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Chapter 9

BODY TEMPERATURE, TEMPERATURE TAKING AND NURSING THE FEVERISH PATIENT

The mankind has three main enemies at any rate:
Fever, Starvation and War.
It is Fever that one dreads most among them.
Sir William Osler, 1896

Goal: to get a notion about the device of thermometers, the rules of their storage, disinfection and temperature taking, types of fever, ways of feverish patients' care; to master skills.

Knowledge objectives:

- to know the fever's definition, its stages; temperature taking rules; mistakes in temperature taking; classifications of fever.

Skills objectives:

- to develop practical skills in temperature taking and registration on a temperature chart; care of feverish patients in different stages of fever.

Subject-matter:

1) the device of thermometers;
2) the rules of thermometer storage and disinfection;
3) the rules of temperature taking;
4) the types of fever;
5) the ways of feverish patients' care.

Equipment required: the maximal medical thermometer, the marked glass (jar) for disinfection of thermometers with 2% and 0.5% chloramine solution, a temperature chart.

Fever is the rise of body temperature that appears as protective-adaptive reaction of the organism in response to pathogens, is a non-specific attribute of many diseases. Fevers are divided by a level of the temperature rising and by character of fluctuations of a body temperature. There are rules of temperature

taking which allow avoiding mistakes. The temperature must be registered on the temperature chart.

Signs of illness are specific and non-specific. The rise of body temperature higher than 37 °C is a non-specific sign of illness.

Fahrenheit in 1723 was the first who offered to take temperature by means of medical thermometer.

Disturbances of thermoregulation, connected with change of a metabolism (accumulation of so-called pyrogenic substances — products of disintegration of fibers etc.) are the main reasons of the temperature rising. The maintenance of higher than normal temperature could be considered as the reaction to various irritators, which leads to a thermoregulation reorganization. More often, fever arises in infectious diseases, but the temperature rising can be only of the neurotic origin.

The medical maximal thermometer which has graduation from 34 up to 42 degrees Celsius (°C) is used for temperature taking. It can be graduated also on Fahrenheit (Fig. 9.1).

Fahrenheit (°F)	Celsius (°C)
107.6	42.0
105.8	41.0
105.0	40.5
104.0	40.0
103.0	39.4
102.2	39.0
102.0	38.9
101.0	38.3
100.4	38.0
100.0	37.7
99.0	37.2
98.6	37.0
98.0	36.6
97.0	36.1
96.8	36.0
96.0	35.5
95.0	35.0

Fig. 9.1. Fahrenheit–Celsius conversion

Fahrenheit (°F)	Celsius (°C)
107.6	42.0
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98.0	36.6
97.0	36.1
96.8	36.0
96.0	35.5
95.0	35.0

Fig. 9.1. *End.* Fahrenheit–Celsius conversion

The thermometer is called «maximal» because, after temperature taking, it continues to show that maximal temperature which has been found in a person at measurement, since mercury independently can not be lowered in the tank of the thermometer without its additional shaking.

One can choose from several types of thermometers. Today, most thermometers have digital readouts.

Some thermometers take temperature quickly from the ear canal and can be especially useful for young children and the elderly. Others can be used rectally, orally or in an armpit. If a digital thermometer is used, read the instructions to know what the beeps mean and when to read the thermometer. Under normal circumstances, temperature tends to be highest around 4 p.m. and lowest around 4 a.m. (Fig. 9.2).

On the far left of the figure 9.2, there is a plastic strip with liquid crystals that react to heat. Moving clockwise, the others are a digital pacifier thermom-

Fig. 9.2. Types of thermometers

eter, a tympanic (ear) thermometer, a regular digital thermometer, and a mercury-free oral glass thermometer.

Due to the potential for mercury exposure or ingestion, glass mercury thermometers are being phased out. Digital thermometers with memory are created today which do not contain mercury and glass, and also thermometers for instant temperature taking (for 2 seconds) in sleeping children or in excited patients. Such thermometers appeared irreplaceable during recent struggle against «atypical pneumonia» (SARS, Severe Acute Respiratory Syndrome) when the temperature was measured in hundreds of patients on transport streams (the airports, the railway stations).

Fever has *three stages* (periods) — the temperature rising, top of temperature (constant high temperature) and temperature falling. These stages in «classical» variant are submitted at the so-called continued fever which happens in pneumonia.

Principles of care of feverish patients, depending on a stage of fever, can be formulated as follows:

- in the first period of fever it is necessary «to warm» a patient;
- in the second period of fever it is necessary «to cool» a patient;
- in the third period of fever it is necessary to prevent falling of blood pressure, haemodynamic disturbances.

The temperature rising of 1 °C is accompanied by increasing of frequency of respiratory movements (FRM) by 4 breaths and increasing of pulse by 8–10 beats per minute in adults and up to 20 beats per minute in children.

RULES OF TEMPERATURE TAKING

Thermometers are stored in a glass (jar) with a disinfectant solution (0.5% chloramine solution), a layer of cotton wool at the bottom of a glass. Before temperature taking, it is necessary to take out the thermometer from disinfectant to dry it and to shake. The basic place of temperature taking is the axillary area which should be dry (body sweat reduces temperature by 0.5 °C). The temperature also can be taken in an inguinal bend (in children), in the mouth. In severely ill patients, the temperature can be measured in the rectum where the temperature is usually higher by 0.5–1 °C. Duration of temperature taking is not less than 10 minutes. Temperature is taken twice a day — in the morning on an empty stomach between 7 and 8 o'clock, and in the evening before last meal between 17 and 18 o'clock. It is possible to take temperature every 2–3 hours in case of necessity. After taking the temperature, the thermometer is shaken and put into a glass with a disinfectant solution. Before giving the thermometer to another patient, it is rinsed with running water, carefully wiped and shaken up to column of mercury below 35 °C.

MISTAKES IN TEMPERATURE TAKING

1. A nurse didn't shake up the thermometer.
2. The hot-water bottle is put to the arm on which the temperature is measured.
3. Temperature taking in severely ill patients (bad pressing of the thermometer by a patient).
4. The tank with mercury was outside of axillary area.
5. Simulation of the temperature rising by a patient.

TEMPERATURE REGISTRATION IN A TEMPERATURE CHART

A patient's name, date and time (morning and evening) of temperature taking are fixed in the temperature chart. The results of temperature taking are marked with points. In connection of points with each other, the temperature curves appear, they are analyzed by a doctor.

In a healthy person, the temperature can change from 36 to 37 °C, in the morning it is usually lower, and it can be higher in the evening. Usual physiological fluctuations of temperature within a day are 0.3–0.5 °C. Age characteristic features of temperature: it is higher in children; in the elderly and exhausted patients decrease of temperature is marked, and even severe

inflammatory disease (for example, pneumonia) can proceed with normal temperature.

On *a temperature chart*, on the ordinates axis (vertically), values of the body temperature are marked (the scale «T°», every division is 0.2 °C). On the abscissa axis (horizontally), the days are marked with the division into morning («m.») and evening («evg.») columns. Body temperature is marked by points (dark blue or black colour), which are connected by the direct lines. Thus, *the temperature curve* is done. Its *type* has diagnostic value in many diseases.

Besides graphic registration of temperature, the curve of the pulse rate is built (the scale «P», red colour) and blood pressure is marked (the scale «BP»). Daily FRM, body weight (every 7–10 days), diurnal amount of consumed and urinal excretion (in millilitres) are expressed in figures on a temperature chart.

CLASSIFICATIONS OF FEVER

Fever is characterised *according to the degree of temperature rise* (by M.V. Chernorutsky):

1) *subfebrile* — temperature 37–38 °C (it is usually connected with keeping heat as a result of decrease of heat emission, irrespective of presence or absence of the latent inflammatory foci);
2) *moderate (febrile)* — temperature 38–39 °C;
3) *high (pyretic)* — temperature 39–41 °C;
4) *excessive (hyperpyretic)* — temperature more than 41 °C.

Hyperpyretic fever is a risk of a patient's life, especially for children.

Temperature below 36 °C is called *hypothermia*.

By the character of the daily temperature fluctuations, the following *types* of fevers (types of temperature curves) are distinguished:

1. *Continued fever (acmastic fever, monoleptic fever)*. Temperature fluctuations within a day do not exceed 1°C, usually in the limits of 38–39 °C. Such fever is characteristic of acute infectious diseases. In pneumonia, acute respiratory viral infections, the temperature elevates quickly within several hours, in typhuses — gradually, within several days: in typhus fever — for 2–3 days, in typhoid fever — for 3–6 days.
2. *Remittant fever*. Long fever with the daily fluctuations of temperature exceeding 1 °C (up to 2 °C), without fall to the normal level. It is characteristic of many infections, local pneumonias, pleuritis, and purulent diseases.
3. *Hectic*, or *exhausting*, fever. Daily fluctuations of temperature are significant — 3–5 °C — with temperature fall to normal or subnormal figures.

These fluctuations of temperature can occur two or three times a day. It is characteristic of sepsis, abscess (of lungs and other organs), milliar tuberculosis.

4. *Intermittent*, or *alternating*, fever. The temperature raises quickly up to 39–40 °C, and within several hours, quickly decreases up to normal. In 1 to 3 days, the temperature rise repeats. Thus, a more or less regular change of high and normal temperature occurs within several days. It is characteristic of malaria, the Mediterranean fever (periodic illness).
5. *Recurrent (relapsing) fever*. Opposite to the alternating fever, quickly elevated temperature is kept at this level for several days, and then temporarily falls down, up to normal one with the subsequent new increase, and it occurs repeatedly. It is characteristic of recurrent typhus.
6. *Perverted fever*. In such fever, the morning temperature is higher than that in the evening. It is characteristic of tuberculosis.
7. *Wrong fever*. Fever of uncertain duration with irregular and various daily fluctuations. It is characteristic of the flu, rheumatism.
8. *Undulant fever*. Change of the periods of gradual temperature increase (for some days) and gradual temperature decrease is marked. It is characteristic of brucellosis (abortus fever).

RULES OF CARE OF FEVERISH PATIENTS

The I period of fever (fig. 9.3). In sudden temperature rise, a patient suffers from chill, pains in the whole body, headache, he cannot get warm.

A nurse should:

1. To calm and put a patient to bed, put a hot-water bottle to feet, cover a patient with a blanket, give fresh tea.
2. To supervise activities of daily living.
3. Not to leave a patient alone.
4. To eliminate draughts.

The II period of fever (fig. 9.4). In continued high temperature, a patient can be disturbed by high fever, the so-called irritative disorders of consciousness, due to the expressed excitation of the central nervous system, manifestation of intoxication delirium (unreal sensation, hallucinations, psychomotor excitation (delirium), tossing and turning in bed).

A nurse should:

1. To organize an individual care.
2. To remove a blanket, to cover a patient with bedsheets.
3. To air a room, avoiding draughts.

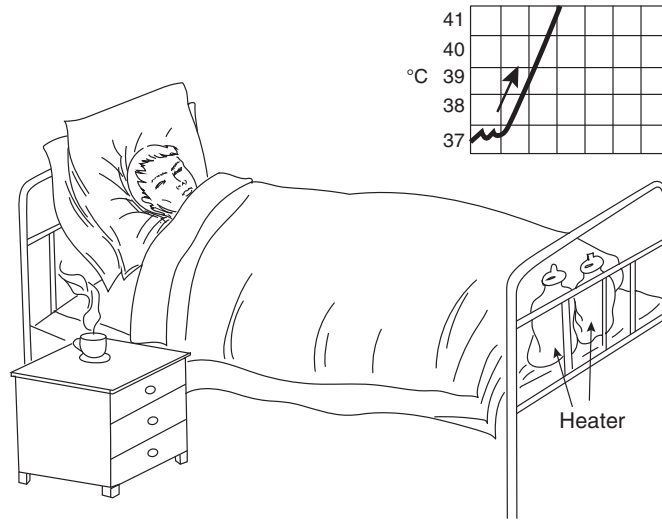

Fig. 9.3. The I period of fever

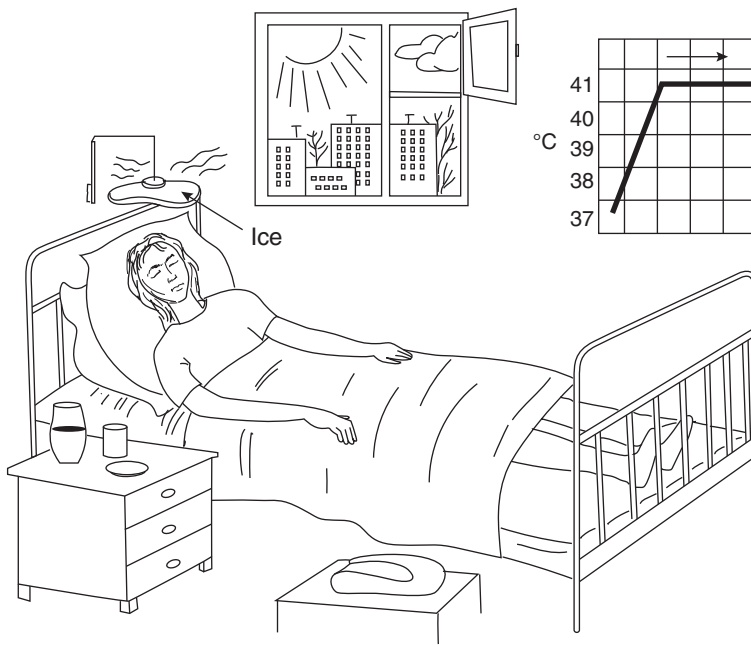

Fig. 9.4. The II period of fever

4. To control haemodynamic indices.
5. It is possible to put on or hang above the patient's head an ice-bag or lotions (i.e. a towel folded four times or linen cloth moistened in a solution of vinegar half-and-half with water and sponged for 5–10 minutes). It should be changed regularly.
6. To look after the oral cavity, the nose and other organs, help in patient's activities of daily living, to prevent bedsore.

The III period of fever (fig. 9.5). Temperature decrease can be gradual *(lytic)* or fast *(critical)*. Critical temperature decrease is accompanied by excessive sweating, general weakness, pallor of skin and collapse (sharp vascular insufficiency) can develop. Blood pressure falling is a major diagnostic sign of collapse. Maximal (systolic), minimal (diastolic) and pulse pressure is reduced. It is possible to speak about collapse in the decrease of maximal BP up to 80 mm of Hg. Progressing decrease of systolic BP testifies the collapse gravity.

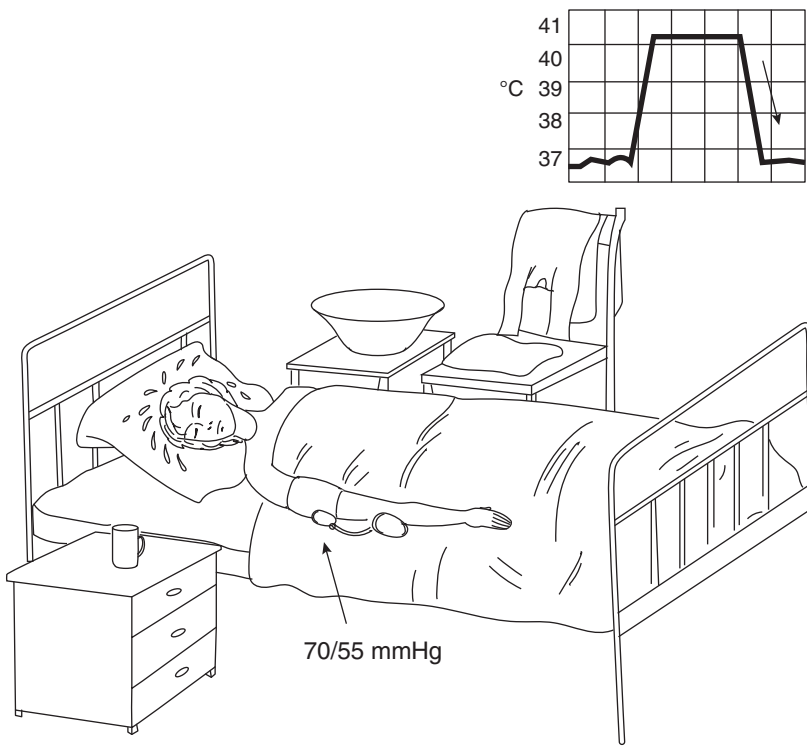

Fig. 9.5. The III period of fever

A nurse should:

1. To inform a doctor urgently about a patient's condition.
2. Not to leave a patient alone.
3. To remove rapidly a pillow, raise a foot part of a functional bed to 20° to give a patient the horizontal position with the raised legs.
4. To put on the arms and feet hot-water bottles in a towel.
5. To use oxygen humidified with water.
6. To change linen and bed-clothes, to sponge skin with dry napkins.
7. To control haemodynamic indices.

PRACTICAL SKILLS

Temperature taking in an armpit

Equipment: the maximal medical thermometer, a glass (a jar, a vessel) with a disinfectant solution (3% chloramine solution), an individual napkin, a temperature chart.

1. To examine an armpit, to sponge it with a dry napkin.
2. To take a thermometer from a glass. In cases of skin allergic reactions at contact with chloramine solution, after disinfection it is necessary to rinse a thermometer under running water and sponge it dry.
3. To shake a thermometer for decrease of mercury column to a mark below 35 °C.
4. To put a thermometer into an armpit so that the mercury tank from all sides touches a patient's body.
5. To fix a patient's arm or to ask a patient to keep a thermometer in fixed position by pressing of the bent arm.
6. To keep a thermometer for 10 minutes.
7. To take a thermometer out and remember the received results.
8. To shake mercury in a thermometer to a mark lower than 35 °C.
9. To place a thermometer in a vessel with a disinfectant solution.
10. To register the result in a temperature chart.

Temperature taking in the rectum

Equipment: the maximal medical thermometer, a glass (a jar, a vessel) with a disinfectant solution (3% chloramine solution), Vaseline, medical gloves, a temperature chart.

1. To put a patient on his side with legs pressed to the stomach.
2. To put on rubber gloves.

3. To take a thermometer out of a glass with a disinfectant and wipe it dry.
4. To shake a thermometer to lower mercury column lower than 35 °C.
5. To oil a thermometer mercury end with vaseline.
6. To introduce a thermometer into the anus to the depth of 2–4 cm and carefully press the buttocks. Buttocks should tightly touch one another.
7. To keep a thermometer for 5 minutes.
8. To take a thermometer out and remember the received result.
9. To wash carefully a thermometer in warm water and place it in a glass with disinfectant solution.
10. To shake a thermometer up to a mark lower than 35 °C.
11. To disinfect a thermometer and gloves.
12. To fix the indices in a temperature chart with the indication of a place of taking.

Temperature taking in the inguinal bent (in children)

Equipment: maximal medical thermometer, jar with a disinfectant solution (3% chloramine solution), an individual napkin, a temperature chart.

1. In order to prevent skin allergic reactions in contact with chloramine solution after disinfection, it is necessary to rinse a thermometer under running water.
2. To wipe a thermometer dry and shake it for the decrease of a mercury column below 35 °C.
3. To bend a child's leg in coxofemoral joint so that a thermometer occurs in the formed skin bend.
4. To keep a thermometer for 5 minutes.
5. To take a thermometer out and remember the received data.
6. To shake a thermometer to a mark lower than 35 °C.
7. To place a thermometer into a jar with disinfectant solution.
8. To register the result in a temperature chart with the indication of a place of taking.

Oral temperature taking

1. To place the bulb under a patient's tongue.
2. To ask a patient to close the mouth for three minutes approximately.
3. In using a nondigital thermometer, rotate it slowly after removing it from the mouth until you can read the temperature.

CONTROL THEMES FOR DISCUSSION

1. Fever's definition.
2. The fever's periods.
3. Rules of temperature taking.
4. Mistakes in temperature taking.
5. Types of fevers.
6. Care of feverish patients in the I period of fever.
7. Care of feverish patients in the II period of fever.
8. Care of feverish patients in the III period of fever.