NOSOCOMIAL INFECTIONS AT THE PHILIPPINE CHILDREN'S MEDICAL CENTER: A PROSPECTIVE STUDY

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ABSTRACT

Nosocomial Infection (NI) not only causes considerable morbidity and mortality but also prolong hospitalization, thereby increasing patient care expenditure. At the Philippine Children's Medical Center, nosocomial infection is a common problem yet, no data exist regarding its true incidence. Thus, a prospective study was done from April to July, 1992 to determine its incidence among service in-patients admitted to the wards and ICU, to determine the common sites of infection, to identify the pathogens involved and their drug sensitivities and to identify the predisposing factors involved in its development.

Out of 644 patients included in the study, 143 developed NI resulting to an incidence of 22.2%. Majority of NI identified were IV related infections (40.7%) followed by septicemia (27.7%) and lower respiratory tract infections (15.7%). Gram-negative organisms such Pseudomonas aeruginosa and other Pseudomonas sp. accounted for the majority of pathogens isolated.

Factors that turned out as significant predictors of NI by logistic regression analysis were age, number of antibiotics received, NGT/OGT insertion and the use of steroid.

This calls for a reevaluation of the hospital's infection control measures.

INTRODUCTION

Nosocomial or hospital-acquired infection not only causes considerable morbidity and mortality but, is also a cause of increased expense for both the hospital and the patients' family. Incidence rates vary widely.[1, 2, 3, 4] While more and more local hospitals are starting to be vigilant about it, thru regular surveillance, no data exists regarding its incidence at PCMC.

Thus, a prospective study was done with the following objectives: 1) to determine its incidence among service in-patients admitted to the wards and ICU. 2) to determine the common site (s) of infection. 3) identify the pathogens involved and their drug sensitivities, and, 4) identify the predisposing factors for the development of nosocomial infection like age, sex, degree of nutrition, service, underlying illness, duration of hospitalization, number of antibiotics given and interventions/ procedures done.

The data will serve as basis for recommending preventive measures against NI. This will also be used as a baseline for which subsequent surveys will be compared, to determine the impact of control measures. Furthermore, identifying the bacterial isolates and their sensitivity patterns will guide the physicians in empiric management of patients with NI pending results of sensitivity.

MATERIALS AND METHODS

All service patients admitted to the wards and ICU between April 22-July 24, 1992 were prospectively followed up and monitored until discharge or death. Excluded were patients previously admitted for more than 48 hours in another hospital and those who died and/or discharged less than 72 hours.

The following data were recorded: age, sex, service, date of admission/discharge or death, nutritional status, underlying illness, results of initial laboratory exams and number of antibiotics given prior to the onset of nosocomial infection. Procedures or interventions done like blood transfusion, chemotherapy, use of steriods, NGT/OGT insertion, catheterization, lumbar/ventricular tap, type of IV access and blood extraction, manner of oxygenation and surgical procedures were all likewise recorded.

Patients were monitored by either one of the principal investigators, rotating residents of the infectious disease section and/or ICC nurse. Infection was considered to be noscomial if there was clinical evidence of an active or new infection, at least 48 hours after admission. When a nosocomial infection was detected, other pertinent data like onset, site(s) of infection, signs and symptoms were recorded. Appropriate laboratory exams and cultures based on the site(s) of infections were requested. Bacterial isolates and sensitivity patterns were noted.

Likewise, nosocomial infection was categorized as either probable or definite based on the modified guidelines developed by the Center for Disease Control (see appendix I). It was considered probable if a patient had the clinical signs and symptoms with significant lab exams but, not confirmed by positive cultures. On the other hand, a nosocomial infection was considered definite if a patient had the clinical signs and symptoms and confirmed by positive cultures.

STUDY/DESIGN: The study was a prospective cohort design. The outcome variable was nosocomial infection (NI) while the following were independent variables: age, sex, nutritional status, duration of hospitalization, type of IV access and blood extraction, number of antibiotics given blood transfusion, chemotherapy, use of steroid, lumbar tap, ventricular tap, NGT/OGT insertion, urinary catheterization, type of oxygenation and surgical procedure, prior to the onset of nosocomial infection.

STATISTICAL ANALYSIS

The data was compiled, edited, coded and analyzed using EPI INFO (software, version 5). Logistic regression analysis was done using EGRET (software).

After the data set has been cleared, the incidence of NI was determined as follows:

$$\frac{\text{Total \# of patients developing NI}}{\text{Total \# of patients included in the study}} \times 100$$

Bivariate analysis was conducted through chi-square test to determine if associations existed between the independent variables and the development of NI. Those independent variables with significant association with NI were likewise tested for association between each other, to examine multicollinearity. If multicollinearity or association existed among these variables, only one of these variables was chosen based on criteria of accuracy of measurement, clinical feasibility and logical viability and this was included on the final multivariate analysis. The final model to explain the incidence of nosocomial infection among patients was then fitted using stepwise method.

RESULTS

There was a total of 917 admissions from April 22-July 24, 1992 but, only 644 patients fulfilled the inclusion criteria. Out of these, 143 patients developed nosocomial infection (NI+), resulting to an incidence of 22.2%.

The incidence varied from 2.14%-60% depending on the service involved as shown in Table 1. The highest incidence was seen at the Septic ICU at 60%, followed by the Neonatal ICU and Neonatology service at 31.7% each.

Table 1

INCIDENCE OF NOSOCOMIAL INFECTION ACCORDING TO SERVICE

SERVICE	INCIDENCE
Septic ICU (SICU)	60.0%
Neonatal ICU (NICU)	31.7%
Neonatology	31.7%
General Service I (GS I)	28.6%
General Service II (GS II)	25.8%
Neurology	21.2%
Respiratory ICU (RICU)	20.0%
Surgery	18.0%
General Service III (GS III)	17.0%
Nephrology	10.0%
Hema/Oncology	5.4%
Adolescent	4.8%
Cardiology	2.14%

The onset of NI varied from 3-60 days, but usually occured between 4-7 days after admission. (Table 2)

Table 2

ONSET OF NOSOCOMIAL INFECTION (Days)

DAYS	# of infections identified
3	8
4-7	72
8-14	69
15-21	36
22-28	13
> 29	18

As to site, NI was highest for IV related Infection (40.7%) followed by septicemia (27.7%), respiratory tract infection (15.7)%, skin infections (6%), urinary tract infections (2.8%), GIT infections (2.8%), CNS infection (0.9%) and eye infection (0.5%). Table 3 shows the breakdown of NI as definite or probable infections.

As to the pathogens isolated, gram-negative

Table 3

FREQUENCY OF NOSOCOMIAL INFECTION BY SITE

	NO. OF CASES		
	PROBABLE	DEFINITE	%
IV related infections	86	2	40.7
Septicemia	15	45	27.7
Lower Respiratory Tract	14	20	15.7
Skin	9	4	6.0
Urinary Tract	4	2	2.8
Candidemia	0	6	2.8
GIT (Diarrhea)	3	0	1.4
(PERITONEUM)	0	3	1.4
CNS	0	2	0.9
Eye	0	1	0.5

bacilli specifically Pseudomonas aeruginosa and Pseudomonas sp. were the most frequent isolates (34.5%) followed by Klebsiella sp. (18.4%), Enterobacter sp. (13.8%), Candida (6.9%), Acinetobacter sp. (6.7%), Alkaligines fecalis (5.7%) Serratia (4.6%), Staphylococcus coagulase negative (4.6%), E. coli (3.4%) and Citrobacter (2.3%).

The causative organisms also varied according to the site of infection (Table 4). Pseudomonas aeruginosa and Pseudomonas sp. however, were the most frequent isolates whether it be bacteremia, a lower respiratory tract, urinary tract or surgical wound infection. These were also the predominant isolates in infections in the ventricles and eyes. Gram positive isolates notably staphylococcus coagulase negative were all isolated from the blood. Although majority of IV related infection were not cultured hence considered only as probable infection, gram-negative bacilli (Enterobacter sp. and Acinebacter sp.) were also the ones isolated from the two cultures done.

As to microbial sensitivity (Table 5), the drugs to which majority of gram-negative bacilli, including Pseudomonas sp. were sensitive to were Ceftazidime and Amikacin. Staphylococci isolated were very sensitive to Amox/Clav, Sulbactam/Amp., Cephalothin and Oxa/Cloxa/Nafcillin. (Table 5)

Patients' ages ranged from 0-220 months with median age of 3 months for those who developed N.I. and 17 months for those who did not develop N.I.

Males constituted a little more than half of the study population (57.6%) but no sex predilection was seen. Patients had varying degrees of nutrition.

The duration of hospitalization ranged from 3-95 days with a median of 20 days for those who developed NI and 7 days for those who did not develop NI. The chi-square test for linear trend for this variable turned out to be significant with a p value of < 0.0001. This means that, patients with a longer duration of hospitalization also had a higher percentage with nosocomial infection. The partitioned chi-square test likewise, resulted to a consistent significant increase in percentage with NI as the duration of hospitalization increased. Patients who stayed for 15-21 days had a significantly higher percentage who developed NI as compared to those who stayed for less than 15 days. Those who stayed for more than 29 days had the highest percentage with NI.

Table 4

ETIOLOGIC ORGANISMS ACCORDING TO SITE OF NOSOCOMIAL INFECTION

SITE	NO. OF ISOLATES
BLOOD	
Pseudomonas sp.	12
Enterobacter sp.	9
Klebsiella sp.	7
Candida	6
Alkaligines fecalis	5
Acinetobacter sp.	4
Serratia marcesens	4
Staph. coagulase negative	4
E. coli	2
Citrobacter	1
LOWER RESPIRATORY TRACT	
Pseudomonas sp.	11
Klebsiella sp.	7
Enterobacter sp.	2
Citrobacter	1
URINARY TRACT	
Pseudomonas sp.	1
E. coli	1
SURGICAL WOUND	
Pseudomonas sp.	3
Acinetobacter sp.	1
VENTRICLE	
Pseudomonas sp.	2
EYES	
Pseudomonas sp.	1
PERITONEUM	
Klebsiella sp.	2
Enterobacter sp.	1
IV SITE	
Enterobacter sp.	1
Acinetobacter	1

The number of antibiotics received by the patients prior to the onset of NI differed from 0-8 antibiotics. Majority (41%) received at least 2 antibiotics. The chi-square test for linear trend turned out to be significant with a p value of < 0.0001. This means that those who received more antibiotics had a higher percentage with NI, as compared to those who received less antibiotics. The partitioned chi-square test likewise resulted to a consistent significant increase in percentage with NI, as the number of antibiotics received increased. Those who received from 0 to 1 antibiotics had the same lowest percentage with NI. The patients who received 2 antibiotics had a

Table 5. Antimicrobial Sensitivity of Pathogen Isolated

	Pseudo		Entero		Kleb		Alk. Fec.		Serratia		Acineto		Citrobac.		E. Coli		Staph. coag. neg.	
AMINOGLYCOSIDE	% S	N	% S	N	% S	N	% S	N	% S	N	% S	N	% S	N	% S	N	% S	N
Netilmicin	42	10	27	3	20	3	75	3	100	2	40	2	100	1	50	1	100	1
Amikacin	43	13	45	5	54	7	60	3	100	4	40	2	50	2	100	3	50	1
PENICILLIN																		
Pen G Na					0	0			0	0							25	1
Ampicillin	0	0	0	0	0	0	0	0	0	0	33	1			0	0	50	1
Oxa/Naf/Cloxa																	67	2
Amoxy/Clav	0	0	0	0	33	1	50	1	0	0	50	1					100	2
Amp/Sulbactam	0	0	0	0	50	1	33	1							50	1	100	2
Aztreonam	40	2	33	1	0	0	67	2			0	0	100	1				
Piperacillin	36	8	12	1	0	0	50	1	100	3	50	1	0	0	50	1	0	0
CEPHALOSPORIN																		
Cephradine	0	0	0	0	0	0											100	1
Cephalothin	0	0		0	0	0											50	1
Cefuroxime	0	0	0	0	0	0	0	0			0	0			0	0		
Ceftriaxone	27	6	54	6	39	5	75	3	100	4	50	2	0	0	100	2	100	1
Ceftazidime	72	18	50	5	21	3	80	4	100	3	75	3	0	0	100	2		
Cefotaxime	12	1	40	2	14	1	33	1	100	3	0	0	0	0				
OTHERS																		
Chloramphenicol	8	1	25	1	20	1			100	1	0	0	0	0	0	0		
Co-Trimoxazole	0	0	33	1	50	2	100	1	100	2	50	1			50	1	75	3
Erythromycin	0	0																
Nalidixic Acid					100	1									0	0		

Table 6

AGE DISTRIBUTION	NI+ (N=143)	NI- (N=501)	TOTAL (N=644)
0-6 months	91	171	262
7-12	20	58	78
13-36	14	93	107
37-72	5	63	68
73-108	9	58	67
109-132	0	17	17
> 133	4	41	45
Median	3.00	17.00*	

*P Value = < 0.05 (Statistically Significant)

higher percentage with NI as compared to those who received less than 2 antibiotics; those who received 3 antibiotics had a higher percentage with NI as compared to those who received less than 3 antibiotics, and so on.

As to underlying illness, 36.9% were admitted for an infection alone, 49.8% were admitted for a disease alone and 11.6% were admitted for both a disease and an infection. Underlying infection were mostly in the form of pneumonia, diarrhea and meningitis. Underlying diseases were mostly blood dyscrasia like leukemia, congenital anomalies and prematurity.

Table 7

NUTRITIONAL STATUS	NI+ (N=143)	NI- (N=501)	TOTAL (N=644)
AGA	27	45	72
SGA	15	22	37
LGA	0	1	1
Normal	43	194	237
Overweight	0	13	13
Underweight	58	226	284
Mild	19	109	128
Moderate	22	75	97
Severe	17	42	59

P Value = 0.0003 (Statistically Significant)

There was a significant difference noted with regards to mortality in that patients who developed nosocomial infection had a higher mortality of 24%, while those who did not develop nosocomial infection had a 3% mortality.

Table 14 summarizes the procedures or interventions received by the patient prior to the onset of nosocomial infection. Blood extraction, IV access, respiratory support and NGT/OGT insertion were the 4 most common procedures or interventions done once patient was admitted.

By chi-square analysis, the following independent variables turned out to be associated with nosocomial infection: a) nutritional status, b) service, c) type of IV access, d) type of blood extraction, e) blood tansfusion, f) chemotherapy, g) use of steroid, h) partial parenteral nutrition, i) lumbar tap, j) NGT/OGT insertion, k) respiratory support, and 1) underlying illness (presence of a disease alone and presence of both disease and infection).

Table 8

DURATION OF HOSPITALIZATION	NI+	NI-	TOTAL
3-7 days	20	273	293
8-14	34	148	182
15-21	25	47	72
22-28	21	15	36
> 29	43	18	61
Median	20.00	7.00*	

*P Value = < 0.05 (Statistically Significant)

To confirm the simultaneous effect of these variables with nosocomial infection, logistic regression analysis was conducted. Multicollinearity however, was checked first.

Hence, test of association was done and revealed the following independent variables to be highly correlated: a) duration of hospitalization, b) no. of

Table 9

NUMBER OF ANTIBIOTICS	NI+	NI-	TOTAL
0	3	95	98
1	19	151	170
2	65	199	264
3	22	36	58
> 4	34	20	54
Mean	2.61	1.48*	1.13

*P Value = < 0.05 (Statistically Significant)

Table 10

UNDERLYING ILLNESS	NI+ (N = 143)	NI- (N = 501)	TOTAL (N = 644)
Well Baby	0	10	10
Disease Alone	59	262	321
Infection(s) Alone	54	181	235
Infection and Disease	30	45	75

P Value < 0.0001 (Statistically Significant)

Table 11. Underlying Illness of Patient with Nosocomial Infection

INFECTION ALONE	NUMBER OF CASES
Lower Respiratory Tract Infection	18
CNS Infection	10
Acute Gastroenteritis	7
Sepsis	6
Others	13
DISEASE ALONE	
GIT Disease	
congenital anomalies	10
others	4
Prematurity	
CNS Diseases	
meningocoele	3
guillain barre syndrome	2
others	15
Hemato/Oncologic Diseases	
lymphoma	2
others	4
Others	
DISEASE AND INFECTION	
Prematurity	
with pneumonia	12
with sepsis	4
Congenital Heart Disease	
with BPN	6
with measles	1
Others	

antibiotics, c) type of IV access, d) type of blood extraction, e) blood transfusion, f) partial parenteral nutrition, g) NGT/OGT insertion, h) use of steroid, i) chemotherapy, j) underlying illness (Disease Alone and Disease and Infection), and k) respiratory support.

Fitting these variables stepwise into the logistic regression equation, only the following variables turned out to be significant predictors of nosocomial infection at p value < 0.05 (Table 15): a) age, b) number of antibiotics received prior to onset of NI, c) use of steroid, d) NGT/OGT insertion. This means that, holding the effects of the other variables in the model constant, those patients with oro/nasogastric tubes were 2.017 times at higher risk of developing NI relative than those without oro/nasogastric tubes. In like manner, patients who received steroids were 1.568 times at higher risk of developing NI than those who did not receive steroids. Likewise, a higher risk for NI was seen among patients who received more antibiotics.

The effect of age is somehow the opposite of the other variables. In terms of age, the result is saying that as one gets older, the lesser was his chance of coming down with a nosocomial infection. Or, the younger the patient the higher was his chance of developing NI.

DISCUSSION

The overall incidence established from this study is 22.2% over the period April 22-July 24, 1993. This is lower than the 31% incidence reported by Occeña, et al. among pediatric patients in the Philippine General Hospital. However, it is considerably higher than the reported 2.3-6.5% incidence among Children's Hospitals in the US and Canada.[4]

The 22.2% incidence of nosocomial infection established in this study may just be a relative increase because, the inclusion of patients to the study was controlled by strict criteria, similar to the study done by Occeña, et al. in PGH. Hence, the total number of patients in the study (644) was not equal to the total number of patients admitted during the study period (917).

However, this may actually be the true incidence considering that, patients were monitored daily by the principal investigators resulting to more accurate detection or reporting of nosocomial infection.

Incidence however, varied from 2.14%-60% depending on the service involved. Septic ICU had the highest incidence at 60% followed by Neonatal ICU and Neonatology service, both at 31.7% each. These 3 services having the highest incidence have neonates as their patients. Indeed, age came out as significant risk factor by multivariate analysis. This means that, holding the effects of other variables, the younger the patient, the higher was the risk of developing NI. This places the neonates as the ones most susceptible to develop infection as they are considered immunocompromised.[5]

Table 12. Underlying illness of patient without nosocomial infection

INFECTION ALONE		NUMBER OF CASES
Lower Respiratory Tract Infection		51
Acute Gastroenteritis		42
CNS Infection		15
Others		73
DISEASE ALONE		
Hematologic/Oncologic Diseases		59
leukemia	28	
endodermal sinus tumor	5	
others	26	
CNS Disease		58
seizure disorder	15	
meningocoele	14	
hydrocephalus	14	
others	15	
GIT Disease		35
congenital anomalies	20	
others	15	
Others		110
DISEASE AND INFECTION		
Prematurity		13
with pneumonia	7	
with sepsis	6	
Congenital Heart Disease		10
with BPN	8	
others	2	
Others		22

Table 13

DISPOSITION	NI+	NI-	TOTAL
Discharged	103	481	584
RIP	35	17	52
Unknown (discharged against advice, transferred)	5	3	8
TOTAL	143	501	644

P Value < .00001 (Statistically Significant)

Table 14

PROCEDURE/INTERVENTIONS ADMINISTERED TO PATIENTS UPON ADMISSION

PROCEDURES	RECIPIENT (N = 644)	%
Blood Extraction	625	97.0
IV Access	600	93.3
Respiratory Support	212	32.9
NGT/OGT Insertion	177	28.6
Blood Transfusion	157	24.7
Surgery	153	23.8
Steroid Use	76	12.0
Lumbar Tap	57	9.3
Chemotherapy	44	6.8
Urinary Catheterization	31	4.8
Partial Parenteral Nutrition	11	1.7
Ventricular Tap	7	1.4

The number of antibiotics received prior to the onset of NI also turned out to be predictive. This means that, patients who received more antibiotics were at higher risk of developing NI. It is known fact that the widespread use of antibiotics may result to suppression of the normal flora and the emergence of more resistant strains causing more severe infections.[6] It was noted that the strains of gram-negative bacilli that patients with NI had prior to demise were resistant to almost all available antibiotics and thus, is very alarming. This may partly explain the higher mortality among patients with NI (24%) compared to those who did not develop NI (3.4%).

Likewise, Candidemia may be a problem with suppression of the normal flora by multiple antibiotics.[7] In the study, 4 out of 6 patients who developed Candidemia had received from 4-8 antibiotics.

The stronger association of NI with certain types of procedures/interventions has been well documented. In the study done by Occeña et al. in PGH, blood transfusion, oro/nasogastric tube insertion and any form of oxygenation came out as predictive risk factors. In this study, using bivariate analysis, these factors also came out to be significantly associated with nosocomial infection. However, in the final logistic regression model, only oro/nasogastric tube insertion and the use of steroid turned out to be predictive.

The lack of predictive value of other variables like respiratory support, parenteral nutrition, chemotherapy, etc. maybe because of close association or multicollinearity of these variables with one another.

Accordingly, patients with oro/nasogastric tubes had 2.017 times higher risk of developing NI than patients without NGT or OGT. This maybe because nasogastric tubes encourage aspiration and may serve as direct channel for gastric secretions which could be heavily colonized by gram-negative bacilli.[8]

The use of steroid also turned out to be predictive so that, patients who received steroid had 1.568 times higher risk of developing NI, than those who did not receive steroid. The association of steroid with the development of NI has long been documented. This is due to its most important complication of generally decreasing host defenses thus, predisposing to infection.[9] Hence, the risk-benefit ratio for the use of steroid must always be in mind.

The frequent occurrence of IV related infection maybe due to the fact that IV sets are not as frequently changed as recommended every 48-72 hours[10] because of financial constraints. Though this turned out to be the most common type of NI, majority were not cultured and hence, considered only as probable infections.

The predominant isolates were mostly gram-negative bacilli. Clinical researchers abroad have suggested that the major reservoir for these nosocomial gram negative pathogens are usually the "colonized" patients as a result of an interplay of factors like prolonged hospitalization, alteration of flora by antibiotics and instrumentation and that transmission of gram-negative nosocomial infection is usually by contact via the hands of personnel.[11, 12, 13, 14] Occasionally, however, contaminated medical equipments may also be responsible for outbreaks of NI. Because of this, the importance of strict observance of infection control measures notably, handwashing cannot be overemphasized.

CONCLUSION

The incidence of nosocomial infection at PCMC has been set at 22.2% over the period of April 22-July 24, 1992. Though this is lower than the incidence reported in a major local hospital, it is a significant cause of

Table 15. Stepwise Logistic Regression Analysis Results

RISK FACTOR	COEFFICIENT	STD. ERROR	ODDS RATIO
Age	-0.005736	.00294	.9943
# of antibiotics	1.273	.622	5.572
NGT/OGT INS.	0.7015	.192	2.017
Use of steroid	0.4500	.220	1.568

mortality, morbidity and expense for both the hospital and the patient's family.

The factors that turned out as significant predictors of nosocomial infection were 1) age, 2) number of antibiotics received prior to NI, 3) NGT/OGT insertion, 4) use of steroid.

Gram-negative organisms, notably Pseudomonas aeruginosa and other Pseudomonas sp. accounted for the majority of pathogens isolated. Ceftazidime and Amikacin were the 2 drugs to which majority of gram-negative bacilli were sensitive to. This should guide us in the empiric management of nosocomial infections irregardless of site.

Staphylococci were very sensitive to Amoxy/Clav., Sulbactam/Ampi., Cephalothin, and Oxa/Cloxa/Nafcillin. Since Staphylococci were all isolated from the blood, coverage for this pathogen should be considered in empiric treatment of septicemia especially in the neonates. Anti-Staphylococcal coverage should likewise, be considered with IV-related and or skin infections.

APPENDIX I

GUIDELINES FOR DETERMINING NOSOCOMIAL INFECTION ACCORDING TO SITE

A. Respiratory Infection:

1. **PROBABLE**
   a. Clinical signs and symptoms of a lower respiratory tract infection (LRTI) like cough, fever, increase in purulence and new auscultatory findings.

   b. Clinical signs and symptoms of LRTI plus new infiltrates on chest X-ray.

2. **DEFINITE**
   a. Clinical signs and symptoms of LRTI plus new infiltrates on chest X-ray + ETA/TTA/LT (+) blood culture.

   b. Clinical signs and symptoms of LRTI plus new infiltrates on chest X-ray plus a (+) blood culture.

B. Urinary Tract Infection:

1. **PROBABLE**
   a. Clinical signs and symptoms of UTI (fever, dysuria, costovertebral angle tenderness, suprapubic tenderness, etc.) and/or pyuria greater than 10 WBC's/hpf in a patient without previous urinary complaints or with a negative urinalysis on admission.

2. **DEFINITE**
   a. Clinical signs of a single organism and symptoms of UTI plus colony counts of 100,000/ml (midstream urine specimen or visible organism on gram stain) in patient with a previously (-) urine culture or a normal urinalysis.

   b. Clinical signs and symptoms of UTI plus 100,000 col/ml of a new pathogen in a patient with a previously (+) urine culture.

3. **ASYMPTOMATIC BACTERIURIA**
   a. Colony counts 100,000 col/ml without previous or current manifestations of infection in a patient with a previously (-) urine culture.

C. Gastrointestinal Tract Infection (Gastroenteritis)

1. **PROBABLE**
   a. Diarrhea developing in a patient with no such complaint on the day of admission but with no stool culture done or with a (-) stool culture.

2. **DEFINITE**
   a. Diarrhea plus a (+) stool culture in a patient with a previously (-) stool culture and without signs and symptoms of diarrhea on the day of admission.

   b. Diarrhea plus pus cells/RBC's/macrophages on fecalysis even with no stool culture done or with a (-) stool examination on admission.

D. Central Nervous System Infection

1. **PROBABLE**
   a. Clinical signs and symptoms of meningitis plus a (+) CSF Q/Q in a patient with a previously (-) CSF findings.

2. **DEFINITE**
   a. Clinical signs and symptoms of meningitis plus a (+) CSF culture and/or blood cultures in a patient with a previously (-) CSF and/or blood culture.

   b. Clinical signs and symptoms of meningitis plus a (+) CSF/Blood culture of a new pathogen different from that which was previously isolated from other sites.

E. Skin and Subcutaneous Tissue Infection

1. **PROBABLE**
   a. Purulent drainage from the burn/wound sites with a negative culture.

2. **DEFINITE**
   a. Purulent drainage from the burn/wound sites and/or bacteremia and/or culture from aspirate.
      a. septicemia
      b. local

F. Vascular Infection (IV Related Infections)

1. **PROBABLE**
   a. Inflammation of the site of intravenous line with or without purulent material or strong clinical evidence of cellulitis.

2. **DEFINITE**
   a. Purulent drainage from the sites of intravenous catheters and needles with (+) cultures from wound and blood.

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