

The Optimal Number of Beds Able to be Managed by One Infection Control Nurse or Doctor in Japan

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1. Introduction

- There are approximately 8600 hospitals in Japan of which 82% contain less than 300 beds.
- A Certified Nurse in Infection Control (CNIC) takes a full-time role in infection control in each hospital.
- The number of infection control nurses or doctors required according to the scale of the facility in Japan has not yet been evaluated.
- The number varies depending on background of each facility

2. Purpose

- To evaluate the optimal number of the beds for an infection control nurse (ICN) or an infection control doctor (ICD).

3. Methods

- Survey for ICNs
 - Subjects: 1284 ICNs registered in the Japanese Nursing Association
 - Period: April 1st to May 18th, 2012
 - Data: Questionnaires were sent to 1,284 ICNs registered in the Japanese Nursing Association. The survey items, such as "The Number of ICN," "Hospital Backgrounds" and "ICN activity time and additional time required", were investigated in three stages.
- Survey for ICDs
 - Subjects: 10 Experienced ICDs in infection control.
 - Period: October 17th to December 14th, 2012
 - Data: we examined the time per week required for infection control using the Delphi method for 10 ICDs.

Table 1 The Actual / Required number of CNICs per facility and number of beds in facility per CNICs (n=527)

	Mean value	Standard deviation	Median	Maximum value	Minimum value
Number of beds in facility	443.8	225.88	400	1489	42
Actual number of CNICs per facility	1.44	0.68	1	4	1
Required number of CNICs per facility	2.34	0.91	2	8	1
Actual number of beds in facility per CNIC	335.3	179.59	301	1489	21.5
Required number of beds in facility per CNIC	194.5	77.70	186.67	598	21.5

Table 2 Working hours in infection control-related activities per month and the number of holidays taken on a yearly basis as per the work record of the past year

	Mean value	Standard deviation	Median	Maximum value	Minimum value	n
Working hours in infection control-related activities per month	230.2	168.53	181.5	883.5	17	180
Required additional working hours in infection control-related activities per month	101.7	81.64	80	320	0	187
The number of holidays taken per year	6.2	5.0	5	24	0	181

Table 3 The required working hours of CICDs in infection control-related activities per week (n=10)

Conducted surveys	Required working hours per week on duty		Required working hours per week off duty		Total required working hours per week
	Mean value	Standard deviation	Mean value	Standard deviation	
First	57.69	75.94	14.02	20.23	71.7
Second	52.33	40.74	17.27	20.13	69.6
Third	50.13	42.35	18.33	20.69	68.5
Fourth	38.01	28.46	12.27	14.41	50.3

The scale of a facility assumed in this study: Secondary emergency acute hospital meeting the following conditions
1) 600 beds in total 2) 8 ICU beds 3) 8 CCU beds 4) 10 operating rooms 5) 5,000 operations performed per year
6) 12 hospital occupancy days on average 7) 88% in-bed occupancy rate

Table 4 The Implementation of surveillance (n=266)

Surveillance items	Implemented		Not implemented	
VAP(ventilator associated pneumonia)	191	71.8%	75	28.2%
BSI(blood stream infection)	97	36.5%	169	63.5%
UTI(urinary tract infection)	165	62.0%	101	38.0%
SSI(surgical site infection)	104	39.1%	162	60.9%

4. Results

- The number of responses from ICNs was 527 (41.0%) in the primary research, 266 (17.6%) in the second and 192 (15.0%) .
- The number of beds per an ICN was 335.3.(Table 1)
- The average actual working time of ICNs was 230.2 hours per month, and they were required 101.7 hours extra per month on average. (Table 2)
- The results of the Delphi method to find out the required time of ICDs on average was 50.3 hours per week supposedly for an acute hospital with 600 beds. (Table 3)

Table 5 The required working hours of CICDs and CINCs for each activity

Activity	CICD (n=10)		CNIC (n=180)	
	Analyzed on required working hours		Analyzed on actual working hours	
	Hours per month	Rate	Hours per month	Rate
a) Performing surveillances of hospital infection	26.50	13.2%	39.18	16.6%
b) Designing and implementing infection control plans	25.53	12.7%	30.79	13.0%
c) Evaluating and reviewing plans	5.97	3.0%	17.46	7.4%
d) Educating and empowering colleagues	32.00	15.9%	27.46	11.6%
e) Responding to outbreak of hospital infection	13.20	6.6%	13.52	5.7%
f) Responding to occurrences of communicable disease	2.93	1.5%	4.05	1.7%
g) Attending meetings and working at desk	30.57	15.2%	46.59	19.7%
h) Working outside hospital	12.13	6.0%	6.87	2.9%
i) Self-empowering	38.40	19.1%	30.28	12.8%
Others	13.87	6.9%	20.36	8.6%
Total	201.10	100.0%	236.56	100.0%

5. Discussion

- The results revealed that the total average actual working time of ICNs was inadequately long: 230 hours per month. Also the fact that there are only 1595 ICNs in 8605 hospitals across Japan, the current situation of the lack of ICNs is a serious problem.
- The standard deviation in many of the responses from ICNs and ICDs was rather great, bringing a speculation that the activities in infection control may vary depending on each facility and/or organization.
- Further surveys are necessary in order to discover the optimal numbers of ICNs and ICDs.
- The structure of the facility, staff education, working environment and workplace relations and human qualities of ICNs/ICDs, such as their position, authority, problem-solving and interpersonal skills need to be considered as well.
- These results could be a useful index to consider the optimal number of healthcare workers required for an infection control facility.

6. Conclusion

- This study demonstrated an ICN is required for 191.7 beds and an ICD is required for 438.0 beds.

The optimal number of CNICs

- 1) The actual working time in infection control-related activities per month: Working hours in infection control-related activities per month + Required additional working hours in infection control-related activities per month.
- 2) The optimal number of CNICs per month: 1.97 persons /month (Standard deviation, 1.2) *1
*1: The optimal working time in infection control-related activities per month / 8 hours x 5 days, the optimal working time per CNIC per month
- 3) The optimal number of beds per CNIC: 191.7 beds /CNIC (Standard deviation, 189.8) *2
*2: 1.09009 x the number of beds / the optimal number of CNICs per month x The number of CNIC

The optimal number of CICDs

- 1) The optimal working time in infection control-related activities per month for a full-time CICD in infection control: 50.3 hours /week *1
*1: 38.0 hours (Total working hours per week on duty) + 12.3 hours (Total working hours per week off duty)
- 2) The optimal number of CICDs per week: 1.26 persons *2
*2: 50.3 (hours /week) /40 hours (8 hours x 5 days, the optimal working time per CICD per week)
- 3) The optimal number of CICDs on duty: 1.37 persons *3
*3: 1.26 persons (the optimal number of CICDs per week) x 1.09009
Therefore, it is suggested that 1.37 CICDs are required for an acute hospital containing approximately 600 beds and the optimal number of beds per a full-time CICD in infection control is 438.0.

References

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