Review Article

COMPUTERIZED SURVEILLANCE SYSTEM OF TUBERCULOSIS IN JAPAN: ITS EVOLUTION, ACHIEVEMENT AND CHALLENGES

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Abstract The nationwide computerized tuberculosis (TB) surveillance system was revised in 2007. It was developed to be user-friendly and to allow the evaluation of current TB problems and control issues in Japan. All public health centers in Japan (518 as of April 2007) have system terminals connected to a central computer, and the data entered at these terminals are sent to the online central computer excluding personal identification data. All the figures and tables in this paper were created using the annual report database which are compiled from this system. The revision in 2007 added many new functions to the system, such as a function for automatically sending data upon transfer. The monitoring information for assisting case management of TB patients by the DOTS was also enhanced. The algorithm for classifying treatment outcomes automatically based on data entered regarding cancellations from registration, bacteriological results and drug usage each month was revised. The proportion of "Failed" and "Defaulted" combined was 4.6% among new sputum smear positive pulmonary TB patients newly registered in 2009, while "Died" accounted for as high as 19.3%, due largely to a high percentage of the elderly. A new system for contact examination management is provided as a subsystem. Feedback of data analyses has been strengthened by various methods. This TB surveillance system is indispensable for implementing the evidence-based TB control program in Japan. An important role of the Research Institute of Tuberculosis is to support the planning and execution of TB control with provision of useful epidemiological information from the system.

Key words: Tuberculosis, Surveillance, Computerized system, Epidemiology, Treatment outcome, Japan

Introduction

The first nationwide computerized TB surveillance system was introduced by the government of Japan in 1987 and has been successfully implemented, with strong technical support from the Research Institute of Tuberculosis, JATA[1)]. It was revised in 1992, 1998 and 2007. The 2007 system represented a major revision and is called "the new system" in this paper. It was developed to be user-friendly and to allow the evaluation of current TB problems and control issues in Japan. This paper not only introduces the new system and its results but also discusses the role of the TB surveillance system for national TB control.

In Japan, the reporting and recording of TB is mandatory under the Act on Prevention of Infectious Diseases and Medical Care for Patients Suffering Infectious Diseases (the Infectious Diseases Control Law). And it had been carried out under the Tuberculosis Control Law until March 2007. These tasks are carried out at Public Health Centers (PHCs) through the nationwide computerized TB surveillance system. TB statistics are compiled from the database of this system and published as monthly and annual reports. All the figures and tables in this paper were created using the annual report database.

The case rates of newly notified TB patients by sex and age group in 1990 and 2010 were compared in order to observe the changes in TB epidemiology in Japan. The current trend in the proportion of foreigners among TB patients from 1998 to 2010 was observed by age group, and the epidemiological TB situations in 2009 and 2010 are shown. The new system yielded some new findings at the national level, such as foreigners' countries, HIV status, diabetes, and susceptibility test results. Since 1998, treatment outcomes have been classified by computer in Japan. We reviewed and comprehensively changed the algorithm used for automatically classifying treatment outcomes, and the treatment outcomes of patients newly registered in 2007–2009 are shown.

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Materials and Methods

1. The computerized TB surveillance system from 2007

The database of TB surveillance system since 2007 consists of two levels: local and central levels (Fig. 1). Local level means PHCs, while central level means the Ministry of Health, Labour and Welfare (MHLW). There were 518 PHCs in Japan as of April 2007, and all have system terminals connected to a central computer through nationwide official private networks. Although the new system was introduced in April 2007 at the start of the fiscal year, the statistics are compiled by calendar year. The data entered at these terminals (local database, LDB) are sent to the online central computer at the same time. However, the central computer receives only the data necessary for evaluating TB control; personal identification data are not sent to the central database (CDB).

Some of the data entered in the terminal are verified immediately, while other data are verified at the time of compiling the annual report database. The main former verifications are: code range check, inconsistency of time such as registration date＜birth date, and missing essential items; the latter verifications include inconsistency between items in the same record or different records such as bacteriological results on different records, and the relationship between treatment status and medical fee subsidy.

Although there are 64 local governments (47 prefectures and 17 designated cities) governing 518 PHCs as of April 2007, their terminals are not connected to the computers at PHCs but are connected to the central computer. The local governments can access the central computer, but they can only see the output and data on CDB, and download the data of the PHCs that they govern. This is because the roles of the local government are to make a control plan, carry out the plan, and evaluate the outcomes of PHCs, but not to perform case registration, holding and management.

2. Data collected through the system

The items and contents of the database were changed several times. Table 1 lists the items from the CDB in the present system. Although a few items have been deleted, new items have been added successively whenever the system software was upgraded. The letter in Table 1 indicates the year in which the item was added to the system. The contents of some items have changed. For instance, the number of organs was increased to clarify the site of extra-pulmonary TB, from 11 in 1987 to 16 in 1998 and 20 in 2007, and the occupation code was modified to clarify the risk of health care workers, i.e. "nurse/public health nurse", "medical doctor" and "other medical personnel".

The main purpose of the latest system revision was to evaluate treatment, and so drug susceptibility tests, complications, HIV infection and continuation of treatment by drug, etc. were added to the data.

Results

1. The key points of the system revision in 2007 are as follows.

(1) Automatic assignment of reference number from the number decided by each PHC

A unique reference number that does not reflect personal

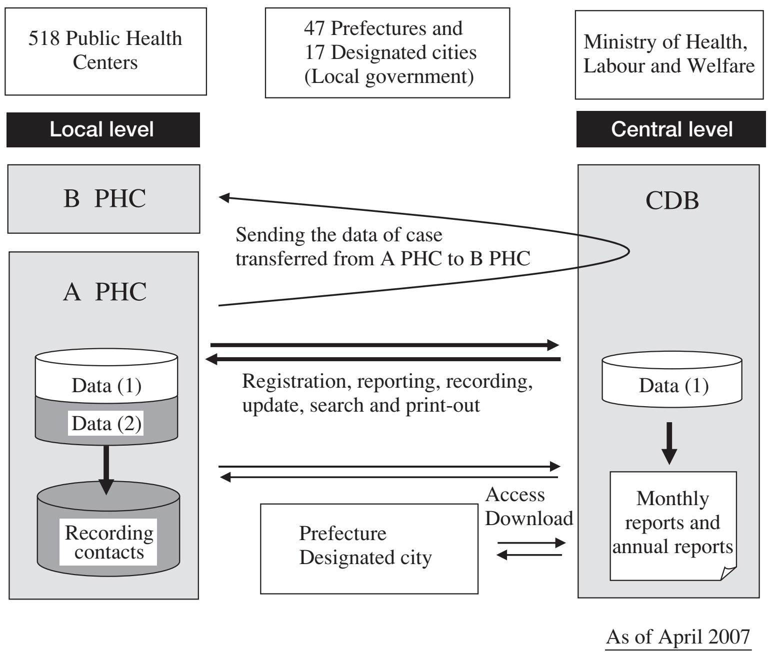

Fig. 1 Schema of nationwide computerized surveillance system in Japan since 2007
PHC＝public health center CDB＝central database

information is computer-generated at each PHC. When a registered case moves out, the same reference number is used at the PHC to which the case is transferred.

(2) Faster registration

A "temporary registration" function was created to help speed up the registration.

(3) Function for automatically sending data upon transfer

A new function was introduced which sends online all the data in the LDB to the transfer PHC. This reduces the workload of data entry and avoids manual data input errors.

(4) New registration of relapsed cases under registration

Unlike in other countries, in Japan cases who have completed treatment but are still registered receive a periodic health check. In the former system, the retreatment under follow-up health check was processed as an occurrence which happened during a series of registration. Since 2007, once a patient has been de-registered for the reason "re-treatment during follow-up", the relapsed patient is registered again automatically with a new reference number in the computer.

(5) New category of treatment outcome

The algorithm for automatically classifying treatment outcomes, which had been used since 1998, was revised. Previously, "cure" or "complete" was classified at the time of six or nine months even though patients still continued to receive treatment. This rule was reconsidered and "cure" or "complete" is now decided at the time when treatment is completed, and classification is done based only on the culture results.

(6) Recording system of DOTS activities and items which can be set up freely

The records of DOTS activities can be entered into the computer and treatment outcomes can be checked on the same screen. Although a patient who moved out during treatment is classified as "transferred out" in the annual report database, the treatment outcome is reclassified at the transfer PHC to confirm the final outcome. Since the system offers some items that the PHC can decide, the PHCs can set the data items freely according to their own purpose.

(7) Improvement of search function

Table 1 List of items in the central database, 2007

(1) Information of identification and status until treatment		Kinds of organ (inputted independently)	A
*Prefecture, designated city code	A	Diabetes	D
*Public Health Center code	A	HIV	D
*City code	A	Classification of X-ray	A
*Identification number	A	Date sample taken for bacteriological test	A
Sex	A	Smear result	A
*Age (from the date of birth inputted at PHC)	A	Culture result	A
Date of registration	A	Identification test result	A
Nationality	C	Type of sample	B
Name of country	D	Date of sensitivity test	D
Occupation	A	Sensitivity test result	D
Homeless	D	Bacteriological result for extra-pulmonary TB	A
Transferred in	A	Need of treatment	A
New/Retreatment/LTBI	A	Hospitalized/outpatient	A
Previous onset	D	Classification of clinical status of activity	A
Previous regimen	D	Drugs (inputted independently)	A
Mode of detection	A	*Treatment regimen	A
Symptoms	A	Insurance	A
Date of diagnosis	D	Type of medical fee subsidy	A
Date of treatment start	A	Type of medical institution	A
*Patient's delay (from the date of onset)	A	*Length of initial hospitalization	D
*Doctor's delay (from the date of initial doctor-visit)	A	(3) Treatment outcome by cohort analysis methods	
*Total delay (from the date of onset and diagnosis)	A	1st month: smear result	C
BCG	D	1st month: culture result	C
Date of treatment end	B	1st month: treatment status	C
Reason of treatment end	A	1st month: type of DOTS	D
*Length of treatment	D	↓ ditto to the 12th month	
Date of cancellation	A	Length of treatment interruption	D
Reason for cancellation	A	Length of PZA use	D
(2) Records under the registration (#)		Continuity of INH use	D
*Serial number of records	A	Continuity of RFP use	D
Date of information	A	Treatment exceeded 12 months	D
*Age at the time information obtained	A	Treatment outcome	C

Abbreviation: LTBI, latent tuberculosis infection HIV, human immunodeficiency virus DOTS, directly observed treatment, short-course PZA, pyrazinamide INH, isoniazid RFP, rifampicin

*Categorized or calculated automatically (#)The number of records differs for each patient.

A.B.C.D: The year in which an item was introduced into the system; A=1987, B=1992, C=1998, D=2007

PHCs often need to search for specific registrants among all the registrants. Although the previous system had a search function, the search conditions were limited. The new system has both a quick search function and a detailed search function. In the former, matching registrants can be searched by selecting given conditions. In the latter, matching registrants can be searched with conditions by freely combining items and codes. The data of registrants searched can also be downloaded.

(8) Contact examination management system as a subsystem

A contact examination management system was developed in the new system and added to only the PHC system as a subsystem. The database of the subsystem has three levels: (a) index patient, (b) contact groups, and (c) contact people. If the index patient is registered in the main system, the necessary information of the patient is imported from the database. A warning function enables the name of contact people and the kind of warning to be checked by clicking on the warning function key. This function will help prevent not conducting health examinations of contacts and missing records of medical checkups. It is also possible to print out official letters of recommendation or letters of action on health examination for the contacts.

(9) Feedback

A monthly report is compiled from the CDB automatically and regularly on the specified day of the next month, and an annual report similar to the monthly report is also produced, but with sufficient time for data correction. In addition, using the data obtained through the TB surveillance system, a year book of TB statistics has been published so far. Feedback of additional results, comments, explanations, etc. is improved by using the internet.

2. Changes in TB epidemiology

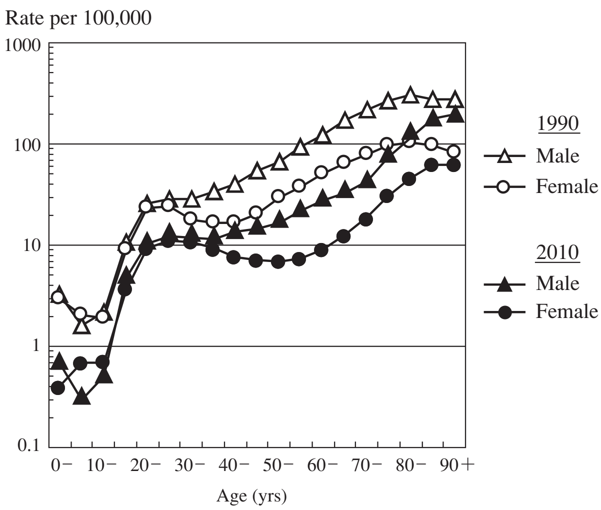

Fig. 2 Case rates of notified patients by sex and age group in between 1990 and 2010, Japan

Over all case rates were 41.9 (male 56.2, female 28.2) in 1990 and 18.2 (male 23.4, female 13.2) in 2010.

Fig. 2 shows the case rates of notified patients by sex and age group from 1990 to 2010. The high-risk age group has shifted to the older generation. The TB notification (incidence) rate has declined and reached 18.2 in 2010, although the case rates of the elderly were high: 65−74 years old (25.9), 75−84 years old (59.4) and 85 or older (96.0). Furthermore, the proportion of elderly cases aged over 65 years increased from 40.0% to 59.1%, and the percentage among those aged over 85 years has increased from 3.3% to 16.0% in the last two decades.

Meanwhile, there was a small peak of young adults which became significantly clearer. One of the characteristics of TB among young adults is the onset of TB among foreigners entering Japan from countries with high TB rates, namely China and the Philippines. The number of foreign TB patients increased from 739 in 1998 to 952 in 2010. In contrast, the number of Japanese TB patients decreased during this period and hence the proportion of foreign TB patients increased from 2.1% in 1998 to 4.2% in 2010, excluding those of uncertain nationality (Fig. 3). Especially, the proportion of those aged 20−29 years increased greatly from 9.1% in 1998 to 28.8% in 2010. Characteristics of foreign TB patients aged 20−29 years are that 83.8% developed TB within 5 years of entering Japan, 41.3% were students, 26.0% were full-time workers, 8.9%

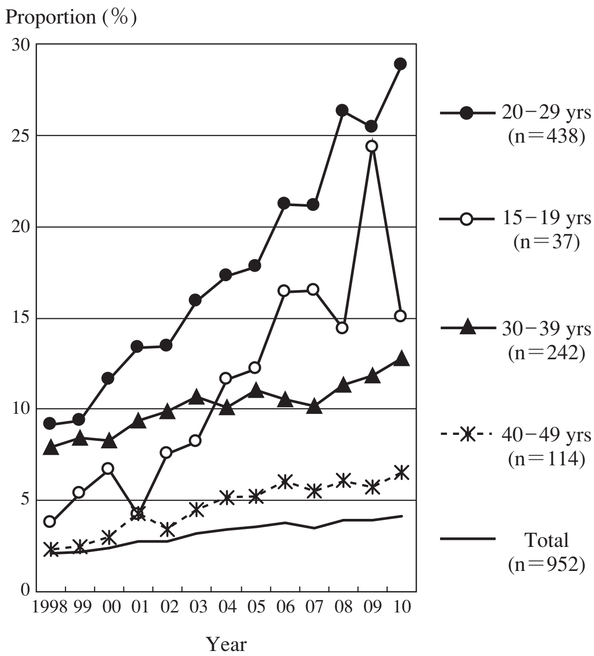

Fig. 3 Trends in proportion of foreigners among newly notified TB patients by specific age-group, 1998−2010

(n=): Number of foreign TB patients newly notified in 2010
The proportion is calculated excluding those of uncertain nationality. Proportions of uncertain nationality among newly notified TB cases were 14.4% in 1998 and 1.4% in 2010. 574 cases of foreign TB patients were entered within 5 years and 378 cases were more than 5 years or uncertain entry time. The number of foreign countries was 40, though the majority of patients were from China (28.7%), the Philippines (22.7%), Korea (8.1) and Indonesia (6.7) in 2010.

were jobless and 8.4% were part-time workers in 2010.

3. Summary of the current TB situation and TB control

Table 2 shows indicators of the epidemiological TB situation calculated based on the annual report database in 2009 and 2010. In 2010, 23,261 active TB cases were newly notified. The main characteristics of the current TB epidemiology in Japan are a low incidence rate among children and a high one among the elderly: more than half of TB patients are 70 years old or over. 83.5% of pulmonary TB cases were diagnosed bacteriologically and 32.2% of pulmonary TB cases were cavitary in 2010.

Regarding the background of cases, 53 HIV positive cases (0.2%) were reported in 2010, but the percentage of HIV tests implemented is unclear. Regarding data entry, the proportion of known culture test results increased from 2007 to 2010, i.e.

Table 2 Number of TB patients and value of epidemiological indicator, 2009−2010

			2009		2010	
		unit	n	value	n	value
Magnitude of TB						
Newly notified TB cases	(1)	Rate$	24,170	19.0	23,261	18.2
Sputum smear positive pulmonary TB		Rate	9,675	7.6	9,019	7.0
Latent TB infection (LTBI) treatment$$		Rate	4,119	3.2	4,930	3.8
Children TB (0−14 yrs)		Rate	73	0.4	89	0.5
Elderly TB (65+ yrs)		Rate	14,011	48.3	13,745	46.9
Ditto		%/(1)	14,011	58.0	13,745	59.1
Pulmonary TB	(2)	%/(1)	18,912	78.2	18,328	78.8
Extra-pulmonary TB		%/(1)	5,258	21.8	4,933	21.2
Retreatment		%/(1)	1,751	7.2	1,762	7.6
Situation at the time of diagnosis						
Bacteriologically confirmed pulmonary TB		%/(2)	15,635	82.7	15,297	83.5
Cavitary pulmonary TB		%/(2)	6,202	32.8	5,899	32.2
Symptomatic pulmonary TB	(3)	%/(2)	14,177	75.0	13,695	74.7
Patient's delay (More than 2 months)		%/(3)*	1,553	17.9	1,637	18.3
Doctor's delay (More than 1 month)		%/(3)*	2,729	20.4	2,958	22.6
Total delay (More than 3 months)		%/(3)*	1,599	18.2	1,770	19.6
Background of cases						
HIV infection**		%/(1)	52	0.2	53	0.2
Diabetes		%/(1)	3,043	12.6	3,085	13.3
Foreigners		%/(1)	938	3.9	952	4.1
Homelessness within 1 year		%/(1)	380	1.6	333	1.4
Vulnerable cases with social welfare		%/(1)	1,916	7.9	1,868	8.0
Medical workers***		%/(1)	617	2.6	564	2.4
Active case finding						
Periodic mass screening		%/(1)	2,632	10.9	2,534	10.9
Contact survey		%/(1)	635	2.6	663	2.9
Susceptibility tests						
Known culture test results		%/(2)	14,146	74.8	14,656	80.0
Culture positive pulmonary TB	(4)	%/(2)	10,902	57.6	11,495	62.7
Known susceptibility test results	(5)	%/(4)	6,920	63.5	8,380	72.9
MDR (INH, RFP resistant)#		%/(5)	56	0.8	68	0.8
INH resistant##		%/(5)	346	5.0	396	4.7
Any resistant###		%/(5)	903	13.0	1,025	12.2
Treatment						
Known initial phase of treatment	(6)	%/(1)	22,949	94.9	22,376	96.2
HRZS/E		%/(6)	14,152	61.7	14,084	62.9
Length of hospitalization++		Days	Median	67	Median	68
Length of treatment++		Days	Median	272	Median	270

Abbreviation: MDR, multi-drug rasistant HRZS/E, isoniazid, rifampicin, pyrazinamide, streptomycin/ethambutol

$: Rate per 100,000 population. In the case of children and elderly, specific population was used.

$$: LTBI is not included in the newly notified TB cases (1).

*: Unknown cases about delay were excluded from denominator.

**: % of HIV test implemented is unclear.

***: Number of nurses/public health nurses, doctors and other medical workers were 669, 169 and 343 in 2009−2010.

#: Proportion having MDR; 0.5%/0.5% in new cases and 3.6%/3.9% in retreatment cases in 2009/2010.

##: Proportion having resistance to any INH; 4.4%/4.1% in new cases and 11.6%/11.4% in retreatment cases in 2009/2010.

###: Proportion having resistance to any drug; 12.4%/11.6% in new cases and 20.0%/19.0% in retreatment cases in 2009/2010.

+: Proportion of HRZS/E usage among those aged less than 80 years old was 77.0%/79.0% in 2009/2010.

++: Subjects were those notified in 2008 and 2009.

63.8%, 62.3%, 74.8% and 80.0% in each year. The proportion of known susceptibility test results also increased from 2007 to 2010, i.e. 41.8%, 45.7%, 63.5% and 72.9% in each year. As a result, the proportion of multi-drug resistant (MDR) cases among culture-positive pulmonary cases and their susceptibility test results obtained was 0.8%; it was 0.5% among new cases and 3.9% among retreatment cases in 2010. Median length of hospitalization was 68 days and median length of treatment was 270 days in 2010.

Table 2 shows that the proportion of medical workers among newly notified TB cases was 2.6% in 2009 and 2.4% in 2010, respectively. However, regarding female cases (n=5,308) aged 25−59 years newly notified in 2009−2010, 10.9% were nurses/public health nurses, while among sputum smear positive pulmonary female cases (n=1,555) aged 25−59 years newly notified in 2009−2010, 8.3% were nurses/public health nurses.

Regarding socially vulnerable people, the proportion of TB cases with social welfare (receiving or applied for) at the time of registration was 7.9% in 2009 and 8.0% in 2010. The proportion of people reported as homeless within the last year was only 1.6% in 2009 and 1.4% in 2010, partly because reporting rate was still low. However, among sputum smear positive pulmonary male cases aged 40−59 years, the proportion of homeless experience was estimated that more than 10 % in the whole country and more than 20% in Tokyo metropolitan area and Osaka city.

4. Treatment outcome obtained through the new system

The new system has 15 category codes. All pulmonary TB patients including not only bacteriologically-negative patients but also patients diagnosed as TB after death are classified into these 15 codes according to the algorithm in the computer. The 15 categories and number of cases classified as new sputum smear positive pulmonary TB cases registered in the 2009 year cohort (n=8,772) are as follows. ① "Cured"; treatment (Tx) was completed within 12 months with a sufficiently long Tx and at least two successive culture negative results were confirmed, at least one of which was within the 3 months before Tx completion (n=1,814), ② "Completed 1"; Tx was completed within 12 months with a sufficiently long Tx and at least one culture negative result was confirmed after positive results and before Tx completion (n=2,382), ③ "Completed 2"; Tx was completed within 12 months with a sufficiently long Tx but a culture negative result was not confirmed (n=340), ④ "Died"; death during Tx by any cause (n=1,693), ⑤ "Failed"; a culture-positive result was confirmed during 5−12 months after the start of Tx (n=79), ⑥ "Defaulted 1"; Tx interrupted for more than 60 days or 2 consecutive months (n=71), ⑦ "Defaulted 2"; Tx was completed by a physician, but Tx duration was insufficient as the standard regimen (n=254), ⑧ "Transferred"; Transferred to a control place in another PHC during Tx (n=288), ⑨ "Still on treatment 1"; still on Tx at the end of 12 months with discontinuation of isoniazid (INH) or rifampicin (RFP) before Tx completion (n=175), ⑩ "Still on treatment 2"; still on Tx at the end of 12 months except category 10 (n=769), ⑪ "Not evaluated (N.A.) 1"; no treatment for TB, mostly caused by early death (n=187), ⑫ "N.A. 2"; no information about Tx regimen at the beginning (n=126), ⑬ "N.A. 3"; not the standard regimen at the beginning (n=221), ⑭ "N.A. 4"; Tx was completed within 12 months but INH or RFP was discontinued before Tx completion (n=116), ⑮ "N.A. 5"; other, usually caused by a lack of information (n=257).

Fig. 4 shows the treatment outcomes for sputum smear positive pulmonary TB cases by age group and treatment history.

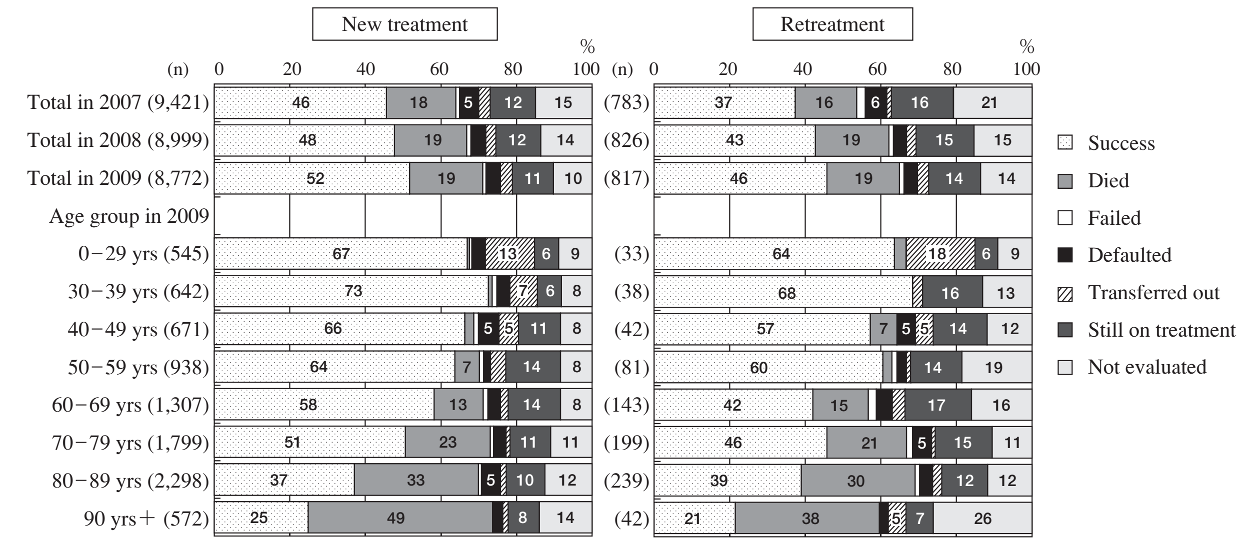

Fig. 4 Treatment outcome of newly notified new or retreatment sputum smear positive pulmonary TB patients newly registered from 2007 to 2009 and treatment outcome of those newly registered in 2009 by age-group

The success rate of "Cured" and "Completed" combined increased, hence "Not evaluated" has decreased in the last three years. The "Success" rate was lower in retreatment cases than new treatment cases, because the proportion of "Still on treatment" and "Not evaluated" among retreatment cases was greater than that among new treatment cases. This figure also shows that treatment outcomes in Japan are characterized by a high death rate, affected by the high death rate among the elderly. The death rate increases remarkably with age. Regarding deaths among elderly TB cases, it was reported that 27.6% of TB patients aged 65 or older died within one year and 15.5% died within 3 months[2].

Discussion

The computerized TB surveillance system was revised comprehensively in 2007 to create a user-friendly system, to evaluate current TB control issues in Japan, and to plan appropriate strategies.

One characteristic of Japan's TB surveillance system is that it collects many kinds of data compared with some countries[3)4)]. Although a system with many data items might cause much work for public health personnel, it is also likely to give them more information in return. The new system provides many cross tables through monthly and annual reports. Especially in annual reports, most data collected as CDB appear somewhere in the tables. In addition to the tables produced by the system, the Research Institute of Tuberculosis (RIT) strengthened the feedback activities and set up the TB Surveillance Center (TSC) in September 2008. TSC provides mainly epidemiological information in html, Excel, PDF and PPT formats through the Web (http://www.jata.or.jp/rit/ekigaku/en), and also publishes papers to provide useful epidemiological information obtained by analysis of the annual report database. From the 2008 annual report database, a series of 10 papers were published on the proceedings of the Japanese Society of Tuberculosis[5)~14)], and this series has been continued using the 2009 and 2010 annual report databases.

In the system revision in 2007, the evaluation of treatment and TB control were strengthened, and so drug susceptibility tests were added to the data. So far, Japanese drug resistance rates were reported once every 5 years by Ryoken (a nationwide coalition of TB hospitals) in which culture isolates were sent to RIT, which performed drug susceptibility testing (DST) at its laboratory[15)~17)], ensuring reliable test results. On the other hand, in the TB surveillance system, since only the test results obtained from patients' hospitals were entered into computers at PHCs, the test results were less reliable, and the proportion of data input also differed among local governments and PHCs. Indeed, the proportion of DST results input into the system was very low in the first two years[11)], so RIT intervened at PHCs through local governments directly to improve their data input; this resulted in a large increase in data input and quality of data from 2008 to 2009. Although many problems remain to be overcome in using this system to monitor TB drug resistance in Japan, it will be useful for this purpose in the future and will assist the nationwide drug surveillance system.

Another major advantage of having susceptibility test results data in the system is the ability to analyze other epidemiological data together. Indeed, it was demonstrated that the Kinki and Kanto districts showed high resistance rates to any INH among new treatment patients[18)]. It was also shown that retreatment TB patients and foreign TB patients who had entered Japan within the last five years showed a high risk of multi-drug resistance[19)].

Treatment outcomes by cohort analysis are an important aspect of TB control. The classification of treatment outcomes was specified by WHO[20)] and many countries follow this classification in principle[3)4)], but some have modified it. For example, Europe follows this classification, but modified and added the category of "Still on treatment"[21)]. In the previous system in Japan, "cure" or "complete" was classified at the time of six or nine months even though patients continued to receive treatment, unlike the WHO definition, because an unnecessarily long treatment period was common at that time in Japan. This problem was resolved by introducing "Still on treatment" to the classification of treatment outcomes. Since the length of TB treatment has been gradually shortened in Japan, we expect that "Still on treatment" will become small.

Unlike the previous system, the treatment outcome can be seen on the computer screen immediately at the time of data input in the new system. Since 15 codes of outcome also indicate the specific details for case management, staff can understand what is required to obtain a preferable outcome. For example, "Success" requires a treatment period of at least 180 days and two months of pyrazinamide (PZA) usage under the standard regimen. They can also learn how to avoid "Not evaluated" through data input. From the cohort in 2007 to the cohort in 2009, the proportion of "Not evaluated" has been decreasing and "Success" has been increasing, although with the acceleration of aging it is difficult to reduce "Death".

The main characteristics of the current epidemiological situation in Japan are a low incidence rate among children and a high one among the elderly. Since 2009, more than half of TB patients are 70 years old or over, and the aging of TB patients is the biggest problem. Among the elderly with TB, "doctor's delay" rather than "patient's delay" is a problem[8)9)22)]. A longer "doctor's delay" might result in nosocomial infection. The risk of medical personnel developing TB is high, and the risk for nurses is reported to be four times higher than for females in the general public of the same age[23)]. On the other hand, nurses/public health nurses tend to be detected at a relatively early stage of the disease by periodic health checks or contact examination. This may be because of proper TB control for medical workers; however, we should continue to carefully monitor high-risk workers.

The proportion of foreign TB patients has continuously increased since the beginning of observation, and the proportion of socially vulnerable TB patients is also increasing, especially in big cities. The difficulty with foreigners with TB is holding and managing cases, since they may return to their country before the completion of treatment, as well as language, living expense, and insurance problems. The difficulties with vulnerable TB patients including the homeless are delay in reaching medical support and discontinuation of treatment due to change of environment and financial problems. For foreigners and vulnerable TB patients, there is a need for collaboration with not only medical personnel but also welfare workers and volunteer groups. As the TB rate has decreased, the number of such socially vulnerable patients has increased, so the TB surveillance system should monitor such cases and show the correct situation for TB control.

On May 16th, 2011, a guideline for new TB control was announced by the MHLW, targeting a TB incidence rate per 100,000 of 15 or less and the proportion of retreatment among pulmonary TB cases of less than 7% by 2015. These targets were set based on the results from TB surveillance, which will also play a role in monitoring the achievement of these targets.

Conclusion

The computerized TB surveillance system was revised comprehensively in 2007 to make it more user-friendly. The system was developed by the MHLW, strongly supported by RIT. An important role of RIT is to support the planning and execution of TB control. However, the evaluation and supervision of TB control among country and local governments remain weak. The analysis of surveillance data and provision of useful information will help overcome this situation and eliminate TB.

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