Nosocomial Infections Surveillance System

I. Foreword

To estimate the magnitude of nosocomial infections and enhance the utility and efficiency of the existed national nosocomial infection surveillance system, Taiwan CDC had revised the system and renamed it “Taiwan Nosocomial Infections Surveillance (TNIS) System” in 2007. Each participating institutions may collect and enter the demographic data of nosocomial infected cases and patient-specific cultures and antimicrobial susceptibility results. This system provides individual hospitals to analyze their data locally as a reference in developing quality improvement initiatives.. Furthermore, the antimicrobial susceptibility results of selected pathogen and multi-drug resistant pathogens are also included in routine monitoring programs.

II. Purposes

1. Establish the epidemiological database of nosocomial infection in Taiwan
2. Discovery of nosocomial infection trends
3. Facilitation of inter- and intra-hospital comparisons that can be used for quality improvement activities
4. Assistance for hospitals in developing the appropriate surveillance mechanism that permits timely recognition of infection control problems.

III. Reporting mechanisms and data analysis feedback

Each hospital may provide their data either through web-based entry or convey their data electronically through interchange platform. The web-based report mechanism mainly serves for the hospitals which lack nosocomial surveillance system of their own. Hospital staff enters the nosocomial data on the TNIS website directly. The other mechanism, conveying surveillance data electronically through interchange platform, serves for the hospitals which had built their own nosocomial surveillance system. However, to enable interoperability between hospital information systems and TNIS system, infection control practitioner has to work on vocabularies mapping from local to standard codes and hospital information technology staff has to bridge the connection between the two systems and make the electronic data pack in a standard format according to the working instruction issued by Taiwan CDC. Through this mechanism, surveillance data could be routinely transferred from hospital information systems to the TNIS system automatically. This can save the hospital staff a lot of time because they would not need to repeatedly enter the data to both of hospital surveillance system and TNIS system. Hospitals may use TNIS system to manage nosocomial infection cases and generate individual hospital reports. Also, Taiwan CDC periodically feedback hospitals with analysis report as a

reference for inter- and intra-hospital comparisons, hope to facilitate hospitals to improve their quality in nosocomial infection control and to safeguard the wellbeing of healthcare workers and the general public.

IV. Nosocomial infection surveillance data analysis content

1. TNIS hospitals contributing data used in this report
2. Distribution of nosocomial infection rates by type of location in the ICUs of medical centers and regional hospitals
3. Distribution of major sites of nosocomial infection in ICU patients from medical centers and regional hospitals
4. Common pathogens of nosocomial infections for patients in the ICUs of medical centers
5. Common pathogens of nosocomial infections for patients in the ICUs of regional hospitals
6. Antimicrobial resistance rates of selected pathogens of nosocomial infections in the ICUs of medical centers and regional hospitals

V. Surveillance method and main results

The data sources of nosocomial infections in the ICUs of medical centers and regional hospitals in this report were collected by the TNIS dataset, except for the nosocomial infection rates. The TNIS hospitals contributing data used in this report is shown in table I. The data sources of nosocomial infection rates by type of location in this report were adopted by the TNIS system and paper-based reports provided by medical centers and regional hospitals not in TNIS system. This report should be considered provisional. When more information is available in TNIS system, Taiwan CDC will provide the updated analysis report on its website as a reference for the general public.

There were 12 medical centers and 51 regional hospitals that contributed data to the TNIS for this report. The distribution of nosocomial infection rates by type of location in the ICUs of medical centers and regional hospitals are shown in figure 1. The highest infection rate was in medical ICU (pooled mean=15.7‰; median=15.5‰), followed by surgical ICU (pooled mean=14.8‰; median=14.4‰), medical/surgical ICU (pooled mean=13.1‰; median=12.3‰), cardiology ICU (pooled mean=12.6‰; median=13.5‰), and pediatric ICU (pooled mean=5.1‰; median=4.9‰) in the medical centers. For regional hospitals, the highest infection rate was in surgical ICU (pooled mean=12.5‰; median=11.3‰), followed by medical ICU (pooled mean=10.2‰; median=9.8‰), medical/surgical ICU (pooled mean=9.9‰; median=9.6‰), cardiology ICU (pooled mean=8.4‰; median=6.0‰), and pediatric ICU (pooled mean=2.5‰; median=0.4‰). In sum, the overall ICU infection rate was higher in medical centers than in regional hospitals. The highest infection rate of type of location in the medical

centers is medical ICU, while in the regional hospitals is surgical ICU.

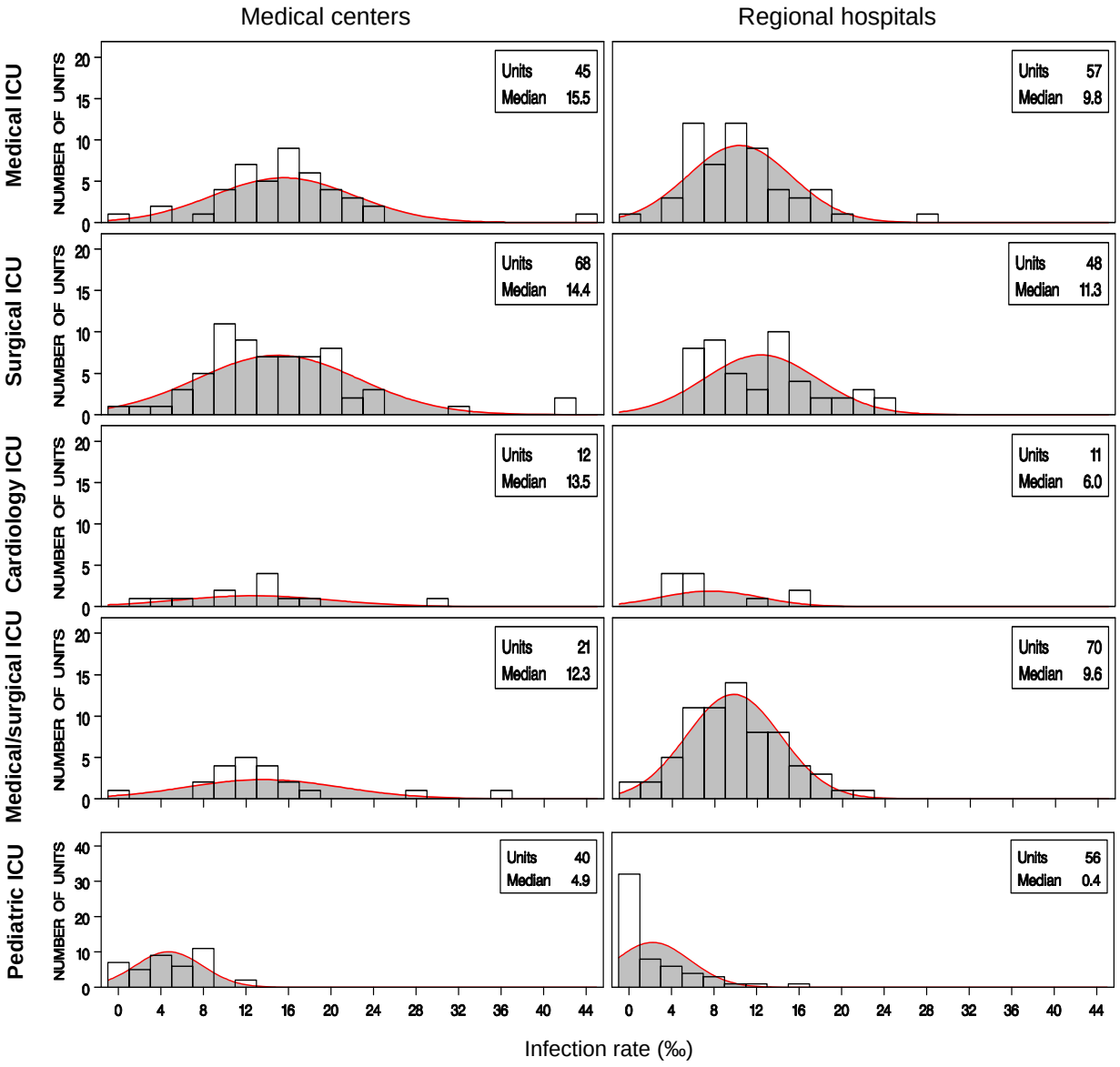
For site-specific nosocomial infections in the ICUs of medical centers, urinary tract infections topped the list (37.5%), followed by bloodstream infections (32.1%), and respiratory tract infections (15.4%). In the ICUs of regional hospitals, urinary tract infections topped the list (37.5%), followed by respiratory tract infections (26.4%), and bloodstream infections (23.3%) (Table3). The top three pathogens of nosocomial infections for patients in the ICUs of medical centers were: *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Escherichia coli*. For regional hospitals, the top three pathogens for the ICUs were *Pseudomonas aeruginosa, Acinetobacter baumannii,* and *Escherichia coli* (Table4). Figure 2 shows the rates of antimicrobial resistance among selected pathogens identified from patients in the ICU with nosocomial infections. For each antimicrobial/pathogen pair, the pooled mean rate of resistance for medical centers and regional hospitals is displayed. For medical centers, the proportion of *Staphylococcus aureus* isolates those were resistant to Methicillin (MRSA) is 84.5%, the proportion of *Acinetobacter baumannii* isolates those were resistant to Carbapenem (CRAB) is 49.0%, the proportion of *Pseudomonas aeruginosa* isolates those were resistant to Carbapenem (CRPA) is 20.2%, and the proportion of *enterococci* isolates those were resistant to Vancomycin (VRE) is 13.9%. For regional hospitals, the antimicrobial resistance rates were 80.6%, 49.8%, 14.6%, and 6.7% for MRSA, CRAB, CRPA, and VRE, respectively.

VI. Nosocomial Infections data from medical centers and regional hospitals: Surveillance System Data Analysis for 2007

Table1. TNIS hospitals contributing data used in this report

	1st Quarter		2nd Quarter		3rd Quarter		4th Quarter	
Hospital type	No. of hospitals	Infection person-times	No. of hospitals	Infection person-times	No. of hospitals	Infection person-times	No. of hospitals	Infection person-times
Medical center	12	1,327	11	1,196	11	1,139	12	1,235
Regional hospital	51	1,331	48	1,168	47	1,189	48	1,271

Note: Data updated to 2008/05/01



Note：1. Units: total numbers of specific location among entire ICUs.

2. All ICUs were categorized into 5 types of location, medical ICU, surgical ICU, cardiology ICU, medical/surgical ICU, and pediatric ICU. In which, medical ICUs included medical ICU, neurology ICU, and chest medical ICU; surgical ICU included surgical ICU, neurosurgical ICU, chest surgical ICU, cardiac surgery ICU, and burn ICU; cardiology ICU only included cardiology ICU; medical/surgical ICU included mixed ICU; and pediatric ICU included neonatal ICU and pediatric ICU

3. Patients admitted in a certain type of ICU were not limited to receive the same type of care.

Figure1. Distribution of nosocomial infection rates by type of location in the ICUs of medical centers and regional hospitals

Table 2 Site-specific nosocomial infections

Infection site	Medical centers		Regional hospitals	
	No.	%	No.	%
Urinary tract	1,838	37.5	1,859	37.5
Bloodstream	1,574	32.1	1,153	23.3
Respiratory tract	780	15.9	1,308	26.4
Surgical site	220	4.5	218	4.4
Others	485	9.9	421	8.5
Total	4,897	100	4,959	100

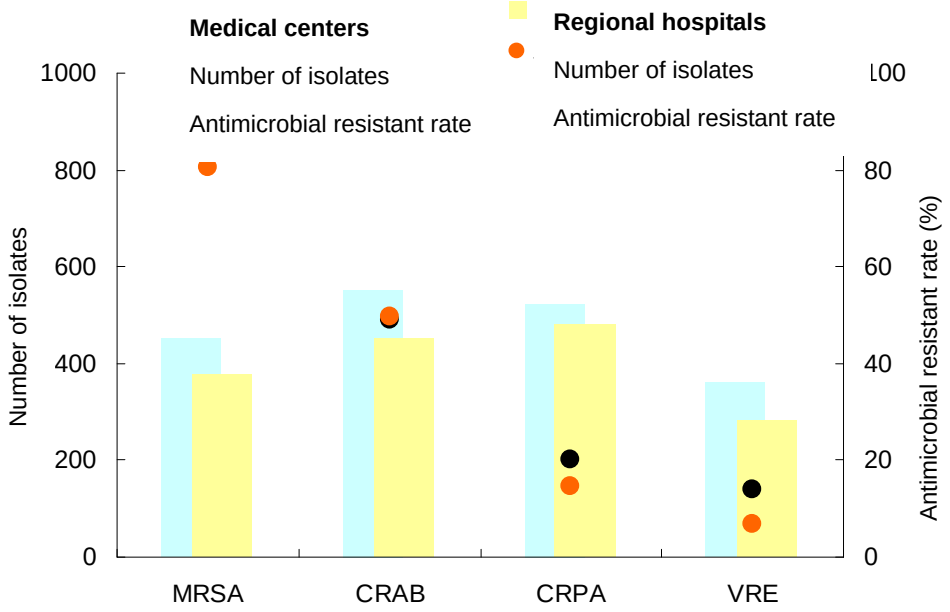
Note: proportion of specific infection site= (number of specific site infection person times/number of overall infection person times)×100%

Table 3 Common pathogens for nosocomial infections in the ICUs of medical centers

pathogens	Total		Infection sites									
			Urinary tract		Bloodstream		Respiratory tract		Surgical site		Others	
	No	Rank	No	Rank	No	Rank	No	Rank	No	Rank	No	Rank
Acinetobacter baumannii	585	1	122	5	198	2	172	1	25	4	68	2
Pseudomonas aeruginosa	562	2	171	3	122	5	160	2	42	2	67	3
Escherichia coli	521	3	341	1	92	6	36	6	27	3	25	7
Staphylococcus aureus	467	4	23	13	223	1	97	3	43	1	81	1
Klebsiella pneumoniae	414	5	137	4	141	4	84	4	19	7	33	6
Candida albicans	396	6	296	2	83	7	1	34	5	16	11	12
Coagulase negative staphylococci	239	7	8	22	163	3	4	17	16	8	48	4
Enterobacter cloacae	202	8	63	9	78	8	21	7	22	5	18	8
Enterococcus faecalis	167	9	65	8	66	9	-	-	21	6	15	9
Enterococcus faecium	164	10	93	6	49	12	-	-	8	11	14	10
Others	1,464	-	574	-	477	-	143	-	90	-	180	-
Total	5,181	-	1,893	-	1,692	-	718	-	318	-	560	-

Table 4 Common pathogens for nosocomial infections in the ICUs of regional hospitals

pathogens	Total		Infection sites									
			Urinary tract		Bloodstream		Respiratory tract		Surgical site		Others	
	No	Rank	No	Rank	No	Rank	No	Rank	No	Rank	No	Rank
Pseudomonas aeruginosa	725	1	209	3	76	6	338	1	44	1	58	3
Acinetobacter baumannii	648	2	102	5	158	2	294	2	23	4	71	1
Escherichia coli	601	3	399	1	76	5	66	6	40	2	20	7
Klebsiella pneumoniae	569	4	194	4	139	3	175	3	21	5	40	5
Candida albicans	441	5	304	2	65	7	31	9	19	7	22	6
Staphylococcus aureus	435	6	21	14	170	1	155	4	27	3	62	2
Coagulase negative staphylococci	215	7	21	15	125	4	9	16	9	10	51	4
Enterobacter cloacae	164	8	39	9	50	8	40	7	19	6	16	8
Serratia marcescens	148	9	45	7	45	9	40	8	8	11	10	10
Stenotrophomonas maltophilia	127	10	5	27	29	11	79	5	9	9	5	12
Others	1,542	-	627	-	360	-	243	-	173	-	139	-
Total	5,615	-	1,966	-	1,293	-	1,470	-	392	-	494	-



Note: 1. The intermediate and resistant results of antibiotic susceptibility tests were categorized to antimicrobial resistant

2. MRSA: Methicillin resistant *Staphylococcus aureus*. CRAB: Carbapenem (Imipenem) resistant *Acinetobacter baumannii* . CRPA: Carbapenem (Imipenem) resistant *Pseudomonas aeruginosa.* VRE: Vancomycin resistant *enterococci* (*Enterococcus faecalis*, *Enterococcus faecium*...etc.)

Figure2. Antimicrobial resistance of selected nosocomial strains in the ICUs of medical centers and regional hospitals