CHAPTER IV

RESULTS

Participatory Infection Control System Development of Dokkhamtai Hospital, Phayao province was a participatory action research aiming for the development of infection control to be efficient, to enable medical staff of Dokkhamtai hospital to analyze infection control problems, and participate in the development of infection control. Target area, Dokkhamtai hospital in Dokkhamtai district, and target population, hospital staff concerning infection control (62 medical and 23 non-medical staffs), were purposively selected. The results are as follow.

4.1 Results of IC problem assessment of Dokkhamtai hospital

4.1.1 Hospital level

4.1.2 Service delivery point level

4.1.3 Individual level

4.2 Plan and activity for problem solution

4.3 Implementation and results

4.4 Evaluation after the implementation

4.1 Results of IC Problem Assessment of Dokkhamtai Hospital

4.1.1 Hospital level

Results of the assessment of IC at hospital level are as follow.

Table 4: Results of the assessment of IC at hospital level

Topic	Findings / Problems
Organization and administration	Committee of IC had 4 meetings in the past year (not constant), no supervision and no stimulation on the staffs to follow the standard guideline.
Surveillance	1. Staff surveillance - Annual physical check-up 64.7% - Accident 7.1% (1 dentist, 5 nurses) • 2 IPD nurses, poked by used syringe while recapping. There was no blood test for these staffs, but blood test result of the patient was negative. • 1 Counselor had an accident, poked by used syringe in as trash can. The staff did not take blood test but took ARV drugs. Blood test result of the patient was positive. • 1 ER nurse injured by IV fluid syringe. The staff did not take blood test and blood test result of the patient is negative. • 1 dentist had an accident from a syringe There was no blood test for the staff and blood test result of patient was negative. • 1 OR nurse was hurt by needle of Wet Dressing set. The staff did not take blood test and blood test result of the patient was negative. 2. Hospital surveillance - Infection rate of client 0.1% (1 patient on injection plug accident at special ward)

Table 4: Results of the assessment of IC at hospital level (cont.)

Topic	Findings / Problems
Surveillance (cont.)	3. Environment surveillance - No periodic check of sterilization equipment - Spore test for biological check, 8 checked negative - Physical inspection, an autoclave was broken - A test on treated waste water, standard met
Prevention and control	1. Waste management - High quantity of waste • Infectious waste reactor is too small so that it was over the capacity of the reactor in the hospital. - Mixed infectious and non-infectious wastes • Infectious mixed with non-infectious waste will be sent to municipality site. It could cause danger to the municipality staff, and also disseminate infection. - Mixed trash and garbage - Waste was carried by hands to deposit • Non-medical staff risk to get the accident while take all garbage. - Infectious waste burned in hospital incinerator (25-kg sized incinerator, incomplete combustion) - Non-infectious waste disposed to municipality's truck 2. Trash bin mapping - Two types: non-infectious and infectious (trash and garbage) - Some had too many bins / There were 93 trash bins, 12 garbage bins and 24 infectious waste bins.

According to Table 4, the result of the assessment was that IC committee had 4 meetings in the past year, and there were no supervisions. For surveillance problem,

64.7% of staff had physical check-up and 7.1% had accident from work. Infection rateof patient was, 0.1% infected while on injection plug at special ward. Sterilization check found that 8 biological and chemical checks had negative result. An autoclave was broken. A test done on treated wastewater, met standard. Prevention and control, there was a high quantity of waste and mixed disposal. From mapping, there were 93 trash bins, 12 garbage bins, and 24 infectious waste bins.

4.1.2 Service delivery point level

Table 5: Results of the assessment of IC at service delivery point level

Topic	Findings / Problems
OPD	- Poor ventilation - Bad smell in toilet
ER	- Small and untidy - Lack of protective barriers e.g. mask, goggles
LR	- Mixed disposal
OR	- Limited number of cabinet for medical equipments, rather mixed storing
Special clinic	- Mixed disposal
Ward	- Mixed disposal - Moldy ceiling (opposite to a sink) - Sharp disposal box made of a paracetamol bottle without lid
Special ward	- Mixed disposal - Moldy ceiling (opposite to a sink) - Inadequate number of sterile set wrap (used one wrap)

Table 5: Results of the assessment of IC at service delivery point level (cont.)

Topic	Findings / Problems
Central supply	- Unorganized - Poor ventilation - No storage for sterile equipments - Only some sterile set had label of date of expiration - Inadequate sterile set wrap
Laundry	- Disorganized - Lack of apron
Laboratory	- Disorganized e.g. messy table counter.
Dental clinic	- Rusty equipments - Many sets were put together as a set for autoclave - Small room, the basin was near dental unit
Community health	- No cabinet for medical equipments
Communicable disease control (AIDS and STD, Environmental sanitation, TB clinic)	- HIV and pulmonary TB attended the same place

According to Table 5 Results of the assessment of IC at service delivery point level, it was found that LR, ward, and special ward had mixed waste disposal. ER and laundry did not have enough protective barriers. Central supply and laboratory were disorganized. Ward and special ward had mold on the ceiling. OPD and central supply

had poor ventilation. Special ward and central supply did not have enough sterile set wrap. Dental clinic wrapped many small sets together for autoclave and some pieces were rusty. OR had limited cabinet for medical equipment. Community health had no medical equipment cabinet. Central supply had no room for sterile equipment and some sets had no label. For disease control, the HIV and TB patients attended the same place. It was found that central supply had more problems than all other service delivery points.

4.1.3 Individual level

Table 6: Results of the assessment of IC at individual level

Topic	Answer	Number	%
Questionnaire respondents (81)	Medical staff	62	76.5
	Non-medical staff	19	23.5
Your work is risky on site?	No risk	19	23.5
	Risky - -Injection, IV fluid, wet dressing, stitch, NG tube insertion, suction, Foley's cath, operation, surgery, dental operation, delivery, blood sampling, PV, Pap smear, X-ray to blood case, TB patient, counseling to TB patient, washing equipments, washing blood contaminated clothes, stretcher, waste handling	62	76.5
Need protective barriers?	No	7	8.6
	Yes - Sterile gloves, rubber gloves, gown, mask, apron, goggles	74	91.4

Table 6: Results of the assessment of IC at individual level (Cont.)

Topic	Answer	Number	%
In the past 3 months, enough protective barriers for your job?	Yes	44	54.3
	No - Many patients, many staff at a point, not available, inadequate number, no allocation, no requisition, no budget	37	45.7
Ever got accident at work?	Never	72	88.9
	Yes - Injection, off IV fluid, washing equipment, dispose a needle	9	11.1
Annual physical check-up?	Never	24	29.6
	Yes	57	70.4
Ever educated on IC?	Never	4	4.9
	Yes - Training, meeting, book, flyer, board, VDO/TV, colleagues talk	77	95.1
Knowledge on transmission • AIDS transmission through blood, bodily fluid except saliva, tear, sweat, urine and not through physical contact and respiration	Correct	71	87.7
	Incorrect Especially in non-medical staff	10	12.3
• Hepatitis B virus transmission Hep-B communicated through blood, bodily fluid except saliva, tear, sweat, urine and not through physical contact and respiration	Correct	66	81.5
	Incorrect Especially in non-medical staff	15	18.5
• TB transmission TB communicated through respiration, not blood, bodily fluid except saliva, tears, sweat, urine and not through physical contact	Correct	72	88.9
	Incorrect Especially in non-medical staff	9	11.1

According to Table 6 results of the assessment of prevention and control at individual level, there were 81 respondents consisting of 62 medical and 19 non-medical staff. There were 76.5% who replied that they had risk at work while 23.5% replied that they did not have, 91.4% needed protective barriers while 8.6% did not have protective barriers were reported to be adequate 54.3% while 45.7% not adequate in the past 3 months.

Accident at work, 11.1% experienced accident at work, while 88.9% never did, 29.6% never had annual physical check-up while 70.4% did, and 4.9% never had education on infection control, while 95.1% had.

Knowledge test, incorrect answers for AIDS transmission was 12.3%, Hepatitis B was 18.5%, and TB was 11.1% specially in non medical staff.

4.2 Plan and Activity for Problem Solution

Table 7: Action plan for infection control

Activity	Goal			Month												Budget	Source	Section
	Goal	Area	Episode	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep			
1. Main goal Standard disinfection and sterilization system Secondary goal Improvement of central supply		Dokkhamtai Hospital																
Activity 1.1 Reform and rearrange working area for IC	Central supply		2 times	/						/						120,000	Profit	Central supply Admin
1.2 Quality control on disinfecting and sterilization both producer and user	Central supply		48 times (producer) 3 times (user)	/ /	/	/	/	/	/ /	/	/	/	/	/ /	/	10,000	Profit	ICN

Table 7: Action plan for infection control (Cont.)

Activity	Goal			Month												Budget	Source	Section
	Goal	Area	Episode	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep			
1.3 Correctly transfer of clean and dirty objects	Central supply	Dokkhamtai Hospital	12 times	/	/	/	/	/	/	/	/	/	/	/	/	10,000	Profit	Central supply
1.4 Central supply study Mae Jai hospital	Central supply		1 time		/											10,000	Profit	ICN
1.5 Med/Non-med staff on peer review	Med/ Non-med		12 times	/	/	/	/	/	/	/	/	/	/	/	/	- **Total = 141,000**	-	ICN
2.**Main goal** All staff had knowledge and awareness on IC																		
Activity 2.1 Training on IC	Med/ Non-med		1 time		/											10,720	Profit	IC committee
2.2 IC evaluation by observation and questions	Med/ Non-med		1 time								/							
2.3 Supervise IC	Staff		2 times						/						/	- **Total = 101,720**	-	ICN

Table 7: Action plan for infection control (Cont.)

Activity	Goal			Month												Budget	Source	Section
	Goal	Area	Episode	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep			
3. **Goal** Efficient surveillance system		Dokkhamtai Hospital																
Activity 3.1 Systematic and continuous surveillance by																		
- ICWN setup and educate	Nurse		1 time		/											-	-	ICN
- Surveillance conducting	Nurse		12 times	/	/	/	/	/	/	/	/	/	/	/	/		-	ICWN
- Publicize or findings	Admin/ ward		12 times	/	/	/	/	/	/	/	/	/	/	/	/	-	-	ICN
3.2 Surveillance in provider by																		
- Annual physical check-up	Staff		1 time						/							80,000	Budget	IC committee

Table 7: Action plan for infection control (Cont.)

Activity	Goal			Month												Budget	Source	Section
	Goal	Area	Episode	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep			
- Staff health surveillance in high risk area	Ward /Special ward/ AIDS	Dokkhamtai Hospital	12 times	/	/	/	/	/	/	/	/	/	/	/	/	20,000	Profit	ICN
- Proper treatment of staff for work-related accident	Staff		1 time	/	/	/	/	/	/	/	/	/	/	/	/	-	-	ICN
- Personal protective barriers	All		2 times	/						/						40,000	Profit	ICN
3.3 Quality improvement from surveillance findings																		
- Accident at work	Staff/ Client		2 times	/						/						-	-	IC committee
- Waste management	All		2 times	/						/						- **Total = 140,000**	-	IC committee

Table 7: Action plan for infection control (Cont.)

Activity	Goal			Month												Budget	Source	Section
	Goal	Area	Episode	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep			
4. **Main goal** Sufficient information / public relation system		Dokkhamtai Hospital																
Activity 4.1 IC information team set up (passive/active)	Staff		1 time	/												-	-	IC committee
4.2 IC notice board	Staff/ client		4 times		/			/			/			/		2,000	-	IC committee
4.3 Announcement - Hospital - IPD	Staff/ client		12 times	/	/	/	/	/	/	/	/	/	/	/	/	-	-	IC committee
4.4 Leaflet of IC	Staff/ client		2 times		/						/					1,000 **Total = 3,000**	Profit	IC committee

Table 7: Action plan for infection control (Cont.)

Activity	Goal			Month												Budget	Source	Section
	Goal	Area	Episode	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep			
5.**Main goal** Efficient waste separation and disposal system		Dokkhamtai Hospital																
Activity 5.1 Waste management training to all staff	Staff		1 time		/											-	-	IC committee
5.2 Bin mapping and set up responsible area	Staff		2 times		/					/						-	-	IC committee
5.3 Supply enough bin and stretcher	All		2 times		/					/						20,000	Profit	IC committee
5.4 Standardize waste disposal system	All		2 times		/					/						- **Total = 20,000**	-	Communicable Disease control

Table 7: Action plan for infection control (Cont.)

Activity	Goal			Month												Budget	Source	Section
	Goal	Area	Episode	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep			
6. **Main goal** Clean environment Secondary goal Good water supply		Dokkhamtai Hospital																
Activity 6.1 Supply clean water and enough container for client	Client		2 times		/						/					2,000	Profit	ICN/ Admin
6.2 Extra water supply system	Staff		2 times			/						/				-	-	Disease control/ Admin
6.3 Quality wastewater treatment	Staff		2 times			/						/				1,000	Profit	Disease control
6.4 Educate cleaning staff for efficient work	Cleaning staff		1 time		/											-	-	IC committee
6.5 Rearrange clinic / unit	Staff		1 time		/											-	-	ICN/ chief
6.6 Improve ventilation in patient building	Client		2 times			/						/				-	-	ICN/ chief

Table 7: Action plan for infection control (Cont.)

Activity	Goal			Month												Budget	Source	Section
	Goal	Area	Episode	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep			
6.7 Pest and insect control	Client/ Staff	Dokkhamtai Hospital	2 times	/						/						-	-	ICN/ chief
6.8 Clean up and arrangement oriented	Client / Staff		12 times	/	/	/	/	/	/	/	/	/	/	/	/	- **Total = 3,000**	-	Chief
7. **Main goal** Efficient IC committee																		
Activity 7.1 Nominate IC committee	IC committee		1 times	/												-	-	ICN
7.2 IC committee meeting and reporting	IC committee		12 times	/	/	/	/	/	/	/	/	/	/	/	/	2,700	Profit	ICN
7.3 Study tour of IC committee	IC committee		1 times			/										1,000 **Total = 3,700**	Profit	IC committee

According to Table 7 Action plan for infection control, The study found that the main goal and secondary goal and activity were set. There were 7 main goals, according to justification and urgency as follow.

1) Standard disinfecting and sterilization 2) Knowledge and awareness of staff in infection control 3) Efficient surveillance system 4) Efficient information / public relation system 5) Efficient waste separation and disposal 6) Clean environment and 7) Efficient IC committee. The first goal had the highest budget (141,000 Baht) and the fourth goal had the smallest budget (3,000 Baht).

4.3 Implementation and Results

Problems and improvement of infection control are shown in the following tables

Table 8: Problems and improvement of infection control

Problems	Improvement solutions
1. Organization and management	
1.1 Management	
- No certain ICN in charge of IC, neglect some IC activity	- Nominated 2 ICN
- ICN as a chief high work load	- Delegate to assistant and ICWN, to distribute workload and empower the staff
- Vague policy on IC implementing and assignment, lack of responsible staff and continued follow up	- Revision of policy and action plan, clear assignment, making the current assignment to have continued work.
- Four meetings of IC committee, not constant	- Monthly IC committee meeting to revise the action plan and prepare the schedule.

Table 8: Problems and improvement of infection control (Cont.)

Problems	Improvement solutions
- No campaign activity of IC, no stimulation to the staff to follow the IC standard	- Waste and cleanliness campaign for clean, convenient and safe environment for the staff
- TB and HIV patients attend at the same place, easy to infect TB	- TB attend separately, to decrease the TB infection rate on HIV patient.
- No evaluation of service delivery point IC, there is no retrospective data	- Hospital /service delivery point /individual level coordination on IC, to revise and improve the work
- No follow up on IC, no continuum stimulation to the staff to follow the standard	- Continuously supervise & follow up, there are minute of monthly meeting and summarize the supervision
1.2 Implementation management	
- Autoclave out of order so the others equipment was overloaded	- Fix the autoclave, can work efficiency
- Lack of protective barriers e.g. face shield at central supply, apron at laundry, risk to get an accident	- Determine protective barriers need and supply them sufficiently, can protect and prevent the accident
- Lack of sterile set wrap, easy to contaminate	- Supply sterile set wrap, can prevent the contamination of equipment
- Lack of hand towel, repeated use of used the same: hand towel source of infection or disease.	- Supply hand towel (laundry after use),
- Patients and visitors share drinking glass at drinking service point, it is risky to infect TB.	- Use paper cup for water (disposable) and provide more drinking service point, to prevent TB and respiratory infection
- Patient trolley used for used equipments transportation to central supply and return sterile ones to the original service delivery points. The staff would get non-sterile equipment.	- Supply and separate trolleys for equipments, JICA supports trolley for sterile set. The staff will get sterile equipments.

Table 8: Problems and improvement of infection control (Cont.)

Problems	Improvement solutions
1.3 Environmental management	
- Limited room for working i.e ER and dental clinic (5x7.5m), it is risky to get an accident on work.	- Enlarge ER (5x2.5m plus) and dental clinic (5x7m plus), the budget is 330,000 Baht
- Poor ventilation at OPD and restroom, risk to infect TB.	- Build a separate restroom away from waiting floor, expand waiting floor of OPD (Budget 185,000 Baht)
- A mold on ceiling (opposite to sink) could be the infectious source.	- Improve the ceiling and re-painting to decrease the infectious source - Clean the medical equipment at central supply to get the same standard.
- Not a one-way system at central supply, poor ventilation, no closet for sterile and no medical staff in charge. It is risky for equipment contamination.	- Make one-way system for central supply, install ventilator, tile the floor, separate compartments for sterile (budget 54,786 Baht) and assign a medical staff. To get standard central supply and can control central supply work, get sterile equipment for the staff.
2.Infection surveillance 2.1 Surveillance in client	
- Fragmented surveillance record which the cause of lack of opportunity to surveillance the other cases.	- Surveillance record to all charts
- Surveillance done only at ward	- Additional surveillance at special ward and LR (admitted) which could develop the surveillance in every patients.
- Infection rate from on injection plug at ward (0.3%)	- Infection rate from retain foley's cath at special ward (0.2%) which is the chronic patients from the other hospital.

Table 8: Problems and improvement of infection control (Cont.)

Problems	Improvement solutions
2.2 Surveillance in hospital staff - Low coverage of physical check-up, only 64.7%, lack of early medical care.	- Campaign on physical check-up and coverage increased to be 75.8%. To increase the surveillance ratio. The staff will know the real situation can receive early care.
2.3 Environmental sanitation surveillance - Biological (spore test) and chemical (compound test) verification 8 times a year, lack of continuum quality control, not follow the standard. Some equipment may be contaminated, it may spread infection to patients.	- Quality testing of sterilization twice a month by biological test and chemical test every autoclave set, always do physical inspection before during and after use to get the standard sterile equipments.
3. Prevention and control 3.1 Place - No separate room at special ward, the other patient, which admitted after, could be infect from TB, respiratory disease. - Disorganized at laboratory, central supply, and laundry, risking an accident.	- Set a separation room, easy to control and prevent the infection to the other patient. - Campaign the routine clean-up, the office will clean, convenient and safe for the staff.
3.2 Equipments - Uncategorized equipment at OR, not convenient for using, take more time to find the equipment. - Some of sterile set had no label or wrapped by a single wrap, the equipment could be contaminated and not follow the standard	- -Categorize and label medical equipment for convenient use. - Supply more wrap (2 per set) - Label all sets, can control the standard of equipments.

Table 8: Problems and improvement of infection control (Cont.)

Problems	Improvement solutions
3.3 Cleaning, disinfecting and sterilization control	
- Central supply and laundry were not cleaned (private cleaning company)	- Enhance more cleaning to all corners and provide primary supervision to follow the right action, clean environment.
- Equipments were cleaned by different service delivery points so that the equipment control systems are not the same.	- Each service delivery point sends its used equipment to central supply for cleaning to be the same cleaning system to disseminate the infectious equipments. - JICA supports cleaning machine to decrease the risk of accidents of the staffs.
3.4 Service control	
- Inconsistent hand wash before service. It could be infected from patients.	- Enhance hand washing to decrease likelihood of infection from staffs' hands to patients. - Training on hand washing in infection control for knowledge and enhance awareness of staff.
- Inconsistent protective barriers wearing	- Urge protective barriers use to protect the infection spreading from hospital staff to patients.
- Disposing of used needles and blades into a paracetamol bottle without lid it is risky for accident.	- Supply covered gallons for used needle to protect injection.
- Accident at work was 7.1% (6 cases : 1 dentist, 5 nurses)	- Reporting of accident case through chief of service delivery point or directly to ICN, in case the staff do not want to reveal the cases. The staff take ARV drugs to prevent HIV.

Table 8: Problems and improvement of infection control (Cont.)

Problems	Improvement solutions
	- Accident form work was 5.8% (5 cases) •1 IPD nurse was injured from IV fluid needle. The staff took the blood test, the result was negative. Blood test result of the patient was negative. •1 doctor had an accident from body fluid flying into the eye while tapping the lung. The doctor did not take the blood test but take ARV. Blood test result of the patient was negative. •1 Nurse Aids of laboratory service delivery point had an accident, by touching blood which flew from a tube. Blood test result of the patient was negative. •1 Laboratory staff was injured by a used needle while drawing blood from a patient. The staff did not take blood test. Blood test result of the patient was negative. •1 Laboratory staff was injured by a used needle because of slipped syringe. The staff did not take blood test. Blood test result of the patient was negative.

Table 8: Problems and improvement of infection control (Cont.)

Problems	Improvement solutions
3.5 Environmental sanitation control	
- Gloves, underwear found in wastewater treatment system	- Educate patients and family on waste disposal, focusing on diarrhea cases
- Mixed type of waste	- One-way route of waste collection, private company collects at 8 am and 3 pm with protective barriers on
- Mixed non-infectious and infectious waste (trash and garbage)	- Separate waste
- Large quantity of waste, full of smoke when burned, smelly (25-kg incinerator)	- Reduced use of disposable syringe
- Excessive number of bins	- Survey waste disposal, waste mixed at central supply and ER - Mapping of bins and rearrange the position and re-categorize: (Figures 5,6) >Before: 93 trash bins, 12 garbage bins, and 24 infectious waste bins. >After: 59 general waste bins and 24 infectious bins.
3.6 Academic development - No health education media, lack of knowledge or get less knowledge.	- Provide health education through hospital announcement daily in ward, and during campaign in OPD - Publish leaflet on nosocomial infection prevention practices - Produce notice board on IC at OPD. To give the appropriate knowledge to the staff and the patients' family.

Table 8: Problems and improvement of infection control (Cont.)

Problems	Improvement solutions
- No research at hospital. There is no principle and guideline to develop the research.	- Conduct a study with provincial health office staff which participate in implementing to share the experience and get the research guideline for continuum development.
- Some of staff lack knowledge on common communicable disease and Infection control. Therefore, inappropriate action on prevention and control	- Study tour on IC work at Maejai hospital Phayao province to exchange work experience and improve the working system. - Peer review activity started, to exchange the opinion of the staff and give the appropriate knowledge. - Set standard operating procedure on: •Nosocomial infection surveillance •Personal protective barriers •Hand washing •Guideline of prevention accident from sharp objectives. •Cleaning guideline for building and tools, the aspect to practice the same standard guideline. - Training on common communicable disease and IC with pre and post-test to medical and non-medical staff. To import knowledge to the staff to follow the guideline of infectious control.

According to Table 8 Management: IC committee revised and redistributed responsibility, had monthly meeting, collaborated in development of IC work, raised a

campaign on waste management, separated TB patients, evaluated and supervised IC work.

Implementing: Autoclave fixed, supplied protective barriers sufficiently, supplied wraps and hand towels sufficiently, supplied paper cups at drinking spots, applied trolleys, and JICA supported sterile set trolleys.

Environmental management: Enlargement of emergency and dental room, adjusted central supply to a one-way system with a medical staff at central supply.

Figure 5: Bins management of Dokkhamtai Hospital before development

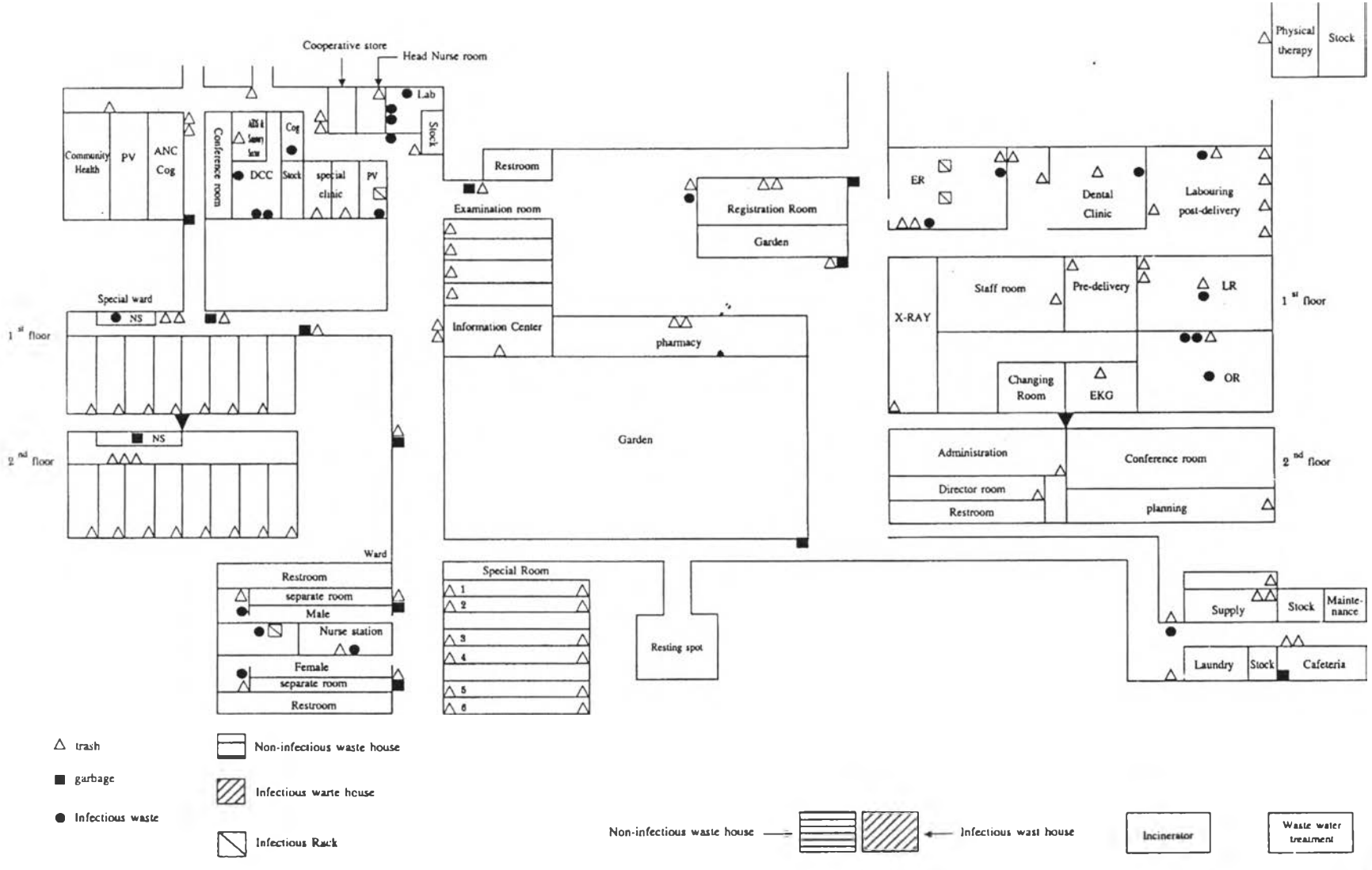
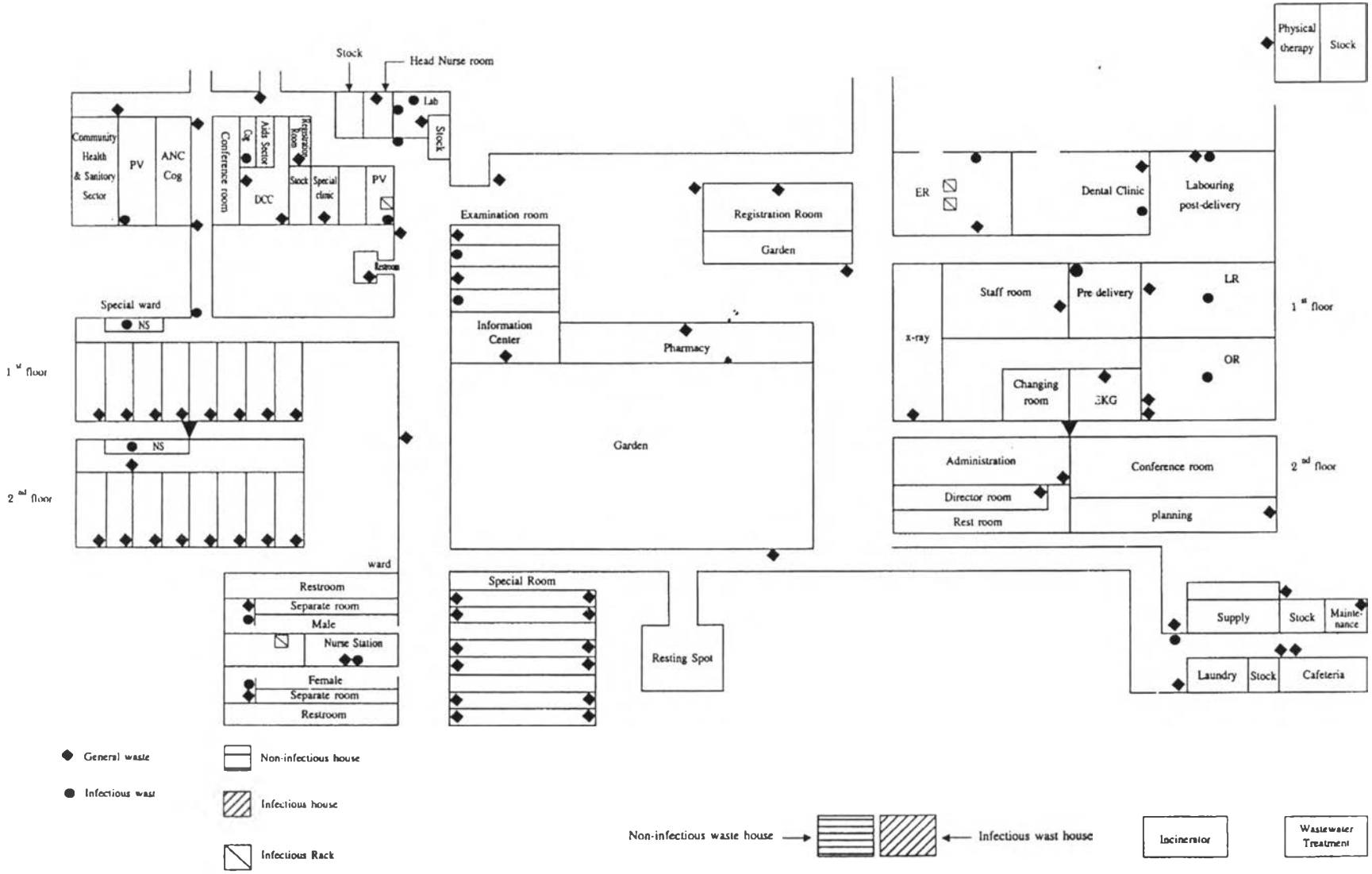


Figure 6: Bins management of Dokkhamtai Hospital after development



Surveillance in client: Expansion of surveillance to clients in special ward and labour room, Catheter-associated urinary tract infection was 0.2%.

Surveillance in staff: annual physical check-up increased from 64.7% to 75.8%.

Environmental sanitation: Sterilization verification twice a month of biological test and chemical test at every set, and always physically checked.

Prevention and control: A separate room at special ward, labeled sterile set and well categorized, sent used equipments from all service delivery points to central supply for cleaning and JICA supported the machine.

Service control: Encouraged hospital staff to use protective barriers, accident rate was still at 5.8%.

Environment and sanitation control: Educate patients and family on waste disposal and focus diarrhea case, one way route of waste collection, waste separation promotion but still mixed disposal at ER and central supply, pre and post development mapping.

Academic development: Training on common communicable diseases and IC to medical and non-medical staff.

Table 9: Comparison of test score (30 items) of medical staff before and after training

staff	Pre-test		Post-test		p-Value
	Mean	SD	Mean	SD	
Medical staff (N=62)	18.3	2.6	24.1	2.9	0.00

According to Table 9 Comparison of knowledge outcome, we used independent t-test to examine the difference in knowledge before and after training of medical staff that rose from 18.3% to 24.1% (P<.05) There were significant increase of knowledge after the training.

Table 10: Comparison of test score (25 items) of non-medical staff before and after training

staff	Pre-test		Post-test		p-Value
	Mean	SD	Mean	SD	
Non-medical staff (N=23)	16.7	2.6	21.6	2.1	0.00

According to Table 10 Comparison of knowledge outcome,we used independent t-test to examine the difference in knowledge before and after training of non-medical staff that rose from 16.7% to 21.6% (P<.05) There were significant increase of knowledge after the training.

4.4 Evaluation After the Implementation

After the Participatory Infection Control System Development of Dokkhamtai Hospital was implemented, Focus Group Discussion (FGD) was used to evaluate at the level of IC committee, medical and non-medical staff. The results are as follow.

Issue 1 The assessment on infection control in the hospital

1.i What assessment of infection control was about?

1.2 Who played role of the assessment?

1.3 How was the assessment done?

Table 11: Results of the assessment

IC committee	Medical staff	Non-medical staff
1.1 The assessment was about - ICN evaluated the IC of all systems e.g. administration, surveillance, accident at work, prevention and control, environmental sanitation, etc. - ICWN assessed the situation on surveillance, prevention and control, etc. from real evidence, emphasizing surveillance, environment, material and equipment, reagents, etc.	1.1 The assessment was about - Waste and sharp tools disposal e.g. needle, blade - Hand washing technique - Ventilation - Separation of rooms and equipment - Infection surveillance on risky function e.g. cath insertion, IV fluid	1.1 The assessment was about - Environment, cleanliness, mixed waste disposal from patient and relative - Mixing of contaminated and used clothes - Central supply was not one-way, no label on sterile set - Contaminated stretcher was not cleaned till the following morning - Sharp tool disposal box was always full with no lid

Table 11: Results of the assessment (Cont.)

IC committee	Medical staff	Non-medical staff
1.2 Role of IC assessment - ICN and assistant evaluated at hospital level - ICWN assessed IC with staff in the service delivery point and they talked	1.2 Role of IC assessment in service delivery point level - All staff in the service delivery point participated in the assessment of IC problem and reported to ICWN or service delivery point chief or the meeting	1.3 Role of IC assessment in service delivery point level - Chief, ICWN, and practitioner in the service delivery point and discussed in the meeting
1.3 IC problem assessment process - On site assessment by a form from the Provincial Health Office	13. IC problem assessment process - All staff assessed on site IC problems and reported to the chief, ICWN, or discussed in the monthly meeting, if solvable immediately it was solved. - ICWN brought the problem into IC committee meeting, chief brought the problem into hospital board meeting (Previously, IC assessment was done by ICN)	13. IC problem assessment process - Assessed in one's responsibility and reported if problem found

According to Table 11 The results of assessment on IC problem by using focus group discussion at the 3 levels was found that:

- IC committee: ICN and assistant assessed together in all systems, using provincial office's form.
- Medical staff: Assessment done together with staff on waste, disposal sharp tools, technique, ventilation, separation room utensil, surveillance. They had monthly meeting, ICWN recorded and brought to IC committee.
- Non-medical staff: Staff discussed on problems on duty e.g. setting, cleanliness, clothes separation, central supply not one-way, unlabeled sterile set.

Issue 2 Planning for IC problem solution

2.1 How were the findings from assessment utilized?

2.2 What are the goals of IC implementation?

2.3 Who plays role in the planning for IC?

2.4 What are the processes of planning and implementation?

Table 12: Results of the planning and IC implementation

IC committee	Medical staff	Non-medical staff
2.1 The finding was utilized by - Reported to the hospital board and to the director of the hospital and it was used for IC problem solution guideline - Created guideline on IC surveillance, protective barriers use, accident from sharp tools prevention - Waste campaign - Expanded coverage of surveillance to other service delivery point with admitted patient and work related accident of staff - Staff training and reporting once accident occurred, to the chief and ICN with report form, enhanced follow up and stocked anti HIV drug at emergency room within 5 days at the pharmacy	2.1 The finding was utilized by - Used for planning - Enhanced the single use of hand towel after hand washing - Needle stick, previously it was not obliged to report, but after training it was reported more and managed in anti HIV drug and reporting form supply - Pulmonary TB, previously surgical mask was used, at present HEPA mask is used and staff has increased awareness - Waste was mixed up at special ward, the problem was solved by providing infectious waste bin at infectious patient service delivery point e.g. TB, HIV - Separately disposed needle in a proper container and disposed used syringe in infectious waste bin	2.1 The finding was utilized by - IC practice reinforcement in service delivery points - Rearrangement of equipment to be in order, convenient and safe e.g. Oxygen tank - Supply sufficient protective barriers, the administration supported and the central supply distributed - Systematic transportation / exchange of medical equipment using a trolley of used equipment to central supply and another sterile set trolley to return

Table 12: Results of the planning and IC implementation (Cont.)

IC committee	Medical staff	Non-medical staff
2.2 Goal - IC focused on target group for the achievement at hospital level, staff and client	2.2 Goal - Long term planning to solve IC problem e.g. cleaning, environment, supply, etc. in IC committee meeting / emphasizing infection control surveillance	2.2 Goal - Improvement planning for a better IC work development
2.3 Role in planning - IC committee played major role in IC planning, Together they considered IC situation and planned for solution, ICN added in activities for higher coverage, with academic references. This enhanced participation and ownership.	2.3 Role in planning - ICWN, Chief, and staff shared opinions - ICWN was important as a representative, bringing IC problem into IC committee for hospital planning	2.3 Role in planning - All staff improved IC by sharing opinions in service delivery point meeting to solve the problem
2.4 IC problem solving process - IC committee discussed on service delivery point's problem and prioritization, set goal and activity	2.4 IC problem solving process - Monthly meeting at all service delivery points discussing on IC problem and solved if possible e.g. peer review on littering, hand washing, wearing mask when taking care of TB patient - ICWN brought problem into IC committee for hospital plan	2.4 IC problem solving process - Monthly meeting, discussing on IC problem and finding solution e.g. expired medical equipment, and no re-sterilized, self re-check, trolley operation delayed, etc. - More discussion brought new ideas and advices, more attendance brought more exchange At present, everyone thinks and acts together

According to Table 12 Results of planning for IC problem solution by focus group discussion at 3 levels was found that.

- IC committee: Utilized information for guideline formulation of surveillance, protective barriers, accident from sharp tools, cleaning campaign, surveillance system improvement, reporting. For goal, set up goal of each service delivery point and IC committee was important for planning by working together, using information, and working together.
- Medical staff: Using assessment information to set agreement of practice on hand washing, procedure in accident case, protective barriers use, waste disposal, sharp tools. For goal, long-term goal was set e.g. cleaning, environmental setting, supplying, surveillance, IC practices. All staff played a role on sharing ideas and ICWN brought them to IC committee meeting.
- Non-medical staff: Work improvement includes reorganizing storage, preparation of protective barriers, good exchange. For goal, goal set up for work improvement, good practices of IC. Everyone talked in a meeting with full participation.

Issue 3 Problem solution and obvious IC development

3.1 How the administration was developed?

3.2 How the administrative perceives and support the development?

3.3 How was done for the surveillance improved? (client, service provider, environmental sanitation)

3.4 How was the information on surveillance applied for the development?

3.5 How was the prevention and control developed? (place, equipment, cleaning, disinfecting, sterilizing, service, environmental management, food sanitation, and academic development)

Table 13: Results of IC solution and development (obviously changed)

IC committee	Medical staff	Non-medical staff
3.1 Administration - Improved central supply to one-way system, labeling date on every sterile set - Set up standard of equipment transportation between the central supply and other service delivery points - Central supply provided equipments. Previously, each service delivery point purchased separately now they purchase through IC committee. The administrator supports this practice for a better holistic view of IC work. - IV fluid with colorcoded. Use color sticker to reveal the third day from admission e.g. admitted, Monday, orange sticker. - Assessment of IC, activity record, etc. - Supply disposable paper cup for drinking water to prevention spread of infection	3.1 Administration - Coordinate with other service delivery points to improve IC, e.g. steriled equipment distribution - Monthly meeting - Written prove / recording of work e.g. IV fluid, switching	3.1 Administration - Brain storming in the meeting and follow the agreement - Improve waste bin position, reduce waste, separate waste - Submit used equipment to the central supply and return the sterile set to service delivery points

Table 13: Results of IC solution and development (obviously changed) (Cont.)

IC committee	Medical staff	Non-medical staff
- Supply saline for wet dressing (previously produced by non-medical staff: poor quality) - Set up route of waste collection to the disposal		
3.2 Administrator - Support budget for renovation and building an isolation room - Support meeting - Support equipment	3.2 Administrator - Support budget, renovate building - ICN support work and encourage	3.2 Administrator - Support meeting - Support equipment - Chief educate and supervise e.g. mask use and play leading role in practice
3.3 Problem solution on surveillance - Client surveillance in all charts, IV with color coded for all admitted patients - Emphasis on staff physical check-up, more staff attend. - Investigation of sickness of staff, a leave for the sick staff, and follow up - Environmental sanitation, a test of treated water in the wastewater system met the standard, drinking water bought from a company approved by Food and Drug Administration	3.3 Problem solution on surveillance - Surveillance record on charts. - In case of infection, records are collected and send to ICN and IC committee. - For staff, emphasis on annual physical check-up, using both public and personal persuasion - Environmental sanitation, focus on sterilization	3.3 Problem solution on surveillance - Encouragement for annual physical check-up and personal persuasion - Spore test twice per month (every other week), all passed, and 100% test of sterile set for OR and LR

Table 13: Results of IC solution and development (obviously changed) (Cont.)

IC committee	Medical staff	Non-medical staff
3.4 Information for IC problem solution - Coverage of information on all admission - A reporting form and manual for accident at work - Enhanced annual physical check-up coverage	3.4 Information for IC problem solution - Information of IC surveillance in staff, enhance participation and awareness of staff through aseptic technique practice	3.4 Information for IC problem solution - Spore test was not monthly, now twice a month. More reliability of equipments.
3.5 Prevention and control - Separation room for infectious patient e.g. TB at ward and another one at special ward. - Central supply became one-way system. - Signs for clean / contaminated areas. - Supply a cabinet for medical equipment for Health Promotion service delivery point (Community Health) and medical tools are in 'first-in / first-out' system, and shelf life not exceeds 7 days	3.5 Prevention and control - -Separate infectious patient, including tools, utensils, etc. after infectious period, move to the back of ward, ventilate the separate room after use - Separate hand washing sink from equipment washing sink - Single pack of medical equipment (last 6 months) with closed cabinet - Dry container and forceps, and change every shift - After use, soak equipment in detergent and reagent, then send to central supply for decontamination and sterilization	3.5 Prevention and control - Daily cleaning of hospital areas by a private company. ER is cleaned by staff because frequent contamination. - Sterile equipments are in 'first-in / first-out' system also for convenience, re-sterilize sets exceeding 7 days - Send used equipments to central supply - Utensils in separation room are to be cleaned, heated, and dried in sunlight - Use protective barriers, wipe out blood droplets out with paper or cloth, put in infectious waste bin, and soak the floor with 70% alcohol for 30 minutes and clean.

Table 13: Results of IC solution and development (obviously changed) (Cont.)

IC committee	Medical staff	Non-medical staff
- Only central supply decontaminates and sterilizes used equipment and distributes to original service delivery points. JICA supports cleaning machine and oven. - Utensils of separation room are excluded, e.g. cup, tray, and heated after use - Drinking fountain supplied with disposable paper cups for prevention - Follow aseptic technique, wear HEPA mask on contact of TB patients in separation room, a single use of hand towel - Put sharp tools into a covered gallon, separate infectious waste bin from general one, set one-way route of waste collection by trained private company staff in rotation - Training on IC to all level staff, emphasizing on waste management, educational board on IC provided	- Follow aseptic technique under supervision of chief, change IV fluid set every 3 days, change urine bags and cath every 7 days - Advice patient and relative about keeping clean and trash disposal, it was fragmented due to many groups of visiting relatives. -Put used needles in a gallon and used syringe in an infectious waste bin - Food sanitation emphasizes on clean food and covered food cart - Training on IC to hospital staff and advice private company cleaning staff about hospital cleaning - Monthly meeting at all service delivery points to exchange information - Randomly check bin whether waste is mixed - Educational board on IC	- Wear protective barriers where transporting a bleeding patient and use rubber sheet on stretcher, lift the patient if little bleeding, and lift both patient and sheet if much bleeding transfer stretcher - Separation of waste - Always use mask when transfer coughing or pulmonary TB patient - Training on IC and study tour to Maejai hospital

According to Table 13 Results of IC problem solution, obvious changes can be seen, by focus group discussion at 3 levels was:

- IC committee: Management of one-way system at central supply, label all sterile sets, systematic exchange, IC committee approved the equipment purchase, IV fluid with colorcoded, IC training, IC assessment, recording, paper cups for drinking, waste collection route. Administrator supported budget, training, and supplied equipments. Surveillance information was used for the improvement, by setting up surveillance system to all admitted cases, using IV fluid with colorcoded, formulating guideline for accident case. Staff physical check-up was increased. Environmental monitoring was water testing from treatment system and it passed. Sterile medical equipment was tested twice a month and was negative. Prevention and control, separation room was set up and its utensil was separately cleaned and decontaminated. Gave a cabinet to Community Health service delivery point. Cleaning and decontaminating at central supply except dental clinic. Emphasis on aseptic technique, sharp tool disposed in a gallon with a cover lid, waste separation into infectious and general waste, training on IC with study tour, and educational board for IC.
- Medical staff: Management; collaboration with service delivery points to improve infection control, meeting in service delivery point monthly, recording, administrator supported budget, restructuring of ICN and chief, encouragement at work. Problem solving; development for surveillance, staff made record of each chart. Prevention and control; separation room for communicable cases, separation of utensil, single pack of medical

equipment, using dry forceps, emphasis on aseptic technique, environmental control on littering of patients and relatives, needles and syringes separately disposed, food transportation, IC training, monthly meeting in service delivery point, randomly check waste bin, and educative board on IC.

- Non-medical staff: Management; brain storming in monthly meeting, adjustment of bin positioning, separation of waste, central supply centralizing, administrator supported training, equipment and tools, chief advised on practice, and led the team. Surveillance, staff were aware of physical check-up. Monitoring; spore test twice a month and always inspect big sets. Prevention and control; reorganized place and office including equipment, cleaning by private company, first-in / first-out system of equipment, central supply sterilize used equipment, separation room utensil cleaned and heated and exposed to sunlight, emphasis on aseptic technique, blood contamination procedures, bleeding patient handling, technique coughing patient transportation, separation of waste, and training on IC and study tour.

Issue 4 Follow up and evaluation on IC

4.1 How was IC followed up and evaluated?

4.2 Who played such role?

4.3 What are the results?

Table 14: Results of Follow up and evaluation on IC

IC committee	Medical staff	Non-medical staff
4.1 Follow up and evaluation on IC - A follow up form was used at to all service delivery points by ICN, assistant and provincial official. Staff support the follow up as it raises their awareness	4.1 Follow up and evaluation on IC - ICWN and chief play supervision role and warn if violated. Now staff can warn one anether. ICWN and chief follow up and evaluation on IC	4.1 Follow up and evaluation on IC - Hospital level, ICN and the team evaluate - Service delivery point level, ICWN and chief supervise and caution
4.2 Role - ICN, assistant and provincial official play such role	4.2 Role - ICN, assistant and provincial official play such role - ICWN and chief play supervision role in service delivery point level	4.2 Role - ICWN and chief play supervision role in service delivery point level, a declaration is needed when violated, peer-review is practiced, ICN periodically checked
4.3 Results - Strong IC implementation - Collaboration of staff in problem solution and IC development, improve IC and systematize work - More perception of role - IC development in many aspects	4.3 Results - Clear IC implementation - Peer-review possible - ICWN is important bringing problems in to IC committee meeting - Enhanced analytical skill - More team working - Monthly meeting updates changes and development to all staff	4.3 Results - Better understanding and problem solving in all service delivery points - Increase knowledge from training, talk, and advices - Better system of central supply and transporting

According to Table 14 Results of follow up and evaluation of IC by focus group discussion at 3 levels was :

- IC committee: Evaluation all service delivery points by ICN and assistant and provincial official using the form. Present implementation, IC team is strong. Collaboration is enhanced for problem solution. Work development occurs in many systems.
- Medical staff: ICWN followed and evaluated in practice. ICN and assistant and provincial official evaluated. At present, IC work is clear, peer review and warning occurs. ICWN is important, bringing problems to IC committee, staff know problem and work in team, with monthly meeting.
- Non-medical staff: ICWN played role in follow up and evaluation in practice. ICN periodically follow up. At present; staff know and understand more, gain knowledge from training, discussion, and equipments sent to central supply.

Issue 5 Problems and obstacles

Table 15: Problems and obstacles

IC committee	Medical staff	Non-medical staff
5.1 Problems and obstacle - Excessive number of clients - Overload duty e.g. IC committee members belong to many committees - Supply of equipment depends on budget	5.1 Problems and obstacle - Lack of awareness on protective barriers use - Some patients and relatives are littering	5.1 Problems and obstacle - Some service delivery point has mixed waste - Degradation of wrap for autoclave due to many use

According to Table 15 Problem and obstacle from focus group discussion, it was:

- IC committee level: Excessive number of client, Overloaded duty, supply of equipment depends on budget.
- Medical staff: Lack of awareness on protective barriers use, some patients and relatives are littering.
- Non-medical staff: Some service delivery point has mixed waste. Degradation of wrap for autoclave occurred due to many uses.