SPECIAL ARTICLE

Nosocomial Infection Control in the Children's and Maternity Hospital "Harapan Kita". Early Warning System

by

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Abstract

In a children's and maternity hospital, where many high risk patients are hospitalized, a comprehensive but cheap surveillance system is of paramount importance for the improvement of hospital administration, formulation of hospital policy on antibiotic use and the nosocomial infection control programmes.

The epidemiological data were primarily collected in a comprehensive built-in monitoring and surveillance programmes of this hospital, and had been distributed throughout the hospital periodically.

The collected data had been broken down into (1) summary of ten leading infectious cases of hospitalized patient by tentative and final diagnosis; (2) types of culture by ward; (3) number of culture by sex and age group; (4) types of bacteria by ward; and (5) types of bacteria by culture. The classification of wards is indirectly inherent to the social – strata of the patients. For the refinement of information, they were broken down into data on bed-occupancy by ward, and data on hospitalized patients by sex and age groups as well.

Introduction

The Children's and Maternity Hospital "Harapan Kita" is a unique blend of a children's hospital and a maternity hospital. It is a healthful hospital where there is a clear-cut segregation of outpatient and inpatient areas, "clean" and "contaminated" areas, connected by service and public corridors, and meets the requirement of the basic principles of healthful housings.

Among the greatest contributions current medicine and health have made to mankind is the control of infectious diseases, and of the parasitic investations of man. With our knowledge of disease causation, dissemination, prevention, and treatment, and together with epidemiological observations, man should never again be devastated by epidemics as he was in the past. And this is very true for nosocomial infections (Rasjid, 1985c).

Continued total surveillance.

In hospitals it is necessary to keep the individuals at risk, especially known contacts, under continued surveillance. The best surveillance method is that keeps all link of the infection chain. Those are infectious agents (patients and laboratory positive isolates), route of transmission and levels of immunity (Rasjid, 1986).

Hospital epidemiologic study requires an accurate and complete record for each case, based on the initial data furnished by the attending physicians. He may see only one segment of the total cases, but this case may be the key to the solution of the source of infection.

The clinician considers the individual as a unit of study. Each individual case of illness in his area under consideration is a symptom of a sign, as a fractional part of a complete picture that must be assembled into syndromes. The epidemiologist gives consideration to a group of patients as the unit of investigation, a rather difficult concept for most physicians to grasp, and hence are quite reluctant to support the epidemiological report system. A report of nosocomial infection is very simple: It contains the name, age, sex and the medical record number, name of the ward; the name of the attending physician together with a short medical report, and measures that have been taken. However, many physicians are quite lax in prompt reporting of cases of nosocomial infections that occur in their wards. Oftentimes the disease is not reported because the physician is not alert to the potential consequences of certain invasive medical procedures (Rasjid, 1985b).

General early warning system.

A workable system for reporting of all patients with communicable diseases hospitalized must be divised. The physician on duty at any point of entry in the hospital has a very real responsibility for the success of the system, since he is the first person to encounter the infections in those points of hospital entry. He, who first sees the patient, makes a tentative diagnosis and institutes tentative isolation measures. He

may ask for any necessary laboratory aids in diagnosis. He is answerable to consultants, doctor-supervisors or other responsible channels. The quality of the tentative diagnosis depends upon the quality of the support services (Rasjid, 1985c).

Simple early warning systems have been set-up in our hospital, for monitoring of: (1) hospitalized infections or contagious patients; (2) the results of infectious laboratory specimens; (3) a-and antiseptic, and sterilization procedures; (4) invasive procedures, and suspect nosocomial cases due to these procedures; (5) the results of the periodical medical check-up of personnel; (6) sanitary facilities and amenities (Rasjid, 1985d; Rasjid, 1985e).

Simple early epidemiological warning system

Every patient admitted to the hospital through emergency or outpatient clinics was registered. Everyday we collected the registered infectious or contagious patients, analyzed them and reported them as "ten leading infectious hospitalized patients", weekly. Advice will be given to the administration of functional units and support services in line with the nosocomial infection control procedures.

As ilustration, dengue haemorrhagic fevers replaced gastroenteritis as the first and second leading, hospitalized patients since March 1987. Through the administration we advised the augmentation of control and the elimination of breeding places of Aedes in the hospital area and surroundings.

System of well-recorded daily data of hospitalized patients at any entry point of the hospital provides our hospital and medical administration the opportunity for quick assessment and quick decision as well. Moreover, daily morning report by the doctors of the afternoon and night shifts enhances their knowledge of what occuring in the hospital in the last 24-hours. The reliability and validity of the data depend upon the quality of the medical diagnostic and support services. Confidence limits can be set-up by comparing the discrepancy of the tentative diagnosis to the final one. Factors inherent to under -, over -, and misdiagnosis can be studied and discussed to augment the quality of the front office services of the hospital.

A more reliable and more valid, but time-consuming final diagnosis can be used for similar assessment. The speed of the data collection, tabulation and presentation depends upon the number of days of hospitalization, time-limit being allocated for the attending physicians to submit the summary report of the cases, and the time being consumed by the Medical Record Service to compile, tabulate and present the list of final diagnosis. For quicker presentation of final data it is advisable to categorize the patients into 4 groups: the acute, sub-acute, chronic and dead patients. In DHF/DSS cases, from the final diagnosis 65.7% cases were serologically confirmed (Harahap, 1987). We are, at the moment, developing this last potential system of surveillance, particularly for studying secular trends of hospitalized communicable cases.

Microbiological early warning system

Monitoring of patients suspected of contracting nosocomial infection through microbiological procedures is one of the ideal nosocomial control programmes. In our hospital due to limited budget, we monitor the entering and potential in-dwelling hospital microorganisms through collecting and analyzing the result of microbial cultures and sensitivity tests.
Data on the resistance of common pathogens to antimicrobial agents and their summaries were issued regularly to the clinicians in writing, as well as the appropriate modifications.

Monitoring of hospital host factors

An epidemiologic approach to the study of the causes of nosocomial infections should take into account the *habits of the medical staff and personnel* which may favor the development of nosocomial disorders.
Habits relating to discipline, cleanliness, sanitary procedures in food and milk preparation, and general a-and antiseptic procedures. They are inherent to the habits in the home and the social customs relating to the spread of infectious agents which influence individual health habits.

It is necessary to maintain a continuous surveillance on the immune status of the hospital population by checking their immunization records. The Employee Service Clinics should have them in the personnel record and keep them up-to date. Special attention should be given to personnel working in hospital eating establishment, laboratories and special care and isolation units. Notation with "PR" (high risk) or "R" for potential risk at the front page upper corner of the personnel records will immediately draw the attention of the physician examining them.

A study of the social aspects, social perception of infectious disease, and the history of immunization among the ward hurses and auxilliaries is on – going, complementary to the periodical medical check – up, including monitoring of hepatitis virus B cases.
Periodic refresher courses and discussions relating to nosocomial infections had been carried out, in class and bed-side, or ward-rounds teaching. Evaluation through *observation-participation techniques* – seems more reliable than the immediate pre-and posttests.

Epidemiologic approach

To a certain extent the epidemiologic approach has been carried out in the study of nosocomial infection in our hospital. The collected data were broken down into (1) summary of ten leading infectious cases of hospitalized patients (table 1, 2, 3); (2) types of culture by ward (table 4); (3) number of culture by sex and age group;

(4) types of bacterial by ward (table 4); and (5) types of bacteria by culture. The classification of wards is indirectly inherent to the social-strata of the patients. For the refinement of information, they were broken down into data on bed-occupancy by ward, data on hospitalized patients by sex and age-groups (Rasjid and Yusuf, 1987).

Composite review chart

Recording the onset of early symptoms and signs of nosocomial infection in a review chart is one of the easiest ways for further discussion and observation by both sides, the physicians and the hospital epidemiologist. This can be carried out by regular daily ward rounds by the ward doctor accompanied by the charge nurse in the ward to examine and to review patient's treatment. The results of the rounds are recorded in the medical records to be plotted afterwards in the review chart, in addition to the vital signs taken in the last 24 hours. The ward doctors should also take into consideration the observation of either the doctors on duty or consultants, and whenever necessary the written advices are noted in the review chart.

A more complete data concerning the relationship between invasive procedures and instrumentations and their probable related nosocomial infections, for convenience, should also be printed in the same chart. Such a review chart may be called: a "composite review chart" (see chart). Information as to whether the patient invasive instrumentation has been carried out are recorded in the composite chart. Surveillance should be carried out for all patients, whether infected or not (Rasjid, 1985a).

Conclusions and recommendations

1. In developing countries, where there is limitation of budget, early warning system is of great help in monitoring nosocomial infections.
2. We can observe the hospitalized infectious and contagious cases, including the potential in – dwelling microbes, through routine registration and examinations.
3. Composite review charge can be used for rounds and case discussion and presentation as well for quick assesment.
4. Discrepancies between tentative final and confirmed serological diagnosis can be reduced through case discussion.
5. Point to ponder: Case input and processing give more or less some information, which is better than total blindness of what occuring in the hospital. This system has been carried out in our hospital, and we offer it to be tried by other hospitals and medico – health set ups.

Table 1 : *The ten leading hospitalized infections cases by out patient tentative diagnosis week IV, July, 1987*

No.	TYPE OF DISEASES	T O T A L
1.	Gastroenteritis	31
2.	DHF / DSS	21
3.	Fever, for further investigation	12
4.	Typhoid fever	8
5.	Premature and RDS	6
6.	Obs. Febrile convulsion	5
7.	Diphtheria	4
8.	Bronchopneumonia	4
9.	Tetanus	3
10.	Asthmatic bronchitis	3
11.	E N T	3
12.	Hyperbilirubinemia	2

Note :
– *One patient can suffered from more than one disease.*
– *Hospitalized pediatric patients, week IV, July, 1987 = 126 persons.*

Table 4 : *Microbial distribution of positive isolates of alimentary pathogens during September 1986 until June 1987*

NO. TYPE OF BACTERIA	POSITIVE	%
1. Escherichia coli	101	31,86
2. Klebsiella aerogenes	67	21,14
3. Citrobacter species	39	12,30
4. Proteus vulgaris	36	11,36
5. Enterobacter aerogenes	24	7,57
6. Pseudomonas aeruginosa	12	3,79
7. Staphylococcus aureus	10	3,15
8. Salmonella typhi	9	2.84
9. Escherichia freundii	4	1,26
10. Escherichia intermedium	2	0,63
11. Streptococcus pyogenes	2	0,63
12. Proteus mirabilis	2	0,63
13. Alkaligenes species	2	0,63
14. Streptococcus viridans	1	0,32
15. Streptococcus faecalis	1	0,32
16. Klebsiella species	1	0,32
17. Enterobacter species	1	0,32
18. Alkaligenes met alkaligenes	1	0,32
19. Alkaligenes faecalis	1	0,32
20. Yeast cell	1	0,32
TOTAL SPECIMENS	317	100,03

Source : Result from the wards, issued by the microbiology laboratory of RSAB "Harapan Kita".

Table 5 : *Antibiotic sensitivity by type and sex (50% and over)*

ANTIBIOTIC	TOTAL			F			M		
	−	+	%	−	+	%	−	+	%
Sulfamethaxazole/Trimetoprim	−	−	−	−	−	−	−	−	−
Chloramphenicol	−	−	−	−	−	−	−	−	−
Ampicillin	−	−	−	−	−	−	−	−	−
Nitrofurantion	−	−	−	−	−	−	−	−	−
Nalidixic Acid	28	240	89,55	12	117	90,70	16	123	88,47
Gentamicin	72	244	77,22	30	117	79,59	42	127	75,15
Kanamycin	−	−	−	−	−	−	−	−	−
Erytromycin	−	−	−	−	−	−	−	−	−
Terramycin	−	−	−	−	−	−	−	−	−
Penicillin	−	−	−	−	−	−	−	−	−
Polymyxin B	−	−	−	−	−	−	−	−	−
Tetracyclin	−	−	−	−	−	−	−	−	−
Streptomycin	−	−	−	−	−	−	−	−	−
Cefotaxim	20	226	91,87	7	104	93,69	13	122	90,37
Ceftriaxone	32	285	89,91	17	130	88,44	15	155	91,18
Cefadroxil	8	18	69,23	1	5	83,33	7	13	65,00
Netilmicin	11	132	92,31	2	69	97,18	9	63	87,50
Ceftazidim	−	−	−	−	−	−	−	−	−
Cefmetazole	16	81	83,51	7	36	83,72	9	45	83,33

Source : Result from for the wards (Gambir), issued by the microbiology laboratory of RSAB. "Harapan Kita".
+ = sensitive   − = resistance

Table 6 : Antibiotic sensitivity by type and age groups (50% and over)

ANTIBIOTIC	TOTAL			AGE GROUPS 0 – 1			1 – 3			3 – 5			5 – AND OVER		
	–	+	%	–	+	%	–	+	%	–	+	%	–	+	%
Sulfa-methaxazole/Trimetoprim	–	–	–	–	–	–	–	–	–	7	12	63,16	6	9	60,00
Chlorampheni-col	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ampicillin	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Nitrofurantion	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Nalidixic Acid	28	240	89,55	17	157	90,23	7	61	89,21	2	13	86,67	2	9	81,82
Gentamicin	72	244	77,22	45	151	77,04	20	66	76,74	4	16	80,00	3	11	78,57
Kanamycin	–	–	–	–	–	–	43	43	50,50	–	–	–	7	8	53,33
Erytromycin	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Terramycin	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Penicillin	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Polymyxin B	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Tetracyclin	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Streptomycin	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Cefotaxim	20	226	91,87	9	142	94,04	9	59	86,76	2	14	87,50	0	11	100,00
Ceftriaxone	32	285	89,91	18	178	90,82	11	75	87,21	2	18	90,00	1	14	93,33
Cefadroxil	8	18	69,23	7	11	61,11	1	5	83,33	–	–	–	0	3	100,00
Netilmicin	11	132	92,31	4	74	94,87	5	43	89,58	1	8	88,89	1	7	87,50
Ceftazidim	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Cefmetazole	16	81	83,51	11	49	81,67	5	21	80,77	0	6	100,00	0	5	100,00

Source : Result form for the wards (Gambir), issued by the microbiology laboratory of RSAB. "Harapan Kita".
+ = Sensitive   – = Resistance

CHART I   NAME OF THE HOSPITAL: Patient's name: Age: Date Admission: Page No.:

THERAPY — Pulse / Respiration / Temp.
140 80 41
130 70 40
120 60 39
110 50 38
100 40 37
90 30 36

AM PM (repeated columns), Date/Date of Onset

Diet / Regimen / Intake / Body Weight (Kg) / Jaundice / Cyanosis / Radiology / Vomiting, frekw / Defecation, frekw. / Consistency

Faeces: Blood / Leucocytes / Erithrocytes / Volume/24 Hr.

Urine: Specific Gravity / pH / Colour / Proteine / Sugar / Urobilinogen / Bilirubin / Others / Clysma / Lavement / Others

Sediment: Leucocytes / Erithrocytes / Casts / Others

Peripheral Blood: Hb / Erithrocytes / Hematocrit / Reticulocytes / Platelets / Leucocytes / Eosinophiles / Basiphiles / Metamyelocytes / Band Neutrophiles / Segmented Neutrophiles

Differentiation: Lymphocytes / Monocytes / Normoblasts / Other Cells / Anisocytosis / Hypochrome / Microcytes / Macrocytes / Fragmentocytes / Polychrome / Others

Specific Examinations: Blood Chemistry / BMP / Pathology / Microbiology / LP / Pleural Puncture / Abdominal Puncture / Electrophoresis / EEG / ECG / Biopsy / Others

INVASIVE INSTRUMENTATION — Hours
PROCEDURES
Injection / Infusion / Transfusion / Venous Puncture / LP / BMP / Catheterization / Indwelling Catheterization / Mucous Suction / Oxygen Therapy / Nasal Tube / Mouth Tube / Clysma / Lavement / Others

LOCAL REACTION — Hours
Local Swelling / Redness / Pain to pressure

GENERAL REACTION — Hours
Sudden Fever 38°C / Increasing fever / Chilling / Decreasing Consciousness / Hypotension (S < 90) / Dysuria / Others

SUSPECT NOSOCOMIAL SIGNS AND SYMPTOMS — Hours
Sudden fever 38°C / Increasing fever / Infected wound/Decubitus / Dermatitis/Skin Eruption / Increasing Cough / Purulen Mucous / Increasing Mucous / Sudden Diarrhea / Others

OTHER INVANSIVE INSTRUMENTATION AND REACTION (SPECIFY S.V.P.)

Imunization

Disease .... Incubation period ....(days)

Period of infectivity ....(days)

(see list)   Mean (Average) .... (days)

Mean (Average) ....(days)

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