Heat Disorder Information System for Japan in 2012.

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Abstract
In 2010, Japan experienced the hottest summer last 100 years. According to the prompt reports of heat disorder patients taken to hospitals by ambulance cars (the Fire and Disaster Management Agency) the number of heat disorder patients was 53,843 from June to August. And, the Vital Statistics of Japan Annual Survey reported the number of fatalities caused by heat disorders was 1,718 (the highest record from the survey begging 1964). In order to reduce risks for heat disorders, seminars for nurses, care managers and local government staffs were held at 11 cities before summer, and guidebooks, explain expedient treatments, preparation for summer and so on, were delivered for participants and opened for the public through the Internet. From June to September, Heat Disorder Information System is managed by Ministry of Environment and National Institute for Environmental Studies. The web site provides 3 hourly WBGT forecast for 150 cities beyond the day after tomorrow, and reports hourly observed and estimated WBGT. It also provides information to the local government or private sectors by Internet web site or e-mail. Additionally 'heat disorder patients report last week' is issued on every Tuesday by the Fire and Disaster Management Agency, and it warns the actual risks of heat disorder patients.

Introduction

Heat disorder patients increase with global warming, urbanization, etc, and heat spells bring health damage especially for elderly people. In 2010, Japan experienced the hottest summer last 100 years. According to the Fire and Disaster Management Agency report, the total number of patients taken to hospitals by ambulance cars from July to September was exceeded to 53,843[(1)]. About the ratio of patients separated by age, elderly patients (older than 65 years) were the most common category 46.3 percent. The Vital Statistics of Japan Annual Survey (the Ministry of Health, Labour and Welfare) reported, the number of fatalities caused by heat disorders was 1,718 and the number is the highest record from the survey begging 1964, and the ratio of elderly people(older than 65 years old) was 79.3% and ratio of people died at their home was 45.6% [(2)].

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During the 1st. heat spell, (1) patients taken to hospitals by ambulance cars were greater than 2nd and 3rd heat spell, (2) severe symptom patients (included more than 10 fatalities) exceeded to 4 to 7 percent and (3) elderly patients (older than 65 years) increased to 60 percents of patients[3].
There are several indexes related to heat disorders, however, WBGT (Wet Bulb Globe Temperature, Yaglou, 1957) [4], adopted as ISO 7243, is commonly used in Japan. WBGT is calculated from T_w (wet bulb temperature), T_g (globe temperature) and T_a (dry bulb temperature) as follows.

$$WBGT = 0.7 \times T_w + 0.2 \times T_g + 0.1 \times T_a \quad (1)$$

Seminars for local governments' staffs (2012 action 1)

The Ministry of Environment (MOE) issued 'A guide book for preventing heat disorders'[5] from 2005, and provided leaflets or a post card to warn heat disorder risks especially for elderly people. In 2012 MOE held seminars for nurses, care managers and local government staffs at 11 big cities from late May and to early June. The seminar is consisted of 4 sessions shown below.
http://www.env.go.jp/chemi/heat_stroke/seminar2012/index.html

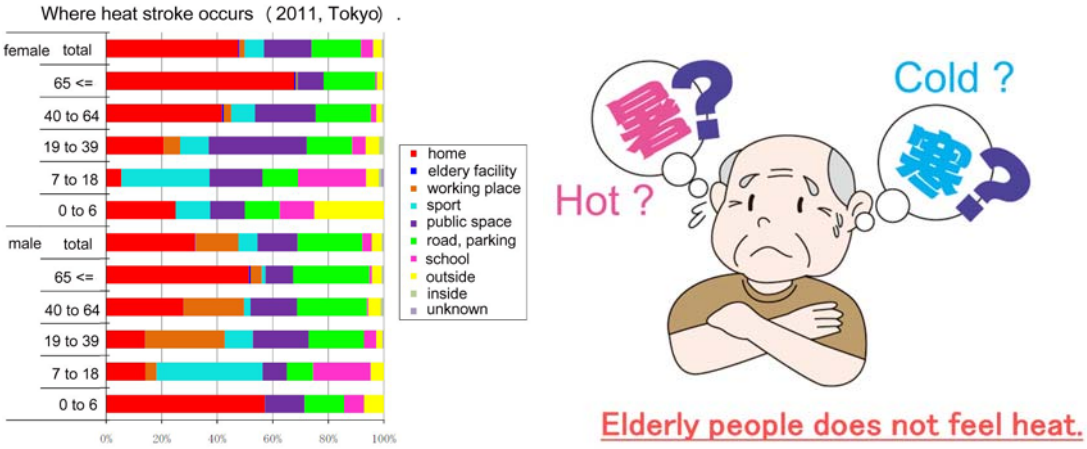

Fig.1 A sample of slides (2012 MOE summer seminars)

Session 1: Heat disorder mechanism, expedient treatment and medical treatment

What is heat stroke?
Heat disorder mechanism (symptom and categories)
Expedient treatment at the accident (with flow chart)
Medical treatment
Vulnerable people for heat disorder

Session 2: Heat disorder in daily life
- Epidemiology of heat disorder
- Statistics of heat disorder patients
- Heat stroke fatalities and meteorological factors
- Adaptation for heat (before summer)
- How to arrange residential environment
- Remarks in daily life under heat condition
- Guideline for preventing heat disorders
- Assertive usage of an air conditioner

Session 3: Heat disorders of elderly people and children
- Heat disorders of elderly people
- Exertional and non-exertional heat disorder
- Why elderly people are vulnerable for heat?
- Heat disorder of babies and children
- Features of cooling mechanism of children
- Remarks for children in exercise and sports scene
- Remarks for farmers and outside workers
- Remarks for outside events

Session 4: Guideline for heat disorders and examples of local government approaches
- Guideline for heat disorders
- Check sheet 1(for elderly people)
- Check sheet 2(for routine visit in communities)
- Examples of local government's approach
- Information regarding heat disorders and how to use them

The presentation files used on seminars are published as a handout and opened for the public usage through the Internet. Through the seminars, we discussed with participants how to develop action plans for reducing heat disorder patients, and with gathering local governments' actual plans implemented in 2012 summer, we're going to update a seminar guidebook for next summer season.

Information system regarding heat disorder (2012 action 2)

MOE also manages 'Heat Stroke Information web site' through June to September from 2006. In the web site, observed WBGT at 6 cities (Tokyo, Niigata, Nagoya, Osaka, Hiroshima and Fukuoka) and estimated WBGT at 147 cities are updated 1 hourly with last 7 days historical data. Additionally 3 hourly WBGT forecast for 150 cities beyond the day after tomorrow is provided. WBGT forecast is updated with 6 hourly basis with updated NWP forecast (JMA-GSM) and corrected with observed/estimated WBGT 1 hourly.

WBGT is calculated with equation (1), however, most of observatories do not observe Tg (globe temperature) and some observatories do not observe sun radiation. When Tg is not observed, we estimate Tg with equation (2) (determined with 6 cities observation data from June to September in 2008). And when sun radiation is not observed, we calculated sun radiation (S_0) in clear sky condition, using sun duration in 10 minutes (SD), we estimate sun radiation (S_1) with equation (3).

$$T_g = T_a - 0.17 + 0.029 \times S - 0.48 \times U^{1/2} - 1.27 \times 10^{-5} \times S^2 \quad (2)$$

Here, T_a is temperature (deg. in Celsius), S is sun radiation (W/m^2), U is wind speed (m/s).

$$S_1 = \begin{cases} S_0 / c & \text{(when SD = 0)} \\ S_0 / \{1 + a \times \exp(-c \times sun)\} & \text{(when SD = 1 to 10 (min.))} \end{cases} \quad (3)$$

Here, coefficient a, b and c are calculated from 2011 observation data at the nearest observatory where sun radiation is observed. For example a= 1.3, b=0.19 and c=4.0 at Tokyo.

Table 1. WBGT warning categories and remark
(Japan Amateur Sports Association, 1994)

WBGT threshold (degrees C)		
31	danger	Stop exercises in principle
28	alert	Stop severe exercises
25	advisory	Take rests frequently
21	caution	Frequent hydration
	almost safe	Risk is relatively lower

WBGT observation and forecast data is displayed with 5 colored categories separated by WBGT threshold (Japan Amateur Sports Association, 1994)[6] shown in Table 1. 'Pink' (WBGT is greater than 28 degree) warns the heat condition is in alert level (patients taken to hospitals will be increasing). And 'Red' (WBGT is greater than 31 degree) warns the heat condition is in danger (patients taken to hospitals might exceed to 1,000 in a day or several fatalities might be recorded)[3]. In the web site or in the MOE guidebook[5], directions how to reduce heat risks or how to protect health condition are mentioned. The system provides actual WBGT abd WBGT forecast to about 400 local governments and 30 private sectors by ftp, http protocol or e-mail. Local governments, received WBGT information, distribute the information to staffs

who responsible for schools, hospitals, care managements, sports and so on.

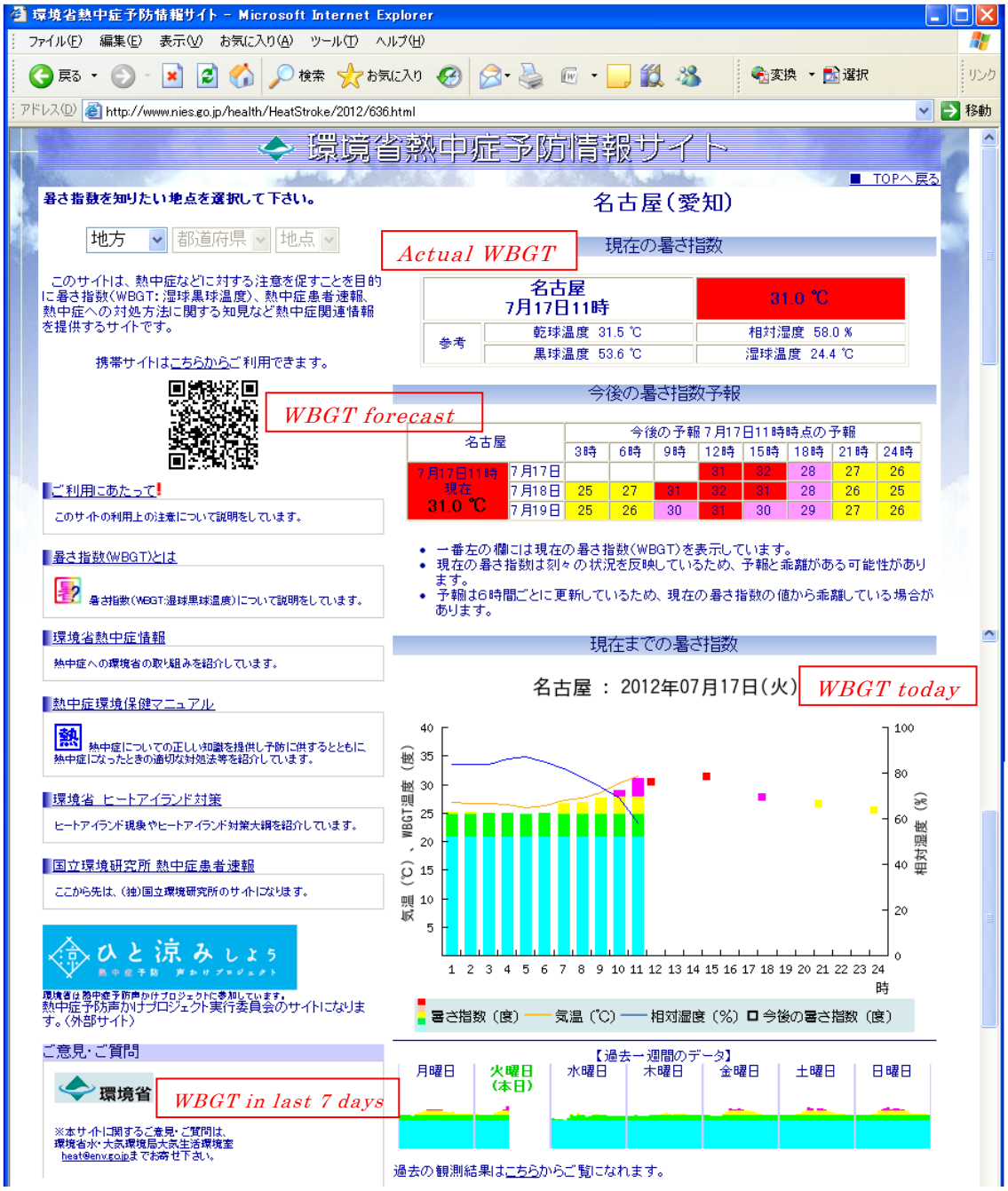

Fig.2 WBGT web site

(Ministry of Environment and National Institute for Environmental Studies)

http://www.nies.go.jp/health/HeatStroke/spot/index.html

WBGT information site is well known in Japan, and the hit for WBGT information is steady increasing year by year. In 2012 summer season (May to September), the total access for the top

page of the WBGT information site was exceeded to 7.7 million hits.

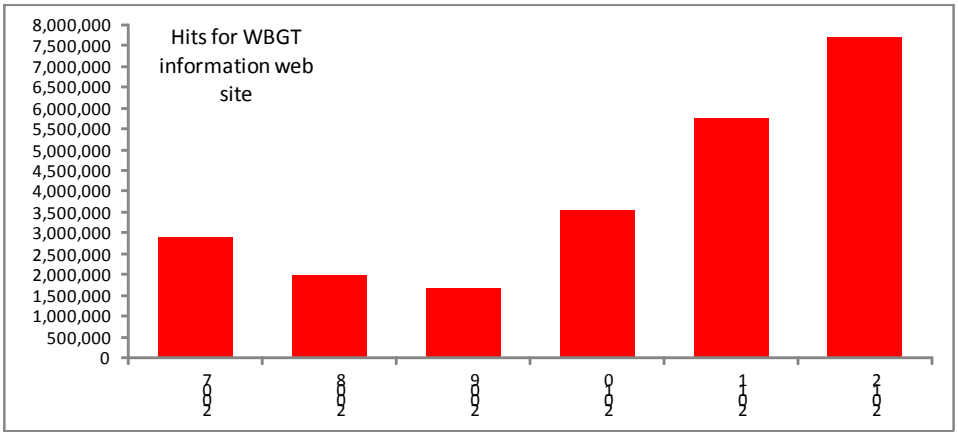

Fig.3 Hits for WBGT information web site

Additionally ‘heat disorder patients report in last week’ is issued on every Tuesday by the Fire and Disaster Management Agency. It warns the actual situation of heat disorder patients.
http://www.fdma.go.jp/neuter/topics/fieldList9_2_1.html

References:

(1) Fire and Disaster Management Agency: Prompt Report for Heat disorder Patients Taken to Hospitals by Ambulance Cars (in Japanese), Available from http://www.fdma.go.jp/neuter/topics/fieldList9_2_1.html

(2) Ministry of Health, Labor and Welfare: The number of fatalities due to Heat Disorders, MHLW press report (24th. Jun. 2011) (in Japanese), Available from http://www.nies.go.jp/health/HeatStroke/spot/index.html

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(6) Japan Amateur Sports Association: A Guidebook for Prevention of Heat Disorders for Sporting Activities (in Japanese), 1994