's | 1,605.00 |
| 3 | Magnesium inj 10% | inject | Atlantic | 19/6/2002 | 1 x 1 amp | 6.12 |
| 4 | Magnesium inj 50% | inject | Atlantic | 21/12/2001 | 50 x 1 amp | 321.00 |
| 5 | Betamethasone Cr. 500 gm | cream | GPO | 29/8/2002 | 2 x 1 jar | 1,240.00 |
| 6 | RI insulin | inject | Diethelm | 6/5/2002 | 5 x 1 vial | 1,551.50 |
| 7 | Succinyl-siccum | inject | Zeullig | 1/1/2002 | 3 x 1 vial | 1,052.88 |
| 8 | Salbutamol tab 2 mg | tablet | GPO | 11/4/2002 | 56 x 500 's | 5,502.00 |
| 9 | Novesin eye drop | solution | Zeullig | 28/5/2002 | 6 x 1 bot | 532.86 |

This report will enable stock officer to manage stock more efficiently with appropriate strategies; e.g. notify physician to use specify drug items, exchange drug with other hospital in local network, cycle short-expired drug with pharmaceutical company representatives. The example of strategies that have been used for certain drugs are as follow;

1. Monitor and do nothing in case that drug is expected to dispense before expired date ;

| | |
|---|---|
| 3) Magnesium inj 10% | 1 amp |
| 5) Betamethasone cream 500 gm | 2 jar |
| 6) RI insulin | 5 vial |
| 8) Salbutamol tab 2 mg | 56 x 500 tab |

2. Exchange drug with other hospital for longer expired date or change to other drugs ;

| | |
|---|---|
| 1) Narcan | 3 amp |
| 4) Magnesium inj 50% | 50 amp |
| 7) Succinyl-siccum | 3 vial |
| 9) Novesin eye drop | 6 bot |

3. Cycle short-expired drug with government pharmaceutical organization (GPO) ;

| | |
|---|---|
| 2) Quinine sulfate tab 300 mg | 1 x 1,000 tab |

### 2.3 Service level

**Table 3.11 : Service level from November 2001 - April 2002**

| Month | Drugs | | | Medical supplies | | |
|---|---|---|---|---|---|---|
| | Items Requested | Items available | **Service Level** | Items Requested | Items available | **Service Level** |
| Nov.2001 | 549 | 517 | 94.2% | 217 | 201 | 92.6% |
| Dec.2001 | 412 | 381 | 92.4% | 187 | 179 | 95.7% |
| Jan.2002 | 578 | 532 | 92.0% | 223 | 199 | 89.2% |
| Feb.2002 | 584 | 569 | 97.4% | 246 | 239 | 97.2% |
| Mar.2002 | 396 | 380 | 95.9% | 201 | 188 | 93.5% |
| Apr.2002 | 478 | 432 | 90.3% | 156 | 150 | 96.1% |

Goal is not less than 95%

### 4.3 Continuous improvement plans

1. In the evaluation of the solution to the problem, a case of inaccurate stock recordings has not occurred, but it is foreseeable. Guidelines for inaccurate stock recording correction should be developed in preparation for the future problem.

2. Improve the requisition system for service units, which had high frequency of borrowing to smoothen the service flow for patients and to reduce time consumption, which was caused by ineffectiveness in practices.

3. Improve drug supply management to reduce turn over rate and make more service level.

## II Summative Evaluation

### *Are its objectives achieved?*

After applying CQI technique to correct the inaccuracy of stock recording, the result showed that this study's objectives are achieved as shown in the error percentage in two types of stock records declining from 17.4% before the implementation to 0% after the implementation.

### *What are the impacts of this study?*

1. This is a new dimensional means of work which staff members can participate in planning and solving problems which positively result in cooperation and practical working methods.
2. It is an example in conducting CQI for other sections to follow for some time later in the popular trend of HA.

3. It has taught staff to learn to use CQI tools.
4. It is the beginning of the improvement for effectiveness of drug stock management in the hospital which has clear indicators.