curable major and minor disorders and by the prevention of social loneliness, boredom, and poverty. In carrying out these tasks the importance of establishing and maintaining close contact with one's ageing patients is stressed and the value of special clinics for the elderly is noted.

The present is still a phase of transition in the development of the Welfare State; the future presents great scope in the development of medical and social services to cope with the problems of the aged.

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VULVAL AND PERINEAL TOILET IN THE PUERPERIUM

BY

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The nursing care of the vulva and perineum in the puerperium has two main objectives—the prevention of infection of the genital tract and the hygiene and comfort of the patient. Details of the procedure vary in individual hospitals or midwifery districts; swabbing the vulva with cotton-wool pledgets soaked in antiseptic solution is part of the routine commonly employed, and was practised until recently in University College Obstetric Hospital. The object of the present study is to determine whether the use of ordinary tap-water, employed as a douche, can replace swabbing of the vulva and perineum with antiseptic solution, without a significant rise in the incidence of puerperal infection of the genital tract.

Technique.—The study was conducted in two phases. The first was a controlled trial to compare the effect of swabbing with antiseptic solution with that of jug douching with tap-water on a group of lying-in patients. The second phase was a study of the incidence of notifiable puerperal infection of the genital tract over a period of 17 months after the introduction of jug douching throughout the hospital. This incidence of infection is compared with the incidence in previous years when antiseptic swabbing was employed throughout the hospital.

Phase I

A controlled trial was started in May, 1954, in a 24-bedded ward. This ward is divided into two separate self-contained 12-bedded units. One sister is in charge of the whole ward, but each unit has its own junior nursing staff. Swabbing was employed in unit A and jug douching in unit B. The trial lasted 14 months. Half-way through the trial the units were changed over in order to eliminate bias introduced by possible local factors such as the amount of dust or minor differences in nursing technique.

Bacteriological studies were carried out during the time, and clinical criteria established to compare the incidence of complications in the two groups of patients.

The antiseptic employed in this study was liquor chloroxylenol *B.P.* 1:10, diluted with hot water to 1:20 just before use.

According to the *British Pharmaceutical Codex* "solution of chloroxylenol is used as an antiseptic for the skin in surgical and obstetric practice, and for this purpose should not be diluted more than 1 in 4." While this concentration is applicable for intact skin, it cannot be used in contact with the mucous membrane of the vulva and vagina or with perineal wounds. The recommended concentration in *Martindale's Extra Pharmacopoeia* (1952) is liquor chloroxylenol 1:80 for wounds and abrasions, and 1:40 as a vaginal douche. One of the best-known brands of chloroxylenol solution was formerly recommended by the manufacturers to be used at a dilution of 1:20, but is now claimed to be twice as effective, and a 1:40 dilution is recommended.

Nursing Procedure

A. Swabbing.—The following technique was employed.

Equipment.—(1) One bowl containing liquor chloroxylenol *B.P.* 1:20, with six sterile cotton-wool swabs. (2) One bowl containing dry swabs and towel.

Method.—The patient was placed on a douche-pan. Unsterile gloves were donned by the nurses and then scrubbed. The labia majora were swabbed separately from above downwards, and then parted with the left hand so that the vestibule could be swabbed. The surrounding parts were then swabbed away from the vulva. The areas were dried and a sterile pad was applied. Next the patient was turned on her side, and the perineum inspected, swabbed, and dried. Finally the pad was adjusted to cover the perineum also.

This routine was carried out three times a day, at 6.30 a.m., 12.30 p.m., and 6.30 p.m., after the routine use of bed-pans, but not if bed-pans were used at other times. It was followed until removal of perineal sutures on the seventh day, or, in patients with intact perineum, until the fifth day.

B. Jug Douching.—The following technique was employed.

Equipment.—(1) Two-pint (1,140-ml.) jug containing tap-water at body temperature. (2) One bowl containing dry sterile swabs and towel.

Method.—The patient was placed on a douche-pan. Unsterile gloves were donned by the nurse and then scrubbed. After preliminary testing of temperature over the nurse's gloved hand, the water was poured over the vulva from a height of about 6 in. (15 cm.) above the symphysis pubis. The vulva was then dried with cotton-wool swabs and a sterile pad applied. Finally the patient was turned on her side, and the perineum dried and also covered by the pad.

Initially in Phase I this routine was carried out twice a day, at 6.30 a.m. and 6.30 p.m., after routine use of bed-pans. Later, in Phase II, it was followed three times a day, at 6.30 a.m., 12.30 p.m., and 6.30 p.m. It was followed until removal of perineal sutures on the seventh day, or, in patients with intact perineum, until the fifth day.

Bacteriological Investigations

A study of the bacterial flora of the perineal skin was made in order to assess differences in the two groups of patients.

Technique.—Five patients, irrespective of the duration of the puerperium, were used as samples from each ward each week. The sampler employed was a sterile filter-paper disk of 2-cm. diameter. This was placed over the perineal body so that the anterior edge of the disk came to the posterior vaginal margin. Each disk was held in place lightly for 10 seconds by means of the metal cap of a 1-oz. (28-ml.) screw-capped bottle. The cap had been flamed to sterilize it and then dipped in sterile saline to render the disk slightly damp so that bacteria would be more easily picked up. After sampling, the disk was transferred with sterile forceps to a bottle containing 10 ml. of 10% broth saline. On returning to the laboratory, the bottles containing the disks were

shaken for two minutes in a mechanical shaker. Part of each sample fluid was then diluted 1:100 in saline, and 1 ml. of this dilution was mixed with Nagler medium in a pour-plate. This medium, which contains 20% human serum and 5% Fildes extract, was chosen because it is transparent and highly nutrient. The plate was incubated overnight in air, and the following day the numbers of organisms on it were counted. A standard 3-mm. loopful of the original undiluted specimen was spread on blood agar and incubated anaerobically to detect the presence of *Cl. welchii* and haemolytic streptococci. Finally a further loopful of the undiluted specimen was spread on MacConkey agar to estimate the numbers of *Bact. coli* present.

Results.—These are expressed (see Table I) as fewer than 10,000 organisms, from 10,000 to 20,000, from 20,000 to 50,000, and more than 50,000 organisms obtained from the original sample. The method does not allow a more accurate estimation than this. The actual numbers of colonies of *Cl. welchii*, haemolytic streptococci, and *Bact. coli* were noted. Except where stated in Table II a few colonies only were found.

TABLE I

No. of Organisms Present in Sample of 10 ml.	No. of Patients on Antiseptic Swabbing	No. of Patients on Jug Douching
Fewer than 10,000	17	13
10,000 to 20,000	7	7
20,000 to 50,000	21	22
More than 50,000	25	28
Total	70	70

TABLE II

Pathogens	No. of Patients on Antiseptic Swabbing	No. of Patients on Jug Douching
Lactose fermenters	7 (2 yielded heavy growths)	13 (3 yielded heavy growths)
Group A streptococci	2	3
" B "	1	1
" G "	1	1
<i>Cl. welchii</i>	1	1

Clinical Assessment

All patients delivered vaginally after the 28th week of pregnancy were assessed. Those delivered by caesarean section were not included, as the factors studied were not applicable.

Infections of the genital tract were classed as either notifiable, according to the Puerperal Pyrexia Regulations, 1951—that is, cases where a temperature of 100.4° F. (38° C.) or more occurred within 14 days of delivery, or as minor pyrexia where a temperature of 99.4° F. (37.4° C.) or more had been sustained for 24 hours or recurred within that time.

The diagnosis of infection of the genital tract was based on clinical and bacteriological findings. Organisms for bacteriological study were obtained by means of a high vaginal swab. Even in the absence of positive bacteriological findings, cases were included as infections of the genital tract if such were diagnosed clinically or no other obvious cause of puerperal pyrexia was found.

In addition to the incidence of notifiable infection of the genital tract and minor pyrexia, delayed healing of perineal wounds necessitating one or more extra days in hospital and the resuture rate of perineal wounds were employed as possible criteria of sepsis.

TABLE III

	Antiseptic Swabbing Series	Jug-Douching Series
No. of cases	325	330
Notifiable infections of genital tract	10 (3.1%)	6 (1.8%)
Minor pyrexias	8	9
Delayed healing	12	11
Resutures	6	6
Intact perineum	61	59

Results.—These are shown in Table III. On the basis of the criteria outlined, no significant increase in the rate of infection was noted in the preliminary trial of jug douching.

Phase II

At the end of the preliminary trial it was decided that no undue risk would be taken by applying the jug-douching technique throughout the hospital. It was further decided to use the incidence of notifiable infection of the genital tract alone as the criterion of the efficiency of this method of vulval and perineal toilet.

From August 1, 1955, to December 31, 1956, there were 1,936 vaginal deliveries, excluding abortions, in the hospital. During this time there occurred 49 notifiable infections of the genital tract. The results over this period are presented in Table IV and compared with those obtained during the preliminary trial in Phase I and during the preceding period of antiseptic swabbing. A statistical analysis of these results is submitted as an addendum to this communication.

TABLE IV

	No. of Vaginal Deliveries	No. of Pyrexia Cases	Incidence of Pyrexia Cases
Antiseptic swabbing:			
1953	1,233	28	2.2%
1954 (Jan.–May)	506	11	2.3%
1954–5 (preliminary trial)	325	10	3.1%
Jug douching:			
1954–5 (preliminary trial)	330	6	1.8%
1955–6 (method established throughout hospital):			
Aug.–Sept., 1955	236	4	1.7%
Oct.–Dec., 1955	338	9	2.7%
Jan.–Mar., 1956	356	11	3.1%
Apr.–June, 1956	338	5	1.5%
July–Sept., 1956	355	10	2.8%
Oct.–Dec., 1956	313	10	3.2%

Analysis of Infection of the Genital Tract

A detailed review was made of the bacteriological findings and associated obstetric conditions in the 36 cases of notifiable infection of the genital tract which occurred in 1956.

There had been no significant rise in the total incidence of infection; but it was considered desirable to determine the nature of the infecting organisms in the cases of infection of the genital tract. If the organisms were of exogenous origin, it might be argued that stricter antiseptic measures for the vulva and perineum could have reduced the incidence of infection. But if the organisms were predominantly endogenous and normal constituents of the vaginal flora, their pathogenic role was thought more likely to be the result of obstetric operations and uninfluenced by the technique of vulval and perineal toilet.

The organisms isolated from high vaginal swabs in these 36 cases were as follows:

Organism	No. of Cases
Anaerobic streptococci	8
" fusiform bacilli	5
<i>Bact. coli</i>	5
Non-haemolytic streptococci	2
Haemolytic streptococci Group A	2
" " " C	1
" " " G	2
<i>Staph. pyogenes</i>	1
<i>Staph. albus</i>	1
<i>Cl. welchii</i>	1
Mixed growth with no major pathogens	8

Associated obstetric complications in these 36 cases were as follows:

	No. of Cases
Artificial rupture of membranes	8
Forceps delivery	11
Breech delivery	3
Twin delivery	2
Manual removal of placenta	1
Retained products of conception	4
Severe anaemia (Hb below 60%)	2
Diabetes	1
Episiotomy	29
Perineal laceration	4

Discussion

The preliminary trial in Phase I revealed that the use of jug douching produced no significant rise in the incidence of notifiable or minor infections, delayed healing, or breakdown of the perineum. The bacteriological studies undertaken at the same time showed no significant difference in the bacterial flora of the perineal skin of the patients treated by the two methods.

It was considered safe, therefore, to introduce jug douching throughout the hospital in Phase II. This step was followed by no significant rise in the incidence of notifiable infection of the genital tract.

Bacteriological study of the 36 cases of infection which occurred in 1956 showed that in only three instances the infecting organisms were not normal inhabitants of the vagina:

Case 1.—Diabetic patient. Artificial rupture of membranes. Spontaneous vertex delivery. Episiotomy. Uterine infection. Haemolytic streptococcus Group A.

Case 2.—Artificial rupture of membranes. Spontaneous vertex delivery. Episiotomy. Secondary post-partum haemorrhage. Retained products of conception evacuated. Uterine infection. Haemolytic streptococcus Group A.

Case 3.—Forceps delivery. Episiotomy. Uterine infection. *Staph. pyogenes*.

In the remaining cases the infecting organisms could be regarded as of endogenous origin. In a significantly high proportion of these there had also been obstetric interference or other factors, such as severe anaemia or retained products of conception, which predispose to infection. Eleven cases had episiotomies but no other factor predisposing to infection; however, the episiotomy rate for the whole hospital is in the region of 50%, and the incidence of infection in episiotomy cases is therefore less than 1%, and no higher than was to be expected.

It is justified, therefore, to conclude that the incidence of sepsis in the hospital bears little if any relation to the types of vulval and perineal toilet employed, but is dependent on the associated obstetric complications.

The jug-douching technique is more economical, inasmuch as it reduces by half the amount of cotton-wool consumed, and dispenses altogether with the use of antiseptic agents and sterile water during the puerperium. From the nursing point of view it was found that, while the saving in time was only small, the jug-douching routine was simpler to carry out by junior nurses. Finally, of the two techniques jug douching was preferred by the patients and considered a more comfortable procedure.

Addendum by N. W. Please, B.Sc., of the Department of Statistics, University College, London

In comparing the incidence of pyrexia during the period when swabbing with chloroxylonol solution was used with that during the period when jug douching was employed, the data may be summarized thus:

	Pyrexia	No Pyrexia	Totals
Antiseptic swabbing	49 (2.37%)	2,015	2,064
Jug douching	55 (2.43%)	2,211	2,266
Totals ..	104	4,226	4,330

The difference in the percentage of pyrexia cases is obviously not significant. ($\chi^2=0.013$ with 1 d.f.)

There is therefore no evidence that risk of pyrexia was greater after jug douching was substituted for antiseptic swabbing.

It might perhaps be suggested that, although the average number of cases during a year has not increased, there is an increased risk of infection spreading through a ward, thus causing a sudden temporary increase in the number of fever cases. That there is no evidence that this has happened

during the period May, 1955, to December, 1956, can be seen from the data in Table IV, where the numbers of cases of fever in each three-monthly period are given.

During the period when antiseptic swabbing was used (1953 to July, 1955) the percentage of pyrexia cases was 2.374, and if the introduction of jug douching has not altered the risk of fever, then we should expect this same percentage

Diagram showing percentage of pyrexia cases with antiseptic swabbing (preliminary survey) and that with jug douching.

in each three-monthly period. The actual numbers occurring in each period will, however, fluctuate by chance, but, assuming the same constant risk, 19 out of 20 periods should have less than approximately 3.8% of fever cases. It is seen from the Diagram that this in fact was so. The data, then, are consistent with the assumption that the risk of pyrexia has remained constant during the whole period 1953 to December, 1956.

If it were desired to watch the situation closely for a further period, then future quarterly percentages could be plotted on the Diagram, assuming the number of deliveries did not vary greatly. It could be seen from the Diagram if an upward trend appeared, and it might give an indication whether there was, for example, a seasonal cycle in the percentage of fevers.

The value of the upper 95% limit, below which the percentage incidence of 19 out of 20 (95%) should fall, may be obtained approximately from the following formula:

$$\text{Upper 95\% limit} = P + 1.645 \sigma$$

$$\sigma = \frac{\sqrt{P(100-P)}}{N}$$

where P = assumed % risk (in this case 2.374, which was the incidence during antiseptic swabbing period)

N = number of deliveries in three-monthly period

The number of deliveries per quarter varied, and hence the upper limit varied from 3.70 for the largest number (356) to 4.00 for the smallest number (236). The mean number of deliveries per quarter was 324, giving an upper 95% limit of 3.77.

Summary

Two methods of vulval and perineal toilet in lying-in women have been compared—namely, jug douching with warm tap-water and swabbing with cotton-wool pledgets soaked in 1:20 liquor chloroxylonolis B.P.

In a preliminary trial there was no significant difference in the incidence of notifiable infection of the genital tract, minor pyrexia, delayed healing, or breakdown of the perineum.

When jug douching was introduced universally in the hospital there was no significant rise in the incidence of notifiable infection of the genital tract.

Evidence is produced to show that infections that did occur are not related to the type of vulval and perineal toilet employed.

Jug douching effects considerable economies in cotton-wool, antiseptics, and the preparation of sterile water; it is simpler to carry out and more comfortable to the patients.

We wish to record our thanks to Mr. N. W. Please for constant advice in planning and carrying out this trial; to Professor Wilson Smith and Dr. Joan Stokes for invaluable help with the bacteriological aspects of the study; to Sister Curtis, who supervised the Phase I trial; to Mr. J. D. S. Flew for permission to include his patients in the trial; and to Professor W. C. W. Nixon, who suggested this study, for his guidance and encouragement.

SHOCK IN PHAEOCHROMOCYTOMA TREATED WITH NORADRENALINE

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The administration of noradrenaline to a patient suffering from phaeochromocytoma seems rather absurd outside surgical practice. Yet this treatment is the logical measure in those rare cases where "spontaneous" hypertensive crises are succeeded by severe shock.

As this treatment has not hitherto been tried the following case is of interest.

Case History

A 77-year-old widow was referred to the Hospital of "The Old People's Town" on April 15, 1953. Until this date blood-pressure values above 170/90 had never been registered.

She was rather adipose and showed signs of cerebral arteriosclerosis, enlargement of the heart to the left, and slight pulmonary hypostases. The blood pressure was 160/110 mm. Hg. Electrocardiographic findings were normal. Roborant treatment had a gratifying effect, and she was mostly up and about until April 25, 1955, when bilateral pneumonia, later complicated by deep phlebitis in the left leg, necessitated bed rest.

At 5 p.m. on May 22 she suddenly felt unwell, was pale and perspiring, dyspnoeic, and anxious, and complained of thoracic pains; her temperature rose to 100.4° F. (38° C.), and pulse rate to 100; the blood pressure was 130/85. On account of auscultatory findings a pulmonary embolus was diagnosed and anticoagulants were given.

At 6.30 p.m. the symptoms became acute, and severe precordial pains together with excitement and shivers set in. Her pulse rate was 120; blood pressure 180/100 (see Chart). The heart sounds were inaudible. Oxygen, procaine penicillin, and intravenous and oral digitalis were administered, but the condition steadily worsened, and at 9.30 p.m. a severe circulatory collapse was manifest: She was cold and perspiring, pale and remote; the palpated blood pressure was 60. As the blood pressure could not be measured by auscultation, only the palpated blood pressure is recorded.

Infusion with L-noradrenaline, 4 mg. in 1 litre of 5% glucose, was instituted, the drip rate being about 30 a minute (about 2 ml. a minute). The patient responded only slowly; but an increase in the noradrenaline concentration (see Chart) fixed the blood pressure at 120, and the noradrenaline concentration could be reduced the following day.

At 5 a.m. on May 25 she was suddenly taken ill with heavy shivers, polypnoea, and a hurried, unequal, but regular pulse at a rate of about 150. The blood pressure was 160 mm. Hg, rising steeply within a few seconds to 200. The noradrenaline infusion was stopped immediately, but the blood pressure did not fall until 30 minutes later, when the alarming symptoms disappeared. At 5.47 a.m. the blood pressure was 90 and the patient showed symptoms of imminent shock; the noradrenaline infusion was resumed, but with no avail until the noradrenaline concentration had been increased.

At 3.40 a.m. on May 26 another spontaneous steep rise in blood pressure occurred accompanied by the same symptoms as before, and the drip had to be stopped for 20 minutes.

This was the first occasion on which the diagnosis of a phaeochromocytoma was suggested, and surmise turned into belief when two typical paroxysms occurred within the next few days. On May 30—nine hours after the last of these attacks—the noradrenaline could be discontinued.

Within the ensuing five days six crises occurred: when most severe they were characterized by shivers so violent that the bed shook; the pulse rate, temperature, and blood pressure rose steeply. There was a pronounced general restlessness, and the patient became voluble, mentally confused, and at periods unconscious. At the onset of the paroxysms she became cold, pale, and cyanotic, but when the attack subsided her complexion became reddish and flushed, and perspiration was profuse. The crises lasted from 30 minutes up to two and a half hours, and were followed by extreme prostration.

During a paroxysm on June 1 a phentolamine ("rogitine") test was carried out. Within a few minutes 5 mg. of intravenous phentolamine caused a fall in blood pressure from 205 to 120 followed by a steep rise up to 185, after which the attack finally subsided.

A sample of venous blood taken during a paroxysm on June 3—that is, four days after noradrenaline had been discontinued—contained 19 µg. of noradrenaline + adrenaline per litre. (Our thanks are due to Dr. Alf Lund, who made the analysis.) The technique applied (Lund, 1950) gives normal values less than 2 µg. per litre (Lund, 1952, 1956).

Simultaneously with a paroxysm on June 4, a pronounced tachycardia occurred; the pulse was often too hurried to be counted, and the blood pressure fell from 170 to 70; every symptom of a severe shock was apparent. As "cedilanid" (lanatoside C) and quinidine had proved of no avail, and since the shock might have been due to the rapid heart action, 500 mg. of intravenous procaine amide was administered; the result was a fall in pulse rate and, unfortunately, also in blood pressure.

The shock was now so profound that the patient was considered to be beyond treatment; however, the noradrenaline infusion was resumed with increasing concentrations. A rise in blood pressure followed, but recurrent symptoms of incipient shock necessitated a further increase in the noradrenaline concentration and noradrenaline proved indispensable for 24 days.

During the second period of noradrenaline treatment no typical paroxysms occurred until June 28, when a hypertensive crisis demanded an interruption of the infusion. When the paroxysm subsided the blood pressure remained normal, and so noradrenaline was definitely abandoned.

From May 30 cortisone and/or corticotrophin were administered in order to improve the patient's general condition; also, nine blood transfusions were given. Severe hallucinations, even actual psychoses, which failed to respond to other therapy, had to be treated by chlorpromazine ("largactil").

From June 5 all peroral administration of drugs, vitamins, proteins, and nutriment (mostly saccharose, cream, and stout) was by stomach tube, which was retained for two and a half months.