XIV.

Golden Rules

OF

Anæsthesia.

GOLDEN RULES

OF

ANÆSTHESIA

BY THE SAME AUTHOR.

A PRACTICAL GUIDE TO THE ADMINISTRATION OF ANÆSTHETICS.

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GOLDEN RULES

OF

ANÆSTHESIA.

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PREFACE.

THE following rules represent some of the principal points to which the attention of the student must be directed during the practical part of his course of instruction in the administration of anæsthetics.

It is hoped that some of them may also be found helpful to those practitioners who are occasionally called on to give an anæsthetic.

As ethyl chloride is now again on trial, and most text-books give no account of its use, a short account of it has been added.

13, WELBECK STREET, W.

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Golden Rules of Anæsthesia.

GENERAL.

1.—**Never** give an anæsthetic without a third person being present.

2.— Never give any anæsthetic — unless it be nitrous oxide for a dental operation—without being **prepared with another** in case the first one proves unsatisfactory.

3.—**Never** give any anæsthetic without having at hand all the apparatus which may be required for the treatment of **emergencies.** These should consist of mouth-props, a wedge to open

the mouth, a gag, tongue forceps, instruments for tracheotomy, a hypodermic syringe—in working order—with strychnine, brandy, or any other drugs which you are in the habit of using.

4.—Always **remember** that emergencies may arise in patients who are fairly healthy, and require an immediate operation on account of an accident, as well as in the comparatively feeble and bed-ridden patients who have been prepared for the administration.

PREPARATION OF THE PATIENT.

Remember that a patient who has been **properly prepared** for an anæsthetic, as a rule takes it far better than one who has not been so prepared.

Remember that the best possible preparation for a patient is to have a light supper, a long night in bed, the

bowels and stomach empty, and the surgeon ready to operate in good time in the morning.

When the patient is weakly the starvation before the operation should not be carried too far, and if the operation may be severe it is a good plan to give an enema of beef-tea or coffee with an ounce of brandy about half an hour before; while if much shock may be expected, gr. $\frac{1}{30}$ of strychnine should be injected.

Smoking and alcohol should be discontinued for some hours before the administration of an anæsthetic.

EXAMINATION OF THE PATIENT.

Always take care **not to frighten** the patient by your examination; and remember that both his respiration and

circulation will be affected by nervousness, and make due allowance for this.

While speaking a few words, watch carefully the **colour of the face** and **look out** for signs of breathlessness. Then **listen to the chest** for signs of heart or lung disease.

If you discover an abnormal **cardiac murmur,** look out for signs of want of compensation; but remember that in cases of death from cardiac failure under an anæsthetic, the heart has often been apparently normal before the administration, and no disease has been found *post-mortem.*

Always ask a patient to take **a long breath**; and if you suspect some nasal obstruction, try whether the nose can be used freely for the purpose of respiration. If it is much blocked, you will find a **small prop** attached to a string placed between the teeth most useful, as

this will ensure free breathing through the mouth.

Always **remove all artificial teeth** which are not firmly fixed, and also remember that very loose teeth may become detached and give trouble; and always see that there are none which are likely to be **broken off** if it is necessary to use a gag.

Remember that a child has been known to retain a sweet in the mouth, and a man a plug of tobacco.

Remember that an inspection of the **back of the mouth** may give you much useful information as to the presence of enlarged tonsils or adenoid growths; these may cause trouble during the administration.

POSITION OF THE PATIENT.

Never give chloroform, or any mix-

ture containing chloroform, to a patient who is sitting in a chair, or who is propped up with many pillows on an operating table.

There is no objection to this position when gas, ether, or ethyl chloride is being given.

If chloroform is required throughout the administration, and the sitting position is **necessary** for the performance of the operation, the patient should be anæsthetised in a position as nearly recumbent as possible, and then gradually raised to that which the operator desires.

When a patient is lying **on his back** see that **the head is turned** whenever possible to one side. In this position the tongue will not fall back so readily, and mucus and saliva which may accumulate will collect in the cheek and can be easily removed.

When a patient is **vomiting** there is

less chance of the vomited material entering the larynx if he is turned on to one side. This position is very useful in cases of persistent vomiting from intestinal obstruction, and the patient should be turned as far over to one side as the operator can allow.

When the operation is to be performed on the upper part of the body, always remember to keep the head turned to the **opposite** side, so that there can be no danger of contaminating the wound.

When during the operation the patient must **lie on one side**, remember that the lung which is lowermost cannot do its work so well, and see that the uppermost lung is unhindered by assistants leaning on the chest, etc.

A very good position may be obtained by the use of Mr. Carter Braine's arm-rest, but if this is not available, care should be taken to prevent the patient

rolling over on to his face, by propping up the arm that is uppermost, and fixing it as much as possible.

ADMINISTRATION OF THE ANÆSTHETIC.

Always try to keep the **room quiet,** both when a patient is being anæsthetized and when he is recovering.

Never let the clothes, dressings, or macintoshes be moved, or an examination be made, while the patient is still in the **first stage** of anæsthesia.

Always start the administration **gradually;** a strong dose of the anæsthetic at first will probably make the patient hold his breath, cough, or perhaps struggle.

Never try to get a patient under quickly.

A little encouragement at first often cheers a patient, and makes him breathe more freely.

When a patient **holds his breath** for some time, **be sure** that he does not get a strong dose of the drug with his next inspiration. This is of the utmost importance in the administration of **chloroform**, as it is generally at these times that an overdose is given, but the same remarks also apply to the administration of mixtures with ether.

When anæsthesia is obtained, the following points must be carefully watched:—Respiration, the pulse, the colour of the face, the condition of the corneal reflex, the size of the pupil, and the amount of muscular relaxation.

Not one of these should ever be neglected.

Remember that your object is to give

just **sufficient** of the drug to produce its desired effect, and not to see how much you can give without endangering your patient's life.

RESPIRATION.

Always watch the respiration most carefully throughout the administration. When the breathing is at all shallow, it can best be estimated by feeling it on the back of two or three fingers held in front of the mouth and nose.

Never be content with watching abdominal or thoracic movement, without at the same time feeling or hearing the breath.

Always try to keep the respiration **as regular** as possible, both in rate and depth.

Always listen to the breathing when the **first incision** is made. If there is no change in the character or rhythm, your patient is probably sufficiently

under; but if the breath is held, it is better to give the patient a little more of the anæsthetic.

Remember that in stretching the **sphincter ani** there will often be some spasm of the larynx, unless your patient is well under.

Remember that when the **breath is held** during a state of light anæsthesia, it may often be started again by rubbing the lips briskly with a towel.

Remember when the nasal passages are more or less blocked, and you keep the mouth firmly closed by holding a face-piece tightly over it, that there is not a very free channel for the purpose of respiration. If a patient cannot breathe well through the nose, it is wise to make sure that he has a **good air-way** through the mouth, and this is best done by placing a small prop between the teeth either before the commence-

ment of the administration or when the patient is becoming unconscious.

The **commonest obstruction** to free breathing is the dropping back of the **tongue.** If pressure behind the angle of the jaw is not sufficient to keep the air-way free you must draw the tongue forward with forceps; but never keep the forceps on longer than necessary, as they bruise the tongue and leave it sore for some time afterwards.

Occasionally it may be necessary to keep the tongue forward for some time, and then it is better to put a **ligature** through it, as by this means it may be kept in a very good position with less swelling and after-pain than would be produced by the forceps.

Remember that frequent applications of the tongue forceps betray want of care or experience on the part of the anæsthetist.

Do not push the jaw forward while the patient is quite conscious.

Remember when keeping the jaw forward for a long time, to bruise the skin as little as possible.

Remember that besides pushing the jaw forward with the fingers of one hand, a good deal may be done to help by pulling the chin forwards and upwards with **fingers of the hand which is holding the inhaler.**

At the same time care should be taken that the lower teeth are not locked behind the upper.

CIRCULATION.

Remember that it is even **more important** to keep a watch on the circulation when **chloroform** or one of its mixtures is being administered, than when ether is the anæsthetic.

The most convenient pulse is the **facial artery,** as it passes over the lower jaw; you can feel this with one finger while you are keeping the jaw forward with another.

Remember that the **amount of shock** which an operation produces in a patient will be indicated in the pulse, and in the colour of the skin.

When a pulse is steadily getting **faster and weaker** in spite of all your efforts to improve it by giving more air, or a more stimulating anæsthetic, it is your duty to **warn the surgeon** that the patient is not doing well, so that he may, when possible, hasten the operation.

Remember that when a patient is **too lightly under** and about to vomit, the pulse may become feeble. This condition must not be confused with the stage of overdose. In both cases the pupil may

be large, but in the case of too light anæsthesia the corneal reflex will be present.

Always keep a careful watch on the pulse of a patient who is recovering from a prolonged administration.

COLOUR OF THE FACE.

Always try to prevent your patient becoming **cyanosed,** and try different positions of the jaw and tongue, etc., till you are satisfied that you cannot do better.

Remember that the colour is well shown in the **lips and ears.**

Remember that when your patient is cyanosed, the seat of operation will also be full of dark blood, which will make the surgeon's work more difficult.

Remember that **cyanosis** or **pallor** is sometimes caused by allowing the patient

to come round too much, and as a result to hold his breath and strain. In these cases the **lips should be rubbed** briskly with a towel to start the breathing again, and rather more of the anæsthetic should be given.

But on the other hand pallor may be part of the result of an **overdose** of the anæsthetic; and then more air must be given.

CORNEAL REFLEX.

Never try to obtain the corneal reflex while a patient is moving or being moved, as you may then do damage to the cornea.

Never try to obtain a corneal reflex while you can **feel resistance in the upper lid** when you attempt to raise it.

When trying the corneal reflex **always** raise the lid with one finger and touch the cornea with another.

Frequent attempts to obtain the reflex in one eye will **deaden the sensitiveness** of the cornea in that eye; and in these cases it is wiser when possible to use the eyes alternately.

In infants, the corneal reflex is not such a reliable sign of anæsthesia as in adults. In these little patients pinching the skin may provoke a response in the form of movements of the limbs, or even cries, when the corneal reflex is apparently lost.

The corneal reflex should **never be abolished** during tracheotomy and operations on the thyroid, or those for empyema.

LIGHT REFLEX.

The pupils as a rule should react readily to light. If a pupil is dilating, and at the same time the reaction to light is **becoming sluggish,** you will

generally find that less anæsthetic is required.

SIZE OF THE PUPIL.

When a patient is becoming anæsthetized the pupil is generally **dilated**, and it is at this stage, before the corneal reflex is lost, that most operations under gas are performed; but as more of the drug is given and the patient becomes more fully under its influence, the pupil again **contracts**.

During an operation the pupil should be of a medium size. If **too much** of the anæsthetic is given it will gradually dilate (dilatation from paralysis), the light reflex becoming sluggish, with the corneal reflex also abolished.

If **too little** of the anæsthetic is given the pupil will also dilate (reflex dilatation), with a brisk reflex to light, and a lid-reflex to touch.

As a rule the average size of the pupil, of a patient under ether, is **larger** than that of one under chloroform. This is in part due to the use of a closed apparatus for the administration of ether.

Remember that a very small pupil, the so-called "pin-point" pupil, is often a sign of light anæsthesia, and a precursor of vomiting.

RECOVERY FROM THE ANÆSTHETIC.

Coughing and vomiting are the two most common of the after-effects of an anæsthetic.

Coughing may to a great extent be relieved, and the risk of more serious respiratory trouble diminished, by keeping the room thoroughly **warm** till the patient has quite recovered from the effects of the anæsthetic.

Vomiting is often caused by giving food too soon. As a rule about four hours should elapse before the first liquid should be given, which may consist of some weak tea. Milk should be avoided, and no solid food should be given until liquids are retained without any discomfort.

Sipping very hot water, or **Sucking** small pieces of **ice** will sometimes be of service, and if the vomiting is severe it must be treated on general principles.

Remember that vomiting is more likely to occur after ether than after chloroform, but that in the former case it occurs as a rule **before the patient is conscious,** and consists of the removal of saliva and mucus which has been swallowed; but if vomiting occurs after chloroform it is generally **when the patient has become conscious,** and often after the first food has been taken.

It is more likely to recur than the vomiting after ether, and to be accompanied by more discomfort.

When the operation is completed, see that the patient is carefully **laid in bed,** and not dropped into it.

If the nature of the operation will allow it, a patient recovering from an anæsthetic will be more comfortable **lying on one side,** and in this position both coughing and vomiting, if they occur, can be more easily accomplished.

ADMINISTRATION OF NITROUS OXIDE FOR DENTAL OPERATIONS.

Whenever possible **try** your gas cylinder before the patient enters the room, or at any rate be careful that you do not alarm an already nervous individual by violent rushes of gas from the cylinder.

Always see that the **valves are acting** well before applying the face-piece.

Remember that it is **easy to let out air** from a distended pad of a face-piece when applied to the face, but it is impossible to fill the pad again without removing it.

Never have your bag so distended with gas that when you turn the tap for the first time the patient gets a puff of gas into his mouth.

Remember that you will as a rule be out of the operator's way if you **stand at the left** of the patient, or **behind the chair.**

Before you begin the administration, always see that your patient's head is in a **good position**, that is to say as nearly as possible in the same axis as the body; the chin should not be pushed forwards, or upwards.

Always ask your patient to take a long breath, and watch to see whether there is any sign of constricting clothing.

Be careful to place the prop on a sound tooth; and if the gag is to be used later on for the other side, see where it should rest while you are inserting the prop.

Never use any form of prop unless it is **attached to another one** by silk or catgut, etc., so that there can be no danger of the patient swallowing it.

When a patient is **not able to open the mouth** sufficiently wide for a suitable prop to be placed on the opposite side of the mouth, be sure that you get some sort of prop between the teeth on the same side as the tooth to be extracted, and when the patient is fully anæsthetized, open the mouth widely by means of a Mason's gag placed on the opposite side.

Remember to insert the prop as the **last** preliminary, and do not leave the mouth propped widely open for some time while you are making other preparations.

Remember that a face-piece will generally fit better when held in position as **lightly** as possible. Pressing it too firmly against the face hurts the patient, and spoils the shape and fitting of the face-piece.

Remember when applying the face-piece to keep one or two **fingers under the chin.** By doing this you can often keep a better air-way, and by a little pressure you can prevent a nervous patient from opening the mouth too widely and so displacing the prop.

Always keep the room as **quiet** as possible when administering nitrous oxide.

Never let your bag get less than half full, for if both cylinders are then empty, you may not have enough gas to obtain anæsthesia by re-breathing.

Do not allow re-breathing unless your supply of gas is running short, or you are going to change to ether. Re-breathing is generally followed by more headache or giddiness than when the valves are used throughout.

When giving gas without air always **try to remove the face-piece** just before the first appearance of jactitation, as otherwise the operator will be much inconvenienced.

Remember that in all patients except very vigorous or alcoholic men you can get a better and **quieter anæsthesia** by giving a suitable supply of air or oxygen with the nitrous oxide.

Remember that the **best sign** of

anæsthesia when giving gas and air, or gas and oxygen, is the **deep, regular breathing,** which is often accompanied by some snoring. You should always try to work by this sign rather than by relying on the absence of the conjunctival reflex, as good anæsthesia may be obtained without this being established. It is very unpleasant for a patient when partly conscious to feel a finger touching the eye.

While the operation is going on always keep the head as **still as possible,** and in the most suitable position.

When the operation is on the **lower jaw,** support should be given to prevent dislocation.

Remember that when the operation is on the lower jaw, the operator will sometimes press the tongue so far back that respiration is impeded. The anæsthetist should see that this is not carried

too far, and should **push the jaw forward** when necessary.

Always watch for teeth, or fragments of teeth, **left in the mouth**, and when possible help the operator by removing them. If in spite of your endeavours to prevent it a tooth gets to the back of the mouth, try to remove it by passing a finger along the tongue, and if the patient has come round, make him lean well forward in the chair with the head bent down, tell him to cough, and slap him on the back. Before inverting the patient, which is sometimes necessary when spasm is set up by the presence of the foreign body in the larynx, **always** be prepared to perform **laryngotomy**.

Always watch the **respiration** of a patient under the influence of nitrous oxide, and if you notice that as the operation proceeds the colour instead of improving **becomes worse**, and respira-

tion is not satisfactorily performed, stop the operation, pull the tongue forward, and compress the chest. If these measures are insufficient, lift the patient from the chair on to the floor, hold his tongue forward with tongue forceps, and perform artificial respiration till he breathes naturally and regularly by himself.

NITROUS OXIDE IN GENERAL SURGERY.

In considering the advisability of giving gas with air or oxygen for a surgical operation **remember**:—

1.—That it is very useful from the fact that no elaborate preparation of the patient is necessary, and recovery is generally rapid and unaccompanied by unpleasant symptoms, such as vomiting, etc.

2.—That it should be reserved for those operations which do not take more than ten minutes, and in which a very profound anæsthesia is not required.

3.—That when the administrator is accustomed to the more complicated apparatus, more satisfactory anæsthesia can generally be obtained for these cases with gas and oxygen than with gas and air.

4.—That the rapid recovery is sometimes a drawback; as for instance in the breaking down of adhesions, when the patient recovers from the effect of the gas so quickly that most acute pain is often felt.

NITROUS OXIDE AND OXYGEN.

Remember that as a rule you can get a **longer and quieter** anæsthesia when air or oxygen is given with nitrous oxide.

When giving it see that your face-piece fits accurately, and that the two bags are kept equally distended.

For a **dental operation** the best sign of anæsthesia to work by is the deep regular breathing, accompanied generally by faint snoring; but for short **surgical operations** the corneal reflex may be kept abolished.

ETHER.

When giving ether with a Clover's inhaler, **remember the following points:**—

Select a face-piece, and then fix it securely to the body of the inhaler.

Pour out a measureful of ether, and smell it to **make sure** that it is really ether.

Turn the indicator to 2 and pour the ether in.

Turn the indicator back to 0, and blow through the face-piece and inhaler to remove all smell of ether.

Now fit on the bag, and holding the inhaler in the right hand tell the patient to take a good breath and then to blow it out into the bag, at the same time applying the inhaler so that the bag becomes distended.

Remove the inhaler during inspiration, and let another expiration be caught in the bag.

Never distend a bag into which a patient is going to breathe with your own expired air.

When the bag is distended to about **two-thirds** of its size, keep the face-piece applied continuously.

Always allow five or six respirations to be taken with the indicator at 0, and then slowly turn towards 1.

Remember that you **can hardly start too slowly.** If you give ether very gradually you may anæsthetize the patient without his noticing the ether to any disagreeable extent. By turning on the ether too quickly, you will cause your patient to hold the breath, cough, or else struggle, and it may be some time before a tranquil anæsthesia is obtained.

Never increase **the strength of the vapour** while the patient is holding his breath; but wait till natural breathing begins again.

If the patient coughs at the beginning of the induction give a weaker vapour for a few breaths, and then increase the strength again very gradually; but if the coughing does not begin till the patient is almost anæsthetized, you may stop it by pushing the ether till anæsthesia is complete.

Remember that a **full strength** of ether is **seldom required,** except for very vigorous or alcoholic men. For most women you need not go beyond 2, and for children 1 or 1½ is quite sufficient.

Whenever possible the head should be **turned to one side** during the administration of ether, on account of the amount of mucus and saliva which is often secreted. In this position much of the liquid will collect in the cheek which is resting on the pillow, and may be easily removed. If the secretion is thin, it is a good plan to place a corner of a towel in the cheek, and much of the liquid will then be gradually absorbed.

The **stimulating effects** of ether are most beneficial during the induction period and for the earlier stages, and for short operations; but the inhalation of ether for long periods and in strong doses may produce bronchitis or even

pneumonia, unless special care is taken during the stage of recovery.

Whenever possible **induce** anæsthesia with **ether**, and if the operation is to be a long one, **change** at the end of half an hour, or sooner if necessary, to a mixture with chloroform, or in some cases chloroform itself for the rest of the time. In operations on the chest and abdomen, after which it is important that there should be as little coughing or vomiting as possible, it is wiser to change from ether earlier, say after about 10 to 15 minutes.

Remember that the stimulating effect of ether is **especially desirable** in all operations which are likely to produce much shock, such as operations on large joints, on sensitive parts, as the generative organs, on the anus, etc., and for extensive operations for cancer of the breast, etc.

When ether has been given during a long operation, **remember** that besides the special care which should be taken to prevent bronchitis, it is important to **watch the pulse** while the patient is recovering. The stimulating effect of the ether will gradually be lost, and the shock produced by the operation will become more apparent. In these cases it may be necessary to **give strychnine** freely.

When it is necessary to **change from ether** to a mixture or pure chloroform, this should be done whenever possible during light anæsthesia, that is to say while the corneal reflex is present. Chloroform should be given **sparingly at first,** as on account of the deep respirations established by the ether, too large a dose might soon be absorbed.

When trouble is caused by **mucus in the larynx,** it is advisable to allow the

patient to cough it out before changing the anæsthetic, if this will not interfere with the operation.

When **giving gas** before ether, especially when using a single bagful, be sure that the face-piece fits accurately, and till the patient is anæsthetized do not remove it to admit air, unless it becomes necessary on account of cyanosis or spasm. It is unpleasant for the patient to have an interval of semi-consciousness between the effects of the nitrous oxide and those of the ether.

If you have **ethyl chloride** at hand, remember that three or four minims will make a very good substitute for gas before ether.

Remember that you cannot be too careful in looking after your ether apparatus, and **cleaning and drying** it after each administration. The metal receiver is best cleaned with alcohol. A

weak antiseptic solution either of carbolic (1 in 60) or perchloride of mercury (1 in 2000) will be the best for washing out the bag, and if an Ormsby inhaler is used the bag may be turned inside out.

All rubber bags and tubes, unless in frequent use, should be **warmed** occasionally to prevent the rubber from perishing.

CHLOROFORM.

Always remember to start the administration with a very **weak** vapour, and never be in a hurry to get a patient under quickly.

Always keep a most careful watch on the **respiration**, and if you are not quite satisfied with the sound of it, the breath should be felt by some of the fingers held near the face of the patient.

Remember that any **obstruction to**

respiration will greatly increase the danger of the absorption of an overdose.

As chloroform is a depressant to the circulation, remember that a **much more careful watch** should be kept on the **pulse** and on the colour of the face than is necessary when ether is being given.

Never attempt to push the administration when the patient is holding his breath or struggling; but on the other hand remove the lint or mask further from the face, and try to re-establish the natural breathing by **rubbing the lips** with a towel, and when the breathing has become freer and more regular, then, and not till then, give more of the chloroform.

Contraction of the pupil and fixity of the eyeball are **more useful signs** of anæsthesia with chloroform than with ether.

Remember that a condition of **sleep** instead of true anæsthesia may be produced by too small a dose of chloroform, and be sure that your patient is really under, before the surgeon makes the first incision. This condition of **false anæsthesia** is more likely to occur with infants and small children than with adults, and in their case the corneal reflex may even be abolished without real anæsthesia being established. It is wiser in these instances, when the operation is an important one, say an abdominal section, to make sure that the patient is **really anæsthetic** by pinching the skin or some other means of provoking a reflex.

Remember that the **path of safety** between too much and too little of the anæsthetic is narrower with chloroform than with ether.

When **children** breathe badly or begin

to show signs of an overdose, they may often be quickly restored by holding them up by the feet with the head just resting on the table, at the same time placing a finger in the mouth to keep the tongue forward, and rhythmically compressing the chest as a form of artificial respiration.

Anæsthesia with chloroform may be induced and maintained very satisfactorily by means of a **Junker's inhaler,** with a face-piece made either of glass or flannel stretched over wire. This method is specially useful during operations on the head and neck, when the anæsthesia may be kept up without bringing a bottle near the face to drop more chloroform on the lint or a mask.

Remember too that the Junker's inhaler is the most suitable apparatus to keep up a light anæsthesia such as is required in all operations on the thyroid.

When using a Junker's inhaler always **remember** :—

1.—That it is better not to have more than about six drachms of chloroform in the bottle,

2.—That great care must be taken when using the older form of the apparatus with two separate tubes to see that they are attached to their corresponding tubes on the bottle, and **always make sure** that the apparatus is working properly before you attempt to give any of the vapour to your patient, and so avoid the deplorable accident of pumping liquid chloroform on to your patient's face, or even into his mouth.

3.—That you will get more chloroform vapour through the inhaler by regular contractions of the bellows, than by hurried pumping with the bellows only partly contracted.

4.—When using a mouth or nasal tube with Junker's inhaler, see that the bore is **sufficiently wide** to allow a free stream of chloroform vapour.

As chloroform easily decomposes, it is a good plan to buy it in **small bottles,** and to keep it away from heat and light.

MIXTURES OF ETHER AND CHLOROFORM.

Always regard mixtures of ether and chloroform as practically weak **forms of chloroform,** and consequently be careful in their use as you would be with the more powerful drug.

Never adminster them from a **closed inhaler** such as Clover's ether inhaler.

Always be careful not to burn the face of your patient. If the mixture is given from a flannel mask or lint, and

large quantities of the mixture are necessary to produce and maintain anæsthesia, it is a good plan to smear the face with **vaseline** or lanoline to prevent this occurrence. If a Rendle's mask is used, be careful to pour the mixture on to the sponge, and not on to the flannel bag.

When using a Rendle's mask, always keep it as **far away** as possible from the patient's eyes, as if this is not done some conjunctivitis may follow.

If you are not giving anæsthetics frequently, it is better to make a **fresh mixture** of chloroform and ether for each occasion.

A good form is the **C.E.** mixture, that is, two parts of chloroform to three of ether, or the A.C.E. mixture without the alcohol: but remember that it is slightly **stronger** than A.C.E., as the chloroform

is in the proportion of 2 to 5, instead of 2 to 6.

DIFFICULTIES AND DANGERS OF ANÆSTHESIA.

Remember that with gas, ether, and apparently with ethyl chloride, respiration will fail **before** circulation; but with chloroform or its mixtures, **either** feeble breathing, a bad colour, or a failing pulse may be the first sign of danger.

Remember that undesirable effects may be obtained with ether in three different ways:—

1.—By giving **too strong** a vapour at first. The patient coughs violently, or holds his breath, becomes cyanosed, and probably struggles.

The remedy for this is obviously preventive, and care should always be taken

that a **weak** vapour is presented to the patient at first.

2.—By continuing it in too strong a proportion, or by giving it for too long a time, so that the soft parts become much congested, and a large amount of **mucus and saliva** is secreted. This is shown by the noisy breathing, accompanied by moist sounds, and by gradually increasing cyanosis. The pupil dilates, but the pulse, though quickened, may remain good for some time. If this condition is neglected, the breathing becomes shallow, and the patient may pass into a serious state.

The appropriate treatment is either to give the vapour in a more dilute form, or if the obstruction to respiration is marked, or the amount of secretion is large, the anæsthetic should be changed to chloroform or one of its mixtures.

The patient's head, and in serious cases his body, should be turned over to one side, and as much as possible of the secretion should be removed by careful sponging of the mouth and pharynx.

3.—Though a patient may be taking ether perfectly, that is to say, breathing well without any abnormal amount of secretion, he may yet be placed in a dangerous condition by **over-stimulation** through an overdose of the drug.

In this state the breathing gradually becomes faster and faster, and finally very shallow and "catchy" in character; the pulse becomes faster and gradually weaker; the pupil dilates, and remains insensitive even to light.

Such a state demands a free supply of air, and careful watching before any more anæsthetic is given; and if any

is required, the A.C.E. mixture will generally be found to be the best,

Remember that **failure of the circulation** which occurs with chloroform may be of two kinds :—

1.—The **sudden** form, or syncope, in which the patient is dead almost before anything unusual is suspected.

2.—The **gradual** failure which occurs during an operation, either from shock, excessive hæmorrhage, or from an overdose of chloroform. In this form the breathing gradually becomes feebler and feebler, and finally stops ; the pulse becomes smaller and faster ; marked pallor is observed, with a dilated pupil, and no corneal reflex.

The **treatment** of both these forms is the same, though unfortunately in the first it is often unsuccessful. It consists of lowering the head, pulling the tongue

forward, performing artificial respiration, and injecting hypodermically strychnine (grain 1/30) or brandy (℥1). Further treatment may consist of transfusion, which is specially for use when there has been hæmorrhage, electrical stimulation of the heart, or manual compression.

ARTIFICIAL RESPIRATION.

In performing artificial respiration, **always remember**:—

1.—That it is useless unless **the air-way is clear**; so let an assistant always keep the tongue forward while you are doing the movements.

2.—Always start with **compression** of the chest, so that no more chloroform is sucked in.

3.—**Careful** movements—not more

than 20 a minute—are of far more value than rapid and hurried ones.

4.—Be patient, and **do not give up** the movements, though you seem to be doing little good at first, as a patient has been restored by this means after a considerable period.

CHOOSING THE ANÆSTHETIC.

Remember that you owe it to your patient to consider which will be **for him the most safe** of the anæsthetics commonly used. First comes nitrous oxide, then ether, then mixtures of ether and chloroform, and lastly chloroform itself, which may be shown by statistics to be more than five times as dangerous as ether.

Ethyl chloride, which is now being

tried again, seems as though it will rank between nitrous oxide and ether.

Remember that though it may often be necessary to change to a mixture, or even pure chloroform, you should always consider whether it is not possible to anæsthetize the patient with ether, and thus get over the period which is most dangerous when chloroform is used from the beginning of the induction.

When the time required by the surgeon **is short,** and the depth of the anæsthesia not profound, always consider the advisability of using **nitrous oxide or ethyl chloride.**

If after consideration, both these drugs seem insufficient, then consider the possibility of **ether.**

Never give nitrous oxide or ether when a patient has any difficulty of

respiration due to goitre, angina Ludovici, swollen tongue, etc.

Remember that ether may be contra-indicated by (*a*) the condition of the patient, (*b*) the necessities of the operation.

(*a*). **Ether** is often unsuitable at the extremes of life, in patients with aneurysm or markedly diseased arteries, in those with an inflamed or narrowed respiratory tract, and those suffering from severe albuminuria.

(*b*). **Chloroform** is to be preferred :—

1.—When it is specially desirable that no congestion should be produced by the anæsthetic as in operations on the brain and cranial nerves, the thyroid gland, etc.

2.—When an excessive secretion of mucus or saliva would increase the difficulties of the operator, as in the

removal of growths from the larynx, and other operations in the mouth and throat.

3.—In many operations on the face or mouth where it would be impossible to keep an ether inhaler in position, though in some of these it will be possible to anæsthetize the patient with ether, and then change to a mixture or pure chloroform.

4.—When a cautery has to be used near the mouth.

5.—When a very light anæsthesia is required, as in cases of painful labour, eclampsia, and when relieving the spasms of tetanus. In all these cases chloroform may well be given with a Junker's inhaler.

6.—In some operations on the abdomen, when absolute relaxation of

the muscles is required, with very quiet breathing.

The age of the patient is an important factor in choosing an anæsthetic, and the following limits may be taken as a rough guide :—

From infancy to 2 or 3 years—**Chloroform** is the best anæsthetic.

From 3 to 6—**A.C.E.** mixture.

From 6 to 10—**Ether**, preceded by a little A.C.E. mixture.

From 10 to 50 or 60—**Ether**, preceded by nitrous oxide, or by ethyl chloride.

When the age of the patient is more than 50, the choice depends entirely on his general condition. If it is decided to give ether, it is better to precede it with some A.C.E. mixture rather than with nitrous oxide, and in many cases

chloroform or a mixture will be found the best agent throughout.

When a patient is suffering from marked **cardiac disease**, a mixture of ether and chloroform should be slowly and carefully given. When a cardiac murmur is heard, and there are no signs of want of compensation, ether may be given ; but the colour of the face should be carefully watched, and a good supply of air allowed.

ETHYL CHLORIDE.

This drug has recently been again tried to some extent, and may in a sense be regarded as a substitute for nitrous oxide.

As an anæsthetic for prolonged operations it does not possess any advantages over those usually employed ; but for

those which are as a rule done under gas, ethyl chloride has the advantage of being easily portable, and not requiring any very elaborate apparatus, while the anæsthesia obtained by a single application is on the average longer than that with nitrous oxide, and unaccompanied by cyanosis.

The drawback to its use is that the recovery is not so good as after gas, vomiting, headache, and giddiness being much more common. Occasionally the patient is quite collapsed for some time, and this is a great drawback to its use in the consulting room of a dentist or surgeon.

Ethyl chloride is **best administered** by means of some form of closed inhaler consisting of a face-piece and india-rubber bag. An Ormsby inhaler is perhaps the best, but the face-piece of a Clover inhaler attached to the bag,

without the metal reservoir for the ether, will answer very well.

The **average dose** for adults is 5 cc., but for children this may be decreased to 3 cc. It is generally well taken, and it is easy to obtain a good anæsthesia rather longer than that which results from a single administration of gas and air, or gas and oxygen. The absence of cyanosis is obvious, indeed the patient's face often becomes flushed. Circulation is somewhat stimulated, and the only danger appears to be from any interference with free respiration.

For a short operation, the face-piece may be removed as soon as the breathing becomes deep and snoring; but if as long a time as possible is desired, the anæsthetic may be pushed till the corneal reflex is abolished.

The anæsthesia obtained is just that

required for a rapid removal of tonsils and adenoids, the reduction of some dislocations, or for the removal of one or two difficult teeth, etc.

Another **good way of giving** ethyl chloride is to place 5 c.c. in a test-tube, then fill with nitrous oxide the ordinary bag of Hewitt's gas apparatus, and detach it as if it were to be used to precede ether in a Clover's inhaler. Now attach the test tube containing the ethyl chloride to the vulcanite tap of the gas-bag by means of a short india-rubber tube.

The administration of the gas is started in the usual way, the patient breathing air through the valves till it is seen that they are working well; the gas is then turned on, and the upper tap is quickly turned so that re-breathing takes place. The vulcanite tap at the bottom of the bag is then turned and the ethyl chloride

admitted to the gas-bag by tilting up the test tube.

Very good anæsthesia may be obtained in this way, and it is specially suitable for nervous patients who do not breathe well at the beginning of the administration.

As mentioned above, another use of ethyl chloride is to **precede ether** in the place of nitrous oxide. To do this it is only necessary to spray 4 or 5 c.c. on to the sponge in an Ormsby inhaler or into the Clover bag, and let the patient have a few breaths before giving the ether. The result is generally very satisfactory; even stout vigorous men, who sometimes give trouble with gas and ether, being quickly and easily anæsthetized without any marked cyanosis.

Ethyl chloride of British manufacture is as good as any other; and the various

forms of special inhaler which are advertised are quite unnecessary.

The above remarks may be applied to **Somnoform**, a mixture of 60 % of ethyl chloride with methyl chloride and ethyl bromide, though this mixture is probably less safe than pure ethyl chloride.

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