

SOME OBSERVATIONS ON THE TEMPERATURE,
PULSE, AND RESPIRATION DURING LABOUR
AND THE LYING-IN.

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(*Abstract.*)

THE writers have first considered the effect of *labour* on the temperature, pulse, and respiration.

Temperature.—They find that their results coincide with those of Dr. Giles ('Trans.,' 1894).

Pulse.—(1) *Rate.* They consider the low rate of the pulse after delivery, as given in the text-books, exaggerated. In one hundred cases of normal labour observed in connection with this point, they found that in seventy-six the rate was diminished, in eleven it remained stationary, and in thirteen it was increased after the end of the third stage.

In this series the average decrease between the rates during the first stage, and half an hour after the end of the third, was 11 beats per minute (from 89 in first stage to 78 after delivery).

Parity and the length of the labour have some influence on this fall; and after the administration of chloroform during labour, it is common to find the pulse remaining high after delivery.

In nineteen cases of post-partum hæmorrhage there was an average *rise* of 19 beats per minute (78 during labour, 97 after delivery).

(2) Tension, as estimated by tracings made with Dudgeon's sphygmograph, is usually above normal during labour (1, 7, 19, 25), but is occasionally low, notably in No. 13, in which delivery was followed by considerable hæmorrhage.

Respiration.—After delivery there was, on the average, a fall of one respiration per minute (23 during labour, 22 after delivery). After the administration of chloroform this decrease was not observed.

Lying-in.—Temperature.—The writers found that the average temperature of one hundred cases varied between 98° and 99°, being higher in the evening than the morning (Chart II). The highest average temperature was reached on the first day, and was higher in primiparæ than in multiparæ (Chart I). Rupture of the perinæum had no appreciable effect on the temperature during the puerperium (Chart III).

Pulse.—(1) Rate. They do not agree with the statements in the text-books that the pulse is normally very slow during the first week (see Diagram, from Auvard), but found that the average rate of one hundred cases was never lower than 72 (Chart II). The pulse-rate was faster in the morning than in the evening throughout this series.

(2) Tension. In a few cases (8, 23) the tension is diminished by delivery; but in the majority it is increased (3, 20, 26). Whatever may be the tension of the artery during labour, and whether it rise or fall after delivery, within twenty-four hours it has always increased so much that it is at least as great as, and generally greater than, the tension during labour (3, 9, 14, 7, 24).

This increased tension may persist throughout the puerperium, and commonly lasts longer in multiparæ than in primiparæ (6, 11).

Respiration.—The rate of respiration was found to vary between 20 and 22 per minute. It tends to follow the pulse-rate in being higher in the morning, and not the temperature, which is higher in the evening.

In the accounts of the normal puerperium given in the text-books in general use there occur statements as to the very slow rate of the pulse, and as to other points in

the physiology of this state, which, when we were house physicians at the General Lying-in Hospital, struck us as not representing the condition of, at any rate, the majority of the women confined there.

We therefore began to collect evidence as to what appeared to be the normal in respect of the temperature, pulse, and respiration during labour and the lying-in; and in this note we briefly give the results of our completed observations.

Of course, in many instances we have only to say that our results are in accordance with the usually received ideas; but occasionally we are obliged to differ from what seems to have been handed on from book to book without any attempt on the part of the writer to confirm it by actual experience.

We should here like to thank Dr. Herman and Dr. Dakin for their permission to carry on our investigations.

To make our account as complete as possible we shall first consider the effect of *labour* on the temperature, pulse, and respiration.

Temperature.—In a paper lately read before the Society Dr. Arthur Giles has dealt with the temperature after delivery, especially in relation to the length of the second stage.

The conclusions he draws are—

First, the temperature as a rule rises slightly (to 98.7° F.) during labour.

Secondly, that this rise is somewhat affected by the duration of the second stage, the temperature rising in proportion to the length of it.

Thirdly, that after the administration of chloroform the temperature is commonly low, even if the second stage lasts long.

In the course of our research we have considered our cases as they bore on these points, and have found that our results coincide with his.

Pulse.—This may be dealt with under the two headings of "Rate" and "Tension."

Pulse-rate.—For this purpose the pulse-rate was taken in 100 normal labours during the first stage and about half an hour after the end of the third.

The amount of the decrease in the rapidity of the pulse after delivery, as stated in the text-books, seems to us somewhat exaggerated.

Galabin says "after delivery the pulse falls to a rate below the normal, sometimes as low as fifty or even lower."

Playfair also states that the rate often sinks "to fifty or even forty per minute."

Most other writers give nearly the same figures, some placing the lowest record at thirty-five (Auvard, Blot).

In our cases, compared with its rate during labour, the average of which is eighty-nine, in 76 it was diminished after delivery; in 12 to a rate of seventy, in 25 to from sixty-nine to sixty, in 1 to fifty; in 11 it remained stationary, and in 13 it was increased.

On the average of the whole series the fall in rate was eleven beats per minute (from eighty-nine in the first stage of labour to seventy-eight half an hour after the end of the third stage).

We did not find it follow that where the rate was most accelerated in the first stage there was the greatest fall after the third. Speaking generally, the causes of this fall probably are—a certain amount of relief to the nervous system following delivery, and a diminution in the work of the heart by the cessation of the muscular efforts of parturition, and by the cessation of the placental circulation.

We find that the amount of fall was modified by parity, and by the length of the labour.

Parity.—In our series of cases parity seems to have had some slight influence on the amount of the fall, which is greater in multiparæ, the actual figures being—in 66 multiparæ a fall of twelve beats per minute; and in 34 primiparæ a fall of nine beats.

Length of labour.—In 32 cases (6 primiparæ and 26 multiparæ) in which labour lasted less than ten hours, there was an average fall of eleven beats. In 36 (14

primiparæ and 22 multiparæ) in which labour lasted from ten to twenty hours, a fall of eight beats. In 32 (14 primiparæ and 18 multiparæ) in which labour lasted more than twenty hours, a fall of twelve beats.

We may point out that parity does not influence the fall by means of the length of labour, as in groups 1 and 3, where the fall is greatest, there is no greater proportion of multiparæ than there is in group 2.

We have found that the administration of chloroform also has an effect on the pulse-rate; as out of 58 cases observed, in 20 (34 per cent.) the rate was increased, in 4 (7 per cent.) it remained stationary, and in 34 (59 per cent.) it fell. In those cases in which the rate was diminished the difference between the rapidity before and after delivery was much less than, but in those in which there was an increase it was much more marked than, those cases in which chloroform was not administered. As a result of this, the comparison of the averages (84 during labour, 84 after delivery) shows that the rate does not fall.

To make a general statement without quoting further figures, our examination of these 58 cases shows that we ought not to be surprised if after labour in which chloroform has been administered for any cause, the pulse remains higher than in those cases which have needed no interference.

Rapid pulse in post-partum hæmorrhage.—Sometimes, however, the pulse remains high after labour, in the absence of any immediately obvious cause, such as the administration of chloroform; and in these cases we are usually recommended to be on the look-out for post-partum hæmorrhage. As bearing on this point our figures are—In 11 cases of post-partum hæmorrhage (that is with a loss post partum exceeding 25 ounces) the average *rise* was nineteen beats per minute, the rate during labour being seventy-eight, and after delivery ninety-seven. We have already mentioned that in 13 normal cases the rate was increased, the highest rise being twenty-eight beats, without any excessive loss. Increase of pulse-rate alone

does not therefore necessarily indicate a tendency to post-partum hæmorrhage.

Tension.—In these observations care has been taken to select cases in which there was no evidence of heart disease, or any disease of the kidneys; to affect the arterial tension. The labour was in every instance quite normal, and the tracings in the first stage were always taken during the intervals, and about midway, between the pains. A Dudgeon's sphygmograph was employed with a constant pressure of four ounces; and, to ensure accuracy, two, or sometimes three tracings were always taken.

It is generally accepted that the arterial tension is above normal during labour, and this we find as a rule to be the case (see Nos. 7, 19, 25). The reasons for this increase, which is shown also during pregnancy, are many, the principal being hypertrophy of the left ventricle which has occurred during pregnancy; the increased amount of blood in the systemic arteries, owing to the pressure of the large uterus on the abdominal vessels; and the thickening in the arterial walls, which is said to occur during pregnancy. But we find that in some cases the tension is not increased, but is even subnormal; and this is markedly so in No. 12, a tracing from a patient who subsequently had post-partum hæmorrhage. In No. 16 also it may be remarked that the tension is not so high as usual, but the dicrotic notch is strongly marked.

Pulse in post-partum hæmorrhage.—Let us now consider the question of the rapidity of the pulse in connection with threatening post-partum hæmorrhage. No one will dispute that the cause of this hæmorrhage is want of contractile power in the muscle of the uterine wall, and there is the same want of contractility in the muscle-fibres of the arteries. When, then, the amount of blood in them is diminished by the loss which has occurred during labour, and by the relief of the pressure on the abdominal vessels by the smaller size of the uterus, they are unable to reduce their calibre. The blood, therefore, flows more rapidly along them, and consequently faster in the veins; the

right auricle fills more quickly, and thus the heart has to beat more rapidly to empty itself.

This diminution in contractility will cause a lowering of the arterial tension, and this is what we demonstrate in the tracing (No. 12). If, therefore, during the first stage of labour we find a marked diminution in the arterial tension we should be more on our guard against post-partum hæmorrhage; for if there is want of tone in the arterial walls, we may expect it in the uterine muscles also. We do not wish, however, to assert that a low tension is always followed by post-partum hæmorrhage, as in No. 16 this sequence of events was not observed. In this case the character of the tracing shows that the cause of the low tension is not want of tone in the artery, but probably weakness of the left ventricle. If the low tension is due to weakness of the left ventricle, and not to want of contractility in the arterial walls, we should expect a marked dicrotic notch, and this is well shown in the tracing.

Respiration.—The effect of labour on respiration is not very marked, but there is generally found a slight decrease in frequency when the rate is taken half an hour after delivery, the average of the 100 cases being a fall of one per minute (twenty-three during, twenty-two half an hour after). After the administration of chloroform this decrease is not observed.

LYING-IN.

Temperature.—Our observations on the temperature, pulse, and respiration of the puerperium were made on 100 uncomplicated cases. By this we mean that we have excluded cases that have not run the normal course, but have suffered from disease the result of pregnancy, such as eclampsia, or some disease merely complicating pregnancy, as pneumonia or phthisis. The cases were as far as possible consecutive.* We have included all cases with tem-

* Not necessarily identical with the 100 cases of labour.

porary rises of temperature due to constipation, tension of the breasts, and mental excitement. We have only taken into consideration the morning temperature (taken at 9), and the evening (taken at 5.30). The temperature is taken in the mouth before the woman is washed or douched, and at least an hour after any meal.

Lusk, in his 'Science and Art of Midwifery,' following Temesvary and Bäcker ("Studien aus dem Gebiete des Wochenbettes," 'Arch. für Gyn.,' vol. xxxiii), states that the temperature of the puerperal woman does not differ materially from that of the non-puerperal, and our observations lead us to a similar conclusion.

We find that it is not at all uncommon for the temperature to rise during the first twelve hours, the highest point noted in our cases being 100.4° , and this is often maintained for the first twenty-four hours, after which the temperature comes down, usually rapidly.

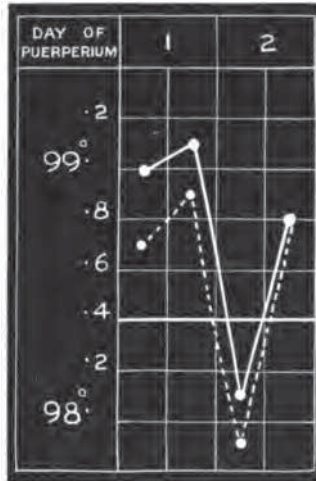
Possibly the cause of this rise is the injury to the genital canal produced during labour, and this rise is much more common in primiparæ, where there is naturally more bruising and laceration.

The accompanying chart (Chart No. I) shows the greater rise in primiparæ, the average of their temperatures on the morning and evening of the first day being 99° and 99.1° respectively, compared with 98.7° and 98.9° in the multiparæ. On the second morning the average temperature of the primiparæ was 98.1° , while that of the multiparæ was 97.9° ; but by the evening of that day they had both become 98.8° , and afterwards were identical throughout the puerperium. On taking the average of the 100 cases we find that the temperature ran a very even course throughout the whole puerperium. On no day was it higher than 99° or lower than 98° .

The slight variations are well shown in the accompanying chart (Chart No. II), where there will be noticed that there is a regular evening rise and morning fall, and a gradual descent as the puerperium advances.

Dr. E. S. Tait, in a paper read before the Society

CHART I.



A composite chart to show the greater rise of temperature in primiparæ after labour.

The continuous line represents the average temperature of the primiparæ, the dotted one that of the multiparæ.

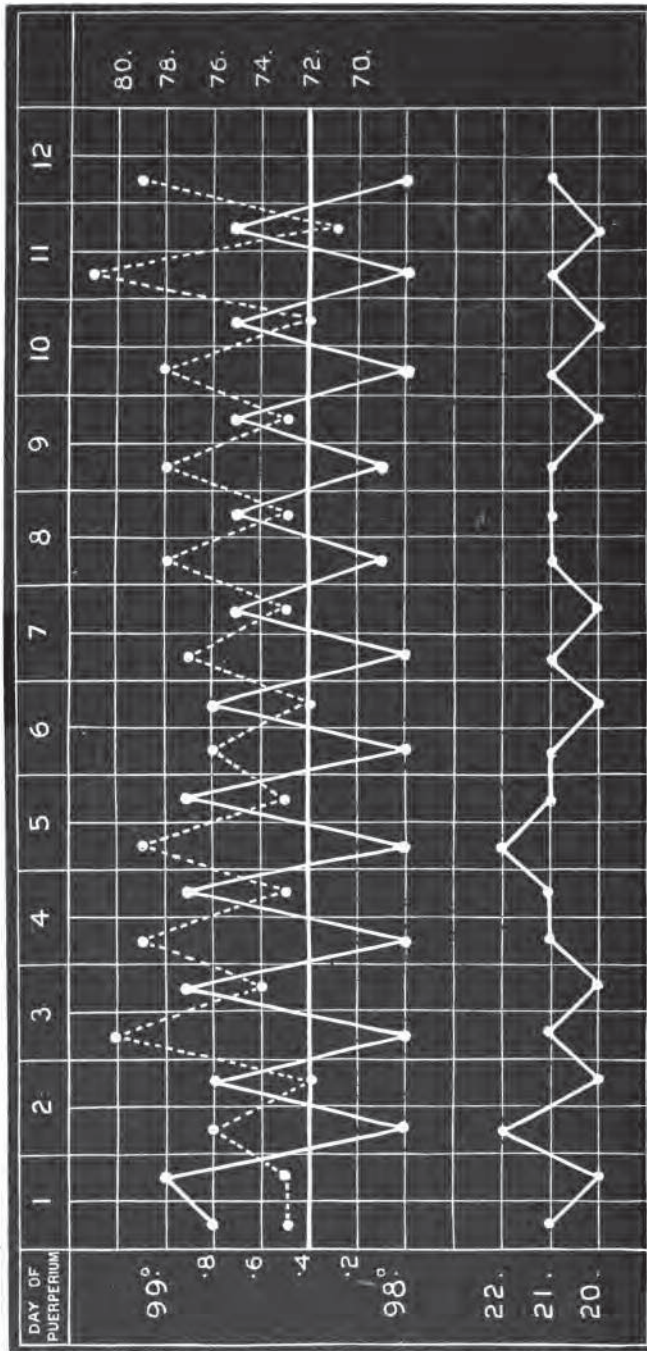
(‘Trans.,’ vol. xxvi), found that the temperature is, as a rule, highest on the third day. Our results do not agree with his, as they show that the highest point is reached on the first day; but it should be remembered that we are only considering the morning and evening temperature, as taken at 9 a.m. and 5.30 p.m., while Dr. Tait has investigated the highest temperature of the twenty-four hours.

Of these 100 cases, four suffered from a rupture of the perinæum requiring one or more sutures. We mention this here as Dr. Tait found that in his series of cases this accident caused a considerable difference in the temperature during the puerperium.

In twenty-three cases of more or less severe tear the average highest temperature was 103.8° ; in seven cases of slight tear 102.6° ; and in eleven cases of labial tear, 103.7° .

We have collected fifteen consecutive cases of rupture of the perinæum requiring one or more sutures, and find

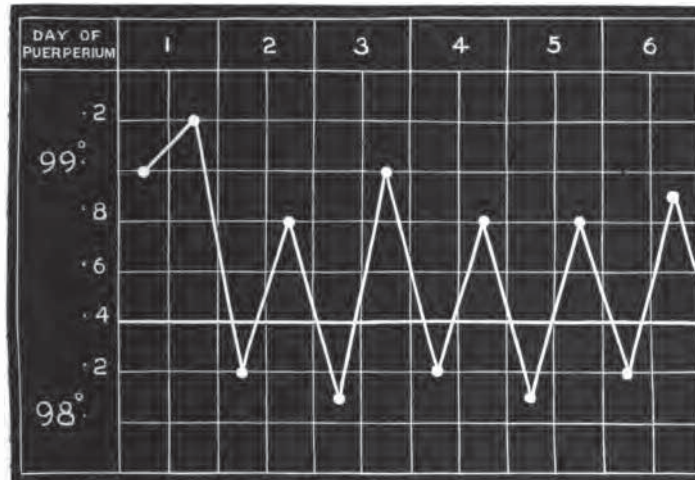
CHART II.



A composite chart to show the average temperature, pulse, and respiration during the puerperium; based on 100 normal cases. Of the two upper curves, the continuous one represents the temperature, and the dotted one the pulse-rate. The lowest curve represents the rate of respiration.

that the average of their temperatures does not differ to any appreciable extent from the normal (Chart No. III).

CHART III.



A composite chart showing the average temperature of fifteen cases in which the perineum was ruptured during delivery.

To account for this difference we may mention that in Dr. Tait's series Condy's fluid was used for vaginal douching instead of corrosive sublimate, while the nozzles of the syringes were kept in a solution of carbolic acid (1—20); and general antiseptic measures were not so strictly carried out as at present.

Through the kindness of Dr. Griffith we have been enabled to examine the charts of some of his cases at Queen Charlotte's Hospital, and we find that the average of the twenty cases taken differs very slightly from those of the General Lying-in Hospital.

Pulse.—(1) *Rate.*—It is generally held that the pulse-rate is slowed after labour, sometimes reaching as low a rate as 40, and most writers agree that this is what should be expected for the first week or so, with perhaps a slight rise in frequency about the third day.

The following are some of the statements given in the text-books :

"The pulse-rate . . . then rises again, and on the second, third, or fourth day becomes remarkably slowed. The rate then varies between 44 and 70,—indeed, a frequency of less than 40, even of 30, has been noticed ; the usual figures are 44, 48, and 56."*

"After delivery the pulse falls to a rate below the normal, sometimes as low as 50, or even lower. Sometimes it is still further diminished on the second or third day, and a rate as low as 40 has been noted. Frequently it regains its usual rate about the third day, but it may remain low as long as a week."†

"This slowing takes place soon after delivery, and lasts for from eight to twelve days, with a momentary interruption about the third day when milk secretion is being established."‡

The diagram (reproduced from Auvard) shows in a graphic form the variations in rapidity which he considers the pulse should undergo ; but we cannot help thinking that this is merely a record of his impressions on the subject rather than the result of observation.

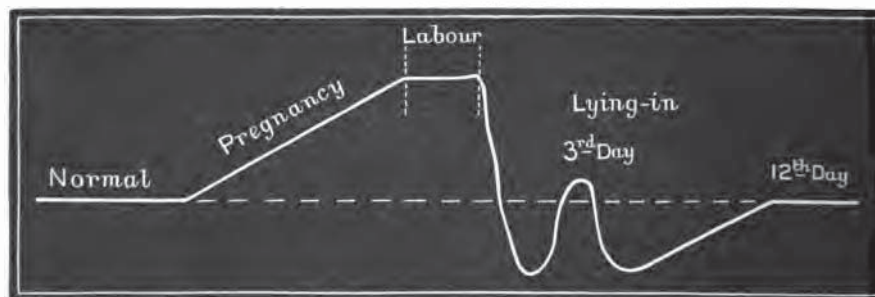


Diagram of the pulse-rate from Auvard's 'Traité pratique d'Accouchements.'

That the pulse is sometimes slow in the beginning of

* Spiegelberg, 'Text-book of Midwifery,' vol. i, p. 289.

† Galabin, 'Manual of Midwifery,' p. 265.

‡ Auvard, 'Traité pratique d'Accouchements,' p. 326.

the puerperium we do not for one moment deny ; but we do not find that this is the rule.

In the 100 cases from the General Lying-in Hospital the averages of all the pulses as taken morning and evening are shown in Chart II. Here it will be seen that the average rate is never lower than 72, and is often nearer 80 than 70. Except on the first day, it is always five or six beats faster in the morning than in the evening, thus contrasting with, and, as it will be seen from the chart, having an opposite daily movement to the temperature, which is higher in the evening.

On examining the Queen Charlotte's cases we found that in them 71 was the lowest average rate, but there was not that markedly regular decrease in the evening rate which is noticed in Chart II. This difference is probably due to the fact that the pulses are not taken at the same time in both series, and in the latter the evening pulse is taken at 8 p.m. after the patient has been douched. We have not found one case corresponding in any marked degree to Auvard's diagram ; or to the nearly parallel statements made in the text-books referred to.

(2) *Tension*.—Although most observers agree that the arterial tension is raised during labour, there is great difference of opinion as to its condition after delivery and in the puerperium.

Marey states that it is always increased after delivery ; but others, as Mayberg ('Archiv für Gyn.,' vol. xii), maintain that it is always diminished.

It is important to avoid confusing the immediate effect of delivery on the tension, and the condition of the pulse when that effect has passed off.

We are of the opinion that the immediate effect of delivery on the arterial tension is in a few cases to diminish it (see tracings 8 and 23), and that this effect lasts about twenty-four hours.

In most instances, however, the contrary happens, and it is actually increased by delivery (see tracings 2, 17, 20, 26).

These differences in the effect of parturition seem anomalous, but there are several factors at work which produce these apparently contradictory results.

The emptying of the uterus allows a large quantity of blood to accumulate temporarily in the portal system of veins, and this is practically withdrawn from the arterial side; and it of course follows that there is a smaller volume of blood distending any particular artery. Then one of two things may occur:

(1) The walls of the arteries and arterioles may contract on to their diminished contents, and although the vessels are smaller in calibre, the tension may remain as high as before, or may even be increased (see Nos. 2, 20, 26).

(2) The vessels may be unable to contract, at any rate quickly, and the tension is that of an imperfectly filled artery, or in other words is lower (see Nos. 8, 23).

Whatever may be the tension of the artery during labour, whether it fall or rise after delivery, within twenty-four hours it has always increased so much that it is at least as great as, and generally greater than, the tension during labour.* This is well shown in No. 14, where although the tension was low both before and after delivery, yet at the end of twenty-four hours it had risen to that seen in the tracing.

The explanation of this rise, as given by Marey, is that the contraction of the uterus after delivery empties its vessels, and the blood contained in them is forced into the general circulation. This constant rise of tension is very striking; but we are unable to give any theory for its causation other than Marey's, which is perhaps hardly satisfactory.

The length of time during which this increased tension is maintained seems to vary very much. In some (Nos. 6 and 11) it was still high when the patient left the hospital on the fourteenth day.

It certainly keeps high longer in multiparæ, possibly on

* See Nos. 3, 9, 14, 17, &c.

account of the greater amount of change in their arterial walls.

In a paper on "The Indications afforded by the Sphygmograph in the Puerperal State," read before the Society by Dr. Fancourt Barnes ('Trans.,' vol. xvi) the writer shows tracings illustrating the effect of high temperatures, such as that of the so-called "milk fever" in rapidly reducing tension.

That slighter causes may act in the same way is shown by the tracing No. 18, where a slight rise of temperature (99.4°), probably due to constipation, has caused a marked diminution in tension.

Respiration.—We have little to add on the subject of the respiration during the puerperium. Spiegelberg states that the respiratory rhythm is slowed, but we have not found this to be the case. The average of our 100 cases is shown in Chart II, where it may be seen that the rate varies between twenty and twenty-two per minute. It tends to follow the pulse-rate in being higher in the morning, and not the temperature, which is higher in the evening.

34 OBSERVATIONS ON THE TEMPERATURE, PULSE, AND

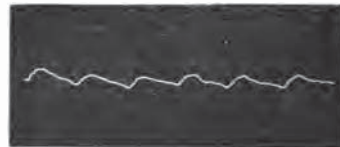
E. G—, aged 30, 5-para.

1.



1st stage.
Temp. = 98°; pulse = 88.

2.



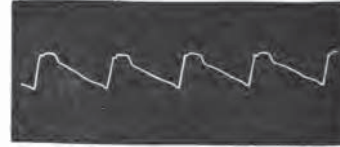
3 hours after delivery.
Temp. = 99°; pulse = 88.

3.



1st day of puerperium.
Temp. = 97.6°; pulse = 68.

4.



2nd day of puerperium.
Temp. = 98.4°; pulse = 74.

5.



7th day of puerperium.
Temp. = 98°; pulse = 70.

6.



12th day of puerperium.
Temp. = 97.8°; pulse = 76.

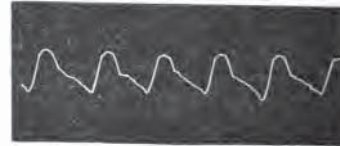
M. S—, aged 37, 10-para.

7.



2nd stage.
Temp. = 98°; pulse = 80.

8.



2½ hours after delivery.
Temp. = 98.4°; pulse = 88.

M. S— (continued).

9.



1st day of puerperium.
Temp. = 98.4°; pulse = 80.

10.



2nd day of puerperium.
Temp. = 98°; pulse = 82.

11.



14th day of puerperium.
Temp. = 97.8°; pulse = 68.

E. H—, aged 21, 2-para.

Post-partum hæmorrhage.

12.



1st stage.
Temp. = 98.4°; pulse = 96.

13.



1 hour after delivery.
Temp. = 99.4°; pulse = 84.

14.



1st day of puerperium.
Temp. = 98.4°; pulse = 80.

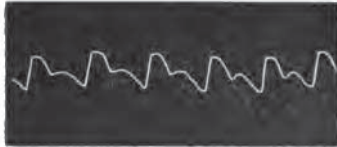
15.



2nd day of puerperium.
Temp. = 98.6°; pulse = 100.

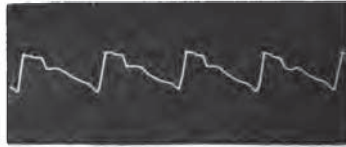
K. M—, aged 25, 3-para.

16.



1st stage.
Temp. = 97.6°; pulse = 98.

17.



16 hours after delivery.
Temp. = 97.8°; pulse = 74.

18.



49 hours after delivery.
Temp. = 99.4°; pulse = 102.

J. A—, aged 29, 6-para.

19.



1st stage.
Temp. = 98.8°; pulse = 96.

20.



6 hours after delivery.
Temp. = 98.4°; pulse = 72.

21.



27 hours after delivery.
Temp. = 99.2°; pulse = 80.

E. G—, aged 21, 1-para.

22.



1st stage.
Temp. = 98°; pulse = 84.

23.



11 hours after delivery.
Temp. = 99.6°; pulse = 86.

24.



36 hours after delivery.
Temp. = 99°; pulse = 62.

A. P—, aged 20, 1-para.

25.



1st stage.
Temp. = 98°; pulse = 68.

26.



8 hours after delivery.
Temp. = 99.6°; pulse = 60.

ANNUAL MEETING.

THE audited balance-sheet of the Treasurer (Dr. Potter) was read.